

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

**OPERATIONAL RECONNAISSANCE FOR THE ANTI-ACCESS /AREA DENIAL
ENVIRONMENT**

by

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A Research Report Submitted to the Faculty

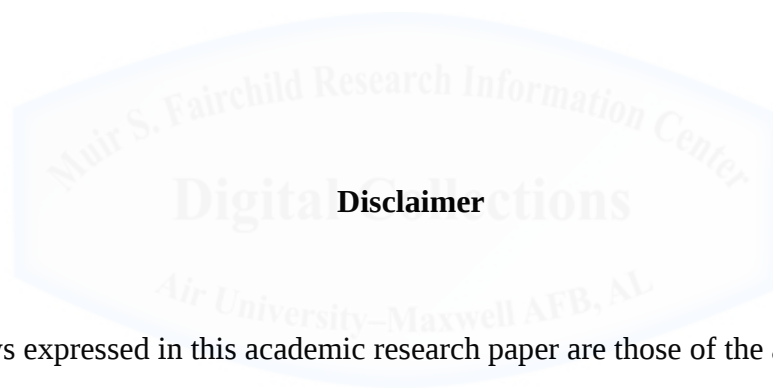
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Abstract

This paper examines capabilities and limitations of fighter aircraft performing Operational Reconnaissance in Anti-Access/Area Denial (A2/AD) environments. Contested battlespace is radically different from the permissive environments in which the Air Force Intelligence, Surveillance, and Reconnaissance (ISR) enterprise has grown and flourished. Unlike recent experience in Iraq and Afghanistan, A2/AD will initially deny air superiority and restrict operational access to ISR aircraft like the MQ-1, MQ-9.

While fighter aircraft cannot replicate all capabilities of these platforms, Ops Recce can fill significant intelligence gaps between the demands of contested airspace and the limitations of traditional ISR aircraft. Fighter aircraft are designed to defeat the surface and air threats present in an A2/AD environment. After gaining access to this airspace, fighters can use a variety of sensors to provide commanders with a real-time understanding of the threat environment.

To optimize Ops Recce, the Air Force must address several limitations inherent to the fighter and intelligence communities. Currently, Ops Recce is not integrated into the Air Force Distributed Common Ground System and fighter-based data networks are incompatible with most air and ground users. Moreover, fighter aircrew and intelligence personnel are not fully trained or staffed to collect, process, and exploit fighter-derived intelligence.

The Air Force global Intelligence, Surveillance, and Reconnaissance (ISR) enterprise has evolved primarily to support irregular warfare and is unprepared for Anti-Access/Area Denial (A2/AD) operations. Through Operational Reconnaissance (previously known as Non-Traditional Intelligence, Surveillance, and Reconnaissance (NTISR)), fourth and fifth generation fighters can help fill significant intelligence gaps between the demands of contested airspace and the limitations of traditional ISR aircraft. After reviewing the current state of the Air Force ISR enterprise, this paper will highlight vulnerabilities of traditional reconnaissance aircraft in the A2/AD environment. Examining fourth and fifth generation fighter capabilities reveals how these aircraft can perform intelligence collection in high-threat airspace. Despite their impressive capabilities, fighter aircraft, aircrew and intelligence personnel do have some limitations in the A2/AD environment. This paper will recommend several material and non-material solutions to overcome these limitations for future, contested operations.

Discussion

Current State of the Air Force ISR Enterprise

The current ISR enterprise evolved within the context of Operations Enduring Freedom and Iraqi Freedom. Between 2002 and 2003, the U.S. military transitioned from major combat operations to counterinsurgency in Afghanistan and Iraq. This transition called for fewer kinetic effects and far more assets to find and fix high value, time-sensitive, human targets.¹ With long loiter times, full motion video (FMV), and communications links direct to the end user, aircraft like the MQ-1, MQ-9, and MC-12 were well suited for this type of complex, irregular warfare. Since 2001, the Air Force expanded its ISR capacity to 65 full-time aircraft orbits and the Department of Defense (DOD) spent over \$44 billion on ISR capabilities.² As a result, the current ISR enterprise provides an impressive ability to collect, process, exploit, and disseminate

imagery and signals intelligence (IMINT and SIGINT) in low-threat, uncontested airspace. With 20,000 Airmen at 33 locations, the Air Force Distributed Common Ground System (DCGS) collects, processes, analyzes, and disseminates over 1.3 million megabits of information and 1,000 hours of FMV every day.³ Even with this massive investment, the Air Force ISR enterprise was unable to fill the DOD's demands for FMV.

To meet the joint force's increasing appetite for ISR, the Air Force began employing fighter and bomber aircraft outside their traditional roles as strike platforms. In 2004 and 2005, fighter aircraft gained the capability of transmitting FMV via Sniper and Lightning advanced targeting pods. Using an unsecured, line of sight Remotely Operated Video Enhanced Receiver (ROVER), F-15/16/18s, A-10s, and B-1/52s can now send electro-optical (EO) and infrared (IR) video directly to ground forces.⁴ These aircraft provided significant contributions as ISR platforms, leading the Air Force to formally define NTISR as a functional concept in 2007. This first definition described NTISR as "employing a sensor not normally used for ISR as part of an integrated collections plan developed at the operational level for preplanned, on-call, ad hoc, and/or opportune collection."⁵ Since 2007, this definition has expanded to include formalized tactics and tasking procedures.

NTISR has matured from a functional concept into a designated mission now known as Ops Recce. Following the 2013 Combat Air Force Weapons and Tactics Conference, Air Combat Command (ACC) added Ops Recce to fighter squadron mission statements. Now, instead of tasking a fighter or bomber aircraft with Close Air Support then conducting impromptu NTISR, Air Operations Center (AOC) collection managers can formally assign aircraft an Ops Recce mission via the Air Tasking Order (ATO).⁶ While fighters and bombers

have a variety of IMINT and SIGINT sensors, the overwhelming majority of Ops Recce missions request FMV for target identification, battle damage assessment, or target location.⁷

In current combat operations, fighter aircraft assigned Ops Recce sorties receive mission products specifying areas of operations, recent intelligence on expected enemy activity, and specific requests for information. Once airborne, Ops Recce fighters work directly with other command and control aircraft like the Joint Surveillance and Target Attack Radar System (JSTARS). In most cases, JSTARS has authority to act as an ISR package commander, assigning new targets of interest for further investigation or an immediate strike.⁸ Like the Air Force's "traditional" ISR assets (MQ-1, MQ-9, MC-12, U-2, RQ-4, JSTARS, RC-135), Ops Recce has made significant advances in irregular warfare and counterinsurgency operations. However, also like traditional ISR, Ops Recce is largely untested in high-threat environments against an enemy conducting A2/AD.

A2/AD Impacts on ISR

Contested battlespace is radically different from the permissive environments in which the Air Force ISR enterprise has grown and flourished. A2/AD focuses on both preventing movement to a theater and restricting maneuver within the theater. Potential adversaries use a multi-domain approach to deny access and degrade operations; combining effects of air-to-air and surface-to-air missiles, electronic attack, counter-space, and cyber warfare.⁹ Unlike the United States' experience in Iraq and Afghanistan, A2/AD threatens the military's ability to employ forces and systems in the manner for which they were designed, organized, trained, and equipped. Cyber-attacks may prevent timely execution of time phased force deployment, ballistic missiles and submarine warfare can deny access to intermediate staging bases, electronic

attack can disrupt data and communications links, and Integrated Air Defense Systems (IADS) can prevent aircraft from flying near adversary controlled territory.

A2/AD operations can be particularly disruptive to aircraft operations. In Vietnam, the United States lost over 3,000 aircraft to North Vietnamese air defenses, primarily anti-aircraft artillery and MiG-21 fighters.¹⁰ In 1999, during Operation Allied Force, Yugoslav helicopters shot-down 15 NATO Remotely Piloted Aircraft (RPA) using door gunners and IR missiles.¹¹ These systems pale in comparison to a modern IADS with Surface to Air Missile Systems (SAMS) like the SA-5 and SA-10 with ranges in excess of 100 miles and effective altitudes over 90,000 feet.¹² Adversaries equipped with these systems can challenge U.S. air superiority, denying operational access to traditional ISR platforms with limited self-protection systems, poor maneuverability, and no offensive capability.

A2/AD operations present challenges to the ISR enterprise beyond aircraft limitations. Current ISR command, control, and doctrine depend on uncontested access to all domains. A single RPA sortie requires a line of sight data link between the aircraft and the Launch-and-Recovery Element; voice and data communications between the RPA crew, end user, and DCGS; satellite data link between the aircraft and ground based receiver; and fiber-optic connection between the receiver, RPA crew, and DCGS. This command and control architecture requires massive bandwidth and loss of any single link can threaten the entire mission.¹³ The same adversaries capable of denying physical access to airspace also possess electronic attack and cyber warfare capabilities that threaten this fragile communications architecture. This complex system, which has worked so well in uncontested irregular-warfare, is poorly matched against an adversary who can attack any number of critical communications nodes.

Current ISR training and doctrine also do not focus on A2/AD operations. When describing the state of the Air Force ISR community, Maj. Gen. John Shanahan, Commander, 25th Air Force, stated: “most of what they’ve been practicing and many of the systems they’ve fielded were designed around operations in a permissive environment.”¹⁴ Indeed, the DoD’s 2012 Joint Operational Access Concept (JOAC) dedicates only a few paragraphs to intelligence in contested environments.¹⁵ Additionally, RPA units are conspicuously absent from the list of attendees at Air Force level exercises focused on high-threat operations. Understandably, ISR flying squadrons remain focused on the ongoing uncontested operations for which they were created. However, without an institutional commitment to developing doctrine and tactics for contested airspace, the ISR community will remain unprepared for A2/AD operations.

Satellites do provide significant reconnaissance capability but are by no means the complete solution to A2/AD. Satellite mounted IR and radar sensors provide SIGINT and increasingly high resolution IMINT over a wide area of operations.¹⁶ Although immune to physical attack from SAMS and enemy fighters, reconnaissance satellites depend on data links with multiple potential points of failure. Just as adversaries can degrade airborne ISR operations by attacking communications nodes, sophisticated enemies can jam satellite signals, destroy ground-based receivers, or physically attack the satellites themselves. Additionally, satellites are few in number, difficult to reposition, and generally have limited persistence over a specific area of interest (low earth orbit satellites complete one orbit in approximately 90 minutes). This is a serious limitation against enemies who can reposition, set up, and fire a ballistic missile in less than 30 minutes.¹⁷ ISR in A2/AD operations will require far more collection capacity than space-based assets can provide alone.

Ops Recce Capabilities in the A2/AD Environment

While Ops Recce is not the complete solution, fourth and fifth generation fighters can fill significant intelligence gaps between the demands of contested environments and the limitations of traditional ISR platforms. During the initial phases of A2/AD operations, adversaries will contest U.S. air superiority and ISR aircraft will be unable to access much of the operational area. Unlike aircraft designed specifically for irregular warfare, fighters (particularly fifth generation) are built to survive in high threat environments. For example, the F-35 contract with Lockheed Martin expressly states the aircraft is: “required to be able to go into high threat anti-access environments, autonomously perform its mission and survive.”¹⁸ Through a combination of stealth and highly integrated sensors and avionics, the F-22 and F-35 can detect and avoid many of the surface-to-air and air-to-air threats employed in A2/AD.¹⁹ The F-22’s central integrated processor provides computational power equivalent to two supercomputers.²⁰ This impressive analytical capacity gives the pilot a coherent, real-time understanding of the threat environment unachievable in any traditional ISR platform.

If unable to avoid surface or air threats, fighters can suppress or defeat them with a combination of advanced offensive weapons, electronic attack, and superior maneuverability. During a 2006 air-to-air exercise, F-22s achieved a 108 to zero kill record against U.S. Air Force F-15s (F-15s are comparable to potential adversaries’ air superiority fighters).²¹ While fighters are by no means invulnerable to A2/AD threats, they are far more capable of operating in contested airspace than any of the Air Force’s traditional ISR platforms. After gaining access to this contested airspace, fighters provide several collection capabilities supporting ISR across the full range of military operations. Fighter-based Synthetic Aperture Radar (SAR), SIGINT, and EO/IR sensors are particularly relevant to A2/AD environments.

Synthetic Aperture Radar

SAR uses advanced algorithms to process and combine multiple radio-wave returns into a single picture, providing refined beam width and pulse length otherwise only possible with a much larger antenna (several hundred meters).²² Aircraft like the F-35, F-22, EA-18G, and B-2 use SAR to generate high-resolution maps and track ground movement at significant standoff distances and in all weather conditions. The radar's short pulse length and ability to modulate bandwidth also makes SAR less susceptible to enemy detection and jamming.²³ With SAR, Low Observable (LO, ie. stealth) fighters can penetrate contested airspace and generate imagery for target development or confirmation. During Operation Desert Storm, the Combined Air Operations Center (CAOC) used SAR to develop hundreds of potential targets when other forms of reconnaissance were unavailable due to weather.²⁴ Based on this proven capability, the Air Force recently incorporated Ops Recce SAR mapping into its premiere high-threat exercise. During Red Flag 15-1 (January 2015), F-22's built SAR maps in highly contested air space for target development and battle damage assessment.²⁵ Using fighter aircraft to collect SAR imagery fills a significant intelligence gap in environments where traditional ISR assets cannot employ FMV. While other manned and unmanned ISR platforms are also equipped with SAR, advanced SAMs and enemy fighters can easily deny their access to the airspace required to employ these systems.

Electronic Intelligence

In addition to SAR, fighter aircraft have significant ability to collect Electronic Intelligence (ELINT) in contested airspace. ELINT, a subset of SIGINT, is defined as: "Technical and geolocation intelligence derived from foreign non-communications electromagnetic radiations emanating from other than nuclear detonations or radioactive

sources.”²⁶ Fighter aircraft like the F-15E, F-16, F-22, F-35, and EA-18G are equipped with ELINT sensors to identify and locate radars used to control adversary IADS. Working together, F-15Es, F-16s, and EA-18Gs can share ELINT over a common in flight data network, Link-16. These aircraft can also share data with but not receive information from the F-22 and F-35.²⁷ This collaborative approach allows fighters to identify both static and mobile SAM systems quickly, even when operating in contested airspace. In addition to precisely locating these critical systems, fighter ELINT sensors gather parametric data unique to each radar. This information not only highlights IADS vulnerabilities, but also helps determine an enemy’s Electronic Order of Battle (EOB).²⁸ Although not a priority in irregular warfare, understanding the adversary’s EOB is essential to operating in A2/AD conflicts and is a capability traditional ISR platforms cannot provide in contested airspace. Knowing where and how an enemy will use their air defenses allows U.S. war fighters to minimize or negate the adversaries’ A2/AD efforts and defeat increasingly lethal surface-to-air threats.

Electro-Optical/Infrared

The final Ops Recce capability relevant to A2/AD operations is EO/IR sensors. All fourth generation (A-10, F-15E, F-16, F-18) and fifth generation (F-22, F-35) fighters are equipped with some variant of advanced EO/IR sensor capable of capturing still images and FMV. Although these systems do not provide the same resolution as the high-definition IMINT sensors on the MQ-1, MQ-9, and MC-12, they are capable of locating point-sized (i.e. human) targets. In current combat operations, fourth generation fighters employ their targeting pods autonomously to find static targets, and in conjunction with JSTARS to fix and finish dynamic targets.²⁹ In an A2/AD environment, this real-time target imagery provides essential intelligence in airspace inaccessible to RPAs and MC-12s.

In addition to target identification and FMV, the F-35's IMINT sensors can detect a variety of heat signatures relevant to A2/AD operations. The F-35 Electro-Optical Targeting System (EOTS) uses six sensors positioned around the aircraft to detect discrete IR signatures within 360 degrees.³⁰ The F-35 targeting system combines information from its EOTS with other sensor data to quickly and accurately detect missile launches and record missile flight path information. During 2011 testing, the EOTS was able to detect and locate discrete infrared events ranging from ballistic missile launches to tank and artillery fire from "operationally significant" distances.³¹ Armed with these capabilities, fighters can collect an unprecedented quantity of information concerning an adversary IADS, quickly synthesize the information into actionable intelligence, and use that intelligence to fight and survive in contested environments.

Ops Recce Limitations in the A2/AD Environment

Like traditional ISR platforms, fourth and fifth generation fighter aircraft also have limitations in the A2/AD environment. Fighters are still vulnerable to many A2/AD threats; their sensors cannot collect all of the information required of the joint intelligence community; and the Ops Recce processing, exploitation, and dissemination (PED) process is slow and poorly integrated. Moreover, both fighter aircrew and squadron intelligence personnel are inadequately trained to optimize Ops Recce collection and exploitation. These limitations stand in stark contrast to some of the enthusiastic rhetoric surrounding fifth generation fighter capabilities. Advocates of the F-22 and F-35 programs routinely refer to these aircraft as "information sponges" and "fast-moving intelligence-gathering, surveillance and reconnaissance platforms."³² While Ops Recce certainly has the ability to fill critical intelligence gaps, fighters cannot replicate all traditional ISR capabilities in contested environments.

A2/AD Impacts on Fighter Tactics

The same threats that deny traditional ISR platforms' access to contested airspace also degrade Ops Recce missions in A2/AD environments. Fourth and fifth generation fighters are very survivable against modern surface and air threats. However, suppressing and destroying SAMS and enemy fighters is extremely task intensive and necessitates formations and maneuvers incompatible with intelligence collection. During air-to-air engagements or when reacting to a SAM launch, fighters are focused on defeating their adversary and are unable to work their targeting pods or SAR.³³ Fighters can passively collect ELINT at all times, however, their ability to precisely locate threats is significantly hampered when performing other combat missions. During a 2008 Joint Expeditionary Force Exercise, Lockheed Martin representatives noted that pilots remained "pretty busy conducting offensive counter air and destruction of enemy air defenses."³⁴ While the aircraft were able to collect and disseminate relevant sensor data, their primary focus was necessarily on offensive operations. Even Low Observable (LO) technology is not a panacea to A2/AD ISR. LO is most effective against higher frequency tracking and engagement radars. China and Russia are developing low frequency, long wavelength radars specifically to target LO aircraft.³⁵ While fighters can and will continue to operate in contested airspace, A2/AD threats constrain their ability to conduct unimpeded Ops Recce.

Persistence and Sensor Limitations

Fighter aircraft also lack both the persistence and sensors required to meet the joint intelligence community's vast IMINT demands. Advance targeting pods and SAR can provide invaluable IMINT in the A2/AD environment, however, Ops Recce cannot provide the continuous, high resolution FMV to which the military has become accustomed. Unlike RPAs

with station times in excess of 24 hours, fighter aircraft have very limited loiter time and high fuel requirements. In current combat operations, fighters sometimes have as little as 20 minutes over a target before breaking-station to refuel.³⁶ This is a significant limitation in contested operations where tanker aircraft must hold well outside effective SAM ranges. Even when fighters do have sufficient time overhead, their sensors are designed for weapons employment and therefore are not optimized for high-definition FMV. In-flight FMV displays are small and lack the resolution of traditional sensors. A fourth generation fighter equipped with an advanced targeting pod can easily track vehicles and people, but cannot positively identify specific individuals or small, hand-held objects.³⁷

Fighter-Based Data Networks

Ops Recce's greatest limitation is timely and effective PED of fighter-derived intelligence. This constraint is a function of both fighter and ground-based data networks and analytical support. Fighter based in-flight data networks like Link-16 were designed for tactical combat operations, not operational or strategic level intelligence collection. Consequently, these line of sight networks have narrow bandwidth and are generally restricted to pre-formatted messages with limited unique target data.³⁸ These networks are incapable of transmitting vast amounts of real-time ELINT or IMINT to ground based users and in some cases, even to other aircraft.

Several fighter data transmitters/receivers were developed concurrently with their supported aircraft and therefore cannot communicate with other networks. For example the F-35's Multifunction Advanced Data Link can only share sensor information with other F-35s.³⁹ Congress's 2014 National Defense Authorization Act pointedly called attention to the Air Force's "serious and embarrassing problem that the 5th generation fighters (the F-22 and the

F-35) cannot communicate with one another or with the 4th generation fighters.”⁴⁰ Efforts to integrate these various ad hoc networks are hampered by hard physical and fiscal realities. A program to retrofit F-35’s with Link-16 (used on most fighter and bomber aircraft) found that transmitting over this network compromised the aircraft’s position, therefore negating the benefits of the aircraft’s stealth characteristics.⁴¹ This inability to share real-time information severely limits intelligence collection in contested environments. Since fighters cannot transmit most data real-time, aircraft store information onboard for post-flight exploitation and dissemination. Once aircraft do land, they face further challenges in retrieving mission data and distributing it to analysts and end users.

DCGS Integration

The Air Force global ISR enterprise is not configured to efficiently receive, exploit, or disseminate fighter-derived intelligence. The bulk of Air Force ISR analytical capacity resides in the DCGS. However, the DCGS only conducts PED for the U-2, RQ-4, MC-12, MQ-1, and MQ-9, and lacks the additional analysts and infrastructure to PED Ops Recce missions.⁴² For aircraft like the F-35, some of the most valuable mission data either resides in the aircraft processors or is downloaded to stand-alone computers.⁴³ Currently, there exist no method for extracting this information and efficiently distributing it to analysts outside the individual fighter squadrons. This problem is not exclusive to the F-35; other fighter aircraft lack the storage capacity to save much of the valuable ELINT collected in flight. Increasing recording capability to capture these extra hundreds of gigabits may be prohibitively expensive or physically impossible in a fighter-sized aircraft.⁴⁴ Currently, what data can be retrieved is processed by individual fighter squadrons.

Processing, exploiting, and disseminating data at the squadron level results in lost intelligence and delayed reporting. Following an Ops Recce mission, pilots debrief with their squadron intelligence personnel and report whatever information they deem most relevant based on their understanding of current collection requirements. Squadrons are far too understaffed to comb through all available ELINT data or watch every sortie's targeting pod footage. Consequently, individual discretion determines which information is processed and which is erased. Although a single sortie may generate several hundred discrete ELINT collections, squadron intelligence personnel can only process events aircrew deem relevant enough to report.⁴⁵ After reviewing these select reports, squadron intelligence sections generate a Mission Report (MISREP) and upload any accompanying FMV to the CAOC ISR Manager via a Secure Internet Protocol Router server.⁴⁶ With this laborious process, squadrons often need several hours to upload only a few minutes of targeting pod footage. Moreover, some mission data is incompatible with this distribution process. During a January 2015 Red Flag exercise, the AOC tasked F-22s to collect SAR maps as part of battle damage assessment. Following the sortie, exercise staff found squadron intelligence personnel were unfamiliar with how to work the imagery conversion software, the files were too large to transmit via e-mail, and the image format was incompatible with the theater server software.⁴⁷ The combination of nonintegrated data networks and limited analysis significantly constrains Ops Recce's ability to contribute timely, valuable intelligence to A2/AD operations.

Aircrew and Intelligence Personnel Training

Further complicating the lengthy Ops Recce PED process, fighter squadron aviators and intelligence personnel are neither trained nor staffed to efficiently collect and exploit fighter-derived intelligence. Understandably, squadron training programs focus primarily on the myriad

of complex combat missions assigned through the ACC Ready Aircrew Program. While pilots are proficient at operating their sensors for combat, they are unfamiliar with specific collection requirements and how to employ their systems for optimal intelligence collection. During a recent Red Flag exercise, some squadrons failed to execute their Ops Recce tasking because their aircrew and intelligence personnel were unfamiliar with the ATO's Reconnaissance, Surveillance and Target Acquisition (RSTA) Annex. Several of the SAR images that were collected were unusable because pilots were not properly trained on using their radar as an IMINT sensor rather than as a strike asset.⁴⁹ To gain the proficiency necessary for effective Ops Recce, ACC may have to sacrifice training in other fighter mission areas.

Like the aircrews the support, squadron intelligence personnel are undertrained and understaffed to process and exploit Ops Recce for the joint intelligence community. All intelligence specialists assigned to fighter squadrons complete a formal training program specific to their supported aircraft. For 5th generation fighters, this includes academics on LO properties and sensor capabilities and limitations.⁵² However, this does not prepare squadrons to process and exploit the large volume of information fourth and fifth generation fighters can collect. Unlike the DCGS, fighter squadrons do not have dedicated reconnaissance imagery analysts and are therefore unable to analyze SAR imagery at the squadron level.⁵³ Moreover, many squadron level intelligence specialists have no experience above the squadron level and do not understand their role within the global ISR enterprise.

Even with the required training, squadron intelligence sections do not have the workforce necessary to support sustained Ops Recce in contested environments. A 2013 review of ACC's ISR capability concluded that a squadron's two or three dedicated intelligence specialists cannot possibly process and analyze the reams of ELINT data and hours of FMV generated during

A2/AD operations.⁵⁴ This is especially problematic as the DGCS also has finite resources and current communications systems preclude rapid dissemination of raw fighter data to analysts outside the squadron.

Recommendations

Based on their capabilities and limitations, both the global ISR enterprise and the fighter community require several material and non-material changes to optimize Ops Recce in A2/AD environments. Specifically, ACC and Air Education and Training Command (AETC) should improve aircrew training; increase fighter squadron intelligence support; and standardize fighter data networks. Integrating ISR systems with the joint intelligence community is expensive and will require long lead times.⁴⁸ However, ACC and AETC can implement non-material solutions like training and education quickly and at comparatively low costs.

Aircrew Training

While recent Red Flag exercises are an excellent first step to address training deficiencies, ACC and AETC must further incorporate Ops Recce to all levels of aircrew education. The current F-35 training syllabus does not include Ops Recce and fourth generation fighter currency requirements do not incorporate academics, simulator, or aircraft training on intelligence collection.⁵⁰ Nor has the USAF Weapons School integrated Ops Recce to its capstone flying exercises.⁵¹ Admittedly, fighter squadrons will find it difficult to build institutional knowledge and maintain Ops Recce currency with smaller budgets, fewer flying hours, and increasing operational demands. However, given the importance of Ops Recce in future contested operations, squadrons may need to sacrifice proficiency in other mission areas for the sake of filling joint intelligence requirements. ACC and AETC should expand the role of A2/AD Ops Recce in flying training programs, annual currency requirements, and most

importantly, joint training exercises.

Fighter Squadron Intelligence Training

Since the DCGS does not support fighter aircraft, squadron intelligence personnel will likely maintain responsibility for Ops Recce PED for the near future. AETC should review intelligence training programs to provide specialists assigned to fighter units with the skills necessary to process and exploit information at the squadron level. While a fighter squadron cannot replicate the DCGS's full analytical capacity, AETC should seek to provide their Airmen with the same analytical capabilities. Additionally, in an A2/AD environment, most ISR platforms will be unable to access contested airspace until after the air component has gained local air superiority. This lull in traditional ISR sorties should create excess analytical capacity within the DCGS, which can forward-deploy analysts to support expeditionary fighter squadrons. After sufficiently degrading an adversary's A2/AD capabilities, Ops Reece sorties will decrease as RPAs and MC-12s resume flying operations. The surged analysts can then re-deploy and resume PED operations for the DCGS.

Data Transmission

In addition to these non-material solutions, the Air Force must eventually address the incompatibility of various fighter-based data networks. Despite the high costs, testing proves the value of outfitting fighter aircraft with high capacity, secure, integrated data networks. During a 2009 joint interoperability exercise, Raytheon successfully modified fourth generation fighters to format and transmit ELINT data real-time from the aircraft to the DCGS. In this new useable format, analysts quickly overlaid the adversary radar information with Global Hawk SAR imagery, creating a coherent view of the electronic battlespace.⁵⁵ This real time horizontal communication significantly improved situational awareness for both the air component and

ground commanders. Updating and integrating data networks will be slow and expensive. However, this is a necessary action to standardize data for expeditious analysis and dissemination. Without these network updates, even the best-trained and staffed fighter squadrons will be unable to exploit Ops Recce's full potential in contested environments.

Conclusions

Contested airspace presents challenges for which the current global ISR enterprise is ill prepared. RPAs and MC-12s simply cannot survive the surface and air based threats found in the initial stages of A2/AD operations. Fighter aircraft equipped with robust offensive and defensive systems have the ability to operate and survive in this high threat airspace. Using advanced radars, targeting pods, and ELINT sensors, fighters can conduct Ops Recce to collect exceedingly valuable data relevant to A2/AD operations. While Ops Recce can fill several critical collection gaps in the high threat environment, fighters cannot replicate all capabilities of traditional ISR aircraft. Until gaining local air superiority, surface-to-air missile systems will significantly affect fighter tactics and detract from their ability to act as ISR platforms. Moreover, fighters cannot provide the same persistent, real-time, high-resolution FMV as RPAs. Additionally, Ops Recce is poorly integrated with common data networks and the Air Force DCGS, which delays valuable information from reaching the end user.

Both ACC and AETC should adopt several material and non-material initiatives to improve Ops Recce's efficacy in contested airspace. Additional aircrew training will improve the quality of data collected while more squadron intelligence support will increase the value of the information they derive. Given the potential lull in traditional ISR sorties at the beginning of A2/AD operations, excess analysts can augment fighter squadron intelligence sections then re-deploy once MC-12s and RPAs resume flying. While standardizing fighter-based data networks

will be expensive, operational tests show that integrating these disparate networks into the larger global ISR enterprise will provide extremely valuable and timely intelligence for high-threat operations.



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