AIR FORCE LESSONS LEARNED REPORT

CSAF PRIORITY: MAINTAIN A ROBUST AND FLEXIBLE GLOBAL INTEGRATED INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE CAPABILITY

COLLECTION: REMOTELY PILOTED AIRCRAFT: FLYING OPERATIONS – INTELLIGENCE PRODUCTION, EXPLOITATION, AND DISSEMINATION RELATIONSHIPS

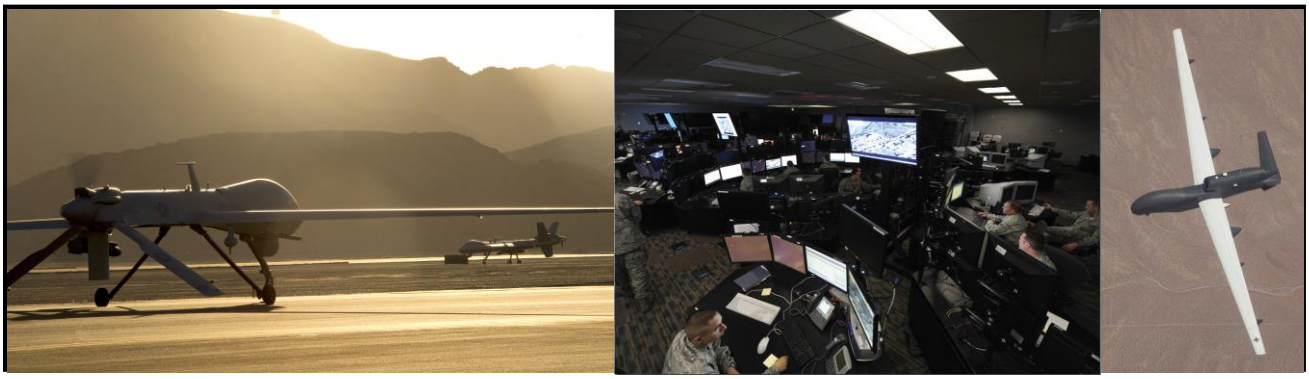

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TABLE OF CONTENTS

"Innovative organizations adapt, and our Air Force's success is founded in innovation. To remain the best in the world, we must learn from history's lessons."

— General Mark A. Welsh III, Chief of Staff of the United States Air Force (USAF)

EXECUTIVE SUMMARY

"**Remotely Piloted Aircraft (RPA): Flying Operations – Intelligence Production, Exploitation, and Dissemination** (**PED) Relationships**" is a Fiscal Year 2014 (FY14) Air Force Lessons Learned (AFLL) Collection report focused on the Strategic Vector of ***"Maintain a Robust and Flexible Global Integrated Intelligence, Surveillance, and Reconnaissance*** (***ISR) Capability,"*** requested by the Chief of Staff of the Air Force (CSAF). The objective of the report is to explore the state of the operational relationship between two distinct groups of USAF military professionals: the pilots, sensor operators and intelligence personnel who conduct RPA flight operations and the intelligence personnel who conduct PED operations enabled by RPA capabilities.

Four key observations provide insight into the current state of that relationship:

OBSERVATION 1: Over the last several years, the working relationship between RPA flying and ISR PED personnel has noticeably improved.

OBSERVATION 2: Both RPA and PED personnel struggle to overcome limitations inherent in Remote Split Operations (RSO).

OBSERVATION 3: An extraordinarily rapid buildup to meet expanding demands of Overseas Contingency Operations (OCO) has negatively affected the ability to innovate and evolve.

OBSERVATION 4: There is a strong, but not universal, desire to create a more definite "crew" or "team."

The rapid build-up of both RPA flying and intelligence PED capabilities has created challenges integrating operations to achieve not only battlefield effectiveness, but also functional efficiency. A majority of interviewees from both communities stated that working relationships and integration have noticeably improved over the last several years. The USAFCENT Combined Air Operations Center (CAOC) has made an effort to better prioritize responses to dynamic situations on the ground. Almost all the interviewees agree that the senior intelligence duty officer (SIDO) establishes priorities and directs any changes to taskings. Mission Intelligence Coordinators (MIC) in RPA flying units have played an important part in reducing tension between the two communities. As operations continue to evolve, the role of the MIC should be tailored to provide improved intelligence support to their RPA flying operations units. There are still points of tension in the groups that deal with the proper prioritization of strike vs. ISR taskings for MQ-1/9 aircraft as well as friction associated with "call outs" of what is being seen in a full motion video (FMV) feed. Both intelligence imagery analysts and RPA pilot/sensor operator (SO) crews feel they have the training to make these calls, which can lead to conflict during a mission. A last area that interviewees stated that still causes friction has to do with understanding RPA flying limitations, particularly with respect to weather and airspace maneuvering capabilities. Additionally, several interviewees suggested the introduction of Mission Type Orders (MTO) has also improved the interactions by focusing both functional

groups on working together to achieve effects described by the supported commander. However, efforts must still be made to mature MTO use, as many interviewees had little experience with them.

The current RSO structure was identified as causing some difficulties. By having personnel based in widely distributed locations, face-to-face interaction is tremendously limited. Some initiatives have been implemented to address this limitation and appear to be having positive effects. The introduction of the distributed mission crew communications (DMCC) creates a virtual intercommunication system among the players in a mission. By being more immediately responsive than communication via internet relay chat (IRC), DMCC allows for smoother operations during critical moments in a mission. As a relatively new capability, many interviewees indicated that DMCC must continue to develop and needs better TTPs and training before it can meet its full potential.

Another area identified by many interviewees that contributes to friction is the "asynchronicity" of schedules between the different communities and the theaters and units they support. This is a result of each community seeking maximum efficiency within their own function. A number of liaison officer (LNO) positions have been developed to help offset some of these disconnects. Most interviewees agreed that the LNOs have indeed helped increase the effectiveness of the entire effort. The communities are also stressed by the need to constantly bring in new personnel to grow the system. In the AF ISR enterprise, this has led to a proliferation of qualifications and growth of the PED element. In the flying community, the newness of the mission paired with the pace of expansion has prevented a complete integration with the rest of the flying community. Many RPA crewmembers interviewed expressed concern about the quality of their force, the suitability of their user interface and the interoperability of the equipment.

A large number of the interviewees expressed the desire to "brief, fly, and debrief" together. All understood that this would involve some level of virtual coordination and crew synchronization. A vast majority of the interviewees felt that an effort to create this level of coordination and accountability would over time greatly improve their combined effectiveness. This may begin with an effort to create comprehensive, RSO-focused crew resource management training. By necessity, this would include pilots, sensor operators, RPA intelligence personnel and distributed ground station (DGS) personnel. Several interviewees suggested that the AF could examine existing crew arrangements such as AWACS, JSTARS, or RC-135 and EC-130 as models to use for closer coordination. Finally, interviews with Air Force Special Operations Command (AFSOC) personnel indicate that, even though they eventually decided not to actually collocate their forces, AFSOC's thoughts about building a "new RPA Operations Center (ROC)" should be considered for future experiments and AFSOC's experiences with highly integrated RPA/PED operations should be used to develop applicable future lessons for general purpose forces.

It should be noted that in the time between the interviews for and the publishing of this report, a number of important changes were made to both the RPA and PED communities, not the least of which were the establishment of 25 AF and the increased tempo of operations associated with Operation INHERENT RESOLVE.

SCOPE AND METHODOLOGY

Observations contained in this report were derived from 71 formal interviews conducted with key members of the staff and subordinate units of: Air Combat Command (ACC); Air Force Reserve Command (AFRC); AFSOC; and 25th Air Force (25 AF) (formerly Air Force ISR Agency). These interviews were conducted from 29 June – 31 July 2014. Collection team members also reviewed numerous USAF doctrine documents, the USAF Joint Lessons Learned Information System (JLLIS) database, tactics, techniques and procedures (TTP), white papers, operating concepts, and other relevant documents.

AF/A9LS partnered with AFRC/A2, to lead a small, focused team to Joint Base Langley-Eustis, Virginia; Beale Air Force Base (AFB), California; Nellis AFB, Nevada (NV), and Creech AFB, NV to collect data on the maturation of the relationship between RPA flying operations personnel and intelligence PED operations personnel. Collection team members examined the impact on strategic, operational, and tactical planning of theater airpower. As with all AFLL collections, the purpose of these interviews was to collect observations having application to a broad USAF audience.

ACKNOWLEDGMENTS

The LeMay Center recognizes ACC, AFRC, AFSOC, and 25 AF for their partnership during this collection. Special thanks go out to these and subordinate commanders for providing unfettered access to their personnel and facilities during busy wartime operations.

INTRODUCTION

The conduct of global, integrated, ISR is a core mission of the USAF. It forms the "foundation upon which every joint, interagency, and coalition operation achieves success."[1] This paper will examine a very select part of that broad mission area. ISR professionals use a variety of platforms and capabilities to enable their work. This includes manned and remotely piloted aircraft, satellites, and other advanced technologies to provide insight into adversaries' capabilities and intentions. Historically, most air-breathing ISR platforms have been envisioned as single-mission, dedicated platforms. With the advent of the MQ-1 Predator and now MQ-9 Reaper aircraft, the USAF has platforms capable of conducting both ISR and strike missions on a routine basis. In the past, this 'new' way of operating has caused some friction.

This paper must also be read in operational context: these two communities have come together and evolved their capabilities while focused on a long-duration war made up primarily of counterinsurgency and counter-terrorism operations. In this environment, air supremacy was a given, there was little interference in the cyberspace domain, and the electromagnetic spectrum was largely ours to manipulate. The interviews therefore, do not contain any opinions on the future of these operations, although the AF has explicitly stated the need to update platforms, sensors, and systems for operations in more contested environments.

OBSERVATIONS

These observations were developed at the time of the collection. Subsequently, actions for many of these observations are being worked at Headquarters USAF, Air National Guard, Major Commands, Centers, and USAF component levels via lessons learned or other appropriate doctrine, organization, training, material, leadership and education, personnel, facilities, and policy (DOTMLPF and Policy) processes.

OBSERVATION 1: Over the last several years, the working relationship between RPA flying and DGS PED personnel has noticeably improved.

Discussion: As mentioned in the introduction, part of the reason for this collection report is to follow up on observations made in previous AFLL reports. Of note, the latest report was focused on RPA employment in combat airspace. Many of the people interviewed, however, mentioned the perceived tension that then existed between RPA flying operations personnel (including RPA unit intelligence support) and intelligence PED personnel. Although unsolicited, they felt the tension was enough of a detriment to mission accomplishment to raise the issue during interviews. Most of their comments related to a perception that, on the one hand, RPA flying crews were always looking to conduct a kinetic strike and would actively seek out units to "help;" while on the other hand, PED personnel appeared to be unwilling to let RPAs contribute their strike abilities to nearby troops in contact in order to avoid interrupting their ongoing collection of essential elements of information.

A majority of the personnel interviewed for this collection insisted that the tension between these two functions has considerably diminished. A number of interviewees stated that in the past,

[1] Global Vigilance, Global Reach, Global Power for America

there was insufficient coordination between flying operations and the ISR Division within the CAOC, which could allow RPA crews to "freelance" themselves during the course of a mission. In our recent interviews there was almost complete unanimity that today "freelancing" of that kind does not, and in fact cannot, occur. In order for an RPA performing an ISR mission to be re-tasked to another unit for support, the SIDO must direct the change. Putting that restriction in place has made the dynamic tasking process significantly clearer to all players. When RPAs are tasked to kinetic operations (via the ATO, for CAS or strike coordination and reconnaissance, as examples) the delineation of the Senior Operations Duty Officer (SODO) as the C2 chain for employment is clear. In those instances, the SODO would concur to retasking to another unit for support. Of course, when an RPA is tasked to support a certain ground unit, that unit can move the RPA within its assigned area and task it as necessary for kinetic operations, with proper control, as it sees fit.

Since part of the friction experienced earlier could be described as resulting from confusion over priorities, mission-type orders (MTOs) were suggested as a means of improving the working relationship. Although many of the people interviewed had very little experience operating under an MTO, those who had felt that when those orders were well constructed they did indeed lead to a greater sense of proper prioritization than operating without them. Those interviewed felt MTOs were generally effective but not well understood and subject to some abuse by ground unit commanders. In many cases, MTOs were used to construct an ISR "stack" of aircraft or capabilities that could be focused on a specific purpose (i.e., the mission) and used to cross-cue each other in a dynamic manner. Interviewees with MTO experience noted that MTOs sometimes seemed to go to the unit that did a good job building a package; but when the RPA arrived overhead, it was used in a way that was inconsistent with the purpose stated in the order. Overall, most interviewees with MTO experience thought that the AF should continue to develop the MTO concept in order to give it more depth.

Another area where the relationship between RPA flying operations and PED professionals is changing is in the evolution of the RPA-unit Mission Intelligence Coordinator (MIC). The origin of this position was simply as a liaison for the RPA Mission Control Element (MCE) crew and the DGS crew. Initially, due to the experimental nature of the RQ-1 program, the MCE equipment in the Ground Control Station (GCS) was incompatible with the highest security-level computer systems. By having an intelligence officer placed at a compatible workstation located outside the RPA GCS, the enterprise now had a way of communicating between flying operations and PED personnel at the appropriate level of security. Since the MIC was available to the RPA crew as a resource, their use expanded to include a variety of functions, including working airspace issues and issues with supported units—areas outside the purview of most unit-level intelligence functions. As systems solutions are now in place to solve computer security access problems, the MIC's role is evolving in a different direction. A group of experienced RPA intelligence officers have proposed a new set of duties for the squadron MIC. These duties would more closely align them with normal intelligence career development, giving them the proper experience with flying unit support while at the same time enabling their real-time contribution to the RPA mission. Under this concept, the MIC not only provides threat and pre- and post-mission briefing and debriefing, but also serves to feed relevant, near real time all-source information to the RPA crew in the GCS. Shortly before our interviews, new guidance was published, outlining some of these changes and expanding the role of the RPA mission

support analyst (MSA). The MSA is tasked with preparing a crew during pre-mission planning, something that was being neglected when MICs were so heavily tasked. The AF should continue to develop and mature the proper roles of intelligence support and operations involved in the RPA enterprise. Additionally, concurrent development of DCGS FMV and multi-source analyst (MSA) crew roles/responsibilities should complement the role of the RPA MSA.

> "Some friction isn't necessarily bad; in fact it may be good."
>
> *-- Senior AF Leader*

Of course, as in many military activities, some friction remains. Interviewees mentioned several sources for this residual friction. Behind the tactical question of the proper prioritization of ISR and strike operations for RPAs lies a more strategic question about the best use for MQ-1/9 aircraft: ISR or strike. During our interviews, it was clear that this question is still on the minds of many people involved in these operations. Although some are moving toward a more holistic view of the roles and capabilities they can bring to joint operations, there remain many who see their position as either/or: either strike or ISR. RPA and PED personnel need a more comprehensive understanding of their roles, how they work with each other and how they fit together within the larger airpower enterprise.

> "Intel is primarily concerned about maintaining SA [situational awareness] [and] minimizing fratricide; it's simply not right to say kinetic operations detract from ISR."
>
> *-- PED squadron DO*
>
> "Intel doesn't do intel for intel's sake, it's meeting someone's stated need"
>
> *-- PED IMS*
>
> "People aren't asking for more Hellfires, they're asking for more ISR"
>
> *-- PED squadron ADO*

Another continuing source of friction seems to come from a question concerning who properly performs the tasks related to definitive identification (ID) of military targets. In this distributed enterprise, there are many people focused on images: the pilot and the sensor operator in the MCE along with the screener and others in the DGS. Many of the interviewees talked about friction regarding who has the authority to make the call on what is actually being seen in the image. The only trained and certified image analysts involved are in the DGS. An analyst will be assigned to maintain eyes on the mission feed at all times for official callouts to the screener while the additional crew members will review the feed and maintain situational awareness in support of the analyst sitting "eyes on." This DGS geospatial analyst is the most image-centered member of the entire effort and is tasked to never take their eyes off the screen. Additionally, RPA pilots and sensor operators (SO) have other duties that may occasionally take their eyes off the video screen, potentially resulting in a partial loss of SA. This disparity in perceived qualification to properly identify a target led to a variety of stories relayed during interviews of how RPA crews and DGS PED personnel disagreed on the proper role each is to play in target identification (ID) and engagement. Some in the DGS community feel that they are in the best position to determine what precisely is being observed and whether it constitutes a valid military target. They point out that while the pilot/SO crew may be able to determine that a target is an

armored vehicle, or even a tank, they lack the specialized training to determine the specific type of tank (e.g., Russian T-72 vs T-90). The problem is compounded for maritime targets, where the analyst must be able to identify not only that a vessel is a combatant, but also identify the type and class, and in many cases the specific ship.

RPA flying unit personnel were quick to indicate that attack/bomber/fighter aircraft have no such qualifications/limitations in order to deliver ordnance using a variety of sensors (e.g., eyes, night vision goggles, infrared images, synthetic aperture radars, etc.). They stated that those other flying units are tasked with identifying, classifying, and applying theater ROE to targets when deciding to engage. As RPAs begin to experiment with a greater role in higher-end operations, these points of friction will increase. This is an area where the AF could more clearly communicate the proper roles and responsibilities of all parts of the ISR/strike enterprise.

Many of the RPA crews interviewed mentioned the lack of awareness of the effects of weather and airspace on flying operations as a source of occasional friction. Most of these stories included references to non-flyers who do not understand that for a variety of reasons, RPAs cannot always operate in areas where manned platforms can. One factor restricting some RPAs is that they are not equipped or certified to fly in certain weather conditions (e.g., when icing is present or likely). Conversely, most manned systems have at least some capability to operate in all but the most severe weather conditions. Ground units, DGS personnel, and LNOs were described by some RPA operators as uninformed about these differences. Several interviewees described essentially the same circumstance when a DGS (on IRC) would comment that "a [manned aircraft] just went there." Another factor that restricts how RPAs perform in inclement weather is the relative lack of visual SA of developing weather conditions during flight. Since the primary use of the RPA's imaging system is ground surveillance, RPA crew do not have the ability to routinely "look around" at weather conditions, something manned crews do all the time. A manned aircraft's crew may be able to find a "hole" in the weather to fly through that an RPA would likely never see. It would be helpful to inform DGS personnel and LNOs of the dynamic complexity of aviation weather. Note that it is not necessary for them to understand that entire subject. It is only necessary for them to understand that dynamic or hazardous weather conditions may cause an RPA crew to declare weather as a limitation to further operations before a manned aircraft would.

Lessons Identified:

- Detailed oversight of the dynamic tasking process within the CAOC by the SIDO has resulted in greater understanding of mission priorities by both flying operators and intelligence analysts.
- Further developing the MTO concept may give commanders more options for mission accomplishment.
- Continuing to develop the roles and responsibilities of MCE intelligence personnel may enhance RPA crew effectiveness.
- By creating a more comprehensive description of the operational employment of multi-mission ISR/strike aircraft, AF RPA leaders will help create more capable airpower options.
- By educating PED and RPA/PED-related liaisons more completely about RPA limitations, particularly with respect to hazardous weather or dynamically changing weather conditions, joint forces will be able to more seamlessly employ these new capabilities.

DOTMLPF and Policy Implications:

- **Doctrine:** The AF should continue to refine the MTO concept.
- **Doctrine/Training:** The AF should more formally address the issue of target ID authority associated with use of multi-role ISR/strike aircraft to help set the stage for true fifth-generation combat.
- **Personnel and Training:** The AF ISR Enterprise along with the 432 WG and ACC NAFs should continue to clarify job tasks for RPA unit intelligence personnel.
- **Training:** Refine TTPs to communicate the proper roles and responsibilities of all parts of the ISR/strike enterprise.
- **Personnel and Training:** Ensure ISR PED and liaison personnel are properly sourced and trained to accurately understand the unique limitations of RPA flying operations.

OBSERVATION 2: Both RPA and PED personnel struggle to overcome limitations inherent in Remote Split Operations (RSO).

Discussion: (Although this observation speaks of the limitations caused by RSO, it should not be read as a criticism of the concept. RSO has many operational advantages as well, and this paper does not attempt to weigh the balance, but illustrates some of the downsides that need to be acknowledged and addressed.)

Many of the sources of friction described by interviewees over the course of several AFLL reports stem from the concrete limitations of the RSO construct. By having the overall RPA/PED enterprise basing widely distributed, the opportunities for person-to-person interaction are correspondingly extremely limited. People involved in this enterprise are well aware of this issue and have created several potential solutions to help overcome the side effects of RSO.

A unit-based and brute-force approach that has been taken in the past is to send RPA and PED operators, in a temporary duty status if necessary, to sit with the other unit's personnel and try to gain an appreciation of their work. For various reasons, interviewees described these efforts as "not having borne real fruit." First and foremost, it seems that it is very difficult to schedule such a visit. In order to actually help overcome the gap in understanding, this visit must be something much more than a simple tour of facilities and overview of capabilities. It requires having the right people available to provide a detailed overview of the mission and then being able to follow that up with, preferably, a multi-day guided interaction during mission operations. A couple of interviewees who had participated in this kind of visitation talked about conflicts that ranged from problems with security clearance verification between units to interference from unexpected VIP tours to simply being "abandoned" on the mission floor without anyone to interpret what was being seen. Certainly, this kind of in-person experience, if properly curated, could have significant benefits. Focusing this effort on fostering greater understanding for supervisors and instructors may be a good initial vector when expanding this kind of training.

A major AF-wide effort has been undertaken to address the friction that results from not being able to easily converse during the course of a mission. Distributed Mission Crew Communications (DMCC) creates a virtual intercommunication system connecting the RPA MCE to the DGS; although it must be noted that in its current form, this is limited to

communications with DCGS PED units. Further, the communications from DGS personnel does not get to the actual GCS, the "cockpit" of the RPA, but stops at the MIC. By preventing direct voice communications from the DGS to the GCS, DMCC does not truly create an intercom system. In AFSOC, the system is called CLEARCOM and does allow communications into the RPA MCE. TTPs are currently in development between special operations forces (SOF) PED nodes and AFSOC MQ-1/9 squadrons. Almost all interviewees agreed that DMCC is an excellent improvement, providing a large step forward in reducing friction. That said, there remain a variety of opinions on the actual utility of DMCC and the need to standardize DMCC interactions.

The most frequent comment our team heard was that in most cases DMCC tended to offset the disadvantages of Internet Relay Chat (IRC)-induced delays. Since receiving an IRC message requires purposely looking over to a specific chat room, crews may sometimes go minutes, particularly when things are very busy, without reviewing a chat screen. DMCC also allows the DGS crew to maintain a higher level of SA than they would have without it. DGS personnel were largely positive when they spoke of DMCC. A number of DGS personnel pointed out that, although this is new in the MQ-1/9 world, DGS personnel already routinely talk directly to U-2 pilots during their missions without negative feedback from those pilots. However, RPA flight crews were split on the utility of DMCC. Most were at least tolerant of it, with a small, but insistent minority feeling it was completely unnecessary. The most common concern expressed by RPA crew members was that DGS members were not adequately trained on intercom/radio procedures and brevity codes. Most felt that the current implementation which has the DGS-in voice capability stopping before reaching the actual RPA MCE was a reasonable construct. Although on this subject, a minority felt that they would be better served if the DGS personnel could talk directly to them during a mission, assuming they were adequately trained in intercom and radio discipline. The biggest concern was that the MCE crew would have to balance voice communications on their aircraft radio with DMCC intercom to the DGS personnel.

> "With a good DGS screener who wants to talk, it's a lot easier over voice than using IRC."
> *-- MQ-1/9 MIC*

Although admittedly it is only one data point, our team heard an interesting story regarding a downside of the way DMCC is currently used. A DGS was working an ISR mission with an RPA crew when the DGS crew began to hear the RPA crew discussing preparation for a kinetic strike. No one in the DGS was aware of any such tasking or target. Since they could not talk directly to the crew, they worked through the MIC to find out what was going on. It turned out that the RPA crew was verbalizing the coordination for a simulated strike for their own training, but had failed to inform the DGS prior to initiating the training. This illustrates the need for more standardized communications within DMCC.

A final method that was suggested for mitigating RSO-induced friction is the 480th ISR Wing's (480 ISRW) daily synchronization briefing. The concept is to have representatives of all the DGSs and RPA units get together and review the day's missions and priorities. By having this daily overview of enterprise activities, subsequent dynamic changes could more quickly be addressed from a commonly understood foundation. The entire RPA community is invited to

participate in this daily event. However, nearly all interviewees, both DGS and RPA personnel, felt that as currently constructed, this briefing does not serve a meaningful, day-to-day purpose with regard to the relationship between DGS and RPA operations. It is an excellent way for the 480 ISRW to manage its substantial worldwide responsibilities. It is only occasionally attended, and then only virtually, by an RPA representative. Many interviewees also mentioned that it does offer a forum that RPA personnel can use to address issues, but that when they do, it is largely outside the normal agenda for the meeting. It may be that a different, recurring meeting could serve to reduce friction for both communities, but based on our interviews, that meeting would have to be specifically structured to provide value to all participants. A strong dissenting view held by several interviewees holds that the global, multi-agency nature of the RPA enterprise makes any attempt at a daily update too hard to actually solve problems before they arise.

Lessons Identified:

- Creating opportunities for regular in-person interaction for key RPA and PED instructors and supervisors increases interfunctional understanding.
- DMCC, functioning as a virtual intercommunication system between members of the RPA and PED communities, has provided a much needed boost to coordination.
- Continuing to develop DMCC will better enable RPA mission accomplishment.
- Increased radio and communications training will improve communication and discipline among crew personnel within DMCC.
- A daily update tuned to the needs of the RPA-PED interface may enhance overall mission integration.

DOTMLPF and Policy Implications:

- **Training:** Formal training of RPA/PED instructors should involve in-depth knowledge of the entire enterprise.
- **Training.** PED analysts need radio training added to their curriculum.
- **Materiel:** DMCC should continue to be improved.
- **Training:** The RPA/PED enterprise should consider implementing a periodic "daily update" centered on issues arising from their interactions.

OBSERVATION 3: An extraordinarily rapid buildup to meet expanding demands of OCO has affected the ability to innovate and evolve.

Discussion: Perhaps the most salient feature of RPA and ISR operations over the last decade is the rapid growth of RPA force structure. The number of RPA combat air patrols (CAPs) and the number of people required to support these missions has grown tremendously over the last ten years. That these increased capabilities have significantly contributed to the wars in Iraq and Afghanistan is not in question. In many cases, the people who have made these platforms and capabilities as effective as they are have paid a personal cost. Airmen and their families have been stressed by the relentless demands of OCO. Yet they have excelled at this mission and in doing so, helped create the conditions necessary for US and coalition victories in both theaters.

In the face of such rapid growth, each community in this distributed system has tended to optimize their individual portions for maximum (perceived) effectiveness and efficiency within

their functional specialties. As an example, several interviewees mentioned the structure of shift-work as an issue. In the DGS, personnel typically work 12-hour shifts on the DGS floor; in an MQ-1/9 squadron, crews routinely work an 8-hour in-MCE shift; while in an RQ-4 squadron, the 8-hour shift is split between four hours of MCE time and four hours in the Global Hawk Operations Center (GHOC). RPA flying crews are restricted by crew rest limitations, DGS personnel are not. Clearly, these shifts are not easily synchronized and they are certainly not connected to each other. There are no habitual associations that would be seen in a wing of manned aircraft, where the groups work together for a local common purpose. They represent a set of solutions that are functionally effective while attaining some functional flexibility as well. There are, as a result, a number of "changeovers" that happen during the course of a mission, to include internal changeovers of crews and external changeovers between RPA and PED entities working the same tasking.

In one particular interview an RPA pilot described a procedure they routinely used to reset certain sensors when they did not respond properly. He went on to explain that only after months of performing this reset did he find out that when they did, it almost completely took the PED element off line. Because these capabilities were grown so quickly, and because he did not usually work with the same individuals or units routinely, he never received feedback. His observation was that it is hard enough to understand how his RPA's systems work, but "we really don't have any idea how my system affects others in the overall enterprise."

Since these capabilities were rapidly fielded directly into active war zones, many personnel did not understand their capabilities and limitations. In order to deal with these misunderstandings, a number of LNO positions were developed and personnel deployed to fill them. These include conventional force intelligence, surveillance, and reconnaissance liaison officers (ISRLO) and SOF ISR Tactical Controllers (ITC). Their employment varies significantly from each other. In the case of the ISRLO, the individual is normally an AF intelligence officer stationed at the US Army division level and serves primarily in an educational and advisory role. They are sometimes sent down to lower echelons, where some interviewees indicated that in addition to their other duty responsibilities, they had helped ground units develop MTOs. Most interviewees felt the ISRLO was largely value-added. Even though they are generally focused on the relationship between USAF ISR capabilities and ground unit requirements (not the relationship between RPA crews and PED nodes), their interactions have an overall positive effect on RPA and ISR operations in general.

The ITC, on the other hand, is an AFSOC/US Special Operations Command-specific liaison and plays a much more direct, tactical role. The ITC is normally deployed to the Tactical Operations Center (TOC) of a supported unit and works directly with the RPA and PED units to relay the ground unit commander's immediate needs. Although they are normally intelligence personnel and are given four weeks of training prior to deployment, they are not always USAF personnel and, according to several interviewees, sometimes require seasoning before they fully understand the capabilities and limitations of the RPA/PED combination. The vast majority of interviewees felt the use of these liaisons increased mission effectiveness, but they pointed out that results were sometimes personality-dependent, a trait common to many liaison jobs. Interviewees stressed that establishing better and standardized pre-deployment training might help to make these liaisons even more effective.

A small number of interviewees brought up an interesting issue. They pointed out that as each "function" does internal functional training, they tend to emphasize the most difficult parts of their own mission. For example, DGS crews described their most challenging training involves putting disparate pieces of all-source intelligence together in order to come up with a good plan to locate a specific individual and identify their likely location within a village or compound. In this DGS-centered training scenario, the kinetic strike that follows is a 'notional' event (i.e., they do not spend any time on how the strike plays out). They might complete their training scenario by saying "and that leads to a successful strike against the target." Conversely, when an RPA crew conducts challenging training for their function, they emphasize the detailed actions necessary for the kinetic strike. They might use as a 'notional' scenario a situation where "intelligence passes you information to look for [some specific cue] within the compound." Then the RPA crew would spend a great deal of time going over the specific tactics and MCE procedures to properly perform the strike. In both cases, one crew referred to the other crew's contribution as a merely notional event for their training. This type of "stovepiped" training may be useful for day-to-day activities and upgrade training, but some effort should be made to create training opportunities where the RPA and PED crews train together on a complete mission.

In discussions with interviewees there appear to be 'dead ends' or islands in the enlisted analyst career fields, and it may make sense to consider streamlining career fields to allow greater flexibility and growth of the enlisted intel operator to avoid the perception of being 'dead-ended' in just one platform or organization. Interviewees indicated that most enlisted members get sent to one of the major ISR centers as a first assignment and do not have much flexibility in terms of career paths or geographic locations. Interviewees suggested the idea of crossflow from one platform to another, so there is growth potential and deliberate variety between Airborne Intel Operators (1A8X2), flying linguists, and analysts assigned to DGS units. Another suggestion included developing a common AFSC for all enlisted analysts, linguists, and sensor operators to improve the resiliency of the 1AXXX career field and allow variety of assignments in terms of airborne and ground operations and geographic locations.

Another point that a number of interviewees highlighted referred to personnel issues associated with the rapid rise of these capabilities. Aside from the high levels of personal stress, which allows very little time for regeneration and reconstitution, interviewees addressed the large number of first assignment Airmen who have been pushed into the system and how they affect the ability to reach out to other parts of the enterprise. There is such a heavy burden placed on units to continually train new instructors to instruct the new Airmen, that it degrades the ability to innovate outside a specific function. Within the DGS particularly, this is manifested in part by a proliferation of qualifications. For the DGS, having Airmen with multiple qualifications allows a certain amount of scheduling flexibility. However, as contingency operations became increasingly complex, from an ISR perspective, the number of qualifications rose dramatically. Several interviewees mentioned that the total number of qualifications is now over 20, and each person typically has 7-10 qualifications. The high tempo of operations makes it very difficult to navigate the fine distinction between an overall experience embodied by having a variety of qualifications and becoming overwhelmed by the requirements of testing and instructor certifications necessary to attain and maintain multiple qualifications. One ISR subject matter expert told us that in the past a normal number of qualifications was more like 2 or 3, and having to maintain more than twice that many may limit effectiveness across all mission sets.

Additionally, the need to properly "mix and match" all the different qualifications together on a DGS floor is one more impediment to streamlining the composition of the PED element.

Several interviewees suggested that due to rapid growth, particularly within DGS-related functions, it was difficult to say with precision just how many people were actually required to support a single full motion video (FMV) flight. As mentioned earlier, there are potentially many intelligence personnel, in addition to the RPA crew, who are tasked with watching the video stream. Only the DGS geospatial analyst is required to never 'blink' and is therefore in turn supported by another analyst who translates anything the geospatial analyst needs to IRC so the geospatial analyst never takes eyes off of the video stream. Within the DGS, there are others who are tasked with supporting the video feed as well, and several interviewees felt this sometimes amounted to overkill compared to what was actually required to cover the mission.

> "We need to cut the fat off the process – how many people are really required to PED a single FMV line anyway?"
>
> -- *DGS Analyst*

Another personnel issue that was raised, though more frequently by the pilot community, was the quality of personnel assigned to RPA duty. One RPA pilot described it as "the island of misfit toys," because, as described by several interviewees, RPA units have been disproportionately assigned to pilots who did not excel in other platforms. According to interviewees, this leads to a situation where people are not as assertive as they might otherwise be. Some interviewees attributed this directly to the quality of the assigned personnel, while others left open the possibility it was due to a perceived inferiority. In either case, the result was what one interviewee described as a tendency to be "a farmer" [passive] versus "a hunter" [aggressive]. Applied to the RPA/PED interface, he described the hunter as a proactive member of a team trying to locate their "prey," while he described the farmer as an individual who does no more than service the needs of the "plants" in his field (i.e., the ISR targets).

A number of interviewees, both from the RPA and DGS communities, mentioned issues with the system design and physical layout of their respective "boxes." One RPA pilot said, "The MCE I'm sitting in front of is like a collection of tinker toys." Similarly, a DGS analyst said, "DGS is like a 5-year-old's really messed up Lego." These systems were fielded rapidly with functionality being more important than the elegance of the user interface. These usability issues are compounded when referring to the interface between elements in the RSO enterprise. Interviewees also identified a lack of configuration control as platforms received additional capability, and as requirements were added to platforms, leading to fractured analytic support. Interviewees also stated that as RPAs received improvements to their Wide Area Motion Imagery (WAMI) sensors, PED capabilities are now being split between multiple ground units and may no longer provide the best support to an individual unit. The AFLL collection team conducted several interviews with information technology professionals who support these systems, and they unanimously spoke of the need to standardize the technologies used in these systems and rebuild them from the ground up with interoperability in mind.

Another observation made by the team is that although the RPA community has access to simulators for training and potentially mission rehearsal purposes, no simulators exist for DGS

personnel. They rely on a variety of "canned" scenarios that have been stored from earlier missions. They then use them to illustrate different aspects of their operations. While interviewees indicated that these recorded episodes are useful, they also universally recognized the increased training opportunities that would come from a robust simulation capability. A final observation is that the current structure of the materiel acquisition and logistic support functions is also not tightly integrated. The system program office (SPO) for RPA flying systems is in the Aeronautical Systems Center at Wright-Patterson AFB, Ohio; while the SPO for DGS systems is in the Command and Control ISR division at Robins AFB, Georgia. The AF should consider the implications of potentially reorganizing these functions under one organization.

Lessons Identified:

- Synchronizing shift schedules, to the extent that is practical, between RPA and PED operations better supports the crew concept.
- A greater understanding on the part of RPA and PED personnel of each other's missions will yield a better sense of participating in a unified, fifth-generation mission.
- Standardizing the personnel and training requirements for filling ISRLO and ITC positions will provide a more capable interface with joint partners.
- A deliberate crossflow among related enlisted intelligence analyst career fields will broaden individual skill sets and improve the resilience and retention of the career field.
- Better integrating the acquisition and programming for RPA and DGS systems will improve interoperability and platform standardization.

DOTMLPF and Policy Implications:

- **Organization:** The AF should identify and track ISRLOs in coded billets.
- **Training:** The AF should review the number of PED position qualifications.
- **Organization:** The AF should examine the appropriate number of PED analysts to cover RPA missions.
- **Organization:** Consider crossflows among enlisted imagery analysts, linguists, and camera operators to improve resilience and retention of the career field.
- **Materiel:** Acquisition of the RPA and DGS systems needs to be integrated with emphasis on configuration control and interoperability.
- **Training:** The PED community needs training simulators for improved mission operations.
- **Training:** The AF should consider developing training opportunities where RPA and PED crews work together to conduct a complete mission from end to end.
- **Training:** The AF should undertake a comprehensive review of the many DGS qualifications with a goal of reducing them to the minimum necessary to support the mission.

OBSERVATION 4: There is a strong, but not universal, desire to create a more definite "crew" or "team."

Discussion: Although not an overwhelming sentiment, a large majority of both flying operations crews and DGS operators interviewed expressed some desire to have their overall effort seen as more of a 'crew' activity. The most frequently expressed idea was that they would like to have some sense that they were "briefing, flying, and debriefing" together.

The sentiment expressed here is, in a sense, the fallout of two previous observations: struggling with the limitations of RSO and dealing with the overwhelming rate of growth within this enterprise. Still, many interviewees felt strongly enough to explicitly mention this point. Some of their thinking is built on the capabilities in the DMCC, which allows more frequent voice communications, in a way building the notion of a "crew." Several interviewees suggested that working together as a crew and debriefing the results together should lead to greater effectiveness over time. Two mentioned that a current obstacle is that as distributed assets, they had different bosses with different standards. Of note, after the course of this collection, the USAF approved Program Action Directive 14-02, which has organized both RPA and PED operations under ACC, though in different Numbered Air Forces. This may provide an opportunity to address the perceived standards disconnect.

"We need to become a team or else we become adversarial."

-- RPA pilot

One interviewee said even if the crew concept cannot be fully implemented, the overall enterprise needed to achieve at least a "synchronized accountability." Part of establishing that kind of accountability would involve an enterprise-wide understanding of who is doing what job. In other words, what am I doing right now that increases the value of the entire effort? Throughout most interviews, it was clear that the personnel involved were highly skilled at their specific jobs, although many lacked a clear view of how what they did fit into the larger effort in theater. One interviewee in particular summed it up in one idea, "I don't really know who is on my team at any given moment." That comment meant more than simply not knowing the name and personality of everyone on the crew, it also addressed the notion that no one really understands what capabilities are resident within this virtual crew.

Another idea that could help foster a greater sense of crew would be creating combined RPA/PED resource management training. RPA crews receive crew resource management (CRM) training, but PED crews do not receive formal CRM training. CRM emphasizes communication within the crew, employing situational leadership and working together as a crew to maintain overall SA. The current arrangement limits the discussion of how each part of the enterprise can most efficiently work with the others. As a result, the overall effectiveness may be less than it could be.

"Sometimes I get feedback, but it doesn't make sense to me."

-- RPA pilot

Clearly, CRM in an RSO environment would be much different than that with a co-located crew. Without the benefit of voice communications, much of the emotional content is lost when using IRC only for interactions. There are individuals we interviewed who identified ways that they try to foster a CRM-like communications environment. One DGS member told the team that they occasionally use a specific IRC phrase, "Just trying to be an enthusiastic crewmember," when they feel that their input is being perceived wrongly. Properly designed CRM for this enterprise would have to address the implications of a distributed, non-voice-connected crew.

Additionally, many interviewees, both RPA and distributed ground station (DGS) personnel, expressed anxiety over the issue of proper intercom/radio discipline. Clearly, establishing a standard, effective regime for managing voice communications over a large group of people who are widely distributed would be difficult, but done properly would augment the ability to rapidly pass critical information throughout the mission.

Taking the crew concept a step beyond CRM, several interviewees suggested that a necessary step to developing a robust sense of teaming was to have an established set of standard practices for mission accomplishment. Each mission would be briefed using those standards including specific contracts and deviations for the mission. This is not a new concept, as many flying units have established unit standards. These standards help to focus mission accomplishment and ease briefing and debriefing of flights. It might even be necessary to ensure all members of the crew be familiar with the planning, collection, processing, analysis, and dissemination (PCPAD) model so that all crew members understand their role in PCPAD and how kinetic operations fit within the model. While establishing an analogous set of standards between RPA flying and intelligence PED units would entail a significant amount of work, the benefits could be substantial.

The USAF has several models on which to base a potential RPA/PED crew concept. Most of the crew concept aircraft in the fleet are based on close coordination between the "front end" and "back end" crews, with the "front end" normally having overall mission command. However, the AF also has aircraft in its inventory where the "back end" crews have situational or even overall mission command. The E-3 Airborne Warning and Control System, the E-8 Joint Surveillance and Target Attack Radar System, and several RC-135 and EC-130 variants are certainly examples that could be explored. Interviewees were not familiar enough with these different aircraft systems to have given an indication of which model(s) would be a good starting point to develop an RPA/PED crew concept.

Perhaps the clearest example of this desire to create an integrated RPA/PED crew was recently considered by AFSOC. AFSOC considered building what was described to the collection team as the "New ROC." In this construct, the RPA crew, the MIC, and the PED crew would all be collocated in the same room during mission accomplishment. It is worth noting, however; that not all interviewees were supportive of the change. Interviewees specifically mentioned problems with synchronizing schedules and with perception differences when part of the 'crew' wears flight suits and part wears ABUs. Interviewees who commented on the "New ROC" were about evenly split on the concept. While all thought it could increase the sense of crew, many felt the potential loss of flexibility and the difficulty of successfully scheduling that many people together offset the potential improvements. In the end, AFSOC decided not to implement the "New ROC." Doing so would have certainly been expensive and the benefits were only speculative. However, the AF should carefully consider experimenting with concepts to more tightly integrate crews using both virtual integration over DMCC (or AFSOC's CLEARCOM) and physical integration through collocation. This experimentation could result in improvements to overall mission effectiveness through improvements in CRM.

Lessons Identified:

- Creating more of a crew atmosphere within the RPA/PED communities will positively affect mission effectiveness.
- Creating an RPA/PED-specific type of CRM training and conducting the training in a combined setting will improve RPA mission effectiveness.
- Monitoring AFSOC's more tightly integrated crews for lessons that can be exported to general purpose forces will yield benefits for the RPA/PED community.

DOTMLPF and Policy Implications:

- **Training:** The AF should create a regime of CRM to meet the unique needs of RPA/PED missions.

APPENDIX A: Acronyms and Abbreviations

ACC	Air Combat Command
AFB	Air Force Base
AFISRA	Air Force Intelligence, Surveillance, and Reconnaissance Agency
AFSC	Air Force Specialty Code
AFSOC	Air Force Special Operations Command
CAOC	Combined Air Operations Center
CAP	Combat Air Patrol
CRM	Crew (or Cockpit) Resource Management
DCGS	Distributed Common Ground System
DGS	Distributed Ground Station
DMCC	Distributed Mission Crew Communications
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities
DoD	Department of Defense
FMV	Full Motion Video
GCS	Ground Control Station
GHOC	Global Hawk Operations Center
ID	Identification
IR	Infrared
IRC	Internet Relay Chat
ISR	Intelligence, Surveillance and Reconnaissance
ISR-D	Intelligence, Surveillance and Reconnaissance Division
ISRLO	Intelligence, Surveillance and Reconnaissance Liaison Officer
ITC	ISR Tactical Controller
LNO	Liaison Officer
MCE	Mission Control Element
MIC	Mission Intelligence Coordinator
MSA	Mission Support Analyst/Multi-Source Analyst
MTO	Mission Type Orders
OCO	Overseas Contingency Operations
OEF	Operation ENDURING FREEDOM
OIF	Operation IRAQI FREEDOM
PED	Processing, Exploitation and Dissemination
ROC	RPA Operations Center
ROE	Rules of Engagement
RPA	Remotely Piloted Aircraft
RSO	Remote Split Operations
SA	Situational Awareness
SAR	Synthetic Aperture Radar
SIDO	Senior Intelligence Duty Officer
SO	Sensor Operator
SODO	Senior Operations Duty Officer
SOF	Special Operations Forces
SPO	System Program Office

TOC	Tactical Operations Center
TTP	Tactics, Techniques and Procedures
USAF	United States Air Force
WAMI	Wide Area Motion Imagery

NOTE: Reference link to the DoD Dictionary of Military Terms:
http://www.dtic.mil/doctrine/dod_dictionary/

APPENDIX B:
Identified Lessons in the Joint Lessons Learned Information System (JLLIS)

The table in this appendix contains the identified lessons from the CSAF Lessons Learned Focus Area Enduring Airpower Lessons from OEF/OIF: Expeditionary Base Closure report and the lessons' associated JLLIS ID number. The final disposition of the office of primary responsibility (OPR) for each identified lesson can be viewed at the appropriate JLLIS entry. The entire report and all the lessons within the report (using the JLLIS ID) can be accessed from the unclassified JLLIS database at https://www.jllis.mil. For more information about JLLIS, please contact AF/A9L at usaf.pentagon.af-a9.mbx.af-a9l-workflow@mail.mil.

JLLIS #	Title	Proposed OPR
121619	Detailed oversight of the dynamic tasking process within the CAOC by the SIDO has resulted in greater understanding of mission priorities by both flying operators and intelligence analysts.	AF/A3
121620	Further developing the MTO concept may give commanders more options for mission accomplishment.	AF/A2
121621	Continuing to develop the roles and responsibilities of MCE intelligence personnel may enhance RPA crew effectiveness.	AF/A2
121622	By creating a more comprehensive description of the operational employment of multi-mission ISR/strike aircraft, AF RPA leaders will help create more capable airpower options.	AF/A3
121623	By educating PED and RPA/PED-related liaisons more completely about RPA limitations, particularly with respect to hazardous weather or dynamically changing weather conditions, joint forces will be able to more seamlessly employ these new capabilities.	ACC
121624	Creating opportunities for regular in-person interaction for key RPA and PED instructors and supervisors increases interfunctional understanding.	AF/A2
121625	DMCC, functioning as a virtual intercommunication system between members of the RPA and PED communities, has provided a much needed boost to coordination.	Info
121626	Continuing to develop DMCC will better enable RPA mission accomplishment.	AF/A2
121627	Increased radio and communications training will improve communication and discipline among crew personnel within DMCC.	ACC
121628	A daily update tuned to the needs of the RPA-PED interface may enhance overall mission integration.	ACC
121629	Synchronizing shift schedules, to the extent that is practical, between RPA and PED operations better supports the crew concept.	ACC
121630	A greater understanding on the part of RPA and PED personnel of each other's missions will yield a better sense of participating in a unified, fifth-generation mission.	AF/A2
121631	Standardizing the personnel & training requirements for filling ISRLO & ITC positions will provide a more capable interface with joint partners.	AF/A2

121632	A deliberate crossflow among related enlisted intelligence analyst career fields will broaden individual skill sets and improve the resilience and retention of the career field.	AF/A2
121633	Better integrating the acquisition and programming for RPA and DGS systems will improve interoperability and platform standardization.	SAF/AQ
121634	Creating more of a crew atmosphere within the RPA/PED communities will positively affect mission effectiveness.	AF/A2
121635	Creating an RPA/PED-specific type of CRM training and conducting the training in a combined setting will improve RPA mission effectiveness.	AF/A3
121637	Monitoring AFSOC's more tightly integrated crews for lessons that can be exported to general purpose forces will yield benefits for the RPA/PED community.	AF/A2

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