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RESEARCH REGARD UPGRADE OF UAV IN LOW COST CONCEPT

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Abstract. *Unmanned Aerial Vehicles (UAVs) have seen unprecedented levels of growth in military and civilian application domains. Fixed-wing aircraft, heavier or lighter than air, rotary-wing (rotorcraft, helicopters), vertical take-off and landing (VTOL) unmanned vehicles are being increasingly used in military and civilian domains for surveillance, reconnaissance, mapping, cartography, border patrol, inspection, homeland security, search and rescue, fire detection, agricultural imaging, traffic monitoring, to name just a few application domains.*
Keywords. *Unmanned aerial vehicles (UAVs), upgrade, low cost, FPV/OSD*

1.INTRODUCTION

Unmanned Aerial Vehicles (UAVs) have seen unprecedented levels of growth in military and civilian application domains. Both civil and military authorities have a substantial interest in UAV robots that are able to operate with lowcost.

1.1.Types of UAV

Fixed Wing: Though this type of vehicle has intrinsic stability it is difficult to get it to operate effectively due to the slow flight speeds required.

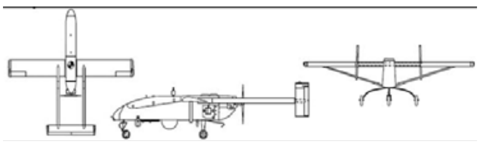


Fig. 1 The RQ-2B Pioneer designed by Pioneer UAV Inc. and operated by the US Marine Corps

Rotary Wing: These are by far the most common configurations currently being explored for this type of mission though few if any are in service. Rotary wing aircraft are inherently unstable which leads to complex flight control systems.

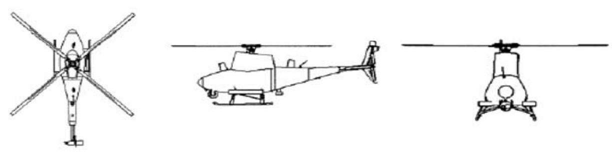


Fig. 2 The RQ-8A/B FireScout. It is designed by Northrop Grumman

Para foils wing. These Para foils have been used to deliver cargo to otherwise inaccessible areas or propaganda leaflets to enemy troops.

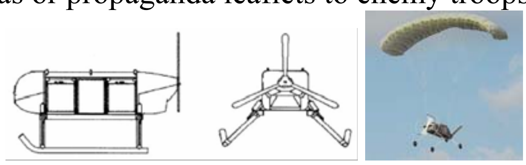


Fig 3. The CQ-10 Snow Goose built by MMIST

Dirigibles: These are lighter than air vehicles usually filled with helium. To lift a significant payload they tend to be large and while stable and maneuverable they are very subject to air movements and temperature variations [1].

Fig. 4 Advanced Airship Flying Laboratory developed by the American Blimp Corporation

as a test bed for improving airship systems technologies, sensors, communications

1.1. Sketch of the UAVs

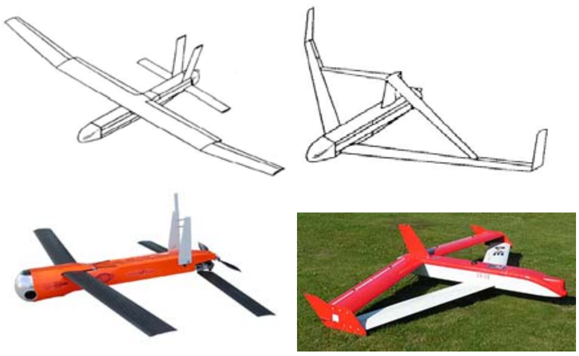


Fig. 5 Variable span and joined wing

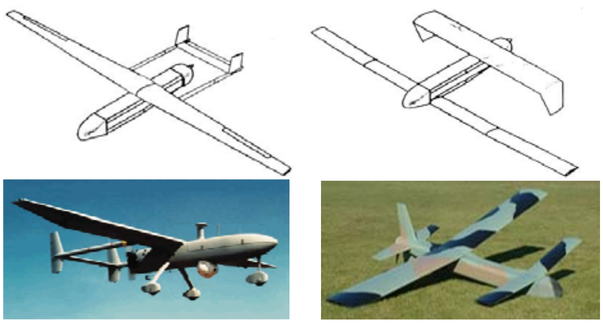


Fig. 6 Twin boom and tandem

2.RESEARCH REGARD UPGRADE LOW COST CONCEPT FOR ATM-1M IN ATM-1V

Upgrade concept is about total performances of the unmanned aerial vehicles, how is in fig. 7

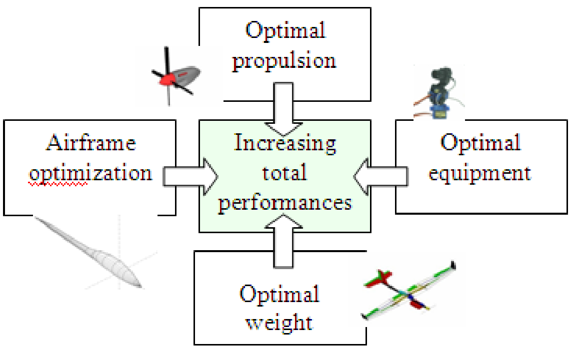
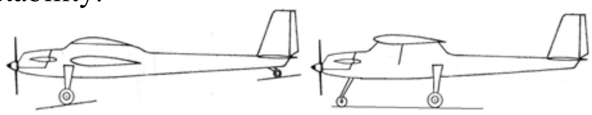


Fig. 7 Method of the increasing total performances

For increasing performances make upgrade at present UAV call ATM-1M, he is an old vector for Romanian Army, in present retired. In the next figure is present upgrade design (parasol wing) for increasing lateral stability.



a. b.

Fig. 7 Upgrade ATM-1M in ATM-1V
a. old version UAV, b. new version UAV

Comparative technical data [2]

Tehnical data	**Old ATM-1M**	**New ATM-1M**
Span	2600 mm	2600 mm
Length	1750 mm	1650 mm
Height	580 mm	580 mm
Empty weight	6 kg	4 kg
Total weight	8 kg	7 kg
Andurance	40 min	90 min
Max. speed	150 km/h	190 km/h
Min. speed	70 km/h	50 km/h
Cruising speed	110 km/h	90 km/h
Operational ceiling	2000 m	3500 m
Max. distance	2500 m	5000 m
Engine	1,2 CP	2,4 CP
Missions	aerial target	aerial target, data acquisition
Ground crew	1	

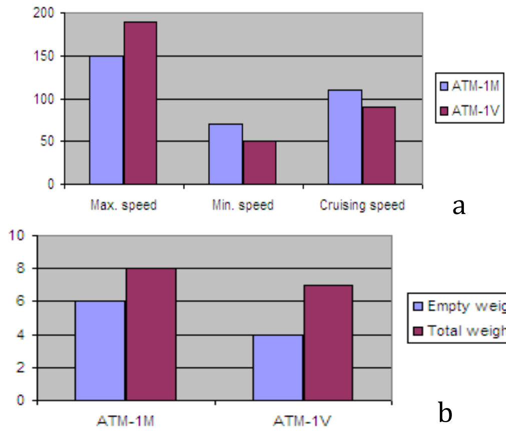


Fig.8 Speed (a) and weight (b) comparation

2.1.Engine and equipment.

This gas engine, are: 2 pcs. aluminium crankcase, Walbro butterfly type carburetor, auto-advance CDI ignition, one GF26i Gasoline Airplane Engine, auto-advance CDI Electronic iginition. [2]

Fig. 8 Engine GF 26 (26 cm^3)

Tehnical data

Capacity	26 cm^3
Power	2,4 CP – 9000 rpm
Weight	1250 g – 1700 g
Bore x Stroke	34mm x 28.6mm
Rotation	1600 – 9500 rpm
Carburator	Walbro pump
Equipment	auto-advance electronic iginition,
Propeller	16x8, 16x10, 17x8 17x10

2.2. Radio control system:

Futaba T-6EX FM 35/40 MHz or 2,4 GHz .

Fig 9. Transmitter Futaba, S3003 servo and Receiver

Specifications:

T6EXAP Transmitter with software [4]
Transmitting on 35, 40, 41, or 72 MHz.
Operating system: 6-channel system.
Power supply: 9.6V Ni-Cd / LiPo.
Current drain: 250mA.
Receiver: R127DF or R136F.
Receiving on 35/40/41/72 MHz band.
Power requirement: 4.8V or 6V.
Current drain: 9.5mA @ 4.8V,
Size: (33.4x50.3x18.1mm),
Weight: / R136F- 0.98oz (27.8g).
Servo: S3003 standard
Power requirement: 4.8 or 6V
Output torque: 3.2kg-cm @4.8V.
Operating speed: 0.23sec/60°@4.8V
Size: 40.4x19.8x36mm
Weight: S3003- 1.3oz (38.0g).

2.3. Electronic systems, equipment image acquisition and FPV system

Electronic failsafe, electronic Battery Switch. Is an electronic safety switch that provides power to a receiver in two packages of 4 or 5 cell NiCd or NiMH. If the battery of the end or suffer a break (so no longer receive current receiver) when the Battery Switch automatically switches the other battery pack .

Fig. 10 Battery switch [3].

Specifications:
- Weight: 18 g
- Working voltage: 4.8 - 6 Volt
- Current: 3.5 A continuously, 5A max.
- Dimensions: 53 x 21 x 13 mm

2.4.Sistem for mission and flyght.

FPV system. The flow chart (fig.11) show all components onboard (minimal equipment).

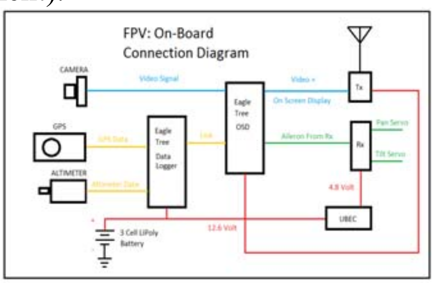


Fig. 11 Sistemul FPV (first visual person)

The OSD system show flight data with datalink FPV and onboard sensors (image online, speed, altitude, RPM, temperature, GPS data)

Fig. 12 OSD onscreen (minimal and full equipment)

3. COSTS FOR UPGRADE ATM- 1V

The estimate costs for a new equipment and new missions show in the next table.

Components	**Price**
Engine	200
Radio control system	250
Electronic failsafe	30
Battery pack	30
Materials and supplies	150
Equipment image acquisition	90
FPV system	300
Total cost euro	**1000**

4. CONCLUSIONS

Implementation, exploitation and the difference in default and equipment lead to differences in costs and capabilities of these aircraft already have a history own evolution alongside the other known types of aircraft.

In future is necessary to take into account the folowing aspects:

- Integration of UAV into the national airspace system;
- Communications with UAV operators;
- Identification of UAVs;
- Airworthiness and maintenance.
- Pilot training, experience and qualifications
- Required navigation performance (RNP) and a dependence on good and reliable GPS coverage;
- Flight termination systems;

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