

UNIFORMITY AND STANDARDIZATION OF THE AIR DEFENSE WEAPONS

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Abstract: *Without any doubt the wide diversity of tactical situations involving the enemy's aerial means requires a certain number of types of AD systems. Some of them are destined to repeal low altitude pinpoint saturation attacks, others aim to face at cruise missiles final approach assault and others must prevent high altitude aircraft evolution at long range (reconnaissance, ELINT/EW, tankers, a.o.). All these requirements cannot be satisfied by a single system but also is uneconomical to spreads too much the number of systems in endowment, especially when the quantity (depending on the Army's size) is small. These considerations impose to search for use the systems very carefully choose and as possible even derivatives of a basic system adapted for mission, conducting to uniformity and standardization. In this case only the cost of life cycle and the replacement spending will be taken under control in small maintenance organizations.*

Keywords: *missile, air defense, system, caliber, maintenance*

1. INTRODUCTION

Today it is not imaginable nor a kind of armed conflict without the use of the air power. The aerial means are intensive used beginning to the preliminary and early stages of modern engagements, either as reconnaissance / lure drones, RECCE / ELINT aircraft, superiority fighters, incursion helicopters, stand-off weapons, cruise missiles, a.o. It can be seen the wide range of threat which air defense must primarily confront and many times simultaneously. Here's why the defensive system must be able to conduct multi-layered air defense (AD) operations, based on centralized multi-spectral sensor network and the cooperation of different fire units, depending on the effective phase of engagement.

A relatively small army usually cannot cover entire area of responsibility, but could try to assure a significant protection for the critical assets, like air / naval bases, important passing points, some special objectives (depots, energy plants, transport hubs), political centres, covering in a same time the bulk of own forces (headquarters, concentrations of mechanized troops, artillery positions, columns).

Even for small sized army (in some limits), it still needs to have a range of AD systems to ensure the two purposes. At a minimum, the types of AD systems generally used in army's endowment are:

- AAG (T) - anti-aerial gun – towed
- SPAAG - self propelled anti-aerial gun
- MANPADS - shoulder fired SAM
- VSHORAD - very short range system, based mainly on SP MANPADS
- SHORAD - short range missile system

- MERAD - medium to extended range missile system
- LRHAAD - long range / high altitude missile system

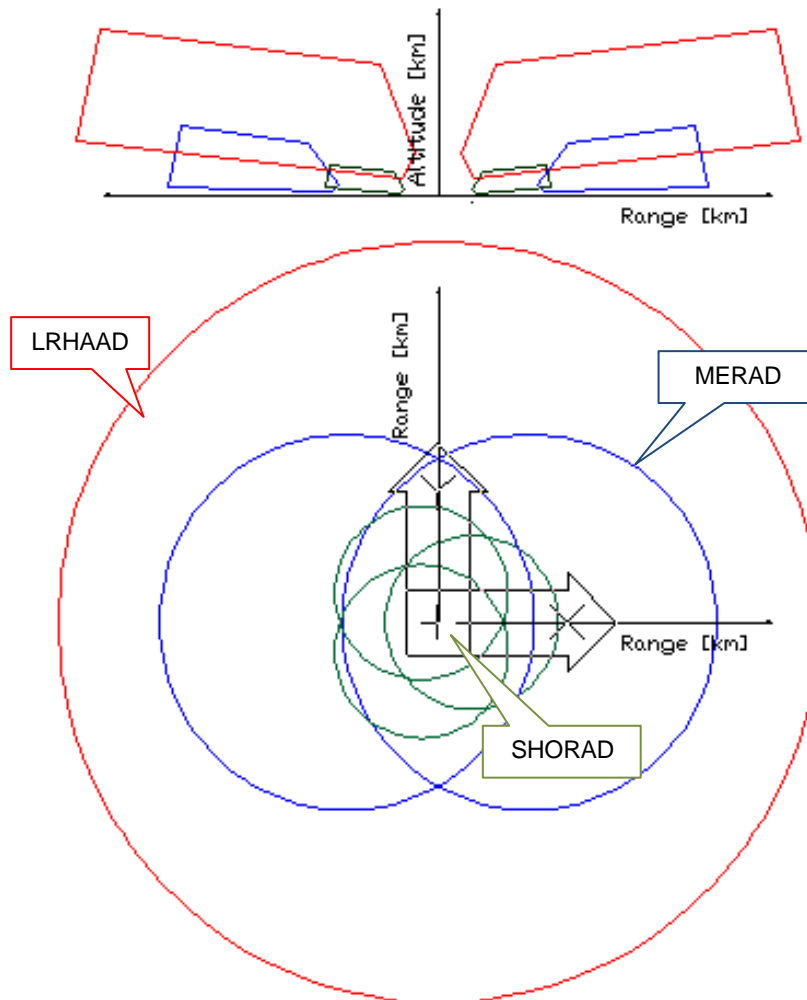


FIG. 1 Multilayer AD diagram

2. SHORT COMMENTS ABOUT PRESENT AD MAIN WEAPONS

In actual structure of the Army the AD weapons are distributed as follows:

Unit / System	AAG (T) 30	AAG (T) 35	SP AAG	AAG 57	CA-94	CA-95	SA-6 Kub	SA-8 OISA	S-75	MIM-23
Mechanized Brigade			X		X	X				
Motor Rifle Brigade	X				X					
Mountain Brigade		X			X					
SAM Regiment						X	X	X		
SAM Brigade									X	X
AFB AD Battalion				X						
Independent Units					X					

At the moment our units uses tree types of AAG (T) and one type of SPAAG:

- A-436 twin 30mm local manufactured
- S-60 57mm Soviet model
- GDF-003 35 mm Swiss-made

The 30mm AAG has little firepower and lack of a modern FCS reduces the utility of this weapon.

The 57mm AAG is reputed inaccurate despite the Radar Fire Control with which is equipped and has a significant weight also, imposing its disposal in fixed positions.

The 35mm twin AAG is relatively useful asset, but needs a good tractor for mobility.

The twin 35mm SPAAG Gepard is a good weapon for the mechanized units close support, mainly combined with a SHORAD.



FIG. 2. The prototype of Gepard SPAAG - mixed VSHORAD at EXPOMIL 2011

Regarding the missile systems available:

The CA-94 MANPADS has some tactical efficacy but the tail-only engagement capability is not enough for the actual battlefield configuration.

The CA-95 is accurate and has a corresponding lethal power, but the range (less 5 km) isn't at the level of a 9 tons SP system.

The SA-8 OSA is developed in little number, without real up-grade solutions and near end of the life-cycle.



FIG. 3. The SA-6 have a certain up-grade potential - here the Polish variant w. RIM-162 ESSM

In a similar situation, SA-6 KUB presents the advantages of a very flexible and reliable chassis and a few NATO-style modernization solutions performed. Both S-75 and MIM-23 systems are now obsolete and must be replaced.

3. PRINCIPLES FOR ENDOWMENT UNIFORMITY

The complete missile range of the Army's equipment includes many other types like:

- Ship borne close AD protection
- Ship borne battle group AD coverage
- Air-to-air dog fight high maneuverable short range missile
- Air-to-air beyond visual range missile

Excepted ground-to-ground, anti-ship and air-to-ground applications, which have another organization and dynamic, parts of other missiles or even entire weapon can be derived in surface-to-air systems. Such a choice could induce some difficulties in the system architecture design but may conduce to great advantages regarding logistics and maintenance.

This permits more flexibility for the resource allocation and allows o concentrate fire power on the threatened directions.

Examples of such development are representing by surface-to-air systems based on the AIM-7 Sparrow, AIM-132 AMRAAM or IRIS-T missiles.



FIG. 4. IRIS-T AAM is directly used in SLS AD derivative -here the Swedish variant

Considering the necessity of replacement/upgrade of totality of actual equipment, the carefully choose of types and models and the limitation of their number appears as mandatory.

A possible schedule of completion to cover the needs of army's structure looks like in the following table:

Unit / System	AAG (T)	SPAAG	MANPAD	VHORAD	SHORAD	MERAD
Mechanized Brigade		X		X		
Motor Rifle Brigade			X			
Mountain Brigade			X			
SAM Regiment					X	
SAM Brigade						X
AFB AD Battalion	X				X	
Independent Units			X			

Accordinging of the size of our Army and of the number and structure of the units, for the moment the 35mm AAG (including SP version) could be the base of barreled AD close range low altitude systems. That may includes ship borne guns and even some primarily ground support guns on vehicle mounts.

Another mandatory item remains a MANPADS, with SP VSHORAD, deck mounting or helicopter-borne self-defense variants.

Considering the capacity to reject the saturation attacks and the wide range of targets which can be engaged a SP SHORAD is necessary; if the weapon (even partially) should assures some ship borne and air-to-air applications, that allows great logistic gain.

A new MERAD system will be necessary to equip the SAM AD Brigade, while a LRHAAD remains to be assured at the NATO Alliance level.

Totally one gun system and three missiles systems, with derivative, could be the backbone of the Romanian AD in the next 20 – 25 years.

4. ADVANTAGES AND COSTS

In the field of logistics, the results of keeping a limited number of AD systems create real advantages regarding:

- depot organization and procedures
- maintenance devices, testers and facilities
- spare parts and auxiliary materials
- transport and maneuver devices and instructions
- personnel training

At the operational level is easier to work using:

- the same symbol code
- the same tactical procedures
- the same efficacy expectations

Considering actual army structure with 5 mechanized and 4 light brigades, 3 SAM regiments, 5 base defense battalions and one SAM brigade the size of the AD equipment is set. Using some market available information it can be estimate, even as a magnitude order, the amount of money that necessary to update the complete AD equipment:

System / Cost	Fire Units	Unitary cost *	Total cost	Comments
Improved AAG	40	20	100	w. 5 radars and TCP's
Improved SPAAG	30	5	150	
MANPAD	60	2.7	162	w. 600 rds
VSHORAD	30	9.5	285	SP systems w. 300 rds
SHORAD	48	10	480	12 Btry w. 480 rds
MERAD	16	350	1400	4 Btry w. 128 rds
Total			2577	

* Estimation mil. USD – for a full package including training, initial spare parts, support equipment, a.o.

These summary looks over a variant of the AD weaponry update process show the complexity and the significant financial effort need for rise an essential branch of Armed Forces, one of the most potent force multiplier and in the same time a real deterrence factor into the hands of political establishment at the opening of a possible conflict.

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