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CENTRAL INTELLIGENCE AGENCY  
WASHINGTON, D.C. 20505

19 July 1976

MEMORANDUM FOR: The Director of Central Intelligence  
FROM : William W. Wells  
Deputy Director for Operations  
SUBJECT : MILITARY THOUGHT (USSR): The Threat of Enemy  
Neutralization of Radioelectronic Means and  
Their Protection in Operations

1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought'. This article summarizes protection measures against US and NATO electronic warfare, which include destruction of the jamming transmitters, radio camouflage and barrage jamming of radio reconnaissance, and improvement of the training of radio operators. Radars may be protected by using different frequencies at a radar post, destroying missiles and their delivery aircraft, or by diverting or disorienting homing missiles. Radio communications also may be protected by using superhigh frequencies and covert communications, and control installations by deploying emitting devices some distance away and using intermediary stations. This article appeared in Issue No. 1 (77) for 1966

2. Because the source of this report is extremely sensitive, this document should be handled on a strict need-to-know basis within recipient agencies. For ease of reference, reports from this publication have been assigned

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## Intelligence Information Special Report

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COUNTRY USSR

DATE OF INFO. Early 1966

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DATE 19 July 1976

SUBJECT

MILITARY THOUGHT (USSR): The Threat of Enemy Neutralization of Radioelectronic Means and Their Protection in Operations

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 1 (77) for 1966 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought". The author of this article is Colonel V. Grankin. This article summarizes protection measures against US and NATO electronic warfare, which is considered to consist of detection and sudden neutralization of electronic equipment by destruction or jamming. The methods of protecting radio and radio-relay communications described by the author include destruction of the jamming transmitters, radio camouflage and barrage jamming of radio reconnaissance, and improvement of the training of radio operators. Radars may be protected by using different frequencies at a radar post, destroying missiles and their delivery aircraft, or by diverting or disorienting homing missiles. Radio communications also may be protected by using superhigh frequencies and covert communications, and control installations by deploying emitting devices some distance away and using intermediary stations.

End of Summary

[REDACTED] s Comment:

The author, recently identified as General-Major V. Ya. Grankin, is a doctor of military sciences and has been a professor at the Military Academy i/n M.V. Frunze since 1962 [REDACTED]

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The Threat of Enemy Neutralization of Radioelectronic  
Means and Their Protection in Operations

by  
Colonel V. Grankin

After World War II, since the early 1950's, more and more attention has been given by the armies of highly technically developed countries to the problems of developing means and methods of neutralizing the radioelectronic equipment of a probable enemy.

At present, all of the main capitalist countries have well-established theories for the neutralization of enemy radioelectronic means during operations. These theories have been adopted as integral parts of their aggressive military doctrines. In the armies of the US and other leading NATO members great strategic importance has been attached to the measures involved in warfare against radioelectronic means. They are classified as one form of conducting military operations which has been designated "radioelectronic warfare". The basic tenets of US and NATO doctrine dealing with the waging of radioelectronic warfare can be summarized as follows.

Radioelectronic warfare is considered as one aspect of modern warfare, and the means used to wage it are considered to be additional weapons at the disposal of the commanders.

It is planned that warfare against radioelectronic means should be waged by all branches of the armed forces and in all types of combat actions. In the ground forces radioelectronic warfare means are expected to be used from the army group all the way down to and including the battalion.

The basis of radioelectronic warfare is considered to be radioelectronic countermeasures. These are directed toward preventing the enemy from employing radioelectronic means. They include the producing of jamming, the destruction of radioelectronic equipment by fire means, and radio deception.

Primary importance in the plans for conducting radioelectronic warfare has been given by the military leaders of the US and NATO to the detection, followed by the sudden and massive neutralization of the radioelectronic means used in reconnoitering air targets and in controlling strategic missile forces and aviation. Among the measures to be carried out for this

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purpose are: the dispatching of jamming transmitters mounted in strategic bombers and missiles on a massive scale into the territory of the socialist camp countries, especially the USSR; the use of powerful stationary radios; the detonation of high-altitude nuclear bursts and bursts of easily ionized chemicals in order to neutralize the operation of radioelectronic equipment by means of artificial ionized formations; the destruction of important radioelectronic targets by missiles, aviation, and sabotage-reconnaissance subunits.

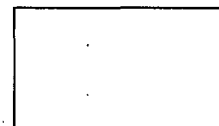
To what extent the efforts of the NATO countries represent a real threat in this area can be judged on the basis of the following data.

In the strategic aviation based in the US and Great Britain there are special aviation units and subunits of strategic bombers equipped with radioelectronic warfare means to be used for neutralizing our air defense radar system in support of their strategic aviation. The American aircraft in these units carry up to 11 to 13-jamming transmitters. In addition, each bomber delivering nuclear weapons carries up to eight jamming transmitters for its individual protection. The English Vulcan, Victor, and other aircraft have three sets for jamming the radar means and ultra-shortwave radio communications of our antiaircraft units.

To neutralize the radio and radio-relay communications of the ground forces and front aviation, and to detonate the radar proximity fuzes of missiles and aerial bombs, radioelectronic warfare units have been established in the US army. They are intended to be attached to field armies and army corps, while subunits of these units are to be attached to divisions, brigades, battalions and missile and artillery battalions.

The Americans have developed and adopted into service several types of missiles with homing heads for destroying the radioelectronic sets belonging to the air defense of the country and the fronts. For example, there is information that the Shrike (AGM-45) guided missile with passive homing head, which was adopted into service in 1964 for use by tactical aviation, was hurried into series production and has already been used to destroy the decimeter band radars in the air defense system of the Democratic Republic of Vietnam. The Snark (SM-62) and the Matador cruise missiles have been modernized, and homing heads have been developed for them. They are expected to be used widely for the destruction of radioelectronic targets.

In order to destroy large communications centers, receiving and transmitting centers and groups of radars, it is planned to make wide use



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of sabotage-reconnaissance groups and detachments. In an army group there may be several hundred sabotage subunits equipped with nuclear land mines and short-range guided missiles with conventional warheads.

Beginning in 1958 the armed forces of the US have detonated more than 16 high-altitude nuclear bursts for the purpose of studying the possibilities of creating artificial ion formations. According to available information, these bursts create areas of high densities of electrons which hinder the detection of missiles and spacecraft by radars, disrupt the operation of shortwave and mediumwave radio communications by space beam, and disrupt radio reconnaissance.

In order to prevent the neutralization of their own radioelectronic means, it is proposed that high-altitude nuclear bursts be detonated in the depth of enemy territory.

Each year the US alone spends more than 600 million dollars on the development of radioelectronic warfare means.

Thus, the US and NATO have a large number of means for waging radioelectronic warfare which have been heavily concentrated in the branches of the armed forces and groupings of troops; a certain portion of them is used in accordance with the plans of the Supreme Command.

On the whole, the use of radioelectronic warfare means is subordinate to the common purpose and is implemented in accordance with a definite system. Included in this system are: a number of measures and powerful radioelectronic warfare means directed toward the neutralization of the radioelectronic equipment of a state or coalition of states; operations of ground forces and combat actions by large units and units; as well as the means that ensure the effective use of various weapons and their protection.

The control of the entire radioelectronic warfare system is centralized. It is exercised by centers, departments, sections and divisions for radioelectronic warfare that are organically a part of the staffs of the strategic, operational, and tactical command levels down to the division, inclusively.

One characteristic of the whole system and the means for waging warfare against radioelectronic equipment is that, having appeared in the postwar period, they have never been mass-tested on the field of battle, although individual models of radioelectronic warfare equipment have been

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tested by the Americans in Korea and now in Vietnam, and by the English and French in the course of the aggression against Egypt.

This is explained in part by the fact that our probable enemies are trying to keep in the strictest secrecy their available radioelectronic warfare means and the methods devised for using them. On the other hand, the fact is taken into account that the massive employment of radioelectronic warfare means during exercises leads, as a rule, to serious disruptions of control during the working out of strategic and operational tasks. For this reason the military leaders of the US and Great Britain usually conduct exercises with their armed forces which make extensive use of radioelectronic warfare means in their own countries. In the exercises held in Western Europe, the NATO command is limited to only operational planning for the use of radioelectronic means and intermittent use of them for working out partial tasks.

The conditions which have developed require that very serious attention be given by command personnel to the study of the enemy's methods of conducting radioelectronic warfare and to the protection of our own radioelectronic means. In our view, the successful protection of the radioelectronic means of the country and armed forces must be structured in accordance with a definite system. It will be based, obviously, on means for rapidly detecting areas of high-altitude nuclear (chemical) bursts, jammers, powerful stationary transmitters and the other radioelectronic devices used by the enemy in radioelectronic warfare, as well as the means for destroying them. The problems of the organization and functioning of such a system, and of the scientific-technical development of it, must be solved centrally.

During combat actions by branches of the armed forces very different methods and procedures must be used extensively for protecting the individual types of radioelectronic means, since there is still no single efficient method of protecting them which guarantees their stable operation during jamming.

At present we can recommend for the protection of radioelectronic means several methods which should be used depending on what means of attack (neutralization) are available to the enemy.

As we all know, a very large number of various types of radioelectronic devices are used in the operations conducted by the large operational formations of the branches of the armed forces. Out of all of these various types of means we shall consider the protection of only two

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main groups: radars and radio and radio-relay communications sets. The protection of these groups of radioelectronic means under modern conditions is achieved by carrying out a series of organizational and technical measures. A list of the main protective measures is given in the diagram.

The organizational protective measures are provided by the staffs that plan the combat employment of radioelectronic means in operations. The technical measures are carried out by the crews of the radioelectronic means by using the technical capabilities built into the radioelectronic devices themselves. In this article we shall consider only organizational protective measures, in particular, the destruction of jamming transmitters and the vehicles that carry them, radio camouflage, and increasing the qualifications and the level of training of radio and radar operators.

The destruction of jamming transmitters. As a rule, enemy jamming transmitters have such high output power that radio and radiotechnical reconnaissance can establish their position comparatively quickly. The most effective means of destroying the radar jamming transmitters carried on aircraft is by aviation and surface-to-air missiles. Missiles with homing heads could be widely employed for this purpose in the future.

The destruction of stationary enemy radio communications stations will be of great importance for protecting our strategic and operational radio communications in an offensive operation. The point is that the probable enemy intends to use stationary radio stations of Western European countries to neutralize the radio communications of the rocket forces, long range aviation and ground forces at the General Headquarters-front and front-army levels. These stations have output powers of 50 to 450 kilowatts and are located close to large cities. The Federal Republic of Germany alone has over 100 stationary mediumwave and shortwave radio stations, of which 36 are manned by American and English troops. The largest transmitting centers of these stations are very well known. They are on the outskirts of Munich, Hamburg, Stuttgart, Frankfurt-am-Main, Gladbach and Heidelberg. In the Erding region (20 kilometers northeast of Munich) is the American radio station "Voice of America", with an output power of 1,000 kilowatts. The destruction of all these radio transmitting centers and stations will to a great extent reduce the enemy's capability to jam our most important radio communications.

Radio camouflage is aimed at countering enemy radio and radiotechnical reconnaissance and at concealing the locations of the control posts, communications centers, groups of radioelectronic means and the operation of our own radioelectronic equipment. It is achieved by limiting or

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completely banning transmission by our radioelectronic means for specified periods during an operation, by strictly observing radio discipline and established operating procedures, by operating means at the minimum required emitting power and from sheltered areas, by eliminating characteristic features of the operation of the transmitting devices and of operators, and by disorienting and jamming enemy radio and radiotechnical reconnaissance.

Improving the qualifications and level of training of the operators.

It is typical, for example, that a trained radio operator 3rd class can receive, by ear, under conditions of quite intensive jamming, up to 40 to 50 percent of the text of a radio message; that a radio operator 2nd class can receive up to 60 to 70 percent; and a radio operator 1st class can receive up to 85 to 90 percent of the text. Radio operators with the same qualifications but without the training cannot receive radio messages by ear without considerable distortions. Moreover, well-trained operators quickly determine the type of jamming and in a timely manner and correctly employ the technical methods known to them for protection against the jamming.

Protection of radars. The main organizational measures for protecting radars employed in the air defense system and in controlling aviation include:

- alternating and joint operation of radars with different wave bands at radar surveillance posts;
- deployment of radar posts in an area so that the radar fields will overlap;
- use of radars with automatically varying frequency and a wave band previously unknown in the given theater;
- joint use of active and passive radar means.\*

Of the above measures, the one deserving special attention is the establishment of radar surveillance posts consisting of several radars operating on different frequencies and the location of these posts so as to guarantee the mutual overlapping of their radar fields. The alternating operation at the radar posts of radars with different frequencies reduces the probability of the destruction of the radars by missiles with homing heads, and in the event that the enemy should produce an ionized area over the radar posts, the targets flying above this ionized area can in part be

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\*Passive radar means are receiving devices with directional antennas (direction finders) with which the coordinates of aircraft (missiles) are determined from the radars and jamming transmitters operating on them.

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detected by adjacent radar posts that are not covered by the ionized area.

The practical solution of the problem of setting up such radar posts in a theater of military operations or on an operational axis may be obtained by combining the efforts and radar surveillance means of the radiotechnical troops of the Air Defense Forces of the Country, groups of forces, districts (fronts), navy coastal observation service and front aviation. At the present time the reconnaissance efforts of the air forces are combined, which facilitates the protection of the radar system for reconnoitering air attack means.

Particular care should be exercised in protecting radars from missiles that have radioelectronic homing heads.

Missiles with homing heads are a new weapon that has a sufficiently high probability of destroying radioelectronic targets. For this reason, underestimating the importance of combating this weapon can lead to serious disruptions of the radar systems of our country and armed forces.

The most effective method of protecting radars is the destruction of the delivery aircraft before they launch their antiradar missiles and the destruction of the missiles themselves in flight by fighter aviation and surface-to-air guided missile complexes. This method is still the only one for protection against missiles with inertial guidance.

The successful destruction of antiradar missiles is achieved by fighters carrying missiles, and particularly by surface-to-air guided missile systems.

A system of diversionary transmitters or reradiators can also be used to protect the most important radars against destruction by missiles with passive homing heads. The diversionary transmitters must operate on the same carrier frequency and at the same pulse repetition rate and pulse duration as the radar to be protected. If the operating program of the diversionary transmitters corresponds to that of the radar the missile can be diverted from the operating radar to the diversionary transmitter, which acts as a simulated target.

We should also use other methods of affecting the homing head of the missile in order to "disorient" it. Such methods include: joint operation of two or more radars against one target in conjunction with a program for switching off the radar as the missile approaches the target, as well as the generation of special "flicker" jamming against the missile homing

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head. We notice that the majority of methods recommended involve protecting high-power radars against destruction by strategic aviation and operational-tactical missiles. However, the protection of radars against the guided missiles at the disposal of tactical aviation, such as the Shrike, which remain in flight only ten seconds, can be ensured only by destroying these missiles with surface-to-air guided missiles. For this reason the radar posts belonging to the air defense of the country and the ground forces must be deployed under the cover of antiaircraft means.

Protection of radio and radio-relay communications. The main organizational measures taken to protect radio and radio-relay communications from neutralization by jamming, the effect of artificially ionized media, and destruction by fire means include:

- wide use at the strategic and operational control levels of tropospheric and radio-relay communications at superhigh frequencies, in addition to the use of mediumwave and long-wave radio communications;
- use of various methods of setting up radio and radio-relay communications (setting up backup communications, covert and bypass communications links, allocating intermediate radio communications stations, maintaining communications through an intermediary station, assigning stand-by receiving frequencies for the most important control posts);
- selection of radio-relay routes that are concealed from the enemy, deployment of communications transmitters in sheltered sites and dug-in shelters, and supplying them with spare sets of buried and surface antennas;
- assignment of alternate frequencies and call signs and maximum separation of the bands for operating and alternate frequencies;
- jamming the enemy's radio reconnaissance and the radio communications providing control over his radio reconnaissance and jamming means.

It should be remembered that, in modern operations, radio and radio-relay communications will operate normally only if protection against enemy neutralization has been carefully organized. In order to do this it is necessary, while still preparing for an operation, to establish communications on the most important axes, primarily with the commanders of missile and aviation units delivering nuclear weapons, over several main and backup channels by using for this all available forms of communications -- shortwave and ultra-shortwave radio, and ordinary, tropospheric and wire

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radio-relay communications. The establishment of covert (reserve) communications, the operation of radio means through an intermediary station and by retransmission are very important for protecting radio communications and for ensuring control under conditions of jamming.

Covert radio communications are those that are initiated and conducted only when the transmission of instructions and reports by main radio communications cannot be guaranteed because of jamming. In covert radio nets and links, information is transmitted without calling the stations in advance and obtaining their consent to receive. Covert radio nets operate "from time to time"; thus, they do not attract the attention of enemy radio reconnaissance and jamming means. Moreover, it will take the enemy about 25 to 40 minutes to jam a covert radio net after it has been detected by enemy radio reconnaissance, and a considerable amount of information can be sent by the radio net within this period of time.

In conducting operations an important role is played by the prevention of the destruction of the most important military installations (control posts, strategic and operational communications centers, radio transmission centers, etc.) that are detected by the emissions of their radio means. The military leaders of the NATO armies include control posts for troops and aviation among the targets which "constitute the nuclear power of the enemy".\* For the destruction of these targets the probable enemy proposes the extensive employment of missile/nuclear weapons and aviation. And for this purpose strategic and tactical aviation have entire groups of aircraft equipped with homing devices that can direct the aircraft to emitting radio, radio-relay, and radar sets.

In order to protect the most important control installations from destruction by missiles and aviation, it is necessary, first of all, for them to be thoroughly covered by air defense means. In addition, all medium-power and high-power emitting devices must be deployed far from the installations that are being protected. If possible, the distance between the emitting means and the installations should be five to ten times the linear direction-finding error made by enemy radio and radiotechnical reconnaissance. Thus, for a linear direction-finding error of 17 to 35 meters per kilometer of range, which corresponds to an angular direction-finding error of one to two degrees, the distance between the radio transmitting devices and the control posts should be about five to ten kilometers (12 to 20 kilometers) or more, if the control post is 50 (100) kilometers or more from the front line. The radio transmitters, in turn, should be located in shelters and separated from one another by one

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\*Modern Military Doctrine of Great Britain (Main Features), Military Publishing House, 1960.

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to two kilometers or more, so that an aircraft would not be able to destroy several targets in one pass.

Extensive use should be made of operations with the aid of an intermediary station for the protection of the control posts and radio means of the commanders of operational formations. The essence of this method is that, periodically, particularly when the control post is at one location for an extended period of time, communications of the formation commander (commander) with subordinates are maintained through a previously unoperated intermediary radio station situated five to ten kilometers from the control post. Instructions to the troops are transmitted to the intermediary station by stations with low output power, and preferably using ultra-shortwave frequency. The reports that are sent from the subordinate commanders via the intermediary station are received directly by the commander's radio by the intercept method. The operation of radio means with the aid of an intermediary station camouflages the control post of the commander and disorients enemy radio reconnaissance. Extensive use of this method of protection is linked with a certain increase in organic radio communications means, and for the time being this method should be worked out in exercises by using reserve radio communications means.

In addition, the camouflaging of radioelectronic installations requires the extensive use of active means of warfare against enemy radio and radiotechnical reconnaissance. The fundamental principles and recommendations for countermeasures against those types of reconnaissance employed by the capitalist states are given in sufficient detail in the Collection of Articles of the Journal "Military Thought", No. 1 (74) for 1965.\* We point out only that to the series of measures recommended by the authors of the article we should add neutralization of the operation of these types of enemy reconnaissance by barrage jamming produced by setting up a radio curtain. We have in mind sending out ahead and to the flanks of our troops ultra-shortwave and radio-relay jammers and, by using the directional properties of the antennas of these jammers, creating directional jamming of radio reconnaissance on portions of the frequency band of our operating communications. This method of neutralization will be used extensively when troops are regrouped or moved out to the front line. Moreover, future plans should include airborne barrage jammers that could be sent into enemy territory to neutralize his radio reconnaissance and radio communications.

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\*A. Cherpakov and A. Fadeyev, "On Countermeasures Against the Radio and Radiotechnical Reconnaissance of the Capitalist States," Collection of Articles of the Journal "Military Thought", No. 1 (74), 1965.

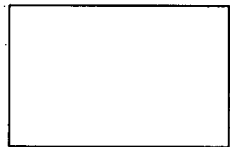
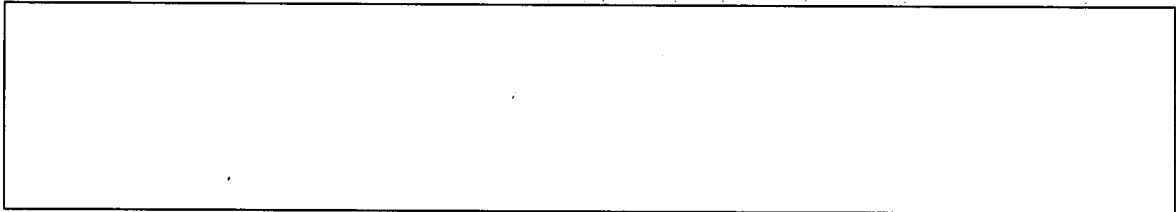
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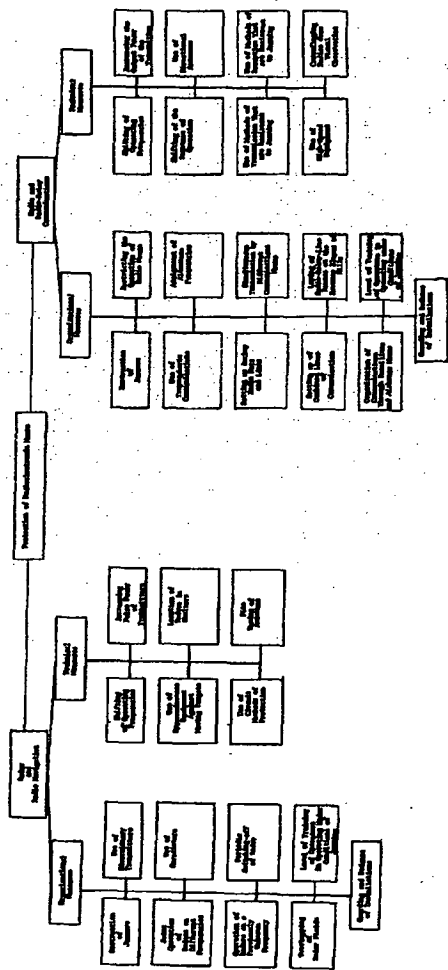
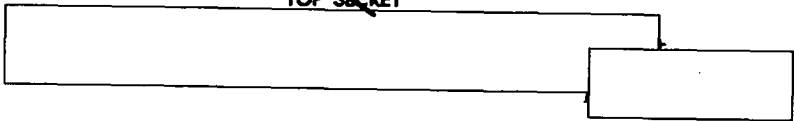


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In conclusion, it must be said that the problem of protecting radioelectronic means must be solved always in a creative manner. The execution, every time, of the same organizational and technical measures will not guarantee the protection of radioelectronic means for long. On the contrary, the enemy can adapt to these measures and devise means and methods of attack against which the recommended methods of protection will not produce the expected results. In addition to the methods which have been proven in practice and are recommended in this article, we must seek other ways also. This problem will be solved most successfully by the development, and introduction into the armed forces, of qualitatively new radar and communications means which, by their physical nature, will be resistant to jamming and operate effectively under conditions of artificial ionized mediums. However, the development of new means is a matter of the comparatively distant future. For this reason, in the organization of the control of troops in maneuvers, command-staff exercises and war games, we must persistently seek and thoroughly develop measures directed toward the reliable protection of radioelectronic means.



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1. The Department of Defense is a federal executive department of the United States government.

