

# 12<sup>th</sup> ICCRTS

## “Adapting C2 to the 21<sup>st</sup> Century”

### Title of Paper: **Air Doctrine: Using Networks to Promote Agility in the Planning Process**

Topics: air planning; decentralized decision-making; NCO; agility

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## **Abstract**

Flexibility must be the hallmark of air power. Against the unpredictable and dynamic threats of the 21<sup>st</sup> century security environment, air operations must exhibit a higher degree of agility that enables air forces to quickly and effectively adapt and shift effort and tempo.

Traditionally, industrial age threats generally demanded more firepower than flexibility. Air power planning has logically developed to maximize massing of forces and utilization of resources to attack large military and industrial formations. In response and in the absence of widely available computers and networks, complicated and centralized processes arose.

Today, air power planning needs to retain the capability to meet large-scale general war requirements while also addressing the greater dynamism posed by a mix of combat and operations other than war.

Ultimately, what is desired in the planning, execution and assessment cycle is for command intent to be fulfilled safely, effectively and efficiently. Networked systems provide potential opportunities to evolve legacy joint processes into a more robust, decentralized and self-synchronized effort.

This paper outlines the theories and realities that have influenced air planning and future directions for reshaping air power into a more effective, efficient and agile force in the battlespace.

# 1 Introduction

Centralized control has been central to U.S. Air Force doctrine for many years. One might ask why, given all of the bedrock changes to the service, it is still the principal tenet of airpower doctrine, and are we best served by this standard? To properly frame this discussion, we must first examine how the tenet of centralized control came to hold its premier position.

## 1.1 Doctrine as Commander's Intent

Doctrine can be a powerfully unifying tool. It can provide a framework for thought and action. It is a collection of the foundational principles from which lower-level tactics are derived. As such, it should reflect goals and values of the organization. Ultimately, the role of doctrine is to provide a basis for making decisions in the face of uncertainty. If a situation is known and there are standardized tactics, techniques and procedures that adequately conform to the operational context, there is little need for referring to doctrinal guidance. One simply employs the standard.

Doctrine comes into its own, however, when one is confronted with the unusual or novel, or the vexing problem that defies a common solution. It is the high-level wisdom that bounds our innovative and evolving solutions and allows us to go forward with the certainty that we are staying in step with the organization. In short, it is effectively the highest level of Commander's Intent.

Therefore, doctrine must be crafted with care. If it is too loose, it will not provide the desired harmonization with other forces and operations. If it is too tight in its prescriptions, it will limit innovation and possibly drive down effectiveness and/or efficiency – especially in cases where the threat deviates from expected patterns. In either case, poorly conceived or communicated doctrine can directly affect operations.

## 1.2 Air Force Doctrine

The U.S. Air Force has experienced a checkered past with regards to the creation and maintenance of doctrine. Throughout the history of the Air Force providing solid and useful doctrine has been a challenge, and at times the written doctrine has not reflected the realities in the air.<sup>1</sup> The Air Force has now developed and adopted doctrinal guidance that is much more encompassing and useful than in the past.

The core source is Air Force Doctrine Document One (AFDD-1) entitled Air Force Basic Doctrine<sup>2</sup>. This document lays out in some detail the foundational ideas behind the development of Air Force doctrine and the justifications for the prescriptions it makes. Furthermore, it taps into the tried and true principles of war (i.e., Mass, Economy of force, Maneuver, Unity of command, etc).

Air Force doctrine typically retains a high degree of flexibility – matching the inherent flexibility of airpower. AFDD-1 is quite clear, however, that the central tenet of air and space power is centralized control and decentralized execution. Through rest of this paper, we hope to bring forward the idea of relaxation of centralized control in the planning process to gain agility, effectiveness and efficiency.

### **1.3 A Look Back: Genesis of Centralized Control**

The value of air power became evident, but not completely so, during WWI. At first, aircraft were used wholly in an intelligence role. If one could see the enemy's large and immobile formations, one could attack them with artillery, the primary weapon of the era.

Soon, however, innovative airmen were taking machine guns and bombs into the air, turning their craft into weapons platforms. A few forward thinking leaders could see the strategic implications of this development. After the war, Mitchell demonstrated this new capability with the dramatic bombing tests of the early 1920's.

Radio communications also drove sweeping changes in basic outlook. During WWI, commanders had little chance to effect changes in a plan once in the air. Rudimentary signals weren't up to the task of providing complex command and control (C2). Each pilot was, for the most part, on his own. This was especially true during the chaos of an engagement. With radios, the aircrews could achieve much higher levels of flexibility and coordination while on missions.

During WWII the value of airpower was validated through countless actions. Nevertheless, imperfect targeting and weapons accuracy pushed the principles of *mass* and *centralized control* to the forefront. Massed effort was the solution for the low probability of hitting a target with any single bomb. So, to overcome the limitations of the technology of the era, huge formations of bombers were employed.

Centralized control was then utilized to orchestrate the combination of these massive strategic efforts and the thousands of daily tactical missions. For an industrial age force with rudimentary radars, radio communication, celestial navigation, little automation, and unguided munitions this focus on mass and centralized control was logical, effective and relatively efficient.<sup>3</sup>

The principles of mass and centralized control have served the Air Force well over the years. Mass, however, has lessened in importance with the advent of precision munitions. Since an identified target can be attacked with very high probability of success, the need for large scale engagement has waned. Currently, mass is more of a tactical or psychological consideration rather than an operational requirement for the Air Force.

Yet, centralized control remains at the core. Some have even called for even greater centralization.<sup>4</sup> What does it provide to a network-centric air force?

## **2 Agility and Complexity**

Network-Centric Operations (NCO) have initiated a sea change with the U.S. military. The chain of logic behind it is that given high quality and timely information, lower-level commanders can act independently to achieve commander's intent. Moreover, the decentralized, network-centric organization can reach these ends more effectively and efficiently than a hierarchical, centralized organization can ever hope.

### **2.1 Self-Synchronization**

The holy grail of NCO is self-synchronization. It rests firmly upon the proposition that subordinates have superior local knowledge, and if they understand the goals (commander's intent), principles (rules of engagement), and plans (orders) of an operation, they can produce results superior to the centrally controlled organization.

If we accept the wisdom this core precept, we cannot help but wonder if hewing to a strict doctrine of centralized airpower control is limiting our force agility and ultimate effectiveness.

### **2.2 Agility**

Ultimately, the competitive advantage provided by NCO is agility. Through C2 and force agility, commands can rapidly adapt to meet a full range of contingencies. During the cold war, we had an appropriate focus on large-scale general war with the Eastern Block. As a result, we built weapons and measures that served us well in large-scale conventional conflict, as displayed in Desert Storm.

The rest of the world took notice of the rout and came to the conclusion that asymmetric warfare was the best hope for taking on the U.S. Even while we face down terrorists and asymmetric threats around the globe, we must still be prepared for general war. Complicating the mix, our forces have also inherited the challenging role of first responder to international humanitarian crises.

Agility is the means by which our forces can rapidly retool to meet any or all of these challenges. As we have witnessed in Iraq, our adversaries are complex. We cannot treat these sophisticated and dynamic threats as a static problem to be solved. We must be constantly innovating and improving our methods faster than they can adapt. Only by taking and jealously holding the initiative can we fight on our terms rather than our enemies'.

### **2.3 Complexity**

Much of the perceived need for centralized control arises from the sheer complicatedness and complexity of our environment and systems. Modern air campaigns are a vast symphony

of logistics, intelligence, and operations. From an industrial age viewpoint, the way to orchestrate these innumerable activities is through strong, centralized control.

However, as one ties more and more operational entities, sensors and databases together in the quest for agility, not only does the level of complication increase, but the effects of uncontrollable factors multiply. Though there are many definitions of complexity and complicatedness, a useful way to distinguish the two is through the effects of random or uncontrollable events on the system.

**Complicated = not simple, but ultimately knowable**

- **Deterministic**
- **Can be modeled accurately**

**Complex = not simple and never fully knowable**

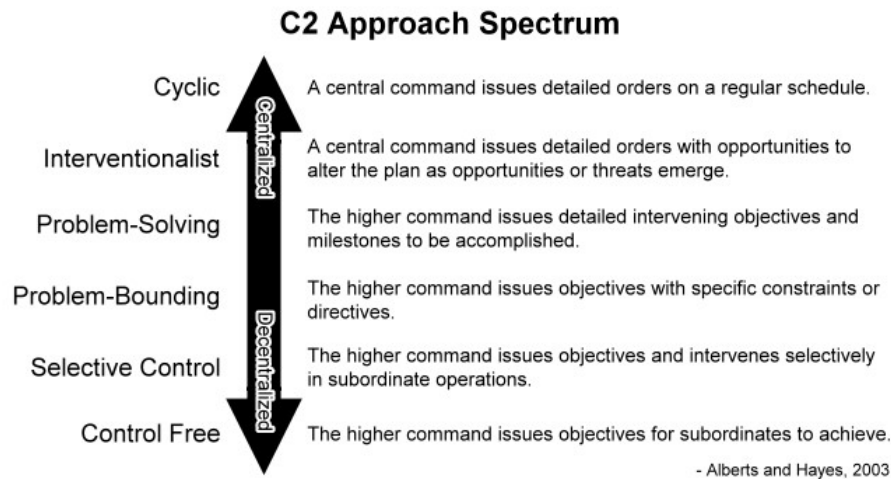
- **Probabilistic**
- **Models always subject to random events**

A future NCO air campaign with heightened operational tempo, interdependent joint actions and myriad sensors and shooters is not merely complicated, it is complex. It is far from simple and will never be fully knowable.

### **3 The Control Spectrum**

Centralized control is an indispensable tool in the commander's toolbox. We should, nevertheless, seek to make our forces as agile as possible. By giving commanders new options for command and control we improve our ability to exceed any future threats.

In the book *Power to the Edge*, Alberts and Hayes outline a continuum of successful C2 approaches.<sup>3</sup> At the most centralized end of the spectrum are *Cyclic* controls based on a specific timeline. The most decentralized approach is termed *Control Free*, whereby commanders issue objectives to subordinates and leave them to accomplish the mission. In between is a range of approaches ordered by degree of centralization.

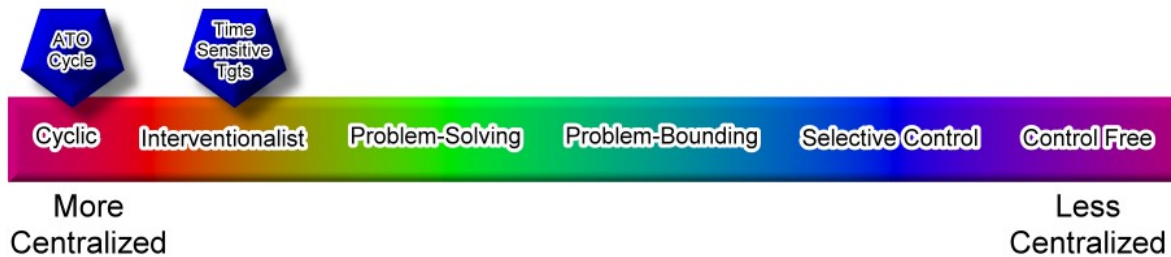


The more centralized approaches fit well into the industrial age schema. Communication channels were lean and crowded, and sensors were limited. As a result, the limited situation awareness of any given subordinate commander would not allow him to understand the greater operation and orchestrate his actions accordingly. In addition, there were only limited networks and computing resources to drive rapid collaboration and coordination. The obvious way to direct such poorly informed sources is through centralized control while allowing some tactical latitude.

## 4 Centralized Control in Air Planning

Even in a fully network-centric operation there will be need for centralized control at times. No approach is more direct and fast for a critical response. A direct command of “take that hill” or “bomb that bridge” often has no substitute. Where centralized control stumbles is in facilitating a wide range of specialized responses. This is where we should seek to develop technologies and practices that will allow commanders to move back and forth along the control spectrum, from centralized to decentralized, at will.

Any form of airpower C2 is a means to getting effects in the real world. Ultimately, what the Air Force needs is a safe, effective and efficient way to achieve mission goals in a prioritized manner. The Air Operations Center’s (AOC) key output is the Joint Air Operations Plan as realized through the Air Tasking Order (ATO). In generating the ATO, the AOC personnel perform airspace planning and deconfliction, dynamic targeting/tasking, and effects assessment.<sup>5</sup> This air planning is generally done on a fixed schedule, although there are opportunities to amend the cyclic plan as in the case of time sensitive targets. The AOC’s command and control efforts clearly fall on the centralized end of the C2 continuum.



**Figure 1 – C2 Spectrum**

This approach has weathered decades of use through countless air missions of all types. In a more network-centric world, however, it will not facilitate agility or respond to complexity as well as decentralized approaches. In the case of complexity, the centralized command cannot scale to understand all of the nuances that are apparent to the subordinates.

In the case of agility, centralized control prescribes that air missions be executed within very specific boundaries. Times, routes, weapons and other parameters are dictated by the central command. By necessity, missions must adhere to standard templates. It is cognitively and computationally impossible for a centralized command to widely tailor individualized mission parameters to a high degree. In short, the centralized command has a limited ability for customization, or agility. This one size fits all solution is reminiscent of Henry Ford’s famous quote, "Any customer can have a car painted any colour that he wants so long as it is black".<sup>6</sup>

## **5 Decentralizing Air Planning Envisioned**

Decentralized operations, on the other hand, provide a greater ability to scale. The decentralized command can concentrate on providing prioritized mission goals. Subordinate commanders can then leverage their superior local knowledge to craft innovative solutions with greater effectiveness and efficiency.

This fundamental change will not come easily. It must be built upon a firm foundation. First, commanders up and down the organization must provide carefully crafted intent so that subordinates can grasp the goals of the operation and how they can best support the main effort. Commander’s intent also provides higher-level commanders with a window into subordinates’ thoughts and actions so that they can refine guidance and give rudder corrections where necessary.

At a more granular level, subordinates must fully understand the constraints on the organization and their actions so that they can self-synchronize. Higher-level commands can manage a great deal through resource allocations. Policy-driven automated systems can take over much of the cognitive load for commanders.



Following is a brief outline of the basic capabilities that might facilitate a more agile airpower planning and control structure:

1. AOC maintained dynamic, prioritized, real-time lists for different mission types (strike, mobility, intelligence, etc).
  - a. Minimal weaponeering/logistical parameters are provided for each individual mission.
  - b. Mission reservation capability so that units can “bid” on missions that they best fit.
2. Current and projected logistical information (e.g., fuel, weapons, parts, etc).
3. Real-time visibility of unit information: commander’s intent, plans, aircraft and flight status.
4. Real-time dynamic airspace management guidance and deconfliction provided by an automated system.
5. Assessment linked back to the dynamic mission lists.
6. Failover capability for units/aircraft with system casualties.
7. An incentives scheme to monitor and reward desired behavior.

If the Air Force can robustly meet these criteria, one can imagine self-synchronizing units choosing targets that best meet their readiness, expertise and local knowledge requirements.

As missions are completed and assessed they drop off the lists. New missions are continually prioritized and added to the lists. Preempted missions’ priorities can be bumped up to ensure they don’t languish in the queue.

As time sensitive targets emerge, the AOC can retask aircraft based on availability, suitability, and the prioritization of their current tasking. The missions abandoned by the retasked aircraft can immediately return to being available on the prioritized mission listing.

One could expect that in addition to greater mission effectiveness there will also be greater efficiencies as commanders take on missions that will play to their particular strengths and current situation. For instance, if a commander sees in the logistical projections that he will have less fuel in coming days, he can adjust his mission portfolio to maximize his unit’s availability within that constraint.

## **6 Steps Forward**

Such sweeping changes would not be without effort. This type of overhaul would require leadership and thought at every level and facet of the organization.

## **6.1 Technical**

Any move towards greater decentralization would not be possible without NCO technologies. Huge enhancements in collaboration, communication and computing abilities are required for such an approach. As outlined above, the centerpiece technologies would generally fall into three categories: (1) situation awareness tools to provide transparency throughout the organization, (2) automated real-time airspace management and deconfliction, and (3) automated mission management. Though a stretch, all of these are attainable with current technology.

## **6.2 Organizational and Cultural**

Beyond the purely technical, this approach would be a major shift for the Air Force in terms of training, organization and leadership. In fact, it could be expected that the human factors of such a transition would far outweigh any technical concerns. The Air Force has practiced centralized control for decades. There is no corporate understanding of how to approach this in any other way.

Decentralized organizations rely much more on the leadership and initiative of the lower echelons. Moreover, the perceived lack of control is an unsettling proposition for many. Still, NCO provides greater levels of transparency which affords leaders the ability to monitor their organizations and provide guidance. Evidence suggests that this improved monitoring capability increases trust, decreases micromanagement and lets commanders and staffs find and correct errors before they become more serious.<sup>7</sup>

## **7 Conclusion**

Agility is the capability that will allow us to confront any threat. Centralized control and decentralized execution has served the Air Force admirably. It has worked through generations of airmen, aircraft and supporting technologies. In spite of this, it may be time to start relaxing this doctrinal tenet to attain greater C2 and force agility.

Our adversaries are continually trying new approaches to confront our overwhelming technological, training and organizational advantages. Their only hope for success in most cases is asymmetric attack. The decentralized airpower planning process briefly outlined in this paper might provide the enhanced agility that could make airpower an even greater weapon for the joint commander.

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