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UNMANNED SYSTEMS SPECIAL REPORT

THE HIGH AND THE MIGHTY

How next generation of UAVs redefines the limits of endurance at all altitudes

GLOBAL HAWK

Gold standard

Northrop's high-altitude, long-endurance air vehicle is the jewel in the crown of the Pentagon's UAV family

GAYLE PUTRICH PALMDALE **CUTAWAY**
DRAWING GIUSEPPE PICARELLA



Northrop Grumman

Northrop says Block 40 is “an added capability, but more of a surveillance capability and less for reconnaissance”

It is easy to forget that the now-ubiquitous unmanned air vehicle that will be the subject of numerous presentations at AUVSI's Unmanned Systems North America 2010 exhibition in Denver was originally deployed to Afghanistan in 2001 as a prototype pressed into early service.

Nine aircraft in what is now known as the Global Hawk's Block 10 configuration were built in initial low-rate production, which, in a rare move for the US Department of Defense, ran concurrently with the engineering and manufacturing development of the UAV.

Since then, the programme has grown into the Pentagon's gold standard for high-altitude long-endurance UAVs, alternately garnering praise and ire from the DoD – praise for its capabilities and ire for its cost and schedule. In that time, Global Hawk has also evolved into a variety of iterations, each with unique capabilities. Soon a new version, the Block 40, will roll off the Palmdale, California production line and into service on a mission slightly different from its elder cousins.

Now known as the Dragonlady's probable killer, the RQ-4 Global Hawk, built by Northrop Grumman, is set to replace the U-2 spy-plane, but only in its Block 30 reconnaissance configuration, says Ed Walby, Northrop's unmanned air system programme's director of business development, and himself a former U-2 Dragonlady driver.

“In looking at the Global Hawk fleet, the Block 30 is the U-2 replacement and the backbone of long-endurance high-altitude reconnaissance for the United States Air Force,” says Walby. “Block 40 was an added capability, but more of a surveillance capability and less for reconnaissance. The Block 40 is for intelligence and surveillance, which is a slightly different community and a slightly different mode of operation. Although there's a lot of crossover.”

To tell one member of the Global Hawk family from another from afar – without the benefit of the operator's own markings, from NASA to the German air force – requires a keen eye for detail. At air shows where the massive full-scale mock-up is on display, it

has become standard operating procedure to change out payloads, belly plates, and markings on a daily basis, essentially showing off a different aircraft each day. The matter of hours it takes to make the change from a US Navy Broad Area Maritime Surveillance (BAMS) to a German air force-designated EuroHawk aircraft is a testament to the fact that much of the difference between the aircraft lies in sensors, payloads and software rather than wingspan and powerplant.

Both the Block 30 and Block 40 aircraft have a 39.3m (131ft) wingspan and have the massive wing delivered fully assembled in a purpose-built box atop an over-long tractor trailer with front and rear drivers. The first 33m of the wings are also the UAV's fuel tanks, powering the single Rolls-Royce AE3007H turbofan engine.

The biggest differences can be found in the undercarriage. The new Block 40 aircraft have a considerably smaller, squared-off plate on the bottom of the 14.5m body to the Block 30's more bubbled belly. The 1.2m payload compartment houses the Block 40's game-changing radar system, the multi-platform radar technology insertion programme (MP-RTIP) sensor.

EVALUATION

The first MP-RTIP was delivered to Edwards AFB in California in late July for integration and operational evaluation. A test of the full system is expected “shortly”, Walby says, although preliminary results already have him impressed.

“It does what no other radar sensors today can do,” Walby says. The high-fidelity radar imaging system allows the MP-RTIP sensor operator to simultaneously collect synthetic aperture radar (SAR) and ground moving target indication imagery (GMTI) for multiple targets.

Flying at altitudes up to 60,000ft for more than 32h per sortie at speeds approaching 340kt (630km/h), the MP-RTIP-equipped Block 40 Global Hawk will be able to see persistently through most types of weather, day or night, searching for multiple targets, in multiple modes.

“In looking at the Global Hawk fleet, the Block 30 is the U-2 replacement”

ED WALBY

Northrop UAS business development director

When fully fuelled for flight, the Block 40 weighs about 14,600kg (32,200lb). More than half the UAV's components are constructed of lightweight, high-strength composites, including its wing, wing fairings, empennage, engine cover, nacelles and three radomes. Its main fuselage is standard aluminium, semi-monocoque construction. Walby calls the \$13,000 per flight hour cost to operate the \$35 million aircraft “surprisingly cheap”, especially when compared with the \$35,000 per flight hour price tag of a U-2.

The Global Hawk family's US DoD designation – RQ-4 – may belie the Block 40's true calling. “R” is the Pentagon's designator for reconnaissance, “Q” denotes an unmanned system and “4” refers to it being the fourth of a series of purpose-built UAVs. But the true calling of the Block 40 carrying the MP-RTIP is surveillance, not reconnaissance, Walby says.

MIXING COMMUNITIES

“There's the Block 30 and the U-2, and there we're looking at a big I [for intelligence], a little S and a big R for reconnaissance,” he says. “But when you're talking about Block 40, that's big I, big S, little R. When you say any platform is an ‘ISR platform’, you're mixing communities, and the funding stream and the requirements come from different places.”

Reconnaissance missions are typically more oriented for long-term intelligence-gathering purposes. The surveillance mission is much more integral to the kill chain, Walby explains, with more tactically oriented operations servicing the short-term decision-making process. Which is where the new MP-RTIP sensor comes in.

Although it now appears to be on its way to becoming a useful sensor and successful programme-within-a-programme, Walby esti-

» mates the radar is the cause of around one-third of the Global Hawk cost increases that have given the USAF so much heartburn in recent months. Originally planned to be a shared cost between Global Hawk and other platforms that would also carry the sensor, including the cancelled Northrop E-10 Multi-Sensor Command and Control Aircraft, the development costs have ultimately fallen on the UAV programme instead.

“What happened there was not a fault of the technology but a fault of the administrative and acquisition processes,” Walby says. “The ‘MP’ was supposed to be for ‘multi-platform’ and when the E-10 went away, all of the things that were going to be developed for the E-10 and slide over into Global Hawk Block 40 went away, so all of that development was put on the back of the Global Hawk programme, because that was the only platform that was going to ‘share’ the sensor. And that gets lost in the shuffle.”

Although development costs have been high – how high exactly was not disclosed – Walby and Global Hawk’s engineers say it was worth it for the “unique capability” that resulted.

“What R-TIP does today just scratches the surface of its capability,” Walby says. “There are some things that we were told it could not do that we’ve already demonstrated. The physics tells you that it shouldn’t be able to do this that well and it actually does it much better.”

The ability to switch between SAR and GMTI functions without interrupting the other function’s sweep is revolutionary for sensor operators trying to get information to commanders as close to real time as possible. The fast, high-fidelity, near-literal imaging is critical for time-sensitive targeting, Walby says.

“You don’t have to shut down GMTI for a SAR hit just to see why one truck of the 100 you’re tracking has stopped moving,” he says.

ROADSIDE BOMBS

Being able to differentiate between moving objects from humans to house cats will allow for better decision-making as teams attempt to track if, when and where roadside bombs are being planted.

“The application is very significant in war-time,” Walby says. “It’s the track that gives you the intent of that moving target.”

US Central Command (CENTCOM) has cited a lack of GMTI capability as a serious shortfall in theatre, and the Block 40 Global Hawk will be able to fill that gap and then some. But the question remains, when? The Block 40 is far from being the first in line out of the entire Global Hawk family when it comes to testing.

Following the MP-RTIP’s hefty price tag, the other stumbling block for fielding the Global Hawk’s Block 40 configuration is the rest

DEVELOPMENT GAYLE PUTRICH PALMDALE

PROGRAMME COSTS UPSET THE PENTAGON

WHILE THE overall RQ-4 Global Hawk programme moves along, the Pentagon has repeatedly voiced its displeasure over the unmanned air vehicle’s cost and the pace of production in recent months.

Northrop Grumman countered first on the defensive, and later, at the Farnborough air show in July, went on the offensive with accusations of its own for the US Department of Defense

In June, the Pentagon’s top weapons buyer, Ashton Carter, and US Air Force assistant secretary for acquisition David Van Buren separately told reporters they were disappointed with the cost of the air vehicle and that testing has been slower than expected.

“I am not happy with the pace of that programme and we are not happy with the cost of the air vehicle,” Van Buren said.

In a rare, on-the-record roundtable with reporters, Van Buren gave a laundry list of reasons why he – and the air service – is dismayed with nearly every aspect of the programme: the high cost, the lengthy testing and delivery period, the programme’s pace, the sensors on the aircraft and even the aircraft itself. Testing and delivery of the Block 30 aircraft in particular was slower than expected, he said.

Northrop quickly countered, arguing that the USAF is well aware of overall cost reductions on Global Hawk’s Block 20, 30 and 40 systems and associated payloads. “While there have been cost spikes within production lots due to the quantity procured within each lot, overall cost of the air vehicle and the sensors is trending down, as the company predicted and expected,” the company says.

“Additional cost reductions have been identified by the company and will be evaluated for suitability.”



Global Hawk has put the Pentagon’s nose out of joint

Weeks later, at Farnborough, Northrop executives took another swipe at the Pentagon’s complaints, calling the accusations that the Global Hawk is expensive and unreliable “exaggerated” and that the real problems with the programme lie in “issues with controlling requirements” and overuse of the platform.

“Global Hawk suffers from a lot of masters,” says Ed Walby, Northrop director of business development for the high-altitude UAV. “There are issues with controlling requirements and a lot of evolving requirements. Trying to capture all of those to satisfy all the customers becomes quite difficult.”

High demand has increased some costs, he says. Combatant commanders have asked to fly the Global Hawk far more than contracted. “In one case, six times its required operational capacity,” he says.

Flying so much more than originally anticipated means more spare parts are required to keep the aircraft running and more operations and maintenance funds are spent.

The UAV is reducing in cost and is very reliable, Walby says. In 2009, only two sorties were cancelled because of maintenance, he says, out of more than 250 scheduled missions.

At the same time, the US military buys the RQ-4 at the fairly low rate of about four a year. Northrop could build up to 12 a year, Walby says, and at a lower cost. “I like to say it’s basically ‘buy 10, get one free’,” he quips.

Meanwhile, air force and navy leaders have been working to increase the commonality between the Global Hawk fleet and the Broad Area Maritime Surveillance (BAMS) programme. The focus has been on sharing systems and components in the ground systems for both fleets, as well as working out production efficiency with Northrop.

Just before leaving town for summer holidays, the House Armed Services Committee seemed to side with Northrop in the debate, denying a Pentagon reprogramming request to move \$71 million from the RQ-4 Global Hawk programme to spend elsewhere.

The committee noted that the “programme has been consistently underfunded in the area of spare parts”, in a 30 July letter from panel chairman Republican Ike Skelton, to DoD comptroller Robert Hale. “The committee encourages the air force to obligate these funds as soon as possible in order to support ongoing operations.” ■

COVER STORY

SPECIAL REPORT

» of the Global Hawk programme.

Squeezing the Block 40's required Independent Operational Test and Evaluation (IOT&E) into Edwards AFB's already busy schedule has been difficult bordering on impossible, engineers say.

"We're going to have six Block 40s ready to go, sitting on the tarmac for about a year or so, waiting for IOT&E. Not because anyone is trying to be bad, but there's not enough room in the schedule to do IOT&E today for it," Walby says. "If there was room at Edwards to do it today, we'd be doing IOT&E today. When I say today, I mean within the year. But there are other competing priorities, higher priorities, for Global Hawk programme."

If some of the capability for Block 40 suddenly became a higher priority than something else that is currently ahead of Block 40 for flight time, things could change, he says. "The debate is, and I'm speaking of Block 40, is that something that's needed right now or can that wait? And it all has to do with capacity to get it out there."

The USAF's Air Combat Command is close to fielding the Block 30 aircraft now, with UAVs expected at Guam's Andersen AFB in late August or early September, followed shortly by a deployment to Sigonella NAS in Sicily before the end of September. From there, CENTCOM is expected to replace its existing fleet of Block 10s with Block 30 UAVs in 2011.

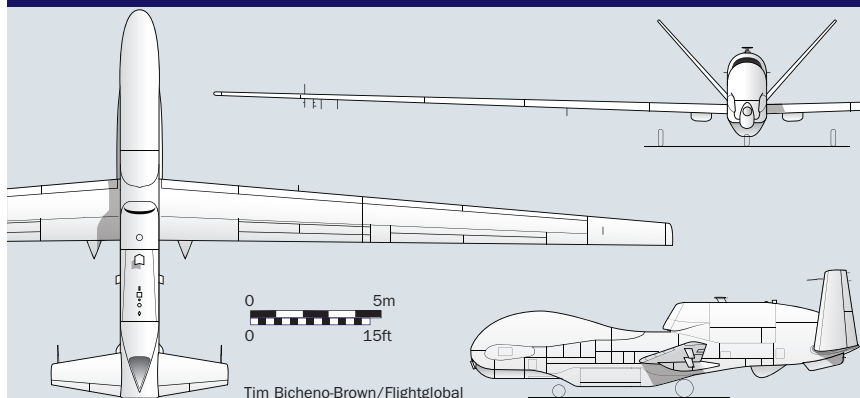
"There's still a debate, should we move aircraft into CENTCOM, the 30s, faster?" Walby says. "And while this whole debate is going on, accelerating getting things, getting ready, you get the establishment saying we must contain costs, we must contain requirements and on the other hand, you've got war fighters asking for more. Real world meets the established world of acquisition."

He adds: "That's where the acquisition world always comes in conflict with the real world. The real world is the war in Afghanistan and Iraq. And acquisition world tries to contain costs and tries to contain requirements so that you can field something. The acquisition process, in some cases, tends to be somewhat rigid, and for a reason. They're not trying to be mean, they're trying to field assets as fast as they can."

TESTING SCHEDULE

Moving Block 40s to a more prominent place in the testing schedule would require a direct request from the combatant commanders. Even speeding up deployment of the Block 30s would be difficult under current testing restraints, Northrop's engineering team says. Although an agreement struck in December now allows the company to bring the UAVs back to Palmdale for some testing after an initial check at Edwards AFB, about 30km away,

NORTHROP GRUMMAN RQ-4 GLOBAL HAWK BLOCK 40



RQ-4 GLOBAL HAWK BLOCK 40

Characteristics

Wingspan	39.9m	Length	14.5m
Height	4.7m	Gross take-off weight	14,628kg
Maximum altitude	60,000ft	Payload	1,360kg
Ferry range	22,780km	Loiter speed	310kt
On-station endurance at 3,700km	24h	Maximum endurance	36h



To tell one member of the Global Hawk family from another from afar requires a keen eye

which does create a little breathing room on the Edwards flightline.

Northrop is also doing additional developmental work on its own, Walby says, hinting at progress and testing on the Block 0 aircraft now in the hands of NASA that could ultimately offload even more tasks from the Cold War era U-2 on to the Global Hawk platform. Working with NASA on aircraft not beholden to the air force's schedule allows Northrop leeway to set some of its own priorities. "We're doing an awful lot of internal investment to

try to get through some of those conflicts on what is a priority and what isn't. I'm not at liberty to tell you what those are specifically... but there may be some capabilities in U-2 that are important and not on the schedule for a year or two that might be accelerated by the company as a demonstration," Walby says.

"Profit and loss is not the focus of our attention," he adds. "The focus of our attention is success of Global Hawk as a programme, because we know the potential for it to do more is so much greater." ■