UCAVS MOVE TOWARDS REVOLUTION IN FUTURE WAR TIME

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Keywords : *UCAV DARPA*

Abstract

Improving the survivability of its military aircraft and the pilot as been a top technological priority for decades. Promotion of stand off weapons reduces the exposure of combat air planes to hostile fire. The idea is to put as much distance as possible between a pilot and dense defense encircling high value targets. The trend is certain to continue and, at some point specific types of aircraft likely will be removed from the battle entirely, with a collection of robotic craft taking their places in combat over the target. Current terminology for this system is "Uninhabited Combat Air vehicle". They may not only help save the lives of the pilot, but also provide more affordable and effective base to attack certain targets. This paper elaborates the inventive concepts, future role, deployment and missions of UCAV.

1 SEAD Mission

UCAV shows much potential for SEAD (Suppression of Enemy Air Defense). Without the need of carry a pilot, the UACV could be smaller and stealthier than a typical fighter, making it harder to detect and shoot down. Such an aircraft could also loiter in an area for extended periods long beyond the duration of human pilot and wait for the enemy to turn on his radar. Being so close, the UCAV would be ready to launch a swift attack. Even if the enemy did get off a lucky missile shot, a UCAV could easily performs escape maneuvers so violent they might kill a human pilot. Like a fighter aircraft, a UCAV would fly back to base, under go rapid rearming, and depart to its next target. After the battle, it could be refurbished to be used again and again. Larry birckelbaw, DARPA';s program manager for the UCAV, explained that the UCAV is an advanced technology demonstration program. Its purpose is to evaluate the available technologies, combine them into a operational concept, and determine if the resulting system could "effectively and affordably address "the SEAD mission .

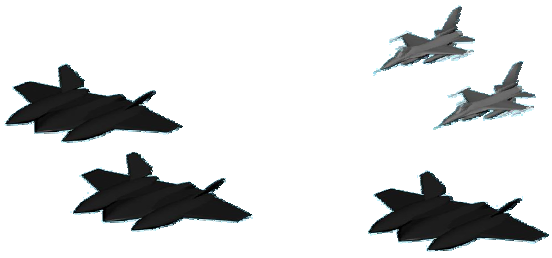

Fig-1 Two F-16 escorted by 3 UCAV formation going for SEAD mission

2 Mission Control Center

UCAV's are expected to remain in cold storage for most of their service life, awaiting the call to action. UCAV operators would maintain proficiency by practicing in a, "virtual environment". The air force maintains a pilot to fighter aircraft ratio of about 1.3-1. In UCAV's the ratio will be reversed: one operator will control-"manage" is the preferred term-many UCAV's at once. The simulation upto 6 UCAVs being operated simultaneously has already been done successfully for certain missions that are very manageable this is accomplished because operator does not hand fly them. It is due to a degree of onboard autonomy, and automatic queues taken by the UCAV;s from various sensor platform and other sources, it will be like flying a highly intelligent auto pilot. Where a higher degree of involvement by the operator would be required during the actual weapon released phase of the mission. On its own, the UCAV's will able to take off, fly the approach to target and return to base, much as today reconnaissance unmanned aerial vehicle can. "Man in the loop" would be retain for weaponries at a minimums and may be for more of the mission, depending upon the rules of engagement.

The operator station will probably look little like a cockpit and more like elaborate home computer setup. Moreover, it will not required an extensive ground trailer or base station but will be small enough that UCAV's could be operated from an E-3 AWACS or E-8 joint STARS console or perhaps even by a pilot or back seater in another combat aircraft. The UCAV can operate with a high degree of safety and reliability as a part of strike package.

Fig-2 Mission Control Center

3 Advance UCAV's

Thinkers are churning out inventive concepts such as UCAV's that can be launch from a submerged submarine in addition to VTOL UAV launched from ships. The US Navy is keeping an eye on the DARPA-Air Force SEAD project and might want to acquire such systems for use abort war ships.

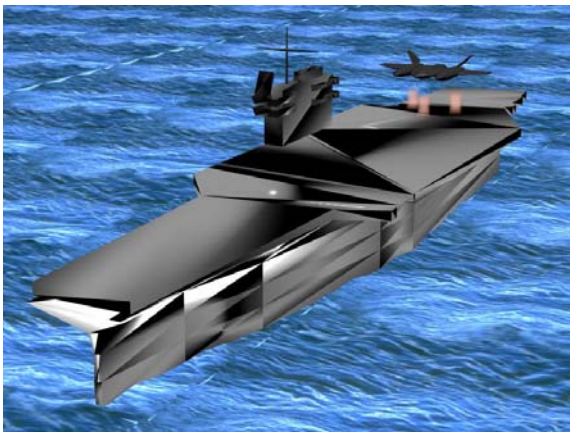

Fig-3 VTOL UAV taking off from ship

3.1 UCAVs Key to network-centric warfare

There is a tan tantalizing vision flickering before the eyes of those mapping the unexplored territory of network centric warfare. It is a fleet

of fast, stealth, unmanned, strike / reconnaissance aircraft that can fight a war largely unencumbered by human intervention.

Advocates see the aircraft cracking enemy air defenses and ranging the battlefield destroying fast-moving targets like ballistic missile launchers or mobile command- and-control vehicles.One UCAV-only option would be the ability to carry high-power microwave weapons that generate large pulses of energy for damaging electronic components and computer memories. In addition, the UCAV is also expected to have a role in computer network attack that would involve penetrating enemy systems to disrupt them and plant damaging algorithms.

3.2 Boeing Concept

Boeing has completed 16 flight tests with its two X-45A aircraft and started trials of the Block 2 software. Special smart-mission management, operational monitoring and cooperative, adaptable autonomous software with decision-aiding logic are capabilities required for UCAVs—which makes their development more demanding than building UAVs. "A UAV doesn't have to respond like a UCAV that flies into the heart of enemy defenses," Personnel with oversight of UCAV operations may be operating from ground and shipboard stations or from specially equipped strike (F-15E, F/A-18F) or command-and-control (AWACS, Joint STARS) aircraft. Unmanned strike and electronic attack aircraft require operational monitoring during critical portions of their flight. Moreover, the man-in-the loop must be able to compensate for changing battlefield conditions. And in the future, cooperative, adaptive, autonomous flight and combat systems will be required to monitor and assign tasks to multiple unmanned aircraft—particularly when their targets are moving and for other reasons that require real-time targeting.

Another Key Boeing component for its UCAV candidate will be four-dimensional (latitude, longitude, elevation and time) navigation.This capability also will be critical for synchronizing data for dynamic targeting. The system's basic capabilities have been demonstrated in the X-45A's Block 1 testing.In parallel with the systems work, Boeing will demonstrate an aircraft—the larger, longer range X-45C—that is more representative of what the UCAV eventually will become. In rough terms, it will be flying wing and look more like a B-2 bomber than the fighter-like X-45A.

The larger wing and modified flight controls are expected to improve the aircraft's low-speed handling characteristics for carrier landing. The avionics architecture for the Boeing aircraft is modular so payloads can be easily changed and yet still plug into a common mission management system.

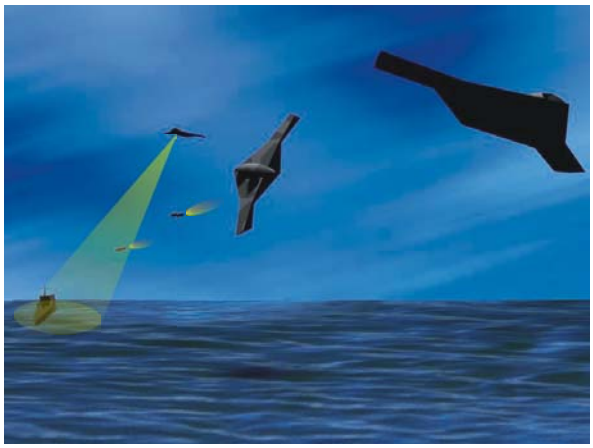

Fig-4 Boeing Concept of Future UCAV

3.2.1 Herding UCAVs

Boeing may be able to demonstrate in less than two years that an F-15E, or similar two-seat strike design, could function as mothership for fast, unmanned, stealthy aircraft sent ahead of strike aircraft to locate air defenses or verify the location of time-sensitive targets.

The new program pursues technological advances made by Phantom Works

researchers who recently demonstrated a two-way, internet-like connection between a command and control (C_2) aircraft and an F-15E that is designed to make the attack of mobile ground targets faster and more accurate. The goal is to demonstrate that many nodes—be added to a strike Internet. Future programs may address the additional capability of tasking the unmanned combat air vehicles (UCAVs) themselves to strike well-defended targets.

Follow-on Phantom Works programs would expand the network to demonstrate that F-15E aircraft can operate in cooperation with fast UCAVs, such as the Boeing X-45, over a dynamic, fast movi battlefield. The F-15E has the advantages of a backseat weapon systems officer (WSO) who can focus his attention on coordinating with unmanned craft to perform surveillance of targets and strike them if warranted. The F-15E, not a stealthy aircraft, could stay out of lethal range of air defenses yet direct attacks in the heart of enemy defenses to extend its operational usefulness.

Boeing is now working on its larger X-45C, but there are even longer-term plans for such unmanned combat aircraft. Military officials are looking for a "persistent kill mechanism" that can loiter over the battlefield waiting for elusive mobile targets to appear. These gunship concepts would likely not carry traditional weapons such as rapid-fire cannon. The weapons of choice may be directed-energy based, such as lasers or high-power microwave beams. With such weaponry, analysts believe the aircraft could operate clandestinely and strike without warning.

3.3 Northrop Grumman

Northrop Grumman has flown only its X-47A, but has now teamed with Lockheed martin to build two large X-47 Bs for the UCAV flight demonstration.

Northrop Grumman's plan is to develop a sealthy aircraft that launches at dusk and searches the battlefield all night for targets and intelligence for its full 8-12-hr mission time.The aircraft is being designed to fly at Mach 0.8 at 35,000 ft. and cost $10-15 million each.

3.4 Next Step in Unmanned Combat

The unmanned combat-armed rotorcraft (UCAR), intended for eventual U.S. army use. Darpa is targeting a level of autonomy in UCAR that is expected to surpass that of UCAVs'. UCAR is supposed to be able to operate alone or in teams that could consist of either other unmanned platforms or manned systems.

UCAR would be possible means of meeting the need of vertical takeoff and landing unmanned aircraft. Darpa is also targeting levels of survivability that exceed those now achieved with helicopters. To avoid threats, helicopters typically operate at low altitudes and standoff from the target area. Use of tactics, electronic self-protection systems, decoys and radar cross-section reductions, could be used to achieve the desired survivability.

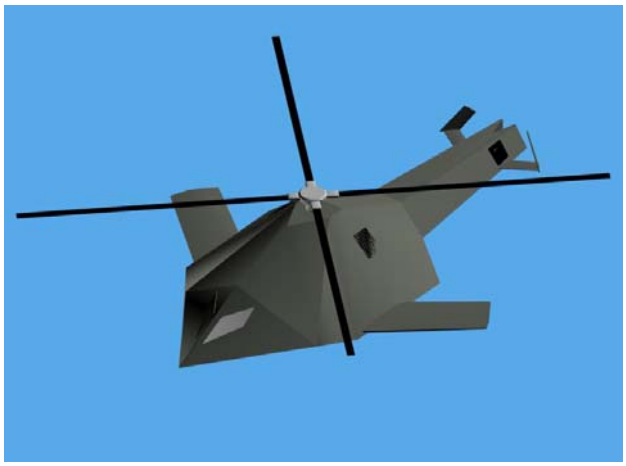

Fig 5 Future Unmanned Combat – Armed Rotorcraft

5. Conclusion

If the idea of UCAV deployment in future combat would be practically materialized it would change the war gaming completely. If the history of the flight has told us anything, it has shown us that aeronautics has always been paced by the concept of faster, higher and innovations. Although this has to be somewhat mitigated today by the need for economically viable and environmentally safe airplanes, the overall march of progress in aeronautics will bring about revolutions through evolution process.

Fig- 6 UCAV Six Shipper Formation

References

[1] David A Fulghum . Huge promise, Nagging Concerns. *AW & ST* , Vol 159, Number 7,August 18,2003.
[2] David A Fulghum . Boeing redesigns X-45 . *AW & ST* , Vol 158, Number 18, May 5,2003.
[3] Robet Wall.Next step in Unmanned Combat. *AW & ST* , Vol 159, Number 8,August 25,2003.