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Network Centric Warfare and the Joint Forces Air Component Commander.

By

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Maritime Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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The JFACC concept rests on the belief that aircraft possess a unique ability to reach the 'deep battle' and need to be centrally controlled and coordinated. Today, however, the JFACC controls more than just aircraft. The JFACC staff continues to grow to accommodate controlling and coordinating new technologies. In reality, the ability of aircraft to reach and influence the deep battle is no longer unique. It applies to a myriad of weapons, sensors, and information. A network centric automated system is better suited to control and coordinate these assets. Such a system would be able to absorb the functions of JFACC as a subset of functions performed. The system would be far streamlined and much more efficient than the JFACC. This system is interactive and fuses all information, weapons, and sensors into a common situational picture for all users. This system is a battlespace system.

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Scenario: It is the year 2010, and the Red Army of China is massed on the Thai border. The Joint Force Commander (JFC) walks into a van for an update. He looks at a computer screen that depicts hundreds of color-coded targets. The red targets indicate today's mission. He touches a symbol with a light pen. Its response is to display the target type, time on target, the weapon attacking the target, the mission number and type of platform, whom the platform belongs to, and where it is stationed. He looks at the clock and the time is 1300. The target symbol turns white. He touches it again. Now it displays: the target hit, to what extent it has been damaged, as determined by what source, and an option to view the video provided by that source. He notices another symbol change from yellow to flashing red. Simultaneously, an aircraft symbol flashes and sends a solid line to the target. A separate window appears on the screen. The display reads: 'Priority Change to Priority One Recommended'. Included are the recommended target/weapon pairing and all the information pertinent to the target. The computer prompts 'Push to Override'.

Following this, the JFC asks for the anticipated changes for the next day. The computer operator prints out a long report. On the report are recommended target priority changes based on current Battle Damage Assessment (BDA) and intelligence, a list of every weapon available, a reduction in the sorties planned for a particular squadron, explanatory notes such as 'Two Aircraft Not Mission Capable', and references to parts and battle damage repair.

On the screen, a blue circle lights up that is 50 miles beyond the forward line of troops. He touches the circle with the pen. The display reads: Observation, Seal Team 1,

and Press to View. He selects 'view' and watches real time through the video camera built into the Petty Officer's glasses...

Desert Shield/Storm provided a good case study of the Joint Force Air Component Commander (JFACC).* During the past eight years, many hours of analysis and pages of commentary have been devoted to the lessons learned. This analysis and commentary provided an excellent discussion of, and recommended many improvements to, the JFACC. However, the approach was reductionist in nature, as opposed to holistic. The process analyzed and improved the individual parts of the JFACC system, without addressing the system as a whole. Due to recent advancements in technology, it is now necessary to review the original premise behind the *creation* of the JFACC. Recent technological advances allow for the development of a model significantly different from the JFACC of today.

This paper will argue that the original premise that necessitated a need for the JFACC now requires a much more robust command and control system: a 'battlespace system'. A network centric system that has within it the functions of the JFACC as a subset of the functions performed. Furthermore, nodes rather than people should perform the functions of the JFACC. The centerpiece of this paper will be an example of a network centric model that supports the concept of the opening scenario.

Understanding the need and purpose that created the JFACC is a prerequisite to recognizing why a battlespace station is now required. The JFACC originated in the European Theater. The European Theater Commander in Chief established the JFACC as

* In this paper, JFACC will refer to either the person, or the organization.

a coordinator to organize the air assets of the theater to accomplish his mission.[†] The Joint Chiefs of Staff (JCS) codified the JFACC into joint doctrine with the publication of JSC Pub 26 in 1986.[1] The concept behind the JFACC dates back to World War II and, specifically, to the lesson learned by the allied air forces in North Africa during the battle for the Kasserine Pass.[2] The Allied military discovered that centralized command and control was required to maximize and exploit the inherent flexibility and ability of air power to deliver a decisive blow to the enemy.[3]

Underlying the need for centralized control of aircraft was the belief that aviation assets had the unique ability to exploit speed, range, and flexibility to reach across the *entire* battlefield. When air forces from different services operated together, it became necessary to coordinate their efforts so as to avoid any duplication of targets. This was the most efficient and effective means to accomplish the objectives of the Joint Force Commander (JFC).

Furthermore, the composition of U.S. aviation forces of today require centralized coordination and control. Today, air warfare, due to the interoperability of aircraft, is probably our most 'joint' endeavor. Each service has an aviation capability that enhances that of the other services. For example, the vast majority of aerial refuelers and surveillance aircraft reside in the Air Force. Likewise, the Navy and the Marine Corps

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[†] There have been disagreements between the services on the doctrinal belief of centralized command and control, particularly between the Marine Corps and the Air Force. However, the two services actually agree on the principal, they disagree on the application. The Air Force believes the assets are theater assets and should be centrally controlled by an airman at the highest level appropriate to the situation, Theater, Joint Force, etc. Marine Corps doctrine endorses centralized command and control of aviation assets at the Marine Air Ground Task Force (MAGTF) level, vice the Theater or Joint Force. This is stated in the following mission statement of Marine aviation: "...to participate as the *supporting* air component of the Fleet Marine Force in the seizure and defense of advanced naval bases and for conduct of such land operations as may be essential to the prosecution of a naval campaign." (Motz p.66)It is from this difference that the debate between the services over the meaning of the last "C" of JFACC--Commander, or Coordinator—stems.

have superb electronic warfare aircraft. It makes sense to employ these forces together. To do so requires coordination.

Recent technological advancement of weaponry has changed what the JFACC presently controls and coordinates. Originally, the JFACC only controlled and coordinated those aviation assets that had strategic, operational, and tactical 'reach'. In modern terminology, the deep battle is what is meant by strategic and operational reach. In 1943, at the genesis of the JFACC concept, only fixed wing aircraft fitted the bill. The limited range of operations of other weaponry did not require centralized control or coordination.

Today, the JFACC, via the Air Tasking Order (ATO), controls or coordinates helicopters and Tomahawk Land Attack Missiles (TLAMs) in addition to aircraft.[4] This is due to the increased 'reach' or, put another way, the increased *impact*, these assets can have on the battlefield. Additionally, ongoing studies are taking place to figure out where the Joint Force Fires Coordinator (JFFC) and Army Tactical Missile System (ATACMS) fit in.[5] A number of studies suggest that they belong within the JFACC; other studies disagree. Either way, it is beginning to look like anything that 'travels through the sky' should be under the coordination and control of the JFACC.

The major reason for this is the redefinition of battlefield to battlespace. This reflects the development of new systems that affect the environment in which we wage war. Various assets now have battlespace-wide impact. Examples of these include: (1) the V-22 Osprey, which will soon replace helicopters and have a far greater range; (2) the development of Ship to Objective Maneuver (STOM) by the Marine Corps and the Navy

- STOM will increase the reach of amphibious operations; (3) Precision Guided Munitions (PGMs) - helicopters in the Marine Corps work in concert with fixed wing aircraft to provide laser designations for PGMs; and (4) Special Operations Forces (SOF) - utilizing helicopters or V-22s, SOF gain strategic and operational reach. The list could also include Unmanned Aerial Vehicles (UAVs) and future space-based weapons. The question is, does it make sense to grow the JFACC to control and coordinate all these assets, or create a new system - a battlespace system?

There are several reasons to suggest that expanding the JFACC to accommodate technological inventions with 'deep battle reach' does **not** make sense. The invention of new capabilities carries with it the possibility that the JFACC staff will grow proportionally. The JFACC staff consist of numerous liaison elements who "provide component planning and tasking expertise, coordination capabilities, and the ability to deconflict component operations and joint air operations." [6] There currently exist eight liaison elements of various sizes within the JFACC; additional to this are senior service representatives for each participating component of the joint force.[7] At the moment, the JFACC staff is not a standing organization; the staff consists of personnel from other units. This in itself has several negative connotations. During the Gulf War, the JFACC staff consisted of over 1,000 personnel.

Difficulties associated with command and coordination are also reasons why expanding the JFACC in order to accommodate new technologies is not a good idea. Early on, one of the biggest problems facing the JFACC was the issue of the last 'C'; namely, was it to Command or Coordinate? Through extensive dialogue at the JCS and CINC level, and a careful wording of Joint doctrine, this issue is, for the most part,

settled.[‡] However, current research as to the proper relationship and placement of the JFFC within the JFACC risks re-awakening this former bone of contention. The importance of this issue will grow proportionally as weapons operated by other component commanders fall under the control or coordination of the JFACC.

A by-product of the command issue is the competition that has sprung up for control of different pieces of the battlefield - specifically, placement of the Fire Support Coordination Line (FSCL). In concert with this is the question of what agency, and what degree of control, is required for operations within and outside of the FSCL.[8]

Finally, the current systems used to process and disseminate information also suggest that growing the JFACC is not the way forward. During the Gulf War, the Computer-Aided Force Management System (CAFMS) used by the Air Force to plan, execute, and disseminate the ATO, was incompatible with those of other services and coalition forces. Fielding the Contingency Theater Automated Planning System (CTAPS) following the Gulf War largely remedied the problem. The Global Command and Control System will add further improvements to the information process. However, these systems used by the JFACC select only information that serves the JFACC in its present form. The information these systems process is particular to the JFACC and, therefore, limited in scope. For instance, logistical information re where a specific part is located in theater is not processed. Additionally, the systems designed are the product of individual service initiatives. This limits what the system can contribute to the JFACC process. Often, individual services do not have the need for information required of another

[‡] The titles of articles listed in the Bibliography reflect the amount of energy and dialogue spent on this subject.

service. The other side to this, however, is that individual services do not realize that the information they have could often be of use to *other* services. A good example of this would be the information processed between tanks attacking a target. On the surface, it would appear that this has no application to the JFACC. However, if this information interacted with a target database it could *well* have application to the JFACC.

A network centric battlespace system can perform both the functions of the JFACC and many others simultaneously. It can do so with less manning, more streamlined avenues of command and communication, and possess inherent interoperability.

However, to describe such a system a couple of definitions need reviewing. The first of these is 'network'. In the wider sense this is defined as "several computers, electronic data processing systems, electronic information systems, or combinations thereof linked to each other by technical communication lines permitting data transmission."[9] The second is network centric and, as it applies to computers, this is defined as "the evolution of computing from platform centric computing (individual computers) to network centric (computers linked together)".[10]

The JFACC is network centric in the sense that it is a system of systems. Each system contributes information that allows the JFACC to produce several products: the Master Air Attack Plan (MAAP); the Air Defense Plan (ADP); and the Airspace Control Order (ACO). However, the JFACC network consists of more human-supported systems of information than is needed, as is indicated by the following statement: "Much of the day-to-day joint air tasking cycle is conducted through interrelated series of information exchanges (through designated component liaison officers and/or messages)".[11]

Incorporating the functions of the JFACC into an automated network with computer nodes spread throughout the battlespace would reduce the staffing levels and increase the efficiency of the current JFACC system. It would also make the information the JFACC has in its possession available to all potential users.

To design a battlespace system requires a holistic approach. What is meant by this is that the battlespace is the system within which all other systems operate, much as the human body is the system within which the respiratory system operates. The goal of the battlespace system is to interconnect all entities or systems within the battlespace. Just as the JFACC fused all the entities within its system (intelligence; targets; platforms; command intent, etc.), so must the battlespace system, but on a far larger scale. What are the entities within the battlespace? Well, they are the ground combat command, the maritime combat command, the JFACC, aircraft, targets, weapons, sensors, supplies, and information, etc. The system then connects these entities through nodes. The nodes are independent computers. These computers are networked together and spread throughout the theater so as to reduce the need for a large standing staff.

The system is interactive to optimize the capability and ability to process information. The system has plug-and-play growth potential to accommodate new technologies. The system is interoperable and uses such technology as Hypertext Markup Language (HTML), web browsers, TCP/IP, and Java computing architecture.

Organic to the system through its myriad of nodes is all databases relevant to the military. To list these databases is beyond the scope of this paper; however, the list would consist of every database used by every component, function, weapon, sensor, person,

etc., in the military. The computer can interface with all of them. This capability does not rest in a single computer, but in the networked system.

The following Air Tasking Order cycle demonstrates how the battlespace system absorbs the functions of the JFACC. [12] The examples of interacting databases used are neither all-inclusive nor exhaustive. The intent is simply to illustrate the logic of the system. Databases in parentheses indicate those that could contribute information relevant to the discussion.

Target development

A master target list and situation board is comprised of target information submitted from numerous sources. The sources could include a rifleman with a video recorder in his glasses, overhead imagery, aircraft, sensors, intelligence, the standing TLAM database, etc. Electronic means (Link 16/ Joint target and identification system JTIDs) transmit the target data to nodes. Nodes are available to all units in the form of computers. The computer assimilates and correlates all inputs. This information is available to all users in the form of a situational picture. Computer screens, or aircraft digital display indicators, display this situational picture. The picture overlays the earth for the area of operations (AO) and is able to position both friendly and enemy forces.

The board is interactive. Users can query targets on the board, perhaps with a light pen, and receive all pertinent information. From this picture, all component commanders can immediately decipher targets within their area. The target database is interactive - information is transmitted electronically to update destroyed and new targets.

Weaponeering[§]

The target database incorporates modeling to provide the JFC with target prioritization recommendations. The modeling will enable apportionment decisions based on enemy and friendly situations. For instance, when troops are not in contact the computer may recommend that priority be given to strategic targets. Equally, as movement to contact commences, the computer may recommend shifting priorities to interdiction targets.

The database contains *all* data for *all* weapons. Essentially, this is a computerized version of the Joint Munitions Effectiveness Manual (JMEM) for each and every weapon. The computer then matches weapons to targets based on a myriad of factors and available information: optimum percentage kill; most efficient; quickest response; known weather; weapons available, or, of course, any desired rule set.

This process is continual and can reflect real-time changes due to diverted missions, weapon damage, weather changes, or any other reason. This system can produce ongoing Master Air Attack Plans (MAAP) for any queried period for a number of variables: by target, by weapon, etc.[13]

ATO Development

The system database includes all weapon and sensor locations and calculates transit times, to include air refueling, based on the specifics of each individual weapon (FFPLAN database). The system calculates regeneration times, builds mission packages, attaches appropriate notes, and produces a master ATO to reflect the MAAP. The system continually updates the master and is available for units to retrieve through the computer

[§] This term is strictly a military term, it is not found in the dicitionary . As weapon and weaponry are

nodes. The system can interact with the scheduling programs of aviation units to fill in time lines.

Force Execution

The system updates the situation board as weapons take off. The target board is also updated to reflect attacks in process, targets awaiting Battle Damage Assessment (BDA), or targets destroyed, as information is made known. If the enemy situation changes in such a way as to require the diversion of weapons then the situation board reflects it, and makes recommendations. Weapons receive the information real-time, either in the cockpit via Link-16 or similar capability, or on the computer screen of the unit.

Updates to the system occur when weapons become unavailable for whatever reason - maintenance, battle damage, etc. The system processes the information and produces recommended adjustments. Forward Air Controllers (FACs) can address a request for support direct to the system. The system will allocate the closest appropriate weapon, thereby increasing efficiency and streamlining the process. The Direct Air Support Center (DASC), much like the JFACC, is absorbed into the system.

Combat Assessment

All sensors and weapons with real time ability to input BDA do so. The computer, based on certain reliability of information models, updates the situation board. Future MAAPs are automatically adjusted to reflect the new information. As new targets emerge, they automatically enter the ongoing process of target-to-weapon pairing. All forces have real-time updates as to the enemy situation.

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nouns, the word should not exist at all.

The JFACC could grow to umbrella all of the above systems. It would effectively then be taking responsibility for the control and coordination of all things that travel through the atmosphere. This could well be a logical interpretation of 'air power'. At first glance, this would look to be a logical development for the JFACC; after all, the original idea behind the JFACC was the control and coordination of assets with the unique ability to reach the deep battle. However, doctrinally, the JFACC is not a permanent, required, element in the joint force structure.[14] In fact, how a JFACC is set up and where it fits into the chain of command differs widely between Commanders in Chief (CINC). It is situational-dependent, as is the need for a Joint Force Commander (JFC). The JFC appoints the JFACC, or the JFC staff performs the functions of the JFACC. The present structure, therefore, does not include the JFACC in the procurement process. To design and build a new battlespace system certainly requires access to the procurement cycle.

To develop such a system the CINCs and services need to recognize and articulate the advantages of the new battlespace system. A lead agency, comprised of representatives from each area of the military and every service, should be responsible for the development of the system. The battlespace system, with a significantly streamlined staff compared to that of the JFACC, should then become a permanent organization.

The ability to construct such a system requires funding and technology. Establishing this system as a joint requirement would provide money and technology from all the individual service initiatives to build their own version of this system, C4I, GCCS, etc. Although the technology of successfully fielding such a system initially appears daunting, the progress of systems such as the Joint Target Identification System,

cooperative engagement, and Link-16 prove that the ability to construct this exists. Additionally there are industry examples to support the concept of such an interactive system. Federal Express clients can track the location of packages sent anywhere in the world from home through the Internet. The 'free flight' initiative by the Federal Aviation Administration to reform the aircraft control procedures in the United States is another example. This system is based on the fusing of technologically advanced navigation systems, inertial navigation and global positioning systems, with aircraft collision avoidance systems.

Conclusion

The success of the air campaign in the Gulf War is testament to the advantages of the centralized control and coordination of unique assets. Today, through the myriad technological advances associated with the Revolution in Military Affairs (RMA), many modern assets possess unique strategic and operational importance to the battlespace. Just as aircraft in days past needed centralized control and coordination to exploit unique capabilities, so do these new assets. The improvements made to the JFACC have focused on individual parts - the computer system, staff, and training. With the technology that exists today the battlespace as an entire system can be significantly improved, not just the individual parts that make up this whole.

To realize that air is the medium through which things move to service the battlespace is the first step to realizing a new system. The technology is available to construct a network centric system that incorporates all information, weapons, and sensors within a given theater. This system can provide all users with equal situational awareness re prosecuted targets, threatened forces, and the accomplishment of the

mission. The only remaining question is what to call this system. Why not 'HAL'? After all, 2001 is only two years away.[15]

NOTES

[1] Jeffery E. Stambaugh, "JFACC: Key to organizing Your Air Assets for Victory." Parameters, Summer 1994, 98.

[2] Jeffery E. Stambaugh, "JFACC: Key to organizing Your Air Assets for Victory." Parameters, Summer 1994, 99.

[3] Ibid.,

[4] Marcus Hurley, "JFACC Taking the next Step." Joint Force Quarterly, Spring 1995, 64.

[5] "Joint Force Fires Coordinator Study," 7 February 1997, Joint Electronic Library CD-ROM, Washington, DC: Joint Chiefs of Staff, June 1998, Ex-1.

[6] "Command and Control for Joint Air Operations," (Joint Pub 3-56.1) 14 November 1994, Joint Electronic Library CD-ROM, Washington, DC: Joint Chiefs of Staff, June 1998, 22.

[7] Ibid.,

[8] Dwight R. Motz, "JFACC: The Joint Air Control 'Cold War' Continues..." Marine Corps Gazette, January 1993, 89.

[9] "Web Dictionary of Cybernetics and Systems." Principia Cybernetica Web. <http://pespmc1.vub.ac.be/ASC/NETWORK.html>.

[10] Fred P. Stein, "Observations on the Emergence of Network Centric Warfare." In 1998 Command and Control Research and Technology Symposium Proceedings, June 1998, 1.

[11] "Command and Control for Joint Air Operations," (Joint Pub 3-56.1) 14 November 1994, Joint Electronic Library CD-ROM, Washington, DC: Joint Chiefs of Staff, June 1998, 43.

[12] "Command and Control for Joint Air Operations," (Joint Pub 3-56.1) 14 November 1994, Joint Electronic Library CD-ROM, Washington, DC: Joint Chiefs of Staff, June 1998, 38.

[13] Ibid.,

[14] "Command and Control for Joint Air Operations," (Joint Pub 3-56.1) 14 November 1994, Joint Electronic Library CD-ROM, Washington, DC: Joint Chiefs of Staff, June 1998, 5.

[15] HAL refers to the supercomputer in "2001 A Space Odyssey", Arthur Clarke, 1968, Macmillan Library.

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