

The marker is 65 orbits, but USAF is already looking for what's next.

The Reaper Harvest

By Marc V. Schanz, Senior Editor

USAF photo by TSgt. Chad Chisholm

Intelligence collection from the air has become a defining mission for the Air Force in Iraq and Afghanistan over the last decade.

The Air Force is confronting a dispersed, elusive enemy who often blends in with populations in dense urban areas or remote mountainous terrain. The task of gathering near-real-time information on these militants and terrorists has fueled USAF's massive expansion of its remotely piloted aircraft fleet.

Since 2005 when demand for full-motion video from ground commanders ramped up along with combat operations in Iraq, the aircraft associated with this mission—the Predator and Reaper remotely piloted vehicles—have proliferated.

Col. James R. Gear Jr., the head of the Air Force's Remotely Piloted Aircraft Task Force, said that as of Jan. 5, the Air Force operates 50 combat air patrol equivalents in the US Central Command region. This consists of 48 MQ-1 Predator and MQ-9 Reaper orbits and two orbits of the high-altitude RQ-4 Global Hawk. These aircraft primarily perform intelligence-surveillance-reconnaissance collection missions and communications relay tasks.

The end state for the current RPA force structure, Gear told the crowd at a defense industry conference in Washington, D.C., on Feb. 2, will be 65 CAPs by the end of Fiscal 2013, a gradual acceleration of a program that as recently as a year-and-a-half ago aimed to hit 65 CAPS by 2015.

Mushrooming Demand

"When I started in this business [in 2003], ... we were planning how we were going to get to 24 CAPs by 2010," Gear said. The Air Force had initially underestimated demand, he recalled, but as the mission grows, the service has poured resources into ISR.

In January, Secretary of Defense Robert M. Gates announced the Air Force will apply a portion of its slice of the efficiency savings generated over the course of the Future Years Defense Program to buy more Reapers and move essential ISR programs from the temporary war budget to the permanent baseline budget.

Gear noted another metric USAF tracks closely: combat hours for the service's RPA fleet. It took 14 years to amass a million combat hours with the Predator and Reaper fleet, Gear noted,

A deployed airman marshals an MQ-9 Reaper on the landing strip at Kandahar Airfield, Afghanistan.

a milestone the Air Force projected it would hit in March. It will likely only take another two-and-a-half years to reach the two million combat hour mark, he added, as the RPA fleet expands toward its 65 CAP goal. According to the service's 2009 unmanned system flight plan, the Air Force anticipated a force objective of 319 MQ-9 Reapers, with the eventual phase out of the Predator and a path to achieve an all-Reaper force by Fiscal 2016.

As of December 2010, USAF boasted a total active inventory of 161 MQ-1B Predators and 55 MQ-9 Reapers. The final Air Force Predator was delivered in March. This year, the service will shift its resources to procuring Reapers and plans on backfilling MQ-1s as they slowly age out of the inventory. (USAF leadership anticipates the Reaper line will soon accelerate to producing four airframes a month.)

Less than two years after the Air Force laid out a unified vision for integrating its unmanned systems into ISR operations, the demand for information continues to

mushroom, even as new challenges loom in the near future, in post-Afghanistan ISR scenarios.

As the service sprints toward its goal of 65 CAPs, it is now in the process of shifting emphasis from its iconic MQ-1 and MQ-9 aircraft to the capability and effectiveness of the sensors and the processing, exploitation, and dissemination (PED) of imagery and intelligence. The service is also grappling with how to collect intelligence in airspace less “permissive” than the skies over Iraq and Afghanistan, as requirements are solidified and defined for the “MQ-X” Reaper follow-on aircraft.

Moving beyond CAPs isn’t easy, as the wars in Southwest Asia have reinforced perceptions of the RPA fleet, and what it can and can’t do. “These are the defining metrics that we became used to,” said retired Lt. Gen. David A. Deptula, formerly head of the Air Staff’s ISR directorate.

“It was not too big of a deal when all CAPs produced the same amount of motion video,” he said. Until recently, a Predator or Reaper would produce one streaming video feed per CAP. Now, with the development of the Gorgon Stare wide-area surveillance sensors, a given aircraft will be able to produce 10 streams, and with additional processing, can go up to 65.

“Folks tended to focus on the number of orbits, when in fact that’s just a means to an end. ... What we ought to focus on [is] the output on what the systems provide,” Deptula noted.

The assumptions laid out in the 2009 UAS blueprint are now being debated regarding the future of the Air Force’s ISR fleet.

Accelerated Technologies

Manned and unmanned systems must be integrated to increase capability, automation of manpower-heavy tasks must be accelerated, and systems must become more “modular” with standardized interfaces, better sustainability, and reduced costs.

The desired ISR effect is a product of the “integrated system”—and less a particular “truck,” or aircraft, according to the 2009 brief accompanying the UAS flight plan.

Gen. Philip M. Breedlove, vice chief of staff of the Air Force, observed that the acceleration of technologies such as wide-area surveillance, multiple aircraft control, and automation of certain PED processes will not only improve the effectiveness of the RPA fleet, but help shrink the personnel footprint of the RPA mission.

“The No. 1 manning problem in our Air Force is manning our unmanned plat-

forms,” Breedlove said last November while leading the Air Staff’s operations, plans, and requirements directorate. “About 180 to 200 people are required for a CAP,” he noted, including maintenance, launch and recovery, flying, and a large PED tail. “The intel take that we bring off of these things, to then break that out into the useable intelligence that informs our ground forces, that is a manpower intensive piece.”

The promise of new tools, such as the Gorgon Stare effort, is technology to improve collection abilities and cut down on the manpower required to glean valuable intelligence from the sensors collection.

“What we need to do is train machines to know rule sets, so that this machine is looking at this [type of intelligence], ... and this analysis machine is looking at [full-motion video],” Breedlove said. Technology can help find patterns and frequency, which can then be examined by a human.

As airframes proliferate, and sensors grow more advanced, new problems must

SrA. Gale Passe (l) and SrA. Jason Atwell (r) lift an inert AGM-114 Hellfire missile from its shipping case as they prepare to load it onto an MQ-9 Reaper. The load crew members are wearing gas masks to simulate loading procedures in a hostile environment.



USAF photo by SrA. Larry E. Reid



be confronted, Gear said in February. More bandwidth is required to facilitate ISR, and the pressure will increase as wide-area surveillance tools grow more capable and new high definition sensors, advanced radars, and “multi-INT” tools are integrated onto RPAs.

The Air Force will seek to move some of its collection activity to military satellites, but also use compression schemes on bandwidth-heavy data such as full-motion video and improve onboard processing tools. “We have to stop pushing all of the data from our aircraft to the ground and then have it collected,” Gear said. The concept of multi-aircraft control, where a single pilot could operate several RPAs at one time, is an idea that is “continuing to go well,” he said, and both the MQ-1 and MQ-9 are on a path to achieve this capability in the near term.

Referencing the Air Force’s recent “Technology Horizons” study, Gear said the Air Force in the coming years will move to invest in automation and autonomy technology, which will have large implications for RPA operations. At the same time, these new tools will present new problems to solve, such as policy, validation, and verification issues, as well as protecting aircraft from cyber intrusion.

The boom in ISR demand has pushed up the timeline on new technologies, but there have also been growing pains as the Air Force seeks to put the most

advanced sensors possible into battle over Afghanistan.

Gorgon Stare, a high-power airborne sensor pod capable of wide-area surveillance is one of USAF’s latest ISR advances. (The program’s existence was first reported just two years ago.) The sensor is a critical element of the service’s ISR transformation efforts, and will enable a Reaper to gather multiple video feeds, each of a different area of interest. Gorgon Stare is slated to deploy this year after a stop-and-start development.

No More Guess Work

Independent of an increase in aircraft, the Air Force would be able to add to the amount of ISR support with the pods, multiplying by a factor of 10 the amount of video and sensor data available on a single airframe, said Deptula in December 2009. This should put an end to one of the common criticisms of UAV surveillance: that they offer a limited, “soda straw” view of the battlefield.

The first set of three pods was scheduled to deploy in spring 2010 to Afghanistan, with three more sets of more advanced increment pods destined for theater by fall. By 2011, according to those initial plans, a single Reaper could gather 30 simultaneous feeds on a Gorgon pod, and in 2012, another increment could enable 65 feeds per aircraft.

Since then, the pod’s deployment date has slipped as testing difficulties beset

An artist’s conception of the future MQ-X, a follow-on to the Reaper. Various requirements for the new UAV are being considered, including stealth and an upgraded capability to operate in extreme weather conditions.

the project. In January, a draft December memo from the Air Force’s 53rd Wing at Eglin AFB, Fla., leaked to the press, indicating the Eglin testers recommended against fielding the sensor until several fixes are in place. Air Force testers said the program had “significant limitations that degrade its operational utility” such as deficient infrared performance, remote video terminal interoperability problems, and unpredictable system reliability, including a delay in imagery transmission between the pod and the ground station.

The Air Force’s senior leadership remains committed to the program. With Gorgon, intelligence analysts will not have to guess where to direct a sensor on a given aircraft, but instead will be looking at an entire area, said Maj. Gen. James O. Poss, the acting head of the Air Staff’s ISR directorate, in a January interview with the *Washington Post*. “There will be no way for the adversary to know what we’re looking at,” he added.

“This system is being fielded to meet a combatant command requirement for a persistent, wide-area surveillance capability that allows multiple users to access the data from one platform,”



added Air Force spokesman Lt. Col. Richard Johnson, in a Jan. 25 statement.

The program is in the first increment of a multi-increment program, with the second segment due to increase range and resolution capabilities of the sensor. Problems identified last year include three issues the Air Force has identified and moved to put fixes in place, Johnson said.

The first involved addressing a critical tech order shortfall, the second was Gorgon Stare's ground station image and grid coordinate generation, and the third was the remote video terminal compatibility.

"We're working all three issues and do not believe they will affect the deployment schedule," Johnson said.

Service leadership understands the importance of providing quick and actionable ISR to troops in the field, but the Gorgon Stare will not be fielded until the theater commander accepts the system, he noted. With advanced capability, and the urgency of combat in Afghanistan pressing these tools into service, USAF needs to make sure its force structure can handle the sheer volume of ISR it is tasked with gathering and exploiting. To a large degree, the most manpower intensive piece of the puzzle in the near term is the analysis and dissemination, Deptula noted, and how all this ISR is utilized in a netcentric environment. "There is going to be a lot of information; we can't just throw more people

at it," he added. Automated analysis, better managing the tasks marked for human scrutiny, and deciding which pieces of information are prioritized are important aspects of managing the rising tide of ISR.

Permissive and Contested Arenas

"We are swimming in sensors; we need to make sure we don't drown in data," Deptula said.

As technology improves, USAF leadership is also showing concern about conducting ISR operations in hostile air environments. "One has to remember that the current ISR fleet... is absolutely a permissive fleet," said Breedlove. "The Predator, the Reaper, the Global Hawk will not fly in contested [airspace] and will certainly not fly in denied airspace," he told reporters in November.

These requirements need to be addressed in the development of long-range systems, particularly the "family of systems" long-range strike concept currently favored by OSD leadership. "The ISR capability of that has to be able to exist, operate, and pair with the other parts of that system in a contested and denied environment," Breedlove said. Any future "air breathing" capability needs to be able to operate in permissive and contested arenas equally. "We need to look at that broad swath of capability and make sure there are no holes in it."

"The vulnerabilities are out there, and we've assessed them," Gear said in

A Reaper carries a set of Gorgon Stare sensor pods in this artist's illustration. The wide-area surveillance sensors will enable the UAV to produce 10 video streams, and up to 65 in later increments.

February, noting Reapers and Predators "are not well-suited" for future scenarios in elevated threat environments. USAF is evaluating a range of requirements for MQ-X, including jam resistance, electronic authentication, and ability to operate in varied weather conditions. Predator and Reaper aircraft have experienced operational difficulties in cold and icy conditions downrange, Gear noted.

"We probably do not need added capacity of the same capability," Breedlove said in November, when asked about growing the ISR fleet beyond 65 CAPs. "What we need is capacity in that area between permissive and that tougher denied environment, and I think the MQ-X is a good place to have that conversation."

In challenged airspace, Reapers and Predators would "start falling from the sky like rain," Deptula said, which is why interoperability is critical in the construction of the long-range strike system and the MQ-X program. They will need to disseminate information and interface with other advanced systems: Deptula said gathering ISR while facing integrated air defenses will be next to impossible without all the parts working together. ■