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DEFENSE OF RADIO-ELECTRONIC EQUIPMENT,(U)
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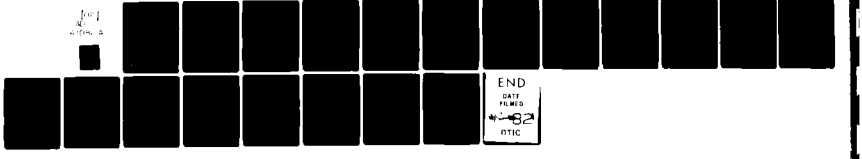

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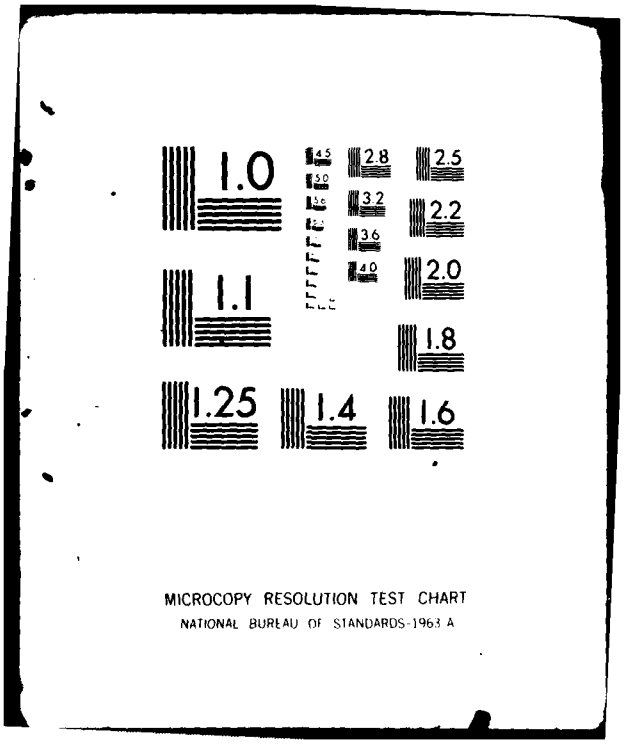
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FOREIGN TECHNOLOGY DIVISION

DEFENSE OF RADIO-ELECTRONIC EQUIPMENT

by

V. Grankin

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DEFENSE OF RADIO-ELECTRONIC EQUIPMENT

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

DEFENSE OF RADIO-ELECTRONIC EQUIPMENT[1]

Major General of the Communication Forces, V. Grankin.

FOOTNOTE [1]. Based on materials of the foreign press. ENDFOOTNOTE.

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The defense of the radio-electronic means/facilities, used in the troop command and control systems and of weaponry, the military foreign press are called the important composite/compound component part of electronic warfare. They consider that the existing methods of the suppression of the work of these means/facilities by jammings/interferences, and also the possibility of damage/defeat by artillery and especially by the rockets/missiles of homing jeopardized their use without the use/application of protective measures.

As assume/set foreign military specialists, the defense of radio-electronic means/facilities from the jammings/interferences and the disinformation is achieved by conducting the series/row of the

organizational and tactical measures which are developed/processed by headquarters, which organize and which plan/glide the combat employment of radio-electronic means/facilities, and the measures of technical ones, realized by specialists, who operate these means/facilities.

The fundamental organizational and tactical measures of the defense of radio-electronic means/facilities from reconnaissance/intelligence and jammings/interferences of enemy consider supervision for the work of their radio-electronic constructions, struggle with radio- and electronic reconnaissance of enemy, annihilation of the jamming transmitters and their carriers, increase qualifications and physical fitness of the operators of radio- radars in the work under conditions of radio interference.

Supervision of the work of its radio-electronic means/facilities includes interception and analysis of their signals. These data make it possible for commander to reveal/detect violations in the transmissions, to find the sources of the escape of information and to take the appropriate measures for the elimination of deficiencies/lacks in camouflage of the work of their radio-electronic means/facilities. Supervision is recommended to organize in all units and large units/formations with any means of combat operations. Especially careful it must be in the periods of

limitation or complete prohibition of the work of radio-electronic means/facilities on transmission.

Struggles with radio- and electronic reconnaissance of enemy it is conducted always, in the peaceful and wartime, in all means of combat operations. As emphasizes one of the authors of the log/journal of the FRG "Truppenpraxis", the fundamental methods of this struggle consist in the limitation of the radiations/emissions of electromagnetic energy to the side of the enemy, in the prohibition of the work of radio-electronic means/facilities on transmission to individual phases of combat and in shortening of the duration of working performances.

Fig. 1. The arrangement/position of radio set taking into account the screening effect of the terrain: 1 - station of radio interception; 2 - shielding elevation; 3 - radio set; 4 - antenna; 5 - counterweight. Key: (1). Enemy.

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For limiting the radiations/emissions to the side of enemy headquarters accommodate their radio-electronic means/facilities under the cover of groves, elevations or any large/coarse ground features, which are screen for the electromagnetic energy (Fig. 1). In particularly critical cases - with the troop regroupings, preparation for offensive and in the defense, and also when the control can be provided by other means/facilities, the work of radio-electronic constructions to the specific time is limited or is

forbidden.

Shortening the duration of working performance is achieved by the decrease of sizes of radio messages, by the compactness of radio signals, by an increase in the speed of transmission, and in the radiolocation - by short-term inclusion/connection of stations for the survey/coverage of terrestrial (water) surface or airspace. In this case it should be remembered: the less the time work the radio-electronic means/facilities, the more difficult to reconnaissance/intelligence to reveal/detect them.

The annihilation of the jamming transmitters and their carriers - most reliable, as consider foreign specialists, safety method, since in this case completely they are rendered inoperable of the radio-jamming equipment and service personnel.

Jamming transmitters, as a rule, have large radiated powers; therefore radio- and electronic reconnaissance can comparatively rapidly establish/install their location. As the most effective weapon of destruction surface/ground army jamming transmitter which are usually placed in the automobiles, is considered aviation, and the transmitters, adjusted on the aircraft, aviation and surface-to-air missiles. Over the long term for this purpose it is proposed to employ rockets/missiles with the homing heads.

Increase qualifications and physical fitness of operators under conditions of jammings/interferences play important role in a question of the defense of radio-electronic means/facilities. As it was communicated in the press/printing of the USA, the operators of radio- and radars, who have high qualification and large experiment, rapidly is defined the type of jammings/interferences and they drive out/select technical safety methods from them. Under conditions of comparatively strong jammings/interferences the aged radio operators accept texts) radio messages almost without the distortions, whereas the radio operators of the lowest qualification and little aged - only half of text or do not accept completely.

It is emphasized that the well prepared radar operator by the adjustment of receiving and display units can detect the echo from the target signal even under conditions of strong jammings/interferences.

In connection with this it should be thoroughly to prepare the operators of radio- and radars, continuously raised their qualification and especially persistently trained/aged in the work under conditions of the various kinds of jammings/interferences. In this case it is noted that the decisions/solutions of operators will

now and then be determining in the provision of a normal operation of the radio-electronic ones of the normal work of radio-electronic means/facilities.

To the technical protective measures of radio-electronic means/facilities from the radio intelligence and the jammings/interferences carry selection and armament of places for operation of stations in the areas indicated, the use/application of antennas of directional radiation, maneuvering by the power of transmitters, shortening the periods of their tuning and conduct by the operators of official negotiations, a strict observance by them of rules/handspikes of radio traffic, the simultaneous shift/relief of working frequencies and numbers, brightness control and definition of the image of target on the screens of radars.

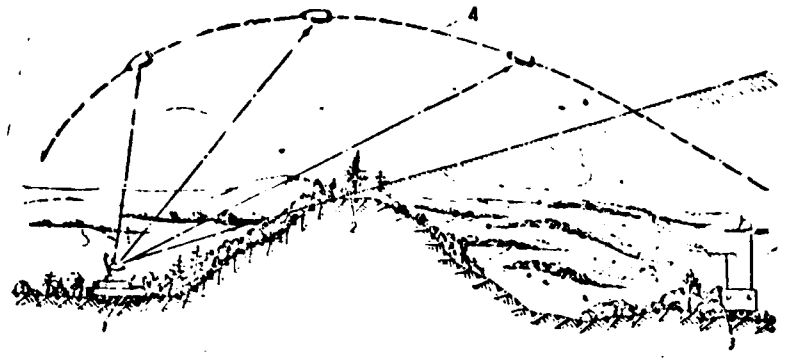

Fig. 2. Disposition of radar of artillery reconnaissance/intelligence taking into account shielding properties of terrain: 1 - station of electronic reconnaissance of enemy; 2 - shielding elevation; 3 - artillery radar; 4 - flight path of shell.

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Places for the radio-electronic means/facilities foreign specialists consider necessary to drive out/select taking into account the screening effect of terrain, in order to weaken/attenuate or to exclude the dissemination of energy to the side of the enemy. Radars, in their opinion, should be accommodated in such a way, that it would be possible to conduct reconnaissance/intelligence in the strictly assigned sector/arc, not radiating energy in other directions (Fig. 2). In this case their search/scanning will be hindered/hampered, since antenna radiations on the lateral and rear

lobes/lugs reconnaissance/intelligence will not be able to reveal/detect.

One should also "overshade" some areas by the installation of radar after the elevations, the buildings, the bushes. In this case the station irradiates the reconnoitered area, but not "does brighten" terrain beyond its limits (Fig. 3). Both in the first and in the second case radar can be detected only in the irradiated sector/arc, and if sector/arc is narrow, then it cannot be intersected by reconnaissance stations and suppressed by jammings/interferences from the adjacent sectors/arcs.

If the methods indicated do not give positive results, it is necessary to rapidly change position. Removal/distance even less than a hundred meters from the previous place can be sufficient in order to lower the effectiveness of jammings/interferences. In this case first is established/installed the direction of the entrance of jammings/interferences, and then they drive out/select position so that between the source of jammings/interferences and the radar equipment would be located any shielding obstacle.

By the use/application of directional antennas it is possible to emit energy in the necessary direction and to limit its dissemination to the side of the enemy, impeding to it thereby conduct radio-and

electronic reconnaissance and the creation of jammings/interferences. By the directional antennas it is possible to also weaken/attenuate the effect of jamming/interference by changing the direction of the reception of useful signal.

By effective measure is considered also maneuvering the power of radio transmitters. In the case when the troops/forces conduct combat operations by compact grouping and the enemy of jammings/interferences does not create, connection/communication is recommended to realize at the maximally low power of radio transmitters. But if enemy creates jammings/interferences, radiated power they increase in order to obtain the strength of the field of useful signal higher than jamming/interference. Frequently this safety method in combination with the use/application of directional antennas is considered as the most effective.

By shortening the time of transmitter tuning and conduct of official negotiations operators is intended to hinder/hamper the activity of radio intelligence, since in this case become complicated the conditions of the identification of radio sets, determination of the identification of radio sets, determination of the identity/accessory equipment of radio nets, the interception of negotiations and direction firding.

In connection with this it is proposed to extensively use timely transmitter tuning without the radiation/emission of energy (to the dummy antennas), as far as possible by several working frequencies.

Fig. 3. Operation of radar of reconnaissance/intelligence of the ground targets in the narrow sector/arc: 1 - radar; 2 - sector/arc of survey/coverage; 3 - station of electronic reconnaissance of the enemy.

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A strict observance of rules/handspikes of radio communication is considered as the best safety method from the radio intelligence, since in this case is achieved the uniformity of exchange and official negotiations.

The overheard official negotiations of radio operator-operators, especially their repeated calls and the proposition of radio messages together with the individual "identification signs/criteria" are the

most important source of the identification of identity/accessory equipment with radio communication. By especially valuable "findings" for the radio-scout are the various kinds of the violation of the rules/handspikes of radio traffic, the extraneous conversations of the radio operators, the arbitrary inclusions of radio sets at the improper time and the transmission clear. Via interception and direction finding radio intelligence accumulates violations and, after establishing place and the category of headquarters, obtain the information about the situation and the intentions of command element.

The simultaneous shift/relief of working frequencies and numbers allows, as assume/set foreign specialists, for some time "to depart" from the radio intelligence and to avoid jammings/interferences. This method requires the trained state of the radio operators and coordination to their work, since carelessness and errors in the time give the possibility to enemy to identify the appropriate radio sets already at the new frequencies, to follow them and to suppress by jammings/interferences.

By brightness control and contrast of the image of target on the screens of radars in many instances it is possible to isolate the reflected pulse among the jammings/interferences. According to the communication/report of the log/journal of "electronics news", this

is achieved by the blackout of screen with the simultaneous tuning of image brightness of the echo signal. Sometimes suppress jammings/interferences by the tuning of limiter and heterodyne, but only in such a case, when jamming frequency does not coincide precisely with the frequency of useful signal.

Of the operators they require so that upon the appearance of jammings/interferences they would utilize all possibilities for continuing the work. On the facts of the suppression of connection/communication by jammings/interferences it is forbidden to communicate opened so that the enemy could not explain the degree of the effectiveness of the created by it jammings/interferences.

Defense from the disinformation provides for the constant vigilance of the commanders, staff officers and operators, their ability to use the framing of the passwords of the commanders and radio sets, timely reports of the texts, accepted from the suspicious stations, transmission to these radio sets of pilot signals and dummy information.

They assume that the disirformation on the radio can appear only in those radio nets which the radio intelligence of the enemy thoroughly follows prolonged time, it knows well the mode of their operation, and also the individual signs/criteria of radio

operator-operators. As the especially favorable moments/torques for the disinformation are considered stressed phases of combat when the attention of the officers and radio operators is removed/abstracted by the developable events, and also when audibility of one of the stations of net/system poor or entirely it disappears (radio set malfunctioned or it is moved).

To radio operators order to be especially careful during the setting connections/communications, upon the appearance in the net/system of the new correspondents and upon the shift/relief of working frequencies and numbers.

The sense of the disinformation of radar reconnaissance of the enemy consists of the creation on the terrain and of the airspace of the series/row of confusing reflectors from which the marks on the screens in form and brightness are equal to marks from the actual target. This is introduced radar operator into the fallacy relative to presence and the locations of true target.

The disinformation of radars of reconnaissance/intelligence of the ground targets is achieved by installation to the terrain and the transfers of the angle reflectors and re-reflectors, while that of the stations of reconnaissance/intelligence of the aerial targets - by dropping from the aircraft of artificial deflectors in the form of

the metallized deflectors in the form of the metal foils and dipoles from the fiberglass, and also other objects/subjects, which imitate aircraft and rockets/missiles.

As the best defense from all forms of disinformation is considered the constant vigilance of the officers and operators.

Rockets/missiles the homing devices consider the weaponry, which possesses the sufficiently high kill probability of radars. Defense from them is provided for by annihilation by fighter aviation and by complexes of the AA guided missiles of carrier aircraft to the launching/starting by them antiradar missiles and by annihilation of rockets/missiles themselves in flight. They recommend to apply also short-term disconnections and shift/relief of the working frequencies of radars.

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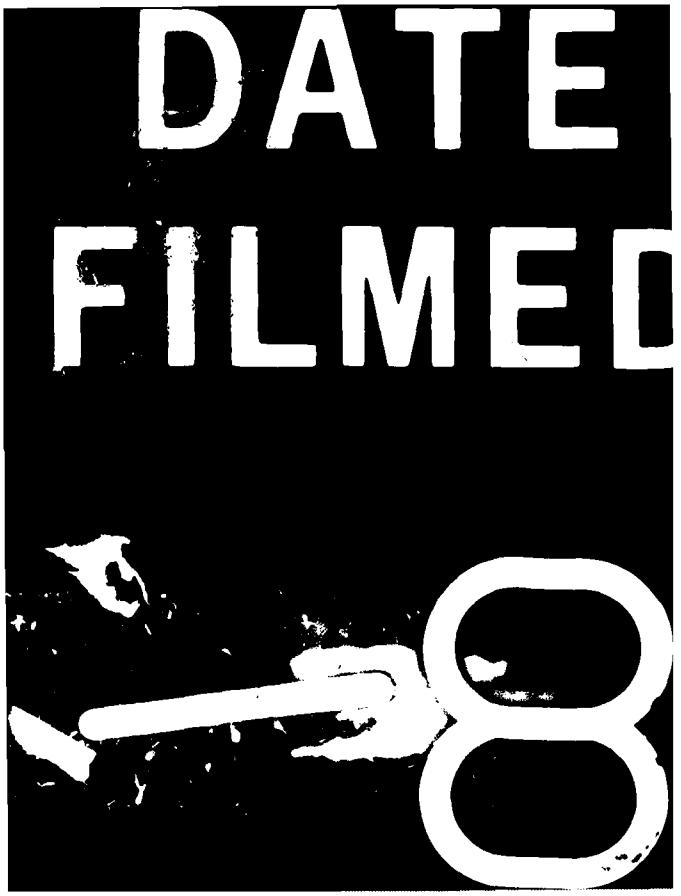
With the disconnection of the transmitter of station on several seconds (after rocket launching by aircraft) the rocket/missile loses orientation and does not strike into the station.

As it is emphasized in the foreign press, for retaining/preserving/maintaining the station it is important to

arrange/locate it in the cover or between the slopes of heights/altitudes. Homing missile due to the reception/method of repulsings from the ground features of the unit of the emitted by radar energy is deflected and it falls at certain removal/distance from the station, without having deposited on it damage. However, covers of the simplest type protect the vulnerable units of the station, mixed in the compartment.

In all cases the problem of the defense of radio-electronic means/facilities should be solved concretely/specifically/actually, creatively so that the enemy is not the smog to be adapted, to rapidly develop and to use the new methods of attack.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