WHITE PAPER

ON

OPTIMIZING JOINT IPOE FOR FUTURE CONFLICTS

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1. Vignette:

Imagine a not-so-distant future where the Baltic region is succumbing to aggressive action. NATO forces have minimal time to generate follow-on targeting and challenge the aggressors in a complex A2AD environment. The area is saturated in more than one domain and spectrum. Joint forces begin collecting data and reporting it into a fictional network called the Tetrarch. The EUCOM assigned ISR-APRP (advanced pattern recognition program) manages the copious amount of data piped in from numerous sources fed by specialized APRPs. Highly mobile and EMCON targets create a complex challenge to generating dynamic targeting in a manner that allows for near immediate prosecution. However, the EUCOM ISR-APRP compiles and fuses mission reports and begins to metastasize multiple solutions for operators to act upon. Combining sources from all intelligence fields, the ISR-APRP ques pre-planned channels for operators to investigate in a specific search area. Onboard crews act on data as high priority resulting in complete F2T which is fed back into the system. The resulting product is forwarded assets as an emergent target. From there, AOC fires cell assigns a shooter from joint options available. The process occurs quickly and could promise greater strategic advantage for knowing where to shoot first, and faster.

2. Assumptions:

This paper does not intend to replace operators with AI (artificial intelligence) holistically. To blindly abdicate control over sensitive operations would likely cause more headaches than reward in the short term. Long term, that is an ethical barrier not handled here. AI is typically defined as a self-aware, conscious thinking program that can learn as it interacts. Instead, what is needed is an APRP which could leverage quantum computing to investigate billions upon billions of data points at lightning speed. This white paper will look for how to dovetail APRP in current operations via pragmatic approaches while leaving room for innovative spiral development. A key

assumption between the relationship of operators and the APRP would be that it executes recommendations only with HITL (human-in-the-loop) approval. Lastly, it will also be assumed that the CCDR's intent could be uploaded to the APRP to increase target generation relevance and weight of efforts. The last assumption is that all services and associated agencies will continue to chase increased bandwidth requirements need to fully maximize this model.

3. IPOE Defined:

IPOE is the culmination of all intelligence data in support of mission, or theater, objectives. IPOE is not just the small amount of time granted before a flag exercise to try and meet ISR desired learning objectives. IPOE instead captures weeks, months, years, if not decades, of historical data. The pattern of life analysis lifts the fog of war and provides operators an unfair edge.

4. Problem Statement:

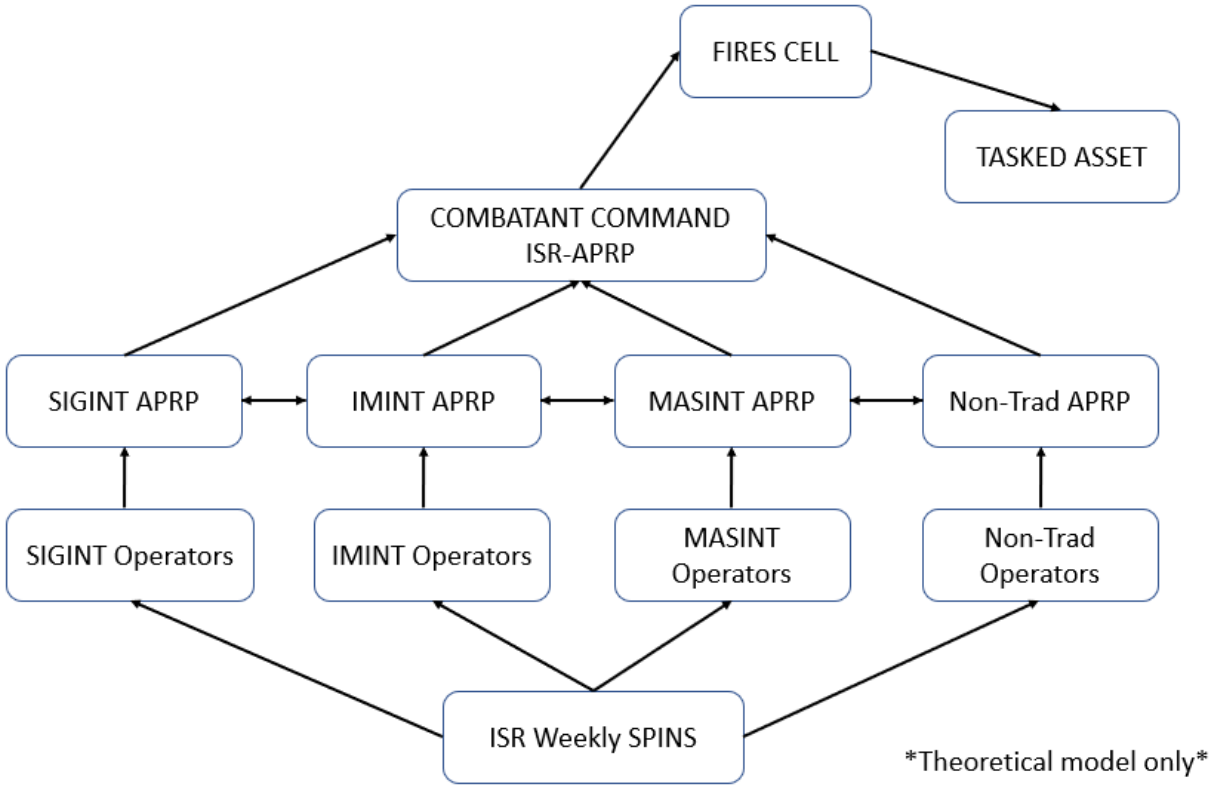
The joint military force needs a way to quickly identify and react to dynamic targets as they emerge real time. Currently, the joint forces are not optimized in their execution and instead practice process-deconfliction. Future battlefields only grow more complicated and convoluted due to increases in A2AD saturation of geopolitical hotspots. Information superiority and speeding decisions can accelerate the turned tide in favor of us. This enables available forces to strike those fleeting opportunities. How do we gain the ability to strike relevant targets and clear fog and friction from the battlespace supported by APRP? This is a large undertaking, and a spiral developed solution will be required to modularly build an open architecture. Open architecture will allow for changing in design as time progresses as new ideas better inform the process. Implementation of APRP in ISR processes is paramount in the next-gen battlefield with an increasing number of emitters, sensors, and data feeds. All intelligence operations must take a step out of their service biases and generate data for all to support strategic objectives through this operational level-process.

5. Purpose Statement

The purpose of this paper is to provide steps to be taken toward a more ideal end-state that is built up of many realistic and short-term ways-forward and barriers. Each short-term way-forward should provide value added to joint interoperability for IPOE. While enhanced and reliable dynamic targeting will be the focused lens for measuring success, that is not the only positive outcome for these solutions.

6. What Does APRP look like in Joint Warfare

Utilizing effects-based planning, APRP will be operationally successful when it is able to receive, fuse, resolve, and issue dynamic targeting tasks to fires cell that are 50% faster than current spec. This requires a new system that can process multiple classifications and translate to SIPR level for dissemination if needed. The idea is not to remove the human element completely. Instead, it should utilize APRP where feasible for tasks that are overly data intense or slowed by operators. Mature theaters, such as CENTCOM, pose a great stomping ground to grow and test this technology and process.



In this model, ISR Weekly SPINS will be kept up to date on priority collection requests. This informs operators on a SIPR baseline classification with what to be looking for as new targets emerge. When operators trigger said data, then they forward it via a reliable communication channel, or tactical data link. Inside undisclosed locations would be various APRP made to process data in their respective intelligence field. They act as gatekeepers to desaturate the bad information from going to the combatant command APRP. These Gatekeeper APRPs can also communicate horizontally based off target possibility to increase chance of identification. Gatekeeper APRPs decisions should be based on location boundaries, algorithmic heuristics, any meta-fusion on a micro-scale so it can determine that data meets parameters to be funneled to the combatant command ISR-APRP.

The combatant command ISR-APRP will then fuse data based off location, correlation to known tracks, and pre-established confidence matrixes that are combatant command specific and informed by the enemy order of battle in its entirety. This is required for the APRP to make operationally relevant decisions.

Combatant command ISR-APRP has a few options. After receiving data from Gatekeeper APRP, it could determine it needs more data in accordance with CCIRs. Subsequently, then it will poll an operator chat service with request for data to increase odds of fusion on a potential target. If successful, a dynamic target could be generated and pushed to fires cell for dissemination. Careful consideration must be given for how much autonomy is given to said APRP. This falls on

the combatant commander and staff to manage internal ALR by what is acceptable to support their mission on a dynamic basis. On a macro-scale, combatant command ISR-APRPs could even begin to assist each other and hand-off threatening assets as they pass between predetermined boundaries. In areas where AORs overlap, potentially no data would get lost in the stovepipe.

7. Barriers

Barriers will be defined as technology, process, or implications that are a hindrance to the process. The biggest hurdles are training Gatekeeper APRPs, program acquisitions, reliable classification-translation-capable communication channels, and the presence of dense electromagnetic attacks in saturated areas to name a few.

Access to a fully operational ISR picture is sparse at best. Various SIPR intelligence web-tools exist for aggregating data. These may server as a model for how to pipe in the different data streams vice fully reinventing the wheel. Training Gatekeeper APRPs for accuracy and reliability in ambiguous situations will be difficult. Mitigation would be to have select SMEs break away from career field to help "train" the APRPs with engineers as it is developed to provide realistic training scenarios and best practices.

Acquisitions and innovation are roadblocked due historical Air Force business practices with the military industrial complex. There are current efforts in play with ABMS on-ramps being conducted, but archaic purchasing models may hinder operational development sooner, or altogether.

A reliable communication channel, or tactical datalink, to allow for standardized auto-reporting to expedite data transfer to Gatekeeper APRP. Current links would only support a minor fraction of what a single platform could transmit during an entire mission for some platforms. This would hinder raw data processing by Gatekeeper APRP in the future. Radio frequency datalinks are not enough currently, and more effort should be placed in created a laser-based satellite constellation datalink for high volume transfusion. Until then, this is the driving force that requires AOC involvement with human operators as filters in the paradigm. Further investigation is required to determine if the AOC model is a good fit for such operations.

In addition, a technology that can translate up and down classifications, as receive only for the APRPs, would allow true aggregation of data. The key is receive-only and APRP queuing-by-exception for more input. This may limit vulnerability of the process and APRPs in a cyber domain. The multi-classification level would allow all platforms to pipe in and all operator-ques would be to the SIPR level only. While the process is made for U.S. only, it could theoretically allow for coalition to pipe data in by exception, to save face as needed. Doing so would increase chances at target generation. Many such prototypes are being developed or tested. Currently most ISR relies on outdated, but practical tactical chat networks to fill the need.

An implication specific to our vignette would be the possible public outcry at European militaries contributing to a targeting system using the broad term of AI. To alleviate that issue coalition should be modularly built in so that it can pipe in when needed for certain times and then sever the connection when needed. A verification must be made to ensure adversarial spoofing does not infect said process. If coalition do participate, then their involvement must be protected at higher levels than SIPR to curb political backlash.

Ways-and-methods protection may preclude certain green-door data sources from contributing. Some data sources are not readily available due to their scarcity or the heightened sensitivity. An example is cyber. It would be difficult to integrate cyber itself inside this process as it may expose our methods that need to stay in the shadows lest we lose those options. But the aim would be to get there in the future.

Heavy electronic attack environments would likely hinder the process by disabling the ability to communicate to the assets collecting or shooting. A proposed solution would be electronic protection tactics. Developing a burn-through comm bridge to pass taskings by certain assets is feasible. It is strengthened is upgrades to generate more power to certain transmission antennae. Further options exist with emergence of space force, but it ultimately comes down to a power issue. As new technology comes online with how to generate more wattage while in orbit this will become more feasible.

Manpower and level of expertise are likely barriers to successful implementation. While a proficient APRP can alleviate if not eliminate manpower shortages int eh long term, getting to that point is the snapshot we are capturing. Can the services spare the bodies to develop and refine this next-gen capability? How does AFPC and applicable AFSCs handle that? With that comes the level of expertise. What is the baseline level of education to operate with the APRP? What levels would it take to maintain the program? Retention programs currently enjoyed by cyber-professionals might be a good place to start. The aim is to make the APRP effectively interactable with a proficient 5-level for operator que. To maintain and program, or teach, the APRP would require likely doctorate levels of education and experience.

8. Requirements & Way Forward

Requirements are defined as items or processes the joint forces can enact now to positively influence and prepare for such a next-gen ISR fusion system. An updated ISR bounty list maintained by AOC, consistently updated confidence matrix libraries, integration of current SIPR intelligence tools, streamline intelligence and operator ISR vernacular. Consequently, this will clean up tactical deconfliction between CFMCC, CFACC, and CFLCC. Minimum required variables are the inclusion of SIGINT, OPIR, EOB, and factor J3.2 thru J3.5. Additional intelligences can be added as feasible.

To expound upon the confidence matrix libraries, it will be heavily fed by the current intelligence field. A library will be subject to systems bound by geography and the different state-actors currently contained in their borders which will be informed by the updated enemy order of battle. Ideally, this would standardize fusion across the joint spectrum to allow us to see what need now for end-state ISR fusion between platforms and then can be readily fed to the APRP as the process develops.

Weekly, or as needed, a list of updated system parametric data and areas of interest to report and cross cue on should be generated by the AOC. As the training wheels come off, APRP could eventually take over this process once solidified and programed.

Current intelligence vernacular needs to merge with operator linguistics to reduce misunderstandings in reporting as a term like "probable" in one AOR likely means something different than on the intelligence side of the house, or another AOR. The process should be about enabling the desired effects earlier with more reliable confidence that the data and fusion have minimal error. To do this we need to develop a common language not covered by this white paper.

Find ways to train APRP on complex reporting by incorporating it into helpful humanitarian, or homeland defense tasks. One suggestion is to link APRP up to OPIR data and provide command and control to generate targets for fire suppressant to be dropped for wildfires. Another would be integration with counter drug operations in and around the United States for proper identification of suspect vessels and airplanes. There are likely other scenarios where homeland services are rendered, and free testing is garnered as a result.

Lastly is a culture issue between the joint forces. A decent job is done at deconfliction from one another's operations and typically act well under our own TTPs with minimal interaction unless painfully forced and planned. Two joint units operating within radio line of sight may very well be on two separate tactical chat servers, utilizing different tactical datalinks, and even hold more restrictive means of reporting data. At some point the two processes should merge to collaborate and share data. In large scale operations this quickly becomes difficult as it is easier to revert to what an operator is comfortable with in times of conflict. The aim of APRP is to have operators continue using their TTPs (to reduce friction and time retraining) and instead have generated results or help guide the operators if needed via operator-queuing.

Creation of a separate joint career field that acts as the ISR fusion engine of the military could be helpful in bringing the future faster as well as cement requirements needed as we uncomfortably progress beyond our normal domains. These bodies might come from the outdated platforms currently on the chopping block for retirement.

9. Conclusion

A spiral development approach provides no real interruption to current ops, assuming we are not overly tasking individuals who are solely in charge of operations. Change agents should

be identified to generate change from joint backgrounds to increase success of buy-in and should PCS to separate from conflicting operations tempos. It is known that the ABMS process is heavily involved in this endeavor.

Further on, we stand to gain better understanding of our enemies, better networks to process the data all while allowing TTPs to remain unscathed and instead leverage what already exists. The purpose of this is not to remove the human from ISR, but rather augment the human to free them up to achieve higher levels of successful F2T2EA in support for future warfare. If successfully implemented, the fog and friction of the battlespace will give combatant commanders near surgical like accuracy of tackling objectives in the most efficient manner possible and providing more options regarding proportionality. It is my opinion that surgical strikes based off high data to eliminate certain key nodes in an enemy is the future of warfare beyond effects-based planning. Would it be considered strategic deterrence if the peer nations were aware of how quickly the U.S. and her allies could strike at a moment's notice? Would it be tactically useful if adversarial operators were afraid to operate within their TTPs because many of their comrades fell in battle simply by leaving EMCON procedures? In a future Baltic scenario, or any other, the knowledge and implementation of such a system could well act as strategic deterrence utilizing only conventional munitions with tactical an operational impact as well.

Sources

Crane, Keith, et al. *Trends in Russia's Armed Forces*. 2019, www.rand.org/content/dam/rand/pubs/research_reports/RR2500/RR2573/RAND_RR2573.pdf.

Crosby, Courtney. “Operationalizing Artificial Intelligence for Algorithmic Warfare.” Military Review, 2020.

Flanagan, Stephen J., et al. “Deterring Russian Aggression in the Baltic States through Resilience and Resistance.” *Rand Research Report*, 2019, www.rand.org/content/dam/rand/pubs/research_reports/RR2700/RR2779/RAND_RR2779.pdf.

Forbes Partner. “Tradier Teams With Q.ai, A Forbes Company, To Bring AI And Big Data Analytics To Customers And Retail Investors.” *Forbes*, Forbes Magazine, 7 May 2020, www.forbes.com/sites/partnerreleases/2020/05/07/tradier-teams-with-qai-a-forbes-company-to-bring-ai-and-big-data-analytics-to-customers-and-retail-investors/?sh=5d036cd45bad.

Jensen, Benjamin M, et al. “Algorithms at War: The Promise, Peril, and Limits of Artificial Intelligence.” Fairchild Research Institute, 2020.

Knight, Will. “China's AI Awakening.” MIT Technology Review, 2019.

Meyer, Sam. “Automation Integration for Air Force Special Operations Command.” AUAR, 2020.

Regens, James L. “Augmenting Human Cognition to Enhance Strategic, Operational, and Tactical Intelligence.” Routledge: Taylor and Francis Group, 18 Feb. 2019.

Rogoway, Tyler. “This Handy Graphic Shows Russia's Land-Based Missiles And Their Range.” *The Drive*, The Drive, 5 Apr. 2017, www.thedrive.com/the-war-zone/9007/this-handy-graphic-shows-russias-land-based-missiles-and-their-range.

Tadjdeh, Yasmin. “Navy, Marine Corps Boosts Investment in AI Platforms.” National Defense Industrial Association, July 2019.

United States Air Force. “ABMS/JADC2 FAMILY OF SYSTEMS: PRODUCT BOOK.” Unpublished, 13 Apr. 2020.