Command and Control in Africa

Three Case Studies before and after Tactical C2

Maj Damon Matlock, USAF
Maj Jonathan Gaustad, USAF
Maj Jason Scott, Georgia ANG
Capt Danielle J. Bales, USAF

Africa provides a unique context to study the role of the United States in coalition command and control (C2) systems. The Air Force's tactical C2 is not well understood outside the platforms that supply the capability despite its importance to mission success. This article highlights modern-day tactical C2 of airpower by using three recent examples in US Africa Command (AFRICOM). The Joint Surveillance Target Attack Radar System (JSTARS) was the common tactical C2 thread throughout the operations and thus offers a good lens through which to study AFRICOM's C2 writ large.

In particular, these operations in Africa have gone largely undocumented since 2011, and properly employed C2 is often treated as an afterthought or a given. The study of examples from Africa is ideal for demonstrating the value of C2 in a wide spectrum of operations. Libya provides conventional C2 battle employment. Additional examples emphasize flexibility and utility of C2 in nontraditional means. These case studies prove the critical nature of tactical C2.

Libya Operations: Odyssey Dawn and Unified Protector

Arguably the most decisive factor in modern airpower is the ability to move rapidly and efficiently to any locale in the world and conduct effective operations. When we do so, we use portable C2 platforms as

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JUL 2014		**00-00-2014 to 00-00-2014**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Command and Control in Africa: Three Case Studies before and after Tactical C2	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air Force Research Institute,155 N. Twining Street,Maxwell AFB,AL,36112-6026**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**20**	

the primary means to ensure theaterwide continuity. This is the role of tactical C2—those who bring overall order to a fractionalized campaign.[1] The Libya campaigns offer a classic example. Odyssey Dawn and Unified Protector demonstrated how modern tactical C2 translated commander's intent, operational guidance, and combat potential into decisive action for a large force-on-force campaign.

The decisiveness of airpower and operational C2 was tested from the first night in Libya. On 17 March 2011, the United Nations (UN) Security Council adopted Resolution 1973, which authorized the use of force under chapter 7 of the UN charter in three areas: enforcement of a no-fly zone, enforcement of a UN arms embargo against Libya, and protection of civilians targeted by the regime of Mu'ammar Gadhafi and its supporters. French, British, and US military action began under Odyssey Dawn on 19 March.[2]

C2 is doctrinally defined as a joint function, but it was not planned this way in Africa.[3] Additionally, C2 in Africa involved an international coalition that was even less defined than its joint dimensions. Specifically, Maj Gen Margaret Woodward, the AFRICOM combined force air component commander, hosted by the European Command's combined air and space operations center (CAOC), maintained operational C2. Although commanders requested tactical C2 assets such as the E-8C JSTARS and E-3 Airborne Warning and Control System (AWACS) from the start of planning, they were not approved until after strike operations were under way.[4] Libya operations began with operational C2 and strike assets with nothing in between the two. That is, the absence of C2 structure in the battlespace to supply real-time direction, solve problems, and bring order to a diverse coalition operation created a stovepipe command structure.[5] Communications were routed along country-specific lines or through the naval vessels, which were ill equipped to handle the volume of information and lacked line-of-sight radio coverage to shooters/sensors in the battlespace, thus causing numerous delays in operations—including targeting.

The dynamic nature of warfare calls for real-time decision making inherent in tactical C2. We relearned that the latter should be present at the onset of hostilities—even more so in a coalition fight. Odyssey Dawn's air campaign constituted a significant departure from practices found in conventional Western airpower doctrine. Instead of beginning with offensive counterair strikes to take down the Libyan integrated air defense system, it sought to produce an immediate impact on the ground to meet the UN resolution and protect civilians as the highest priority.[6] In these opening strikes, the coalition's Rafale and Mirage fighter-bombers expertly destroyed several armored vehicles on the outskirts of Benghazi, the rebel stronghold in eastern Libya.

By 24 March, no aircraft were assigned to pure air-to-air missions; rather, all air-to-ground-capable assets performed dual roles (air and ground).[7] Since the initial strikes did not have either the JSTARS or AWACS performing battle management at the point of attack, an enormous C2 burden was placed directly on the aircrews, according to Major General Woodward.[8] Fighter/bomber aircrews were initially expected to complete the entire find, fix, track, target, engage, and assess (F2T2EA) kill chain without external support from command, control, intelligence, surveillance, and reconnaissance (C2ISR). Major General Woodward had orders to minimize civilian casualties, avoid aircrew losses, and do nothing to suggest that Gadhafi himself was targeted.[9] Yet the C2 structure was organized, trained, and equipped only to meet the demands of a traditional no-fly zone—not interdiction operations—resulting in a C2 system ill matched for the mission. Thus, the addition of air-to-ground C2 players was pivotal to overall campaign success.

Overcoming fog, friction, and chance calls for continuous, in-battlespace, and real-time problem solving with "line of sight" situational awareness (SA). In coalition ground operations, many players in the air or at sea lack dependable voice-satellite capability. In Libya, passing SA remains anchored primarily to line-of-sight radio communications. The reachback distances resulted in area limitations and, in some cases, area denial until C2 assets were in place.

Speeding the kill chain was a direct result of adding tactical C2 to combined operations. When tactical C2 aircraft entered the fight, "their job was to orient shooters, pair shooters with targets, solve battlespace problems, [and] speed accurate decision-making," Major General Woodward reported.[10] By meeting core C2 functions, the airborne C2 assets inherently expanded the commander's influence over operations. A blanket of order was cast over the entire operation in the reformed C2 structure.

The kill chain was reduced from 20 minutes to seconds. The JSTARS crew blended internal sensor data to assess ground scheme of maneuver, rules of engagement (ROE), special instructions, asset availability, ordnance type, and commander's intent to identify potential targets. The vehicles used by Gadhafi's forces were identical to those of the rebel forces—trucks with heavy machine guns or rocket launchers. Features such as point of origin, direction of travel, and direction of fire (determined by the asset conducting the air strike) were quickly matched to grant target authority. This complete cycle often took seconds and, due to alignment with the commander's intent, required no coordination with the CAOC.

The United States' tactical C2 systems and experience were necessary for successful combined operations, even when partner nations provide the vast majority of combat power. This is especially true if the coalition lacks an air-to-ground-focused C2 platform for counterland operations. On 23 March, Odyssey Dawn shifted to Unified Protector, and the North Atlantic Treaty Organization (NATO) assumed operational C2 to enforce the UN arms embargo. The execution of NATO's Unified Protector overwhelmingly relied on C2 systems from the United States. At the same time, non-American member states carried out 75 percent of strike sorties and 100 percent of sea-based enforcement of the arms embargo.[11] France and Britain successfully ran the coalition strike operations, driven by the use of NATO assets for C2—most of which belong to the United States. Additionally, America continued to provide nearly 80 percent of all air refueling, 75 percent of aerial surveillance, and 100 percent of all electronic warfare missions.[12]

Unified air operations in Africa needed a robust tactical C2 network, but modelers did not develop it when they created the plan. US AFRICOM had neither the staff to run a full-scale air campaign nor the organic C2 assets to meet the daily requirements of the air tasking order, which introduced additional fog, friction, and chance into the operation (see the figure below). No one expected US AFRICOM to be "a command that conducted and led" air campaigns, observed Gen Carter F. Ham, US Army, head of that command.[13] When created, AFRICOM was expected to concentrate on training, advising, and support missions.

Blue = United States Air Force **Purple = Non-US Coalition** **Magenta = United States Navy**

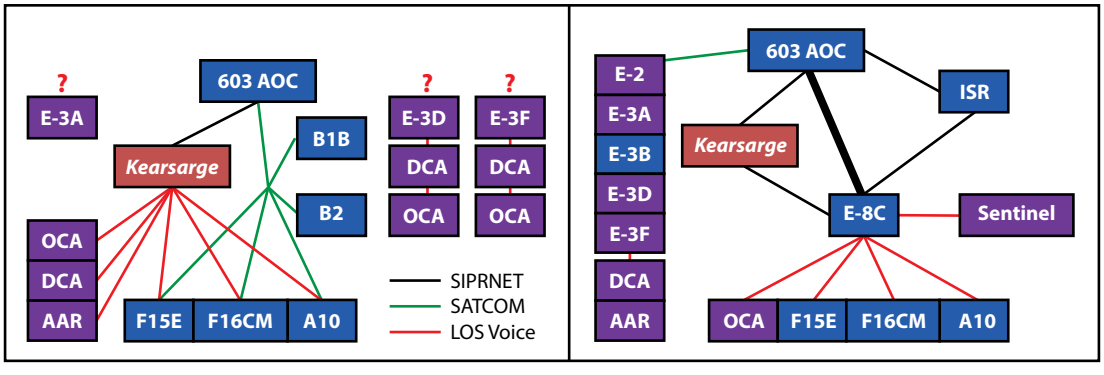

Figure. The left chart represents the initial fragmented C2 effort. The one on the right reflects the refined C2 organization that aligned C2, ISR, and strike assets in a coherent manner by having E-3 variants control defensive counterair while the JSTARS controlled offensive counterair.

603 AOC = 603rd Air and Space Operations Center
A-10 = US close air support fighter
AAR = air-to-air refueling
B-1B = US bomber
B-2 = US bomber
DCA = defensive counterair
E-3A = NATO AWACS
E-3B = US AWACS
E-3D = British AWACS
E-3F = French AWACS
E-8C = JSTARS
F-15E = US strike fighter
F-16CM = US attack fighter
Kearsarge = US amphibious assault ship
LOS Voice = line-of-sight voice radios
OCA = offensive counterair
Sentinel = British airborne standoff radar
SATCOM = satellite communications
SIPRNET = Secret Internet Protocol Router Network

Tactical C2 arrangements are critical to the continuous problem solving necessary to cut through the fog, friction, and chance inherent to war. The JSTARS proved uniquely suited to meet this C2 challenge. This C2ISR asset identified targets, applied the ROEs, and supplied that continuous problem-solving function.[14] C2 in Africa at the operational level also offered insight into the requirement for future joint/coalition operations.

Operational Examples in Libya

Lessons for operational C2 also support modern-day tactical C2. The JSTARS was present throughout much of Odyssey Dawn and all of Unified Protector, flying nearly 150 C2 missions.[15] Consequently, viewing operational lessons through the JSTARS is simply an objective way to study C2 rather than advocate for a specific platform. Six key observations address melding the operational and tactical levels of C2.

First, compounding problems with air-to-ground targeting demanded tactical C2 players to bridge the operational and tactical seam in the war. Planners had to complete the F2T2EA process against regime forces without the benefit of an allied ground force for coordination and target cueing. As implemented, operations included strikes on mechanized forces, artillery, mobile surface-to-air missile sites, and lines of communications that supplied regime forces as well as the C2 of any regime-sustainment activities of forces attacking civilian populations and cities.[16] After 10 years of close air support in counterinsurgency operations, many people were unaccustomed to the quantity and pace of the targeting effort. The counterinsurgency target sets of "individuals" were very different from the target types in Libya.

Second, the rapid onset of hostilities in Odyssey Dawn and the subsequent short buildup of forces became a forcing function to honor airpower doctrine rather than transfer concepts in use at the time in US Central Command. Major General Woodward, the joint force air component commander, empowered the air and space operations center (AOC) planners to honor the airpower tenet of centralized control and

decentralized execution. Centralized control maximized the flexibility and effectiveness of air and space power. Yet her staff realized that this control must neither become a recipe for micromanagement nor stifle subordinates' initiative when dealing with combat's inevitable uncertainties.[17] In doing so, the Odyssey Dawn planners were free to use available ISR sources to focus airpower on the joint force commander's priority areas. Sensor fusion allowed quick adaptation to the changing battlespace situation, such as gains by antiregime forces.[18]

Decentralized execution allowed subordinates of the AOC to exploit opportunities in rapidly changing, fluid situations through delegation of decision making to the lowest level.[19] In this case, delegation of targeting authority often went to tactical C2 platforms such as the JSTARS and to individual strike aircraft rather than centralizing engagement authority at the AOC. The JSTARS crews efficiently divided the operating areas using kill boxes to deconflict assets and define targeting assignments while preventing targeting redundancies.

Third, tactical C2 bridged the tyranny of operational distance in Africa. The size of the area in which regime forces were arrayed (the distance from Tripoli to Benghazi is roughly that from Oklahoma City to Denver) and the distance that aircraft had to fly simply to get to their targets created unique problems. Air assets often had little time to assess the situation and make targeting decisions, much less inform the AOC and wait for a decision before fuel states required an abort. The JSTARS was able to solve this problem. Operators applied the joint force commander's priorities and intent, used available ISR cueing and information fusion, applied ROEs, and paired assets to destroy regime forces that threatened civilians. In particular, the fusion and dissemination of available information to speed the kill chain taught a valuable lesson to apply toward future antiaccess/area-denial battlefields.[20]

Fourth, the JSTARS significantly increased the speed of dynamic C2 tasks, resulting in a more responsive kill chain for the whole operation. All assets conducting operations over Libya were under control of the JSTARS with the noted exceptions of preplanned strikes, which oc-

curred three times a day on average with strike packages that routinely had fewer than 10 aircraft. These strikes were important to the operations but did not constitute the main effort.

Unified Protector's primary emphasis involved finding, fixing, and targeting the Gadhafi regime's forces in order to protect the civilian population, and the JSTARS was ideally suited to meet those requirements. Its crews tracked enemy movement of tanks, armored transports, and trucks. On a typical day, NATO forces flew 132 missions, including 50 strike sorties, destroying five heavy vehicles, three tanks, two rocket launchers, one ammunition storage site, one communication tower, and one radar.[21]

Fifth, to bridge the operational-tactical seam in counterland operations, tactical C2 should have robust, well-trained crews and extensive communications suites well suited to counterland operations. The primary mission of the JSTARS is to conduct battlefield surveillance for supported ground commanders and exercise C2 over assigned assets conducting a range of missions.[22] Unique to the JSTARS is its ability to take data in the form of radar moving-target indications and to interpret that data to convert surveillance and reconnaissance information into real-time intelligence. The crew can then determine the best asset to strike the target and communicate through radios or links to fighters (C2 functions), thereby reducing the kill chain's time line.[23]

Sixth, tactical C2 functions result in three operational "rights": right target, right time, and right purpose (i.e., the commander's intent and weapon choices). In Libya the three rights were compounded by numerous factors. The JSTARS managed operational complexities that included language barriers, differing means of communications (whether radio or links), differing ROEs for each coalition nation, and the desire to have coalition countries' aircraft flown together during the same time frame.

A key technology—Internet relay chat (IRC) via satellite—melded the three rights in coalition warfare. IRC "rooms" were used in the battlespace like "visual" radios to paint a "word picture" of real-time

events for the CAOC. Air Force doctrine captures this effect by noting that secure IRC enhanced critical C2 capabilities through exponentially improved vertical and horizontal data communications. It did so by simultaneously transmitting C2 information to, and receiving data from, all participating and monitoring organizations across all echelons, thus providing greater SA resulting from increased information volume and reduced latency of information exchange.[24]

The utilization of IRC in warfare is not new; it prevailed during operations in both Iraq and Afghanistan. However, prior to Odyssey Dawn, the network of systems using IRC (both terrestrial and airborne) was never used to conduct C2 of a major phase-one air-to-ground targeting effort. These C2 nodes included the AOC (ground), the USS *Kearsarge* (sea), and the E-8C JSTARS (air), all using common IRC rooms to collaborate targeting efforts.[25] During operations over Libya, IRC proved the most effective communication tool available. In particular, the ability of airborne platforms to receive and share information immediately with the AOC and relay IRC-derived information to "shooters" via radio (fighter, bomber, and armed remotely piloted aircraft) sped up all decision making, often resulting in target engagements measured in seconds rather than minutes.

Additionally, IRC produced a digital log of communications, which allowed operators to review missed posts and monitor more chat rooms than radios—all via secure means.[26] Planners developed innovative tactics, techniques, and procedures to collaborate targeting information in preplanned IRC rooms in an agreed-upon format that became known as a "10-line," designed over IRC for dissemination using line-of-sight voice radios or tactical data links. After it "posted" in IRC and following review of the information, the 10-line was pushed to shooters and considered actionable. Planners avoided data saturation by enforcing proven communications techniques, such as designating "room owners" to add oversight and priorities for the posted information in a given IRC room. IRC became a powerful method of conducting secure, distributive, and collaborative targeting within the C2 community.[27]

Unnamed Operation No. 1: Command and Control of Intelligence, Surveillance, and Reconnaissance

Operations in Libya set the stage for other JSTARS missions in Africa. Demand for this platform in AFRICOM increased after Odyssey Dawn / Unified Protector. Two additional, unnamed operations in Africa followed Libya—very different from their predecessor. The first example examines an unnamed operation conducted in support of Africa that involved deployment of the JSTARS under sensitive reconnaissance operations (SRO) authorities.

SRO missions by nature have to do with operation preparation of the environment (OPE), emphasizing the "find/fix" portion of the kill chain rather than "engagement." Although the synchronization of intelligence requirements and collection is doctrinally held in intelligence channels, the JSTARS had the mission capacity for tactical and real-time C2 of ISR and SRO operations. This happened by fusing the intelligence, surveillance, and operations sections of the crew with a mission-support cell dedicated to fusing data from the JSTARS and offboard sources to create a cohesive operational picture. The aircraft's SRO missions validated the requirement for the conduct of what is known at Nellis AFB, Nevada, as ISR package command.

During SRO OPE missions, the integration and fusion of all aspects of collection (often referred to as the tasking, collection, processing, exploitation, and dissemination [TCPED or simply PED] model) demanded as much "C2" as traditional military operations (and was generally less understood by planners). C2 professionals overcame this lack of understanding through a routine education process on the capabilities of the JSTARS (see the table below). Subsequently, the E-8C's sensor was placed in a position to collect on specified and prioritized targets over austere and sparsely governed areas, doing so safely and in accordance with SRO procedures.

Table. Phases of JSTARS processing, exploitation, and dissemination

Phase I	Near real time during the mission	• Basic MTI/SAR analysis *during* the mission • Off-board cross-cue required to add significance/ context/combat ID to MTI	• TADIL-J, SCDL track broadcast • Juliet TACREP/ SALTREP (near-real-time reporting conducted during E-8C on-station via voice, FTM, or SIPR IRC as events develop) • Screen-capture products sent directly at the request of unit	• E-8C JSTARS crew
	Forensics less than 12 hours after mission	• MTI/SAR analysis conducted *immediately following completion of every mission* • Unless specifically tasked otherwise, this would primarily be MTI derived without fusion	• Density plots annotating choke points or • Traffic pattern analysis characterizing heavy/medium/light • Track backtracking highlighting point of origin and/or end point • AF DCGS analysis report • Graphical reports for the sortie duration or highlighted time period	• Distributed PAD crew - DART MTI cell
Phase II	Forensics less than 24–72 hours after mission	• Multiple missions of data, multiple intelligence-source fusion products	• Various fusion products including MTI (no standard product type)	• National Geospatial Agency (NGA) • Distributed mission site - National Air and Space Intelligence Center (DMS-NASIC)
Phase III	Forensics over a period of weeks or months	• Many missions of data, multiple intelligence-source fusion products	• Various fusion products including MTI (no standard product type)	• NGA • DMS-NASIC

MTI - Moving Target Indicator
SAR - Synthetic Aperture Radar
TADIL-J - Tactical Digital Information Link-J
SCDL - Surveillance and Control Data Link
TACREP - Tactical Report
SALTREP - Size Activity Location Time Report
FTM - Free Text Message
SIPR - Secure Internet Protocol Router
DCGS - Distributed Common Ground Station
PAD - Processing Analysis Dissemination
DART - DCGS Analysis Reporting Team

SRO missions included lead responsibility for the JSTARS crews to fill capability gaps in the overall intelligence channels to process, exploit, and disseminate "forensic" information in areas or missions not fully addressed by combatant command processes. Additionally, although the JSTARS conducted the OPE mission set, the ability to conduct additional C2 mission sets (e.g., kinetic operations) was not diminished.

During this unnamed operation, delegated authorities were defined in clear mission type orders that produced an effective collection strategy which aligned all ISR/SRO missions. Rather than simply matching "collection to requirements" (i.e., "greening up" the Excel spreadsheet and metrics-based measures of effectiveness), effects-based operations were more productive. The "mission command" style of mission type orders allows operators to layer "multi-intelligence" approaches with multiple platforms simultaneously to cross-cue information dynamically for the commander's intent.

A clearly defined commander's intent and the freedom of mission type orders allowed C2 and ISR subject-matter experts to devise collection strategies and adapt quickly to real-time situations. In turn, this allowed decentralized execution of ISR operations, taking advantage of the multitude of problem solvers available for the mission to solve pieces of the puzzle rather than send the thousands of variables up the channel to stovepiped PED organizations that lack an action arm in the battlespace.[28] The completion of this "phase zero" PED process resulted in identification of routes of travel and the takedown of numerous high-value individuals fed by postmission PED phases.

Unnamed Operation No. 2: Command and Control and Special Operations Forces

A second unnamed operation in Africa showed how Air Force tactical C2 provides range and reach to support special operations forces (SOF). The previous two examples in Africa demonstrated how the

JSTARS can bring order to chaos in conventional warfare and SRO. In spring 2013, the JSTARS supported unconventional coalition action in northern Africa, indicating that tactical C2 can also be pivotal to SOF operations.

In austere and remote environments, doctrinal forms of C2 are not the norm. Tactical C2 agencies are often called upon to bridge operational C2 and the tactical fight. Additionally, tactical C2 is vital to communicate between two or more operational C2 nodes to ensure common understanding of the real-time fight. This tactical C2 node can bridge interservice, intraservice, or coalition agencies, similar to forming the functions of a joint interagency task force without naming one. The JSTARS brought long loiter time, long-range communication, and tactical C2 operators into a ground situation that, until the platform's arrival in-theater, had no C2 allotted or assigned to coalition SOF. The C2 void does not stem from the SOF forces themselves but from all of the coalition assets supporting them.

Updating commanders on the ground and then immediately applying fixes to unfolding events in the battlespace were key components of flexible C2 in Africa. During the second unnamed operation, the operations area featured multiple AOCs manned and supported by US and coalition forces with no directed C2 node to bridge the gap between all of the players. Two AOCs resided within the European theater, one staffed mostly by US forces and the second manned by coalition forces with a minimal number of US liaison officers to bridge the gap at the strategic and operational levels. A third AOC operated by the coalition was located in Africa, with limited communication to the US AOC in Europe. This situation resulted in a communications void at the operational level—one that the JSTARS crews filled by utilizing beyond-line-of-sight communications to pass ground-situation updates to three AOCs simultaneously. Removing the lag time in communication from one AOC to another led to a more efficient use of air assets in a resource-constrained environment.

Due to the sensitive nature of the coalition operations and a general SOF requirement for higher operations security, many of the executed missions occurred with little coordination between the units supporting the unnamed operation at the tactical level. This produced fog and friction between the ground forces, which consisted of coalition SOF, conventional armies, and air assets split among countries.

Theater allocation of air support further contributed to the overall fog and friction at the tactical level. Air assets were assigned not to overall ground operations or individual objectives but solely to SOF or conventional ground forces. JSTARS missions were assigned only to support coalition SOF, creating an additional communication layer in which coalition forces either refused or could not share data with US partners for mission execution beyond the traditional SOF close-hold plans. Only late in the deployment were the E-8C's wide-area surveillance and C2 capabilities extended to support multiple commands in a single mission. The JSTARS bridged the gap between multiple ground units, executing on objectives and communication plans by relaying data to higher headquarters. Operators also gave ground-movement information to land forces and interpreted vague plans for ground scheme of maneuver along with commander's intent to prioritize limited assets and loiter time in a large theater of operations.

C2 naturally occurred via crews that overcame stifled information flow and bridged the gap between SOF and conventional forces. Multiple JSTARS missions were executed despite having little to no information regarding the friendly ground picture and ground forces' scheme of maneuver, including such basic information as ground-unit call signs and working frequencies. To circumvent these issues, JSTARS crew members prioritize sensors and communications, often armed with only a theater communications plan, a list of possible joint terminal attack controller call signs, and vague ground-operations plans written in the coalition country's language. The crew utilizes commander's intent and end state derived both from the theater air operations directive and the SOF operation's end game. The JSTARS

was not specifically deployed to execute tactical C2, but operators on the E-8C utilized their tactical C2 training to speed decision making by serving as a connecting node between SOF and conventional forces, prioritizing the use of limited air assets to meet the commander's intent.

Perhaps the most important aspect in this unnamed operation was the fact that the JSTARS filled a void in the C2 of ISR. The aircraft deployed with the ability to fuse wide-area surveillance, moving-target-indicator data with near-real-time airborne ISR reporting and reachback to a mission-support cell with access to multi-intelligence products.[29] JSTARS crew members were also ready to provide real-time deconfliction of air assets with sensors. They not only made real-time decisions on allocation of sensors supporting SOF operations but also supplied high-fidelity target and threat point-outs to forces on the ground. To do so, they combined an advanced understanding of the commander's intent, a working knowledge of airspace procedures, the ability to reach out to players on the ground, reachback to three AOCs, and coordination with intelligence agencies in-theater and at the home station. The JSTARS applied the commander's intent in near real time to the tactical situation by maintaining SA of the ground situation via radio, data links, and IRC. It then prioritized air support to units on the ground by moving sensors and airborne assets from one operation to another.

The E-8C's successful provision of both ISR and tactical C2 resulted in the tracking of eight high-value individuals, directly contributing to the capture of one such person and confirming the killing of three others. Long loiter times, long-range communication levels, and execution of the tactical C2 role contributed to the platform's success. The increase in end game while the JSTARS executed in-country reflects the immense value and additional capability that tactical C2 brings to the fight in Africa. JSTARS support in the AFRICOM theater demonstrated that a national asset equipped with tactical C2 operators can enhance the operational-level common operational picture. This platform con-

nected multiple AOCs, bringing clarity and order to a chaotic ground and air situation at the tactical level.

Conclusion

Political sensitivities in war demand more robust C2, not less. The fact that our culture must have more precision and detailed information during combat operations necessitates an expanded focus on C2. Recent operations in Africa demonstrate that the United States is likely to provide the majority of C2, electronic warfare, and tanker support. Recording the successes and failures of the operations is essential to gaining an understanding of applications for future endeavors.

Africa provides a unique context to study the need for C2 design in coalition warfare. The contributions and successes of tactical C2, as seen through the lens of the JSTARS, highlight the requirement to incorporate C2 in full-spectrum operations. These contributions are often intangible and overlooked as silent successes, resulting in a decreased emphasis on the importance of tactical C2. A well-executed mission rarely underlines the significance of the C2 role, which creates a design/requirement difference in the next fight. Studies tend to emphasize C2 in failures rather than successes. Thus, these three Africa case studies show what success really requires in the form of C2 systems.

In Libya, six observations stand out regarding tactical C2. First, C2 by definition is joint. Coalition building has increased the probability of C2 becoming a combined (i.e., international) structure with unique challenges. Second, coalitions are more common, but the capacity to provide C2 is increasingly held by US assets. Third, the lack of tactical C2 results in a less decisive operational C2 structure. Real-time decision making during force-on-force operations is best delegated where the most SA exists—at the tactical C2 level. Fourth, decisions made by tactical C2 ultimately serve to speed the kill chain when speed matters. Fifth, the transfer of information between operational-level and tactical-level C2 is vital, calling for robust, redundant communication.

Sixth, solving problems at the tactical C2 level permits continuous prosecution of warfare.

Consequently, operations in Africa reflect the importance and necessity of C2. Whether conducting traditional operations as in Odyssey Dawn / Unified Protector, support to SOF, and C2 of ISR, these examples showcase the critical nature of tactical C2. ✪

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28. Examples include partners in distributed ground control stations and interagency and intelligence community watch personnel.

29. These products included Google Earth KML files, intelligence feeds inaccessible to the airborne crew members, and imagery files from agencies such as the National Air and Space Intelligence Center and the National Geospatial Agency.

Maj Damon Matlock, USAF

Major Matlock (BS, Regents College; MAAS, American Military University) is the assistant director of operations for the 461st Operations Support Squadron. He ensures the combat readiness of 123 Air Force personnel supporting the E-8C Joint Surveillance Target Attack Radar System (JSTARS) weapons system and develops joint command, control, intelligence, surveillance, and reconnaissance (C2ISR) tactics, techniques, and procedures for E-8C employment in support of the combat air forces. He is a senior air battle manager and instructor mission crew commander with more than 1,000 combat hours in support of Operations Iraqi Freedom, New Dawn, Enduring Freedom, Odyssey Dawn, and Unified Protector, along with nontraditional operations supporting US Pacific Command. Major Matlock is a graduate of the US Air Force Weapons School, Squadron Officer School, and Air Command and Staff College.

Maj Jonathan Gaustad, USAF

Major Gaustad (BA, University of Minnesota–Duluth; MAAS, Air University) served as the assistant director of operations for the 12th Airborne Command and Control Squadron. He has served in a broad range of academic, operational, and joint positions in the areas of operational test, special operations, training, weapons, and tactics. A prior enlisted terminal attack controller and senior air battle manager who has flown combat missions in Operation Enduring Freedom, Operation Iraqi Freedom, and other sensitive reconnaissance operations, he previously served as the wing weapons officer for the 461st Air Control Wing (E-8C Joint Surveillance Target Attack Radar System [JSTARS]). Major Gaustad is a graduate of the US Air Force Weapons School, Squadron Officer School, and Air Command and Staff College.

Maj Jason Scott, Georgia ANG

Major Scott (BA, Florida State University) is deputy chief of plans and programs, 116th Air Control Wing, Robins AFB, Georgia. He is responsible for the development, acquisition, and sustainment of 23 current Joint Surveillance Target Attack Radar System (JSTARS) programs valued at $720 million. Additionally, he is part of the capability development and acquisition of next-generation JSTARS. A senior air battle manager who has flown combat missions in Operations Iraqi Freedom, Enduring Freedom, Odyssey Dawn, Unified Protector, and other sensitive reconnaissance operations, he previously served as weapons officer for the 116th Air Control Wing. Major Scott is a graduate of the US Air Force Weapons School, Marine Aviation Weapons and Tactics Squadron One, Squadron Officer School, and Air Command and Staff College.

Capt Danielle J. Bales, USAF

Captain Bales (BME, Emporia State University; MA, American Military University) is the chief of weapons and tactics at the 12th Airborne Command and Control Squadron, Robins AFB, Georgia. She is responsible for the tactics training for worldwide command, control, intelligence, surveillance, and reconnaissance operations for over 200 Airmen. An E-8C instructor air weapons officer and senior director with more than 900 hours, she has deployed in support of Operations Iraqi Freedom, Enduring Freedom, and Unified Protector as well as nontraditional operations in US Africa Command and US Pacific Command. Captain Bales is a graduate of the US Air Force Weapons School and Squadron Officer School.

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