Tech focus

This month's focus is on unmanned aerial vehicles.

Northrop Grumman progresses on road to UAV autonomy

"Those that lead the autonomy arena will lead the UAS [unmanned aircraft systems] arena."

The implication in that quote from **Northrop Grumman**'s Giorgio Accolti-Gil is that his company is a leader in both arenas.

With several UAV (unmanned aerial vehicle) products in operation and in development, it is hard to argue otherwise.

Since the 1999 purchase of Teledyne Ryan Aeronautical, Northrop Grumman has become a major player in the UAV arena. Shown are the company's Global Hawk (far left), Hunter (top), and Fire Scout.

Not that Northrop Grumman is resting on its laurels. "Northrop Grumman has demonstrated capabilities in 'on-vehicle' autonomy technologies," Accolti-Gil, Director of Engineering, said. "Global Hawk and Fire Scout have demonstrated autonomous operations and landing. So, we are one of the leaders. But our competition is working very hard also. There is still a lot that needs to be done.

"Over the past decade, we have seen a growth in the autonomy levels possible with unmanned systems. Higher levels of autonomy will be required to prevent a massive 'remote pilot' command-and-control infrastructure, which comes with additional technological issues including bandwidth and pilot overload. For UAVs to expand in numbers … autonomous technologies will lead the way—providing human-like decision capability for operation in civilian airspace, aerial refueling, and cooperating in teams, including manned/unmanned teams. When we talk about the success of UAVs, we must talk about safe operations in civilian airspace. The autonomy technologies most needed by the nation are equivalent levels of safety as a piloted vehicle in civilian airspace—A big challenge."

Advances in sensor technology and computing power have helped fuel the proliferation of UAVs, said Accolti-Gil. "Limitations today remain in command-and-control bandwidth, situational awareness, interoperability with manned aircraft, and integration into controlled airspace. But the nation has and is investing heavily to overcome these factors, in programs like UCAS-D [unmanned combat aerial system–demonstrator]."

The keys to future autonomy are more policy than technology, according to Accolti-Gil. "We are deeply involved in developing exciting new technologies in many areas, from sensor integration to propulsion and aerodynamics," he said. "The real questions become, 'What are the policies and requirements to ensure safety? How much money will it cost to convince the decision-makers that the airplane is safe to operate in civilian airspace, operate behind a manned tanker, operate in a team with manned assets, and someday carry and release weapons?'"

As a prime systems integrator, Accolti-Gil said, "Northrop Grumman is responsible for autonomous systems integration, which involves leveraging multiple technologies spanning vehicle-management systems, flight control, mission management, software, communications, sensors/payloads, and human-system interface. The company is constantly assessing the best-of-breed of component-level or subsystem-level technologies for integration into the optimum system-level solution. One example is the development of sense-and-avoid technology. Northrop Grumman is leading an AFRL-sponsored effort developing an overall system incorporating sensor technology, image-processing, and collision-avoidance algorithms to provide a fully autonomous capability, with the eventual plan being to incorporate the resulting system on the Global Hawk."

The Global Hawk today can fly missions in excess of 24 h, un-refueled, supporting war fighters throughout the world, said Accolti-Gil, who noted that the program recently achieved two significant milestones: 15,000 overall flight hours and 10,000 flight hours in direct operational support of joint war-fighting forces around the world. "Its ability to provide eyes-overhead 24/7 has helped mitigate numerous threats, enhance situational awareness, and shorten the kill-chain," he said. "Our road map contains both strategic and tactical UAV systems and pursuits with spiral capability growth plans."

Patrick Ponticel

Military applications driving UAV market growth

The growth of unmanned aerial vehicles (UAVs) for commercial use in the United States has been severely stunted by **FAA** restrictions, and it's unlikely those restrictions will be loosened very soon, according to **Frost & Sullivan**.

Even so, UAVs overall have a bright future, said Frost & Sullivan research analyst Lindsay Voss. That is mainly because of heavy reliance on UAVs within the U.S. **Department of Defense** and because of the DOD's aggressive UAV developmental initiatives. With an eventual loosening up of FAA restrictions, "I think you'll really see these markets emerge" over the next five to 10 years, she said.

Voss predicted that DOD funding for UAV RDT&E (research, development, testing, and evaluation) and procurement will rise from an estimated $1.3 billion in 2006 to $2.5 billion by 2013. Currently, so much money is being spent for UAV operations in the wars in Iraq and Afghanistan that there is great competition for military developmental dollars, said Voss. She noted that the UAVs deployed in those wars are performing excellently.

Reliability is still a concern, but that aspect of the UAV market should improve "somewhat" over the next three to five years, and more so over the longer term, Voss said.

With the competition fierce for DOD dollars, it is essential for companies overseeing development programs to keep them on schedule and within budget. Voss said the DOD has demonstrated that it will kill programs coming up short on those regards.

And while there is much money to be made in developing and selling UAVs, supplying components and systems for them is also a lucrative business—especially regarding sensors, according to Voss.

In addition to FAA restrictions, a factor retarding growth of UAVs in the commercial arena is cultural acceptance of them. A real education job is needed, said Voss, who noted that these factors are not as important in Europe as they are in the U.S. and help explain why UAV development is on a faster track on the Continent—and will continue on a faster track.

Fire monitoring is one of the many potential commercial applications of UAVs, she said.

Patrick Ponticel

EADS studies UAV modularity

With unmanned aerial vehicles (UAVs) very much the flavor of June's Paris Air Show, **EADS** took a novel approach, revealing its multi-role modular concept. On the opening day of the show, it was described as a "study."

But within four days the company made an announcement that effectively advanced it: "The defense ministries of France, Germany, and Spain announced that they have decided to move ahead with the joint project planning and development of a future tri-national modular system family of jet-powered, high-performance UAVs."

Different wing configurations are envisioned for EADS' modular UAV.

EADS explained that a "technical arrangement" between the three countries provides the basis for a subsequent study, the aims of which are to consolidate the capability requirements of the armed forces of the partner nations in the areas of unmanned surveillance and reconnaissance systems, and to propose "appropriate technical solutions."

"This decision is an important milestone to realize a future-oriented and truly European military program," said Stefan Zoller, member of the EADS Executive Committee for Defense and Security. "It also paves the way for the implementation of a modular, advanced UAV concept that efficiently closes identified capability gaps while at the same time immensely improving force interoperability in this future-oriented field."

EADS regards gas-turbine-engined autonomous UAVs as being suitable

both for long-endurance wide-area surveillance scenarios and for high-speed, low-altitude reconnaissance flights over combat zones. Gas-turbine powerplants provide required flight performance and onboard energy supply for powerful sensors and data links.

A senior EADS spokesman explained the thinking behind the modular system: "It comprises a main module—fuselage, tailplane, engines, landing gear, and avionics—to which can be added the required wings, payload, sensors, and data link for specific missions. That does not mean that we envisage wings being changed very quickly in the afternoon for a reconnaissance mission following a morning surveillance mission. But modularity does give the operator an opportunity to create different types of UAVs from one platform—from a high-aspect-ratio wing to a low-aspect-ratio one for tactical or strategic applications."

As well as providing operational flexibility, the design would reduce development costs and time, and lower production unit costs, said the spokesman. The main structure would be of carbon fiber. Although the engines would be part of the core element, their software would not.

Roles for a modular UAV would include maritime and synthetic aperture radar. It is not envisaged as having a combat capability.

EADS' UAV presentation at Paris also included its SHARC, a short-range VTOL (vertical takeoff and landing) system for small ship and nonmilitary applications. It uses a coaxial rotary wing configuration. Payload is up to 60 kg. Other UAVs from EADS include Eagle 1, an autonomous MALE (medium altitude long endurance) type, equipped with satellite link and capable of 12-h/1000-km missions.

The DRAC (Drone de Renseignement Au Contact)/Tracker is a fixed-wing UAV developed for army use. It can be carried in a backpack and hand-launched. EADS is prime contractor for the project in cooperation with **Surveycopter**.

Orka is a new-generation UAV described by EADS as "the upstream study program DEVIL promoted by the French armaments directorate DGA." Another VTOL system, it is for maritime and land applications and is able to perform surveillance and search and rescue roles. It can carry a 150-kg mission payload for 8 h. "It will be possible to deploy the naval version of Orka in anti-ship combat missions by controlling it from the operations center of a vessel on which it will land automatically," stated EADS. Late last year, the company was selected to carry out the definition study.

Stuart Birch

SHARC—EADS' short-range VTOL system for small ship and nonmilitary applications—has a coaxial rotary wing configuration. Payload is up to 60 kg.