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'TETRAEDR' – TOWARDS HIGHER EFFECTIVENESS AT LOWER COSTS

The Scientific Industrial Unitary Enterprise "Tetraedr" is a company, specializing in development and production of radio-electronic and radar units and systems, training and auxiliary assets (training simulators, target simulators) for radio-electronic and radar weapon systems as well as in upgrade of antiaircraft missile systems.

The enterprise has achieved the most significant results in the field of development, design and production of missile control systems designated for antiaircraft missile weapons. "Tetraedr" has developed and tested in practice (by live firings) innovative missile guidance methods - "KDC" (kinematical differential control) guidance method and "MTP" (modified three points) guidance method. The KDC and MTP missile guidance methods allow to considerably enhance combat efficiency of modern surface-to-air missile (SAM) systems without any upgrade of the missile itself. Company has also made progress in the field of radar systems protection against active jamming. These developments are the basics of a number of antiaircraft missile system upgrade projects carried by this enterprise.

The project for upgrading the S-125-2T "Pechora-2T" SAM system (SA-3 "Goa" NATO designation) is a well-known example. The incorporation of innovative methods of missile guidance (KDC and MTP) and a newly developed receiving device in the S-125 SAM system enabled us to create, as a result of this upgrade, a SAM system that meets modern requirements set to combat efficiency and jamming immunity.

In November, 2004 the first upgraded S-125-2T "Pechora-2T" SAM system was successfully tested during state tests with live firings and accepted for service and operation in the Republic of Kazakhstan.

Tactical and performance characteristics	"Pechora"	"Pechora-2T"
Target channels	1	2
Maximum speed of target engaged, head-on/receding, m/sec.	700/300	900/300
Maximum altitude of target engaged, km	18	25
Range to remote boundary of kill zone, km	24.8	35.4
Maximum cross range of target engaged, km	16.5	25
SAM system jamming immunity, W/MHz	24	2700
Target kill probability with one SAM:		
a) tactical fighter	0.45-0.92	0.85-0.97
b) helicopter	0.16-0.28	0.75-0.95
c) cruise missile	0.04-0.48	0.45-0.95
d) maneuvering target	0.20-0.50	0.55-0.97

Employment of these developments in upgrading the "OSA" SAM system (SA-8 "Gecko" NATO designation) allows to tangibly enhance the principle performance characteristics of the system and make them comparable with characteristics of advanced SAM systems such as "Tor" (SA-15 "Gauntlet" NATO designation), "Grotal", "ADATS". The "OSA" SAM system upgrade project was designated "OSA-1T".

Tactical and performance characteristics	"OSA-AKM"	"OSA-1T"
Target channels	1	1 (2)
Maximum speed of target engaged, head-on/receding, m/sec.	500/300	700/350
Maximum altitude of target engaged, km	5	7
Range to remote boundary of kill zone, km		
Tactical aviation/Helicopter	10,3/6.5	12/10
Maximum cross range of target engaged, km	6	8
SAM system jamming immunity, W/MHz	24	1100
Target kill probability with one SAM:		
a) tactical fighter	0.5-0.7	0.6-0.8
b) helicopter	0.4-0.7	0.6-0.8
c) maneuvering target	0.2-0.5	0.4-0.7

The important aspect of the "Pechora-2T" and "OSA-1T" SAM systems upgrade projects consists in the fact that all works for upgrading the S-125 "Pechora" and "OSA" SAM systems are carried out on the customer territory. Terms of upgrading a batch of a few SAM systems, including repair and restoration works, does not exceed 8-10 months. Thus, a customer, bearing only minimum financial and time expenditures, would get a SAM system repaired and upgraded that meets modern requirements and is capable of being operational and executing combat tasks during a period of 10-15 years.

The company's developments are also used in upgrading European-made SAM systems. At present the Unitary enterprise "Tetraedr" is engaged in modernizing a SAM system made in one of the countries of Western Europe with the view of stepping up its combat efficiency by incorporating novel missile guidance methods (KDC and MTP).

Another direction of the company's activities is development and production of electronic warfare systems, allowing for successful counteraction against high precision weapons and better protection of objectives covered.

The product mix of the enterprise also involves the IVTs-M1 and IVTs-M2 aerial target simulators, designed for training combat crews of short-range antiaircraft missile systems when conducting live firings and for debugging and testing newly developed SAM systems.

The IVTs-M1 and IVTs-M2 aerial target simulators feature technical characteristics that provide simulation of modern small-size and high-speed aerial attack assets. The M1 modification enables the simulation of aerial targets in the radar wave band of 2-4 cm The M2 modification additionally provides aerial target simulation in the visible optical and infra-red wave bands.

The IVTs-M1 and IVTs-M2 aerial target simulators are installed in place of the organic 9M28D (9M22U) rocket warhead of the "Grad" BM-21 salvo system. The IVTs-M1 and IVTs-M2 aerial target simulators are in service with the Republic of Belarus' Armed Forces and are used for simulating targets in combat training of Air Defense units.

All products developed by the company, including the upgraded "Pechora-2T" and "OSA-1T" SAM systems will be exhibited at the "MILEX-2005" 3rd International Military Equipment and Weapons Fair to run in Minsk on May 17-20, 2005. DT

IVTs-M1 air target simulator

IVTs-M2 air target simulator

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