

THE HISTORY AND THE EVOLUTION OF UAVs FROM THE BEGINNING TILL THE 70s

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Unpiloted machines have known an upstanding dependent evolution since those times. The development of UAV produced a change in the concepts regarding the architecture and operations through the evolution of their characteristics and capabilities. Thus, they generated continuous construction designs and a wide range of domains in which UAV's can be used.

Key words: UAV, remotely piloted vehicle, UAV history.

1. INTRODUCTION

The idea of flying preoccupied man since the beginning of time. The wish to fly has been put to test since ancient times (Dedal and Icar), and then to projects with fundamental science (Leonardo da Vinci 1452-1519, Montgolfier 1783). The flight dream never stopped here, it continued with light flyable machines that were easier than air (Santos-Dumont 1899, Zeppelin 1900-1909), then machinery that was heavier than air (Otto Lilienthal, 1890-1896), and then continued in World War I and World War II.

The evolution of unpiloted machines had known the same evolution as the one's with human command, and military conflicts would have proven which is more efficient.

The technological and design evolution influenced the development

of unpiloted machines, thus reaching a complex design over the years, see figure 1.1.

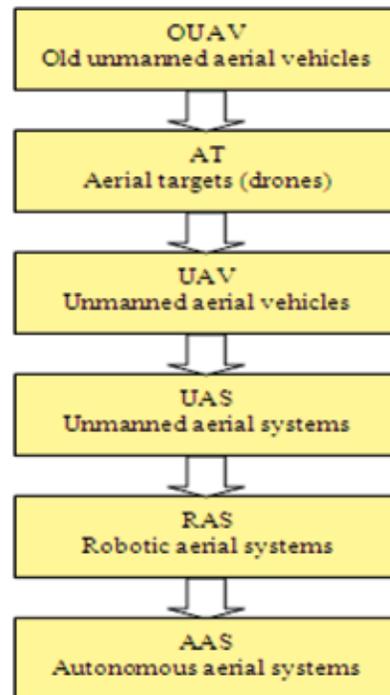


Fig. 1.1. Evolution of the UAV

Specialty references [1, 15 and 28] offer a series of categories of UAV's, the most representative being captured in figure 1.2.

Unpiloted aerial systems have known many names and acronyms throughout history: drones, RPV (remotely piloted vehicle), UAV (unmanned aerial vehicle), UCAV

(uninhabited combat aerial vehicle), FVO (organic aerial vehicle), UCAV /S (uninhabited combat aircraft vehicles/system), RPA (remotely piloted aircraft), RPH (remotely piloted helicopter), aerial robotics, MAV (micro aerial vehicle) and the list goes on [16, 28].

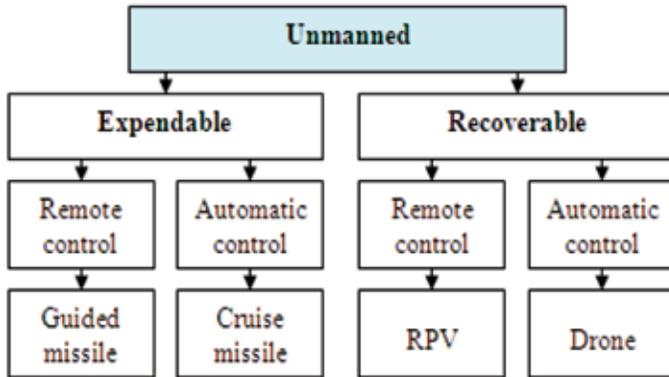


Fig. 1.2. Classification of the UAV

2. HISTORICAL LANDMARKS

Specialized references provide sufficient cues to highlight the most important moments in the evolution

of unpiloted aerial systems. A number of significant projects from beginning till 1980 can be viewed in Figure 2.1.

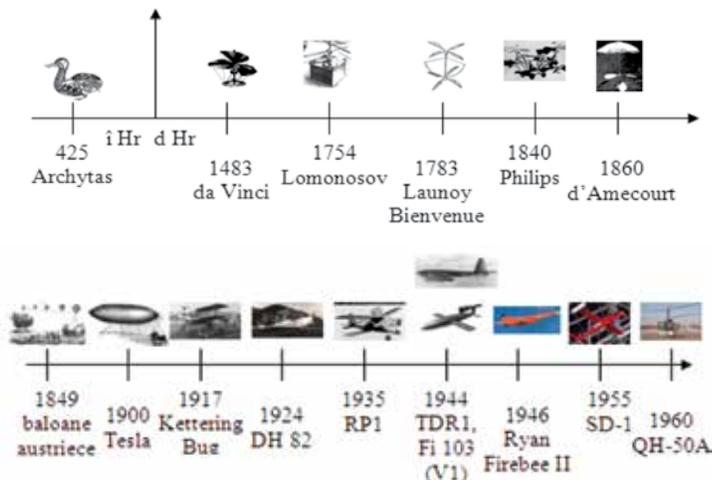


Fig. 2.1. Development of the first projects

2.1. The first projects

The first major contribution to the discovery of autonomous mechanisms occurred during Pythagoras and is attributed to Archytas of Tarantas

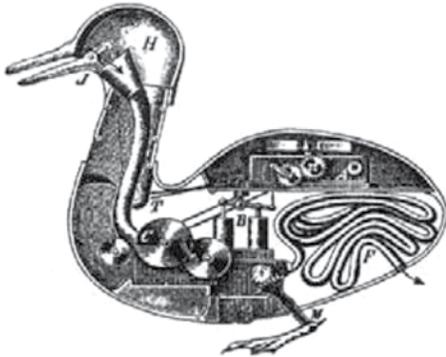


Fig. 2.2. The first UAV, Archytas din Tarantas

In the year 400 BC China has been documented in the idea of a device that achieve vertical flight. Leonardo Da Vinci in 1483, has designed an aircraft capable of vertical rise (see figure 2.3), considered by some experts as the ancestor of today's helicopter [2]. Also in 1508 da Vinci designed a mechanical bird that contained a double crank mechanism that descended along a cable, [3].

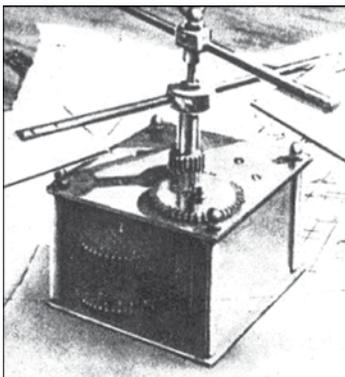


Fig. 2.4. Axial rotor, Lomonosov -1754

(southern Italy). He has implemented a set of geometrical concepts, thus creating in 425 BC the first UAV, as a mechanical bird (see figure 2.2) which can fly by a mechanism placed in the stomach [1].

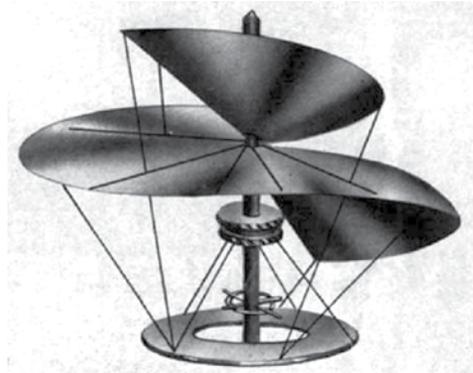


Fig. 2.3. Leonardo da Vinci's screw

Later in 1754 Mikhail Lomonosov has designed an axial impeller (figure 2.4) and in 1783 Bienvenue Launoy and a counter-model propeller (figure 2.5), based on the Chinese idea [4, 22]. George Cayley designed a carriage convertaplane [1] which remained at the stage of idea due to the propulsion systems gauge which at that time were only available for steam locomotives (Figure 2.6).

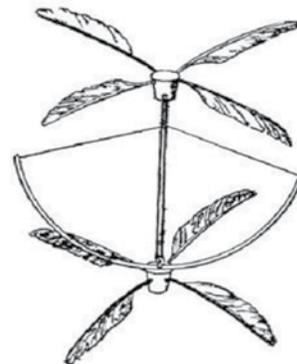


Fig. 2.5. Contra-rotating propeller, 1783

In 1840 Horatio Phillips has designed a machine capable of vertical flight routes. It contained a miniature boiler to generate

steam and in 1860 Ponton d'Amécourt flew smaller helicopters models powered by steam (see Figure 2.7) [1, 6].

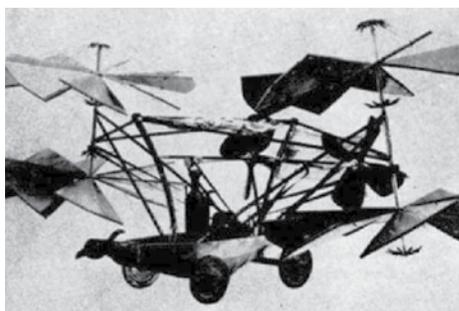


Fig. 2.6. Convertoplan carriage, G. Cayley

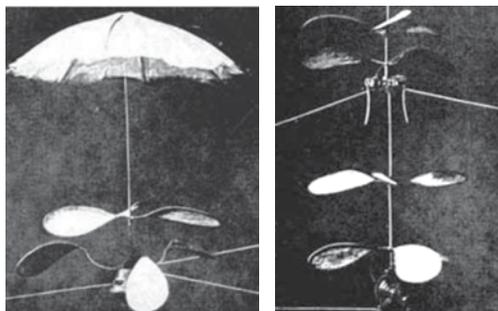


Fig. 2.7. Mini Helicopter, d'Amécourt - 1860

2.2. The first uses of drones machines

In 1849 it was first used an unmanned combat air vehicle when the Austrians attacked the Italian city of Venice with 200 unmanned

balloons (Figure 2.8) loaded with bombs fitted with timer devices. [7].

In 1900 Nikola Tesla (1856-1943) presents the concept of wireless control of the balloon (figure 2.9) and in 1915 described a fleet of unmanned aerial vehicles in aerial combat, [7].

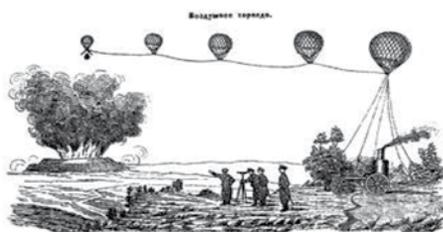


Fig. 2.8. The Austrian balloons, 1849

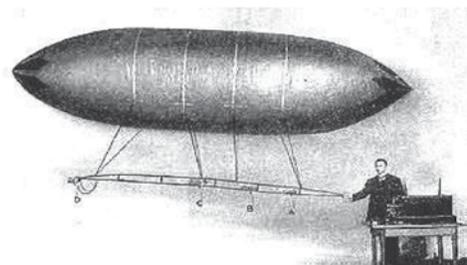


Fig. 2.9. The concept of Nikola Tesla

WWI

In 1916, occurs the earliest attempt to use an unmanned aerial vehicle powered so-called „aerial target” by Archibald Montgomery Low (1888-1956), target planes were controlled from the ground by an automatic Hewitt-Sperry known and as the „flying bomb” [8, 16, 26], which is integrated in the control of a gyroscope (1917).

In 1917 November Kettering Bug plane (Fig. 2.10) called „aerial torpedo”, flew in automatic mode for representatives of the US military, though he was not ready to fight in the war, [21, 22, 23].

In 1917, after the war aircraft conversion took place, Standard E-1 (Figure 2.11) in drone see features in Table 2.1 [10, 27].

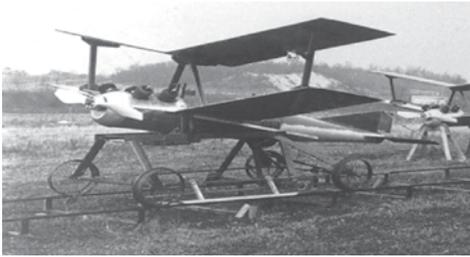


Fig. 2.10. The unmanned system- Kettering Bug



Fig. 2.11. Standard E-1

Tabel 2.1 Caracteristici Standard E-1

Span	7.31 m	Speed max	16 km h
Mass empty/ total	520 / 811 kg	Distance	290 km
Engine Rhone	60 CP	Ceiling	4420 m

The interwar period

In 1922’s first launch of a target (RAE 1921 - larynx, Figure 2.12) unmanned carried aboard HMS Argus by the US military, [9].

In 1924 September, it held the first successful flight of the same target,

RAE 1921 for 39 minutes and in 1933 the British fleet used for withdrawals of practice and training drones in the Mediterranean. De Havilland DH-target drones 82B Queen Bee (Figure 2.13) were Tiger Moth biplane based ubiquitous, [21, 22, 26, 28].



Fig. 2.12. RAE 1921 - Larynx



Fig. 2.13. De Havilland DH-82B

In 1935 there were developed a series of RPV (Figure 2.14), projects led by Reginald Denny. (1891-1967).

In 1939 the same Reginald Denny introduced a low-cost RC aircraft

for training AA gunners. In the same year, he demonstrates another prototype for U.S. Army:RP-RP-3 and 4 [15, 17].



Fig.2.14. RP-1 (Reginald Denny)

The Second World War

June 1944 Germany used Fi-103 (V1) (Figure 2.15) during the Second World War known as cruise missiles, [11, 24, 26].

In October 1944, the first combat mission and use of a UAV is made from Balla islands. Japanese positions were bombed by 10 bombs



Fig. 2.15. Fi-103 (V1)

The postwar period

In April 1946 the first aircraft flying unmanned scientific research Northrop: Northrop P-61 Black Widow who have the task of gathering weather data for U.S. Weather Bureau. In 1951 the first jet engines were used (Teledyne Ryan Firebee type I) [13, 15, 21], see Figure 2.17.



Fig. 2.17. Ryan Firebee II

In 1959 takes place the official birth plan of the on unmanned flights with RPV / UAV, when the USAF is concerned about the loss of US pilots in hostile territories in theaters at the time. In 1960, the launch of the program UAV codenamed „Red

aboard TDR-1 built by the Interstate Aircraft Company in Los Angeles (Figure 2.16) belonging to US Navy, [12, 20, 26]. Also in 1944 held project Aphrodite, a program that converted the US B-17 and PB4Y into bomb flying drones. They were used later to nuclear tests in the classical missions „dirty” [18, 19].



Fig. 2.16. TDR-1

In 1955 takes place the first flight of an unmanned aircraft in reconnaissance (Northrop radioplane SD-1 Falconer/Observer) subsequently used by the US military and the British company Beechcraft. Entered the game with the Model 1001 for the US Navy, [22, 25], see Figure 2.18.



Fig. 2.18. SD-1 / MQM-57 Falconer

Wagon” take places, when Francis Gary Powers piloting a U-2 was shot down over the USSR and in August the same year takes place the first flight of a helicopter unmanned Gyrodine QH-50A in Maryland see Figure 2.19 [21, 22].

In August 1964, in Gulf of Tonkin the U.S. used a UAV in the conflict between U.S. Navy and North Vietnamese Navy. Since 1964 until the fall of Saigon in 1975 USAF Strategic Reconnaissance Wing 100 3435 launched Ryan drone reconnaissance over North Vietnam in which they lost 554 unmanned aerial vehicles, [22].

In 1966 initiating the project Lone Eagle (later called Compass Arrow) for the design of UAV



Fig. 2.19. Girodina UAV QH-50A

3. CONCLUSIONS

UAV tests and functional vectors have been developed both in rotary wing and fixed-wing concept (heavier than air) and inflatable wing (lighter than air).

A viable solution would be the conversions of UAV from piloted aircraft (de Havilland DH-82B).

UAV development in the field resulted in a shift of architectural concepts through the development and operation of UAV in terms of features and capabilities continuously generating constructive types on one hand and on the other areas of use.

Unmanned airborne systems continuously developed, especially

necessary reconnaissance missions over China, so arises D-21 (Figure 2.20) following a competition launched by the US Airforce which was also attended by North America Ryan Aeronautical. The objective was to perform photo reconnaissance missions at high altitude [5, 14].

In 1976 - the recognition aircraft utility was demonstrated in Vietnam. These are the first steps for use in combat of UAVs at sea and on land.

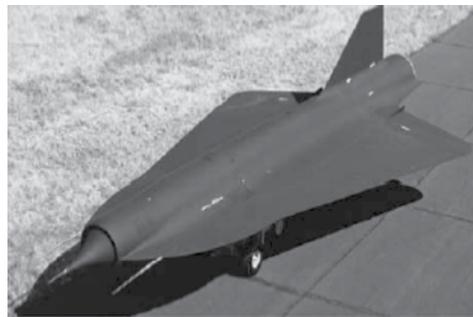


Fig. 2.20. D-21 Tagboard

major advantages: the ability to operate in hazardous environments without human risks.

The current challenges are related to human removing aircraft, the need for data link flight control and monitoring, this component has a significant positive impact due to the fact that it can perform aerial overload developments far beyond human limits. In terms of design there are obvious advantages compared to piloted aircrafts, UAVs can be designed in any size suitable to the mission profile, starting from tactical missions and ending with the strategic operative.

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