Eyes and Ears of Freedom:
The Intelligence Backbone of America's Drone Program

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At the height of Operation Enduring Freedom, the United States Air Force operated over 50 remotely piloted aircraft (RPA) missions each day through the skies of the U.S. Central Command area of responsibility. Each mission – which often spanned more than 24 hours – peered down at the Afghan or Iraqi landscape below, hunting suspected insurgents, searching for hidden roadside bombs, and providing an extra set of eyes to coalition convoys and patrols. Half way around the world at bases in Cape Cod, Northern California, Alabama, Virginia, and elsewhere, Air Force intelligence analysts working in dimly lit, windowless ground stations analyzed the streaming video and imagery collected by RPAs.

From their units, located far from the frontlines, analysts relayed intelligence to commanders and troops using real-time chat rooms. The thousands of intelligence Airmen assigned to these ground stations are part of the Air Force Distributed Common Ground System (AF DCGS), a worldwide network of units, analysts, and equipment responsible for processing, analyzing, and disseminating the vast quantities of intelligence data collected each day by both manned and unmanned Air Force reconnaissance assets.[1] Most studies of Washington's "drone" program focus on the pilots and sensor operators who fly RPAs like the MQ-1 Predator and MQ-9 Reaper, but the intelligence crews that analyze the vast quantities of data collected by these systems are an often overlooked yet integral backbone of America's RPA operations. Every day, the men and women assigned to the AF DCGS enterprise work at 27 geographically separated sites, and assess over 1,200 hours of full motion video (FMV) collected by RPAs and produce

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3,000 signals intelligence (SIGINT) reports.[2] Without these intelligence airmen and their global intelligence network, RPAs would likely not have made as significant an impact on modern warfare.

A greater appreciation of the complexities of the intelligence infrastructure behind Washington's RPA program is critical for understanding America's global RPA operations and for informing policy debates on the effectiveness of drone operations and the consequences of drone proliferation. The significant training of analysis teams monitoring each RPA mission should mollify critics concerned that the decision to launch drone strikes is in the hands of small numbers of trigger-happy operators.[3] At the same time, concerns that the increasing proliferation of drone aircraft will have destabilizing effects on international security should be tempered by the knowledge that global drone operations – like those carried out by the United States – require a vast intelligence infrastructure that takes decades to develop.[4]

To provide readers with a glimpse into the drone program's intelligence backbone, this chapter draws from analysis of hundreds of pages of government documents, in-depth interviews with Airmen who worked within Washington's RPA program, along with my own experiences as an Air Force officer supporting RPA operations. The chapter begins with a brief history of the Air Force's intelligence analysis enterprise that aims to map its transformation from the earliest days of aerial reconnaissance. It will track this process from its Cold War mission of processing and interpreting rolls of film from the high altitude U-2 spy plane, to its current role of providing real-time intelligence support to commanders and warfighters through the analysis of imagery and signals intelligence collected by a range of platforms, including Predator and Reaper RPAs.

The chapter then dives inside the AF DCGS, providing insight on the intelligence analysis and production efforts that support worldwide military operations. Beyond simply

examining the operations of this intelligence infrastructure, material gathered from interviews, primary sources, and participant observation allows me to capture the experiences of the men and women analyzing intelligence gathered by RPAs and to assess the unique challenges they face when conducting combat support operations from bases thousands of miles from the front lines.

The Origins of the Air Force Intelligence, Surveillance, and Reconnaissance Enterprise

As Chapter X *[insert depending on content of other chapters]* describes, states have used remotely controlled aircraft since the 1920s. The earliest drones were used for aerial target practice, World War II era drones were designed as rudimentary cruise missiles, and Cold War RPAs were used to collect air samples following nuclear tests, to jam adversary radar systems, and to gather intelligence over war zones and other non-permissive environments.[5] For as long as militaries have used RPAs to collect information on adversaries, intelligence personnel have played a critical role in interpreting RPA-collected data and delivering finished intelligence products to commanders and warfighters. But even before RPAs entered the scene, analysts assigned to the predecessors of today's AF DCGS squadrons analyzed the photographs collected by manned reconnaissance aircraft during the First and Second World Wars and throughout the Cold War.[6] Analyst airmen were historically deployed to combat zones along with the aircraft they supported so they could develop film and analyze imagery after reconnaissance missions were completed. While the mission of providing decision-makers with actionable intelligence has remained unchanged, the more recent development of robust network communication infrastructure, data links, and advanced software has enabled the real-time intelligence analysis that underlies today's RPA operations.

The forerunners to today's AF DCGS enterprise emerged during World War I with the Army Air Corps' establishment of aerial observation units. These groups flew manned aircraft equipped with cameras and observation officers to collect imagery of the battlefield for use in planning tactical operations and mapmaking. After each mission, crews offloaded rolls of film from propeller driven bi-planes, processed the film in rudimentary facilities built at deployed bases, interpreted the photographs to pinpoint the locations of trenches, barbed wires, roads, and other manmade or geographic features, and provided the information to ground commanders.[7]

During these early years, processing took time meaning that airborne intelligence generally could not be used to support operations as they unfolded. Still, intelligence gathered by airborne platforms was rapidly becoming an important component of military planning. One early guide on military photo-interpretation highlighted the utility of airborne reconnaissance and suggested that "An Infantry Commander preparing an attack over unfamiliar grounds is given the nearest thing possible to an aeroplane ride over the terrain – he receives a photograph of it[.]"[8] Although aerial reconnaissance during World War I provided warfighters with greater awareness of their operating area and their rival's forces, the process of developing and analyzing film took time and was generally limited to tactical intelligence of the battlefield rather than strategic intelligence on enemy intentions and capabilities.

The need for intelligence collected by airborne reconnaissance platforms grew during World War II as Allied forces carried out strategic bombing missions throughout the European and Pacific Theaters. In the years leading to World War II, airpower theorists like Billy Mitchell and Guilio Douhet promoted the strategic use of airpower to bomb targets such as cities and industrial sites deep within an adversary's homeland, rather than focusing on tactical targets along the frontlines. Strategic airpower advocates believed that airpower could take the war

directly to a foe's political and military core, more rapidly bringing about an enemy's surrender by bypassing peripheral battlefields.[9] To employ airpower strategically, however, planners needed vast amounts of intelligence about potential targets. Successful targeting required the locations of facilities, transportation networks, defensive equipment and description of structures to ensure Allied air forces launched the appropriate number of bombers armed with the right munitions for a given mission.[10]

To meet this demand, the Army Air Forces activated dozens of new reconnaissance squadrons that carried out long-range reconnaissance operations in addition to tactical battlefield missions.[11] Because identifying and analyzing strategic targets required more significant analysis than mapping battlefields, these flying units were supported by photographic technical squadrons staffed by trained analysts and technicians responsible for processing and analyzing the film collected by reconnaissance flights. American analysts identified Axis factories and transportation nodes, and helped assess damage to these sites after bombing raids.[12] Operations carried out by these reconnaissance airmen and photo-interpreters represented a significant professionalization of air component intelligence, and marked an evolution in the analytical infrastructure that underpins today's global RPA operations.

As the allied victory gave way to the early Cold War, the focus of America's reconnaissance operations shifted to the Communist bloc. Heavily modified World War II-era bombers equipped with cameras and equipment designed to intercept and record radar and radio transmissions flew along the periphery of – and at times deep into – the airspace of Communist bloc states, attempting to keep tabs on Soviet and Chinese military and industrial capabilities. Dozens of American aircraft were downed during these dangerous operations.[13] The eventual development of purpose-built reconnaissance aircraft designed to operate beyond the reach of

Soviet-built fighter jets and anti-aircraft systems helped reduce the risks, but at least 264 American airmen were killed or declared missing while flying missions that peered behind the Iron Curtain.[14]

Despite the dangers, these missions were critical for gathering information that shaped U.S. military planning and helped Washington ensure it was not caught off-guard by Soviet or Chinese military developments.[15] Most of these missions collected intelligence on static facilities like airfields, air defense sites, ports, urban areas, and factories that American bombers or missiles could strike in the event of conflict. Since these targets were stationary, there was little need to analyze imagery in real time. Intelligence personnel assigned to the descendants of World War II-era photographic interpretation units therefore continued to manually develop and analyze film after it was offloaded from aircraft, a process that could take days to accomplish. It took two days, for instance, for the imagery of Soviet missiles that triggered the Cuban Missile Crisis to reach President Kennedy.[16] In contrast, President Obama's national security team watched a streaming video feed of the May 2011 raid on Osama bin Laden as the operation unfolded.[17]

In addition to providing intelligence about rivals during periods of peace, military analysts also provided decision-makers with intelligence gathered by airborne reconnaissance assets in instances when the Cold War turned hot. During the Korean War, reconnaissance aircraft collected photographic and signals intelligence in the Korean theater and along the Chinese and Russian coasts, helping to inform bomber and fighter operations.[18] Later, during the Vietnam War, a mix of manned reconnaissance aircraft including the U-2 and SR-71 snapped imagery and collected signals intelligence (SIGINT) of Communist forces in Southeast Asia.[19]

Operating alongside these manned platforms were large numbers of RPAs, which provided analysts volumes of intelligence data.[20]

The most common Vietnam-era RPAs – variants of the BQM-34 Firebee – were highly modified target drones designed to gather a mix of photographic and signals intelligence. Firebees often operated in areas deemed too risky for manned aircraft, and played a vital role in gleaning information on North Vietnam's supply routes, air defense capabilities, and military bases.[21]

The Firebees also routinely penetrated Chinese airspace to monitor the flow of Beijing's military aid to Hanoi and to keep tabs on People's Liberation Army forces along the Vietnamese border.[22] Like earlier reconnaissance operations, intelligence personnel typically lacked real time access to data collected by Firebees and analyzed information after the drone completed its mission. In the case of the Firebee, recovery involved a complex process in which a helicopter used special equipment to catch a descending RPA in midair.[23] Film was then rushed to a waiting transport aircraft for airlift to Tan Son Nhut Air Base in South Vietnam, where analysts assigned to the 12th Reconnaissance Intelligence Technical Squadron processed the film, interpreted the imagery, and disseminated intelligence products.[24] Intelligence was therefore useful for planning and battle damage assessment, but could still not be used to support ongoing operations because of the lag between collection and dissemination of the analyzed imagery.[25]

While imagery exploitation typically occurred post mission, the Air Force began experimenting with real-time analysis of intercepted radar and communications signals through the Combat Dawn program in 1969. The test and development program placed signals intelligence sensors onboard AQM-34Q RPAs and manned U-2 aircraft that transmitted data about enemy radar systems to an in-theater ground station, allowing intelligence analysts to

monitor and assess the data in real-time and relay information about adversary threats and air defense activity to U.S. aircraft that might be in harm's way.[26] The RPA-collected information that intelligence Airmen processed and analyzed proved critical for the war effort, helping to protect allied aviators and target Communist forces. General John Vogt, the commander of air operations in Vietnam highlighted the importance of RPAs and the intelligence they provided by describing himself as "a great believer in drones…Drones went into areas where conventional airplanes wouldn't live. They were the main source of my battle damage assessment."[27]

The widespread use of RPAs in Vietnam foreshadowed two significant shifts in airborne reconnaissance and intelligence analysis. First, the success of assets like the Firebee showcased the value of RPAs for intelligence gathering in a combat environment. By flying in areas off-limits to manned aircraft, RPAs provided decision-makers with valuable information about enemy capabilities and intentions, and demonstrated an alternative to traditionally piloted aircraft. Second, the Vietnam experience highlighted the need for a robust intelligence infrastructure to support RPA operations. The analysis and dissemination of RPA-gathered intelligence allowed commanders to more effectively target adversaries while also mitigating risk to friendly forces.

The ability to deliver information to commanders in real time became increasingly important as the nature of potential targets changed in the post-Vietnam era. Although fixed sites like cities and military facilities continued to be important intelligence targets throughout the Cold War, the emergence of highly mobile Soviet military systems such as truck-mounted ballistic missiles and air defense systems presented a dangerous new threat to the United States and its allies.[28] The slow processing times historically associated with analyzing data collected by airborne reconnaissance assets no longer met the timelines required to detect and track these

emerging threats. By the time film was offloaded from reconnaissance aircraft, then developed, and finally analyzed, mobile targets could be long gone.

To meet the requirement for faster analysis, the Air Force took steps to shorten the exploitation process. Building upon the success of Combat Dawn operations in Vietnam, the Air Force established a similar intelligence ground station in Europe in 1979. The Tactical Reconnaissance Exploitation Demonstration System (TREDS) in West Germany was intended to process intelligence collected by the U-2 during a confrontation with Warsaw Pact forces. During reconnaissance missions, U-2s would transmit imagery and signals intelligence information to analysts at the TREDS ground station in real-time via a line-of-sight downlink.[29] Analysts could then assess the information and relay it to intelligence consumers long before the U-2 landed. This new intelligence infrastructure represented a significant advance in airborne reconnaissance as imagery or signals data collected from the battle zone could now be used to support operations that were already underway.

Although the system never saw combat service against the Soviets, it was deployed to Saudi Arabia during the Gulf War. Because TREDS enabled intelligence data to be analyzed in near real time, the location of suspected targets, such as mobile Iraqi SCUD missile launchers, could be relayed to strike aircraft for targeting within ten minutes of the U-2 collecting the image.[30] This shortening of the exploitation process and targeting cycle contributed to the destruction of at least 15 Iraqi missile launchers in the first week of the Gulf War.[31] In short, the ability to quickly analyze and disseminate intelligence gathered by airborne reconnaissance assets fundamentally reshaped commanders' expectations of intelligence, surveillance, and reconnaissance (ISR) operations and reinforced the need for real-time intelligence analysis to conduct modern military operations.

Despite the success of the Air Force enterprise during the Gulf War, the fall of the Soviet Union led to significant cuts in military and intelligence spending. As part of the post-Cold War peace dividend, Congress terminated funding to the TREDS program, but subsequently directed the Air Force to develop a similar intelligence ground station system based in the Continental United States. Drawing from the successes of TREDS, the Air Force established the Contingency Airborne Reconnaissance System (CARS) in 1994. CARS consisted of ground stations and intelligence personnel based at Langley Air Force Base, Virginia and Beale Air Force Base, California that could be rapidly deployed to exploit imagery and signals intelligence collected by the U-2 during military operations around the globe. When deployed, CARS needed to be positioned in close proximity to the area of operations because of the limited range of the down-link used to transmit data from U-2s to ground stations.[32] Langley's Deployable Ground Station-1 (DGS-1) was deployed to support operations in Haiti and Iraq in 1994, and Beale's DGS-2 was preparing to deploy to support Balkan operations in 1995 when advances in data transfer technology made the deployment unnecessary.

Using a communications relay system known as Mobile Stretch, or MOBSTR (pronounced "mobster" by Airmen involved with its operations), intelligence analysts could access data collected by U-2s flying in the Balkans without leaving their bases in the United States.[33] This marked the start of "reachback exploitation," the practice of analyzing intelligence gathered around the world by airborne reconnaissance assets at bases well outside combat zones. The ability to conduct intelligence operations in real time without deploying analysts to combat zones represented a fundamental change for the Air Force ISR enterprise that set the stage for the massive network that enables today's global RPA operations.

Reachback exploitation promised several operational and personnel benefits for the Air Force. Keeping analysts at home reduced the number of personnel deployed in combat zones, mitigating the high financial costs, personnel and logistical challenges, and physical risks associated with overseas deployments. Consolidating analysts at centralized ground stations also enhanced the operational flexibility of the Air Force's ISR enterprise. Rather than having deployed analysts supporting operations in a specific theater, the technology that enabled reachback exploitation allowed DCGS airmen to support a range of contingencies without ever leaving their base. An imagery analyst in California or Virginia might support a combat mission in Afghanistan one day, help search for roadside bombs in Iraq the next, and conduct a humanitarian support mission in Haiti later in the week.

CARS evolved into Air Force Distributed Common Ground System in 1996 and soon found itself responsible for analyzing intelligence gathered by the Air Force's growing fleet of MQ-1 Predator and RQ-4 Global Hawk RPAs. As demand for intelligence expanded following the 9/11 attacks, so did the DCGS network, The Air Force stepped up recruiting of intelligence personnel and established new ground stations in Korea, Germany, and Hawaii.[34] To manage this growing intelligence system, the Air Force established a new wing in 2003 that included subordinate units at five bases in America, Europe, and the Pacific. Active Duty Airmen assigned to the 480th Intelligence Wing (later Intelligence, Surveillance, and Reconnaissance Wing) were supported by an expanding network of Air Force Reserve and Air National Guard units who were needed to meet the seemingly insatiable demand for RPA coverage of the Afghan and Iraqi battlefields.

The development of data links, communications technologies, and RPAs that make up the Air Force's intelligence enterprise represent a significant advancement from Cold War-era

analysis efforts. The ability of today's analysts to quickly disseminate information to users in multiple theaters has increased the operational flexibility and effectiveness of Air Force ISR, but the mission of analyst airmen has remained unchanged over time: providing policymakers and warfighters with actionable intelligence that informs decision-making.

Inside the Air Force Intelligence Enterprise Today

Surrounded by fields where laborers harvest fruit, nuts, and rice, Beale Air Force Base – forty-five miles northeast of Sacramento – is largely hidden from drivers passing by on California Route 65. Only after turning down a winding two-lane road flanked by alternating plots of shoulder-high grass and fruit trees would they come across a drab brown U.S. Air Force sign and an equally drab cinderblock guardhouse marking the base entrance. The scenery changes little after passing through a checkpoint manned by armed, camouflage-clad members of the 9th Security Forces Squadron. The wheat-hued farmlands surrounding the base are interrupted only by a barbed wire-topped fence before continuing onto base, where the fields are dotted with nearly 2,000 cattle that graze on Beale's 23,000 acres of rolling grasslands throughout winter and spring.[35]

Several miles beyond the checkpoint is the first indication of Beale's key role in Air Force ISR operations. A windowless beige and brown warehouse with the phrase "Recce Town USA" emblazoned across it in massive mid-century cursive letters sits adjacent to a row of hangars. In the background, matte black U-2 reconnaissance jets – the modern descendants of Cold War aircraft best known for their role during the Cuban Missile Crisis – line the airfield alongside newer, remotely piloted Global Hawks, a regional jet-sized plane that resembles a Humpback whale with wings. Across base, another windowless complex houses Distributed

Common Ground Station-Two (DGS-2), an Air Force DCGS site where hundreds of intelligence airmen work around the clock analyzing imagery and signals data gathered by aircraft like the U-2, Global Hawk, Predator, and Reaper.

At the beginning of each shift, personnel assigned to DGS-2 walk under a sign that reads, "Eyes and Ears of Freedom," reminding them of their part in America's global RPA program. These analyst airmen, along with their counterparts stationed at Air Force installations around the world, are a vital component of America's RPA operations. While "front-end" RPA crewmembers control the aircraft – and in the case of armed RPAs, fire their bombs and missiles – from places like Creech Air Force Base on the northern outskirts of Las Vegas, intelligence analysts on the "back-end" work 24 hours a day to help pinpoint insurgents, track enemy movements, and communicate intelligence information to consumers ranging from frontline soldiers to generals at military headquarters.

After passing through a series of badge checks and biometric scans, analysts began their shifts with a pre-mission briefing.[36] Members of the outgoing crew reviewed intelligence updates, identified issues with analysis or communications systems, and most importantly, listed the missions that the crews would "PED" – process, exploit, and disseminate – during the shift. The briefing identified which ground units the missions would support and highlighted any intelligence about the target area. Following the pre-mission brief, analysts shuffled across the hall onto the operations floor to begin their eight to twelve hour shift.

The DGS-2 operations floor was a cavernous, windowless, room crammed with hundreds of computer workstations, each with at least two monitors that allowed intelligence airmen to analyze full motion video or imagery streaming from reconnaissance aircraft while simultaneously monitoring classified chat rooms with messages from ground forces, command

centers, and other intelligence platforms. The illumination in the room came largely from the seemingly endless rows of computer monitors, which cast an electric glow on the faces of DCGS airmen. Digital clocks displaying the time in Afghanistan, Germany, and Greenwich, England, along with dozens of big screen televisions broadcasting cable news or RPA video feeds provided lighting around the perimeter room. The few times each year when the lights were turned on revealed a repulsive mess of fist-sized dust bunnies, candy wrappers, and the occasional dehydrated apple core hidden under analyst workstations.

DCGS crews were led by an intelligence officer and comprised of airmen representing several intelligence disciplines. A majority of DCGS airmen were imagery analysts, with signals analysts who assessed communications and electronic data, and all-source analysts who fused intelligence from a variety of collection sources making up the rest of the crew. Analysts spent the bulk of their shifts on the operations floor analyzing data collected by a variety of manned and remotely piloted ISR aircraft including the U-2, unarmed RQ-4 Global Hawk RPA, and the armed Predator and Reaper, which have become synonymous with Washington's use of RPAs to carry out strikes on suspected terrorists and insurgents.[37]

The DCGS enterprise received its mission taskings from regional air operations centers, command posts responsible for planning and overseeing air operations in a given region of the world. In the case of operations in the Afghanistan and elsewhere in the Middle East, planners at the 609th Air Operations Center – a sprawling complex just outside Doha, Qatar – paired intelligence targets to specific ISR assets operating in the region.[38]

Requests for intelligence collection came from a variety of consumers that included everyone from special operations units posted at remote forward operating bases in the Afghan countryside to analysts sitting at U.S. Central Command's state of the art headquarters in Tampa.

Regardless of the consumer, the requests all listed the location of targets, the date the intelligence was needed, and a list of "essential elements of information" or EEIs. EEIs let analysts know exactly the type of information that customers were looking for. EEIs might ask analysts to identify the entrances to buildings, activity in suspected insurgent compounds, or indicators associated with illicit activity like improvised explosive device (IED) emplacement, narcotics production, or weapons trafficking.

Airmen at the 480th ISR Wing Operations Center (WOC) at Langley Air Force Base, Virginia then assigned processing, exploitation, and dissemination (PED) responsibilities for each ISR mission to specific DGS sites.[39] Each site's PED apportionment was based on its reported capacity, which was calculated using an algorithm that took into account the number of qualified personnel at a particular unit, the number of analysts on leave or in training, and any computer outages that might affect the ability of the unit to analyze imagery or full motion video.[40] Even though leadership from each site helped design the apportionment algorithm, there was little agreement over its accuracy. Analysts typically thought the capacity calculations overestimated the amount they could accomplish in a day, while wing headquarters demanded explanations when units failed to meet their daily capacity.

Regardless of the perceived accuracy of capacity calculations, the WOC issued a PED Tasking Order (PTO) several times each day, notifying the sites of their exploitation responsibilities.[41] DCGS sites were tasked to analyze both still imagery collected by platforms like the U-2 and Global Hawk and full motion video from the Predator and Reaper. Requests for high altitude imagery and full motion video both involved fulfilling EEIs, but the exploitation and dissemination processes differed.

Analysts exploiting high altitude still imagery generally produced annotated products that included an image overlaid with labels identifying important geographic or manmade features and suspicious activity. This type of intelligence product was best suited for planning purposes, helping to identify key terrain and threats prior to operations or to conduct battle damage assessments after air or artillery strikes. Still imagery was also used outside of combat zones to support humanitarian relief missions. For instance, Air Force intelligence analysts used imagery collected by the Global Hawk to help pinpoint access roads and helicopter landing zones following the 2010 Haiti earthquake and to find hotspots during wildfires in California in 2007.[42]

Many of these products were based on electro-optical imagery – visible light images similar in appearance to what might be found on GoogleEarth – but analysts also produced infrared and radar products that pinpointed ground disturbances, heat spots, and the presence of unnatural materials, which could indicate the presence of human activity or suspicious material like hidden roadside bombs. Once completed, these products were typically disseminated to units via classified emails, although more time sensitive information like the presence of suspected IEDs was relayed via chat messages or phone calls to units operating in the affected areas.[43]

When analysts supported FMV missions, they monitored live feeds from RPAs and delivered analysis in real-time to intelligence consumers using classified chat rooms. Real-time exploitation allowed analysts to support ongoing raids on suspected insurgent facilities and provide overwatch to convoys and patrols. Analysts typically worked in a two-member team with one analyst monitoring the feed streaming off a Predator or Reaper halfway around the world, while the other analyst relayed intelligence to ground users and coordinated with the front end crew that was flying the aircraft and controlling its imagery sensor. A more senior analyst and an intelligence officer oversaw these analysis teams.[44] Analysts helped fill EEIs and

searched for potential threats to ground forces like ambushes and snipers, communicating intelligence to customers using a unique shorthand: "3 MAMs, 500m NE of cmpd," for instance, notified ground forces that three military aged males were 500 meters northeast of a target compound. The extra set of eyes that DCGS analysts provided enhanced the situational awareness of ground commanders, helping them to "feel more comfortable" as they carried out their operations.[45]

DCGS analysts, however, did more than offer an extra set of eyes. Instead of just typing what they saw, analyst airmen attempted to enhance the value of the information they relayed. During their training analysts learned about adversary tactics, how to identify telltale signs of IED emplacement, and how to distinguish schools, mosques, and other protected infrastructure from lawful targets. Signals intelligence and all-source analysts also supported imagery analysts at the DCGS, helping to refine intelligence analysis by layering information collected by other sources.[46]

Officers serving as ISR mission commanders that oversee all activity on the operations floor also worked to enhance the quality of collection and analysis by coordinating with other intelligence assets to gather additional data on targets or working with ground units to clarify intelligence collection requirements. For instance, after analysts identified a suspected insurgent weapons cache in a still image collected by a high altitude Global Hawk, an ISR mission commander might coordinate coverage from a Predator or Reaper to get a closer look of the building or to monitory activity at the stockpile site. These skills and coordination processes took time to develop; tactics development often took years as intelligence analysis units built ties with flying units and supported units on the ground.

Despite being located thousands of miles from the frontlines, DCGS analysts had an intimate, yet one-way relationship with those they watched. Airmen exploiting RPA-collected full motion video typically spent hundreds of hours staring at a particular compound or village, building what intelligence personnel called "pattern of life." Analysts often knew who lived in a building, when they came and went, their sleep-wake cycles, and captured even private moments like restroom routines and acts of intimacy. Indeed, it was not unusual for analysts to watch their individuals walk to a secluded corner of a field, squat, and few minutes later stand up to reveal a mass that an RPA's infrared camera showed as several degrees warmer than the surrounding earth. This ongoing and personal relationship between the watcher and the watched made the task of DCGS analysts real and tangible, far different than the fantasy videogames that critics often compared their work to.

DCGS analysts also developed close relationships with personnel in the units they supported. Over the course of long shifts across several months, airmen chatted with their counterparts sitting at computer terminals in Afghanistan and Iraq, building a unique form of camaraderie between fellow servicemembers who would likely never meet. Many became friends on Facebook, some DCGS analysts sent care packages stuffed with candy, wet wipes, and other essentials to their virtual counterparts, and deployed units often sent mementos and emailed photographs of weapons caches and IEDs discovered by DCGS airmen. The entrance foyer to DGS-2 in California was lined with U.S. and Afghan flags that had previously flown over bases that had received intelligence products produced by DGS-2 airmen. The close, but virtual, bonds between DCGS personnel and deployed troops helped motivate intelligence analysts who realized their work helped protect the lives of personnel not that different from themselves.

Analyst training, their relationships with supported units, and the DCGS's multidisciplinary approach to layering intelligence has paid off, yielding significant operational impacts. In early 2010, for example, DCGS airmen helped plan and execute a large-scale intelligence effort to support a Marine campaign aimed at disrupting Taliban networks in Helmand Province, Afghanistan.[47] During the operation, ISR mission commanders and their DCGS crews coordinated directly with supported Marine units and helped deliver imagery and signals intelligence that shaped ground operations. For instance, one ISR asset supporting the operation collected voice communications indicating IED-related activity. The ISR mission commander at the DCGS then coordinated to have a Global Hawk RPA collect imagery of the location identified in the voice communications. The following day, a Marine explosive-ordnance disposal team traveled to the site identified by DCGS reports, and located a 40-pound IED.[48]

DCGS analysts are also directly responsible for saving the lives of American personnel. In May 2012, for instance, a team of three young airmen stationed at Beale helped avert a fratricide incident while conducting real-time analysis of video streaming from a Reaper RPA operating over southwestern Afghanistan. A Marine unit on the ground was taking heavy fire from insurgents, and in the ensuing melee, six Marines became separated from the main formation. As the unit continued taking fire, ground commanders called for an airstrike on a group of men they believed were Taliban insurgents. DCGS analysts, overheard the airstrike request, and – based on the tactics and movements of the targeted men – quickly realized the ground commander was ordering a strike on his six isolated Marines. According to the citation of the Air Force Achievement Medal awarded to the DCGS analysts following the incident, the airmen "expertly identif[ied] a Marine sniper team that ground commanders had previously

mistaken as hostile insurgent forces…[and] rapidly and professionally communicated this critical information to an MQ-9 Reaper aircrew, averting an airstrike on friendly forces moments before a 500-pound bomb was released."[49] All six members of the Marine team survived, and the Reaper pilot and sensor operator later personally traveled from Creech to Beale to thank the analysts who had prevented them from ending the lives of six fellow servicemembers

Analyst Airmen

While critics of Washington's drone program often characterize the military personnel associated with drone operations as trigger-happy video-gamers, the men and women that walked under the "Eyes and Ears of Freedom" sign each day represented a cross-section of American society. To be sure, there were the young airmen who spent off-duty hours sequestered inside their rooms attached to computer and video games, but DCGS airmen represented a variety of socioeconomic classes, races, educational backgrounds, genders, and regions of origin. There was the forty year old mother, the pastry chef turned analyst, the gay twenty-three year old who went to boot camp after graduating from college, the Mormon father of four who balanced work with preparing to send his eldest son on a two-year mission, and the young airman who joined the Air Force to escape inner-city Baltimore. Some enlisted to continue a family tradition of military service, others signed up for the educational benefits or the promise to see the world, while some joined purely out of a sense of patriotism. Despite their varied backgrounds, these airmen shared a set of common bonds: they went through the same training, they worked to deliver intelligence to decision-makers, and they all faced the challenges associated with supporting combat operations from bases thousands of miles from the frontlines.

Airmen complete nearly a year of training before being allowed to analyze the video or imagery feed streaming from RPAs operating over combat zones. All airmen first spend eight weeks learning military customs and courtesies and survival skills as they transition from civilian to military life while attending basic training at Lackland Air Force Base in San Antonio, Texas. Upon graduation, new intelligence airmen are transferred some 200 miles northwest to Goodfellow Air Force Base in San Angelo, Texas, home of the 17th Training Wing, which provides much of the Air Force's intelligence training.[50] The roads connecting Goodfellow's north and south gates are dotted with Soviet-built fighter jets and American reconnaissance aircraft including Predator and Global Hawk RPAs, hinting at the base's intelligence training mission. During their first four months at Goodfellow, imagery intelligence analyst trainees learn basic interpretation principles, techniques and procedures for imagery exploitation, and practice the art of exploiting and disseminating information collected by both manned and remotely piloted aircraft.[51]

Upon completion of imagery training, analysts earn their intelligence badge – a small silver globe emblazoned with the outline of a skeleton key – and receive orders to their first operational base. Some imagery analysts are assigned to regional analysis centers and to organizations like the National Geospatial Intelligence Agency, but most are assigned to the five main active duty DCGS sites in Germany, Virginia, California, Hawaii, and Korea. Airmen destined for these sites spend another several weeks at Goodfellow attending the DCGS Intelligence Formal Training Unit, learning the specialized skills needed to support RPA missions.[52]

Training for imagery analysts is far from over once they arrive at their first duty station. While the instruction at Goodfellow provides airmen with the baseline knowledge to analyze

imagery, each DCGS site administers several more weeks of hands on mission qualification training to ensure airmen are ready to conduct analysis in an operational environment.[53] New analysts shadow more senior personnel, observing the nuances of real-world intelligence operations. Once analysts pass a series of classes, practical exercises, and written exams, evaluators assess their ability to serve as an imagery analyst. Only then do analysts gain the entry-level qualification to analyze imagery and video gathered by RPAs. Training continues throughout an analyst's DCGS assignment, with monthly currency exams, training on new systems or analytic techniques, annual requalification, and upgrade training to earn advancement to more senior quality control or supervisory positions.

The officers charged with leading these intelligence airmen shared similar backgrounds and motivations with their troops and completed a similar training pipeline. Some officers arrived as newly minted lieutenants fresh out of the seven-month Air Force Intelligence Officers Course at Goodfellow, while others reported to the DCGS after several operational assignments. The DCGS was a sought after assignment for most young officers who realized they could gain significant operational ISR and leadership experience during a standard three-year assignment. Indeed, after receiving their qualification to serve as ISR mission commanders, many officers were quickly promoted to serve as flight commanders responsible for overseeing the training, administration, and discipline of enlisted analysts. In many cases, lieutenants in their early to mid-twenties led upwards of 130 airmen, a vast departure from the rest of the Air Force intelligence enterprise where lieutenants were typically responsible for just a handful of troops.

Challenges

Despite their successes, the intelligence airmen supporting RPA operations face a variety of personnel and mission-related challenges. Like their front end crew counterparts, the unique nature of reachback operations introduced a set of stressors that earlier generations of Air Force intelligence personnel had not experienced. On top of the long hours and overnight and weekend shifts that make maintaining family and social lives difficult, DCGS analysts effectively commute to the warzone every day where they are asked to make decisions that can have life or death consequences for both friends and foes on the ground. Every eight to twelve hours, airmen shift from being citizens with everyday responsibilities, like childcare, laundry, and lawn maintenance, to warfighters responsible for tracking down, and in some cases helping eliminate, America's adversaries. At the end of their shifts, airmen return home to friends and families, unable to talk about the sometimes horrific sights they were exposed to during the duty day. One Air Force psychologist who worked with intelligence airmen described analysts as "going literally from combat to cul-de-sac in a short drive…They've gone from being eyes, head in the fight, and making critical life and death decisions, to then being involved in all the normal…responsibilities that we have, where they're a spouse, they're a parent."[54] Analysts repeat this routine on a near-daily basis, giving them little time to decompress from the stresses of war. This operations tempo contributes to emotional distress, burnout, post-traumatic stress disorder (PTSD), and suicide among DCGS personnel supporting RPA operations.[55]

Airmen working in the intelligence backbone of America's RPA program are immersed in a sensory milieu that was previously experienced only by those on the frontlines. Unlike their forerunners, who generally analyzed photographs several hours or days after they were snapped by a reconnaissance aircraft or satellite, today's analysts witness the horrors of armed conflict in real time. Crews watch high definition video as events unfold on the ground, and in some cases,

even hear the radio calls of ground units under fire. Jason Brown, the Air Force colonel who commands the 480th ISR Wing described how his analysts are "exposed to the most gruesome things you can think about that could happen on a battlefield…They find mass graves; they witness executions."[56] The Wing's flight surgeon noted that one in ten analysts witness a rape or act of torture within a year of analyzing intelligence from RPA missions.[57]

One former DCGS imagery analyst remembered the psychological trauma she experienced while analyzing video streaming from RPAs. She recalled witnessing men "bleeding out from severed legs" and "young soldiers…bleed[ing] to death on the side of the road…Horrifying barely covers it. And when you are exposed to it over and over again it becomes like a small video, embedded in your head, forever on repeat, causing psychological pain and suffering that many people will hopefully never experience."[58] This airman was not alone. Air Force-sponsored research, including studies conducted by the Air Force's School of Aerospace Medicine, revealed that DCGS intelligence personnel suffer from higher levels of psychological distress than their non-intelligence counterparts in part due to the "sensitive, high demand nature of the DCGS intelligence mission."[59]

On top of witnessing the effects of combat, analyst airmen are in a position where their analysis often shapes life or death decisions. For instance, an analyst's assessment as to whether an individual viewed through an RPA's sensor is digging an irrigation ditch or emplacing IEDs can dictate whether that individual subsequently becomes the target of an airstrike. To be sure, DCGS crews and ground commanders are guided by strict rules of engagement and leverage a variety of intelligence sources before making any call, but they often operate with limited information. For instance, ground units often provide vague descriptions of intelligence targets, informing DCGS analysts that they were searching for a "known Taliban facilitator" or

"nefarious actor" with little additional information. The knowledge that an incorrect assessment could end an innocent life placed a heavy burden on analyst airmen. The former DCGS analyst recalled the doubts she often experienced while supporting RPA missions, "What if it's a shovel, and not a weapon? I felt this confusion constantly[.]…We always wonder if we killed the right people, if we endangered the wrong people, if we destroyed an innocent civilian's life all because of a bad image or angle."[60]

These combat stressors were compounded by abnormal duty hours, high workload levels, and organizational leadership issues.[61] At the height of the Afghan surge, DCGS imagery analysts and officers typically worked twelve-hour shifts that could span overnight and through weekends and holidays. Long and odd hours – especially night shifts – made it difficult for personnel to maintain any semblance of a normal life. Analysts who were parents often had little interaction with their children, everyday tasks such as grocery shopping and medical appointments became substantial burdens that needed to be scheduled for days off, and maintaining a social life proved challenging for many DCGS airmen. One intelligence officer who served at DGS-2 in California described how the long hours had "physical effects" that caused exhaustion, and remembered spending her off days "catching up on sleep and chores, leaving little time for dating or friends."[62] To stay awake during their shifts, many analysts resorted to downing sugary energy drinks, which resulted in intelligence analysts having the worst cavity rate in the Air Force.[63]

Additional duties on top of analyzing RPA-collected intelligence added to the stresses of those assigned to the DCGS enterprise. Airmen were required to complete a much-loathed battery of mandatory annual training on topics ranging from computer security to religious tolerance, to draft performance reports and award nominations for subordinates, complete

community service, and to build products designed for internal DCGS leadership – like PowerPoint presentations of operational highlights – that provided no intelligence value to warfighters. During particularly busy periods that typically coincided with major coalition ground operations, analysts often worked for much of their shifts with little time to complete these ancillary tasks, exercise, or simply take a break from staring at video feeds and classified chat windows. This high workload led many analysts to view DCGS command staff as inept and inefficient, unable to control the workload for those in their charge. Airmen complained that their leadership often had unrealistic mission goals, did a poor job communicating how DCGS operations contributed to broader battlefield operations, and failed to balance administrative and operational requirements.[64]

These leadership shortcomings were exacerbated by the large numbers of personnel assigned to DCGS sites coupled with the relative inexperience of many front line supervisors. One former DCGS flight commander described how she was "overwhelmed" by the responsibility of leading 140 airmen working across different shifts as a newly promoted captain.[65] Because personnel operated across multiple shifts, officers and non-commissioned officers tasked with leading DCGS flights often had few opportunities to interact with all of their troops on a daily basis, making it difficult to build the type of trust and camaraderie needed in military operations. This high operations tempo, combat stressors, and perceptions of poor organizational leadership contributed to heightened levels of occupational stress and burnout among DCGS personnel. As a result, many skilled analysts chose to leave military service upon the completion of their initial enlistment.

The Air Force took several steps to improve working conditions for its DCGS airmen, but maintaining morale and retention proved difficult. Many squadrons reduced analysts' shifts from

twelve to eight hours and paid more attention to the psychological needs of airmen conducting reachback operations. To help mitigate the emotional stressors of experiencing combat, the Air Force began assigning mental health and medical professionals and chaplains with top-secret security clearances to DCGS sites.[66] These cleared medical providers and clergy members provided analyst airmen an outlet to discuss in detail their experiences supporting RPA operations and, when necessary, to seek medical care. Some DCGS sites even recruited therapy dogs that roamed the operations floor.[67]

Despite these efforts to enhance quality of life for intelligence airmen, they provided only a partial solution. Most intelligence analysts were reluctant to seek counseling for fear that receiving care from mental health professionals could jeopardize their top secret security clearances, a necessity for working in the DCGS and for the lucrative government and contract intelligence positions that many analysts hoped to secure after completing their military service. As a result, many analysts looked for ways to escape what they referred to as the "prison" of the DCGS operations floor.[68] Some airmen sought out "backshop" positions in training, tactics, and scheduling offices that worked more standard duty hours, others looked for deployments to break up the monotony of daily operations, while many simply separated from active duty service.

The challenge of manning the DCGS enterprise was compounded by the growing demand for ISR coverage. As the operations tempo increased, the Air Force stepped up recruitment of intelligence analysts and began offering reenlistment bonuses of up to $90,000 to retain skilled analysts.[69] In addition to recruiting new airmen, the Air Force transferred hundreds of already serving airmen into intelligence career fields. Airmen who had previously maintained nuclear weapons, provided medical care, guarded military bases, and repaired roads soon found themselves reporting for intelligence training. The Air Force also repurposed several Air

National Guard units – like a Massachusetts Air National Guard Wing that flew F-15 fighter jets – as DCGS intelligence units. Some of these "cross-trainees" were eager to conduct intelligence operations, while others were bitter about losing their flying mission or entering a new career field where their entry-level analytic capabilities were not commensurate with their rank and several years of Air Force service. At times, tensions arose between these cross-trainees and airmen who had entered the Air Force as intelligence analysts, with junior personnel becoming frustrated that they were subordinate to officers and non-commissioned officers who they perceived as lacking technical competence.

On top of personnel challenges, the vast separation between intelligence analysts and the units they supported generated a range of operational shortcomings. While there were countless success stories, both analysts and intelligence consumers frequently lamented that the DCGS enterprise operated like a factory that focused on quantity rather than quality of analysis. Indeed, many DCGS airmen were convinced that their commanders were motivated by production metrics like the number of images exploited or hours of video analyzed each day, without sufficient attention paid to whether the intelligence was of value to deployed forces and battlefield commanders. On the receiving end, deployed forces sometimes expressed concerns about unclear or inaccurate analysis of imagery or video. When issues arose, intelligence consumers often had difficulty contacting the DCGS analysts who had built a given intelligence product – particularly imagery that was not exploited in real time – because the duty hours of analysts and intelligence users often did not align.[70]

Although the DCGS continued to be a major source of decision-quality intelligence for deployed forces and decision-makers, some intelligence consumers turned to alternate intelligence providers to avoid the frustrations of dealing with the DCGS. One Air Force

intelligence officer who deployed to Afghanistan recalled that Army units that grew frustrated with their inability to contact the DCGS began channeling intelligence requests to in-theater units that conducted imagery and video analysis at deployed bases. When issues arose, "you could just drive across the base and talk to the analysts" rather than trying to get in touch with the DCGS.[71]

On top of difficulties with supported units, it also took time for the DCGS community to build relationships with the RPA crews they worked with. There were occasional tensions between back end intelligence personnel and front end crews, often over who had the right to make assessments of the video feed. Sensor operators, who controlled the RPA camera, often offered assessments, which frustrated many DCGS airmen who viewed the assessments as infringing on their analytical role. These conflicts subsided over time as tactics and processes were refined, and as analysts and RPA crews gained more experience working alongside each other.

To improve communication and coordination between ISR assets, analysis units, and intelligence consumers, the Air Force launched its ISR Liaison Officer program, which embedded intelligence officers and NCOs officers within ground, special operations, and naval units.[72] These liaison officers advised commanders on ISR operations and served as a conduit between intelligence users and the DCGS, helping to optimize Air Force ISR collection and analysis. Their reach was limited, however, as only a handful of liaisons were responsible for coordinating ISR across the four million square mile U.S. Central Command area of responsibility.[73]

Analysts also expressed concern that despite their extensive training, they could benefit from additional regional expertise. The demand for DCGS support to global RPA operations

meant that during a single twelve-hour shift, intelligence airmen might analyze data collected by RPAs in multiple combat theaters. It was not uncommon for an analyst to start her shift supporting a Reaper mission flying over Afghanistan, spend time analyzing Global Hawk images of Iraq, before finishing her shift exploiting imagery gathered over Libya. While analysts received semi-annual area of responsibility training that provided an overview of the operational environment and daily pre-mission briefings that covered each of their target areas, analysts wanted deeper substantive knowledge about regions where they worked. Analysts were generally comfortable analyzing intelligence collected in places like Afghanistan where they had previous experience, but sometimes felt less prepared to conduct analysis of new environments during contingencies such as humanitarian relief efforts and armed conflicts in new theaters.

Conclusion

The global employment of RPAs has become an increasingly central part of U.S. military operations. The worldwide reach of Washington's RPA operation, however, entails far more than aircraft like the Predator and Reaper and the crews that fly them. Behind each mission is a robust intelligence enterprise made up of teams of highly skilled intelligence airmen working out of advanced facilities located around the world. These analysts are supported by massive communication networks, tactics development programs, and training infrastructure that enable the real-time analysis of imagery and full motion video. The complexity of the intelligence infrastructure underlying Washington's RPA program differentiates American RPA operations from those of other states, and has significant implications for international stability and America's national security.

Critics fear that RPAs will have a destabilizing effect on international security, but these worries are likely exaggerated. To be sure, RPAs have proliferated widely with more than six-dozen states operating unmanned aircraft.[74] Today's RPAs, however, are less able to carry out aggressive activity than many pundits believe, and most are smaller and far less capable than those flown by the U.S. military.[75] More importantly, most states will be unable to quickly emulate the massive intelligence network that underpins American drone operations. Even if RPAs allow a state to carry out military operations with fewer political obstacles from a casualty averse public, the utility of these systems is limited without a robust intelligence backbone. While states can acquire drones with increasing ease, training personnel, developing infrastructure, and refining the tactics needed to transform RPA-collected information into actionable intelligence takes far longer and can require significant shifts in military culture. Indeed, bureaucracies are slow to change and it took decades for RPAs to become a key component of U.S. military operations.

Even after RPAs and their associated intelligence network are integrated into a state's military, commanders must learn to cope with the effects of sustaining reachback operations. Medical professionals must be trained to respond to the psychological stressors and burnout experienced by intelligence analysts, plans must be implemented to retain skilled airmen and improve the quality of life of those working long and abnormal shifts, and continual training and tactics refinement are necessary to keep analysts sharp.

In the near future, the more significant impact of increased RPA use will likely be felt primarily within the U.S. military as the services work to integrate the role of remote warriors like DCGS analysts into military operations. On one hand, the Pentagon has already made significant strides to incorporate RPA operations. Services have established training processes,

activated units, and refined tactics. At the same time, the military continues to wrestle with the unique personnel and operational challenges associated with remote operations. Recruitment and retention of skilled personnel, psychological health of intelligence airmen, and quality of analysis all remain key issues facing the defense establishment as RPAs and reachback intelligence analysis play an increasing role in modern military operations.

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