INCREASING RADIO COMMUNICATION EFFICIENCY WITH THE TRANSPORT FACILITIES

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Radio communication systems accomplish one of the main functions in the information provision of the processes of controlling movable objects, being the only means of the exchange of the operation information between dispatchers' stations and movable objects crews.

Territorial systems of communication are highly reliable, but in case of the information provision of the processes of controlling the movable objects on the territories – the considerable technological and financial expenses are necessary and it's quite purposeless with the comparatively low number of abonents.

This work is devoted to the radial systems of the decametric range, they being free of above mentioned disadvantages. The use of the decametric range waves can be explained by their increased length of propagation, though these systems have their own drawbacks: there are silence zones in them and they are less reliable in comparison with territorial systems.

The information provision of controlling movable objects even in the silence zone can be achieved with the help of zenith radiation and reception.

The simplified scheme of such radio communication is shown in Fig.1.

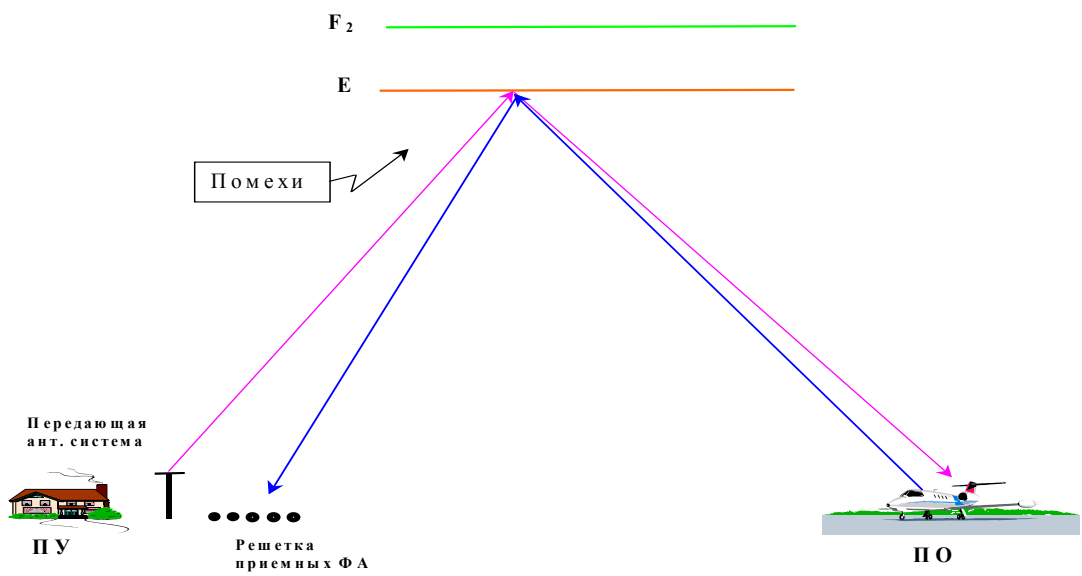

Fig. 1. *Radio communication with the movable objects scheme*

The energetical potential of the radio communication line is considerably defined by the effectiveness of aerial devices work.

Under theses conditions this work directed to increasing the effectiveness of the radio communication radial systems with movable objects through increasing the efficiency of the aerial systems of the zenith radiation and reception is considered to be complex task, that is why we pay attention to the receiving aerial devices for movable objects.

The complexity of the problem is strengthened by the presence of the unfavorable peculiarities; considerable absorption of the radio waves in the ionosphere with their propagation in the direction coinciding with the zenith direction or with the nearest to it direction; the presence of the deep signal attenuation in the point of reception; the influence of the ionospheric movement; the presence of the radio interferences of the sufficiently high level.

The author has completed the energetical account of the radio communication channel (Fig.1.) for 2 cases, when: 1) the layer E is used for radio waves reflection; the layer F_2 is used for radio waves reflection.

To estimate the efficiency of the radio communication channel we used such an indicator as radio communication reliability that is understood as the time percent during which the speech distinction is not lower than the given level. Radio communication reliability depends on the signal relation to the interference at the point of reception, i.e. on the efficiency of the work of the receiving aerial devices.

We drew the conclusion that to provide the communication reliability not less than 90% when the speech distinction is not worse than 87% (the third class of distinction; when the speech perception is accomplished with the increased attention but without reinterrogations), we need the situation when the relation of the signal to the interference at the point of reception has to be not less than 64 dB. (relatively 1 mkV/m).

It is impossible to provide such level with the help of the stationary aerial system or even with the help of the aerial system installed on the movable objects

But as the work [1, 2, 3] demonstrated, the receiving ferrite aerial with the electrodynamic screens allows to weaken the action of the interference (more than to 36 dB).

That is why at the place of movable object the level of one signal created by the stationary aerial system located in the point of controlling (Fig. 1.) can be minimized up to 46 dB which is simply realized practically.

Besides, the suggested aerial has got small sizes and can be installed either on the vehicle body or in the special deepenings in the body. The latter condition is of great significance for flying apparatus because it does not lead to the distortion of the aerodynamics of the movable object.

The functioning model of the small size active receiving ferrite aerial was developed and produced for the experimental investigations. The aerial part of this model is shown in Fig.2.

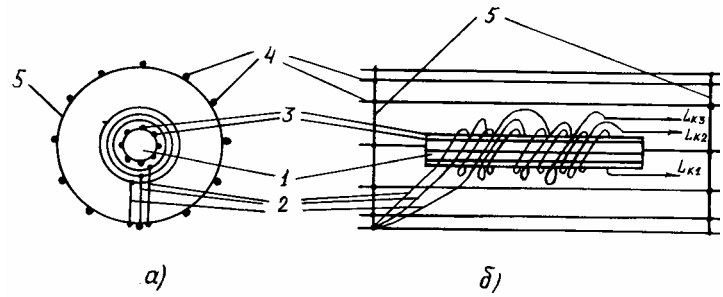

Fig. 2. *The aerial part of the ferrite aerial model with two electrodynamic screens*

As for the construction – the aerial part of the ferrite aerial (Fig. 2.) consists of the chain of 19 ferrite cores (1), located inside three spirals (2), which have accordingly 7; 4; 2 windings, one

spiral end being grounded. The spirals with the ferrite core are placed in the electrodynamic screen which is presented by the system of 12 longitudinal metallic rods (4) located equally along the circle and soldered to the separated metallic rings (5). The screen is constructively fixed to the metallic body of the aerial amplifier and electrically connected with the latter. 8 metallic wires are equally distributed on the lateral surface of the group of the ferrite cores.

The first spiral L_{k1} is used in the range of (1,5….8) MHz, the second one L_{k2} is used in the range of (8….13,5) MHz, the third one L_{k3} is used in the range of (1,3….30) MHz. Definite spiral switching is accomplished distantly from the control station by means of the communication block. The latter is constructively fulfilled on the printed plate and is located in the back part of the aerial electrodynamic screen. The useful signal is taken from the ferrite aerial itself. The whole range of the working frequencies (1,5….30) MHz is subdivided into 5 subranges. Switching to and off these subranges is accomplished distantly from the control station.

Thus, the work shows the principal possibility of increasing the effectiveness of the short wave radio communication with the vehicles through the application of the small size receiving ferrite aerials with the electrodynamic screens.

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