The Mitchell Forum

Targeting the Islamic State:
Activity-Based Intelligence and Modern Airpower

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Abstract

To improve counter-Islamic State targeting as part of Operation Inherent Resolve, the US Air Force has implemented significant changes to the analysis and targeting enterprise of the campaign. The challenge of targeting a "proto state," which is neither an established state nor a terrorist network, requires the rapid development of actionable intelligence against the adversary facilitated by the global connectivity and full capabilities of the intelligence community.

This activity-based intelligence (ABI) approach is revolutionizing target development and driving organizational change as the campaign against Islamic State (IS) forces continues. The goal of ABI is to enable more rapid response to create desired effects against the adversary. Airmen analysts have learned many of the techniques of ABI over the past decade of supporting counter terror and counter-insurgency operations. However, effective adoption of this enterprise approach to analysis and targeting in modern air campaigns will require a major overhaul of Air Force organization, training, and equipping with regard to its ISR forces, and to ensure doctrine keeps pace with a rapidly evolving threat environment around the world.

Introduction

In 2015 the allied coalition fighting Islamic State (IS),[1] under the banner of the Combined Joint Task Force-Operation Inherent Resolve (CJTF-OIR), began a significant strategy shift for the then-nascent air campaign. While previous operations were primarily in support of coalition ground units fighting IS forces, CJTF-OIR empowered the Combined Forces Air Component Commander (CFACC) to launch deliberate strikes aimed at infrastructure, logistics, and governance nodes deep within IS-held territory. The CFACC at the time, US Air Force Lt Gen Charles Brown, viewed the strategy as vital to strike targets that matter to IS at a pace that degraded and destroyed their capability:

> *"As the coalition has garnered greater under-*
> *standing of the enemy, our air power effects*
> *have evolved…coalition airstrikes have been*
> *increasingly effective at targeting [IS]'s critical*
> *capabilities. Now, over the past six months,*
> *we've seen the numbers of weapons released*
> *continue to exceed the campaign monthly*
> *average. And when matched with an increased*
> *understanding of [IS], the coalition is able to*
> *strike more lucrative targets to great effect."* [2]

This shift moved assets toward financial, logistic, and governance centers in Mosul, Iraq, and Raqqa, Syria, and focused efforts along major supply lines between these cities. Similar strikes on oil and financial centers, notably in Mosul in early 2016, led to IS cutting pay to their fighters and decreased funding available to conduct operations.[3]

At the heart of this strategy was a fundamental shift in the Intelligence, Surveillance, and Reconnaissance (ISR) enterprise.[4] "The weapon of choice here is information because the more information we have both about the enemy and about our friendlies, the better we're able to make decisions," Air Force Lt Col David Haworth told CBS News in 2015, during a media visit to the operations center at Al Udeid AB, Qatar.[5]

During the Cold War and afterward, an intelligence foundation was developed from months-to-years worth of observations of potential adversaries and detailed, in depth studies of critical adversary systems were performed prior to the start of air campaigns. Planners targeted systems such as critical infrastructure, military forces, leadership, and communications, and prioritized the order in which to strike targets, choosing which weapons configuration would achieve maximum strategic effect through "deliberate targeting" and target systems analysis (TSA).[6] Adversaries in the first decade of the Global War on Terrorism posed a separate challenge. Lacking fixed infrastructure and reliant on human networks for survivability, ISR Airmen shifted focus to hunting and killing leadership and financiers critical to sustaining their complex network, primarily through "dynamic targeting."

As a proto state just emerging as OIR got underway in June 2014, IS posed a hybrid challenge to existing intelligence collection and analysis methods. IS sought to control territory and function as a government, so it increasingly relied on fixed, albeit covert, infrastructure to carry out governance and impose control on the population. This included using its own police, banking institutions, tax and toll collection, and providing basic government services. It sought the control, infrastructure, and governing hierarchy of a state, but relied on the lower profile of a network to retain survivability. The great challenge this created was an imperative to rapidly develop intelligence understanding sufficient to feed deliberate targeting in a dynamic environment. In other words, CJTF-OIR air forces needed to proactively find the targets that mattered and plan air operations time-sequenced to maximize effectiveness. Collections and near real-time connectivity to operations remain a challenge, but developing depth of understanding of the adversary through intelligence analysis in support of targeting is the weakest link in a modern campaign.

The Islamic State's critical nodes are not limited to individuals in a human network, however. Therefore a successful campaign must effectively leverage both the "hunter mentality" of recent conflicts with the deliberate planning and time-sequenced system-of-systems approach of past air campaigns. The Air Force's answer today is to embrace an enterprise activity-

based intelligence (ABI) approach to analysis concurrent with operations. It relies on the discovery of points of interest (POIs) to feed both targeting and intelligence preparation of the operating environment by rapidly fusing data to geographic points shared across the intelligence community (IC) through a global intelligence network – a contemporary ISR "cloud."[7] Global connectivity and access to large volumes of data is necessary to facilitate analysis, which in turn has resulted in new forms of intelligence tradecraft and automated programs to improve intelligence analysis. Sustaining this approach and broadening it throughout the ISR enterprise will, however, require a major shift in how the Air Force organizes, trains, and equips its ISR workforce to meet the challenges of the information age.

## Reforming Air Force Analysis for Target Discovery

As the Air Force has shrunk its force structure over the past ten years, the demand for ISR and targeting has continued to rise. Air Force ISR has undergone a series of gradual evolutions owing both to the shifting nature of the Air Force's role in joint operations and the rapid proliferation of new sensors and technologies for analyzing collected data over the same period. These changes have raised a number of questions from outside the ISR community, with Congress raising concern that the Distributed Common Ground System (DCGS) in particular was "stepping beyond the appropriate functional boundaries for the system, unduly broadening the mission, and distracting the operational focus."[8]

In practice, the combination of techno-logical advancement and the need to gain understanding of rapidly evolving networked adversaries forced this change. Modern ISR doctrine was largely written in the early post-Cold War era, with campaigns like Operation Desert Storm and Operation Allied Force in mind, following decades of lessons learned from the Cold War period, which was dominated by state-centric threats. Lessons from these eras shaped the basic structure of most intelligence entities. Some units and organizations have broad analysis missions such as the National Air and Space Intelligence Center (NASIC) at Wright-Patterson AFB, Ohio. Others have more specific tactical intelligence analysis functions. Figure one illustrates a linear model of this traditional form of analysis.[10] Intelligence production follows a "production chain" with different offices responsible for different steps in the process, allowing for a focused and systematic approach to relatively fixed but complex adversaries.

To understand how this worked in practice, using airborne imagery collection as a case study, the scenario would follow this route: The supported task force would manage collection requirements and task components with intelligence collection. The air component would then task ISR assets such as U-2s through the air tasking order (ATO), produced by the Combined Air Operations Center (CAOC).[11] Images would be processed by the DCGS, then transferred back to the CAOC for multi-source analysis and then NASIC for all-source analysis by combining the image with 'finished products' from other agencies. Distinct entities for each step of the intelligence process combined with fixed reporting timelines produced authoritative assessments. But this process from beginning to

Figure 1: Traditional model for analysis feeding target development[9]
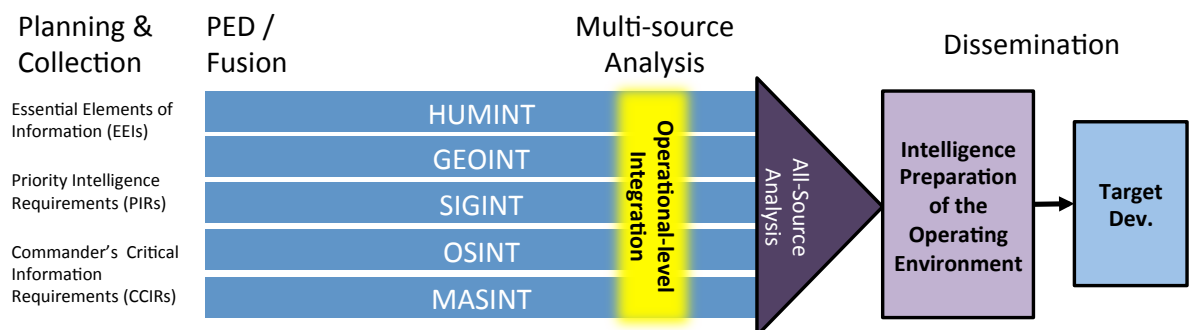
end could take up to a week, and was reliant on "finished" intelligence products, which themselves could be weeks in the making. One intelligence product could be triggered by collection allocated a week prior, and be reliant on all-source analysis whose origins were months older.

Several major changes occurred in both the ISR field and the world more broadly while doctrine remained largely static. First, older ISR Airmen used to use an analogy with film processing to describe the role of the DCGS, but this analogy is now lost on Airmen today. Many ISR Airmen today have never touched a film camera, since we live in a smart phone era, where multiple technologies are integrated and access to information has increased exponentially. In ISR this has translated to an explosion in collection and processing capabilities, most visible in the rise of the number of RPAs in the USAF's force structure from 2003 to 2009.[12] In the DCGS, as the system was tasked with processing collection from all airborne assets, the PED (processing, exploitation, and dissemination) mission set grew to include the U-2 Dragonlady, RQ-4 Global Hawk, MQ-1 Predator, MQ-9 Reaper, and the MC-12 Liberty fixed wing aircraft, among other platforms. In addition, a multitude of collection payloads were carried by each platform. As a result,

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the DCGS focused on two intelligence disciplines, geospatial (GEOINT) and signals intelligence (SIGINT), but processed dozens of intelligence sources. In 2007, DCGS analysis and reporting teams (known as DARTs) stood up to enhance operations, provide threat warning, and support analysis at higher echelon task forces that were not as familiar with Air Force products by rapidly fusing all sources of intelligence processed at the DCGS sites. This process became known in the Air Force intelligence community as "time dominant" fusion, which stood in contrast to more traditional, deliberate modes of intelligence analysis that often take more time (referred to as "content dominant" analysis in the ISR community).[13] This increased the air component's ability to refine collection as data emerged, and provided greater context for analysts based on earlier access to "unfinished" intelligence. In the process, DARTs also became pioneers in the implementation of ABI tradecraft within the Air Force.

ABI today is still an emerging concept, developed to provide a "big data," interdisciplinary approach to analysis as illustrated in figure two. It is "an inherently multi-INT approach to activity and transactional data analysis to resolve unknowns, develop object and network knowledge, and drive collection," then National Geospatial-Intelligence Agency Director Letitia Long wrote of the concept in 2013.[14] The goal is to use a common database with "structured observables" such as time, coordinates, and other variables to focus all intelligence

Figure 2: ABI model to feed target development
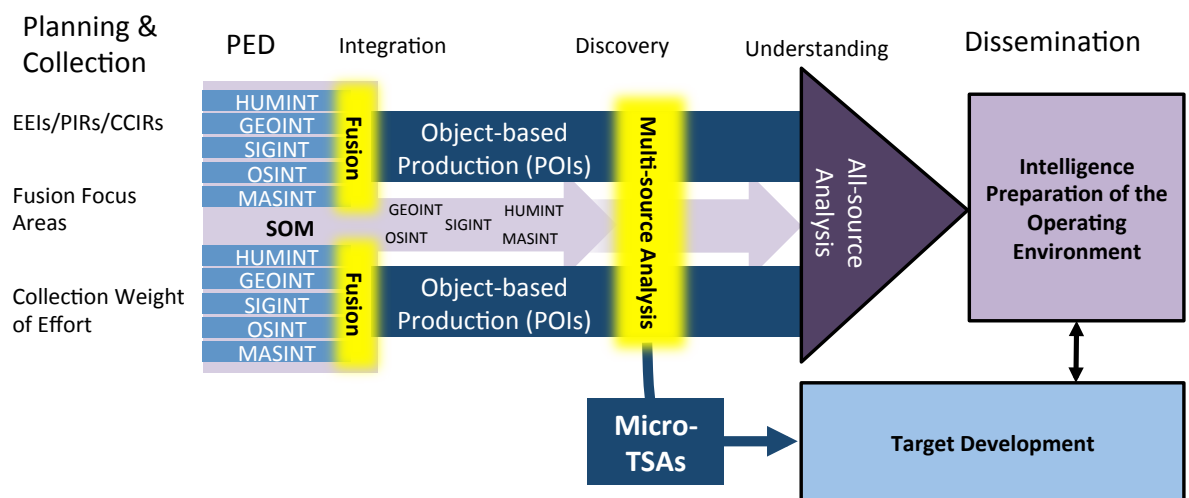
Figure 3: POI to micro-TSA example

Point of Interest:
Tying all intelligence to a fixed point

Micro-TSA:
System-of-systems analysis of POIs

HUMINT:
- POI active for 6mos as weapons storage location
- Fighters worship at nearby Mosque on Fri/Sat
GEOINT:
- Vehicles observed carrying assessed small arms
- Children observed in nearby streets at 1400Z-1600Z

HUMINT/GEOINT/SIGINT/OSINT of region, networks
Network analysis leads to generation of more POIs, characterization of adversary network:
- Organizational Hierarchy
- Imagery of locations
- Pattern of life for region

activity around a fixed object or a point of interest (POI). In its origins as used by special operations forces, ABI was performed through intelligence sharing among a small cadre of analysts looking at a limited operating area. In an air campaign, this translates to "fusion leads" observing a segment of the operating environment while collaboration between analysts across the enterprise generates understanding of adversary systems, leading to "micro-TSAs," as shown in figure three.[15]

Though DARTs were a pioneering effort for the Air Force in ABI, these teams were not alone. The surging requirements for ISR over the last decade led many analysts to be tasked under what is called "joint expeditionary tasking," which often placed Airmen in non-traditional billets in joint operations.
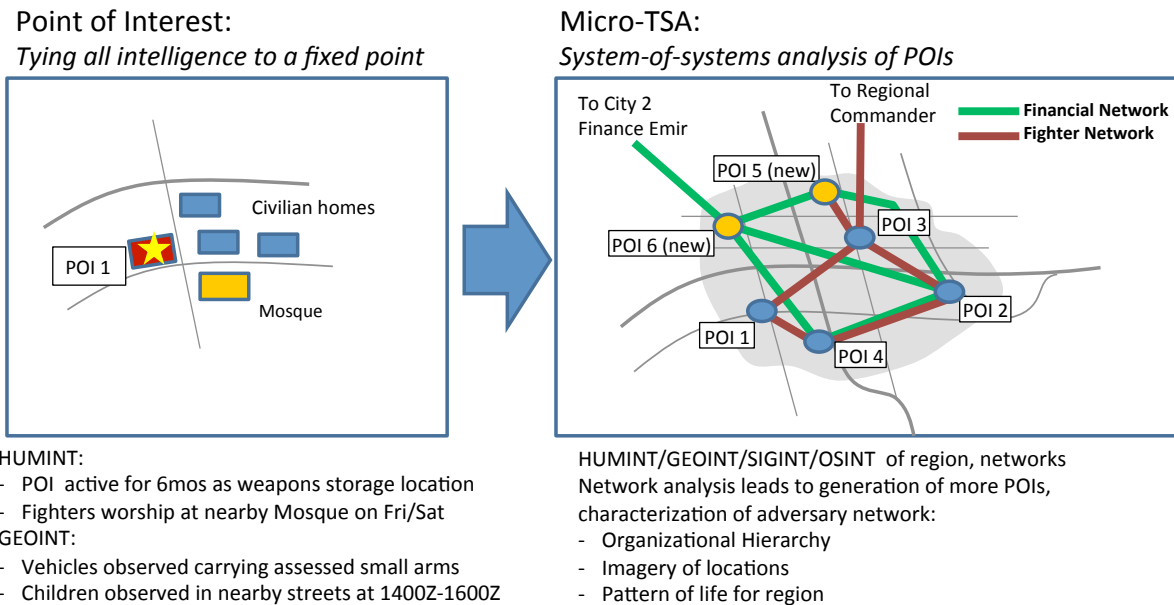
The growth of JETs exposed Airmen to new tradecraft, forcing the embrace of innovation to develop skill sets for new environments. Analysts had to learn the art of counterinsurgency, ground operations, and how to work with special operations forces, among other skill sets. During this period, Airmen had to rely on personal networks to get

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the tradecraft and underlying data needed to prepare for complex missions. While a trial by fire for many, the output helped familiarize Airmen with the principles of what became formalized as ABI methodology—to the point that many Airmen and operators do not see its revolutionary implications. In this sense, tradecraft and tactical planning have been evolutionary, but systematic Air Force acceptance for campaign planning represents a revolutionary step. Transitioning from the grassroots to a theater-wide campaign, as with applying many lessons learned from special operations forces to conventional campaigns, is fraught with challenges owing to the need for a "big data" system to organize, share, and automate parts of analysis necessary to execute ABI. Also, as part of executing ABI, there is also a need to increase training in critical thinking skills and analytical processes to navigate the challenges of working with less refined information from a greater number of sources.

Structuring the ISR Enterprise for the Counter-IS Fight

In practice the most important application of ABI has been its role in building a culture of cooperation across the intelligence community for a federated, source- and office-indifferent, collaborative approach. This puts the development of POIs and rapid near-real-time fusion at the

earliest point in the process of developing intelligence first, rather than waiting for "finished intelligence" products. For this reason, co-location of analytic and PED elements, combined with increased collaboration between analysts and collectors in both forward and reachback locations, are essential. Some analysts need to be experts in collection; some need the proximity to the customer and operators to facilitate information that meet their intent. Rather than having clearly defined "lanes in the road" for different offices, ABI is an inherently team-driven effort with different perspectives based on mission needs and unique expertise. This leads to a dynamic, complex, and accelerated approach requiring strong leadership and management in the air component from the CFACC and the CAOC. But this requires analysis and targeting functions to be decentralized among organizations with close proximity to the point of intelligence collection, rather than solely with proximity to the user or customer of that intelligence.

In 2015, Air Forces Central Command (AFCENT) integrated the "time dominant" fusion capabilities of the DCGS, the operational analysis capabilities of its CAOC, and the "content dominant" analysis capabilities of the 363rd ISR Wing at Joint Base Langley-Eustis, Va. and NASIC to produce a new approach to targeting analysis. That enterprise is approximated by the illustration in figure four, with a linear model tracing a single POI's development in figure five. Four broadly defined enterprise components—collections, PED/fusion, analysis, and command and control (C2)—combine to form two interlocking cycles, one for ISR operations driving collections and PED, and one for micro-TSA generation. Operations began with strategic guidance from CJTF-OIR to frame the parameters of the air campaign, as managed by the CAOC through an air tasking order (ATO) and in particular the reconnaissance, surveillance, and target acquisition (RSTA) annex to the ATO. Through the RSTA annex, the CAOC is positioned to manage the ISR enterprise through tasking collection, PED, analysis, as well as basic and intermediate target development responsibilities.

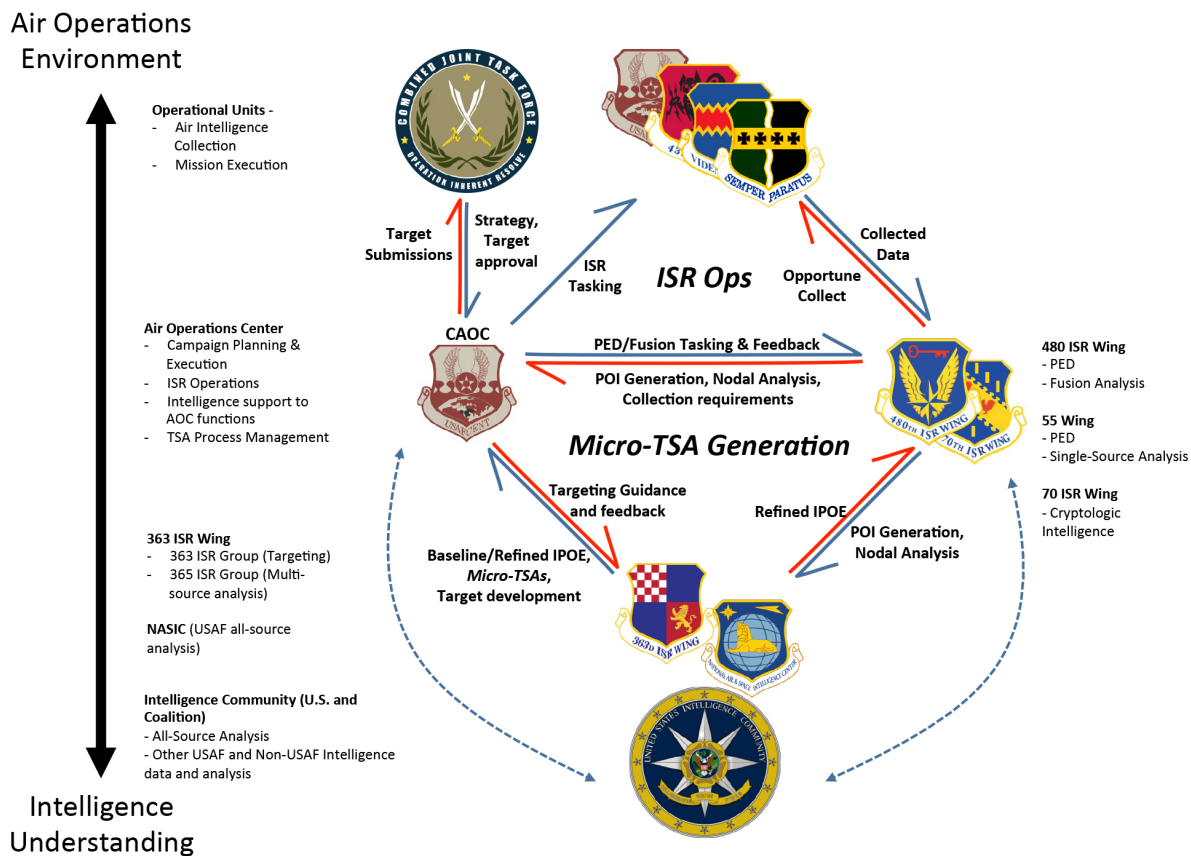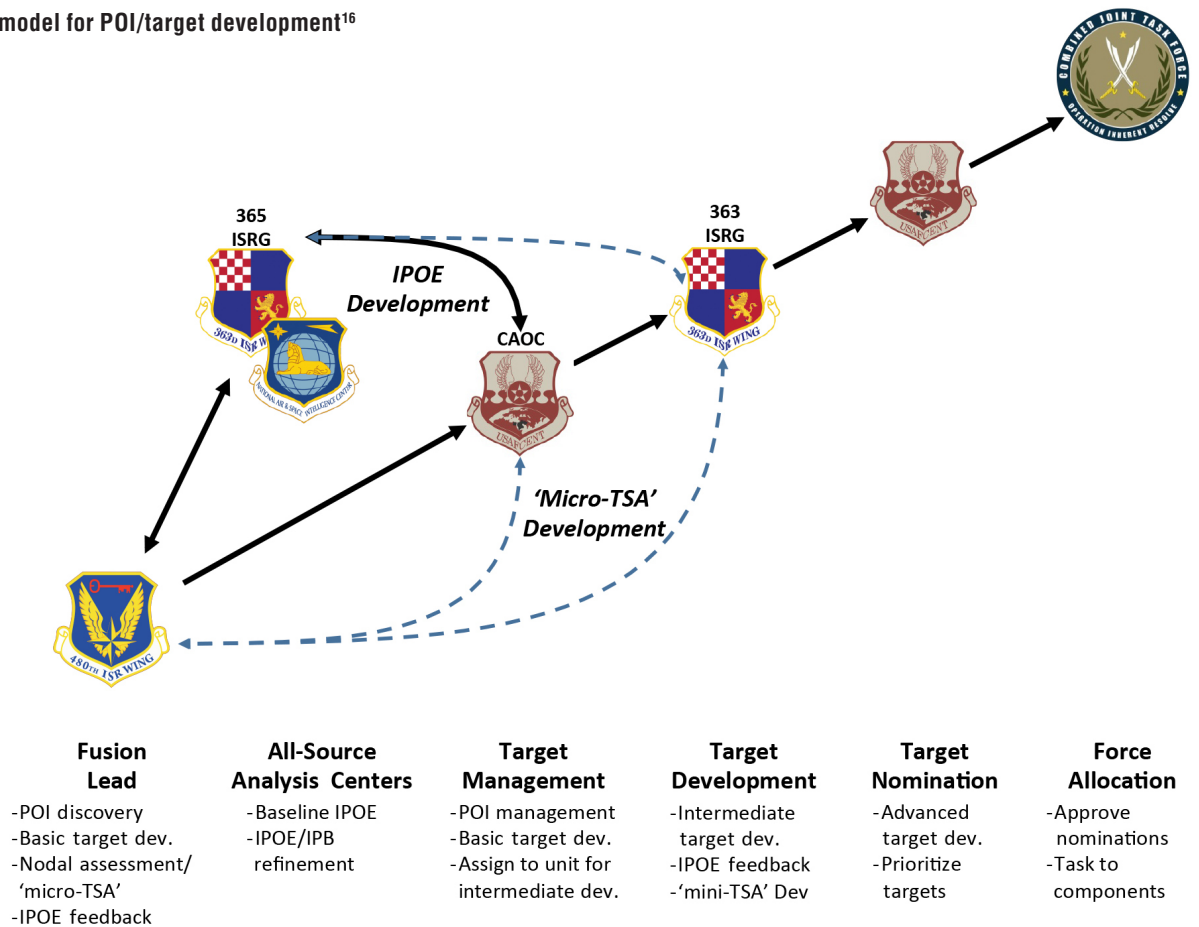**Figure 4: Modeling the counter-Islamic State ISR enterprise**

Figure 5: Linear process model for POI/target development[16]

Fusion Lead	All-Source Analysis Centers	Target Management	Target Development	Target Nomination	Force Allocation
-POI discovery -Basic target dev. -Nodal assessment/ 'micro-TSA' -IPOE feedback	-Baseline IPOE -IPOE/IPB refinement	-POI management -Basic target dev. -Assign to unit for intermediate dev.	-Intermediate target dev. -IPOE feedback -'mini-TSA' Dev	-Advanced target dev. -Prioritize targets	-Approve nominations -Task to components

Rather than pulling analysis away from the CAOC, the CAOC has grown in responsibility both as an analysis entity supporting both the CFACC and operational units, and leading the management of a complex air campaign enterprise. A federated approach allows different lenses of analysis in different entities, but unity of effort requires a central coordinating mechanism best served by the CAOC and the ATO it produces. The tasked fusion lead in this construct focuses on coordinating PED and analysis entities to identify POIs and begin the construction of micro-TSAs. Simultaneously, analysts at higher levels supply the fusion lead with baseline intelligence preparation of the operational environment (or IPOE), while the CAOC manages development of points of interest and works with targeting entities (such as the 363rd ISR Group) to validate targets, facilitate deliberate targeting, and incorporate micro-TSAs into the broader air campaign. As understanding of target systems develop, the CAOC can prioritize potential targets and future collections per the CFACC's intent, and submit deliberate targets to CJTF-OIR for approval. Further, the addition of "organic lines," which are ISR collection assets under direct control of the CFACC, enable the air commander to better link the collections, analysis, and targeting enterprises in a manner that enables strategic patience for more effective target development. The ultimate goal is to enable planned strike operations to focus on achieving strategic effects rather than reactionary dynamic strikes with limited impacts.

This approach has produced a number of successes in the OIR campaign, but is not without challenges. Analysts have located POIs that previously would be de-emphasized as "restricted targets"—targets that should not to be struck, and therefore were seen as having minimal value to monitor and develop. These targets included sites such as hospitals, and mosques that were frequented by key IS leaders. Empowering analytical entities to track and monitor those locations, without the pressure to develop to targets, enabled analysts to focus on patterns of activity. These patterns helped identify procedures for the movement of leaders and equipment, and in turn led to the discovery and focused collection on new POIs, which could then be developed into targets.
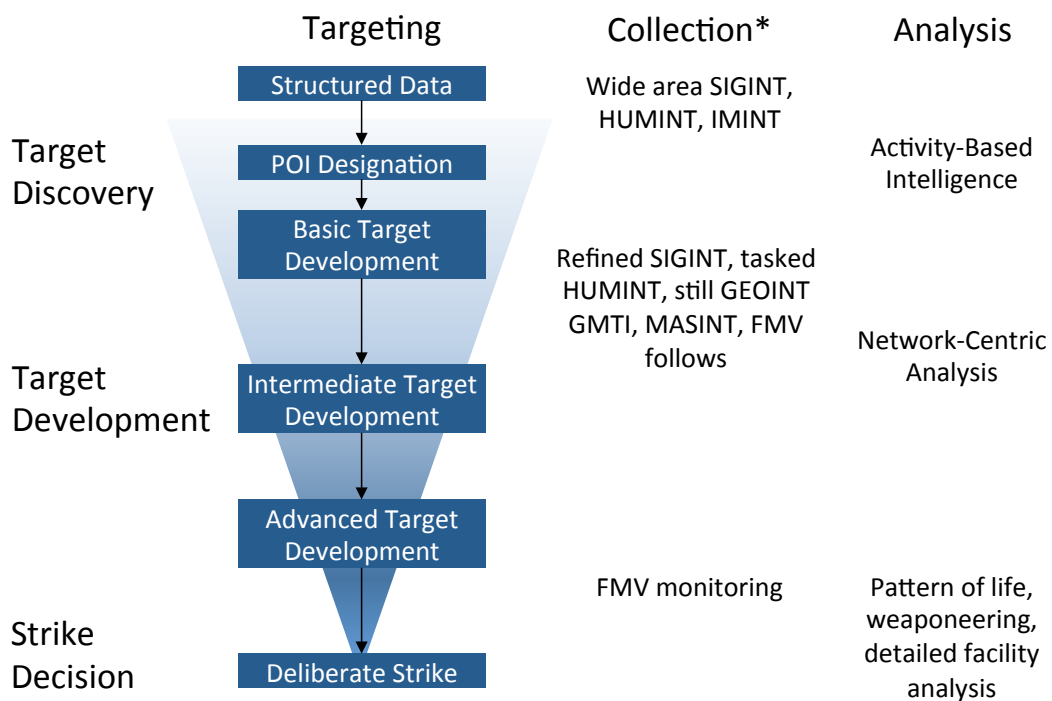
The shift has also enabled the Air Force to move from a role as a supporting entity for ground forces, to one focused on discovering and disrupting IS critical support networks necessary to organize, train, recruit, and execute the group's strategy.[17] The flat analytic network, which spurred significant crosstalk and collaboration between analysts, has mitigated a number of challenges by standardizing templates for shared materials. Some programs are in development to help alleviate the workload on analysts, such as using "big data" capability to perform some aspect of automated analysis. But a single database that is essentially "plug and play," putting certain tasks in the hands of machines and freeing analysts to spend more time analyzing information, remains elusive. These more rudimentary tasks are likely to remain a drag on the process for the foreseeable future.

The bigger existential challenge for targeting using the ABI approach is that it was designed to facilitate decision advantage in what was a limited, ground-centric counterterrorism environment. To this end, it provided solid insights for hypotheses regarding micro-TSAs, but ABI is generally insufficient for providing targetable data on critical nodes. A ground force can use ABI to move into a territory cued to what they are likely to encounter and can adapt to once in contact, but an air campaign must rely on intelligence for an airstrike or a kill decision–requiring a higher intelligence burden. A deliberate "content dominant" approach to network-centric analysis is still required to build on the knowledge gained from ABI, to test and refine the network hypotheses generated by ABI methods, and produce intelligence points that lead to actionable targets.

Figure six illustrates this "big to small" perspective of layered ISR campaign planning, detailing distinct types of collection and analysis occurring at each stage of target development. Campaign planners must remain aware of the need to maintain a layered approach to facilitate target development. "Big data" is a popular catch phrase right now and gets a lot of warranted attention, and full motion video (FMV) remains popular for commanders as a critical tool for a final strike decision. But focusing too many assets

Figure 6: Layered ISR collection and analysis strategies

	Targeting	Collection*	Analysis
	Structured Data	Wide area SIGINT, HUMINT, IMINT	
Target Discovery	POI Designation		Activity-Based Intelligence
	Basic Target Development	Refined SIGINT, tasked HUMINT, still GEOINT GMTI, MASINT, FMV follows	
Target Development	Intermediate Target Development		Network-Centric Analysis
	Advanced Target Development		
Strike Decision	Deliberate Strike	FMV monitoring	Pattern of life, weaponeering, detailed facility analysis

* *SIGINT/GEOINT/HUMINT/MASINT – Signals/Geospatial/Human/Measurement & Signature Intelligence*
GMTI - Ground Moving Target Indicator
FMV – Full motion video

and analytic efforts on these aspects of the ISR enterprise misses the critical center and leaves a gap in target development. More emphasis on a layered campaign, notably with the addition of "organic" CFACC platforms more closely aligned to an air commander's target development priorities is critical to filling this gap.

Conclusion: Implications for the Future of Air Force Intelligence

Following a decade of sustained support to dynamic targeting, the Air Force is well versed in this brand of targeting for counterinsurgency operations. But the service lacks the skills to apply tactical tradecraft to deliberate target development. This realization led to the development of a 2012 Air Combat Command roadmap, which concluded the "capability and capacity to adequately conduct deliberate planning and support air operations has atrophied."[18] As the Air Force seeks to capture the lessons learned of conflicts largely defined by dynamic targeting, and to reinvigorate the deliberate targeting process, the demands of revolutionizing intelligence analysis to counter the threat of a proto-state adversary will only add urgency to the need to revolutionize USAF and joint intelligence doctrine.

To date, a lot of discussion on these issues has focused on the tools and technologies needed to facilitate analyst communication. While technology is necessary to facilitate ABI and a "big data"-driven solution to some of the challenges of intelligence, it is not sufficient in and of itself. With this in mind, the following four mindset changes and concepts should be considered to reform the ISR enterprise. While emphasis should vary in different aspects of current intelligence education and training, these points should be at the forefront of reforming the development of the next generation of Air Force intelligence operators, customers, and leaders:

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Flexible analyst-centric, customer focused enterprise: While the counter IS fight may require a fusion-centric model, this will not be uniform in all situations. IS may rely on terrorist tactics in regions where it is weak in capabilities but strong in resolve, its forces can take on the characteristics of an insurgency against an unpopular government, and it can function as a state within urban areas and immediate outlying areas. The enterprise is also likely to vary in different areas of operations based on the nature of likely adversaries. When the primary planning consideration is for a state actor in a deterrence role, deliberate planning and traditional CAOC-centric models will guide planning and training documents. With criminal organizations and insurgent campaigns however, a dynamic strategy with a diffused enterprise for near-real-time development will drive ISR. The advantage the networked enterprise structure provides is a data-driven sharing infrastructure that can be organizationally and regionally adaptable, allowing for "time dominant" fusion analysis and "content dominant" all-source analysis through a common shared intelligence infrastructure. This will enable a future where intelligence analysis can focus on the most pressing operational problem of the day.[19]

Hunter and gatherer ISR mindset: This enterprise approach has implications for the employment of collection platforms, as the emphasis on collecting large amounts of data impacts how wide-area collectors support a given campaign. As dynamic targeting-driven campaigns required careful collection prioritization of limited assets such as FMV, the challenge for collection managers is to plan as hunters, and not gatherers.[20] Today, ISR must balance the need to hunt for specific data to "finish" the adversary, with a gatherer mentality to enable ABI to use wide area collection and let data drive analysis. Without a balanced wide-area collection strategy, some analysts may misinterpret a large volume of information on some points as suggesting those points have more value to the adversary, when in fact this may be a product of more thorough collection in a given region. Linear PED techniques, stove-piped intelligence analysis, and an emphasis on hunting for "known unknowns" leaves ISR activity vulnerable to being blindsided by "unknown unknowns."

Emphasize connections, not dots: ABI gives analysts the framework for looking at a section of an operating environment, identifying which "dots" are likely important, and then determine why they are important. The "time-dominant" brand of fusion ABI discovers and characterizes adversary nodes, but "content dominant" network-centric analysis is necessary to identify critical nodes, which leads to effective targeting. Big data and technological infrastructure for modeling and sharing data are necessary, but not sufficient alone to manage this process. The Airman in the loop—in ISR collection, fusion analysis, multi-source analysis, and targeting—remains the most valuable asset to this process, and must be developed and empowered to transform the enterprise. This approach requires skilled leaders able to manage distributed mission operations and guide a diverse community toward a common intelligence picture. Technology does not replace the human component, but it allows skilled operators to be more effective in their work, while requiring more of the operator to effectively manage the process.

Adaptable doctrine: It is important that the ISR enterprise periodically captures lessons learned and updates doctrinal documents accordingly. Doctrine drives organization, training of forces, and procurement of equipment to ensure operators have the means to achieve desired ends. Further, it provides a baseline understanding of organizational responsibilities and a common lexicon to ensure the efficient flow of information. It should not unduly restrict operational needs, but to ensure this happens requires that doctrine reflect the realities of the operating environments Airmen face as accurately as possible. In this regard, a flatter and more dynamic enterprise may be more reliant on clear doctrine than a traditional hierarchy.

For Airmen to be organized, trained, and equipped to function in dynamic environments, the Air Force needs to develop a mechanism to capture enduring lessons and models of force employment while emphasizing the need for operational and tactical flexibility. The operational art of the intelligence analyst is found in using the models described above as baselines for area of responsibility (AOR) and threat-specific planning to keep forces agile, and prepared to meet the challenges of modern warfare by delivering decision-quality intelligence. ✪

Acronyms and Endnotes

Acronyms

ABI	–	Activity-based Intelligence
ACC/A2	–	Air Combat Command Director of Intelligence
AFCENT	–	Air Forces Central Command
CAOC	–	Combined Air Operations Center
CFACC	–	Coalition Forces Air Component Commander
CJTF-OIR	–	Combined Joint Task Force-Operation Inherent Resolve
DART	–	DCGS Analysis and Reporting Team
DCGS	–	Distributed Common Ground System
DGS	–	Distributed Ground Station (Component of Air Force DCGS)
HAF/A2	–	Air Force Deputy Chief of Staff for Intelligence, Surveillance, and Reconnaissance
IS	–	Islamic State, also Islamic State in Iraq and the Levant/Syria or ISIL/ISIS
ISR	–	Intelligence, Surveillance, and Reconnaissance
NASIC	–	National Air and Space Intelligence Center
PED	–	Processing, Exploitation, and Dissemination
POI	–	Point of Interests
TSA	–	Target Systems Analysis

Endnotes

1   Author's note: IS is also commonly known as DA'ISH as an acronym for the Arabic title or ISIL/ISIS.

2   Department of Defense Press Operations. "Department of Defense Press Briefing by Lt. Gen. Brown via teleconference from Al-Udeid Air Base, Qatar." Defense.Gov. February 18, 2016. http://www.defense.gov/News/News-Transcripts/Transcript-View/Article/658292/department-of-defense-press-briefing-by-lt-gen-brown-via-teleconference-from-al (accessed March 21, 2016).

3   Ibid.

4   Author's note: The Air Force "intelligence enterprise" is comprised of four disciplines: collections, analysis, targeting, and integration. Headquarters, US Air Force. "AFSC 14NX: Intelligence, Career Field Education and Training Plan." Air Force E-Publishing. February 13, 2013. http://static.e-publishing.af.mil/production/1/af_a2/publication/cfetp14nx/cfetp14nx.pdf (accessed February 18, 2016).

5   David Martin, "Inside the Air War." CBS News. October 25, 2015. http://www.cbsnews.com/news/inside-the-air-war-against-isis-60-minutes/ (accessed March 21, 2016).

6   Author's note: Target systems analysis "approaches targets and target sets as systems to determine vulnerabilities and exploitable weaknesses…. TSA takes a system-of-systems approach to look at interdependencies and vulnerabilities between systems as well as intra-system dependencies in order to maximize the effectiveness of target development." "*Annex 3-60 Targeting: Target Development*." Curtis E. LeMay Center for Doctrine Development. January 10, 2014. https://doctrine.af.mil/download.jsp?filename=3-60-D25-Target-Tgt-Dev.pdf (accessed May 9, 2016).

7   Mike Wynne, Herbert "Hawk" Carlisle, Mike Hostage, Linda Urrutia-Varhall, and David Fahrenkrug. "21st Century Warfare: The Combat Cloud." US Air Force. September 15, 2014. http://www.af.mil/Portals/1/documents/af%20events/Speeches/15SEP2014-AFA-CombatCloud-Carlisle-Hostage-UrrutiaVarhall-Fahrenkrug.pdf (accessed March 11, 2016).

8   Scott Maucione, "Air Force's information-sharing program hits its target," *Federal News Radio*, September 29, 2015.

9   Author's note: Model derived from graphic originally appearing in *Joint Forces Quarterly*. Atwood, Chandler P. "Activity-based Intelligence: Revolutionizing Military Intelligence Analysis," *Joint Forces Quarterly,* April 1, 2015. http://ndupress.ndu.edu/Media/News/NewsArticleView/tabid/7849/Article/581866/jfq-77-activity-based-intelligence-revolutionizing-military-intelligence-analys.aspx (accessed January 27, 2016).

10   Author's note: The processes are shown linearly in this paper, but are cyclical in practice.

11   US Air Force doctrine, LeMay Center, *Annex 2-0, Global Integrated Intelligence, Surveillance & Reconnaissance Operations*, 29 Jan 2015. https://doctrine.af.mil/DTM/dtmisroperations.htm (accessed January 2016).

12   Michael P. Kreuzer, *Drones and the Future of Air Warfare* (New York: Routledge, 2016), pp. 33-36.

13   Author's note: See definitions for key US Air Force intelligence terms in *Air Force Instruction 14-133: Intelligence Analysis*; https://fas.org/irp/doddir/usaf/afi14-133.pdf. See also Jason Brown and David Vernal, "Time-dominant Fusion in a Complex World" *Trajectory Magazine*. November 11, 2014. http://www.trajectorymagazine.com/got-geoint/item/1840-time-dominant-fusion-in-a-complex-world.html (accessed December 9, 2016).

14   Letitia A. Long, "Activity Based Intelligence: Understanding the Unknown." *The Intelligencer*, Fall 2013. http://www.afio.com/publications/LONG_Tish_in_AFIO_INTEL_FALLWINTER2013_Vol20_No2.pdf (accessed January 27, 2015). See also Patrick Biltgen and Stephen Ryan' *Activity-based Intelligence: Principles and Applications* for further discussion on the baseline model for ABI. Patrick Biltgen and Stephen Ryan. *Activity-based Intelligence: Principles and Applications*. Norwood, MA: Artech House, 2016.

15   Author's note: TSA resides at the combatant command level. "Micro-TSA" is non-doctrinal and likely to be replaced in future publications.

16   Author's note: This linear graphic tracks one POI through specific units. Basic target development represents transition from a POI to a target, intermediate target development represents the refinement of the target, and advanced target development consists of refining points and weapon solutions for force employment.

17   Author's note: This shift parallels to the shift in the Joint IED Defeat Organization's approach from targeting IED "emplacers," or personnel who planted IEDs, to an "attack-the-network" philosophy employed beginning in 2007.

18   Air Force Targeting Roadmap: Reinvigorating Air Force Targeting. September 30, 2012. http://www.defenseinnovationmarketplace.mil/resources/AirForceTargetingRoadmap(13Dec12).pdf (accessed January 5, 2016).

19   See Jason Brown, and David Vernal, "Time-dominant Fusion in a Complex World" *Trajectory Magazine*. November 11, 2014. http://www.trajectorymagazine.com/got-geoint/item/1840-time-dominant-fusion-in-a-complex-world.html (accessed December 9, 2016)

20   David Deptula, and Mike Francisco. "Air Force ISR Operators: Hunting Versus Gathering." *Air and Space Power Journal*. November 2010. http://www.airpower.maxwell.af.mil/airchronicles/apj/apj10/win10/2010_4_04_deptula.pdf (accessed February 18, 2016).

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