A QUICK LOOK OVER THE ROMANIAN GROUND BASED AIR DEFENCE

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Abstract: *The paper work proposes a short review of the Romanian Ground Base Air Defense today and try to identify few ways of development into the next future, focusing on the Land and Air Force belonging systems. An important point is the revealing the significance of networking and flexible integration of the sensors, C3I capability and the firing units, allowing the growth of the Air Defense power by addition of the new own or allied units on the existing and compatible pattern. While some systems are completely obsolete and will be replaced, others are susceptible to follow a life cycle up-grading program and certain equipments must be purchased. As a conclusion, the Air Defense is a very dynamic branch of the armed forces and represents a priority in the operational and financial effort to setup a credible armed deterrence.*

Keywords: *equipment, missile, integration, system*

1. INTRODUCTION

The Air Defense takes a major role in the military capability of a state, because is a component characterized by:

- early action
- rapid reaction
- great inhibitive factor

in case of an aggression. This capability prevents the effective use of the enemy's most important asset – the air power.

Building in the peace-time even a solid defense against planes, drones and missiles imposes to an enemy more precautions for a conflict planning and in many aspects forces him to not considers the easy scenarios.

As a general view, AD assures also relatively safe area for other components forming so called National Defense, Safety and Public Order System (SNASOP).

The AD has three initial destinations:

- covers the critical military and civilian infrastructures
- assures the protection of military force
- gives time to react for the political deciders

Together with Intelligence, Special Forces, Communications and Aviation, the Air Defense is in the first line of the state defense.

2. THREATS

Today the air threat rapidly evolves due to the technological advance in software, micro-electronics and precision mechanics mainly. Alongside the fighter-bombers,

helicopters and a wide range of UAV's, some new target categories came to challenge the air defense, including the cruise missiles (CM) and air-to-surface missiles (ASM).

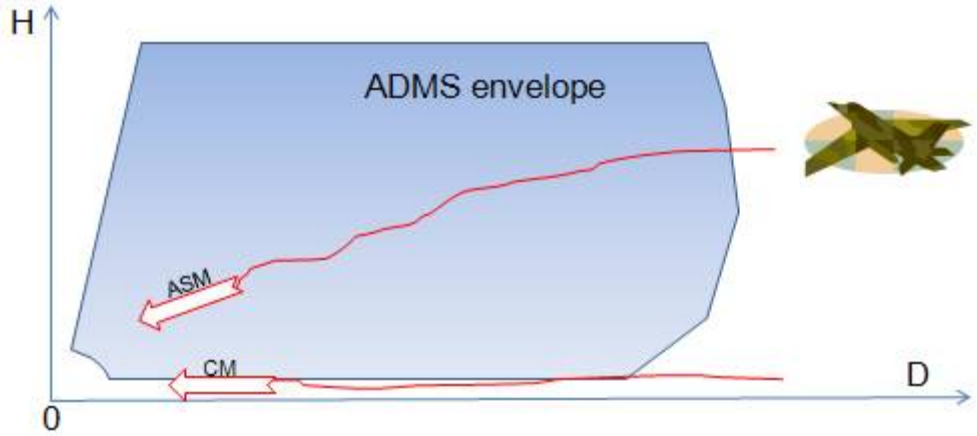

FIG. 1. AIR DEFENCE MISSILE SYSTEM vs. HEAVY TARGETS

The CM as well as the ASM, both stand-off launched, are very difficult targets and imposes high performances to ADMS (Air Defense Missile System). Their low RCS (Radar Cross Section), almost unpredictable trajectory and reduced vulnerability required to ADMS an accurate tracking, quick reaction and high hit-to-kill probability.

3. THE AD SYSTEMS EFFICACY

Contrary to some wrong expectations, the real AD efficacy is dramatically lower than that claimed by sellers or obtained in ideal conditions in field range firings. If values presented in [12] for gun systems or in [9] for common missile systems will be considered, easily may be calculates that no reasonable tactical disposal could delivery enough fire power to assure the target destruction.

Table 1. THE EFFICACY OF SOME AD SYSTEMS

	Missile system		Gun system	
	A	B	C	D
SSKP	0.22	0.33	0.7	0.2
No of rds	1	1	560	70
No of weapons	6 … 7	4	9	42

Even the most advanced missile systems, for that producers claim high kill probability (around 90%), reach this performances in the controlled field range scenarios, while real, with strong jamming environment and in presence of a very maneuverable target, the parameter is lower (between 60% and 40%) [6].

Another limitation is strictly connected to the cost of the target kill operation (i.e. unit elements work and missiles [4], [5]) vs. the value of the target itself.

4. THE STRUCTURE AND THE VOLUME OF THE ROMANIAN GBAD (GROUND BASED AIR DEFENCE)

The Ground Forces disposed by a number of fighting brigades, supported by an AD battalion each and a number of independent AD regiments assigned to the divisional structures. The AD battalions are equipped with small caliber automatic cannon (2 x 30, 2

x 35 tracked and 2 x 35 self-propelled), as well as with VSHORAD (Very Short Range Air Defense) local-built missile systems (CA-94 and CA-95).

FIG. 2. CLOSE RANGE AD EQUIPMENT OF THE GROUND FORCES

These provide an acceptable protection level today, but only at close range (2.5 to 4.5 km) and will become obsolete in the next future.

At the infantry and mechanized units, the close AD is supported by the heavy machine-guns of the armored vehicles.

FIG. 3. THE 12.7 MM, 14.5 MM AND 25 MM WEAPONS ON MBTs, APCs AND IFVs

Generally these are effective against low flying rotary or fixed wing aircraft and UAV's at a range of 1 to 2 km.

Regarding the equipment of the AD regiments, the Russian origin SA-8 and SA-6 ADMS have enough good engagement performances, but their technical resource is almost consumed. However, these are susceptible to perform a life cycle up-grading program [4], [5], going even to the missile replacement [8], 9], [10].

FIG. 4. SHORAD/MRAD EQUIPMENT OF THE GROUND FORCES

The Air Force operates a MRAD missile brigade and a number of Air Force Base AD battalions. The equipment consists on the last variant of Russian made SA-2, now at the end of life cycle and Hawk missile system which attend an up-grade program to the Hawk-XXI standard, while the AFB AD battalions retains the ageing radar-controlled S-60 57mm semiautomatic gun system.

FIG. 5. AD EQUIPMENT OF THE AIR FORCE

The Air Force launched a RFI document (Request for Information) concerning an acquisition of a VSHORAD/SHORAD systems destined for the AFB's (Air Force Base) protection mainly, and the self-defense means of the Deveselu NATO strategic area assure coverage for a large part of Romanian infrastructure.

The Navy has on-board specialized and quite different AD systems. The Danube units operate multi barrel 14.5 mm and 30 mm systems, while Black Sea units are equipped with Russian made 30 mm (AK-230 and AK-630), 2 x 57mm and 76 mm (AK-176 and AK-276) radar controlled gun systems, the OTO Melara 76 mm Super Rapido gun and a board version of CA-94 missile system. Counting the numerical limitation of the naval systems and the specific requirements, we consider these a separate chapter regarding the object of this paper work.

5. MODERN AD DEVELOPMENT CONCEPTS

Integrated Battle Management Center (IBMC) including a Sensors Fusion sub-system represents the expression of coordination between the forces categories in time of a military operation. A C^4I (Command, Control, Communications and Informatics) system supports the action of a skilled staff, capable to use all available forces to fulfill its mission. High performance battle management software, containing likely scenarios comes to assure an advanced efficiency of the staff work [1], [3].

Concerning the AD, these conduct to better target allowance, concentrates enough fire-power on target, permits good IFF dialogue to avoid the blue-on-blue engagements and offer stealthiest pattern for the own firing units.

In other sense, a network with territorial distributed terminals, compatible with NATO data link protocols (ATDL-1, Link 11b, Link 16) is necessary to be setup in peace-time even. That allowed to enhance a zone AD protection adding own supplementary sensors and FU (Firing Units) or allies. This capability called Plug-and-Fight confers flexibility and quick power growth for a dedicated AD operation in a system open architecture [6].

The stability reached by the Commercial off-the-shelf (COTS) components opens the perspective to solve many technical problems [7], mainly regarding the integration jobs, in local industrial facilities.

7. PRIORITIES

Maintaining of the yet-effective AD systems - Today, some AD systems can be up-grade yet while others are complete obsolete and must be replaced. This imposes few urgent up-grading programs, in time of systems life cycle:

- Hawk improvement to XXI standard
- SA-6 Kub flexibility enhancement

In parallel an effort to develops in country in partnership with adequate foreign companies, the elements of the future VSORAD/SHORAD integrated system deserve to be start.

Slowly replacement of the obsolete systems - In this matter may proceeds to a standardization or guns caliber and type of missiles inside of the specific classes. An actual trend looks to build FU based on dual-use high performance missiles, for SHORADs especially [9].

Development of the industrial infrastructure - This work looks first for maintenance and partial production of the AD ammunitions (projectiles and missiles spare parts) mainly. The task supposes a coherent multi-year politics, supporting programs in the fields of:

- equipment acquisition
- systems up-grade
- equipment integration
- research and development (some of these in partnership)
- teaching and advanced training facilities (including the field range modernization)

8. CONCLUSIONS

Using a system open architecture and a common line developed missile family, the C^4I operational command can integrates different AD assets that are existing in field at a moment, like 3D surveillance radars, MRADs and semi-fixed (towed) SHORADs of the Air Force and the highly mobile SHORADs of the Army units, until at the piece level [2].

The local industrial facilities and also the local (Romanian) R&D capabilities may support a consortium to accomplish the AD systems engineering and integration work, and can assume the organization of a training facility, a maintenance facility or even a local Centre of Excellence for Missile Systems.

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