UAS

UNHEARD, UNSEEN, UNSTOPPABLE

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When the Air Force grounded all of its 700 F-15 Eagles in November 2007, following a mishap, the jet's firepower was noticeably absent in the war on terrorism for 18 days.

Sometimes the only Air Force bomb-carrying aircraft in Afghanistan during that time didn't even have pilots in the cockpit. Carrying the load was the service's deadly MQ-9 Reaper UAS, or unmanned aircraft system.

Able to carry as much as an F-15 or F-16 Fighting Falcon, the Reaper becomes more popular each day in war zones because of the bombs-on-target capability it provides. And its footprint is small: Reaper operators fly the unmanned aircraft from half a world away.

Today, the Air Force must operate with unmanned aircraft systems, and they are now part of the way the Air Force does business, from launching bombs in support of ground troops to providing real-time reconnaissance.

While some in the pilot community eyes the unmanned aircraft with apprehension, the new systems are the most-requested assets in Iraq and Afghanistan.

When the first of the unmanned aircraft, the RQ-1 Predator, became operational in March 2005, it only provided real-time "eyes in the sky" reconnaissance capability. But its success spawned the hunter-killer Reaper and the high-flying, long-range, reconnaissance-gathering RQ-4 Global Hawk.

The advantage unmanned aircraft systems have over manned aircraft is the human element. Pilots need breaks. Unmanned aircraft can fly from 20 to 30 hours without stopping. They all can "loiter" over an area for hours on end, thwarting developing enemy operations that could kill friendly forces. But that's only one advantage.

The Air Force continues to exploit each aircraft's capabilities — seemingly only limited by the users' imagination. The Air Force use of unmanned aircraft systems is still in evolution.

As Charles Darwin once said: It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change.

The following pages highlight the Air Force's main unmanned aircraft systems: Predator, Global Hawk and Reaper. Think of it as Unmanned Aircraft Systems 101.

RQ VS. MQ

RQ: "R" is a Department of Defense designation for reconnaissance. "Q" means unmanned aircraft system.
MQ: "M" stands for multi-role.

IN THE BEGINNING

Few may know that unmanned aircraft have been around nearly 100 years.

Just a few years after the Wright Brothers' historic flight, someone was trying to figure out how to remotely control and fly aircraft.

In 1917, Charles Kettering of Dayton, Ohio, invented the unmanned Kettering Aerial Torpedo, nicknamed the "Bug." The torpedo with wings could fly remotely to a target.

Launched from a four-wheeled dolly that ran down a portable track, the Bug's controls stabilized and guided it toward a target. After a set time limit, an electrical circuit would shut off the engine, release the wings and cause the Bug to plunge to Earth, detonating on impact.

The Bug never saw combat because fewer than 50 were built before the end of World War I. After the war, the U.S. Army Air Service stopped further development of the Bug because of fiscal constraints.

MQ-1

PREDATOR: BATTLEFIELD WORKHORSE

Editor's note: Some Airmen requested that we identify them by their call signs.

To say the Predator is unmanned is somewhat misleading. Yes, there is no pilot in the cockpit. But, it takes about 55 experts to operate the unmanned aircraft system during a 24-hour mission.

That's because the Predator is more of a system than an aircraft. A fully operational Predator system consists of four aircraft; a ground-control station that harbors the pilot, sensor operator and mission coordinator; a primary satellite link so Airmen can operate the aircraft from half-way around the world; and a forward-deployed launch and recovery element.

"Compared to the F-16, where the pilot makes most of the decisions, we now have a virtual cockpit with hundreds of people — if we need them — to give us the information to get the sortie done and the mission accomplished," said Col. Chris Chambliss, the 432nd Wing commander at Creech Air Force Base, Nev.

One way Predator experts do their mission is via remote split operations. This means a bulk of Predator personnel stay at Creech and remotely fly combat missions, while a small contingent deploys with the aircraft abroad. That's why Colonel Chambliss also commands Creech's 432nd Air Expeditionary Wing, fighting the war on terrorism from a base outside Las Vegas.

"We have a very small footprint forward that launches, recovers and maintains the aircraft. But back here it takes a large footprint of people to make the system work — operations and maintenance," the colonel said. He said there are also many imagery analysts around the world who interpret Predator imagery and provide it to customers.

Predator maintainers deploy to a war zone six months a year, on average. As "enablers," they are not included in the Air and Space Expeditionary Force schedule, but deploy when needed.

"Creech is a training ground for us," Staff Sgt. Jason Gregory said. "It takes about six months to train a new maintainer, and the minute they're trained, they're deployed.

"While deployed, we work six days a week, 12 hours a day," said the Predator crew chief with the 43rd Expeditionary Mainte-

UAS Cousin

BATMAV: Battlefield Air Targeting Micro Air Vehicle unmanned aerial system
Primary Function: Provide real-time, direct situational awareness and target information. Dimensions: Wingspan, 16.5 inches; length, 11.5 inches.

UAS Cousin

Desert Hawk: Force Protection Airborne Surveillance System
Primary function: Aerial reconnaissance. Dimensions: Wingspan, 4 feet, 4 inches; length, 2 feet, 10 inches; weight, 7 pounds.

The stabilized gimbal contains two color video cameras and a forward-looking infrared camera. It can transmit near real-time video imagery day or night in all weather conditions via satellite worldwide.

nance Squadron. "It's rewarding. We're sending aircraft up to do real missions — saving people's lives, taking out the bad guys."

Two years ago, the Predator's work pace wasn't as grueling because few people knew of its capabilities.

When Captain "Scamsky" switched from flying B-52 Stratofortress bombers to become a Predator pilot, some other pilots treated him like an outcast. He said many didn't grasp the importance of the new system.

"However, as time passed, and ground commanders are asking for more and more Predators — the most requested asset in the war — I think the mentality of people started to change," said the member of Creech's 15th Reconnaissance Squadron.

"They're realizing the importance of the platform and what we bring to the fight," the captain said. "Every time they say they need more, we send more into the sky. That's how we help the guys on the ground find the bad guys."

Predator evolution is the cause of the flood of requests coming in from combatant commanders. Its capability to gather near real-time video imagery, day or night, in all types of weather, is popular with troops on the ground. And it fires Hellfire missiles.

The Air Force owns the unmanned aircraft system, but Soldiers, Marines and special forces determine its operations tempo.

So the Predator community continues to tweak its missions to better serve ground troops. For instance, because it can loiter for so long, one Predator mission is to find improvised explosive devices — and actually try to catch the enemy planting them.

The exponential growth of the Predator's spawn, the MQ-9 Reaper, doesn't mean there will be fewer Predators. Colonel Chambliss said the Air Force is still buying Predators to continue its role as an intelligence gatherer, or to engage the enemy when needed. At the same time, Reaper is evolving into a close-air-support aircraft, like the A-10 Thunderbolt II.

As time goes on, and the Air Force changes the Predator system to better serve ground troops, its role may change yet again, the colonel said.

Only time will tell.

PREDATOR PROGRESSION

When the Predator first appeared, the Air Force used it strictly for unmanned reconnaissance.

In 2002, it changed from an RQ-1 reconnaissance, unmanned aircraft system, to MQ-1, a multi-role unmanned aircraft system. When armed, it wasn't just an unblinking eye in the sky, but a tactical weapon to help coalition troops.

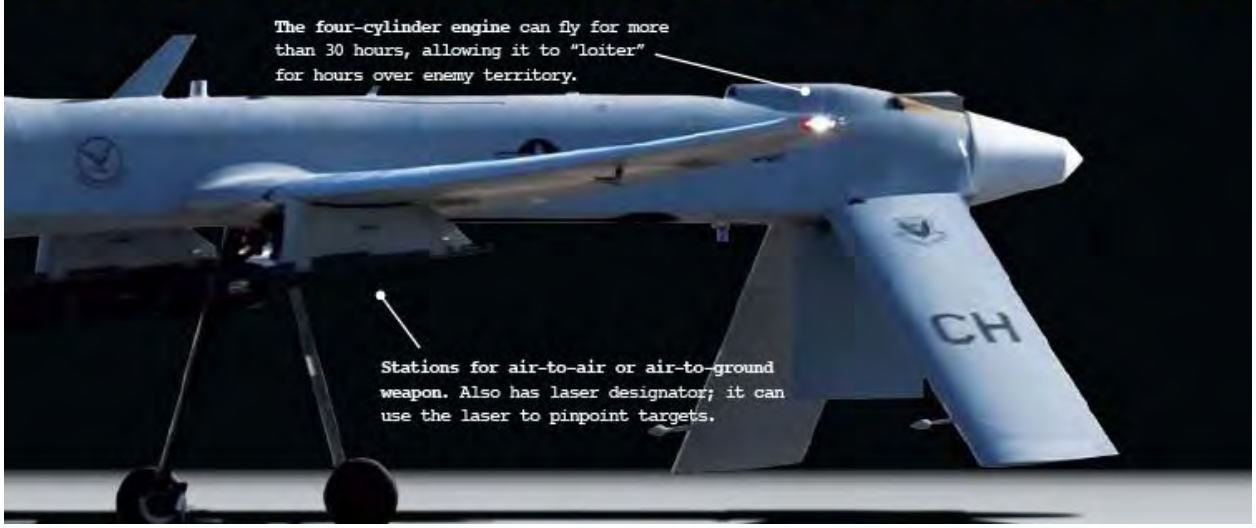
"Now we can fly close-air-support missions and do armed over-watch missions, in addition to many other missions," said Col. Chris Chambliss, 432nd Wing and 432nd Air Expeditionary Wing commander at Creech Air Force Base, Nev.

Predators are now the number one asked-for asset by troops in war zones.

To meet the increased need, the Air Force not only doubled the number of Predator combat air patrols over Iraq and Afghanistan, but it beat the 2010 deadline of 21 daily patrols by two years. Predators now provide 25 combat air patrols to U.S. Air Forces Central.

On average, the Predator logs 15,000 hours a month, said officials from General Atomics Aeronautical Systems Inc., Predator manufacturer.

About 85 percent of those hours were flown in combat zones, and add up to more than 465,000 hours since its inception. That's about the same distance as flying nearly halfway to the sun.



RQ-4

GLOBAL HAWK: ABOVE IT ALL

The RQ-4 Global Hawk might look a bit ungainly.

But many liken the high-flying, long-endurance unmanned aircraft system's reconnaissance mission to that of the venerable U-2. It cannot shoot full-motion video like the Predator. But it can take photos so quickly that they form a kind of stop-motion animation — like drawing stick figures on a page corner and making the figures "move" by quickly flipping through the pages.

Global Hawk can gather different types of images:

Electro-optical, which looks like what a TV camera might see, is the system's most-requested product;

Infrared imaging, which detects heat from such things as people, pack animals, vehicle engines and recently-fired mortar tubes; and

Synthetic aperture radar, specifically used in bad weather to spot objects like tanks, people, buildings and trees.

Each unmanned aircraft system has its own mission — and Global Hawk is no different. Sometimes those missions are part of a much larger cooperative effort, called "cross cue."

Global Hawk manufacturer Northrop Grumman said one incident illustrates the cooperative effort between Global Hawk and the Predator.

In November 2004, enemy forces were on the run, fleeing in multiple directions. Overhead were two Predators, a Global Hawk and two fighter jets. Two Predators followed one group, and the Global Hawk set its sights on the other. Both tried to track the bad guys to their hideouts.

When the insurgents came to a four-way intersection in a road, Global Hawk operators weren't sure which way they would go. So they quickly took pictures of each road, eventually allowing image analysts to determine the insurgents' route.

Global Hawk kept the track, then handed it off to the Predators — in what's called a cross cue — after they finished tracking the other group.

Mission complete. Game over.

The Global Hawk's specialty is to take images of wide areas so analysts can pinpoint areas of interest, then call upon other assets — fighters, Predators or Reapers — to investigate the area

MAKING SENSE OF THE IMAGES

Imagery analysts Airmen make heads and tails of imagery data.

They determine what Global Hawks see, said Lt. Col. Paul Wade, 548th Intelligence Group deputy commander, Beale Air Force Base, Calif.

With thousands of Airmen worldwide, the group analyzes images gathered by the U-2, RQ-4 Global Hawk, MQ-1 Predator and the MQ-9 Reaper.

"We make sense of the images quickly so we can pass that information to the folks on the ground in Iraq and Afghanistan," the colonel said. "Our people look at images and identify threats in the battlespace, or targets, and get that information to the people who need it."

The colonel said the people behind the scenes don't get enough credit.

"It's an amazing system, but we also need to give credit to the hundreds of folks who are exploiting this information during every mission," said Lt. Col. Jonathan Ellis, commander of Beale's 13th Reconnaissance Squadron. "We have folks in the fight every day who are basically the wingmen for convoys that are going through Iraq and Afghanistan — wingmen for the folks getting ready to engage the enemy."

Tech. Sgt. Donald Kunkel is an imagery analyst at Beale. After nine years on active duty, he joined the 222nd Operational Support Squadron of the California Air National Guard.

"We're like the Burger King of intelligence," the sergeant said. "Customers tell us what they want, and we give it to them."

Sergeant Kunkel said the need for intelligence imagery in Afghanistan and Iraq is huge, and that it helps to have a total force package to help with the war.

With 24-hour, on-station-endurance rate it can perform missions for different customers — from troops on the ground to theater commanders — all in one sortie.

With a maximum altitude of 60,000 feet, it can take imagery once only accomplished by U-2s.

more closely.

The Global Hawk mission, like the Predator and the Reaper, continues to grow as the Air Force finds more ways to exploit its capabilities. For instance, the Air Force is stationing the Global Hawk system in Hawaii to use its reconnaissance capability in the Pacific region.

The Global Hawk was used to help fight fires because sometimes smoke is so dense that it's hard to find hotspots using standard remote sensing techniques. So the Global Hawk's infrared and synthetic aperture radar images helped firefighters direct their efforts.

Global Hawk designers say it can also perform homeland security missions.

And the Global Hawk mission is also a perfect fit for the Air Force Reserve, said Lt. Col. Jonathan Ellis, 13th Reconnaissance Squadron commander at Beale Air Force Base, Calif.

"All of the mid-mission control is done here," Colonel Ellis said. Global Hawk aircrews remotely fly the unmanned aircraft system from Beale. "We take off from wherever the aircraft is, like 'you-pick-a-stan,' and we control the mission from here."

Reservists share the flying mission with Beale's active duty 9th and 12th reconnaissance wings.

"It makes perfect sense to me to have a reservist do this type of mission," Colonel Ellis said.

The colonel said that if a Global Hawk operator had to deploy for each mission, it would create a significant burden on that person, the person's employer and the person's family.

So the Air Force plans to increase the Global Hawk program by 85 people, enabling reserves to handle an entire mission, or orbit, on their own. The entire Global Hawk program currently calls for six orbits. If reservists get their way, they'd be fully responsible for one of those orbits.

"Many active-duty members don't even know about us," Colonel Ellis said. "They don't realize we're here. The running joke is that the only way you know Global Hawk is here is because we're the guys with the walkers. We're older."

UAS Cousin

RQ-11 Raven
Primary Function: Reconnaissance surveillance and target acquisition. Dimensions: Wingspan, 4 feet, 5 inches.

A big engine allows the aircraft to fly up to 350 mph. It gets over an area of interest, take care of business, then gets back.

Used mostly for reconnaissance, it provides high-resolution, near-real time imagery of large geographic areas, through all weather conditions, day or night.

MQ-9

REAPER: THE DEADLY SPAWN

Like the MQ-1 Predator, MQ-9 Reaper missions take a team of experts to accomplish: a pilot, sensor operator, mission coordinator and a host of other support experts.

The Reaper is larger and more powerful than the Predator and designed to get to targets quickly to either destroy or disable them.

"We employ it like an attack squadron," said Col. Chris Chambliss, commander of the 432nd Wing and 432nd Air Expeditionary Wing at Creech Air Force Base, Nev.

And requests for the hunter-killer are ever rising.

To meet the increased need for the unmanned aircraft systems, "We have the Nevada Guard and Reserves, and our British coalition partners, right next to us flying and maintaining these aircraft," the colonel said. "It takes a lot of people to make this mission happen."

Reaper aircrews are currently flying two combat air patrols a day over the war zone. The colonel expects that to soon increase to three.

"Supporting combat troops on the ground when they get into a firefight and call for air support — and we're able to provide it — is the greatest satisfaction I get," said Captain "Nester," a Reaper pilot with Creech's 42nd Attack Squadron.

His sensor operator, Sergeant "Tube," says he feels a weight of responsibility on his shoulders, especially as an enlisted aircrew member.

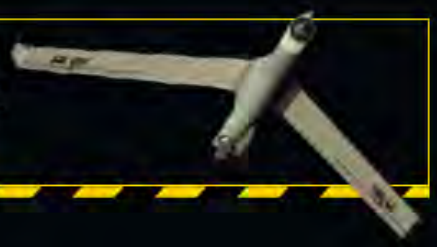
"I sit next to a pilot who has years of pilot training. The responsibilities I have are amazing," the sergeant said. "I don't know where else I'd be able to do this in any other career field."

The pilot, sensor operator and mission coordinator —normally in the intelligence career field and who helps coordinate the mission and ensures customers get what they need — work as a team. The pilot controls the aircraft and the sensor operator controls the "unblinking eye" of the aircraft's optical lens.

"We need to be coordinated to where 'Tube' is looking during the critical stages of the flight to provide the support needed for

UAS Cousin

Scan Eagle
Primary Function: Situational awareness and force protection. Dimensions: Wingspan, 10 feet, 2 inches.



With a turboprop engine that provides 900 horsepower of thrust, the Reaper can travel up to 230 mph, getting to targets quicker.

the combat troops on the ground," the captain said.

When aircrews are not flying combat missions, they're flying training missions.

"On any given day, we could be doing either. But, typically, we don't do both on the same day," the captain said.

But training and real-world combat missions meld.

"With the request for Reaper support intensifying comes the need for more Reapers, which increases the need for more students, which means more instructors — it affects the entire pipeline," the Reaper pilot said.

More Reaper training requires more people, equipment and money to meet mission needs. That's why Creech is growing like a weight lifter on steroids. The wing stood up Nov. 1, 2007, with about 600 people. It expects to have 2,000 by the end of 2008, Colonel Chambliss said.

"We're experiencing an explosive growth, and that doesn't even include the associate units we have with the Guard and Reserves," the colonel said.

At no other location is training so obviously important than at Creech, he said. The minute pilots and sensor operators graduate, they begin flying combat missions.

"Training is the key enabler to combat missions. So having it collocated with the combat mission is really priceless," Colonel Chambliss said.

Airmen at Creech not only maintain and fly the Reaper and Predator, they provide the training and fly combat missions from there, too. This gives them a unique opportunity to quickly adapt or change the Predator and Reaper to meet the needs of troops on the ground.

"We're continuing to grow both systems," Colonel Chambliss said. "With the Reaper — as we discover what we can do with the airplane — we're going to do more with the system as we discover new ways to use it."

Troops on the ground can't wait.

REAPER MADNESS

When the MQ-9 Reaper first started flying, the need was so great for the unmanned aircraft system that the Air Force put it into combat a year earlier than expected.

It made its debut at Bagram Air Base, Afghanistan, in May 2008. Operators use it as a hunter-killer against emerging targets, a surveillance platform and a real-time data gatherer for combatant commanders.

"We put it into combat without knowing everything about it. But the Air Force needed to get the Reaper capability into the field," said Col. Chris Chambliss, the 432nd Wing and 432nd Air Expeditionary Wing commander at Creech Air Force Base, Nev.

After substituting for the F-15 Eagle, when the Air Force grounded it in November 2007, the Reaper quickly proved itself in the war zone, Colonel Chambliss said.

"That increased everybody's confidence in its use, and increased the amount of missions we fly," the colonel said.

"Right now, we're using Reapers to carry bombs and missiles. But it could easily switch to carry electronic attack payloads, or something else. As we proceed with the Reaper, we're going to discover more and more about what we can do with it," he said.

The Reaper can fly at 50,000 feet. The reduced sound signature makes it stealthy.

Twice the performance of the Predator, it has six wing stations for external payloads — meaning it can carry more firepower.

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