

10th International Command and Control Research and Technology
Symposium

The Future of C2

**Joint Mission Capability Packages:
The Future of Joint Combat**

Topic: Edge Organizations

15 March 2005

Colonel Louis M. Durkac, USAF

HQ Air Combat Command
Langley Air Force Base, VA

HQ ACC/DRG
204 Dodd Blvd. Ste 244
Langley AFB, VA 23665
Telephone: (520) 405-8317
Fax: (757) 764-2884
Email: louis.durkac@langley.af.mil

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JUN 2005		2. REPORT TYPE		3. DATES COVERED 00-00-2005 to 00-00-2005	
4. TITLE AND SUBTITLE Joint Mission Capability Packages: The Future of Joint Combat				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) HQ ACC/DRG,204 Dodd Blvd Suite 244,Langley AFB,VA,23665				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 28	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

ABSTRACT

This paper will describe the Joint Mission Capability Package (JMCP) concept - a capabilities-based force package composed of existing weapon systems possessing interoperable information network equipment. These weapon systems combine to not only mitigate each other's weaknesses, but become a powerful entity unto themselves through the synergy of their combined strengths.

The Stryker / F-16C+ JMCP is the first JMCP in development today. It advances several critical steps along the path to the future Joint Force. By using existing, fielded systems in a new way, it demonstrates the transformational concepts that are possible in the near term. By putting single service weapons systems together to form pre-planned capability-based force packages, it serves as a prototype for the future Joint Force – in essence an operational laboratory. The capabilities possible with the combination of these two systems gives the joint commander enormous flexibility to conduct many missions currently unavailable to either system by itself, or even with current doctrinal cooperation methods. Many of the capabilities envisioned by the future Joint Force will be realized with this concept. The requirements for the JMCP concept will shape its organization and operation - providing a glimpse into one possible edge organization of the future.

Joint Mission Capability Packages: The Future of Joint Combat

Introduction

The key to the successful transformation of the armed forces is through the implementation of Network Centric Warfare (NCW). NCW's full potential can be reached through the formation and development of Joint Mission Capabilities Packages (JMCP). A JMCP is a capabilities-based force package composed of fielded weapon systems possessing interoperable information network equipment. The term "weapon system" is used to describe a platform and the capabilities that platform possesses which enables it to accomplish its assigned mission. An Abrams tank and an aircraft carrier are two examples of weapons systems. The weapon system components of a Joint Mission Capability Package (JMCP) combine to not only mitigate each other's weaknesses, but become a powerful entity unto themselves through the synergy of their combined strengths.

The requirements of a particular JMCP will shape its organization and operation, will define the technology required for success, and will establish its place and function within network-centric operations. The very nature of a JMCP will provide a glimpse into one possible edge organization of the future. The Stryker / F-16C+ JMCP will be used as an example to describe the JMCP concept. This paper will discuss the JMCP concept in terms of the co-evolution of doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) with emphasis on the organizational aspect of concept development.

Stryker / F-16C+ JMCP Description

The Stryker / F-16C+ JMCP is an innovative transformational concept that applies currently fielded technologies to develop future capabilities. Stryker is the US Army light armored vehicle which is the cornerstone of Army transformation efforts. Stryker relies on a rapid-response capability and on speed and agility for success against heavier opponents. The F-16C+ is a multi-role fighter flown primarily by the Air National Guard and Air Reserve Component of the USAF.

The Stryker and F-16C+ weapon systems share interoperable communication and navigation equipment allowing them to share information in the battlespace. In the simplest terms, a Stryker Brigade Combat Team (SBCT) will be paired with a number of named F-16C+ squadrons and assigned a JMCP designation. Tactics, techniques, and procedures (TTP) developed by the operational test community will be standardized so any JMCP component can operate with any other component. Each JMCP will habitually train together in accordance with a joint training plan, in small and large-scale training exercises. When the SBCT deploys, F-16C+ squadrons will be aligned to ensure there will always be JMCP team members deployed concurrently. Deployment length



Figure 1. Stryker / F-16C+ JMCP

differences will be mitigated through standardized TTPs for each replacement F-16C+ unit. This JMCP concept will be used to illustrate how a JMCP should be built, and what the organizational structure of the JMCP might look like.

Assumptions

The following assumptions have been made for the purposes of this paper:

1. NCW is a valid emerging theory of war that has become the centerpiece of the transformation of the armed forces of the United States and most of its closest allies.
2. The Tenets of NCW are accepted as the core of NCW capabilities and form the theoretical foundation for the development of transformational Joint Mission Capability Packages.²
3. Joint Mission Capabilities Packages are a key element in the implementation of NCW, and by extension, the successful transformation of the armed forces.

<i>Tenets of NCW¹</i>	
●	A Robustly Networked Force improves Information Sharing
●	Information Sharing and Collaboration enhances the Quality of Information and Shared Situational Awareness
●	Shared Situational Awareness enables Collaboration and Self Synchronization, and enhances Sustainability and Speed of Command
●	These in turn dramatically increase Mission Effectiveness

JMCP Requirements

The US Military is moving from the “large and the few” to the “small and the many.” Although the “small and the many” comes with many advantages, it also introduces limitations and weaknesses inherent to the design (e.g. fire power, self-protection, sustainment). The future battlespace and the nature of lighter forces require joint interdependency. Joint interdependency purposefully combines service capabilities to maximize their total complementary and reinforcing effects, while minimizing their relative vulnerabilities. Numerous academic studies and reports, as well as US strategic guidance, recommend the formation of preplanned force packages with named units representing the spectrum of requisite capabilities.³ The synergistic effect of these JMCPs is a mitigation of the individual limitations of each system through horizontal integration and a family of systems approach.

The desired characteristics of a JMCP depend upon the tasks which prompt its formation, but all JMCPs will have common requirements, which can be derived from the NCW Value Chain (refer to the dark purple ovals in Figure 2).

¹ *The Implementation of Network-Centric Warfare*, Office of the Secretary of Defense, Office of Force Transformation, Washington DC: 5 Jan 2005, page 19.

² Alberts, David S. and Richard E. Hayes, *Campaigns of Experimentation*, Washington, DC: CCRP Publications, 2005, page 5.

³ Alberts, David, S., John J. Garstka, and Frederick P. Stein, *Network Centric Warfare*, Washington, DC: CCRP Publications, July 2002, page 193, and *Speed and Power: Toward an Expeditionary Army*, RAND MR-1755-A, 2003, pages 70-72, and *Joint Operations Concepts (JOpsC)*, Office of the Secretary of Defense, Washington, DC, November 2003, page 25.

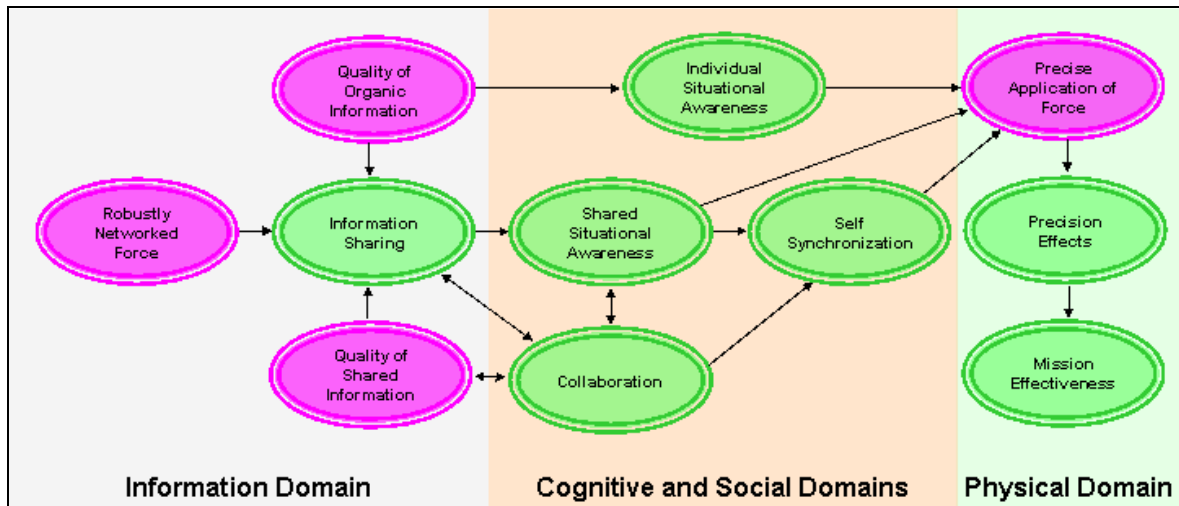


Figure 2. NCW Value Chain for Combat Operations ⁴

Mission effectiveness (the ultimate goal) begins with a robustly networked force, which enables and enhances all subsequent tenets of NCW. It follows then that an effective JMCP should be networked to the point where it enables and enhances the sharing of information and enables collaboration of its membership, leading to the *capability* for self-synchronization. The quality of shared information and the quality of organic information should feed the shared information, providing the entire force with situational awareness of the operation. Only then can sound tactical decisions be made at the lowest possible levels, enabling collaboration for the precise application of force, when and where it is needed most.

Therefore, the requirements for a combat-oriented JMCP are:

1. A robust interoperable information network (IN). The IN must be a mobile mesh network with high data throughput and survivability. Units must be capable of sharing information at all times. Capture of nodes must not compromise system security. The IN for the JMCP must be directly interoperable, not rolled-up and filtered through command nodes in distant locations. This direct local network will reduce the need for larger bandwidth requirements, create an airborne relay network, and keep information close to where it is needed, not at a central repository.
2. Imbedded intelligence, surveillance, and reconnaissance (ISR) for quality organic and shared information. An effective JMCP must be a “sensory organization,” with each entity contributing to and benefiting from a common operating picture. Direct, local connectivity of friendly forces will significantly reduce the potential for fratricide incidents in the battlespace.
3. Rapid, precise joint fires. An effective JMCP must be capable of Remote Positive Control (RPC) of airpower. This capability goes beyond the rudimentary targeting

⁴ *The Implementation of Network-Centric Warfare*, page 23.

⁶ Alberts, David, S., John J. Garstka, and Frederick P. Stein, *Network Centric Warfare*, Washington, DC: CCRP Publications, July 2002, page 193.

assurance measures inherent in typical Close Air Support (CAS) operations. RPC is a closed-loop system where the aircraft transmits the intended bomb impact point to the ground controller prior to approval to release ordnance. This will ensure targets engaged are the ones intended, and will also provide a powerful anti-fratricide measure. The machine-to-machine interface between ground C2 and airpower ensures target coordinates are precise, allowing use of precision-guided ordnance and “one target, one weapon” efficiencies.

Light ground forces need airpower to engage heavy enemy forces and for air defense. Airpower needs agile ground forces to dislodge heavy enemy forces (making them easier to target and destroy) and as forward air controllers. A tailored, capabilities-based, jointly-trained, rapidly-deployable force needs to be developed. Two fielded weapon systems currently have the capability for direct, real time interoperability and are being teamed together to form the first JMCP in the US armed forces: the Stryker light armor vehicle and the F-16C+ multi-role fighter.

Building a JMCP

The process of building a new JMCP starts with a military task list, represented by a concept of operations, or CONOPS. From the CONOPS, a C2 approach that reflects the characteristics of the CONOPS can be developed, followed by the organizational form(s) required to allow the JMCP to reach its full potential.⁶ All aspects of DOTMLPF must co-evolve through experimentation until the JMCP is ready to field. An experimentation campaign with specific capabilities milestones will determine the maturity of the JMCP and its worthiness for operationalization at each spiral of development. For the Stryker / F-16C+ JMCP, the construction process will flow as follows:

1. CONOPS development. The basic task required of this JMCP is to deploy forces to operational depths and immediately transition to tactical operations through the self-organization of available forces. This self-organization may be best achieved through self-synchronization, with the ultimate goal of the JMCP to possess a swarming capability. With swarming as the ultimate goal, the requirements of a swarming force must also be the requirements of the JMCP. These requirements include large numbers of tightly internettted small units, an imbedded ISR capability (with each member adding to and receiving information from the whole sensory organization), the capability for standoff engagement of enemy forces, and a decentralized command and control (C2) approach.⁷ TTPs developed to accomplish the assigned tasks will have a profound effect on current Service doctrine, which must evolve with the JMCP (see Appendix A for an example of human swarm intelligence).
2. C2 Approach. A C2 approach that reflects the characteristics of the CONOPS must be developed, through experimentation, which is capable of the entire range of operations envisioned by this concept, from centralized control of individual tactical actors, to “management-by-exception” self-synchronized operations. A skillful blending of hierarchical and network organizational structures will enable this full spectrum of control. The self-organizing aspect of a swarm implies that the characteristic shape of its organization must be allowed to emerge and change as

⁷ Arquilla, John, and David Ronfeldt, *Swarming and the Future of Conflict*, Santa Monica, CA: RAND, 2000, page 22, and Edwards, Sean J.A. *Swarming on the Battlefield: Past, Present, and Future*. Santa Monica, CA: RAND, 2000, page xiii.

it executes, and may vary from engagement to engagement because of changes in the environment. Detailed moment-by-moment control of the swarming force would damp out this self-organization and sacrifice many of the benefits of swarming. However, swarming does not imply anarchy. Swarms can be controlled without sacrificing their power in two ways: shaping the envelope (through rules of engagement, commander's intent, standards, etc.) and management by exception (intervene when appropriate when tactical objectives conflict with operational limitations).⁸ However, a self-synchronizing force composed of a higher percentage of entities simultaneously engaged with enemy forces would overwhelm even the most digitally connected C2 system. "As the number of simultaneous calls for fire and the number of potential shooters and types of weapons increases, the target assignment problem becomes more difficult. Beyond some threshold, a human decision maker is overwhelmed, resulting in suboptimal assignments, or worse, unacceptable delays in allocating forces."⁹ One goal of an experiment campaign will be to find that threshold.

3. Organization Structure. The organizational structure must be based on the CONOPS and Command Approach, and designed to facilitate the flow of information to carry out the task. There should be no organizational speed bumps that degrade performance. It must allow the capability for both decentralized decision-making, with shared information of the entire battlespace (versus the old decentralized decision-making due to necessity and a lack of SA on the rest of the battlespace), and centralized control (in situations where this is warranted). The conceptualized organizational form(s) for this concept JMCP will be discussed in detail later in this paper.
4. Information System Structure. The requirement for a robust interoperable IN was discussed in a previous section. The IN for this JMCP is enabled through common, fielded, interoperable communications and navigation equipment, allowing all JMCP team members to share the same information. This IN also has access to external sources of information, allowing the JMCP to contribute to and gain knowledge from a wide range of information sources.
5. Personnel, Leadership, and Education. Education and training take on an increasingly important role as more knowledge and decision-making authority is pushed to the edge. All JMCP team members must be educated on NCW processes to become fully integrated team members. This education extends from the top leadership, who must support and defend the JMCP against bureaucratic roadblocks and late adopters, to the tactical level, where actors must know the capabilities of the entire team in order to know their place in the overall battle plan. As decision-making is pushed out to the edge, commander's intent takes on a crucial role as the envelope of allowable actions enables (versus constrains) the force. Figure 3 illustrates the co-evolution of all aspects of DOTMLPF which is required for a JMCP to succeed.¹⁰

⁸ Parunak, H. V. D. *Making Swarming Happen*, Presented at the Conference on Swarming and C4ISR, Tysons Corner, VA, 3 Jan 2003, URL <http://www.erim.org/~vparunak/MSH03.pdf>.

⁹ Alberts, et al, *Network Centric Warfare*, page 182.

¹⁰ *The Implementation of Network-Centric Warfare*, page 43.

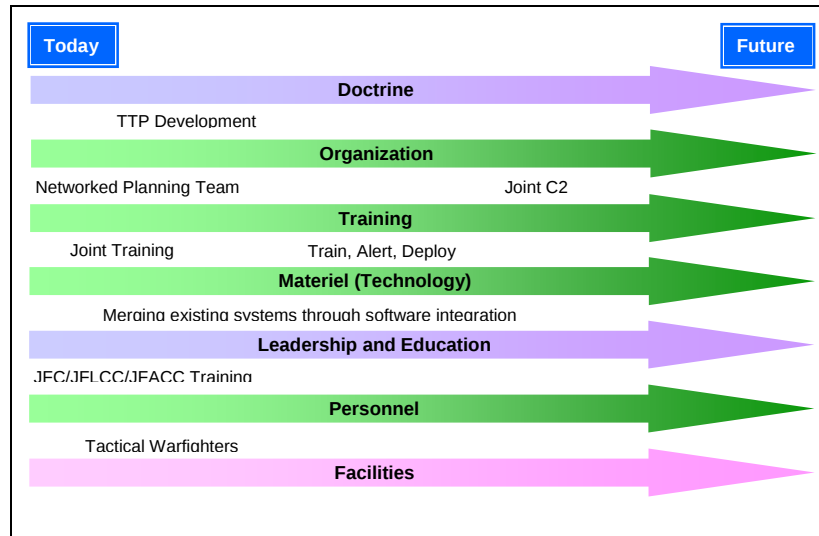


Figure 3. Co-evolution of DOTMLPF

Military Edge Organizations

We can't say for sure what the organizational structure of the JMCP will look like - that's what experimentation and experience will determine. But we can get a pretty good idea of where to start based on information that is already available.

First, hierarchies will remain the standard military organizational structure for the foreseeable future. Hierarchies are a social phenomenon - it's how we *like* to organize - and all the rhetoric in the world is not going to change this. As long as a commander will be held responsible for the actions of those under his command, a hierarchy will exist. And the commander will always make sure his picture of the battle is more complete than anyone under his command. This is apparent in the amount of money pouring into C2 systems versus the relatively small amount going to upgrade tactical network systems. Unfortunately, this is leading to a "digital divide"¹¹, where the operational commander is getting smarter at a faster rate than the tactical warfighter. This in turn is leading to more centralized control of tactical warfighters, since the operational commander *perceives* he has more knowledge of the tactical battle than the tactical commander himself. Simply put, a commander will centrally control (some would call it micromanage) a tactical action until he can no longer keep pace with the action. Unfortunately, by that time, the tactical warfighters will be left to their own survival instincts to extract themselves from their individual predicaments. An edge organization will have to grow and flourish within the hierarchical structure of a military organization. A *military* edge organization, then, will have to be a skillful blending of hierarchical and networking structures. As the operational commander gains trust in the edge organization to carry out his intent in a more efficient manner than he himself could control, he will gradually allow the tactical warfighters to carry more of the decision-making responsibility. Once this delegation of decision-making authority occurs, the operational commander will find he has more time to spend on the operational aspects of the battle.

¹¹ Walter Perry, RAND Senior Researcher, interview with *Technology Review* for the Nov 2004 Issue.

A military edge organization will no doubt have certain characteristics, derived from the CONOPS and C2 approach, as listed previously. Some of these edge organization characteristics include:¹²

- Peer-to-peer relationships and widespread sharing of knowledge, enabled by a low level of supervision and access to networking capabilities will be the norm. This networking at low levels will span through all phases of an operations, from initial coordination, through planning, execution, and debriefing.

- Virtually everyone in the organization will be at the edge. Everyone will contribute to the overall knowledge of the team, and everyone will benefit from the wealth of knowledge available. A higher percentage of team members will be simultaneously engaged with the enemy.

- Collaborative and inclusive, the organization will empower everyone through information. Those with the knowledge will have permission to make the decisions.

- The mission will take priority. Unity of effort will be more important than unity of command. Commanders will provide the overall plan and commander's intent. Subordinates will provide the situation picture, their decisions, and plans for their next actions. In edge organizations where decision-making is pushed out to the edge, the unambiguous understanding of command intent is essential.

A military edge organization, then, must be agile and adaptable to the situation at hand, and must be equally adept at performing along a spectrum from the tight central control of the operational commander, to self-synchronized autonomous operations, sometimes from one moment to the next. Only a networked structure within a military hierarchy could handle both extremes.

The Stryker / F-16C+ JMCP will have many hierarchies to deal with. Since the components come from different Services, the organization that forms when the package assembles will have to be a network design (in order to enable the characteristics of an edge organization) and must also answer to the individual Service hierarchies as well as the joint forces commander and his hierarchy. This "virtual organization" will form within these structured hierarchies, and will cease to exist once the package separates into its component pieces.

Just as swarming suggests a "disperse-converge" scheme of maneuver and fire, the JMCP edge organization will follow the same model when assembling for training, deployment, and tactical operations, then dispersing to its parent hierarchies for non-JMCP tasking. Figure 4 shows the Converge-Diverge Model for developing change in an organization. The JMCP concept development organization will also follow this model. The organization will follow a series of divergent actions, where small groups resolve action items and make progress on assigned tasks before coming together again in a larger group for status briefings, to gain situational awareness of the activities of other small groups, and to get guidance from leadership for the next phase of the mission.

¹² Alberts, David S., and Richard E. Hayes, *Power to the Edge: Command...Control...in the Information Age*. Washington, DC: CCRP Publications, 2003, pages 176-177, 218.

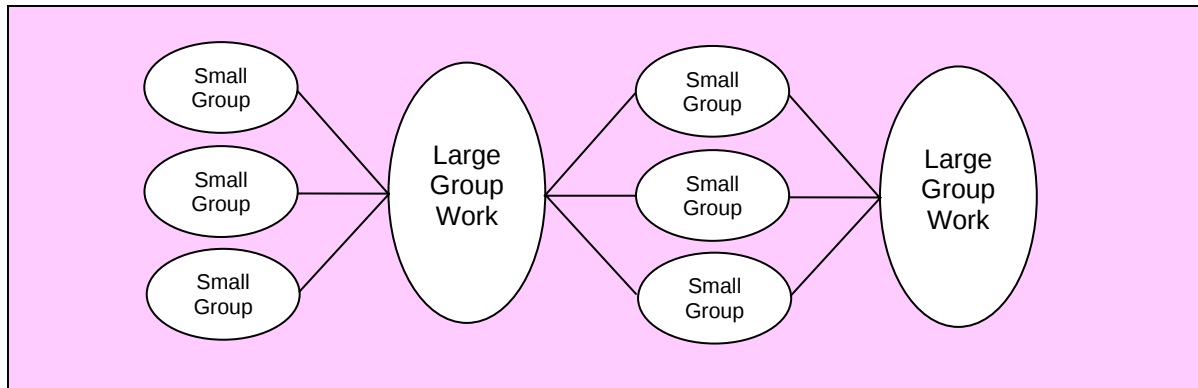


Figure 4. The Converge-Diverge Model ¹³

Campaign of Experimentation

Joint experimentation is the key vehicle to investigate innovative organizational structures which will enable the JMCP to reach its full potential. The path this concept will take to fielding will be as transformational as the concept itself. The organization forming to develop the concept - to take it from concept exploration to a system of record - is itself an edge organization, with all the characteristics listed above. This concept development organization, then, may provide additional insight into the JMCP organization itself. Figure 5 illustrates the probable interactions of groups responsible for specific tasks within the DOTMLPF co-evolution, and is the initial organizational structure of the JMCP development team.

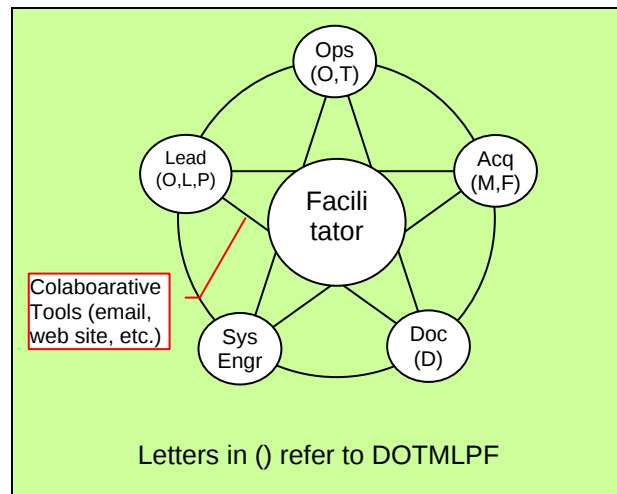


Figure 5. JMCP Concept Development Edge Organization Structure

The first JMCP prototype will follow the “wildcatting” method, where the team will experiment with a limited but operationally significant number of systems, concepts and force structures.¹⁵ Using the NCW Value Chain (Figure 2) and the NCW Maturity Model (Figure 6), we can determine the measurable variables of a campaign of experimentation. Since self-synchronization capability is the ultimate goal, we can construct experiments where a JMCP prototype which begins in quadrant 2 (Collaboration enabled by Information Sharing) will migrate into quadrant 3 (Collaboration with Shared Awareness) through command inputs. With a firmly articulated rule set and a desired outcome

¹³ *The Converge-Diverge Model*, excerpt from “Whole-Scale® Change Toolkit,” Dannemiller Tyson Associates, presented at the Organizational Development Network Annual Conference, 2004, URL http://www.odnetwork.org/conf2004/followup/109PRE_502TH.pdf.

¹⁵ Krepinevich, Andrew F. Jr. “The Army and Land Warfare: Transforming the Legions.” *Joint Force Quarterly*, Autumn 2002, page 81.

(commander's intent) in place the prototype can move into quadrant 4 (Self-Synchronization through Shared Awareness) to see if a value-added interaction occurs.¹⁶

Form will follow function in the structure of an edge organization. The mission and command approach of an organization will determine the structure the organization must follow in order to operate efficiently. By manipulating command approaches through experimentation, organizational structures can evolve and effects can be measured. If edge organizations are more effective than traditional hierarchies as hypothesized, then the effects should support that conclusion.

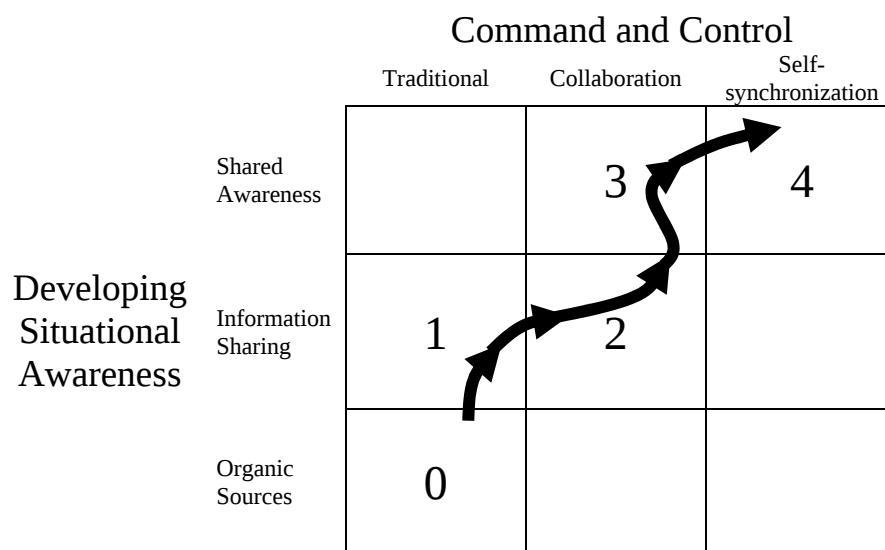


Figure 6. NCW Maturity Model¹⁷

Summary and Conclusion

The Stryker / F-16C+ JMCP is a prototype of the future joint force. The organizational structure that develops out of its campaign of experimentation will be one example of an edge organization. This edge organization will hopefully encourage self-synchronization and enable advanced warfighting techniques like swarming.

There are challenges to the formation of military edge organizations. The “digital divide” will hamper efforts at shared awareness and collaboration at the tactical level. The Stryker / F-16C+ JMCP, being a sensory organization connected by an interoperable information network, will enhance collaboration and shared awareness, and will provide the best chance to date of a force achieving self-synchronization.

As a prototype of the future joint force, this JMCP will be an operational laboratory for experimentation on edge organizations. Some questions which may be answered with this concept include:¹⁹

¹⁶ Alberts, et al, *Network Centric Warfare*, pages 175-176.

¹⁷ Alberts, David S., and Richard E. Hayes, *Power to the Edge: Command...Control...in the Information Age*, Washington, DC: CCRP Publications, 2003, page 109.

¹⁹ Alberts, David S., *Information Age Transformation*. Washington, DC: CCRP Publications, 2002, page 141.

-Under what circumstances does self-synchronization work? Under what circumstances should we allow it to happen? We know it may not always be appropriate - when is it and when is it not?

-How can command intent be best articulated? If a self-synchronizable force exists, this question can be answered more easily. Command intent articulation (whether it uses high-order or low-order words, for example) could be the trigger which allows a force to self-synchronize. Consequently, poorly articulated command intent could be the limiting factor which prevents a force from self-synchronizing.

-What kinds of command interventions are needed to maintain control of a swarming operation?

Through a systematic campaign of experimentation, the Stryker / F-16C+ JMCP will help to answer these questions, further refining the NCW theory, and advancing another step toward the future joint force.

Appendix A

Human Swarm Intelligence: The Hash House Harriers²⁰

Wolves, ants, bees, and sharks - they all exhibit swarm intelligence or engage in various forms of swarming activities. But do humans swarm? Are there any documented cases of human swarm intelligence, either through instinct or as a pre-planned effort?

One example of human swarm intelligence can be found in the Hash House Harriers (HHH), a world-wide organization of anonymous strangers who gather together in small groups at predetermined times and places to operate as single units who's goal is to catch the elusive quarry (the "Hare") before arriving at the ultimate destination (the "On! In!") as an intact group. These self-described "drinkers with a running problem" have derived their weekend frolic through local neighborhoods from the old English game of "Hare and Hounds." The "Hare" gets a head start, marking a trail (and many false trails) with various standard symbols scrawled on any convenient location (pavement, tree trunk, parked car, etc.), which the "Hounds" must follow in order to get the reward at the end (the "On! In!" is usually a local purveyor of adult beverages). These symbols, or codes, enable the hashers to communicate as they fanatically try to follow the trail and catch the Hare before he reaches the destination. When the trail turns cold, or when there are a number of possible trails the Hare could have followed, the group is forced into a series of

"disperse-converge" actions (a la swarming). When a member of the dispersed group finds the true trail, he yells "On! On!" and the rest of the group abandons their investigation of the many false trails and joins the chase along the true trail. Other symbols instruct the group to engage in a particular activity, such as to assemble the entire group before moving on, or to indulge in strategically-placed refreshments prior to continuing the hunt. The rules (commander's intent) combined with standard symbols (shared awareness) enable self-organization (use who you have available) and self-control (self-synchronization). Exhausted members of the group can rest at the last true trail sign, while the more rested members can disperse to hunt for the next symbol. This self-organizing, continuous reconfiguration of the group ensures the true trail is regained in minimum time, maximizing the strengths of individual members while minimizing individual weaknesses. Hounds don't even have to speak the same language. At last count there were over 1700 HHH

groups, located in every major city in the world. A hasher from Seattle need only look up the local HHH group in Singapore (on the World Hash House Harriers Internet home page) and show up at their next event. Strangers and visitors are welcomed with open arms, since more Hounds improves the odds of catching the Hare prior to reaching the "On! In!" There is no leader in the Hound group - self-synchronization is thrust upon them, and the person with the best knowledge at the time makes the decisions. Swarming is defined as a useful self-organization of multiple entities through local interactions.²¹ By this definition, the Hash House Harriers qualify as bona-fide human swarmers.

A Guide to Hash Marks		
A publication of the Pikes Peak Hash House Harriers and Harriettes		
Hash Mark	●	A blob of flour indicates a trail. Three consecutive hash marks indicates true trail.
Check Mark	⊗	Indicates that the trail may change direction at this point. Here hounds spread out and look for trail. From the check, true trail will begin again in about 100 yards in any direction. There also may be one or more false trails from the check.
False Trail Mark	≡	Three parallel lines across the trail indicate that the trail is false and the hounds should return to the last check to look for the true trail.
Hare Arrow Mark	⇧	An arrow laid only by hares. A hare arrow always indicates true trail. Hounds may also mark arrows, but hound arrows lack the three hash marks on the shaft and may or may not indicate true trail.
Beer Near Mark	BN	Indicates that there's beer within 100 yards or so. Front Running Bastards (FRBs) must wait until the Dead F***ing Last (DFL) hound arrives before proceeding on trail. The beer check's purpose is twofold, to provide refreshment and to regroup the pack.
Regroup Mark	Ⓜ	Indicates that the hounds must wait and regroup the pack at this point.
Turkey-Eagle Trail Split	T ^E	At this point the trail splits into a segment which is easy (turkey) and a segment which is difficult (eagle). The two segments will eventually rejoin somewhere before the trail ends or at the end itself.
A Guide to Hash Marks, Pikes Peak Hash House Harriers and Harriettes, 2005, URL http://www.harrier.net/primer/marks.html		

²⁰ The World Hash House Harriers Home Page, 2005, URL <http://www.gthhh.com/>.

²¹ Parunak, H. V. D. *Making Swarming Happen*, Presented at the Conference on Swarming and C4ISR, Tysons Corner, VA, 3 Jan 2003, URL <http://www.erim.org/~vparunak/MSH03.pdf>.

Headquarters Air Combat Command

Joint Mission Capability Packages: The Future of Joint Combat



Colonel Lou Durkac, USAF
HQ Air Combat Command
16 June 2005

This Briefing is:
UNCLASSIFIED



Overview

- **Joint Mission Capability Package (JMCP) – Definition and Purpose**
- **Example: Stryker/F-16C+ JMCP**
- **JMCP Requirements**
- **Building a JMCP**
- **Military Edge Organizations**
- **Campaign of Experimentation**
- **Summary and Conclusion**



JMCP Definition and Purpose

- **A JMCP is a capabilities-based force package composed of fielded weapon systems possessing interoperable information network equipment**
- **Components mitigate each others weaknesses, synergize strengths**
- **JMCP uses interdependencies to increase mission effectiveness**
- **JMCP characteristics promotes the development of a hybrid networked/hierarchical organization**

***May provides a glimpse into a
Military Edge Organization***



Operational JMCP Example

- **Stryker / F-16C+ JMCP**
 - Fielded Weapon Systems
 - Interoperable Network Equipment



Joint Mission Capability Packages: The Future of Joint Combat



Stryker / F-16C+ Concept of Operations (CONOPS)

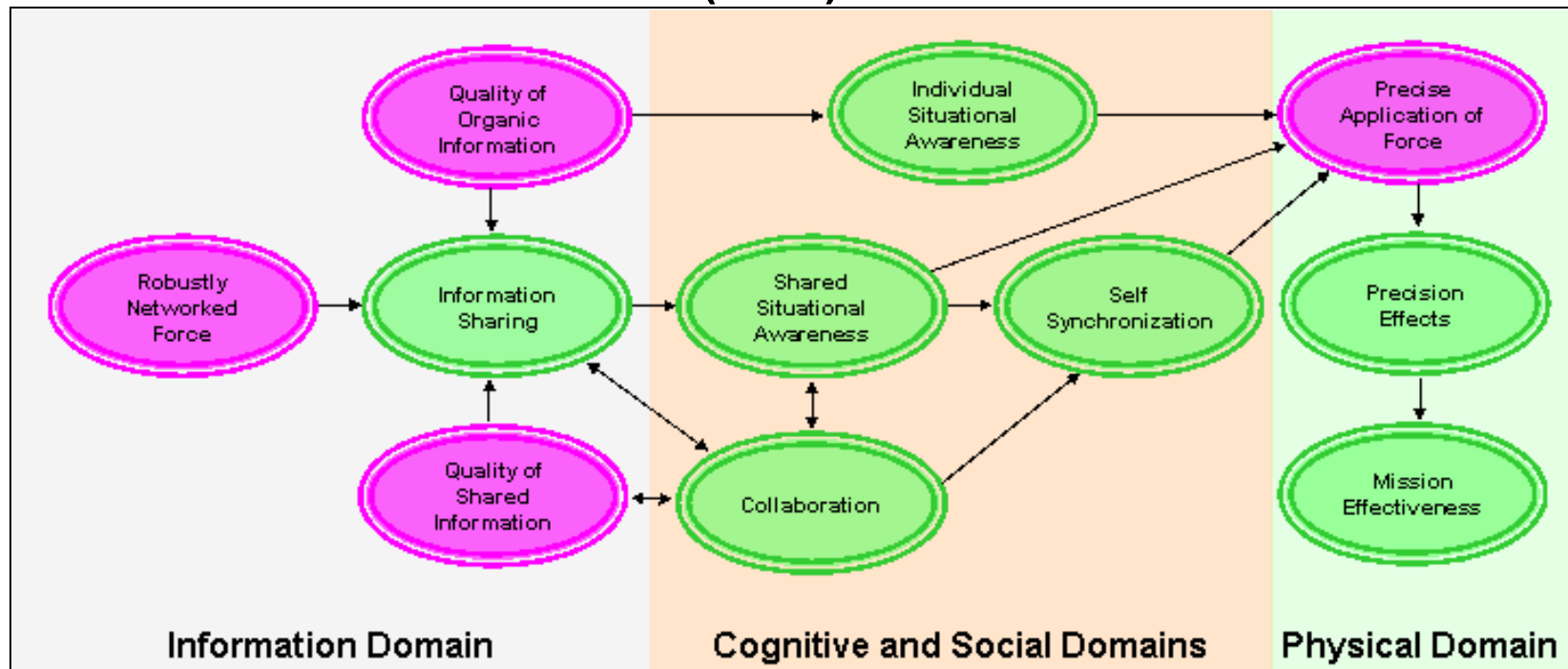
- **The basic task required of this JMCP is to deploy to operational depths and immediately transition to tactical operations through the self-organization of available forces.**
- **Named, paired units will train, alert, and deploy together.**
- **The combined capabilities of this JMCP give the joint commander enormous flexibility to conduct many missions currently unavailable to either system by itself, or even with current doctrinal cooperation methods.**



JMCP Requirements

Derived from the NCW Value Chain* for Combat Operations

1. **Robustly Networked Force:** Interoperable Information Network
2. **Quality Organic/Shared Information:** Imbedded Intelligence, Surveillance, Reconnaissance (ISR)
3. **Precise Application of Force:** Rapid, Precise Joint Fires under Remote Positive Control (RPC)





- F-16C+ PPLI info on all ground forces
 - Mutual Synchronization (enables swarming operations)



- Imbedded real-time ISR
 - F-16C+ targeting pod video downlink

- Remote Positive Control
 - **F-16C+ bomb impact point displayed to forward air controller**
 - **Friendly fire prevention**





Building a JMCP*

- 1. Develop CONOPS**
- 2. Determine Command and Control (C2) Approach**
- 3. Develop Organization Structure**
- 4. Develop Information System Structure**
- 5. Develop Personnel, Leadership, Education, etc (DOTMLPF)**

** NCW, 1999*



Develop Organization Structure

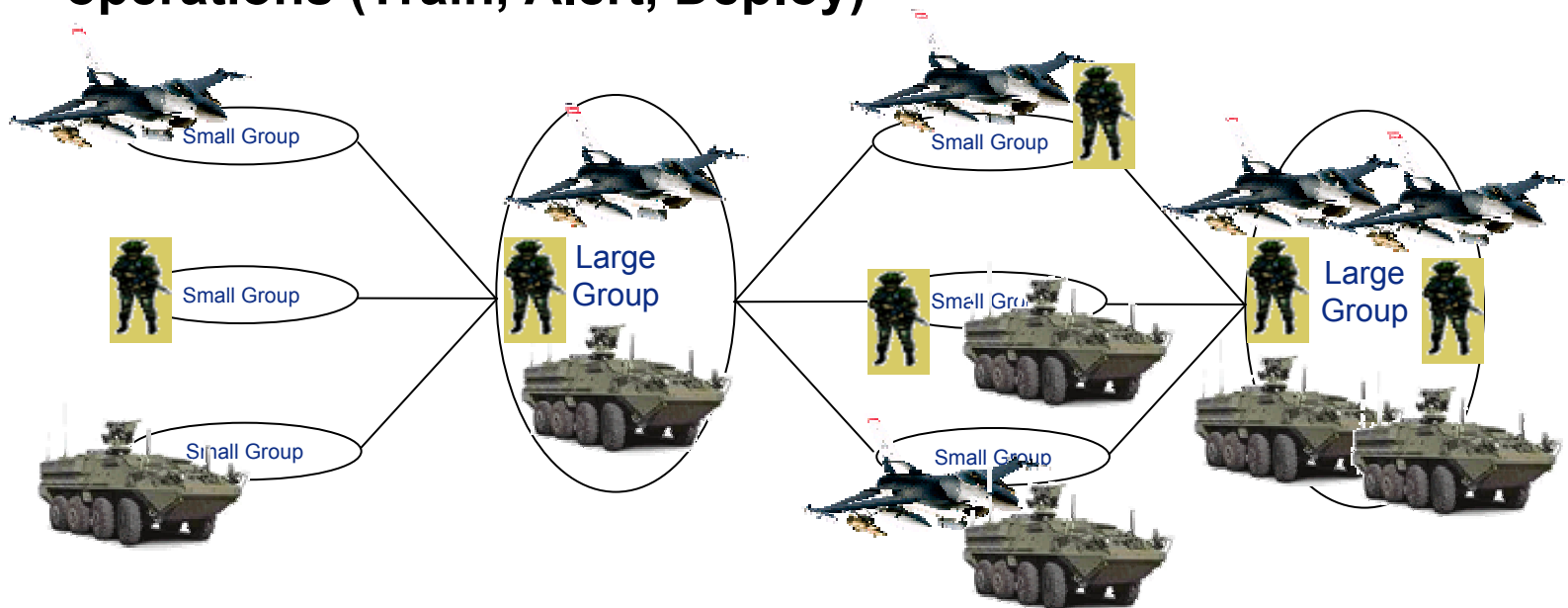
- **The Military Edge Organization – Assumptions**
 - Military hierarchies will remain the standard
 - An edge organization will have to exist inside a military hierarchy
 - A military edge organization will be a network/hierarchy blend
- **Characteristics of a Military Edge Organization***
 - Peer-to-peer relationships, widespread knowledge sharing, low level of supervision, access to networking equipment
 - Everyone will be at the edge – a high percentage of forces simultaneously engaged with the enemy
 - Those with knowledge will be allowed to make decisions
 - Unity of effort more important than unity of command
 - Must be equally adept at performing along a spectrum from tight control to self-synchronization (based on assumptions)

** PTTE, 2003*



JMCP Edge Organization

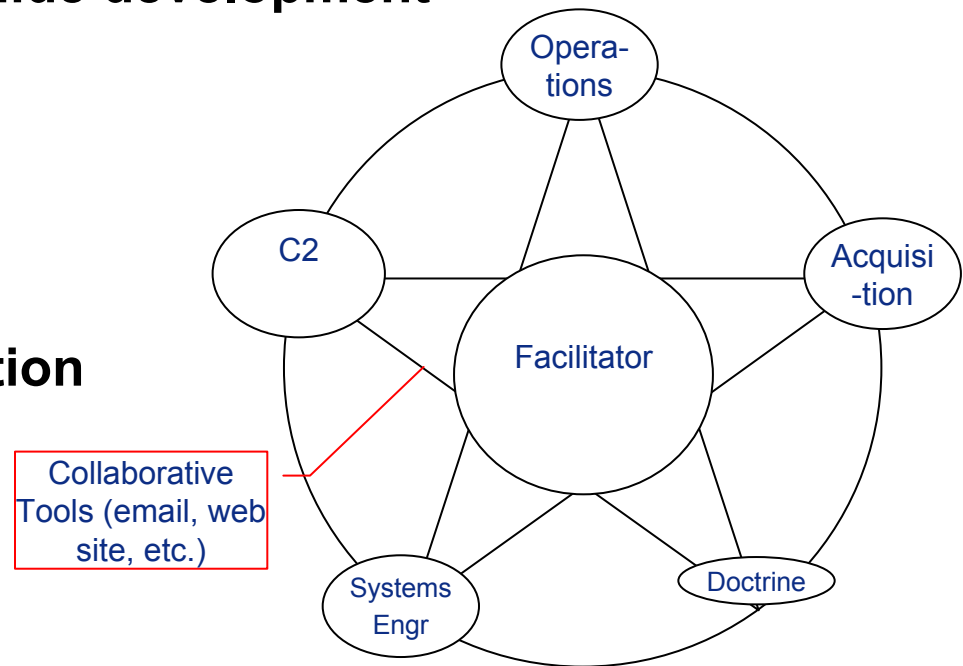
- **Stryker / F-16C+ JMCP Edge Organization**
 - Multiple hierarchies – individual Services, Joint Force Command
 - Virtual Organization – will form within standing hierarchies when brought together and will cease to exist when separated
 - Converge-Diverge Model for training, deployment, and tactical operations (Train, Alert, Deploy)





JMCP Edge Organization

- **Stryker / F-16C+ JMCP Development Team**
 - Development Team Organization mirrors JMCP Organization
 - Teams use the Converge-Diverge Model
 - DOTMLPF analysis will guide development
 - Doctrine
 - Organization
 - Training
 - Materiel
 - Leadership and Education
 - Personnel
 - Facilities





JMCP Experimentation

- **Role of Experimentation**
 - Key tool to investigate innovative organizational structures
 - Will enable the JMCP to reach its full potential
- **“Wildcatting” Method of JMCP Development**
 - Limited but operationally significant number of weapon systems
 - Ultimate Goal – Self-Synchronizing Force
 - Process – NCW Maturity Model and Experimentation Campaign



Summary

- **The Stryker / F-16C+ JMCP is a prototype of the future Joint Force**
 - **The JMCP Organizational Structure will be one example of a Military Edge Organization**
 - **Challenge – Digital Divide: Operational Warfighter is getting smarter at a faster rate than the Tactical Warfighter – hampers efforts at shared awareness and collaboration at the tactical level**
 - **Stryker / F-16C+ JMCP is connected by an interoperable information network – enables shared awareness and collaboration at the tactical level – and may encourage Self-Synchronization and advanced warfighting techniques like Swarming**
 - **Campaign of Experimentation will develop and mature the concept**



Conclusion

- **The Stryker/F-16C+ JMCP will be an operational laboratory for experimentation on edge organizations**
 - will answer questions on self-synchronization, command intent, and command approaches applicable to a swarming force
 - will help refine NCW theory, and advance another step toward the future Joint Force



Headquarters Air Combat Command

Joint Mission Capability Packages: The Future of Joint Combat



Colonel Lou Durkac, USAF
HQ Air Combat Command
louis.durkac@langley.af.mil

This Briefing is:
UNCLASSIFIED
