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Illusions of Prescriptive Control: Understanding Intelligence, Surveillance and Reconnaissance Operations

by

Lieutenant Colonel Chad J. Hartman
United States Air Force

United States Army War College
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United States Air Force

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Captain Mark F. Light
United States Navy

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by

Lieutenant Colonel Chad J. Hartman
United States Air Force

Captain Mark F. Light
United States Navy
Project Adviser

U.S. Army War College
CARLISLE BARRACKS, PENNSYLVANIA 17013

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This research project argues that the Air Force should modify its current doctrine to strike an adaptive balance between centralized and decentralized control of Intelligence, Surveillance and Reconnaissance (ISR) operations. An examination of contemporary context reveals a need for ISR agility due to a complex and dynamic environment full of networked and ever-changing threats. A detailed analysis of ISR operations reveals an inherently decentralized network of platforms, sensors, communications, exploitation nodes and analytical centers the orchestration of which involves more than just efficiently managing low-density/high-demand aircraft. Recent ISR operations also reveal an initial paradigm shift from a centralized and bureaucratic theater collection management process to the mission command inspired delegation of ISR authorities. An investigation of modern enemies indicates a hybrid mix of regular and irregular adversaries that increasingly offer only ambiguous and fleeting targeting opportunities. The study concludes by recommending three proposals designed to optimize ISR operations: adaptive control; the use of mission-type orders to focus the ISR enterprise on theater lines of effort; and the creation of expeditionary ISR support teams.

Illusions of Prescriptive Control: Understanding Intelligence, Surveillance and Reconnaissance Operations

Laws control the lesser man…right conduct controls the greater one.

—Mark Twain[1]

United States military command and control is built upon a foundation of tenets and doctrine forged from the experience of multiple campaigns over many years. These principles encapsulate the historical knowledge of invaluable and often costly lessons learned. Like the study of history, the canons of military command and control can help us navigate a complex and uncertain future by understanding what worked in the past, and more importantly, why it worked. Human nature likes simplicity however. Thus, the natural tendency is merely to adopt what worked before without a real appreciation of the unique circumstances behind why it worked, or that conditions have changed. Such shortsightedness can lead to prescriptive tenets of military command and control instead of an adaptive use of doctrine to the distinctive environment faced. An example of this dilemma lies in the application of the United States Air Force's centralized control, decentralized execution tenet for intelligence, surveillance and reconnaissance (ISR) operations.

Centralized control, decentralized execution of airpower is a core and longstanding tenet of the United States Air Force with origins that date back to World War II.[2] Focused on airplanes, the United States Army initiated centralized control of airpower following tremendous losses experienced when aircraft were parceled out to individual ground units in the North Africa Campaign's battle for the Kasserine Pass. Shortly after the Kasserine Pass incident, Field Manual 100-20 declared that "control of available air power must be centralized and command must be exercised through the

air force commander if this inherent flexibility and ability to deliver a decisive blow are to be fully exploited."[3] The problem is that seventy years of evolution in our operational environment, vast technological developments and a modern recognition that airpower now includes far more than just airplanes changed many things since World War II.[4] Despite these changes, the Air Force doctrine continues to apply the prescriptive tenet of centralized control, decentralized execution to airpower missions like ISR operations.

The Air Force recognizes ISR as a core function of airpower.[5] "Global Integrated ISR is the synchronization and integration of the planning and operation of sensors, assets, and processing, exploitation, dissemination (PED) systems across the globe to conduct current and future operations."[6] In essence, Air Force ISR consists of a global, multifaceted and dynamically interactive enterprise, the orchestration of which helps illuminate what are "complex, ever-changing and uncertain operational environments."[7] Air Force doctrine also acknowledges that such complex and uncertain environments necessitate a breadth and depth of flexibility in the execution of airpower, to include ISR operations.[8] Centralized control, decentralized execution of airpower is prescribed as the solution for enabling this flexibility without sacrificing a theater commander's control of the big picture.[9] Others claim, however, that "the illusion of control exists when someone has the perception they can control dynamic and complex interactions 'from the top.'"[10] The question is then, should a global, multifaceted and dynamically interactive ISR enterprise always be centrally controlled?

The following paper argues that it should not and that the Air Force should strike an adaptive balance between centralized and decentralized control of ISR operations. To support this thesis, the paper leverages a modified Sun Tzu axiom as a framework to

better understand ISR operations: know your context; know yourself; and know your enemy. Throughout this framework, the paper looks at why the Air Force chooses centralized control, decentralized execution as an airpower tenet and its effect on ISR operations. The more decentralized command and control concept of Mission Command is also examined in terms of how this model can impact ISR operations. The paper concludes by discussing findings from the overall analysis and proposes subsequent command and control recommendations for optimizing ISR operations.

Understanding ISR Operations

Know Your Context

The world is becoming more complex, ambiguous and multidimensional, which in turn leads to increasingly multifaceted, diffused and networked threats.[11] These developments will not only continue to make our operational environment more complex and interconnected, they will make it more dynamic and adaptive as well.[12] As a result, the U.S. military faces an operational environment that is nonlinear, unpredictable and full of wicked problems.[13] Successfully operating in such an environment demands continuous adaptation and a networked agility that transcends the scope of any single control node.[14] Despite this need for horizontal solutions to what are horizontal problems, the vast majority of the United States military is still comprised of vertical hierarchies.[15]

General Stanley McChrystal lived this dilemma first hand while leading a special operations task force in the targeting of terrorists in Iraq. Facing a horizontal problem in a nonlinear environment, the General's task force initially focused on streamlining their organization's vertical hierarchy in order to make it more operationally efficient.[16] However, they soon discovered that they were still being outpaced by a more agile Al

Qaeda network.[17] General McChrystal realized that his task force must become more adaptive in organization and strategy in order to keep up with an enemy and an environment that were continuously evolving.[18] His solution was to transform his special operations task force into an adaptive yet disciplined network of interagency organizations with a "shared consciousness and purpose."[19] General McChrystal recognized that "it takes a network to defeat a network" in the 21st Century.[20] A network, of course, requires connectivity.

Incredible advances in communication technologies over the past twenty years catapulted us from the industrial to the information age, and enabled the power of mass collaboration via interconnected networks.[21] This connectivity and the collaboration it can spawn gives both individuals and organizations rapid access to immense amounts of information. Information technologies like social networking, blogs, global communications, instantaneous chat, worldwide news available 24/7 and a ubiquitous internet are evolving the structure of our world order.[22] The Westphalia system of nation-states still administers world order; however, modern information technology is also empowering individuals and transnational networks.[23] Modern information technology allows non-state actors like Al Qaeda to circumvent international controls and increase their operations by diffusing their global network's decision-making.[24] Consequently, modern information technology is changing our world order as it expands both the number of stakeholders and the way they organize.

This same technology and its empowerment of individuals and networks is also diffusing United States military decision-making. A military operation does "not result from a single decision by a single entity, but involves many independent and interrelated

decisions by many individuals within a system."[25] To be fair, modern information technology itself actually gives a commander the ability to "centralize or decentralize his control and execution options."[26] Advanced sensors, robust communications and network connectivity give a senior commander access to unprecedented amounts of information if he or she chooses to centralize their decision-making.[27] These technology attributes, however, also empower lower echelons with an extraordinary degree of information that can enhance their ability to support decentralized decision-making.[28]

The problem today and for the foreseeable future is not a lack of info, but that we have too much information. So much so, that a centralized theater node can quickly become inundated with a vast array of information that paralyzes their decision-making ability. This explains mission command's call for decentralizing decision-making despite a temptation for micro-management given all the tactical information available to a senior commander today. Decentralized nodes operating within collaborative networks and the bounds of a senior commander's intent are better postured to frame and act on the plethora of information available within their respective spheres of influence. These decentralized nodes can capitalize on their refined situational awareness to "take advantage of transitional opportunities" that would typically fall off the radar of a centralized node overwhelmed in information overload.[29] This distinctive advantage in decentralized decision-making holds true across the spectrum of warfare.

General McChrystal's message that it takes a network to defeat a network is not just a lesson for counterterrorism or counterinsurgency warfare. The global proliferation of technology and asymmetric American military advantages like airpower are leading potential state and non-state adversaries to evolve their capabilities and strategies.[30]

Our future enemies are unlikely to make the same mistakes Serbia's Slobodan Milosevic and Iraq's Saddam Hussein made; they will not dig in and let American precision bombing systematically fix and destroy vulnerable infrastructure and warfighting means.

Both state and non-state actors are exploiting advanced communications technologies and network strategies to improve the mobility, redundancy, deception and adaptability of their forces.[31] The application of these dynamic characteristics to more conventional threats like air defenses, coastal defenses and ballistic missiles can make targeting these individual systems nearly as complicated as hunting terrorist networks. Trying to simultaneously monitor and affect all of them will quickly overwhelm any centralized control process. An even more challenging and seemingly prevalent threat development lies in the growing synthesis between conventional and irregular warfare. Known as hybrid warfare, this modern evolution of war combines the asymmetry of unconventional conflict with the high-intensity character of conventional combat.[32] Complex networks of state and/or non-state forces using both regular and irregular approaches make hybrid warfare an inherently decentralized affair.[33]

The United States military faces a daunting operational environment of complex and interconnected dynamics that can only be overcome through the agility of adaptive networks and strategies. It thus not only takes a network to defeat a network, it also takes a network of decentralized decision-making to effectively operate in what is a nonlinear world of diffused threats. Furthermore, modern information technology and networking have enabled the power of mass collaboration, as well as the likelihood of information overload for centralized control centers. Whether irregular conflict,

conventional combat or hybrid warfare, this technology is driving increasingly networked operations the speed and complexity of which demand decentralized and adaptive decision-making. Perhaps nowhere is this more evident than in United States Air Force ISR operations.

Know Yourself

Airborne ISR operations consists of far more than just individual aircraft; they involve the complex orchestration of a global enterprise. Pilots, controllers and ISR operators must de-conflict airspace and choreograph various platforms and sensors to collect copious amounts of raw data. An array of global communication architectures must simultaneously relay this bandwidth-intensive data along with dynamic control inputs for the platform and/or sensors. PED nodes must convert the raw data into useful, actionable intelligence and immediately use it to cue and drive additional collection. Analytical cells must also take that intelligence and fuse it with other multiple sources to produce the all-source analysis necessary for understanding the complex, adaptive systems of our enemy and environment. This global ISR enterprise encompasses an inherently decentralized network of numerous actors and organizations working together in an overall unity of effort. Although aircraft are only one component in what is an extremely multifaceted ISR enterprise, the platforms are typically the focus of centralized control advocates.

Air Force doctrine defines centralized control as a "…broad focus on the [Joint Force Commander's] JFC's objectives to direct, integrate, prioritize, plan, coordinate, and assess the use of *air*, space, and cyberspace *assets* in any contingency across the range of operations."[34] The doctrine also states that "because of airpower's *unique potential* to directly affect the strategic and operational levels of war, it should be

controlled by a single Airman who maintains the broad, strategic perspective necessary to balance and prioritize the use of a powerful, *highly desired yet limited force*."[35] In essence, airpower's aircraft are heralded as unique assets in that they can range the globe and rapidly transit an entire operations area to address emerging requirements.[36] These unique platform capabilities in-turn give airpower its "unique potential to create effects across the levels of war, from tactical to strategic," and thus this flexibility makes them high-demand assets.[37]

Advocates for centralized control of ISR operations go one step further and argue that ISR aircraft are low-density, high-demand (LD/HD) assets in need of more centralized, efficient control to ensure their availability for a theater's high-priority requirements.[38] ISR demand continued to increase over the past decade as overall theater tasking jumped nearly 400 percent from FY07 to FY10.[39] The growing prevalence of multi-role aircraft that can perform both ISR and kinetic operations is adding another dimension of complexity, if not outright competition.[40] Retired Lieutenant General and former Director of Air Force ISR David Deptula put it this way: "there will always be more demand for capability than there is supply."[41]

While it is probably still fair to characterize airborne ISR as LD/HD assets, their numbers are increasing. Secretary of Defense Robert Gates proclaimed in a 2008 address that our ISR-capable, unmanned aircraft inventory increased 25-fold since 2001 to more than 5,000 assets.[42] The Air Force alone increased its continuous, unmanned assets performing ISR operations from one air patrol in 2001 to nearly 65 simultaneous orbits at the end of 2013.[43] Technology is also leading to not just unmanned aircraft, but swarms of miniaturized unmanned platforms capable of

autonomous operations.[44] Distributing continuous knowledge between themselves, thousands of small aerial drones will “mesh” and adapt their battlefield-wide ISR functions in real-time with little to no need for centralized control.[45] Such swarming technology could not only resolve the low-density problem with ISR assets, but will probably also change how we control overall airpower in the future.[46]

Having control authority over an ISR aircraft does not necessarily translate into control over its sensors. Today’s ISR aircraft typically employ multiple sensors the capabilities of which can range from simple imagery or full-motion video (FMV) to elaborate signals intelligence (SIGINT) or even complex measurements of a target’s signatures. The variety of means to control these sensors can be just as diverse, and can be exercised under separate authorities independent of who controls the platform.[47] Sensor control options range from cockpit or aircraft back-end control to remote control via remote ground stations or intelligence PED nodes. Sometimes the complexity of a sensor and the need to perform off-board processing of its collected data dictates who can control a sensor. Other times, control is based on who has the best situational awareness to optimize the sensor’s collect. ISR fusion centers (like a PED node) often possess this awareness and not cockpits or air operations centers. Sensor technology is also advancing and thus collecting greater swaths of the electromagnetic spectrum at higher levels of fidelity. The increased data from these advancements make communications links and PED nodes more LD/HD than ISR aircraft.[48]

Exponentially growing intelligence bandwidth and data storage requirements are quickly outpacing the global communication architecture necessary to enable ISR operations.[49] Furthermore, the variety of actors involved in controlling the numerous

components of this architecture are just as convoluted as who controls what sensors. Despite these complications, the global communication architecture is increasingly vital to ISR operations as we employ ever more unmanned assets that are controlled and exploited from remote ground stations.

Remote PED is almost a given for any ISR aircraft operating today. The amount of intelligence data processed and exploited at these sites is staggering. The Air Force Distributed Common Ground System (DCGS) alone "processes more than 1.3 petabytes of data a month—equivalent to 1,000 hours a day of full-motion video."[50] Not focused on a single form of intelligence, DCGS nodes use the exploited data from one ISR sensor to promptly cross-cue other sensors and/or aircraft in the area.[51] These nodes also collaborate with other PED centers and analytical cells to ultimately fuse the collected data into actionable intelligence.[52]

"Intelligence is a product, surveillance is systematic observation, and reconnaissance…obtain[s] information or secure data…*when analysis is applied to each…the synergistic effect makes the whole greater than the sum of the parts*."[53] Multiple analytical cells also fuse ISR data with other intelligence sources and assessments to expediently produce the most complete picture possible. This fused, all-source analysis is pivotal to understanding the complex and adaptive nature of today's networked adversary and systemic operational environment. Although different analytical cells typically serve different masters, they often collaborate in a decentralized manner to produce actionable intelligence outside their chain of command. As we have seen, control is not a straightforward affair when it comes to the ISR enterprise.

However, an aircraft-centric concern with LD/HD ISR assets spawned a centralized control process in the form of theater collection management.

Theater collection management takes a “farmer approach” to ISR operations; it is a production-focused process that formally subjugates the ISR enterprise to centralized administration of a prioritized collection deck.[54] The Joint Force Commander’s Prioritized Intelligence Requirements (PIRs) drive a rank order of target submissions from the hierarchies of theater organizations that in-turn form the collection deck used to plan, task and assess the ISR enterprise’s operations.[55] If this process sounds highly bureaucratic, that is because it is. This centralized collection management process prompted an inflexible mentality in the past where some ISR assets were expected to fly a “black line” with zero deviations.[56] The production-focused nature of the process also led to a “peanut butter spread” of ISR assets in an attempt to efficiently cover as many collection deck targets as possible.[57] Efficiently managing the collection deck became more important than understanding an evolving environment and adaptive adversaries. The bureaucracy of this centralized process naturally led to prevalent problems in the timeliness, flexibility and tempo of theater collection management, and by extension, the ISR enterprise.[58] Consequently, the theater collection management process is widely felt to be a too long and cumbersome process.[59]

What about decentralized execution? The Air Force realized from day one that a single node cannot do it all and thus paired centralized control with decentralized execution. Specifically, decentralized execution helps ensure airpower’s tactical flexibility.[60] While decentralized execution implies some degree of decentralized control, it too is an aircraft-centric concept and is also very tactically-oriented.[61] Air Force

doctrine uses examples of Joint Terminal Attack Controllers and airborne controllers tactically vectoring an aircraft's final leg to illustrate what decentralized execution means.[62] What this vision of decentralized execution does not incorporate is the systemic decentralization of decision-making inherent in any enterprise. Nor does the Air Force's vision of decentralized execution discuss the decentralization of control at the operational level. This is the paramount shortcoming of centralized control, decentralized execution in an ISR enterprise where control is multifaceted in nature and transcends the operational and tactical levels. To overcome the deficiencies of centralized control in today's theater collection management process, the philosophy of mission command is increasingly influencing ISR operations.

Mission command is a commander-centric concept, but one that does not promote centralized control.[63] The concept is built on an understanding that the two words command and control mean very different things. Simply put, "command is the *authority* to direct forces while control is the *process* of directing those forces."[64] Mission command does resemble the Air Force's doctrine of centralized control in that both promote unity of command with the requisite authority to direct forces as required.[65] The fundamental difference between the two is in their respective processes for how to direct those forces. Where Air Force doctrine emphasizes centralized control, mission command stresses decentralized decision-making and adaptive leadership.[66] Mission command therefore recognizes that environmental context and the nature of the mission will dictate levels of control, not prescriptive doctrine.[67]

Mission command's guiding principles are to "build cohesive teams through mutual trust…create shared understanding…provide clear commander's

intent…exercise disciplined initiative…use mission orders…and accept prudent risk."[68] In what is a paradigm shift, commanders and ISR professionals are starting to leverage these attributes to effectively and efficiently orchestrate networked operations in their complex and diverse ISR enterprise. For example, ISR constraints were partially reduced in Afghanistan as commanders started decentralizing control authorities and emphasizing mission command's principles of team building and disciplined initiative.[69] Consequently, adaptive leadership was injected into a bureaucratic theater collection management process traditionally focused on administering collection decks.[70]

The Central Command (CENTCOM) Commander, his Combined Forces Air Component Commander (CFACC) and the Combined Air Operations Center (CAOC) all played a key role in this paradigm shift as they entrusted ISR control to subordinates. These command and control entities still retained their overall responsibilities and power to intercede in ISR operations as required through the practice of "command by negation."[71] However, CENTCOM leadership delegated planning and execution control of some ISR missions to Afghanistan units responsible for specific functions like counter-terrorism and/or geographic areas like a regional command.[72]

The functional and regional-focused units given ISR authorities obviously knew the intricacies and dynamics of their respective problem sets better than anyone. What they did not typically understand was ISR and its capabilities, limitations and enterprise complexities.[73] Thus, the CFACC and his CAOC also augmented these lower echelon units with the expertise of ISR liaison officers from the CAOC and the Air Force DCGS community. ISR liaison officers not only brought detailed ISR knowledge to lower echelon units, they also came with direct liaison authorities (DIRLAUTH) to the greater

ISR enterprise. This DIRLAUTH removed many bureaucratic hurdles that previously impeded cooperative teaming between the ISR enterprise and its customers.[74]

Special Operations Forces (SOF) in Afghanistan went a step further and deployed ISR Tactical Controllers (ITC) to their units. Representing a SOF commander, these ITCs used disciplined initiative to orchestrate teams of ISR professionals operating assets, sensors, communication relays and distributed exploitation nodes. Like their ISR liaison officer counterparts, they also synchronized the ISR enterprise with the SOF unit they were supporting. Delegating authorities to the units responsible for specific issues or areas and collocating ISR experts with them enhanced the adaptive employment of ISR in Afghanistan through greater teamwork. To keep these adaptive ISR teams focused on the commander's priorities; CENTCOM also employed mission-type orders.[75]

ISR mission-type orders use narrative tasking to focus dedicated ISR assets and professionals on a "commander's desired effects."[76] Similar to the overall mission command concept, theater commanders assume prudent risk and issue ISR mission-type orders that prescribe what to do, not how to do it.[77] That said, the ISR mission-type orders employed in Afghanistan were not a blank check arbitrarily allocating ISR assets to tactical units. The theater commander used the orders to dedicate specific ISR assets and stipulate how much authority and flexibility he was willing to delegate.[78] ISR mission-type orders were also used to convey a theater commander's priorities and assign the DIRLAUTH critical to teaming the ISR enterprise with its customers.[79] ISR professionals then applied their dedicated assets and DIRLAUTH to synchronize the planning and execution of layered ISR assets in pursuit of commander priorities.[80] This

process allowed the ISR enterprise to continuously optimize their operations and create opportunities for synergy between multiple collection assets, sensors, operators and analysts. Most importantly, ISR mission-type orders conveyed clear commander's intent to guide shared understanding.

The principles of clear commander's intent and shared understanding inherent in ISR mission-type orders are essential to achieving unity of effort throughout the ISR enterprise. The commander's intent in Afghanistan's ISR mission-type orders gave a globally distributed enterprise a "greater understanding of the WHY" behind tasked missions.[81] Knowing the why behind a mission gave operators and analysts throughout the ISR enterprise common purpose to focus their initiative and collaboration. This purposeful collaboration brought both effectiveness and efficiency to ISR operations via a ubiquitous yet simple online chat technology.

True to mission command, the ISR enterprise used secure chat to flow vital information up, down and in between a myriad of command chains in order to increase everyone's shared understanding.[82] This instant collaboration of shared understanding allowed dynamic cross-cueing between ISR assets, sensors and exploitation nodes.[83] Cross-cueing in turn optimized the intelligence gained through the fusion of multiple sources. The immediate access to common knowledge through secure chat also helped streamline communications and permit the widespread distribution of collaborative ISR operations.[84] Commander's intent inspired purposeful collaboration via chat to produce shared understanding and ultimately unity of effort across the ISR enterprise.

Although not codified in current doctrine, the mission-type orders recently employed in Afghanistan demonstrated the start of a paradigm shift in ISR operations.

This shift recognized that a global and decentralized enterprise of assets, sensors, communication architectures, exploitation nodes and analytical centers make ISR far more than just LD/HD aircraft. The selective delegation of authorities partially decentralized a bureaucratic theater collection management process as it created teams of distributed ISR professionals focused on specific problem sets. These empowered ISR teams then leveraged the commander's intent to induce purposeful collaboration and disciplined initiative throughout the ISR enterprise. The result was a strategy-focused ISR enterprise with the shared understanding and dynamic influence necessary to exercise network agility. "ISR strategy should provide focused direction and create a shared context that orients the ISR enterprise toward problem-solving over production."[85] Furthering this paradigm shift from a centralized production mentality to one of decentralized problem-solving is essential if we truly want to know our enemy.

Know Your Enemy

The diversity of potential enemies and threats that the United States could face for the foreseeable future is extraordinary. Examples range from individual terrorists operating within a network of non-state actors to a hostile nation-state's ballistic missile capability.[86] There are however common threads throughout this variety of enemy threats. The contemporary enemy predominantly consists of complex and adaptive networks, and their current threats are typically mobile and ambiguous.[87] Whether a terrorist network or a nation-state, the modern enemy has learned from past mistakes and there may only be fleeting opportunities to affect an enemy and its threats.[88] Consequently, the ISR enterprise needs to focus on a new methodology for tasking and employing ISR to truly know today's enemy and keep pace with its threats. This new

approach demands not only the networked agility across the ISR enterprise already discussed, it also necessitates focused, persistent and multiple-source ISR.

Revealing the complex and adaptive nuances of a modern day enemy requires dedicated focus and habitual relationships in our ISR enterprise. Like the analogy of a local cop working a local beat, dedicating ISR operators, exploiters and analysts gives them an invaluable familiarity with their targets and the corresponding environment. Accordingly, these dedicated ISR professionals can recognize obscure trends and anomalies that would otherwise go undetected. Dedicating ISR also means allocating certain numbers and types of ISR aircraft, sensors and exploiters to specific problem sets to enable ISR layering and cross-cue opportunities.[89] Despite the current LD/HD character of ISR assets, sometimes a commander needs to mass resources to achieve his or her objectives.[90]

Habitual relationships are another reason to dedicate ISR assets and professionals. This paper already discussed how important it is for commanders to trust their subordinates and be willing to delegate ISR authorities. The need for trust, however, also has a horizontal dimension. Habitual relationships go a long way in building and solidifying the horizontal trust necessary to generate collaborative innovations and initiatives.[91] This sage advice includes dedicating habitual relationships within the ISR enterprise, as well as between ISR professionals and their customers.

Habitual relationships in Afghanistan special operations led to enriched collaboration as specialized ISR professionals became integral members of a greater operational team and not simply individual outsiders with some information.[92] The establishment of habitual relationships also allowed ISR professionals throughout the

enterprise to tailor their operations to the needs and situation of a well-known customer. These relationships produced a distributed network of team members with the knowledge and motivation necessary to “break down cultural and organizational barriers in pursuit of mission accomplishment.”[93] Besides ISR professionals, assets and habitual relationships, a complex and adaptable enemy also make dedicated persistence a key ISR attribute.

The successful operation to eliminate Abu Musab Zarqawi as the head Al Qaeda in Iraq involved “over 600 hours” of concentrated ISR to find and fix him, “followed by about 10 minutes of F-16 time” to finish him.[94] Persistent ISR coverage of targets is often required to observe the pattern of life and network associations of a complex and adaptive enemy.[95] As enemies and their threats become more mobile and ambiguous, their individual components and linkages become more difficult to discern. Persistent ISR and its focus on sensor dwell help deny adversaries sanctuary from observation and thus reveal the enemy’s dynamic components and network linkages. Leveraging persistence in the ISR coverage of a target gives military forces the ability to observe activity as it happens or forensically reconstruct it later. Persistent ISR takes dedicated resources, however, and this runs counter to a centralized collection management process focused on efficiently using ISR aircraft to cover as many targets as possible. Fittingly, the CENTCOM CAOC spread theater ISR across more than 12,000 pre-planned targets in October and November 2007 as compared to only 870 dynamic targets that required concentrated observation.[96] Today’s enemy networks require more persistent ISR coverage, and they also require diversity in that coverage.[97]

Airborne ISR provides a “high ground” perspective that complements other viewpoints, forms of collection and overall intelligence analysis.[98] Even within just the domain of airborne ISR, the complexity and dynamics of modern enemies necessitate the complementary use of multiple types of sensors.[99] Iraq and Afghanistan witnessed many incidents over the past decade where different airborne ISR assets and sensors complemented each other to produce intelligence that none could independently. For example, a Ground Moving Target Indicator (GMTI) radar-equipped aircraft cross-cued suspicious tracks with another ISR asset possessing FMV and SIGINT sensors.[100] This cross-cue ultimately characterized an entire network of improvised explosive device makers in only four hours.[101] Lessons from the North Atlantic Treaty Organization’s air campaign against Libya in 2011 also reinforced the need for comprehensive ISR coverage as GMTI assets in this campaign often could not confirm potential targets due to a lack of FMV assets.[102]

The key is to not be “one ‘int’ focused,” or even single domain focused.[103] Single sensors produce data that once processed, yields information that can be exploited and fused with other forms of information to create intelligence.[104] This intelligence in-turn is then analyzed holistically through collaboration across multiple domains to improve the fidelity of one’s overall knowledge.[105] Such all-source analysis optimizes the strengths of diverse sources of intelligence, while also minimizing their weaknesses.[106] When combined with all-source analysis, intelligence can lead to the knowledge necessary to understand today’s complex and adaptive enemy.[107]

Knowing a modern enemy is increasingly difficult as both conventional and unconventional threats become more dynamic and obscure. Recent ISR operations

spanning Iraq, Afghanistan and Libya demonstrated new planning and execution approaches to help address what are more and more fleeting targets. First, CENTCOM dedicated ISR professionals, assets and habitual relationships to specific problem sets. These dedications increased the ISR enterprise's target and environment familiarity, cross-cueing opportunities, and overall teamwork respectively. Persistent ISR also played a vital role in observing an enemy's critical patterns of life and network associations. Finally, the synergistic employment of multiple sensors and all-source analysis produced an overall knowledge that was critical to better understanding multifaceted and changing enemies. These approaches serve as recommended lessons to future applications of ISR.

Findings and Recommendations

Need for Adaptive Control in ISR Operations

An inherently decentralized ISR enterprise and a complex, ever-changing world necessitate adaptive control of theater ISR operations. Adaptive control recognizes that control is a means and not an end.[108] Unlike the airpower tenet centralized control that tries to make ISR campaigns fit a prescribed doctrinal process; adaptive control allows the process to fit the campaign.[109] There are certainly scenarios that demand centralized control of ISR; small scale raids into non-combat zones to kill a strategic terrorist leader come to mind. However, this paper demonstrated that there are also numerous situations where ISR operations should be decentralized. The point is that context should drive how ISR operations are controlled, not prescriptive doctrine.

There is a contextual argument that the current LD/HD character of ISR aircraft warrants their centralized control in order to achieve greater efficiencies.[110] Efficient ISR operations are important, however, efficiency it is not an ends to itself. Whereas

efficiency is about trying to do things right, effectiveness is about doing the right things in the first place.[111] Hence, adaptive control must always make efficacy the most important consideration when dutifully balancing ISR efficiency and effectiveness. Adaptive control also needs to take a holistic approach in weighing ISR efficiency and effectiveness as these attributes apply to more than just aircraft.

While the examples of decentralized control presented in this paper focused on optimizing the effectiveness of ISR, they also produced important overall efficiencies. The delegation of ISR control authorities allowed higher headquarters like the CAOC to get “out of the tactical weeds” and focus their efforts on theater-level strategy.[112] Empowered ISR professionals reduced target acquisition time by cross-cueing different aircraft and sensors and thus maximized the fleet’s total performance. Dedicated assets and DIRLAUTH streamlined the coordination required to flex a multifaceted ISR enterprise to dynamic mission requirements. These examples did not necessarily take a frugal approach to ISR aircraft allocation, but they did provide key holistic efficiencies across the theater and within the ISR enterprise level.

Others argue that we need to further centralize the control of ISR planning and execution in order to keep it focused on theater and strategic priorities.[113] These advocates feel that the current theater collection management process does not go far enough in that it only centralizes the planning of ISR aircraft. The argument is that theaters should routinely centralize control over ISR planning and execution of aircraft, sensors, and exploitation at the CAOC to preserve a higher-level focus.[114] Otherwise, theaters risk “’near-sightedness’ as [decentralized] ISR assets focus on immediate and near-term needs as opposed to longer-term, strategic analyses."[115] In short,

prioritization of effort is a definite must in ISR operations. The key, however, is leveraging a commander's intent and PIRs to operationalize his or her priorities instead of using a centralized control process to bureaucratize it. Orchestrating a global enterprise against an adaptive environment and/or enemy takes purposeful collaboration, not bureaucratic control.

Adaptive control can give the ISR enterprise both the focus and agility it needs to accomplish a commander's prioritized intent while facing ever-changing conditions. Adaptive control thus strikes a balance between a commander's need for centralized influence and the ISR enterprise's need for decentralized decision-making. Unfortunately, there is no doctrine for adaptive control of ISR operations. Furthermore, the delegation of ISR control outside the CAOC is a new paradigm for what is still doctrinally a centralized process for theater collection management. Incorporating adaptive ISR control into both joint and airpower doctrine will help codify the lessons learned over the past decade of war and propel a necessary paradigm shift. Another key void in doctrine that needs to be addressed is the ISR mission-type order.

Use Mission-Type Orders to Focus ISR Enterprise on Lines of Effort

Theater commanders already possess a combat proven methodology to exercise adaptive ISR control in the form of ISR mission-type orders. However, the ISR mission-type order is still not included in Joint or Air Force doctrine despite its successful use over the past few years in Afghanistan.[116] Like many ideas that are in military doctrine, this new command and control concept is an almost "accidental improvement" resulting from ISR professionals seeking new and better ways to employ ISR.[117] Their efforts gradually converted bureaucratic, myopic and reactive procedures to dynamic, holistic and proactive operations. What ultimately makes ISR mission-type orders attractive is

that they can transform a requirements-centric process for collection management into a problem-centric approach to ISR operations.[118]

Mission-type orders use PIRs and commander's intent to prioritize and tailor ISR approaches to the unique problems they face. Theater commanders can frame these problems and their ISR approaches in any number of ways. The most useful method for linking specific problems to focused purpose, however, is to employ lines of effort (LOEs).[119] Theater commanders already use LOEs to focus their distributed operations to overall mission objectives at the operational level. The execution of LOEs usually involve multiple organizations, but there is typically a functional component at the operational level responsible for a particular LOE's overall synchronization. For example, a Combined Force Maritime Component Commander (CFMCC) may be responsible for maintaining maritime superiority in a specified area of operations.

A theater commander can issue an ISR mission-type order that dedicates necessary ISR resources and their control to the CFMCC for the purpose of executing the maritime superiority LOE. In doing so, the theater commander does not just apportion ISR resources toward filling a LOE's requirements; he or she dedicates those resources and empowers the organizational entity most familiar with the problem set. The use of ISR mission-type orders in Afghanistan demonstrated how a theater commander can dedicate ISR resources and delegate corresponding authorities to a tactical unit. The above CFMCC example illustrates that theater commanders can use mission-type orders to focus ISR on specific LOEs at the operational level as well. Such an approach helps ensure that a single operational level node like the CAOC is not overcome in an extensive array of ISR information overload. Whether targeted at the

operational or tactical level, ISR mission-type orders centralize a theater commander's influence through PIRs and intent yet decentralize decision-making to the appropriate level and networked team.

Using LOEs and ISR mission-type orders to focus the ISR enterprise on specific problems exemplifies adaptive control. The methodology capitalizes on decentralized teams each orchestrated by a principal unit to pursue prioritized LOEs and optimize the overall efficacy of ISR employment. Consequently, these empowered teams can focus the ISR enterprise and leverage habitual relationships and communication technologies like chat to generate purposeful collaboration toward their respective LOE. Armed with the shared context of commander's intent and enterprise collaboration, the LOE designated teams can then tailor ISR's inherent versatility, flexibility and persistence to their specific problem set. This use of adaptive control via LOEs and ISR mission-type orders increases the breadth and depth of command relationships without imposing an increased span of control burden on theater commanders or the CAOC. The only burden comes in outfitting the designated principal units with ISR experts.

Build Expeditionary ISR Support Teams

A decade of complex and dynamic conflict evolved the ISR enterprise from a farmer-like focus of methodical intelligence production to that of anticipatory operators hunting knowledge.[120] This evolution also changed what it takes to run the ISR enterprise, yet this change is still not codified. Current doctrine continues to rely too much on managing theater collection instead of leading ISR operations.[121] The Air Force and special operations community deployed ISR Liaison Officers (LNOs) and ITCs in recent years to help orchestrate the ISR enterprise, but only the latter established a formal training program. The importance of these expeditionary ISR experts cannot be

understated. As the current Army Chief of staff General Ray Odierno said while leading Iraq operations in 2008, “providing Air Force subject matter experts…as key members of the intelligence-operations team has been a combat multiplier.”[122]

The joint community and in particular the Air Force need to institute a hybrid approach to the Air Force and Special Operations Command’s deployment of ISR LNOs and ITCs. This hybrid approach should resemble how the Air Force provides Air Liaison Officers and Joint Terminal Attack Controllers to various operational commands and tactical units. Focused on spearheading ISR operations instead of managing collection, an expeditious support team of ISR LNOs and ITCs would bring a depth of ISR expertise to those responsible for the overall execution of a specific LOE. By collocating an ISR expert with a supported organization, the CFACC can ensure that adaptive ISR control remains within the realm of a qualified airman.[123]

Institutionalizing this concept of expeditious ISR support teams in the Air Force will not happen overnight. Viable solutions will need to overcome organize, train and equip challenges that are beyond the scope of this paper. The capabilities provided by ISR LNOs and ITCs, however, warrant further analysis of this concept by the Air Force. A team of trained ISR LNOs and ITCs enable adaptive ISR control. They anticipate evolving needs, optimize planning for specific problems, provide a tactical control capability as required, and ultimately synchronize all aspects of the ISR enterprise. Fielding such a team of ISR LNOs and ITCs would distribute the expertise and leadership necessary to influence network agility in the ISR enterprise.

Conclusion

We live in an increasingly dynamic and enigmatic world with complex and ambiguous threats. Understanding those threats and their environmental context

demands more than a prescriptive airpower doctrine of centralized control; it demands network agility throughout our diverse ISR enterprise. Spanning platforms, sensors, global communications, PED nodes and analytical centers, the ISR enterprise and its operations involve far more than just the efficient management of LD/HD aircraft. Orchestrating such an extensive network necessitates adaptive control that can centralize influence through commander's intent, but decentralize decision-making by leveraging modern communication technology and purposeful collaboration.

Codifying ISR mission-type orders that dedicate ISR professionals and assets to specific LOEs and their unique problems progresses a recent paradigm shift in ISR operations that is optimizing ISR's inherent versatility, flexibility, and persistence. The Air Force should also institutionalize expeditious teams of ISR LNOs and ITCs to instill disciplined initiative and distributed leadership in a historically bureaucratic theater collection management process. Through habitual relationships, these dedicated teams can synergistically employ multiple sensors and all-source analysis to exploit fleeting target opportunities. These new approaches to ISR enable the network agility necessary to understand our modern operational environment and the enemies within.

Endnotes

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