



## NEW “H” DIAPASON SPOON REST RADAR



On basis of experiences and studies of Balkan war at the end of 1990's Hungarian Air Force started the modernisation program for P18 H diapason" spoon rest" type radar stations. The main aim was on one hand the fact that this type of radar carried out the surveillance task very successfully during the war. It was the only type of radars that could recognise and detect for example "the stealth "type air craft. On second hand that the maintenance cost of this type of radars was very low comparing wit other radars. With help of modernisation this cost reduced even more 50%.

As a result of P-18 modernisation, the modernezed equipments are required to have the following tactical and technical parameters:

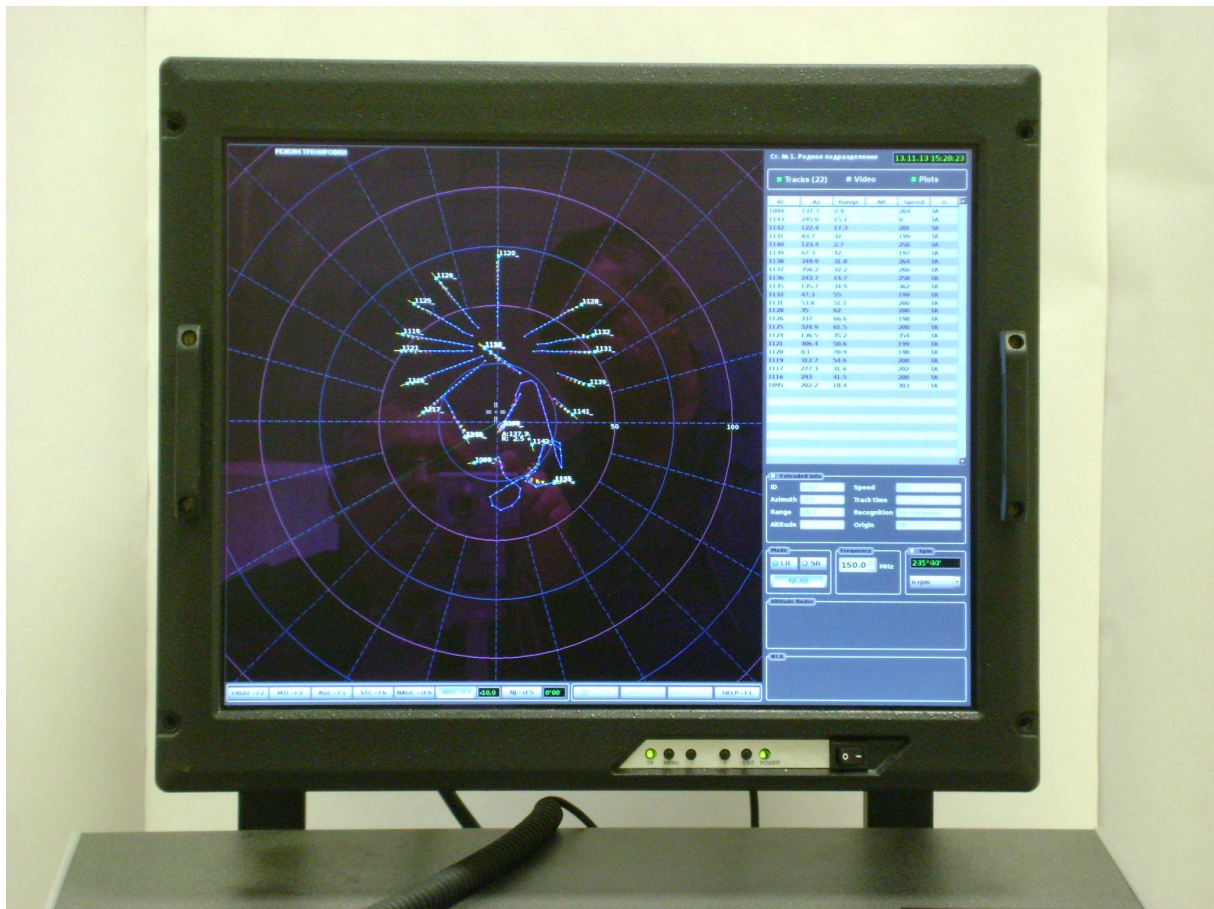
It has a full solid state transmitter system on base of high power elements. The receiver and operator working place built on the last generation microchips. Elelectornic system that is based on the requirements' of 21 century. It has full military design works from -40C to +85C. Comparing the technical solution and parameters it is one of the best productions of spoon rest type radars at the international market.

#### **A) Tactical parameters (essential depends of the costumer's requirements)**

<b>No.</b>	<b>Requirements</b>	<b>Parameters</b>
1	Set-up time	$\leq 40$ minutes
2	Tear down time	$\leq 40$ minutes
3	Start-up time (with power applied)	$\approx 1$ minute
4	Time of checking of readiness for intended application	$\leq 3$ minutes
5	Power consumption (including heat and condition systems)	$\leq 10$ kW
6	Rate of space observation	10-20 s
7	Maximum instrument range of detection	$\geq 400$ km
8	Minimum range of detection	$\leq 2,7$ km
9	Area detection on azimuth	360 degrees
10	The upper failure free border of detection on altitude	$\geq 18$ km
	The upper border of area on altitude with acceptable failure in range	$\geq 27$ km
11	The range of flight speeds of detectable air targets	30-2000 m/s
12	Vertical antenna characteristics ( $\epsilon$ )	The same as current P-18
13	The lower and the upper boundary of area on the angle of elevation	not less than the same data of P-18 radar.

### The Advantages of the P-18 radar

- The number of built-in devices decreases. New units based on up-to-date components replace and take over the functions of a number of tube circuit design units. That improves reliability and availability, and decreases demand for tuning and servicing.
- The applied advanced digital signal processing technologies increase the jam resistance and improve the capability to detect low radar cross-section targets
- Energy consumption and emitted power decreases. Omission of high voltage parts of PP indicators further increases reliability of operation
- Operator comfort improves as a result of more space in indicator cabin and operation procedures aided and simplified by modern computer workplace
- The digital output enables connection to modern airspace control centres even as part of mobile radar subordinate units



In harmonisation with challenges of new international “Today’s requirements” (such as: radar signal processing, radar information display radar data output, identification, reliability) we have fully changed the technical contents of modernization in that result we fully change the following subsystems of radar.



New modernisation includes:

Fully coherent all-solid state radar transmitter (impulse compression)







Full digital receiver system  
Digital signal and data processing





## New locale console



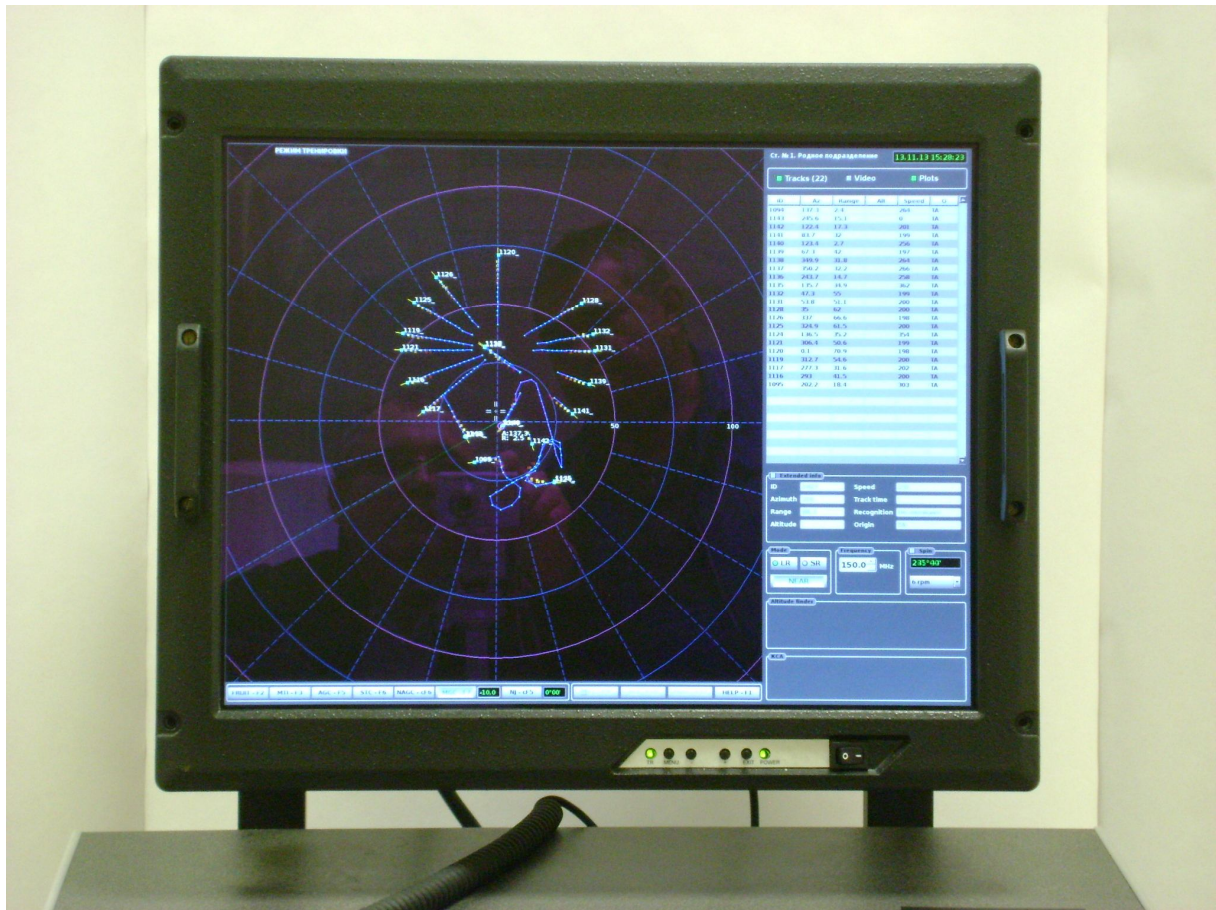
## GPS integration

Features of radar:

- Meter band to effective stealth-technology;
- Maximum use of commercially available COTS components;
- Stable, solid-state transmitter module type;
- Integrated test and diagnostic equipment;
- No special settings in the operation;
- Radically simplified maintenance;
- Project-oriented solutions to the minimum cost of operation and maintenance.

The upgrade improves detection performance, implemented automatic tracking trajectories of air objects. The station can receive data from other radars, radar information exchange occurs on any of the channels in a consistent data exchange protocol.





Depth modernization:

In the radar completely upgraded hardware stall. Extended frequency range (140-180 MHz), Increased the number of operating frequencies from 4 to 200 with the possibility of instant electronic frequency tuning.

In the receiving and transmitting equipment uses only solid state components.

The transmitter has a modular design, and provides a "soft" failure - the failure of a single module results in only partial degradation of the parameters of the radar.

In the antenna system establishes a new induction motor speed, controlled by a frequency converter.



The radar is a two-coordinate is used to automatically determine the coordinates of the azimuth and range. Third coordinate is provided by connecting the upgraded radio altimeters. Characteristics of the emitted signal and processing parameters are set on the operator's position (ARM-O), and secondary processing and formation runs with the calculation parameters of their movements are carried out on remote workstation (AWS-B).

As an option, you can control based radar interrogator in automatic and semi-automatic modes and assigning the basis of nationality. The whole air situation automatically documented with the possibility of playing in passive and interactive modes.

In the P18HM2 implemented effective protection against surge and active noise. Clutter it clearly appears on the operator's screen. Protection against active jamming provides extended dynamic range of the signal processing and the possibility of instant electronic frequency tuning. Anti-clutter provides adaptive digital MTI system and map noise.

Reduced the number of mobile units from 4 to 2 compared to the prototype. Diesel power is placed in a separate compartment of the car with the antenna mast device. Other variants of accommodation station equipment can be placed on a trailer or on a trailer without a chassis. Diesel power can be placed on separate transport units.



### **The modernized receiving and signal processing unit:**

The modernized receiving and signal processing unit provides the amplification and mixing of the received low-level signal, and the adjustment of the bandwidth, too. The receiver is signal processing-microprocessor-based and includes a special high-performance processor. The local oscillator has been replaced by an electronically tuned and moving parts free one. The receiver is fully digital-structured from the intermediate-frequency stages. Every receiver operation mode is implemented in pure software way, therefore the equipment needs less adjustment and maintenance. Signals arrive to the operator's workplace through onboard computer network.

Receiver operation modes can be set in software way. For this purpose the unit has a digital control system. Every unit continuously evaluates the received signal during operation, and in case of abnormality it gives a warning.

### **The modernized controlling and displaying unit:**

The duty of the controlling and displaying unit is to create the man-machine interface between the operator and the radar. This unit allows the radar's switching on and off, selection of different operation modes, adjustment of the different units of the radar, and displays on a uniform surface the analogue and synthetic air picture, moreover it provides the objective control functions, too. The computer-based equipment can be easily handled and is clear-cut. on its displaying surface appears the total air picture and operator can get an overall picture about the radar operation. the unit continuously logs the analogue and synthetic radar picture, the incoming status data and the operator's activities, too. The logged data can be replayed from a given time. By this the equipment realizes the full-scale objective control. The objective control allows data logging – analogue and synthetic information, error messages, operator's activities,- data replaying- with desired speed in desired time, by selected displaying and

filtering functions – and there is the possibility for photo taking, recording by this the given air situation.

### **The modernized communication and transmitter unit:**

Requirements to the means of communication and data transmission:

The means of communication of the Item should provide information exchange with the coupled items over the wired physical lines, channels of a basic network connection on leased communication channels, in accordance with the protocols of information-technical conjugation, in the volume of ensuring the implementation of the sets of tasks.

The means of communication of the item should include:

- means of operational command telephone communication;
- means of operational command telephone communication;
- the equipment of data transmission;
- radio communication equipment

The means of operational command telephone communication and radio communication of the item should be provide:

- the open telephone and loudspeaker communication between the automated workplaces of the item and the coupled objects;
- the open selective telephone radio communication on VHF band of the communication center with control of radio stations on C-T4 joint;
- the loud speaker and telephone communications on all the workplaces of the item;
- the transmission of voice information from all the remote subscribers of APM and BAPM to the input of the registration device;
- the open radio-telephone communication from the driver's cabin through the VHFband radio stations of small power in the movement of the item in the column with the same type of radio stations with range of radio communication not less than 10km while radio station works on a rod antenna;
- automated monitoring and evaluation of the communication channels, check of the serviceability of trunks, connected to the item

The equipment of the radar should provide the stabilization of probability of a false alarm under different terms of jamming layout.

### **Main technical characteristics:**

- Frequency range 140-180 MHz;
- Coordinates measured azimuth, range;
- Detection range for the effective area of the secondary emission targets (ERC) 2.5 square meters with a probability of detection of 0.5 at 10,000 m 175/250 km; review of space velocity azimuth 3/6 / min.;

Accuracy of coordinates:

- Distance of 180 m;
- bearing 0,4 °;
- Resolution: in range of 1200 m;
- Azimuth 8 °;
- Pulse transmitter power of 10 kW;
- The types and duration of probing signals:
  - FM near zone 21 ms;
  - FM distant zone 250 ms;



- Chirped the far zone 250 ms;
- Receiver noise, no more than 2 dB;
- The number of tracked trails to 250;
- Retrofit kits radar has protection from the following types of noise:
  - Pulsed interference,
  - Cutter;
  - Active noise interference (ACP).
- Impulse noise is suppressed completely.
- Anti-clutter ensures MTI system and maps its noise parameters:
  - Work area 0 - 400 km;
  - Factor suppressing clutter > 40 dB.
- Protection against active jamming is provided by:
  - Automatic monitoring of noise conditions and display it results in the workplace of the operator;
  - restructuring of the operating frequency of the radar in 0.1 MHz;
  - High dynamic range receiver and digital processing unit signals of 100 dB, in addition to 30 dB by using AGC.
  - Power is supplied by a three-phase AC 380 V 50 Hz. Power consumption <10 kW;
  - receiving radar from other radar on the remote workstation uses the protocol ASTERIX, or other connection.

Group of modules for digital processing of radar signals





The modernized radar can be connected through a digital radar extractor to a modern air space C2 system.

IFF: We can provide installation of any IFF system according to the customer request. The customer should indicate and provide the IFF system due to it is national obligation.

#### ADVANTAGES

- New radar highly covered

- Protected from all type active and passive jamming

- Has only one (or no one ) operator

- Reliable: provides aprox: 12000 operational hours. (for electronics components)

Time of produces:

10 month for the first equipment and additionally 4 month for the second equipment.

Warranty and spare parts.

Our company provides 12 months warranty for each unit.

Starting the negotiation our company will propose and provide a spare part list that should be negotiated for the selling. Spare parts we will provide for 10 years maintenance cycle.

#### References.

Our company with the producer HM ARZENAL CO. as a fully government owned company has both domain and international references for works produce and modernize of several types of radar systems air command and control systems. We participate in several international radar programs.

The main customer is Hungarian Defence Forces (Air Force part), NATO NAMSAS Greece and Turkish Air Force and other countries as well.

#### Technology.

MIL-EXIM is the full owner of the modernisation and the produce technology. The producing process is carried out in cooperation with HM ARZENAL Co. at its base.