

THE USAGE OF UAVs AND REQUIREMENTS IN MODERN COMBATS

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Abstract: *The strong development of science and technology, especially the outstanding achievements in the recent fourth industrial revolution, has created many changes in the fields of social life. Especially in the fields of military in general, combat activities in particular, the application of scientific and technological achievements to improve the effectiveness of commanders and staffs contributing to creating breakthroughs in construction, regular, modern and elite armies of all countries' army. Recently, the use of UAVs, the quintessential product of science and technology, has brought a lot of effectiveness in modern combat operations, especially in reconnaissance and targeting targets in difficult combat conditions. From that common trend, the article generalized the history, discussed and posed a number of characteristics of requirements and design for UAVs to meet the new requirements of modern warfare.*

Keywords: UAV; CUAU; Modern combats; Drone.

1. THE USAGE OF UAV

Uninhabited air vehicles (UAVs) are vehicles specifically designed to operate without the pilot onboard or the aircraft intended to be piloted to be converted to unmanned operation, UAVs range in size from a few inches to hundreds of feet, can be fixed or rotary wing aircraft, can be remotely controlled or self-propelled, and can be jet or propulsion. In modern warfare, UAVs are used in many combat operations [1, 2], which are parts of the two primary UAV development programs for the main operational activities: Reconnaissance and combat participation [3].

In reconnaissance program, the defense industry in the world developed some generations for reconnaissance missions [4-6], such as: Pioneer was developed by Pioneer Company; it was designed to provide targeting support for Navy ships in 1997. Then, it has been used for reconnaissance, surveillance, target acquisition, battle-damage assessment, and battle management in 1986. The features of the UAV by Pioneer are, 14 feet long, being driven by a pusher-propeller powered by a 26 horsepower, two-stroke, twin-cylinder, rear-mounted engine. It can carry a 75-pound payload, has a maximum altitude of 15,000 feet, a range of 185 kilometers, and an endurance of five hours at that radius. The next generation is Hunter; it was developed by Israeli Aircraft Industries to perform short-range surveillance for ground forces. Hunter is equipped with electro-optical and infrared video sensors. The Hunter can carry a 200-pound payload and has a maximum altitude of 15,000 feet, a range of 267 kilometers, and endurance of 11 hours at that radius. Hunter was cancelled after low-rate initial production of seven systems, with eight aircraft each. The third generation, the Predator is a medium-range, medium-altitude vehicle capable of all-weather reconnaissance, surveillance, targeting, and battle damage assessment. The UAV was manufactured by General Atomics, the features are: can carrying a payload of 450 pounds, has a maximum altitude of 25,000 feet, a range of 926 kilometers, and endurance at that radius of more than 20 hours. The specialized feature is the satellite communication system on the Predator enables it to operate beyond line-of-sight from the control station. The Predator was seemed successfully demonstrated in reconnaissance missions during peacekeeping operations in Bosnia. The next, the Global Hawk is a developmental high-altitude, long-endurance reconnaissance vehicle designed

to complement the Darkstar UAV. The UAV has been designed as a “highly capable, moderately survivable” system capable of reconnaissance, surveillance, and providing targeting information. The features are: carrying a 2,000-pound payload, have a maximum altitude of 65,000 feet, a range of 5,556 kilometers, and endurance at that radius of 22 hours. The Darkstar was designed by Lockheed Martin and Boeing, the UAV was stealthy, so that it could penetrate air defenses to perform reconnaissance, surveillance, and targeting missions. The features are: carrying a 1,000-pound payload, have a maximum altitude of 45,000 feet, a range of 926 kilometers, and endurance at that radius of eight hours. The last, the Outrider was developed by Alliant Systems [7], Portland. It is a tactical UAV developed for the Army, Navy, and Marine Corps for reconnaissance and surveillance missions for brigade and task force commanders. The UAV is a small aircraft with a wingspan of only 13 feet, was designed to carry a 65-pound payload, have a maximum altitude of 15,000 feet, a range of 200 kilometers, and an endurance of three to four hours at that radius.



Figure 1. MQ-9 Reaper.

In combat program, The Defense Advanced Research Projects Agency (DARPA, USA) is collaborating on a program to develop Uninhabited Combat Air Vehicles (UCAVs). The program demonstrates the technical feasibility of a UCAV that can effectively and affordably perform lethal missions, including Suppression of Enemy Air Defenses (SEAD) and strike missions, as an integral part of a mixed inhabited/uninhabited force structure. As operational concepts and vehicle technologies mature and UCAV affordability goals are achieved, UCAVs will be able to perform a broader range of combat missions. UCAVs will perform combat missions that do not currently exist; high-risk missions that do not warrant the risk to human life; or current missions that UCAVs can perform more cost effectively than current platforms. The affordability of UCAVs will be a result of reduced acquisition costs and operation and support costs. Operation and support costs will be reduced through the introduction of condition-based maintenance, simplified onboard systems, and the ability to keep vehicles in flight-ready storage.

The General Atomics MQ-9 Reaper (sometimes called Predator B) is an UAV capable of remotely controlled or autonomous flight operations developed by General Atomics Aeronautical Systems primarily for the United States Air Force. The MQ-9 and other UAVs are referred to as Remotely Piloted Vehicles/Aircraft. The MQ-9 is known as the first hunter-killer UAV designed for long-endurance, high-altitude surveillance. The MQ-9 is a larger, heavier, and more capable aircraft than the earlier General Atomics MQ-1 Predator; it can be controlled by the same ground systems used to control MQ-1s. The features of the Reaper: It has a 950-shaft-horsepower (712 kW) turboprop engine. The greater power allows the Reaper to carry 15 times more ordnance payload and cruise at about three times the speed of the MQ-1[6]. The aircraft is monitored and controlled by aircrew in the Ground Control Station, including weapons employment. The Reaper is also used by the United States Navy, the CIA, U.S. Customs and Border Protection, NASA, and the militaries of several other countries.

2. REQUIREMENTS FOR MODERN COMBATS

In modern operations, UAVs can be an effectiveness equipment to support different forces in series of operational tasks. The popular missions of UAVs are listed: Countering weapons of mass destruction; theater missile defense (ballistic missiles/cruise missiles); attacking fixed targets; attacking moving targets; jamming enemy communications; suppression of enemy air defenses, intelligence, surveillance, and reconnaissance, communications and navigation and air-to-air combat. Base on the common features and requirements of modern combats, there are some key adaptive features for attributing and designing, using we need to concern.

2.1. UAV's attributes

Requirements on UAVs attributes, on the basis of vehicle attributes, design trade-offs, and technology trends, the committee was able to identify the technologies that would enable the development of potential UAV systems. Vehicle attributes in the general areas of configuration, performance, operation, and control ranged from conventional capabilities to special capabilities.

The configuration, the way to configure the UAVs is very important for the force, which controls the UAVs for the missions in combats. In combat, the commander of the UAV needs to manipulate quickly and accurately to create opportunities for the combats. The UAVs' configurations are dominated by the need to accommodate human operators. The configuration of the vehicle can be determined by some considerations, such as mission requirements, operating environment, and size and configuration of major subsystems or payloads. The principal attributes were vehicle size, configuration drivers, and mode of takeoff/landing. Vehicle size was assumed to range from conventional midsized to very small. Air vehicle configuration drivers ranged from conventional flight-configured vehicles, in which the operating regime or survivability determine configuration, to advanced payload-configured vehicles, in which factors such as aperture size and orientation and payload volume determine the configuration. One other modern combats requirement could be met without advances in the mode of takeoff/landing.

The performance attributes of UAVs are considered such as threat environment, observability, range, and maneuverability. Because the use of UAVs and anti-UAV equipment is relatively common among countries' military forces, the strength of UAVs is one of the decisive factors in competition issues, creating an advantage in combat. In the performance attributes, the threat environment was considered to range from low threat to operational environments, it depends on the threat environment, and observability can range from conventional untreated vehicles to vehicles with extremely low observability, either as a result of design or surface treatments. Two other attributes are the distance from station/airport and endurance. The limitations were considered to vary from conventional short-range/midrange capabilities to very long-range capabilities. Finally, movement capacities was considered to range from flight capable to advanced, highly movement capabilities, no pilots to withstand high accelerations.

The costs and operational attributes of the UAV are the basis for determining the investment goals, allocating to which forces, performing tasks in combat operations. The operational attributes of UAVs are considered included reusability, logistics, and life-cycle costs. Reusability, a reflection of the design trade-off between cost and durability or survivability, ranged from long-lived vehicles like conventional inhabited vehicles, to expendable, low-cost vehicles suited to high-threat environments. Vehicle logistics, which include transportability and maintainability, they was considered to vary from crew-maintained vehicles to canister-shot vehicles. Life-cycle costs were considered to range

from competitive costs, for vehicles with productivity and support requirements similar to those of inhabited aircraft, to extremely low costs, for which design and operational issues have been optimized for extremely low acquisition and support costs.

The capture of control attributes is very important in the combination of operational operations order in combination with UAVs in modern combat conditions. The UAVs' control attributes are considered, which are the communications and control environment, the level of autonomy, and the ability to provide redirection. The communication and control environment ranges from stand-alone capability to system-embedded capability. Autonomy, the degree of self-reliance and independence the system is given, ranges from remotely piloted vehicles to autonomous vehicles. Finally, redirection, an attribute related to autonomy, varies from programmable vehicles to responsive vehicles.

2.2. UAV's design

In the trend of countries' military efforts to master technology to actively research, design and manufacture UAVs with their operational characteristics, identifying requirements in UAV design is extremely important to create effective support products for operational combats. So, based on current system technologies, through the influence on air vehicle design, affect the basic vehicle subsystem technologies we need to concern about communications and human-machine interactive, which are fundamental to the development of vehicle controls, as well as low-cost manufacturing.

The communications systems associated with a UAV can be divided into three components: the external component used to communicate commands to the UAV or extract data from the UAV; internal component used to interconnect the payload, the flight and engine control systems, other mission management subsystems; and relayed component, where the payload is used to extend the horizon of ground-based communications systems or communicate other UAVs. In UAV design, communications technology is neither an enabling nor a limiting factor, except in the case of design mini UAVs (like a drone) to adapt specialized missions of combats.

The human-machine interactive, it takes advantage of human capabilities and compensate for human limitations in the design, manufacture, and operation of systems of all kinds. Human-machine interactive not only used for the primary system, it also can be used in all ancillary activities, such as logistics, operational procedures, maintainability, and training. It can relate with other disciplines such as psychology, physiology, medicine, engineering, sociology, anthropology, mathematics, and computer science.

In design, it needs to reduce the total life-cycle costs of UAVs compared to the costs of conventional, inhabited air vehicles will be vital to the successful introduction and deployment of UAV technologies. Reducing the life-cycle costs to acceptable levels will necessarily entail reducing all system acquisition costs, including design costs, personnel costs, and manufacturing costs. The designers need to reduce the cost on manufacturing, specifically for fabrication and product realization.

3. CONCLUSION

UAVs have been and are commonly used in the military of countries with many different combat missions such as reconnaissance, attack and many other missions. With the ability to operate in complex environments, the ability to combine with gas services in a flexible way, especially the ability to smartly identify and process target information. In fact, in recent conflicts, armed struggles in many parts of the world, especially in hot spots in border dispute areas, UAVs have been effective and become a trend. weak in modernizing combat operations to meet modern warfare requirements. The article outlines

the development history, the requirements for a UAV in combat operations, and meets the practical requirements for combat operations in modern warfare

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TÓM TẮT

ỨNG DỤNG VÀ YÊU CẦU CỦA UAV TRONG TÁC CHIẾN HIỆN ĐẠI

Sự phát triển mạnh mẽ của khoa học công nghệ, đặc biệt là những thành tựu nổi bật trong cuộc cách mạng công nghiệp lần thứ tư gần đây đã tạo ra nhiều chuyển biến trong các lĩnh vực của đời sống xã hội. Đặc biệt trong các lĩnh vực quân sự nói chung, hoạt động tác chiến nói riêng, việc ứng dụng thành tựu khoa học công nghệ vào nâng cao hiệu quả của người chỉ huy và cơ quan góp phần tạo ra các bước đột phá trong xây dựng quân đội chính quy, hiện đại, tinh nhuệ của quân đội các nước. Gần đây, việc sử dụng UAV, sản phẩm tinh hoa của khoa học kỹ thuật mang lại nhiều hiệu quả trong các hoạt động tác chiến hiện đại, nhất là trong trinh sát và tiến công mục tiêu trong điều kiện tác chiến khó khăn. Từ xu thế phổ biến đó, bài báo khái quát lịch sử, thảo luận và đặt ra một số vấn đề về đặc điểm yêu cầu, thiết kế đối với UAV đáp ứng những đòi hỏi mới của tác chiến hiện đại.

Từ khóa: UAV; CUAV; Tác chiến hiện đại; Drone.

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