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AIR UNIVERSITY

AIR TASKING ORDER DISSEMINATION:

DOES IT GET THE JOB DONE?

by

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Preface

The purpose of this research project is to explore interoperability challenges of disseminating the Air Tasking Order (ATO) at the operational level of war.

As the United States military fights more wars in a coalition environment, system and informational interoperability between and among coalition partners will continue to be a key consideration of coalition warfare.

The aim of this paper is to first study the current method of ATO dissemination and then explore alternative methods of dissemination. Finally, the paper will conclude by highlighting an ATO dissemination method for further study.

I would like to thank my faculty advisor, Lt. Col. Boozer, for his support and constructive comments leading to the completion of this paper. His guidance and insightful comments helped considerably.

I would also like to extend my heartfelt appreciation to my wife Maria-Cristina for her support and encouragement during this period.

Abstract

The purpose of this research paper is to study limits, capabilities and future possibilities of the Air Tasking Order (ATO) dissemination system.

Increasingly, the United States military generally fights as a member of a coalition. Therefore, system and informational interoperability between and among coalition partners will continue to be a key consideration and perhaps a perquisite of coalition warfare.

However, some critics point out that the current ATO system cycle cite that the system is too linear and inflexible to meet the dynamic demands of modern aerospace warfare.

Particularly worrisome is the ineffective and slow method of dissemination of the ATO to all the execution elements of air power and the nagging interoperability problems of piping the ATO to coalition allies.

Given the technical, political, and modern contextual elements (such as transnational threats, war on individuals such as terrorists rather than states) of effectively disseminating the ATO, the obvious question to ask and central thesis of this research paper is: does the current ATO dissemination system get the job done?

More to the point, the goal of this research is to highlight some promising avenues to enhance ATO dissemination and recommend further areas of study. To do so, this paper will outline the foundational background of the role of the ATO within the Joint Air

Tasking Cycle.

Additionally, subsequent chapters will highlight the limitations of the current ATO dissemination system such as lack of interoperability with coalition allies and lack of timeliness to engage time critical targets.

This will be followed by a discussion of two alternative methods of disseminating the ATO along with analysis of each method. The first method discussed is the current method which uses an "air gap" to bridge the networks of the US and coalition allies. Second method is using a multi-level security device as a gate guard between the two networks and finally, a discussion on using a web based ATO that is graphical in nature and uses a high throughput Global Broadcast Service as the transmission medium.

The main point of the paper concludes that the last model (web based ATO with GBS) has the highest rating of "suitability to task" of the three models presented and merits consideration for further study and research. The web based model scored high in areas of timeliness, user friendliness and flexibility because of its graphical nature, high processing rate and high refresh rate inherent in a web based system.

Chapter 1

Introduction

> *The lesson from the last war that stands out clearly above all the others is that if you want to go anywhere in modern war, in the air, on the sea, or the land, you must have command of the air.*[1]
>
> —Fleet Admiral William Halsey to congress after World War II

To adequately lay the foundation for this research, this chapter will provide relevant background information and the statement of the problem, and research methodology used.

Winning modern wars is often dependent on winning command of the air. Winning command of the air is dependent on adhering to basic airpower tenants. Perhaps no other airpower tenant is as universally accepted or familiar as: centralized planning and decentralized execution.

The keystone concept of centralized planning is crucial to effectively employ air assets in a synergistic and effective manner. One vital tool of the Joint Force Air Component Commander to centralize planning is the Air Tasking Order (ATO).

Per Joint Publications, the ATO's used during the Gulf War and Air War over Serbia both complied with the standard 72-hour planning and 48-hour tasking cycles. However, some critics of the current ATO system cycle cite that the system is too linear and inflexible to meet the dynamic demands of modern aerospace warfare.

Particularly worrisome are the ineffective and slow methods of dissemination of the ATO to all the execution elements of air power and the nagging interoperability problems of piping the ATO to coalition allies.

Given the technical, political, and modern contextual elements (such as transnational threats, war on individuals such as terrorists rather than states) of effectively disseminating the ATO, the obvious question to ask and central thesis of this research paper is: does the current ATO dissemination system get the job done?

More to the point, the goal of this research is to highlight some promising avenues to enhance ATO dissemination and recommend further areas of study. To do so, this paper will first lay the foundation of the research by exploring the role of the JFACC and Joint Air Tasking Cycle.

Subsequent chapters will present capabilities and limitations of the current ATO dissemination system. This will be followed by a discussion of two alternative methods of disseminating the ATO along with analysis of each method.

Finally, the paper will conclude by highlighting a promising area for further study based on the analysis and operational requirements.

Notes

[1] Joint Pub 3-56.1 *Command and Control for Joint Air Op*erations, Nov 1994, pg. I-1

Chapter 2

The JFACC and the Air Tasking Cycle

> *Battle experience proved that control of the air, the prerequisite to the conduct of ground operations in any given area, was gained most economically by the employment of air forces operating under a single command.*[1]
>
> —General Dwight "Ike" Eisenhower

As the theater "Air Boss," the JFACC is the "go to guy" for the Joint Force Commander to address all of the theater's aerospace requirements.

Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms*, defines the JFACC as:

> The joint force air component commander derives authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The joint force air component commander's responsibilities will be assigned by the joint force commander (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision).[2]

To effectively optimize and employ aerospace assets, the JFACC uses the Joint Air Tasking Cycle. Over the years, the Air Tasking Cycle has been formed, shaped and honed by operational experience and doctrinal refinements. According to Joint Publication 3-56.1, the air tasking cycle provides a "repetitive process for the planning, coordination, allocation, and tasking of joint air missions/sorties and accommodates

changing tactical situations or JFC guidance."[3]

There are six major phases to the air tasking order cycle as illustrated by the following diagram with a brief, high-level discussion of each phase.

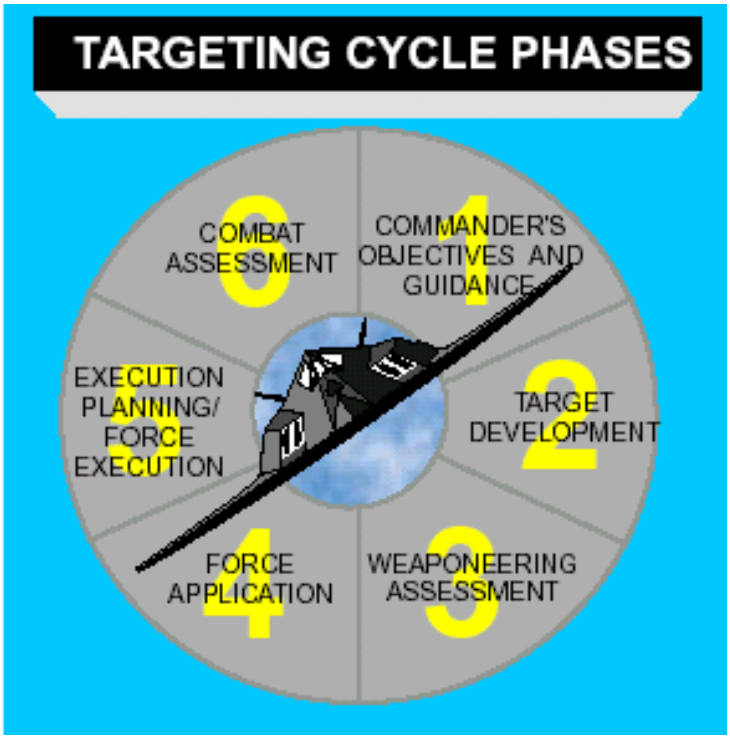

Figure 1 Targeting Cycle Phases

Source: Joint Pub 3-56.1, 14 November 1994, IV-1

Phase 1 is JFC/Component coordination. This phase is where the Joint Force Commander will normally "apportion the air effort by priority or percentage of effort" against specific targets or mission areas.

Phase 2 is target development. This phase translates the objectives of phase 1 into a prioritized list of targets—the Joint Integrated Prioritized Target List (JIPTL), which is a prioritized listing of potential targets.

Phase 3 is weaponeering/allocation. The JIPTL provides the basis for weaponnering assessment activities. The final "prioritized targets are then included into the Master Air

Attack Plan, (MAAP).4" The MAAP then forms the strawman for the Joint ATO.

Phase 4 is joint ATO development. This phase generates the ATO along with its associated special instructions (SPINS).

Phase 5 is force employment. This phase leads to aerospace operations. The Joint Air Operations Center (JAOC) is the primary OPR for required changes during the execution phase of the Joint ATO (e.g. initial battle damage assessment may cause a redirection or restrike of the target sets).

Phase 6 is combat assessment. This phase gauges the effectiveness of the combat results with the mission objectives and commander's intentions. The results of this phase lead back into phase 1.

The following diagram shows the iterative and sequential nature of the Air Tasking Cycle. The product of one phase, logically supports and leads into the activities of the next phase.

The key word for the cycle is notional. Although the steps and desired outcomes of each component of the Air Tasking Cycle are fairly standardized, the actual mechanics of getting it done varies considerably from AOC to AOC.

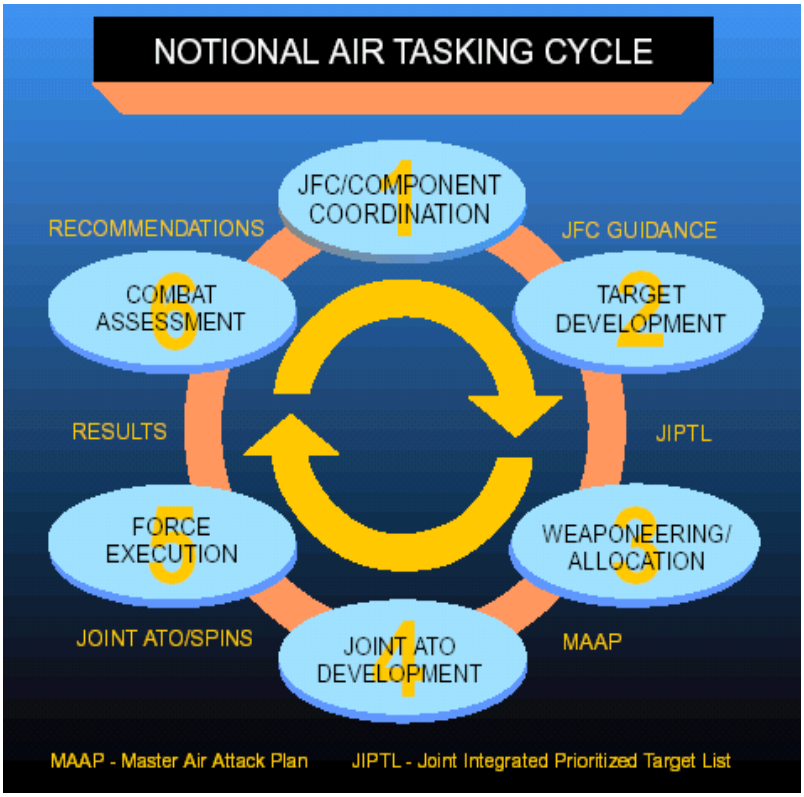

Figure 2 Air Tasking Cycle

Source: Joint Pub 3-56.1, 14 November 1994, page IV-4

The following diagram depicts a sample ATO timeline. The actual timeline will be set by the JFACC. Periodically, the timeline will "flex" with the operational environment where one element will take longer or be compressed to better meet the commander's intent and objectives of the Joint Forces Commander. Again, the phases of the ATO cycle is designed to be linear, repetitive and sequential. Of particular interest to this paper is the sequencing of ATO development, production and dissemination which takes place on the second day after the Master Air Attack Plan has been fleshed out.

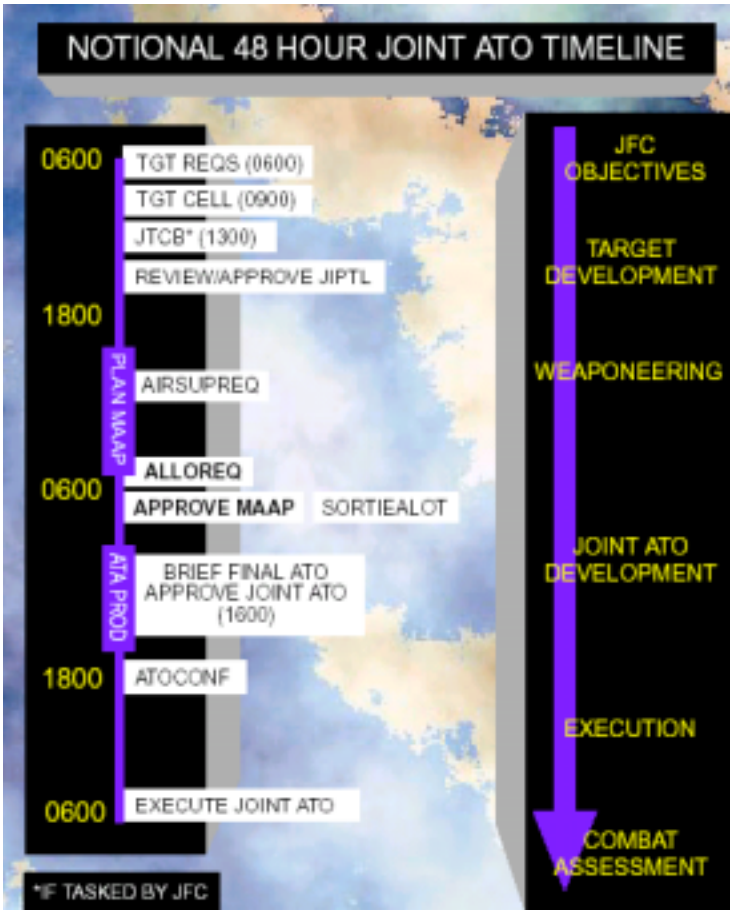

Figure 3 Notional 48 hour Joint ATO Timeline

Source: Joint Pub 3-56.1, 14 November 1994, page IV-5

Notes

[1] Joint Pub 3-56.1 *Command and Control for Joint Air Operations*, Nov 1994, pg. III-7

[2] Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms*

[3] Joint Pub 3-56.1, *Command and Control for Joint Air Operations*

Chapter 3

ATO DISSEMINATION SYSTEM

> *If successful war making depended upon masses of men, this country would be at least fourth down the list of world powers. If it depended on world-girdling colonies, possessions, and sea bases, we should definitely have to take secondary position. But when it depends upon technological progress, mass production and men capable of intelligent use of intricate machines, we are in a field where America can be second to none.*[1]
>
> —Gen. Jimmy Doolittle, USAF

The Air Tasking Order is a powerful tool for the JFACC to sequence and direct air operations. While the steps to compile the ATO have changed dramatically with the integration of automated tools (e.g. enhanced intelligence graphical databases that help identify centers of gravity and build target nominations), the dissemination of the ATO has been limited by service parochialism, lack of interoperability and technical challenges.

Additionally, for a period of time, there was no joint, universally agreed upon system for ATO dissemination, therefore each service relied on a service specific system.

For example, the Air Force used the Vietnam-era Computer Assisted Force Management System (CAFMS) which translated the MAAP into a functional ATO. CAFMS proved to be time intensive, for example, the system required up to 5 hours to transmit and print the roughly 800 pages of the ATO.[2]

Moreover, interoperability with execution elements such as the Wing Operations Centers was another challenge. To access CAFMS, WOCs needed a modified PC to work as a dedicated terminal. However, there was a very limited supply of terminals, and even if you had one, it would be of dubious value. For example, the WOC operator could only view 20 lines of the ATO at a time, and it took roughly 8 hours to view a typical ATO on the screen.[3]

Now a turning point for joint ATO dissemination was prompted by the lessons learned of Desert Storm. During the Gulf War, compiling and disseminating the ATO to all the execution elements of the Operation DESERT STORM was often difficult and frustrating task. For example, to get the ATO from the JFACC (located in Saudi Arabia) to the Navy carriers, the US either had to modify ships with "band aid" interim communications package or physically hand deliver the ATO's to the carrier fleet via aircrafts; a modern version of the Pony Express.[4]

Fortunately, the CAFMS was eventually replaced by the much more capable Contingency Theater Automated Planning System (CTAPS). CTAPS is really a wide area network that accesses various integrated databases. The good thing about CTAPS is that it reduces service component stovepipes by using standard hardware (Unix based) and commercially available software (Oracle). Because CTAPS was the approved Joint standard, it was the only way of doing business for service components to disseminate the ATO. CTAPS greatly enhanced synchronization and synergy of the air campaign and reduced service parochialism by having all components "pulling on the same side of the rope."

To illustrate how far ATO dissemination has improved over the years, consider this

example: recently, a Navy command ship used CTAPS to transmit 98-page ATO to Barksdale AFB, La., in 2 minutes, with no interoperability problems.[5]

Of course refinements are constantly being made. Significantly, the Air Force has fielded the Theater Battle Management Core System (TBMCS) at 16 wings worldwide as part of the initial installment.[6] TBMCS is designed to provide a force-level command and control system to plan the Air Battle Plan Force and execute the ATO.[7] One of the primary differences between CTAPS and TBMCS is structure. While CTAPS uses up to 26 databases and lacked industry standards, TBMCS contains only 2 integrated databases and was compliant with the demanding DoD standard Common Operating Environment.[8] This consolidation of information allows greater integration of the air campaign among and between service components.

Notes

[1] Joint Pub 1. *Joint Warfare of the Armed Forces of the United States*, Nov 2000, pg VIII-1

[2] Bender, Bryan, *Planning, Execution of Air War much Improved since '91*, Defense Daily, 21 Nov 1997

[3] USA Center for Lessons Learned. *Joint Tactical Communications Newsletter*. Jan '92: 1, 2, 18.

[4] Robinson, John, *Ships Sees Positive Impact of Information Technology*, Defense Daily, 21 March 1997

[5] Hyde, John and Johann Pfeiffer, and Toby Logan*, "The First Information War: CAFMS Goes to War*," ed. Alan D.Campen (Fairfax, VA: AFCEA Press, Oct '92), 42, Keaney and Cohen.

[6] C4I News, "*Air Force Moving Toward Fielding New C2 System Service Wide*," Jan 6, '00

[7] AF C2 BattleLab CD, *TBMCS,* Hurlburt Field, Fl

[8] Ibid

Chapter 4

Limitations of current ATO DISSEMINATION SYSTEM

> *Many forget that the 72-hour ATO cycle is not an execution cycle, it is a planning and execution cycle. We can execute instantly and what we need to be able to do is* ***execute in single-digit minutes*** *(emphasis added).*[1]
>
> —Gen John Jumper, AF Warfare Symposium

While the ATO dissemination system has evolved considerably since the days of CAFMS. The current system is still a "work in progress." Many feel that although the current ATO dissemination system is a vast improvement over the past iterations, it still has a ways to go.

Particularly, two items of concern are: the lack of an effective way to interoperate with coalition allies and ability to engage time critical targets.

Coalition Interoperability

First limitation is the lack of common interoperability with coalition allies. According to Joint Pub, interoperability is defined as the "ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use these services to enable them to operate effectively together."[2]

In December 2000, HQ USAFE asked the Warrior Preparation Center to lead a "Tiger Team" to study the lack of interoperability between the United States and Coalition allies

during Operation ALLIED FORCE.[3]

In the report, the tiger team cites the operational impact of the lack of interoperability with coalition allies. The report states, the lack of interoperability "undermined planning, centralized control of forces, and combat assessment"[4] of the air campaign.

The reason that the coalition allies such as Germany, United Kingdom and Italy could not access the ATO was because there were two of them. One ATO covered the majority of the air missions (tactical strikes, airlift, ISR etc.) and was releasable to NATO countries. The second ATO contained strike missions of "special capability" of the United States such as the B2 stealth bomber and F117 which was classified "SECRET-US ONLY."

Compounding the complexity of the technical interoperability between US and NATO allies was the fact that the US transmitted their ATO on "US Only" classified lines and systems (e.g. CTAPS). Meanwhile, Non-US NATO countries disseminated their ATO (which was different from the US's ATO) via a NATO system called LOCE (Linked Operations-Intelligence Centers Europe).[5]

Although serving similar functions, US and NATO security policies mandated an "air gap" between LOCE and US information systems, which effectively hampered the speed of transfer between the two systems.

Perhaps more worrisome to senior leaders was the fact that publishing two ATO's degraded NATO's attempt for unified action, which joint pub 3-0, Doctrine for Joint Operations, describe as "the synchronized application of all of the instruments of national and multinational power."

The JFACC of ALLIED FORCE, Lt. Gen. Michael Short considered the dual

channeling of the ATO a mistake.[6]

> On the first night of the war, as the F-117 force was forming up in Hungary with its escort, a foreign national was screaming from a NATO AWACS [Airborne Warning and Control System], asking the CAOC "what were those airplanes doing in Hungary?" We had a U.S.-only ATO and a NATO ATO, and that young man on board NATO AWACS did not have a U.S.-only ATO.
>
> Clearly we have concerns for technology, and perhaps we have concerns for timing. But you don't ever want to be in a position where on the first night of the war, sitting at the table of the JFACC, and a flag officer from one of your strongest allies says, "General, it appears to us we are not striking the SA-6s at location A, B, and C." And the best you can do is say, "Air Commodore, trust me." We are playing this game.[7]
>
> —Lt. Gen. Short, JFACC, ALLIED FORCE

The lack of technical interoperability between US and other NATO country's ATO dissemination system diluted the effectiveness of centralized control and decentralized execution and projected an ominous perception that some NATO countries were not on the same team as the US in operation ALLIED FORCE.

Time Critical Targeting

Second major limitation of ATO dissemination is the lack of effective means to pursue time critical targets and dynamically retask air assets. Gen. Jumper encapsulated the vision and desired effects of time critical targeting in a recent speech.

> We will measure success in our revolution in information technology pretty much the same way we measure it in industrial measures of information technology. We need to be able to move information quickly and I've set out a general goal that we want to do time-critical targeting in single-digit minutes. This sets out a wide-variety of goals for us and we start with the notion that you take in your combat planning and you get rid of the post-it notes, the yellow stickies that you put on the acetate. That is how we do our planning today. We replace that with a digitized version so that when the targets are entered, the ATO is automatically built in the background because the machines know, the databases know, where the

> right airplanes, the right bombs, the right fuses, the qualified crew chiefs, etc. all reside in a theater of operation. When you get that last target entered, the ATO is all but built and what you don't have, the machine tells you. This is what you've got to go do to make this ATO executable. It also puts the ISR assets in the right places and the tanker orbits in the right place.
>
> When the JFAC walks in the next morning at 7 a.m. he hits enter and watches the whole thing fly out in 50-time speed so that he can see where the weak points are: If that tanker orbit is too close to that SA-5 ring, what is the consequence of moving it? Will this EA-6 stand-off jamming coverage be able to cover this target up here? You pause and you ask those questions and you do that analysis, you turn ***the art of administering an ATO into the art of commanding air power*** (emphasis added***)***.
>
> —Gen. John Jumper

We can see this playing out in OPERATION ENDURING FREEDOM. US air assets are not only engaging traditional target sets (Command and control, communications sites etc.) but also small terrorist cells or in some cases—individual terrorists.

Since the ATO is embedded in a sequential 48-hour notional timeline, the current ATO dissemination system is simply not designed for an operational environment where dynamic retasking and engagement of highly unpredictable and non-static targets (such as individual terrorists) are the norm.

In summary, evaluating from the context of a system that allows coalition interoperability and enhanced time responsiveness to engage dynamic targets, it is clear that the current ATO dissemination system is not getting the job done.

Notes

[1] Jumper, Gen. John, speech at "17th Annual Air Warfare Symposium," Feb 2001
[2] Joint Pub 1-02, DoD Dictionary of Military and Related Terms, Apr 1999
[3] Tiger Team Report, "Coalition Interoperability," HQ USAFE, Sep 2001
[4] Ibid
[5] Federation of American Scientist, *LOCE*, Internet Web site, www.FAS.org
[6] Short, Michael Lt Gen, speech at "Southern Europe AFA Air Warfare

Notes

Symposium," Feb 2000

[7] Jumper, Gen. John, speech at "17th Annual Air Warfare Symposium," Feb 2001

Chapter 5

Two Alternative Conceptual ATO Dissemination Models

> *What the Warrior Needs: a fused, real time, true representation of the battlespace—an ability to order, respond and coordinate horizontally and vertically to the degree necessary to prosecute his mission in that battlespace.*[1]
>
> —The C4I for the Warrior Vision

Clearly, recent air campaigns point to the need for an interactive planning and information dissemination system that can meet coalition interoperability requirements and time lines imposed by modern warfare.

Looking at the longview, there are two alternatives to the current ATO dissemination system.

TBMCS with Multi-Level Security (MLS)

The first alternative is strapping on additional capabilities (most notably multi-level security) into the current TBMCS system.

Multi-level security is a device that controls and restricts access between information systems of different security classification levels to communicate through a carefully defined and approved security protocols, usually involving encryption and authentication.

Unlike ALLIED FORCE, where security concerns mandated an “air gap” between US and NATO information systems, MLS would allow operational units unprecedented

ability to communicate between planners and execution elements. The net effect is a seamless system of all approved US and coalition information systems into a cohesive and comprehensive network.

A formidable hurdle that first must be cleared prior to implementing MLS is working the thorny issue of security.

For US information systems, the MLS must be certified and accredited by the DoD Information Technology Certification and Accreditation Process or DITSCAP prior to operation.[2] Since Non-US systems falls outside the control of most US authorities, certification officials (under the DITSCAP process) have been reluctant to take responsibility for systems they do not own nor control.

However things may be changing, a 1996 Defense Science Board Task Force concluded that use of a capable electronic gateway such as Multi-Level Security with an appropriate "information guard" features would not significantly increase the risk over current methods of transmission.[3]

Moreover, the Task Force concluded that the dated notion of "we must have an air gap" does not necessary apply to today's information system using sensible security measures.[4]

The National Security Agency (NSA) has pursued an innovative program that may shed some light on the issue. The Multilevel Information Systems Security Initiative (MISSI) is an evolutionary effort intended to provide better MLS capability in a cost-effective manner[5] to tactical users.

The initial products include the FORTEZZA crypto cards and FORTEZZA compliant workstations to control access to and protect data on a workstation in a network

environment.[6] Roughly the size of a credit card, FORTEZZA cards are extremely portable and versatile for users to employ. Other products include high-assurance guards and firewalls to provide access control and encryption services between the local security boundary and external networks.

The figure below simplified concept to merge NATO's LOCE and US's CTAPS (using a certified and approved MLS device), into a cohesive multi-national network.

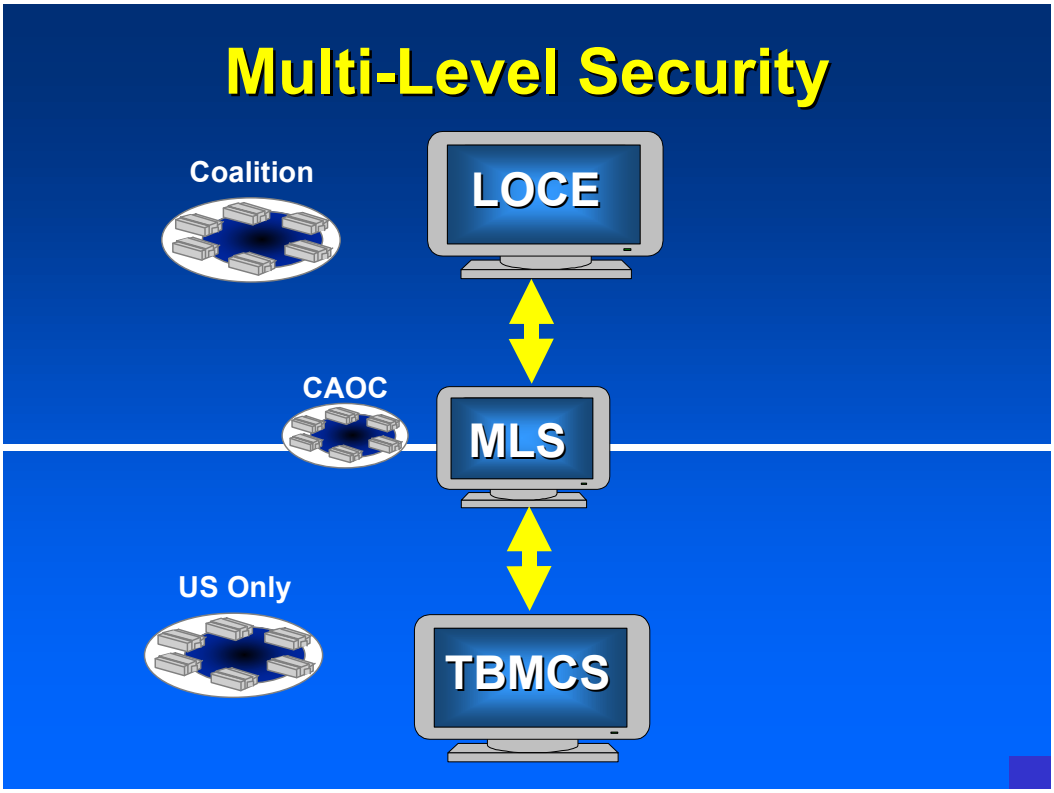

Figure 4 Multi-Level Security.

Graphical ATO/Web hosted/Global Broadcast Service

Second alternative method of disseminating ATO is to make it host the graphical ATO on a secure web site and using the Global Broadcast Service (GBS) as the high speed, transmission medium.

Graphics intensive

Currently, the ATO is a text-based application that relies on the users to "sweat" the details out themselves. To enhance "information superiority," and "aircrew friendliness" a graphical based ATO could provide much more meaningful and context sensitive information to the user.

For example, in addition in giving the geo-locations, the graphical ATO would provide relevant, value-added graphical representation of the objective, timing/tempo issues, and special instructions would all be depicted on the ATO graphically.

The following figure depicts a notional real-time convergence of text, data, pictures that replaces the traditional "text only" ATO. This gives aircrews access to real-time streaming video and traditional ATO information that enhances situational awareness of the operators, planners and support personnel of the air campaign.

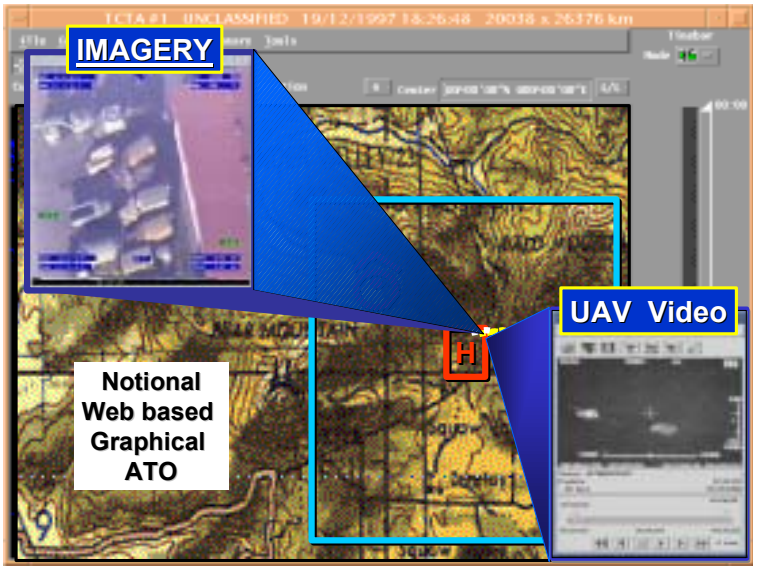

Figure 5 Web-based Graphical ATO (Notional)

Web Based / Virtual Private Network

The ATO could also be web based vice client server based as the current TBMCS

system. Since the information will be hosted on a secure web site, greater interoperability will be gained because users can access the web site regardless of operating system or hardware configuration of the information system.

Another advantage of hosting the ATO on the web site is that owners of the ATO can set the access privileges. In other words, system administrators can tailor the settings of the ATO access settings on the web page to give each different user or teams different levels of privileges based on "need to know." For example, a combat planner deployed forward in the AOC would likely have more privileges than an administrative budget analyst working in the Pentagon.

A final advantage of the web based VPN is the dynamic nature of updating the ATO. With the current system, once the ATO is released, changes and especially dynamic retasking (e.g. vectoring strikers to engage a mobile scud that is about to launch) is extremely difficult. A more technically elegant solution is to update the changes directly onto the web based ATO, that way the ATO is always "up-to-the-second" updated (even when aircrews are airborne).

Global Broadcast Service

Global Broadcast Service (GBS) is a DoD program that uses satellite communications technology to enhance information interchange within and between "theater, national, and multinational forces."[7] By using state of art compression/encryption technologies, GBS can broadcast up to 23 Mbps down to a terminal roughly the size of a medium size Pizza (18 inches).[8]

Additionally GBS is capable of multilevel security[9] and can adjust the broadcasts beam to cover an entire theater of operations or a spot beam to cover an "area of

approximately 500 square miles."[10]

GBS would give deployed units unprecedented capability and access to high volumes of information regardless of location or organic communications support.

The disadvantage of using a web based, graphical ATO is that it would be a bandwidth hog. Because of its high processing capability, GBS would be ideally suited for this type of information application.

Notes

[1] DoD Instruction 5200.40, *DITSCAP*, 30 Dec 97
[2] Ibid
[3] Ibid
[4] Ibid
[5] National Security Agency Web site, *MISSI*, www.nsa.gov
[6] Ibid
[7] Office of the Assistant Secretary of Defense, *C4ISR Handbook for Integrated Planning (CHIP)*, 1998, pg 6-46
[8] Ibid
[9] Ibid
[10] Ibid

Chapter 6

ANALYSIS OF MODELS

In conducting the analysis, I evaluated the three models discussed in the paper (first model-current system with an air gap, second model—multi-level security, and finally the third model—web based using GBS) against identical 7 criterias.

The criterias included: interoperability with coalition allies, timelines of response (particularly dynamic retasking), ease of use, ability to implement now, flexibility, security and finally portability.

I will now discuss a few of the evaluation justification for the criterias. On the first issue of interoperability, the MLS had an advantage because NATO and US will continue to use their respective networks. An approved MLS device would serve as bridge between the two networks. So from the perspective of "suitability to task," the MLS option would cause the least amount of disruption and offer the quickest implementation time. However, as mentioned before the security and accreditation issues will be likely shortfalls and must be worked diligently.

Second criteria of timeliness goes to the "Web based GBS" because of the high throughput of GBS and the fact that the web based ATO will always be updated. Which would be ideal to support dynamic retasking and time critical targeting.

The desired end result of an ATO dissemination system is a picture that looks like a

radar scope. Unlike the text version of the ATO, the constantly updated ATO "radar" picture will direct the air campaign in near real time. Additionally, by porting out the ATO to "networks in the air" such as Link-16 from GBS, the JFACC would have a powerful tool to retask and direct air operations like never before.

Another criteria of Flexibility also favors web based GBS ATO because it is designed to be hardware and operating system independent. As long as the standard protocol will be used, different machines will be able to communicate with each other. This "everyday" miracle happens every day on the World Wide Web.

In summary, reviewing the models against the established criteria, the one model that serves as the most practical solution is the "Web based, GBS ATO." Combining high capability data flow with unprecedented flexibility to refresh ATO "up-to-the-second," this option offers the best technical solution to enhance coalition interoperability and ability to engage time critical targets.

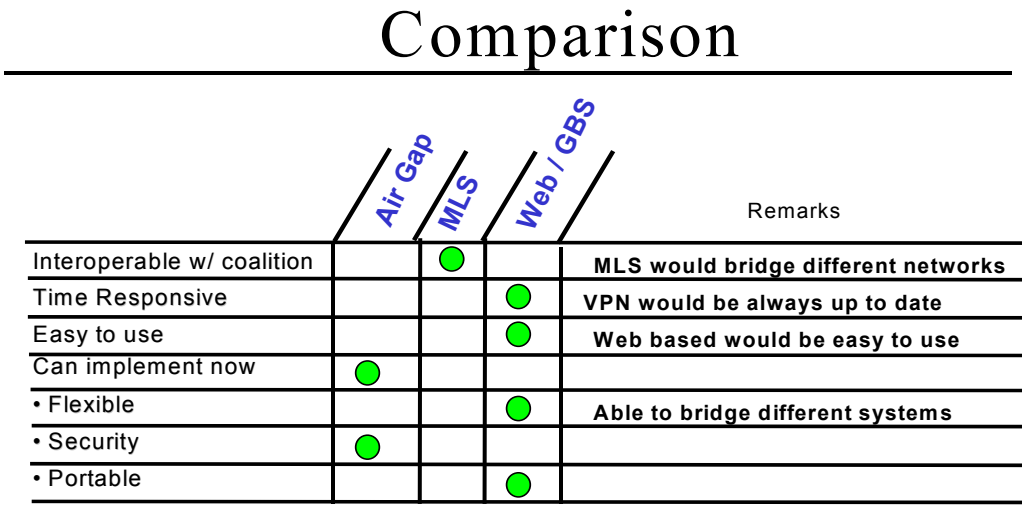

Figure 6 Comparison Chart of the 3 Models

Chapter 7

Conclusion

The capability of technology to alter organizational relationships may be invaluable or dysfunctional based on the effect it has on the organism.[1]

—General Charles Horner, Comments on EFX 98

The ATO, as the centerpiece controlling element of the Joint Air Tasking Cycle, must be disseminated in a manner that optimizes the synergistic effectiveness of air power.

Ideally, interoperability between all organizations supporting the JFACC mission will be established to allow seamless and effective exchange of ATO information.

The three models of ATO dissemination described by the paper were studied and evaluated against 7 identical criterias.

The model that was rated as the best "suitable to task" to accomplish the twin requirements of enhanced operability between coalition allies and improved timeliness to respond to time critical targeting was the "web based ATO using GBS."

This model is the only model that allows greater interoperability by combining hardware independent platforms (such as those found using web based applications) with a highly capable transmission medium of GBS. The net effect of this arrangement is a system that bridges the gap between different hardware platforms and security levels and delivers the ATO to the right person, any time…anywhere.

Of course the breadth, scope, and depth of the research paper doesn't not adequately justify the selection of one system over the other, rather it highlights the need to conduct further research into the topic.

As the ATO dissemination system continues to evolve and flex with the operational environment, there are many promising areas of research that merits further exploration. I mentioned only two options, but there are likely to be several more.

In conclusion, what is clear is the need for an ATO dissemination system that can meet not only the Command and control requirements of today, but also adapt to the emerging threats of tomorrow by leveraging and applying promising technological innovations.

Notes

[1] Corder, Johm C. Maj Gen (Retired), "*EFX-98 Good News Story*," C2 Earlybird: Special Edition EFX 98 Lessons Learned, Vol 1, Special Edition Issue1, Dec 1998, pg 9.

Glossary

ACSC	Air Command and Staff College
ACA	Airspace Control Authority
ACC	Air Combat Command
AC2ISRC	Aerospace Command, Control, Intelligence, Surveillance, and Reconnaissance Center
AEF	Air Expeditionary Force
AFDD	Air Force Doctrine Document
AOR	Area of Responsibility
AETF	Aerospace Expeditionary Task Force
CFACC	Combined Forces Air Component Commander
C2	Command and Control
C4I	Command, Control, Communications, Computers, and Intelligence
CAOC	Combined Aerospace Operations Center
COMAFFOR	Commander, Air Force Forces
COP	Common Operational Picture
GCCS	Global Command and Control System
ISR	Intelligence, Surveillance and Reconnaissance
JFACC	Joint Forces Air Component Commander
JFC	Joint Forces Commander
JTF	Joint Task Force
MAJCOM	Major Command
NATO	North Atlantic Treaty Organization
ROE	Rules of Engagement
TBMCS	Theater Battle Management Control System
TCT	Time Critical Targets
USAF	United States Air Force

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