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ASPECTS REGARDING THE CONCEPT, DEVELOPMENTAND USE OF MODERN UAVS

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***Abstract**: UAVs, constitutes an important branch of aerospace, UAVs sites because construction and operating costs incomparably smaller than the well-known aircraft will be used increasingly over the coming decades. . The armed interference must be done based on some highly accurate information that must be gathered without endangering the human lives. The armed interference must be done based on some highly accurate information that must be gathered without endangering the human lives. This is the role the unmanned air vehicles (UAVs) presently play; they can perform both the function of surveillance, information gathering, data storage and their transmission to the ground stations, and the function of interference, when needed.*

***Keywords:** UAV systems (UAS), theater of operations, conflict zone, intelligence.*

1. INTRODUCTION

Unmanned aircraft in the general sense is the vector actually and equipment that are located on its board. Together executing specific tasks which were built and designed.

The unmanned air vehicles (UAV) have reached an unprecedented level of development and distribution and in the next two decades they will probably take the lead on the battlefield. From a strategic point of view, USA have issued a long term development plan since 1997, which they have subsequently upgraded, thus we can now speak about a UAVs hierarchy depending on the destination, action area, intervention means within the battlefield and the conventional echelon that operates them.

If in the first Gulf war a single UAV had been used, eight years later their number reached three vehicles used by the allied forces in Iraq, especially for aerial research and surveillance {7}. Initially, in Afghanistan there have also been used three UAVs, the essential difference being that there the first RQ-1 Predator had been used, having been engaged in battle missions, together with data gathering or surveillance missions.

RQ-1 Predator Unmanned Air Vehicle

The purpose of this paper is to review the unmanned air vehicles, the status of the technological development in the field (especially in the European Union country members) and to present the role and importance of UAVs within the current theaters of operations, as well as the capabilities this type of airplane may have, through the comparison between the strategic mission and the current technological level.

UAV: A powered vehicle that does not carry a human operator, can be operated autonomously or remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload. Ballistic or semi-ballistic vehicles, cruise missiles, artillery projectiles, torpedoes, mines, satellites, and unattended sensors (with no form of propulsion) are not considered unmanned vehicles. Unmanned vehicles are the primary component of unmanned

systems.

NASA tehnology

UAV is contiunes field expansion in both constructive solutions and the tasks that can be fulfilled by them, whether using UAVs to the top sites were military excusiv currently have a wide use in civilian areas. UAV sites today know a great variety of shapes, sizes, configurations and construction characteristics.

The main reasons to use this type of aircraft is reduced construction and operating cost compared with older sisters with human pilot.

Note that air vectors satisfying simple missions do not require specialized training of human operators on the ground, but the situation changes in UAV sites that have a high degree of complexity of construction and equipment on board, it is necessary both to a specialized training of human operators as well as a logistics training. Another important indication is that missiles are not part of the UAV category sites for simple reason that they can be reused after the mission although they may be (self) guided.

2.CLASSIFICATION UAV SITES

The most important criteria for the classification of unmanned aircraft:

a. in terms of weight:

Category	**Weight**	**Sample**
Micro	Sub 5 kg	Dragon Eye
Mini	5 – 50 kg	RPO Midget
Light	50 – 200 kg	Raven
Medium	200 – 2000 kg	A-160
Heavy	> 2000 kg	Global Hawk

b. in terms of andurance and range of:

- andurance / low range: up to 1 hours (short mission) and the range under 100 km
- andurance / medium range: between 1 and 5 o'clock and range between 100 and 1500 km
- andurance / high range: 5 to 24 hours and range between 100 and 250 km
- andurance / veryhigh range: over 24 hours and the range between 250 and 22000 km

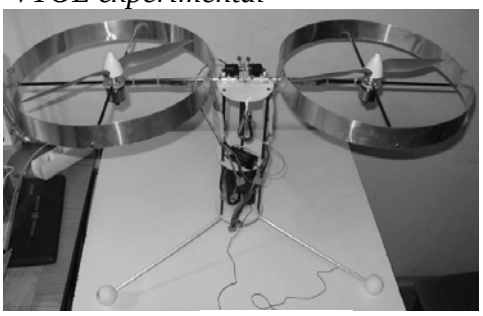
c. in terms of altitude at which it operates:

- Low altitude - up to 1000 m,
- Average altitude - between 1000 and 10000 m
- High altitude - more than 10,000 m

3.TYPES OF UAVS

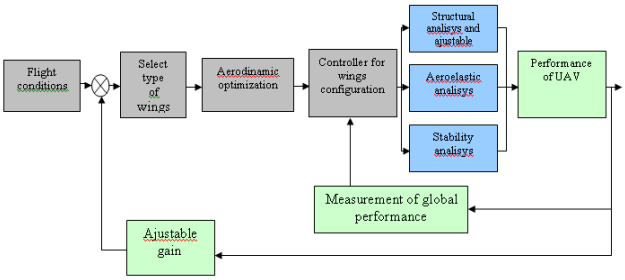
Category micro unmanned aerial vehicle

MAV VTOL experimental



MAV VTOL

The final goal is microUAV experimental audio-video surveillance enclosed large perimeters. Quiet diesel engine provides the air carrier near the zones of interest.



Model UAV

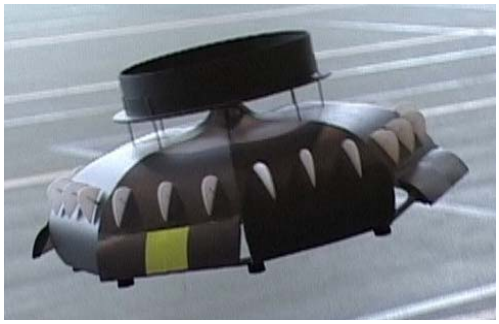
The limitations imposed by the concept of morphing described below for optimized wing complies with the conform limits of the execution mechanism. The main differences between optimized wing shape and deformed wing shape are the following:

• Reorient the wing sections in the deformable space occupied by the mechanisms and therefore loss of this area of wings;

• Failure of the mechanism to provide an optimal structure to a good aerodynamic shape with curved lines between control points;

• Limitation of the mechanism in changing the profile for low-speed flight.

In 2006, Jean-Louis Naudin made and tested his first UAV (GFS-UAV model N-01A). This one, propelled by an electric engine, was using the Coandă effect to take off vertically, fly, hover and land vertically (VTOL).



J.-L. Naudin's first GFS-UAV (N-01A)

The design of the GFS-UAV N-01A was based on the Geoff Hatton' flying saucer from GFS Project limited. In the next year, Jean-Louis Naudin freely published the full plan of the GFS-UAV N-01A and a detailed tutorial to help UAV fans to replicate his GFS UAV.[**Error! Reference source not found.**]

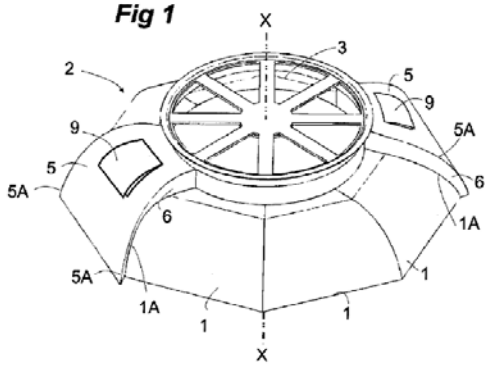
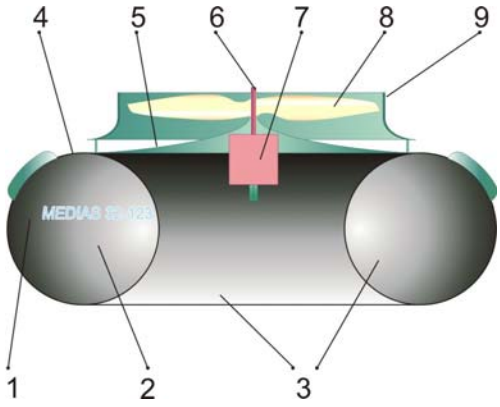


Fig. 1 Geoff Hatton's 2007-UAV model

In 2007 Geoffrey Hatton presented an optimized control for his family of Coandă UAVs, this time improving the airflow over the outer surface, especially in open air, when it may be disturbed by a lateral wind. [**Error! Reference source not found.**]

In 2008, in Romania, an academic consortium, with researchers from Galaţi, Iaşi and Bacău universities, coordinated by the author, obtained, for the researches on Coandă effect, a national grant from CNMP, (contract no. 32-123), for the surveillance and protection

of the natural environment, using a Coandă UAV.



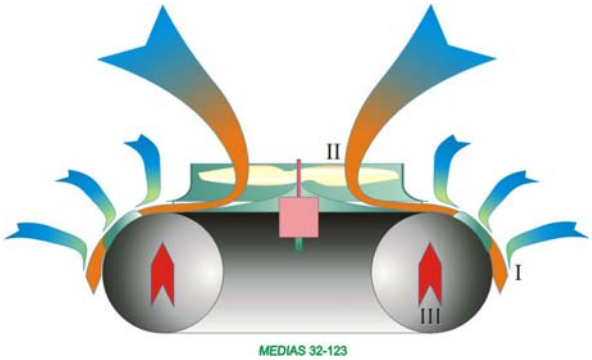
MEDIAS components **Error! Reference source not found.**

1 - curved upper surface; 2 - steering flaps; 3 - toroidal He chamber; 4 - counter-rotating fins; 5 - inner exhaust profiled cap; 6 - propeller's shaft; 7 - electrical motor and batteries; 8 - propeller; 9 – propeller duct

According the contract, this new UAV, named MEDIAS, had to be in the same time a modern and a nonpolluting aerial vehicle, easy to maneuver and safe to the environment and people.

As a main characteristic, MEDIAS with his adequate shape, uses the Coandă Effect (I) for lift and maneuverability. An air flow created by an electrically driven propeller (II) flows over the upper surfaces of a curved radial canopy and changes the pressure field above and under the vehicle, creating more lift and improving the stability of the flight.

A toroidal Helium optionally added inflatable chamber (III) is increasing the buoyancy and functionality of the MEDIAS VTOL UAV design and is increasing also the UAV's mission autonomy.



The sustentation and propulsion components of MEDIAS UAV

This high propulsion efficiency will be obtained because, besides using Coandă effect, the vehicle has an innovative design, MEDIAS being a hybrid between the following:

I. An aerial vehicle - propelled and steered by Coandă effect and vertical air jets,
II. An aerial platform - which ensures its sustentation by using a propeller, preferably ducted, for a greater efficiency,
III. An aerostat - preferably filled with Helium - which improves some of the flight parameters.

However, the Coandă effect, as physical phenomenon used for sustentation, should allow it to lift and carry a significant weight compared to its estimated energetic consumption.

For an increase in efficiency, the electrical driven propeller itself was mounted in a central duct. In this particular arrangement, also the air volumes entrained by the Coandă effect became several times multiplied.

UAVs are designed and manufactured depending on their mission and they may perform one of the following roles [5, 6, 11]:

- **surveillance** representing a monitoring process of the humans', objects' or processes' behavior, to be compared to the expected or required norms (for example, detecting some nuclear, biological or chemical activities or phenomena);
- **intelligence** considered to be a military branch of knowledge, which concentrates upon the gathering, analysis, protection and the dissemination of the information about the enemy, field and weather in the military operations area or within the area of interest;

1 History of Unmanned Aerial Vehicles - www.vectorsite.net
2 The Role and Importance of UAV Within the Actual Theaters of Operations NICULAE MARIN, ELENA MARIN, AFASES 2010 BRASOV
3 Civil Aviation Authority - CAP 658, Model Aircraft: A Guide to Safe Flying, United Kingdom, June 2003;
4 Policy for Unmanned Aerial Vehicle (UAV) certification, EASA-AMENDAMENT (NPA) No 16/2005;
5 Civil Aviation Authority of New Zealand, January 2007;
6 Pahonie R., Cîrciu I., Boşcoianu M.- „AN ANALYSIS OF DIFFERENT ROTARY WING MICRO AIR VEHICLES SOLUTIONS"- Metalurgia Internațional No.7 Special
7 Geoffrey Hatton, Simon McIntosh, GFS Projects Ltd., *Craft having flow-producing rotor and gyroscopic stability*, UK Patent Office no. GB 2,424,405 /23.03.2005

- **reconnaissance** having the purpose of inspecting or scanning an area to gather information;
- **communications,** in which case they can perform units connecting missions, including the connection to the higher command structures;
- **insertion** for the load delivery within specific target areas. For military purposes, we can talk about weapons airdropping (not necessarily lethal) and that could also include electronic war actions and target destruction actions. The electronic war actions may have two features: the attack against the enemy, for the electromagnetic jamming or by high energy weapons bombing of the convoys, and the protection of their own and allied communications, equipments or objectives;
- **target** represented by a UAV that can be used to simulate a fighter aircraft or a missile in the following purposes:
  - operators' training, in this case being considered as a **practice target**;
  - the imitation of any kind of a person, object, phenomenon to mislead the enemy surveillance devices or the enemy report, in this case the UAV being used as **bait.**

References: