No. 14: Unmanned Aircraft Systems, 2010-2050: Implications for the Industrial Base (10/15/09)

Given the value of Unmanned Aircraft Systems (UAS) to provide Intelligence, Surveillance and Reconnaissance (ISR) and firepower without placing warfighters at undue risk, these systems are receiving much attention and growing increasingly sophisticated and versatile. The U.S. Air Force (USAF), the U.S. Army, and the European Defense Agency (EDA) have recently published long-term visions for UAS, identifying numerous benefits and challenges to developing future systems.[1] Realization of these plans may have several implications for the global aerospace and defense industrial base.

Maintenance

Maintaining increasingly sophisticated UAS will require a concurrent increase in support capabilities. Illustrating this point, the USAF has over the last several years preferred contractor logistics support over organic maintenance. [2] This has ostensibly reduced cost and ensured that technologically sophisticated aircraft receive expert service, supplementing the armed services' abilities. Though data to verify the cost-effectiveness of outsourcing versus organic maintenance is lacking, and even with a trend to build up military maintenance capacities, contractors may still be used for supplemental and surge capacities.

Datalinks

Greater UAS numbers and capabilities require increasing amounts of bandwidth. Satellite communications (SATCOM) using military platforms can satisfy some of this demand, providing jamming-resistant resources dedicated to sensitive mission data transmission. However, there are relatively few such systems, and these share their bandwidth with other ISR requirements. And though the U.S. and NATO allies are developing several new military satellite systems, these may not be operational until 2012 or later. [3] Military SATCOM is, therefore, currently insufficient as a source for handling all UAS data.

Commercial SATCOM, however, is immediately available. Indeed, UAS are currently highly dependent on commercial satellites for bandwidth (USAF, for example, leases up to $25 million worth of bandwidth each year).[4] Overall costs of bandwidth are expected to rise as larger numbers of more sophisticated UAS enter service. One solution to the emerging bandwidth bottleneck might be commercial SATCOM designed to military standards yet built and operated by private entities. The British Skynet 5 program, undertaken as a private finance initiative, may serve as an example.

Sub-components

The USAF and Army effort to increase the operational flexibility of UAS through use of modular payloads will also affects future acquisition. By enabling the interchangeability of parts among single aircraft and their use across all airframes, modular components reduce costs. Furthermore, the open architecture of future UAS eases market access, which, in turn, has the potential to expand the industrial base and increase competition among subsystems producers.

Standardization of UAS components will also increase joint capabilities and lead to commonality in UAS across branches of service. Achieving cross-service commonality will allow DoD to more effectively leverage its acquisition resources for UAS components. Reaching joint agreement on these subsystems' parameters may prove difficult, however,

[1] U.S. Air Force (2009) *Unmanned Aircraft Systems Flight Plan 2009-2047*, USAF; Institute of Land Warfare (2008) *U.S. Army Aviation: Balancing Current and Future Demands*, Association of the United States Army; European Defense Agency (2009) *France, Germany, Italy, Spain and Sweden launch world leading technology on the MID-air Collision Avoidance System (MIDCAS) at the Paris Air Show*, http://www.eda.europa.eu/genericitem.aspx?area=2&id=497 .

[2] Michael Boito, Cynthia R. Cook, John C. Graser (2009) *Contractor Logistics Support in the U.S. Air Force*, RAND Corporation.

[3] Adam Baddeley, "MILSATCOM – Satellite Communications for the Warfighter", *Military Technology* 32:5 (March 2008), p. 64.

[4] U.S. Air Force, pp. 43, 44.

as some services insist on unique components. Yet, the recent adoption of the USAF's Global Hawk airframe by the Navy, and the full procurement of the Army's Shadow UAS by the Marine Corps, may mean more such agreements in the future.[5]

Artificial Intelligence

As software, computer processors and communication advance, UAS are expected to achieve greater autonomy. In Europe, for example, a UAS capacity to "sense and avoid" (S&A) is being developed to prevent UAS collisions with manned and unmanned aircraft. In addition to enabling UAS missions in civil airspace, this technology helps realize the vision of "swarming" the battlespace with multiple multi-role UAS simultaneously. Eventually, development efforts may allow UAS to conduct ISR and fire missions with minimal human input. Fully realizing these goals will depend on innovations in several technology fields, but also in policies, legislation and military doctrine.

Complexity, Competition and Innovation

New developments in UAS are highlighting the role of innovation and competition in a defense context.[6] Given the increasing technological complexity of UAS, the number of companies able to develop and operate them may decrease in the near future. However, such a decrease in the supplier base may lead to a drop in the rate and quality of innovation. To ensure sufficient competition, defense policymakers will need to balance the number of UAS programs with a healthy number of prime contractors able to undertake them. Smaller firms sub-contracting to the primes will also benefit from more competition, and sustaining these firms will contribute to the innovation base.

Funding and Acquisition

Near-future increases in UAS funding are expected to focus on subsystems development, giving smaller manufacturers opportunities to integrate new technologies into existing frameworks. This is especially true for payloads and systems integration, both of will are seeing increased investment in the near-term, as highlighted by the examples of the Global Hawk and the Shadow programs.

RDT&E budgeting for select USAF Global Hawk program elements (USD millions)

Program Element	FY 2009 Estimate	FY 2010 Estimate	% program budget 2009	% program budget 2010
Aircraft	14.4	8.9	5%	3%
MP-RTP sensor	42.1	71.9	14%	23%
Payloads	33.2	56.2	11%	18%
Ground segment	27.5	26.1	9%	8%
Communications	24.3	10.3	8%	3%
Total program budget	310.7	317.3	------	------

Source: Department of the Air Force; 2010 Budget Estimates; Research, Development, Test and Evaluation (RDT&); Descriptive Summaries vol. III

RDT&E budgeting for select U.S. Army Shadow program elements (USD millions)

Program Element	FY 2009 Estimate	FY 2010 Estimate	% program budget 2009	% program budget 2010
Wing extension	10.6	-----	10%	------
Common system integration	.2	31.5	.2%	14%
Adv. Payload Development	25.7	49.7	25%	21%
Shadow Encryption	-----	29.5	------	13%
Total program budget	103.9	232.0	------	------

Source: U.S. Army; 2010 Budget Estimates; Research, Development, Test and Evaluation (RDT&E); vol. III

Summary

Rising demand for UAS will expand opportunities for industry on many fronts. Open architecture and common airframes will increase economies of scale for large producers while broadening the base of small subsystems manufacturers. Increasingly sophisticated UAS capabilities will require greater bandwidth, opening opportunities for military as well as commercial satellite systems. And to fill the gaps in organic maintenance, contractors may be needed to service greater numbers of more advanced UAS.

To develop new UAS capabilities, government and industry leaders will need to align defense plans with industry goals as well as begin to address the relevant policy, legislation and doctrinal changes that will be required.

— David Morrow, Timothy Walton & Guy Ben-Ari

[5] Government Accountability Office (2009) *Defense Acquisitions: Opportunities Exist to Achieve Greater Commonality and Efficiencies Among Unmanned Aerial Systems*, GAO, pp.13, 15.

[6] Jeffrey A. Drezner (2009) "Competition and Innovation Under Complexity", in Guy Ben-Ari and Pierre A. Chao (eds.) *Organizing for a Complex World: Developing Tomorrow's Defense and Net-Centric Systems*, CSIS, p. 41.