

6.0 Information in Warfare: Toward Dynamic Command and Control

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Desert Storm provided a window onto 21st century aerospace warfare. Authors have described the contribution of precision weapons in the Gulf War. Indeed, smart munitions became the symbol of how Desert Storm differed from previous conflicts. However, though precision characterized much of JFACC operations in the Gulf, it is information, its demand, use, and shape, that characterizes Desert Storm as the precursor conflict of the 21st century.

In Desert Storm, the JFACC conducted simultaneous, asynchronous planning for operations over wide areas for over 40 days in which hundreds of strike and support aircraft conducted multiple and disparate missions. Commanders required focused sensors, near-real time situational awareness, flexible and agile air tasking, and quick, accurate battle damage assessment. Combinations of targets, both strategic C⁴ centers in Iraq and tactically deployed ground combat units in the Kuwaiti Theater of Operations, required persistent sensor and fusion efforts. In turn, these targets proved to be highly dynamic, frequently changing in priority and in the case of tactical targets, in composition and disposition as well. Desert Storm provided our first real example of selective, precision attack, which in turn drove the high demand for information to accurately locate and describe the overall situation and specific targets.

Not just attack, but control also put demand on information. Fixed and Rotary wing aircraft, unmanned aerial vehicles, and ground air defense systems all from different US services and coalition partners required detailed planning, structured but flexible control measures, and quick dissemination of a common, relevant situation. Thus, Desert Storm punctuated for commanders the crucial nature of a highly accurate, responsive, agile, and fast information system. Of course, the Desert Storm information system did not function as commanders required. It was not designed to do so and was pieced together, practically at the penultimate hour, to perform as it did. What we lacked in cyberspace, we made up in aerospace, in leadership, dedication, training, and also to a significant degree in massive force. In a 21st century conflict, we may not have the benefits of overwhelming aerospace overmatch and mass as well.

USAF Enduring Roles

While uncertainty, itself, will be the defining characteristic of future military missions, the US Air Force will retain key enduring roles.

- Continue to maintain readiness and dominance to conduct aerospace warfare in all its manifestations of strategic and operational attack, offensive counterair, air interdiction, and reconnaissance and air support to land-force operations.
- Retain and enhance its force projections capability to selectively and precisely attack, to demonstrate US power, and to deploy with dispatch and decision US force anywhere in the world.

- Provide world-wide sustainment operations. Quick operational tempo, flexibility of organization, and mission agility require continuous, paced, and tailored sustainment operations forward to aerospace and ground battlespace warfighters.
- Provide trained and ready Special Operations Forces role will also become increasingly more important.

These enduring roles, which in sum describe a global and spatial reach capability, place an increasing premium on timely, accurate, graphically and flexibly displayed information in warfare. But since information has always been important in military operations, what has changed that has made information a critical element of combat power? The real change can be stated tersely: information's effect on decision and on operation precision. Now and much more so in the future, commanders will reach out to sensors and interactive databases to tailor accurate, real time situational awareness for themselves. Cybersystems will quicken, quantumly, command capabilities to decide and to execute decisions. These systems will represent a powerful suite of military capability to be used as a weapon and to be protected as much as the current key weapons systems are now. Information is changing the very nature of military operations as much or even more than historically critical advances in warfare (e.g., the bow and arrow, firearms, and aircraft).

Information Requirements

One key conclusion from the Gulf War was that the priority for information is now on field forces. During the Cold War, military information flowed upwardly and centralized at the National Command Authority, due to the key mission of strategic nuclear deterrence. Now, deterrence remains an element of US national security strategy; however, power projection is the key strategic element. In this new environment commanders at the theater commander and Chief (CINC) or his designated Joint Task Force level and below make and execute strategy. Young naval commanders and lieutenant colonels operate today in the strategic through tactical-levels from Macedonia to Kuwait, and the information system must focus on their needs. Traditionally, information moves sequentially and hierarchically in our military. That contributes to order. It serves the senior levels well, but it is inadequate for today's and tomorrow's military operational environment. This change—the increasing priority for information at the JTF and below—and the emerging communication and computer technologies to support it signify a crucial element of the revolution in military affairs that is underway.

Information in Warfare is a defining aspect about what is new in military operations in this new information age in which we enter. Information in Warfare is the means by which warfighters drive and derive, use and apply, and shape and share information in the course of their operations, whether in war, operations other than war, in crisis planning, or in day-to-day peacetime activities. While “warfighter” can be defined as any military leader from a CINC to a pilot, for the purposes of this paper, we focus on the Joint Task Force commander and his subordinate commanders.

JTF and below commanders require timely and relevant information which provides decisive advantage in controlling their battle space. Their information has to be common (relative to other commanders up and down the hierarchy), but adaptive to suit each particular level.

Commanders have to protect their own information and systems without restricting operations, while disrupting and denying their adversary's information.

By the second decade of the 21st century, commanders will have an automated fusion capability that provides the means to have insight into an environment of simultaneous, asynchronous, parallel operations. This will reduce (but not eliminate) friction in operations through clear situational awareness. Staring sensors and dynamic perspectives of the area of operation will provide the means to focus on massing effects and on determining environmental effects. Clear understanding of terrain, space, weather, weapons, forces, cultures electromagnetics, and other factors will come in forms of visual portrayal of these effects on operational space. Commanders will pull, tailor, and synchronize information from national through tactical data bases. They will use simulations which are integrated and interactive to seek insight into potential futures, and to rehearse, decide, and act. They will have wide access to data bases, the contents of which will be tailored to their information needs.

Information will move simultaneously around and through military organizations which while retaining some essential elements of hierarchy (for coordination, and centrality of command) will be more horizontal and matrixed for eclectic operations. The information age will effect staffs directly by reorganizing them on knowledge based plans, decision, and action rather than along traditional, functional lines. In fact, command authority itself will depend on information in the 2020's. The commander with the clearest insight will dominate.

These profound changes in military operations brought about by information age systems and technology portend major impact on doctrine, organization, and training. The 21st century warrior will truly have to be a Cyberwarrior. Commanders will need to know the information system as well as they know aircraft and weapons systems today. They will train not just on the use of their cybersystems but also on the ways to employ them as operational multipliers.

Doctrinal Implications

Doctrine will evolve, being pushed by technology and in turn driving technology, itself. The current command and control paradigm of a theater CINC or his designated JTF controlling of military operations will endure, but Information in Warfare 21st century characteristics will influence (perhaps drive) doctrinal and organizational models for joint operations. By the 21st century, joint doctrine will center on JTF operations and will lead and integrate directly with service doctrine. Joint doctrine will drive standardized tactics, techniques, and procedures for JTFs operating across different theaters. This is a crucial step in the evolution of Information in Warfare as a combat multiplier, because it will place all operating elements on a common standard. If joint commanders demand the capability for "information dominance" and a common, relevant picture of their battlespace, then the Information in Warfare tools they have must also be common. For example, there currently exists joint military terminology which defines command and other relationships, but which leaves specific service terms under the purview of the services. As the doctrinal lead settles at the JTF-level, service unique terminology and operational concepts (especially where land, air, and sea operations overlap at the seams) will meld at the joint level. In turn this will foster more integrated JTF planning and operations and will drive the development of common information system suites and commonly constructed, distributed data bases. Certainly Doctrine will retain its role as a guidepost (vice directive) for commanders. They will continue to tailor their planning and execution based on mission using

doctrine as a standard. However, joint-led doctrine will be a necessary foundation for the effective use of Information in Warfare technological capabilities.

Dynamic Command and Control

The objective of Information in Warfare technologies is to provide commanders the means to command and control forces in dynamic situations and be successful. A top-level vision of how Joint Task Force Commanders will use information in the future follows:

- Commanders must have a dynamic, near- real time, accurate situational picture of their battle space (air, land maritime & space). This “picture” serves two main purposes: clear situational awareness for support to planning and operational decisionmaking, and target planning and execution. By dynamic we mean automated, visual portrayal of terrain, weather, sensors, and forces in perspectives tailored by the commander to provide situation awareness. Real time means fast enough to be of significant military value. For example, against tactical ballistic missiles, the time frame might be seconds. Against other high value, less mobile targets, the time frame might be minutes to a few hours. Accurate means good enough to be of significant military value.
- The commander must focus the effort. in planning and in operations. From clear situational awareness and based on his campaign plan, he decides on high priority targets and focuses sensors and surveillance on detecting, identifying, and locating them.
- Commanders attack with minimal losses using the most efficient land, air, maritime or space weapons. They determine the results of these attacks quickly, and directs that the near real time, accurate picture be promptly updated to permit the dynamic operations to continue.
- The time dimension of the above process must be minutes and seconds vice hours.

This vision of dynamic command and control holds major doctrinal (and organizational) implications. It implies a melding of planning and execution functions and interactive ways of prioritizing effort during simultaneous, asynchronous operations. Aerospace operations provide an example of this issue.

The ability of US military air power to conduct deep and sustained Offensive Counter Air (OCA) and Air Interdiction (AI) set it apart today from all other air forces, and that depends largely on the ability to plan and execute the Air Tasking Order (ATO). In the overall scheme of air power employment, ATO planning, preparation and distribution represents 35% of the C⁴I problem, while execution represents 65%. Most of the effort to improve the ATO, ironically, has gone towards planning. While this will improve air operations, the major enhancement can be made in execution.

Planners construct the ATO based on the joint forces commander’s campaign plan. They use the latest targeting data, usually about 12 hours old, and operational input. Their mission is to focus air power on the commander’s intent. Once disseminated, the ATO becomes the purview of current operations for execution. Since ATO planning and execution occur simultaneously and asynchronously, planners continually hand off to operations. This allows the former

to focus on campaign priorities and the latter on implementing the plan. The issue is that military operations always change, because the situation is dynamic. Since target data from the recently transmitted ATO is old, the current operations element in the Air Operations Center (AOC) executes the ATO almost entirely differently than its actual plan and this requires clear situational awareness to execute and focus air power on the right targets.

How does the current operations function in the AOC make change and adjust OCA and AI missions once sorties are airborne? The Gulf War clearly outlined this need in, for example, JFACC responses to fleeting targets like mobile armored units or tactical ballistic missiles or attacks on dug-in ground forces, the locations of which were deep in the battle area and of which were generally, not precisely known. The answer to the current operations enigma lies in assessing doctrine and organization and how information (read intelligence) on targets moves into the current operations element of the AOC.

The JTF J-2, as the senior joint intelligence officer, manages sensor collection and the production of intelligence based on the commander's intelligence requirements. A significant part (but nowhere near all) of those requirements is to develop precise location, composition, and disposition of priority targets. The J-2 has additional missions, as well, to warn, develop the enemy situation, and provide battle damage assessment, to name a few other significant users of sensors, time, and dissemination resources. During the planning function of the ATO, AOC planners (representing the JFACC) pass requirements to the J-2 for targets. In turn, the J-2 focuses sensor collection and analytical resources. Sensors provide input which intelligence analysts turn into their best estimate of target data and disseminate to AOC planners. This organization for information functions reasonably well for planning purposes, in peacetime or in military operational situations. (Figure 21 provides a description of the intelligence flow.)

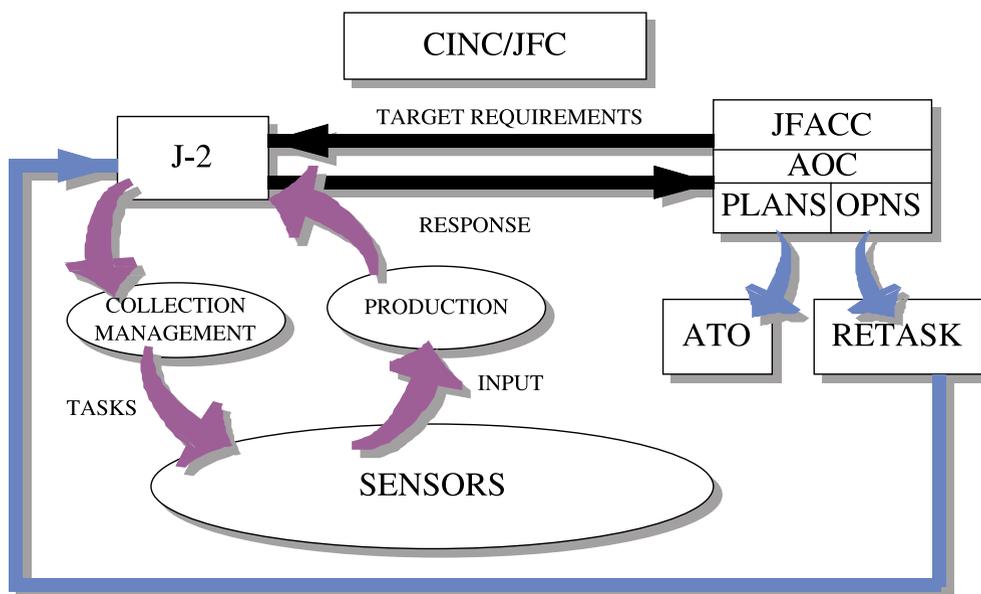


Figure 21. Intelligence flow

Technology For Information In Warfare

This vision requires a significant leap ahead in military informational technology over that which exists today. Automated processing of individual sensor input will become faster and capable of discerning priority command information needs. Fusion will be a reality, with heretofore disparate data inputs providing operationally significant and quickly understandable, holistic situational views. Commanders will be able to select his perspective of the situation and view it from various angles, inputs of which will be provided by sensor, operational, and data base outputs. Automated target recognition will provide the ability for staring sensors to cue shooters on to commander designated high priority targets. Imbedded simulations will provide the means to project from the near-real time, accurate situational picture to alternative futures based on several potential courses of action. Simulations would provide the means to train and to mission plan and rehearse before an operation begins, but would create the virtual environment in which commanders who are in fact operating could see the results of their decisions before they make them.

Doctrinal and organizational paradigms will also be determined by how information is used and moved in the future. Because information requirements also drive communications capacity, and conversely, communications sometimes becomes the limiting factor in moving information distributed data bases might serve as one plausible solution. Ironically, the further down the tactical chain a commander is, the more specific detail he needs, and the less communications capability there is. One solution is to imbed high data base capability on each platform that would contain required operational data with change data the only input required. That would allow for robust backbone networks to serve high order commanders and provide the tactical pilot, for example, his particular common, dynamic picture. Distributed data bases, interactive through their inputs, would give even tactical commanders the informational agility to shape their particular picture of battlespace at the time and place they need it. These technological advances—automated sensor processing, dynamic fusion, automated target recognition, advanced planning and operational simulations and distributed, interactive data bases—concomitant with improved communications will provide the bases for realizing the vision for Information in Warfare, described in this document.

Command Qualities

Enduring command qualities will continue to mark superb warrior leaders. While in the years beyond 2020, computers will make more decisions for commanders, superb leaders will still be characterized by their intellectual agility, innovation, mental discipline and intuition. Knowledge-based operations will demand of commanders high technical proficiency on cyber-operations. Command will center on knowledge and insight rather than capabilities and seeing the battlefield. The technique and art of massing of operational effects will replace maneuver and fires. The art of command will be measured by gaining and maintaining informational dominance, the essential ingredient in maintaining the momentum in the information age. This 21st century commander will plan and execute independent operations using versatile information systems, risk taking actions, and intuitive response which recognize and advantage opportunity, so though computers will increasingly assist in decision-making, commanders will retain those control measures central to accomplish intent. In sum, commanders will focus the effort, synchronize effects, control information, and lead by example. Computer technology will allow

for more accuracy, timeliness, and clarity, but the commander will retain the elements and essence of decision.

Summary

This paper asserts that the defining element of warfare in the information age is the use by commanders of Information in Warfare. Information dominance in all its implications will change, fundamentally how military operations will be carried out in the 21st century. To get to that point where planning and operations move at high pace and accuracy, and where commands will dominate the information domain, there will have to be significant investments in technology areas and also in doctrinal development. Informational technology will influence doctrine in a major way; however, doctrine provides the means to apply technology smartly to military operational environments and to highlight the significant changes and seams created by the infusion of technology.

The Information in Warfare Age, (upon us now), requires well-thought through, integrated, and standard doctrine for both the Joint Force and the service component combat commanders. In an age in which command and control, by definition, will be dynamic, clear situational awareness in near real time becomes the critically necessary capability. That, in turn, will cause melding and integration of planning and execution functions, for example, in aerospace operations, and the blurring of staff responsibilities. The impact of these and other significant changes to the art and science of command would be forewarned, in part, through doctrinal development.

Finally, while technology will make more decisions for commanders, leaders will still be characterized by intellectual agility, innovation, mental discipline, and intuition. The 21st century warrior will retain the elements and essence of decision.