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INCREASING TIME SENSITIVE TARGETING (TST) EFFICIENCY THROUGH HIGHLY INTEGRATED C2ISR

by

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Contents

Page

Illustration

Page

Tables

Page

Preface

After my experience in Operations DESERT STORM and ALLIED FORCE, I saw the need for the C2 and ISR communities to work together. The USAF Weapons School (USAFWS) at Nellis AFB, NV, incorporated the C2 and ISR communities in 1993, including the Rivet Joint and Compass Call platforms into the Command and Control Operations Division. At that time, the architects did not clearly know such inclusion would affect the way C2 and ISR assets employed in training and war. An instructor at the USAFWS (1993 –1996), I experienced first hand what the capability of highly integrated C2ISR could accomplish. When these two systems come together and work together for a common goal, they produce a formidable force multiplier that proves to be decisive in combat scenarios. Yet, several factors limit C2 and ISR. First, these communities do not regularly exercise together. Secondly, the two communities have different supporters within the Air Operations Center (AOC). This practice diminishes the USAF's ability to achieve integrated C2 and ISR.

This paper highlights the USAF's need to completely integrate C2 and ISR to make it a more effective force multiplier and to enhance the effectiveness of Time Sensitive Targeting (TST). Currently, this integration effort is focused on developing technology specifically aimed at integrating C2 and ISR within the AOC. This is the vision of the Chief of Staff of the Air Force and is a high priority for the Joint Staff as well. However, we need to develop an intellectual architecture and organizational structure before we can

effectively incorporate a technological solution. This research does not advocate retarding technological growth, usurping the authority of the AOC director, adding another layer of "command" into command and control, or lobby for a particular platform; rather, it encourages commanders to accept a new thought process in employing C2 and ISR in order to enhance the effective engagement of Time Sensitive Targets. Integrated C2ISR produces a "system of systems" and it demands special attention by C2ISR professionals under the direction of the C2ISR Package Commander to meet CINC objectives and Mission Commander's requirements.

I would like to thank those who supported my research during these times of national urgency: Major Anthony C. Shaw, Major Michael Kelly, Major Ronald Henry, Major Greg Guillot and Lt Col Joseph Rosacci. Had these individuals not provided the most current data and lessons learned, this project would not have been possible. The views expressed in this paper are purely my own; the research is my humble attempt to formalize the problem within the community. I would also like to thank Lt Col Philip Bradley for demonstrating undying patience with me during this time of great consternation and helped me stay the course. To Major Vicki Rast for showing me better ways to write. Thanks also go to my wife of 22 years, Tammy, and my children, Brandon, Justin, and Megan, for allowing me the time to digest all of the information, produce this paper, and not make me batty in the process.

Abstract

Recent conflicts in Kosovo and Iraq have demonstrated that there is an urgent need for C2ISR platforms to work together synergistically to prosecute objectives outlined by the CINC. Coordination of C2ISR assets under JTF command is necessary to maintain unity of effort in support of the overall campaign plan. It is also necessary for C2 and ISR to work as one to support the Mission Commander (MC). Maximum effort needs to be taken to ensure friendly radar, collection, electronic warfare support (ES), command and control (C2), and communications assets are employed to their fullest potential.

This paper explores procedural solutions to integrate C2 and ISR. Horizontal integration of C2 and ISR assets can enhance Time Sensitive Targeting operations. This paper examines the current structure of C2 and ISR, and the problems therein, focusing specifically on why having each work for a different directorate inside the AOC produces inefficiencies. Recent exercises utilized different architectures and organizational structures to make the process more efficient. I explore what can be done procedurally to fix the problem with current technologies, to focus the efforts of the C2 and ISR communities at the tactical level.

This thesis utilizes lessons learned from recent exercises such as JEFX 99, JTFEX 01, and two C2 Red Flags. Additionally, it analyzes data from recent contingency operations, such as Operations ALLIED FORCE (OAF)and ENDURING FREEDOM (OEF). Having done that, I will explore the impacts of using the current system. Since

C2ISR is a system of systems, the objective is to produce an integrated, executable C2ISR plan to support to the Mission Commander and Time Sensitive Targeting.

The "C2ISR Package Commander" concept is being tested through exercises and ongoing operations. Based on this concept, the C2ISR Package Commander is responsible for employing C2ISR assets tactically within the Joint Operations Area (JOA). This concept allows the C2ISR PC to integrate C2 and ISR platforms in such a way to take advantage of their inherent strengths and mitigate weaknesses. Current plans to develop C2 of ISR or ISR Battle Management within the AOC, produces a more centralized approach to asset management instead of decentralizing decisions to the lowest possible level. The re-tasking of ISR assets from a collection manager on the ground, will better prepare the battlespace for the next day's war but will take away the tactical focus of the assets assigned to support the mission commander attacking targets today. Providing a C2ISR package Commander in the air to respond to real time concerns is consistent with the tenets of centralized control and decentralized execution. A trained and experienced operator airborne with good situational awareness is in a much better position to decide how assets are distributed.

Chapter 1

Introduction

> *Without originality, let alone genius, the new technologies will merely be grafted on to existing organizations and doctrine in a way designed to cause the least inconvenience and least unpleasantness in peacetime. The risks of having operated on this principle in the past are as nothing to the dangers of doing so in the future.*
>
> —Brigadier J.P. Kiszely, 1993

Information technologies are expanding exponentially, possibly too fast for military planners to incorporate in the planning and execution of modern warfare. Future advances in sensor-to-shooter technology, with the appropriate C2 structure in control, is one way to speed the kill chain. In fact, recent conflicts in Kosovo and Iraq have demonstrated the worth of synegistic C2/ISR packages. During Operation Allied Force, SA-6s emerged as a high interest target and topped the priority list. Efforts to find and destroy these targets involved multiple disciplines and platforms. For instance, SIGINT platforms detected and passed this information back to the AOC. A JSTARS received radar indications in that same area and passed this information to the AOC. With this information, an AWACS directed two airborne alert F-15Es to strike this time critical target. Hence, each of these platforms held interlocking pieces of the TST puzzle. These assets integrated horizontally through data links and voice communications, providing for target's detection, identification, and prosecution. Still, one problem remained: none of these platforms could authorize the strike. Once the ROE wickets had been met and the

different agencies within the AOC had coordinated the target enabling the JFACC to order target prosecution, 45 minutes had passed.

Coordination of C2 and ISR assets in the JOA is necessary to maintain unity of effort for C2ISR in support of the overall campaign plan. This is where the work needs to be done. Technology offers great solutions to facilitate slower paced C2 wherein multiple layers of human intervention are not required. However, real-time target prosecution shows that collecting, analyzing and distributing the needed information to the shooter is a time consuming process. The seductive nature of information technology is transforming military organizational cultures towards accepting greater centralized control and more rigid hierarchical organization, moving away from the desired orientation of decentralized control and organically flexible organizations.[1]

Today's dynamic, time compressed environment comprised of time sensitive targets, requires the JFACC (or duly appointed Director of Operations wihtin the AOC), to employ a host of C2 experts to engage weapons efficiently. Through an AF/XO document, Lt Gen Esmond recently acknowledged that C2 and ISR do not train together regularly, work for different agencies, and only employ together as a system when a contingency operation is under way.[2] Additionally, the procurement systems of C2 and ISR are completely separate leading to interoperability problems both technically and procedurally.[3]

This paper argues that by the use of highly integrated C2 and ISR executing in a decentralized environment, Time Sensitive Targeting (TST) will be more effective. A small portion of what the C2ISR communities do, the TST challenge illustrates how this system of systems can work together efficiently at the tactical level of war. Still in its

infancy, integrated C2ISR communities need to work as one to improve doctrine and test new Tactics, Techniques and Procedures (TTPs). The paper analyzes current C2 and ISR doctrine. Additionally, it investigates how C2 and ISR are integrated, if at all, within the baseline AOC. The paper documents deficiencies in these areas and subsequently provides recommendations for doctrine writers, AOC personnel, and tacticians.

Notes

[1] Roman, Gregory A., Lt Col, USAF, *The Command or Control Dilemma: When Technology and Organizational Orientation Collide*, *Air War College Paper, April 1996*

[2] Air Force XO Statement, Lt Gen Esmond, 2000, page 1

[3] Ibid

Chapter 2

Current Structure and Supporting Platforms

> *When choosing a course of action with insufficient knowledge of the situation, the commander can either increase his information gathering capacity, and thus the complexity of his organization, or he can divide his mission into parts and reorganize his forces to accomplish those parts on a semi-independent basis.*
>
> —Martin Van Creveld

The AOC, the senior element of the Theater Air Control System (TACS), is the weapon system through which the Joint Forces Air Component Commander (JFACC) exercises command and control (C2) of all aerospace forces under his Area Of Responsibility (AOR). It is comprised of personnel, process, and equipment. The JFACC employs the AOC weapon system to plan, execute, and assess aerospace forces.[1] During Operation ALLIED FORCE, all TST operations were conducted in a very centralized manner through the AOC. This prompted the then USAFE/CC Gen Jumper to make this statement in reference to TST: "We need to go from hours to single digit minutes."[2] The process for prosecuting TSTs proved cumbersome and time consuming. The information for targeting was available in many places, both in the intelligence directorate (A-2) and the combat operations directorate (A-3). Deficiencies identified in the *Operation ALLIED FORCE Tactical Lessons Learned* report included the lack of integration, highly centralized operations, and lack of a tool to fuse real time intelligence.[3] Classification issues within the NATO environment also posed special

problems. Lt Gen Esmond's recent XO statement also had these words to say about operations during ALLIED FORCE.

> Conflicts involving the application of aerospace power in the last 20 years have highlighted the increasing importance of more closely integrating intelligence, surveillance, and reconnaissance capabilities with decision-making centers. Increasingly complex technology has improved sensor abilities, communications capability, geo-locational equipment, and weapons accuracy. Generally, application of this technology has resulted in huge advances in the Air Force's ability to find, track, and target and engage targets within the traditional Air Tasking Order (ATO) cycle.
>
> However, recent operations in Kosovo required US and allied aerospace forces to find well-hidden mobile targets, plan strikes against them, and execute the strikes before the targets moved. Though there were some "flex" targeting success stories, in general we were slow in responding to rapidly changing targeting needs. These deficiencies in the Find, Fix, Track, Target, Engage, and Assess (F2T2EA) process that reduced our success should be addressed. Sensors to find hidden targets, communication methods to get targeting data to an airborne attack aircraft, and the processes and systems in between, need to be improved and better integrated.[4]

These statements are indicative of the problems brewing in the prosecution of TST. This process deserves much attention; otherwise, technological innovation will prove ineffective. An understanding of C2 and ISR assets is essential to enhancing the TST process.

Airborne C2 and ISR Platforms Contributions to the TST Process

The following paragraphs give a brief overview of the capabilities of each platform in the TST process. It is a laundry list for the readers who are not familiar with C2 and ISR platforms.

Airborne Warning and Control System. The Airborne Warning and Control System (AWACS) is an airborne radar control element of the TACS and is normally one of the first battle management assets to arrive in the theater of operations. It is normally tasked with establishing the initial command, control, communications, and computer (C4) system capability and for providing early warning, surveillance, battle management, weapons control functions and combat ID. It has the ability to detect and control aircraft below and beyond the coverage of ground-based C2. During initial operations, or as a show of force, the AWACS can perform airborne battle management functions for the AOC and other friendly forces. In support of offensive operations, the AWACS can provide surveillance and warning to friendly forces operating well forward of the main force. Once the TACS is mature, the AWACS is normally tasked to support the Control and Reporting Center (CRC).[5] The CRC will be fully described in a following paragraph under ground C2 platforms.

Joint Surveillance and Targeting System. Joint STARS is an integrated Army-Air Force C2 battle management surveillance, target detection, and tracking platform. On-board battle managers provide direction based on data collected by the Joint STARS sensors. This data is also used to build a common tactical picture. Joint STARS detects, locates, and tracks slow-moving ground targets and rotating antennas and has a limited capability to detect, locate, and track helicopters. It provides air and ground commanders with situation development, targeting, attack planning, and limited post attack assessment information. Its command, control, and communications (C3) supports deep attack operations planning. Joint STARS data is also transmitted to airborne and ground elements of the TACS capable of receiving and processing the encrypted digital messages

using Joint Tactical Information Distribution System (JTIDS) Link 16 and to ground stations via the Surveillance Control Data Link (SCDL).[6]

RIVET JOINT. The RIVET JOINT (RJ) aircraft, provides direct, near real-time reconnaissance information and electronic warfare support to theater commanders and combat forces. RJ is a nationally tasked priority. It collects, analyzes, reports, and exploits enemy Battle Management/C4I information. During most contingencies, it deploys to the theater of operations with the airborne elements of TACS (AWACS, ABCCC, Joint STARS, etc.) and is connected to the aircraft via datalinks and voice as required. Refined intelligence data can be transferred from Rivet Joint to AWACS through the Tactical Digital Information Link TADIL/A or into intelligence channels via satellite and the TACTICAL INFORMATION BROADCAST SERVICE (TIBS), which is a nearly real-time theater information broadcast. [7]

U-2. The U-2 provides continuous day or night, high-altitude, all-weather, stand-off surveillance of an area in direct support of U.S. and allied ground and air forces. It provides critical intelligence to decision makers through all phases of conflict, including peacetime indications and warnings, crises, low-intensity conflict and large-scale hostilities. The U-2 is capable of collecting multi-sensor photo, electro-optic, infrared and radar imagery, as well as performing other types of reconnaissance functions. An Air Force initiative following Desert Storm demonstrated the ability to locate mobile targets from the U-2 all weather reconnaissance platform and transfer the data to a precision weapon platform within minutes enabling accurate targeting among multiple items. The U-2's modular payload design allows the aircraft to be reconfigured to perform various missions.[8]

ABCCC. Airborne Battlefield Command and Control Center. The ABCCC provides threat, intelligence, and target updates to aircrews, and radio relay to ground-based and other airborne C2 elements. It can provide battle management of airborne assets operating beyond the normal communications coverage of ground-based C2 elements. The ABCCC can support the aerospace operation as an airborne extension of the AOC and, as a backup, can temporarily assume their functions. The ABCCC is a highly capable C2 platform with extensive communications capabilities.[9]

COMPASS CALL. COMPASS CALL is the designation for a modified version of Lockheed corporation's C-130 Hercules aircraft configured to perform tactical command, control and communications countermeasures or C3CM. Targeting command and control systems provides commanders with an immense advantage before and during the air campaign. COMPASS CALL provides a non-lethal means of denying and disrupting enemy command and control, degrading his combat capability and reducing losses to friendly forces. The EC-130H Compass Call is the only US wide-area offensive information warfare platform, Compass Call provides disruptive communications jamming and other unique capabilities to support the Joint Force Commander across the spectrum of conflict. Specifically, the modified aircraft uses noise jamming to prevent communication or degrade the transfer of information essential to command and control of weapon systems and other resources. It primarily supports tactical air operations but also can provide jamming support to ground force operations.[10]

Airborne Command Element. If required, the Airborne Command Element (ACE) is a single officer or team of mission experts who fly on board airborne C2 platforms. During emergencies or communications outages, the ACE conducts the aerospace battle

in accordance with the latest command guidance and the Air Tasking Order (ATO). The establishment of an ACE is situation-dependent, based on assets and personnel available and guidance/direction from JFACC.[11]

Ground Platforms in the TST Process

The TACS is the backbone of the AFFOR's contribution to the Theater Air-Ground System (TAGS) and consists of units specifically trained and equipped to support the C2 process. The TACS is designed to permit centralized control and decentralized execution. The elements that form the TACS are the AOC and tactical C2 nodes. With TACON of joint aerospace forces and through the roles of ACA and/or AADC, the JFACC plans, coordinates and executes joint aerospace operations from the JAOC and through the TACS.[12]

Aerospace Operations Center. The AOC provides the JFACC operational level C2 of aerospace forces as the focal point for planning, execution, and assessment of aerospace operations. Although the Air Force provides the core capability for the AOC, other Service component commands contributing aerospace forces provide personnel in accordance with the magnitude of their force contribution. AOC personnel plan, execute and assess aerospace operations, directing changes as the situation dictates.[13]

Control Reporting Center. The Control Reporting Center (CRC) is directly subordinate to the AOC and is the primary radar element charged with decentralized execution of the air defense and airspace control functions. The CRC also exercises C2 of subordinate remote radar elements and exercises TACON of the airborne elements of the TACS to include but not limited to the E-3, E-2, Airborne Battlefield Command and Control Center (ABCCC), etc. Within its area of responsibility (AOR), the CRC directs

region or sector air defense and provides aircraft control and monitoring for offensive and defensive missions. The CRC is capable of conducting airspace control, weapons control, surveillance, and aircraft identification. When directed by the AOC, the CRC establishes liaison with allies and other components to exchange airspace management and air defense data from C2 systems established in the Tactical Digital Information Link (TADIL) interface. Through the use of TADILs A/B/J and other links, the CRC is capable of receiving data link information from the various C2 elements in the TADIL interface. If necessary, the CRC can temporarily assume limited duties performed by the AOC.[14]

CRC Remote Radars. The CRC may deploy mobile radars to extend radar coverage and communications range within its assigned AOR. These remote radars are capable of providing early warning, surveillance, weapons control and identification (ID).[15]

AOC Baseline Structure for Supporting Air Operations

AOC Organization. The baselined AOC organization includes an AOC director, five divisions (Strategy; Combat Plans; Combat Operations; Intelligence, Surveillance, and Reconnaissance; and Air Mobility), and multiple support/specialty teams. Each integrates numerous disciplines in a cross-functional team approach to planning and execution. [16]

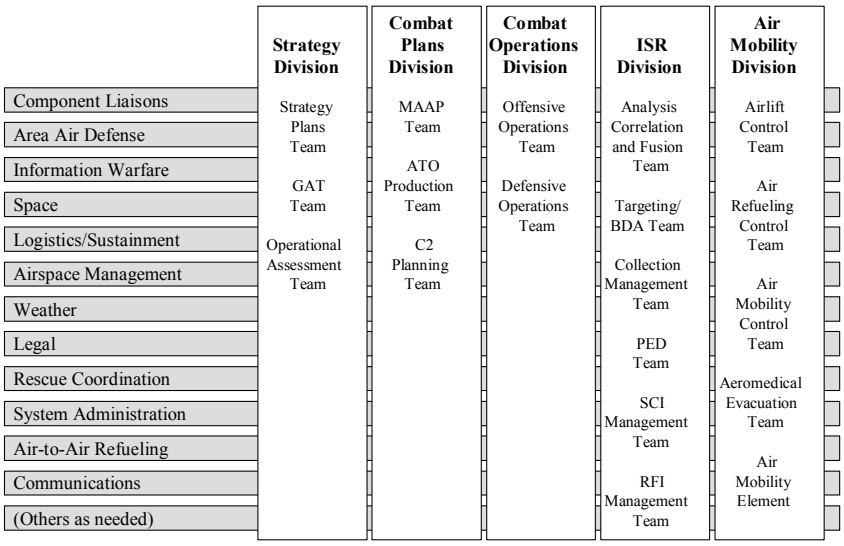

Table 1. AOC Baseline Organizational Structure

Since this paper explores ways to find how to more efficiently prosecute TSTs, the focus here will be on the Combat Operations Division and its integration with the ISR Division.

The Combat Operations Division assumes responsibility for the next ATO (i.e., "tomorrow's war") as soon as the ATO is released, normally 12 hours prior to execution. The ATO is written and disseminated based on intelligence estimates and other perishable data that may be 36 hours old or older. When the ATO is executed, changes in enemy (and friendly) capabilities, locations, and intent, along with weather and political conditions, may impact the planned operations. Defensive and Offensive Duty officers, specialty/support teams, and component liaisons coordinate and direct real time changes to the ATO/ACO to support mission requirements.[17]

The ISR Division provides current situational awareness, targeting, and ISR battle management for execution of the ATO. They integrate ISR personnel throughout the Combat Operations Division to secure all necessary ISR capabilities and assets to support

JFC objectives across the complete range of aerospace operations. Additionally, ISR personnel within Combat Operation Division core teams monitor and synchronize employment of ISR capabilities and assets.[18]

The exact composition of the Combat Operations Division will be tailored to the contingency or exercise, but the general structure is presented in Figure 1. The Combat Operations Division is normally task-organized into two functionally oriented core teams; Offensive Operations and Defensive Operations, which are supported by integrated specialty/support teams, combat reports team, component and coalition/combined liaisons, and communications support.[19] The following text is how the AOC will prosecute TSTs according to AOC 13-1 Vol 3.

> Time Sensitive Target Function. Prosecution of a TST is one of the most challenging tasks of the Combat Operations Division. Per *Joint Publication 1-02 DoD Dictionary of Military and Associated Terms,* TSTs are "those targets requiring immediate response because they pose (or will soon pose) a clear and present danger to friendly forces or are highly lucrative fleeting targets of opportunity." The Chief of Combat Operations (CCO) is ultimately responsible for the existence of an expeditious process within the Combat Operations Division for prosecuting TSTs. This process may vary dependent on the situation, the theater and/or particular AOC procedures. Each member of that Combat Operations Division should be familiar with the established process for TST prosecution. Though processes and/or teams may vary, there is common AOC functionality that will occur within the Combat Operations Division. The common steps follow: Once a TST is input to the Combat Operations Division, the Combat Operations Division performs the following functions:
>
> 1. Procedurally identify and/or nominate a potential TST.
>
> 2. Assess a TST's priority as it relates to the established strategic guidance of the JFC and/or JFACC, the daily GAT guidance, and any predetermined TST hierarchy.
>
> 3. Identify potential assets/weapons for TST prosecution, applying JFC and/or JFACC guidance to minimize risk and collateral damage.

4. Assess the gain of the TST tasking solution versus potential loss of previous tasking.

5. Coordinate support required to successfully task TST prosecution (e.g., AAR, SEAD, Airspace Management, etc).

6. Task and monitor the execution of the TST prosecution.

7. Task ISR Battle Management Cell for collection on TST, if required.

8. Provide feedback to other divisions on intent to and results from TST execution.

TST Management. To prosecute a TST, the entire targeting cycle may be replicated; however, its functions are compressed in time. As such, some functions may occur in parallel while others are sequential. Predetermined guidance and/or some form of TST hierarchy or priority are vital to successful prosecution. If JFC and/or JFACC guidance for predetermined TST prosecution is not provided, the CCO should request it or advise in its generation. An asset management hierarchy may be developed to facilitate assets selection, for example:

1. Dedicated TST alert assets (threat permitting).

2. Airborne missions suitable for retasking.

3. Ground alert aerospace assets.

4. Scheduled missions that have not yet launched.

5. Any other mission available.

TST ISR personnel have the following responsibilities:

Analyze the current battlespace for TST opportunities and forward nominations for approval.

Develop amplifying TST data for retasked strike assets.

Receive, validate, and nominate targets for immediate attack, considering current guidance, ROE, and attack restrictions.[20]

This breakdown of duties for personnel within the Combat Operations Division is a very helpful tool; however, at this point we need to discuss horizontal and vertical integration.

Horizontal Integration. Horizontal integration is the seamless linkage of lateral elements to optimize personnel and functional and support systems capabilities. The AOC's horizontally integrated functions push developed options to the decision-maker facilitating flexible responses within a dynamic battlespace.[21]

Vertical integration. Vertical integration is the seamless linkage of superior and subordinate elements within the TACS, joint force, and external agencies to optimize personnel, functional, and support system capabilities. Well-executed horizontal and vertical integration combine to increase joint task force operational effectiveness and efficiency.[22]

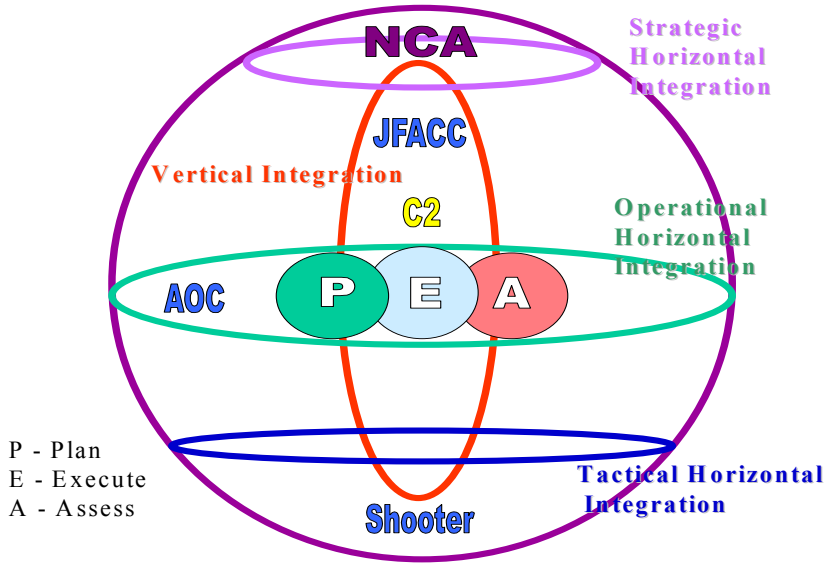

Figure 1 Integration Model from AOC 13-1, Vol 3 1 Oct 2000.

Now knowing how the process is supposed to function and what assets are critical to make TST work, lets explore the problem areas -- operational and tactical levels of integration.

Notes

[1] TO AN/USQ-163-1, Block 10, Version 1. 0, 01 December 2001

[2] Gen John Jumper, comments made at OAF Tactical Lessons Learned conference in Ramstein AB Geramny, Jun 1999.

[3] Operation Allied Force Tactical Lessons Learned, HQ USAFE/DOW, August 1999, Classified Document, All portions used unclassified.

[4] Air Force XO Statement, Lt Gen Esmond, 2000, page

[5] AOC 13-1 Vol 3, 1 Oct 2000, p 13

[6] Ibid

[7] Federation of American Scientists, web page, Internet, available from http://www.fas.org/

[8] Ibid.

[9] AOC 13-1 Vol 3, 1 Oct 2000, p 16

[10] Federation of American Scientists, web page, Internet, available from http://www.fas.org/

[11] AOC 13-1 Vol 3, 1 Oct 2000, p 16

[12] 12th Air Force Standard Operating Procedures, 10 September 1999.

[13] Ibid.

[14] TO AN/USQ-163-1, Block 10, Version 1. 0, 01 December 2001

[15] Ibid.

[16] AOC 13-1 Vol 3, 1 Oct 2000, p 47

[17] Ibid.

[18] 12th Air Force Standard Operating Procedures, 10 September 1999.

[19] Ibid.

[20] AOC 13-1 Vol 3, 1 Oct 2000, p 51

[21] Concept of Operations for the Air Operations Center, 9 March 2001.

[22] Ibid.

Chapter 3

Deficiencies

> *As strategic decision-making and control become decentralized, lateral cooperation between semiautonomous agents and agencies becomes more vital to effective system operation than top-down command.*
>
> —Lt Col David S. Fadock

C2 and ISR operators rarely train together. Air Combat Command (ACC) has started to change this practice with two Red Flags a year that emphasize tactical level integrated C2 and ISR training. A move in the right direction, this approach enhances integration without compromising any training for the youngest flight member, which is the intent of Red Flag. Additionally, CAOC-X (a baseline AOC set up to train and test new methods in AOC operations) is a training tool being used to help war fighters at the operational level integrate C2 and ISR. Both of these training focuses are making great strides and should be continued. Lt Gen Esmond states, "It has become apparent that C2 and ISR elements need to be fully integrated in the strategy, planning and execution phases of aerospace operations to achieve dominant battlespace awareness (DBA) and dynamic aerospace control (DAC)."[1] This chapter examines deficiencies regarding the planning and execution phases of aerospace operations.

Doctrine

Current doctrine addresses C2 and ISR as separate entities. If C2ISR integration is to improve, both horizontal integration between airborne and ground platforms and vertical integration up and down the chain of command, doctrine needs to treat the entire sensor-to-decision-maker-to-shooter process as an integrated continuum. Military doctrine treats C2 and ISR as described below.

Joint

Joint Pubs such as 3-56.1 (C2 for Joint Air Operations) and 3-01 (Countering Air & Missile Threats) mention the need for C4I integration, but surveillance and reconnaissance are addressed separately. In the Joint Doctrine Encyclopedia, intelligence, surveillance and reconnaissance are considered part of the Command and Control Support (C2S) system, as opposed to an integral part of the sensing, deciding, and executing chain.[2]

Air Force

AFDD 1 (Air Force Basic Doctrine) lists C2 and Intelligence, Surveillance, and Reconnaissance as separate functions. ISR is described as a direct contribution to Information Superiority, a core competency. C2 is described as a "key enabler", not a core competency itself. C2 and ISR are expanded upon in Air Force Doctrine Document 2-8 (Command and Control) and 2-5.2 (Intelligence, Surveillance, and Reconnaissance). The draft update to AFDD 2-8 mentions the need for good information flow in the horizontal and vertical organizational directions, but doesn't provide specifics on how that should happen.[3]

AFDD 2-5, Information Operations, is intended to explain the Air Force's perspective on information superiority and the relationship between information operations (IO) and its two major facets, information warfare (IW) and information-in-warfare (IIW). However, the current document is primarily focused on the offensive and defensive parts of IW and how they should be integrated with AOC operations. AFDD 2-5 relies on other documents in the series for a more detailed doctrinal discussion of IW and IIW, but none of them adequately address the relationship between C2 and ISR, nor the importance of integrating C2ISR to achieve information superiority.[4]

Emerging Doctrine

Recent ACC and AC2ISRC-drafted CONOPS have outlined emerging concepts in controlling theater forces. A new AOC CONOPS describes the AOC weapon system, its crew, and the corresponding processes they use to command and control theater forces. Further CONOPS by ACC and the AC2ISRC work outlines processes and organization involved in managing ISR assets from the AOC level. CONOPS development is a crucial first step, but there is a need to more clearly define and institutionalize the linkages between ISR and C2 capabilities, processes, and organizations to execute the entire Find, Fix, Track, Target, Engage, and Assess (F2T2EA) kill chain.[5] The F2T2EA kill chain is the sequence of events used to quantify how TSTs should be prosecuted.

Horizontal Integration

The goal of integrated C2ISR is to convey the right information at the right time to the shooter to prosecute a target within acceptable levels of risk. This goal requires C2 and ISR elements to coordinate and correlate information and forward it to the shooter in

a consumable manner, either electronically or by voice communications. The deficiency here manifests itself in terms of coordination and correlation.

C2 and ISR operators have proven to be well trained and experienced in a number of contingency operations as well as exercises. However, each of these systems works from a different tasking prioritization, which creates two stovepipe like systems, both technically and procedurally. ISR airborne platforms such as RJ and the U-2 are strategic collection assets with specific reporting requirements. They also work for the A-2 (Intelligence Directorate) at the operational level. C2 assets such as the AWACS and Joint STARS are used as battle management tools to control the air and ground battle and provide situational awareness to air and ground commanders. C2 assets fall under the purview of the A-3 (Operations Directorate) at the operational level. For ISR operators, trying to support both the Collection Management Authority (CMA) and tactical threat warning operations can become difficult.[6] This does not include "pop-up", "flex", or "TST" targets of opportunity. ISR operators have succeeded in doing both for years, but the emphasis now put on executing TSTs is causing a prioritization problem at the operational and strategic levels. This problem is compelling operators to wonder, "Which is more important: the collection deck or the emerging targets?"

During the Air War Over Serbia (AWOS), one reason we could not efficiently execute TSTs was the lack of tactical level horizontal integration. Furthermore, the execution authority was not being decentralized to the tactical level. In a recent book published by RAND on the AWOS, these statements were made by Benjamin Lambeth, "the cumbersome command and control arrangements and the need for prior CAOC approval before fleeting pop-up IADS targets detected by Rivet Joint or other allied

sensors could be attacked resulted in many lost opportunities and few hard kills of enemy SAM sites."[7] The platforms, when horizontally integrated, can exercise great influence on the timeliness of executing TSTs if the authority is delegated to the tactical level. Another strong statement by Lambeth hits at the core of the issue:

> "Once there, the aircraft (JSTARS) was typically thought of as a surveillance platform operating in the service of the intelligence community, rather than as a strike support asset working to provide direct and immediate assistance to NATO aircrews conducting flexible targeting missions. With the right teaming, connectivity, and practice, the use of Joint STARS to cue UAVs might have reduced, if not eliminated, the "searching-through-a-soda straw" problem, lessened UAV exposure to hostile fire, and helped maintain tactical surprise for NATO aircrews engaged in the search for VJ (Serbian Forces) targets of opportunity. No measures of that sort, however, were attempted until quite late in Allied Force".[8]

According to Lambeth, teaming was needed to improve almost non-existent horizontal integration. Teaming refers to organizing C2 and ISR platforms into constellations or groups tasked to support one portion of the operation to increase efficiency under a single authority. Although there was mention in the ATO about which sensor platform was in charge of what duties, (i.e. link Net Control Station for TADIL-A or Net Time Reference for TADIL-J, SIGINT ID Authority (SIA) who had the authority for identification), no single platform was identified to be in charge and orchestrate tactical asset integration. The absence of a teaming architecture led to ad-hoc improvisation by the crewmembers trying to make the best of a difficult task and situation.

Vertical Integration

Operation ALLIED FORCE's C2 structure was cobbled together quickly. The lack of an AOC CONOPS or baseline AOC left planners with no standardized

operational structure upon which to build. This deficiency has since been identified and there is now an AOC Baseline for equipment and an AOC CONOPS. Each Numbered Air Force still has their own standard operating procedures (SOPs) and evidence has shown these SOPs are coming in line with the Air Force's standard. However, there are still some integration issues that require attention. As we have seen from previous examples in OAF and more currently, in Operation ENDURING FREEDOM (OEF), a "Mother, may I" approach of over centralization is still recognized institutionally. Genreal Horner (ret) said in a Joint Expeditionary Exercise 99 (JEFX99) After Action Report that "the generals are still too involved in the execution of the war, we need to let the Captains fight the war with clear guidance".[9] Research indicates most overly centralized operations occur due to extremely restrictive Rules of Engagement (ROE) and pressures put upon the CJTF to avoid collateral damage.[10] Over centralization results in a slow decision loop: Lambeth's AWOS study notes the following,

> "Unless an object of interest was clearly determined to be a valid military target, such as a VJ (Serbian) tank operating in the open, pilots had to get clearance for any attack from the CAOC, with General Short himself often making the decision after checking second sources like real-time UAV video feed. Because of the delays created by these and similar hurdles, orbiting NATO aircraft often ran low on fuel before being cleared to drop their weapons and accordingly were forced to leave the area in search of a tanker".[11]

This example of attacking VJ fielded forces and tanks using a Forward Air Controller (FAC) clearly show how the authority to engage a target was overcentralized. Yet, TSTs (such as SAM sites) detected by airborne sensors and on the CINC's priority list, also required the same authority. Doctrinally speaking, the tenet of "centralized control, decentralized execution" was not adhered to in OAF. A new example has come to the forefront with OEF. Major General Behler, Commander, AC2ISRC at Langley

AFB, VA, sees centralized control and centralized execution as becoming the norm in OEF; especially in regards to use of its ISR assets in the TST area.[12] Maj Gen Behler also stated, "that the current war provided some great insight on the use of ISR and time-sensitive-targeting, but that the environment was so permissive that we were able to accomplish the mission given the huge ISR shortfalls". He also stated that ISR needed to be tasked by the operator, not by the intelligence community.[13]

Summing Up Procedural Deficiencies

Deficiencies in horizontal and vertical integration are both technical and procedural. Knowing the technical challenges are being worked currently by the AC2ISRC, this paper focuses upon the procedural problems. Let's sum up the deficiencies as a whole, combining both horizontal and vertical integration. The first deficiency is the lack of a "single belly button" at the tactical level to integrate and focus the C2 and ISR assets. The second problem is highly centralized decision-making authority for fleeting targets. This decision-making authority is often held by the JFACC, but is rarely delegated to the tactical level for decentralized TST execution. According to doctrine, the JTF and the JFACC have the authority to place this decision-making authority at the lowest level they see fit. Placing that decision-making authority on the ground or in the air is discussed in the next chapter. The third, and final, deficiency seen in the way C2 and ISR procedurally execute TSTs is how assets are tasked to support TST execution. Tasking of sensors needs to be done by an operator. An operator who possesses expertise in sensor capabilities and a thorough understanding of the ramifications such retasking places on sensors tasked against pre-planned missions in support of a mission commander, as opposed to tasking against a TSTs. With the advent

of technologies (such as ISR Battle Management tools within the AOC), much more power to re-task and move ISR sensors has been given to the A-2. This sometimes puts the CMA - who is thinking about the collection deck for the next day - in direct conflict with the tactical mission objectives. To explain further, ISR asset taskings originate at many levels; national, operational, and tactical. When executing a TST, the ISR division in conjunction with the A-3 ISR cell, re-prioritize and re-task airborne sensors in order to provide the shooter battlespace awareness and targeting data on the TST. When the ISR cell retasks the sensors to TST, it may conflict with a pre-planned mission, such as support to an ingressing package. In the next chapter we will discuss conclusions and recommendations to fix these deficiencies in integration both through a rewrite of doctrine and organizational structure.

Notes

[1] XO Statement, Lt Gen Esmond, White Paper, V5, 2000, p 1

[2] Air Force XO Statement, Lt Gen Esmond, 2000, page 3

[3] Ibid

[4] Ibid

[5] Ibid

[6] The CMA is responsible for determining collection targets for the next days ATO. This is commonly referred to as a collection deck

[7]Lambeth, Benjamin A., NATO'S Air War For Kosovo: A Strategic and Operational Assessment, Rand Study, p 137

[8] Ibid. p 143

[9] JEFX 99 After Action Report, 1999

[10] Meeting minutes form SAIC with MG Behler, Commander, AC2ISRC, Jan 2002

[11] [11]Lambeth, Benjamin A., NATO'S Air War For Kosovo: A Strategic and Operational Assessment, Rand Study, p 145

[12] Meeting minutes form SAIC with MG Behler, Commander, AC2ISRC, Jan 2002

, told Mr. Carl Jensen a contractor at ACC/DOYA that his major concern was “about the centralized control and “centralized execution” habits that were emanating from CENTCOM and Enduring Freedom's use of ISR assets in time sensitive targeting, versus the "decentralized execution" currently specified in AF Doctrine.”

[13] Meeting minutes form SAIC with MG Behler Commander, AC2ISRC, Jan 2002

Chapter 4

Conclusions and Recommendations

The capability of technology to alter organizational relationships may be invaluable or dysfunctional based on the effect it has on the organism.

——General Charles A Horner, Comments on EFX 98

Conclusions

To effectively execute attacks against TSTs, the JFC and component commanders must dictate clearly defined procedures for control and coordination of air operations.[1]. C2, as defined in Joint Publication 1-02, is "the exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission".[2] C2 is accomplished on the tactical level with airborne and ground assets. Without proper management and integration of ISR, the TST process will break down. The unique requirements of C2 and ISR assets must be met in order to achieve success.

Each operational participant must rely on the capabilities of others to compensate for their own limitations – this is the main reason for combined/joint operations. Without knowledge of these factors, capabilities may be overlooked and participants may incur undue risks/hazards. C2, DCA, air refueling, electronic warfare support, and other supporting functions depend on classic management techniques to maintain combat-capable systems in place. For instance, most supporting forces operating orbits/stations require time windows of "vulnerability" instead of specific target times. More often than

not, these windows exceed the unrefueled endurance of the weapons system. Air refueling must be managed closely to achieve complete coverage of station time and mission commander objectives. The tactical control agency can usually manage the flow but a higher authority, such as the mission commander or the AOC, will usually establish asset priorities.

Force application missions generally include strategic attack, interdiction, and close air support - all of which require tactical C2ISR. Aircraft fragged and/or scrambled against ground TSTs require threat warning, target updates, deconfliction, and mission assistance. During ingress and egress, C2ISR must enhance attack aircraft, air-to-air and air-to-ground situational awareness. This fact necessitates coordinated procedures between all C2ISR players and shooters.

It is necessary for C2 and ISR to work as one to execute TSTs and directly support the Mission Commander (MC). The Mission Commander is the person responsible for achieving the objectives set forth by the JFACC for the assigned task. A Mission Commander may be in command of multiple packages directed against a certain set of targets. The responsibilities of a Mission Commander are wide ranging and require massive coordination between multiple disciplines in air power functions. Maximum effort needs to be taken to ensure friendly radar, electronic warfare support (ES), command and control (C2), and communications assets are employed to their fullest potential. At this time these duties are relegated to liaison officers (LNOs) within the AOC. Still, no single person is given responsibility and authority for planning, coordinating, and executing both ISR and C2 missions, in a given time frame, in support of TST or Mission Commanders. Instead, these responsibilities are divided between the

A-2 and A-3, requiring coordination between directorates with different requirements. This drives the lack of horizontal integration of the platforms. Consequently, over-centralization of air operations is slowing the decision cycle for TST execution. If we are to stay inside of our enemy's decision cycle, the decision-making authority over certain assigned assets must be delegated to those battle management specialists executing real-time operations. The air assets that are airborne and "on-scene" with the present situation facilitate decentralized control. With control delegated to the mission commanders and the battle managers, they can then control their area of responsibility and have the authority to make on-the-spot decisions affecting their Area of Responsibility (AOR) battle plans.[3]

Recommendations

First Recommendation

The first recommendation is to designate a C2ISR Package Commander (C2ISR PC) on one of the C2 platforms. This C2ISR PC would plan, coordinate, execute, and debrief both C2 and ISR platforms to integrate operations. This may sound similar to the duties of an ACE, but the C2ISR PC would perform many different functions. The C2ISR PC would be the flight lead for orchestrating the activities of all C2/ISR assets employing within the JFACC's Tactical Area of Responsibility (TAOR). The JFACC determines the composition and force levels, provides general or detailed execution guidance through Mission Type Orders (MTO), and would designate the C2ISR PC through the ATO. (This practice parallels that of other MDSs such as SEAD Package Commander or DCA Package Commander.) This designation is normally "by unit".

Unit-level commanders, in turn, designate those qualified aircrew members who would perform the duties of C2ISR PC and Deputy C2ISR PC. Unit commanders would select C2ISR PCs based upon their breadth and depth of expertise in composite force employment, experience, and decision-making ability.

The goal of the C2ISR PC is to ensure mission commanders receive highly effective and coordinated C2ISR support. Since C2ISR is a system of systems, the focus should be to produce an integrated, executable C2ISR plan in direct support of the Mission Commander.

The C2ISR PC would be responsible for C2ISR tactical employment for an assigned time within the AOR for all missions requiring C2ISR support. This concept provides mission commanders a single person who will also be airborne and a part of the mission to contact for C2ISR coordination and prioritization to meet the assigned mission objectives. Instead of the mission commander having to coordinate with all supporting C2 and ISR assets separately, he will have one single "belly button", an operator, to contact and establish the priorities and concerns for the tasked mission. This does not prevent the mission commander from contacting all of the agencies independently, but provides a person whose sole responsibility is to support him/her with integrated and focused C2ISR. Since C2ISR is a system of systems, one operator needs to coordinate the overarching objectives and desired effects to develop a plan that encompasses all of the players and is based upon system strengths and weaknesses. This needs to be done at the tactical level of war by an operator who has had special training and is focused on the support of the mission commander. Current plans to develop C2 of ISR or ISR Battle Management at the operational level of war will provide a more AOC-centric or very

centralized version for TST execution. The redistribution of ISR assets from a collection manager on the ground will better prepare the battlespace for the next day's war, but will degrade the tactical focus of the assets assigned to support the mission commander attacking targets in real-time. By providing a C2ISR PC in the air to respond to fallout or system problems, the tenet of centralized control and decentralized execution is not compromised.

Second Recommendation

The F2T2EA methodology mechanizes the operational level "kill chain." For example, theater and national assets/resources detect objectives of potential significance *(fin*d). These systems identify and determine the location of a target *(fi*x). From this location, tracking systems acquire and monitor the object *(track*). Dynamic decision-making then directs resources *(target*), and applies capabilities *(engage)* in a timely and decisive manner. To achieve the desired effect, an assessment *(assess*) occurs during or after engagement to determine whether the target should be re-attacked. These sequential steps describe a critical path that must occur for each dynamic event.[4] This operational kill chain is what is defined in the current AOC CONOPS. TST needs to become more like an air-to-air event where the intercept phases have certain actions associated with them. The USAF has mastered the air-to-air war, but this procedure of the operational kill chain has not been instituted successfully at the tactical level for air-to-ground operations. Within the air-to-air community, the phases of the intercept are known and taught from Fighter Pilot and Air Battle Manager Initial Qualification Training and continue on through upgrade training to 4-ship flight lead and senior director. However in the TST arena this is not the case. Perhaps it is the word "operational" kill chain that

keeps it from working down to the tactical level. The kill chain needs to become as familiar to pilots and air battle managers as the air-to-air intercept phases. The kill chain should be taught from cradle-to-grave to all participants and refined at the USAFWS. Institutionalizing this thought process for those platforms executing the kill chain will advance Tactics, Techniques, and Procedures (TTPs) development. It is essential for operators to know where and how they fit into the process.

Final Thoughts

An overarching C2ISR CONOPS is needed to outline basic processes and organization to accomplish this. This should be followed by revisions to AF doctrine documents that describe how C2 and ISR work together to create dynamic battlespace awareness and allow rapid, accurate, command and control decisions. Joint doctrine should be amended to describe seamless links from ISR to C2 to weapon systems.[5]

Lessons Learned from OAF show the need for a tactically focused, coherent C2ISR plan. Mission Commanders often felt C2ISR assets were not focused on the tactical objective and, therefore, support was not tailored to their needs. A single point of contact responsible for developing a coherent tactically oriented plan was needed: The C2ISR PC meets this need. This concept provides a single "belly button" to Mission Commanders for C2ISR coordination and prioritization, a practice that better supports the tactical mission and TST.

What is the value added of more closely integrating C2 and ISR? It will reduce the number of sorties required to accomplish the desired effects, which means fewer lives at risk within a hostile environment. The shortened operational cycle will increase our ability to destroy more mobile, time sensitive targets efficiently and effectively by

distributing decision-making authority. All this results in a more effective force able to project and apply aerospace power to shape the international environment, deter conflict escalation into war, and decisively halt aggressors.[6]

Lt Gen Esmond, captures my perspective perfectly. He said:

> "Modern information technology and communications allow for a great deal of information to move at the speed of light -- faster even than an F-22 in afterburner. By thinking of C2 and ISR together as a team, we can release the brakes we are currently placing on available technology. This will keep us operating inside of our opponent's decision cycle and increase the force of aerospace power we bring to the fight".[7]

There are people who think the Air Force needs to embrace centralized control as Col. Bernett does in *Future Wars*. He presents one example advocating JFACC's becoming super commanders and making decisions at the tactical level. The problem with his approach is that the information technologies available today are enough to overwhelm even the most experienced and intelligent JFACC. The only way I see to shorten the decision cycle and reduce it from hours to minutes is to decentralize even more. Further, decentralizing and assigning people the authority to engage TSTs can reduce the time from hours to minutes. C2 and ISR operators have been trained independently to do the job of engaging TSTs: Integrate C2 and ISR - give them the authority to make decisions and watch the targets go away.

Notes

[1] Maj Kevin L. Fox, "Dynamic Targeting", ACSC paper, April 1999
[2] JP 1-02, p. II-1
[3] Maj Kevin L. Fox, "Dynamic Targeting", ACSC paper, April 1999
[4] AOC CONOPS, 9 Mar 2001
[5] Air Force XO Statement, Lt Gen Esmond, 2000, page 3
[6] Air Force XO Statement, Lt Gen Esmond, 2000, page 16
[7] Ibid. p 17

Glossary

ABCCC	Airborne Command and Control Center
AC2ISRC	Aerospace Command and Control, Intelligence, Surveillance, Reconnaissance Center
AEF	Air Expeditionary Force
AFDD	Air Force Doctrine Document
AFTTP	Air Force Tactics, Techniques, and Procedures
AOC	Air Operations Center
ARM	Antiradiation Missile
ASCIET	All-Service Combat Identification Evaluation Team
ATO	Air Tasking Order
AWACS	Airborne Warning And Control System (E-3)
BVR	Beyond Visual Range
C2	Command and Control
C2ISR PC	C2ISR Package Commander
CAS	Close Air Support
CID	Combat Identification
CMA	Collection Management Authority
COA	Course of Action
COI	Contact Of Interest

DBK	Dominant Battlespace Knowledge
DOD	Department of Defense
DSP	Defense Support Program
ELINT	Electronic Intelligence
GCI	Ground-Controlled Intercept
GPS	Global Positioning System
HARM	High-speed Antiradiation Missile
HUMINT	Human Intelligence
IADS	Integrated Air Defense System
ID	Identification
IDM	Improved Data Modem
IMINT	Imagery Intelligence
ISR	Intelligence, Surveillance, and Reconnaissance
JDAM	Joint Direct Attack Munitions
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
Joint STARS	Joint Surveillance and Tracking Radar System (E-8C)
JSEAD	Joint Suppression of Enemy Air Defenses
MAFB	Maxwell Air Force Base
MLRS	Multiple Launch Rocket System
MOOTW	Military Operations Other Than War
MOUT	Military Operations in Urban Terrain
MPEG	Multi-Platform Emitter Geolocation

MTI	Moving Target Indicator
NAF	Numbered Air Force
NATO	North Atlantic Treaty Organization
OODA	Observe, Orient, Decide, Act
PGM	Precision-Guided Munitions
RJ	Rivet Joint (RC-135V/W)
ROE	Rules Of Engagement
RTIC	Real-Time Information into the Cockpit
SAM	Surface-to-Air Missile
SEAD	Suppression of Enemy Air Defenses
SIGINT	Signals Intelligence
SPINS	Special Instructions
TA	Target Acquisition
TADIL	Tactical Digital Information Link
TAWS	Theater Airborne Warning System
TCT	Time-Critical Targeting
TIBS	Tactical Information Broadcast Service
TMD	Theater Missile Defense
TST	Time Sensitive Target
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Air Vehicle
WEZ	Weapons Engagement Zone

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