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2. In some cases, the articles were translated in their entirety; in other cases, they were summarized.

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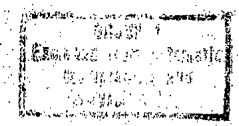

Vestnik Protivovozdushnoy Oborony, No 5, May 1963

TABLE OF CONTENTS

50X1-HUM

In Chasti and Podrazdeleniya of Our Forces

Preparations for 60th Party Anniversary (Page 2)

Summary:

In honor of the 60th anniversary of the Communist Party of the Soviet Union, Komsomol members of a chast' made increased socialist pledges to improve their special skills.

Komsomol members of a podrazdeleniye organized a technical study group to enable soldiers to study radar equipment and other related specialties.

Friend and Adviser of Officer Candidates -- by Lt Col I. V. ALEKSEYEV (page 2)

Summary:

The wall newspaper Raketchik (The Rocketeer) plays an important role in the life of officer candidates. It publishes articles on all aspects of training of future officers and enjoys great authority and popularity. A photograph shows the editorial collegium at work on a regular issue of the wall newspaper.

For New Success in Combat and Political Training of Troops -- by Col Gen Avn G. V. ZIMIN, HSU (Pages 3-7)

Summary:

Despite consistent Soviet efforts to achieve general disarmament and a cessation of nuclear weapons testing, the imperialist powers are increasing the arms race and using various provocations to unleash a new world war.

In view of the complex international situation, the Communist Party and Soviet government are giving serious attention to the strengthening of the Soviet defense power and the maintenance of complete combat readiness.

The PVO Strany Troops have an enormous responsibility in the defense of the Soviet skies. As a result of constant attention by the Party and the government, these troops have greatly improved and almost radically changed in the past few years. They are now supplied with first-class equipment for successful anti-aircraft defense and are able to defeat any attacks from the air.

50X1-HUM

The results of the 1962 training year and of the winter training period of the current year have shown further improvement in combat readiness, combat skills, and military discipline. Soldiers in antiaircraft rocket troops have improved their rocket launching skill. They are able to hit any target with the first rocket. In most chasti and podrazdeleniya the performance of functional duties by combat crews has been automated; each soldier and sergeant understands his maneuver and knows his place in performing the combat task of podrazdeleniye.

The personnel of the Nth antiaircraft rocket chast' has achieved high results in the winter training period. For example, the podrazdeleniye under the command of Maj KHYUPENEN received an "excellent" rating for combat firing. All of the personnel has acquired rated specialties. A number of soldiers and sergeants are trained to perform duties normally assigned to officer-technicians.

Pilots have improved their skill in intercepting and destroying aerial targets under difficult weather conditions, both during daytime and nighttime flights, and at various altitudes. The crews of interceptor aircraft have mastered the use of rocket weapons and most of them have learned to hit the targets on the first attack. The pilots under the command of Officer SHELUDYAKOV may be cited as an example.

The soldiers of radiotechnical troops have been perfecting their training in close contact with antiaircraft rocket troops and fighter aviation. Operators have learned to detect targets at maximum effective radar range, to determine their nature and coordinates, and to track them effectively.

Much attention is given in a radiotechnical chast' to the improvement of training methods. Many officers, sergeants, and soldiers are innovators and inventors, who have contributed to the perfection of combat training. For example, Sr Engr-Lt CHUBOV with a group of innovators designed a teaching machine of the "Kontroler" type, which permits an objective evaluation of the specialists' knowledge of equipment and functional duties.

The successful training during the winter period was the result of several important factors, such as better organization and preparation for the training year, training conferences, and efficient plans for combat and political training.

The technical training of personnel has been improved and particular attention was given to the mastery of related specialists by various categories of servicemen. Extensive use was made of various training devices and slides. Much has been achieved in solving the problem of introducing electronic teaching machines into practical training.

The winter training period served to consolidate and disseminate the achievements of leading chasti and podrazdeleniya.

The complex training method of troops has become firmly implanted in practical training. Commanders and staffs at all levels have begun to take an active part in the planning and introduction of this method. Officers with radiotechnical specialties are required to work directly at the screen on exercises prescribed by training courses and programs. This method of training officers directly at the equipment is very important, since it gives them the practical skill which they must have in training their subordinates.

In addition to positive results obtained in carrying out training plans during the winter period, there have been some serious shortcomings which should be eliminated during the summer period. Some officers regularly fail to fulfill training plans and try to explain this with various "objective" reasons.

Some commanders do not show the proper interest in improving the combat readiness of their podrazdeleniya and lack a sense of personal responsibility for the organization of combat and political training. This should not be tolerated.

Some antiaircraft rocket troops permit laxity and oversimplification in their practice firing. Some aviation podrazdeleniya give insufficient attention to day and night flying. In trying to accumulate a large number of flying hours, the elements of combat flights in bad weather are sometimes overlooked. Sometimes long intervals occur between flights, which is detrimental to combat readiness.

Some operators in the radiotechnical troops have poorly mastered methods of detecting and tracking targets under difficult conditions. Errors occur in determining their coordinates, composition, and identification.

Although methods councils are supposed to play an important role in the improvement of organizational forms and methods, their activities are often limited. As a result, advanced training methods are being introduced too slowly, especially in complex types of training, study of combat equipment, nuclear weapons, and methods of protection against them. In some podrazdeleniya, problems of antiatomic and antichemical defense are handled under oversimplified conditions.

All of the personnel, commanders, staffs, party and Komsomol organizations should thoroughly analyze the quality of combat training during the winter training period, find out what is impeding progress, and introduce new methods of training.

The summer training period is the most decisive stage in the combat and political training of troops. During this period the previous training level must be both consolidated and improved.

The general improvement of training and combat readiness requires the concentrated efforts of all the personnel, and the improvement of organizational work of commanders, staffs, political organs, and party tions. Special attention should be given to coordination between staffs and command posts and to the development of practical skills to guarantee continued troop control in a complex aerial situation, by using means of automation and mechanization.

The solution of tactical problems should be practiced more widely in the training of commanders and at various training conferences. This will give the officers practical skills in carrying out various types of calculations, evaluating situations, preparing brief and accurate reports, and giving orders to subordinates. Not a single training exercise should be carried out without working on problems of antiatomic defense.

The problem of training personnel to function faultlessly under conditions involving the use of weapons of mass destruction should be included both in training exercises and in the course of daily combat training.

Rocketeers must be perfectly trained in the proper use and maintenance of equipment and in acquiring skills for the elimination of high-altitude and high-speed targets under conditions of passive and active interference. They must work out methods of combat actions for the elimination of aerial targets jointly with fighter aviation.

During the summer period, fighter aviation units must engage in the most intensive training of pilots. For this purpose, flight training must be properly planned and organized. Flight control and the preparation of aircraft for flights must be improved in order to ensure flight safety. Aviation commanders at all levels must give their main attention to training pilots in the conduct of combat actions under complex weather conditions, by day and by night, at all flight altitudes of fighter aircraft.

In the course of tactical training exercises, radiotechnical units must concentrate on a further improvement in the training of crews and control posts for handling a large number of simultaneous targets and own aircraft at different altitudes and under conditions of strong radio interference. For this purpose, extensive use should be made of mock-ups, slides, and flights of real aircraft.

The personal, specialized, technical, and tactical training of officers and generals is of special importance in combat training. In the training of commanders there should be no gap between the current development of military science and technology and the level of knowledge acquired by officer cadres. The main emphasis should be placed on the acquiring of tactical skills, especially the ability to organize combat in the air and to exercise control over chasti and podrazdeleniya in the course of such combat.

The style and methods of commanders' activities must be generally improved. The organizational activities of supervisory personnel consist in a correct determination of their role for the fulfillment of cer[illegible] and in the ability to employ all possibilities for carrying out a plan under any conditions.

It is the duty of all commanders to master the Leninist style of work in supervising chasti and podrazdeleniya, which implies "less high-sounding phrases, and more ordinary, everyday work."

During the summer period, officer candidates, students and instructors of military schools will go through practical training with the troops. Commanders should not only create the necessary conditions for these trainees, but also make extensive use of the latter's theoretical knowledge and experience to improve the level of combat training.

Ideological work is of enormous importance in improving the quality of combat and political training of troops, and in developing a sense of responsibility for assigned tasks. By thoroughly explaining the ideas of Marxism-Leninism and exposing the aggressive plots of imperialists, the personnel must be inspired to increase their vigilance and constantly improve their combat readiness. During the summer period, this remains the principal task in the work of commanders, political organs, and party and Komsomol organizations.

Great Trust and High Responsibility (Page 8)

Summary:

The command personnel and political organs of chasti have given a great deal of attention to young officers so that the latter may constantly improve their ability and experience required for the training of subordinates. For this purpose, various lecture-courses, conferences, and other activities have been conducted.

One of the garrisons recently organized a meeting of young officers, which was also attended by experienced commanders. Discussions were held on the subject of moral fighting qualities essential to officers, on the ways of developing these qualities, and proper methods of working with subordinates; in other words, on the education of able commanders.

The young officers' meeting was held shortly before the anniversary of the Day of Victory over the German troops. Therefore, a large part of the meeting was devoted to the history of the Great Patriotic War and the heroism of Soviet soldiers during the war.

The following articles are summaries of the speeches delivered at the meeting.

Be Equal to the Tasks Prescribed by the Party -- by G. P. DANIN (Pp 9-10)

Summary:

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The first speaker, G. P. DANIN, stressed the historical significance of the Soviet victory, the importance of party-political work in fostering the patriotism of Soviet soldiers, the frantic preparations of imperialist countries for a new destructive war against the USSR and socialist countries, and the enormous expenditures (of imperialist countries) for the production of weapons of mass destruction.

Skill and Ability Can Be Acquired Gradually -- by Col Gen Avn A. I. POKRYSHKIN (Pp 11-13)

Summary:

A. I. POKRYSHKIN spoke about his aviation career and combat experience. He stressed the importance of discipline and efficiency and gave valuable advice to the young officers. A photograph shows A. I. POKRYSHKIN with a group of young officers.

How to Educate Each Subordinate --- by Lt Ye. A. VYSOTSKIY (Pages 14-15)

Summary:

VYSOTSKIY spoke of the education of subordinates and of the individual approach to each soldier. A photograph of VYSOTSKIY is shown next to the heading.

A Soldier's Strength Is Based on Political Maturity and Training -- by Lt A. V. BORISOV (Pages 16-17)

Summary:

BORISOV spoke about his experience as leader of a political study group, about socialist competition in the Army, and the education of soldiers in the spirit of devotion to their profession. A photograph of BORISOV accompanied the article.

Propaganda and Introduction of New Methods -- by Lt V. G. SKOKOV (Page 18)

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Summary:

SKOKOV referred to new methods of military technical training required to master the complex combat equipment of aviators, rocketeers, radar operators, and signalmen. He stated that several new models of teaching machines had been designed by the Kiev Higher Radiotechnical Engineering School and that on of the machines had been adapted by military personnel for their own use. The machine was said to be equipped with 60 questions and 2-3 answers to each question, and a preliminary test had been successful. SKOKOV emphasized that much more should be done to introduce advanced methods of training and that the "commissions and sections for innovations and inventions" had not given any active support to innovators. A photograph of SKOKOV accompanied the article.

Never Be Satisfied With Yourself -- by Sr Tech-Lt Ye. A. STROCHKIN (Page 19)

Summary:

STROCHKIN, an aviation technician, who had served in an aviation unit for over 3 years, stressed the need for continued self-improvement and the acquiring of practical experience by young officers recently graduated from military schools. He warned young aviators, rocketeers, and other specialists against overestimating their knowledge and abilities and advised them to use self-criticism. A photograph of STROCHKIN accompanied the article.

Persistence and Hard Work Lead to Mastership -- by Capt V. S. BOGDANOV (Page 20)

50X1-HUM

Summary:

Capt V. S. BOGDANOV, Pilot 1st Class, also stressed the continuous need for persistent training and self-improvement of aviators. He mentioned that some young pilots tend to forget this and become too complacent, but they soon find out that such an attitude is harmful and dangerous. BOGDANOV stated that the pilots of his "outstanding squadron" are constantly striving to improve their skill, both by practical training and theoretical studies. He appealed to the officers of various arms and services to cooperate more closely in combat training. A photograph of BOGDANOV accompanied the article.

An Officer Does Not Acquire Authority Without Effort -- by Lt A. G. SPITSYN (Page 21)

Summary:

Lt A. G. SPITSYN, platoon commander, spoke about the training of signalmen. He stated that it was often difficult to assemble the personnel in one spot for training purposes, because of the widely scattered locations of individual crews and the constant need to be on duty. Therefore, he recommended that commanders find ways of influencing each individual soldier and sergeant to achieve a high degree of organization and discipline.

SPITSYN discussed the problem of a commander's authority and ways of achieving it, stressing the importance of a commander's proper, understanding attitude toward his subordinates. He also mentioned the importance of seeking the support of the Komsomol organization to improve and maintain a commander's authority. A photograph of SPITSYN accompanied the article.

How to Find the Way to a Soldier's Heart -- by Capt V. P. KORNEYCHUK (Pages 22-24)

Summary:

Capt V. P. KORNEYCHUK, commander of an "outstanding podrazdeleniye," was awarded the Order of the Red Star in 1963. He stated that he graduated in 1955 from the Zhitomir Military (Radiotechnical) School of PVO Strany Troops and began his officer's career as a platoon commander. KORNEYCHUK stressed the importance of being thoroughly familiar with the character, sentiments, merits, and shortcomings of each individual soldier for the purpose of achieving a high degree of combat readiness and excellent morale among the personnel of a unit.

KORNEYCHUK spoke of the time when his chast' was being retrained in the use of new, more complex and powerful equipment. He said that the prospect of becoming a highly qualified rocketeer and of acquiring mastery

of the "formidable new weapon" inspired him with new energy and a feeling of personal responsibility. He mentioned the persistent training of officers and personnel in studying the theoretical principles of spacecraft rocket complexes and their combat use, and the many difficulties which were overcome before the first rocket was launched.

KORNEYCHUK told the young officers about his experiences in improving his technical and specialized skills and knowledge and how his platoon became an outstanding one. He was subsequently promoted to commander of a battery. KORNEYCHUK stressed that the continuous development of means of antiaircraft and antirocket defense made increasing demands on the professional training of officers. For this purpose, he continued to study the physical essence of phenomena in rocket technology, the theory of rocket firing, and other special problems.

KORNEYCHUK recommended the use of seminars and conferences for the exchange of experiences among officers with regard to the training and education of personnel. Finally, he stressed the importance of a thorough knowledge of Marxist-Leninist theory so that an officer may be fully able to instruct his subordinates and help them to understand current political problems and draw the correct conclusions.

KORNEYCHUK reported that his podrazdeleniye (battery) had become outstanding in the period of 2 years, that 80 percent of the crew commanders were able to perform the functions of platoon commanders, and that all soldiers had acquired several related specialties. He stated that there had been no serious violations of discipline in the podrazdeleniye. A photograph of KORNEYCHUK accompanied the article.

COMBAT TRAINING

The Commander is the Organizer of the Training Process -- by Lt Col G. M. SEROV (Pages 25-29)

Summary:

The success of a training program depends entirely on efficient organization of the training process in each unit, for which the commander is mainly responsible. This is especially true in the case of PVO Troops, since its units are usually stationed at great distances from the staffs of chasti, and commanders are unable to obtain advice and help from their senior chiefs, but must rely on their own organizational ability. The organization of training in a remote unit requires the commander's constant attention, initiative, and persistent work. In this respect, the work of Capt ZHMENYA, commander of an outstanding radar company, may serve as an example. He was greatly helped by Capt IPPOLITOV, his deputy for political affairs. Capt ZHMENYA worked out a number of practical measures to enable the conduct of regular training without interfering with on-duty periods of radar crews. He also gave special attention to new recruits arriving

in the company at the beginning of a training year to help them to become thoroughly trained.

50X1-HUM

Capt ZHMENYA introduced a more extensive use of training slides and mock-ups as well as a more effective use of outlying (vynosnyye) radar indicators for detection and tracking of aerial targets. All of these measures resulted in a constant improvement of training skills of all soldiers, sergeants, and officers of the company.

The company commander achieved an efficient organization of the training process by seeking the constant support of the party organization, which took an active interest in all phases of training and service. At the beginning of the training year, party members of the company discussed future tasks, exposed shortcomings, and made suggestions to the commander on how to eliminate deficiencies.

The company commander has shown constant concern for the needs of his subordinates. At present the military settlement (gorodok) occupied by the unit is a model of good organization. The streets are paved and planted with trees; a summer club and sports area have been established.

The example of Capt ZHMENYA has shown the excellent results achieved through the efforts of a company commander who has a high sense of r responsibility and has organized the training of personnel in a constructive manner.

They Were Given High Awards (Pages 26-27)

Summary:

A short article identified Lt Col A. P. KASHIN, commander of an outstanding squadron, who has been awarded the Order of the Red Star. All the pilots in his squadron are experts in intercepting aerial targets, both during daytime and nighttime flights, under any weather conditions. They all have a thorough knowledge of aviation equipment, a high degree of discipline, and a desire for constant improvement. KASHIN is an experienced pilot and an excellent commander and instructor.

The article also identified Maj T. A. GALYAN, commander of an outstanding podrazdeleniye, who has been awarded the Order of the Red Star. He has good organizational ability, profound theoretical knowledge, and great practical experience. In the podrazdeleniye commanded by Maj GALYAN, all soldiers and sergeants have two or three related specialties. As a result, complete interchangeability has been achieved in various sections and crews.

The article is accompanied by sketches of KASHIN and GALYAN.

The Triumphal Development of Soviet Radioelectronics (Page 30)

Abstract:

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Marking the 7th of May as Radio Day, traces the development of Soviet radioelectronics since the invention of radio by Aleksandr Stepanovich POPOV in 1895 and discusses possible Soviet achievements of the future as shown in the following:

Excerpt:

Further investigation in the realm of radioelectronics is opening new possibilities in the use of the inherent energy of matter and in the study of cosmic space and complex processes and phenomena existing in nature. In the not too distant future systems of communication will be introduced which use artificial earth satellites as waveguides. The search for new information carriers is being carried on to the use of coherent radiations in the light band for communications purposes. The development of the information theory has revealed the possibility of reliable transmission in conditions when the power of interference exceeds the power of a useful signal which was earlier considered impossible. Methods have been developed which make possible practically any transmission range.

Important practical problems of modern radioelectronics include the increasing of radioelectronic equipment reliability, the miniaturization of radio equipment parts, the mastering of problems of molecular electronics, and the study of possibilities for using free space or an occupied nonconducting environment for communications channels.

The question of the most rational use of the radiofrequency spectrum has presently become extremely poignant and urgent. Scientists in the realm of radioelectronics are working now to develop equipment which has exceptionally high viability, i.e., it is capable of executing its functions under heavy load conditions and with individual components out of operation. An important problem is the unification of equipment, i.e., the block construction of systems. The development and putting to use of automatic continuous operation lines and electronic computer equipment based on the wide use of the latest achievements of modern Soviet radioelectronics is opening remarkable possibilities.

(A captioned photograph of the laboratory in which A. S. POPOV invented radio appears on page 30.)

When Opportunities Are Not Fully Used in Preflight Preparations -- by Lt Col M. S. LEONOV (pages 31-36)

Summary:

The purpose of preflight preparation is to provide high-quality preparation of pilots for routine flights and, subsequently, the successful execution of assigned missions without accidents or near-accidents. It includes the assignment of flight missions, self-preparation, training lessons, and checking the flight readiness of personnel. The degree of personnel readiness for flight in some podrazdeleniya leaves much to be desired. All the opportunities for preflight preparation in these podrazdeleniya are not fully used and, as a result, a stable basis for successful fulfillment of exercise and flight safety is not provided.

Missions are assigned at preflight briefings by the squadron commander. In some podrazdeleniya, the commander reads the flight planning log (planovaya tablitsa) to the assembled pilots. He reads off the pilots' names, exercise numbers, takeoff times, flight durations and other necessary data. The pilots jot down information in their notebooks (rabochaya tetrad') and ask questions when they do not understand something. The commander explains the content and order of execution of the exercises, using aircraft models, diagrams, and blackboards. However, commanders sometimes spend too much time reading the flight planning log. Each pilot listens not only to his own instructions but also to the others, thus losing time which could be spent more productively. Commanders should designate someone to copy down the flight planning log on a blackboard beforehand or hand a copy of it on a bulletin board whereby each pilot could copy down information pertaining to his own mission.

Some commanders attempt to explain all the elements of a mission too thoroughly, giving advice on all possible changes in the flight situation. The pilots can obtain much of this information from the appropriate manual, Kurs (The Course), and thus save time. The commander should give advice on only the most complex situations. The majority of our commanders spend 15-20 minutes on preflight briefings and find this adequate for routine flights.

It is well known that pilots often repeat the same exercises. Sometimes it happens that they are required to cope the conditions and the order of execution of that exercise and trace the same diagrams before each exercise. The pilots, however, copy the content of the exercise from one page of their notebook to another. It would be better merely to refer to the same page and economize on time.

There are commanders who have a formalized attitude towards the organization of independent flight work for pilots. They do not take into consideration the level of training and the individual characteristics of each pilot. For example, in squadrons where there are both experienced and inexperienced pilots, the experienced pilots are often left to their own resources. Commanders devote their attention to the inexperienced pilots, and the experienced pilots, who have repeatedly executed the same exercises and think they know everything, lose their acquired skills and cease to improve themselves.

Independent work is an important method of preparing for flight. Some commanders therefore see to it that pilots have sufficiently available

educational literature, visual training aids, and the opportunity to consult specialists when problems arise. In some podrazdeleniya, however, commanders are concerned with the formulation of preflight and postflight doc[redacted] the copying of the content of planned exercises, and the tracing of diagrams, leaving little time for the pilots to thoroughly think about the mission, the best ways of executing it, and for reviewing and deepening the necessary theoretical knowledge.

No matter how experienced a pilot is, he does not execute all elements of a mission with equal proficiency. Therefore, in the process of self-preparation the pilot should concentrate on those aspects of flying at which he is less proficient. The pilot's work thereby becomes more meaningful and will provide for future professional growth. While carrying out these individual tasks, the experienced pilot will review and extend knowledge and improve his practical skills.

During independent training, commanders and specialists from aviation engineering services play an important role in helping the pilots. It will be a successful role if it is objective and individualistic, that is, if it is closely connected with the missions which have to be executed and if it considers the level of pilot preparation. At times, however, this help is replaced by coaching and over-watchfulness. In some cases rules, regulations, and instructions are read aloud which are already well known and valuable. time is wasted.

This does not mean that questions concerning the flights should not be worked collectively. Mastering equipment and its combat applications urgently requires the examination of one or two theoretical questions on the eve of each flying day or night in the interests of constant improvement and strengthening of pilot knowledge in aerodynamics, tactics, aerial gunnery, and operation of aircraft. This is especially important during periods of intensive flight work when the organization of planned studies in command training is difficult.

Unfortunately, not all commanders devote time to the examination of theoretical questions, thinking wrongly that it will not be of especial help to the pilots. Occasionally it happens that the examination of theoretical questions is abstract and not connect with the nature of the missions which the flight personnel must execute.

In the squadron commanded by Maj NEVZOROV, checking the flight readiness of personnel begins during the course of independent work. Flight commanders begin the check by personal observations and individual talks with the pilots. The squadron commander and his deputy also take an active part. The squadron ask questions on the characteristics peculiar to the forthcoming flights. After confirming that everyone understands the missions, the commander and pilots head for the airfield where the check is completed in the aircraft cockpits. Theoretical knowledge and the ability to act practically when executing a mission are checked. This method of checking permits excluding unprepared pilots from takeoff and provides high-quality, safe flight.

Experience has shown that only a check which is based on planned utilization of all forms and methods, covers all the studied materials, and is of an individual nature, succeeds. However, there are instances when insufficiently prepared pilots arepermitted to take off. A basic reason for this is that checks are at times conducted formally and preference is given to group checking methods instead of individual methods.

As already stated, the check begins with the flight commanders. But it should be remembered that the flight commanders were line pilots themselves not long ago and they have not yet mastered methods and skills as well as the squadron commanders or other experienced officers. Therefore, the flight commander needs help. The squadron commander, one of the chast' deputy commanders, and an engineer are usually present at preflight preparation. It is not necessary to set up an official questioning of the pilots, as this is sometimes done, but merely to clarify the pilots' degree of preparation by means of individual talks, and, if assistance is necessary, to render it.

For some reason or other, in some podrazdeleniya the practice has taken root of giving complete control of the checks to the flight commanders, limiting the squadron commanders or other experienced officers either to asking check questions or demonstrating the flights. This method is hardly justifiable since asking check questions and demonstrating the flights are only auxiliary methods of control checking.

There are a number of shortcomings in this method. First, it is impossible to determine the flight preparedness of each pilot since this can only be done by means of individual checks. Secondly, the check questions are predominantly theoretical. It is very difficult to determine a pilot's knowledge of the practical aspects of a flight. It often happens that a pilot demonstrates a thorough knowledge of flying in a classroom but commits errors when flying. Thirdly, the check questions are frequently known by the pilots beforehand because the same questions have been asked on similar exercises. The checking cannot, therefore, be completely objective.

The same can be said in relation to demonstrations of flights. Many commanders consider it the most efficient method of checking prior to formation flying exercises, when cooperation between aircraft is of special significance.

The best results can be achieved by comprehensive individual checking in classroom studies and training on special apparatus or in the aircraft cockpit. The more a pilot trains on the special apparatus or in the aircraft cockpit and the better the commander organizes this training, the quicker the pilot will master the aircraft, the means of its combat applications, and better results in flying mastery will be achieved.

Party organizations are also concerned with preflight preparation.

It has become a rule that political workers and party activists are present at the control checks. By word and deed, they mobilize pilots to skillful execution of their service duties, operationally expose shortcomings, map out ways to eliminate them on the spot. But party organizations are not doing everything to conduct preflight preparations in view of modern requirements and to satisfy the high level of aviation technology. Political workers and party organizations do not always devote enough attention to searching for new methods of providing flight safety; they do not always struggle firmly against the old, the obsolete. The party organizations working in close contact with commanders have the opportunity to help the commander improve the system of preflight preparation for they are familiar with the needs of flight personnel.

(A photograph on page 33 by O. GRIGOR'YEV of Maj V. MARUGIN, a pilot 1st Class and squadron commander in the Moscow PVO District, states that his squadron has been declared outstanding.)

(A photograph by G. OMEL'CHUK on page 34 shows Majs V. TEPLOV and V. PONOMAREV, Pilots 1st class, discussing intercept flight missions).

(The caption to a photograph by Z. SORKIN on page 35, which shows Capt. I. BERKERIAN calculating a target intercept point with the aid of two plotters, states that the GCI Controller carefully analyzes the aerial situation and accurately guides interceptors to the target.)

Preparation and Conduct of Podrazdeleniye Training Activity -- by Col V. S. KISLYANSKIY (Pages 37-41)

Text:

An important condition for further improvement of the quality of combat training of rocket podrazdeleniya and for perfecting the skills of launch crews and command post crews in the skillful organizing and systematic conduct of combined training in a podrazdeleniye.

The combined method of training is a system of organizing and conducting training activity which allows the best results in combat training to be achieved with the least expenditure of strength and time. At the basis of this method is the joint and simultaneous working out of combat training problems by the personnel of a podrazdeleniye. The example of one rocket podrazdeleniye might serve to prove the effectiveness of combined training.

Here, maximum use is made of planned training flights of aircraft and of simulation equipment during such training. Problems involving the most complex aspects of combat training are resolved and people and equipment are wisely employed. During the training, an instructive situation is developed which requires that subordinates act conscientiously and perform their functional responsibilities exactly.

However, some officers are not rushing to put this progressive method of combat training into practice. They simply do not want to trouble themselves with forming the questions which must be worked out dur 50X1-HUM training. They do not consider it necessary to consider thoroughly those things that are involved in training, whom to put in charge of the training, how to provide the material and technical means, how to establish a sequence in training, etc. Therefore, these officers conduct combined training a formal manner allowing indulgence and oversimplification.

What can be used to guide an officer in the organization of combined training so that the desired result can be achieved?

Experience shows that ordinarily the first combined training for podrazdeleniye teamwork should be carried out under the leadership of a superior. This leadership, as a rule, should be a model for all commanders of podrazdeleniya and leading staff officers. Subsequently, this type of training might be conducted periodically in the podrazdeleniye by the superior officer, but podrazdeleniya commanders must carry it out on a weekly basis.

The training supervisor enlists the aid of all of the chiefs of services to act as his aides in carrying out the indicated training activity. The time set aside for the training activity can be varied according to the number of problems to be worked out. However, practice shows that the training periods should be at least three to four hours long.

We will consider the organization and conduct of the combined training in the indicated podrazdeleniye commander pays considerable attention to its thorough preparation. He beforehand works out the tactical assignment and the attack patterns of both simulated and actually planned targets and plots their flight plans on a plotting board. Also, the officer outlines what assignments must be worked out by crews in the prospective training activity and developes a problem plan with time indications, the order of problem introduction, and also with the anticipated action of trainees. Then, the podrazdeleniye commander selects aides, instructs the officers and sergeants who are taking part in the training on the execution and requirements of the training, and prepares the material and technical base.

A good, well thought-out plan has great value in the preparation for the training activity. Here is how it looks for one period of training..

Theme: "The actions of a surface-to-air rocket podrazdeleniye in repelling an attack by 'enemy' aircraft."

Training goal: to consolidate the knowledge of functional' responsibilities of all podrazdeleniye personnel and to improve skills by practical execution.

Time: 4 hours.

Location of training: the launch position.

50X1-HUM

Method of execution: practical activity on the material parts of the complex combined with the working out of questions concerning special, tactical and technical training, atomic and chemical defense, and the elimination of the after-effects of "enemy" atomic and chemical attack.

Material and technical provisions: the equipment of the podrazdeleniye and chemical defense means.

Activity supervisor: the podrazdeleniye commander.

Time (hr, min)	Stage of Training Activity	Podrazdeleniye Commander (training activity supervisor)
0-00, 0-15	Beginning of activity.	Command: "Podrazdeleniye, readiness No 1." He checks the assembled personnel and the combat readiness of the podrazdeleniye.
0-15, 0-30	Briefing on the actions of personnel for the alert.	Carries out a briefing with crew commanders on the actions of personnel for the alert including target activity and the aerial situation. Reminds crew commanders of safety precautions and sees that this question is passed on to the personnel.
0-30, 0-40	Preparation of the podrazdeleniye for combat action.	Gives the command, "Podrazdeleniye, readiness No 1," and occupies his operations position.
0-40, 0-50	Study and evaluation of the aerial situation.	Studies and evaluates the aerial situation. Conclusions concerning the situation are passed on to all podrazdeleniye personnel.
0-50, 1-00	Personnel are informed of a possible ballistic rocket strike.	In view of the absence of aerial targets and a possibility of a ballistic rocket strike, the podrazdeleniye commander commands: "Podrazdeleniye, readiness No 2," "To cover."
1-00, 1-10	Targets appear, an "enemy" aerial attack begins.	Command: "Podrazdeleniye, readiness No 1."
1-10, 1-30	Combat with an aerial "enemy".	Command: "Podrazdeleniye, to combat, prepare..." Guides the operation of combat crews in sequential target "destruction."

[attach to page 19 here]

50X1-HUM

Radiotechnical and Launch Crews	SRTs [Aircraft tracking center?] crew	Other Personnel
With the alert, the crews are assembled in conformance with requirements of the combat operations manual.		The damage and rescue team, the ground defense group, and the chemical and radiation observation post occupy their positions and check the readiness of equipment, instruments, and personnel for combat action.
Crew members are assembled in an indicated place. Crew commanders make remarks on the work of each crew member, briefly recall safety precautions, question individual crew members on their knowledge of the aerial situation and on tactical and technical problems of "enemy" aerial attack, specify what problems will be worked out during the training activity, etc.		
The podrazdeleniye personnel prepare equipment for combat.	Begin operation with the signal "Readiness No 1. The crew is readied to transmit target data (conforming to the problems plan.	Section support and other personnel take measures for the protection of equipment, rations, and supplies from radioactive and chemical damage.
The crews are readied for combat operation.	Reports data concerning the aerial situation.	
Personnel take cover.	Transmits the information "Podrazdeleniye, readiness No 2," "Personnel under cover."	
Personnel occupy their operations positions and prepare equipment for combat	Transmits information on the aerial situation to the podrazdeleniye and further acts according to the problems plan and the instructions of the training activity supervisor.	
Personnel act in accordance with the combat operations manual.		

[attach to page 18 here]

50X1-HUM

Time (hr, min)	Stage of Training Activity	Podrazdeleniye Commander (training activity supervisor)
1-30, 1-50	Combat continued. Defensive action by personnel. Damage and rescue teams in action.	Command: "Podrazdeleniye, gas." Guides combat operations. Gives instructions to personnel who are not directly taking part in combat to eliminate the effects of the attack with the damage and rescue team and to carry out local reconnaissance.
1-50, 2-00	Break	Command: "Podrazdeleniye, readiness No 2," "To cover."
2-00, 2-15	"Enemy" aerial attack.	Command: "Podrazdeleniye, readiness No 1." Guides the combat operations of the personnel in destroying the aerial "enemy." Requests ammunition replenishment.
2-15, 2-50	"Enemy" aerial attack continues. An "enemy" parachute drop is launched.	Guides operations for destruction of the aerial "enemy." Commands the ground defense detachment to destroy the parachute drop.
2-50, 3-00	Break	Command: "Podrazdeleniye, readiness No 2." "To cover." Orders chemical engineer personnel to determine the amount of equipment contamination.

[attach to page 21 here]

Radiotechnical and Launch Crews	SRTs [Communications center?] crew	Other Personnel 50X1-HUM
Personnel put on gas masks and continue combat operations wearing protective clothing. A chemical attack and radioactive contamination is then simulated. The amount of radiation at the SP [launch position] and on the equipment is reported and the means for decontaminating equipment is checked. Medical personnel check the readiness of the means for personnel decontamination.		The chemical and radiation observation post transmits information on the enemy use of atomic and chemical weapons, on the amount of position contamination, damage, and other effects of the attack. The damage and rescue team strengthened by personnel who are free from combat activity carry out their assignments.
Under the leadership of the crew commanders, personnel take cover.	Transmits the information "Podrazdeleniya, readiness No 2," "Crews under cover."	The damage and rescue team continues its operations.
Personnel occupy their operational positions and prepare equipment for combat operation, They battle the "enemy." They strive for personnel interchangeability.	Transmits the information "Podrazdeleniye, readiness No 1." Also transmits data according to plan.	
Personnel continue combat operations.	Transmits information on the parachute drop.	The ground defense detachment destroys the parachute drop.
Personnel take cover under the leadership of the crew commanders.	Transmits the information "Podrazdeleniye, readiness No 2." Determines the amount of equipment contamination.	Chemical engineer and observation reconnaissance personnel determine the presence, amount, and locations of equipment contamination and report results to the podrazdeleniye commander.

[attach to page 20 here]

50X1-HUM

Time (hr, min)	Stage of Training Activity	Podrazdeleniye Commander (training activity supervisor)
3-00, 3-35	Decontamination of equipment and personnel.	Summons the chiefs of the crews, the medical personnel, and the chemical engineer personnel. Gives the command for decontamination of equipment and personnel.
3-35, 3-50	Training activity debriefing.	Assembles personnel and debriefs them on their actions during the combat operations, decontamination procedures, etc.

[attach to page 23 here]

50X1-HUM

Radiotechnical and Launch Crews	SRTs [Communications center?] crew	Other Personnel

Personnel restore combat readiness. They carry out partial and where necessary complete decontamination of equipment and reserve supplies. They also carry out partial or complete decontanimation of those personnel who are "contaminated."

Commanders assemble their subordinates in an indicated position for debriefing. According to the commander's order, the debriefing is done in crews and sections.

[attach to page 22 here]

It should be noted that during combined training radiotechnical crew personnel execute their functional responsibilities in co50X1-HUM with combat operations documents and according to specific assigned problems for the given training activity.

Some officers experience difficulties in organizing training drills for launch crews. The problem is that not all podrazdeleniya have enough training rockets and other material and technical provisions. How does one get around this situation?

Training drills to train crews in the loading and discharging of launchers should be done in the following manner. One half of the personnel must be trained in the first hour and the other half in the second hour. Thus, by taking turns, all personnel can take part in the training. With this, one crew not occupied with the training drill should train in loading a launcher and the other crews, according to the commander's orders and depending on their training level, should repeat the duties of other crew members, study equipment safety measures and the norms of combat operations, work out practical problems in chemical and atomic defense, etc.

Usually before the training is begun, crews with TZM [launcher simulators?] and one training rocket assemble in their shelters. With the command from the commander, "to combat," the crew commanders lead their personnel to the launchers. One crew loads the training rocket on the launcher and after reporting on their readiness goes to cover. The other crews simulate the loading operations with their TZMs and after reporting their readiness also take cover. One of the crews with a TZM go to the launcher where the training rocket is loaded, discharge the launcher, and with the training rocket go back to their shelter.

When so commanded, the crews repeat this procedure again. Only this time, another crew carries out the loading of the training rocket. By training in this way, launch crews receive sufficient practice in combat operations within a determined time period.

An important factor for increasing the effectiveness and instructiveness of combined training activity is the debriefing. As a rule, this is done by the training activity supervisor. He evaluates how well personnel have executed their assignments, analyzes shortcomings, and enlists the crews for the further perfection of practical skills in executing functional responsibilities. During the debriefing, there should be special attention paid to the analysis of mistakes. The podrazdeleniye commander should not only find the reasons for them, but should also indicate what their consequences might be in actual battle and what should be done in the more complex situation.

The debriefing must be illustrated by diagrams and concret50X1-HUM; and it must be reinforced with references to official regulations, manuals, orders, and directions from superiors.

In closing, it should be noted that the example for organizing combined training in a leading podrazdeleniye which was presented in this article, of course, does not exhaust all interesting questions. Obviously, other officers have accumulated their own experience in conducting such training. This experience must be shared in order that combined training become an effectual means of increasing the skills of rocketeers.

Rocketeers on the March -- by Lt Col S. Ye. TIKHONOV (pages 42-44)

50X1-HUM

Text:

Tactical training is an important part of troop combat training. Its purpose is to train personnel in methods of organizing and conducting combat against an aerial enemy and in the skillful use of arms and equipment in various conditions of a combat situation.

Podrazdeleniye commanders pay constant, assiduous attention to tactical training as they recognize its great value. They take care that all training activity approximates actual combat as closely as possible and that they aid their soldiers in acquiring practical skills for carrying on combat with an aerial enemy. The organization of tactical training in a rocket podrazdeleniye might serve as a graphic example of this. It was necessary during this training to check how well personnel of the podrazdeleniye got ready for column movement and deployed, completed a long march with automobiles and other means of transport, crossed a water barrier, set up a launch position, coordinated crew responsibilities, and executed the combat assignment. We will discuss how this training was organized and how it was conducted.

The podrazdeleniye commander was given the assignment three days before the beginning of the training. In conformance with the assignment, he had to study the map, to prepare the personnel for the march by vehicle transport including the crossing of a water barrier, and to learn the march route. He also had to determine the transport capability of the podrazdeleniye for completion of the march.

The day before the podrazdeleniye undertook the training assignment, crews were trained in preparing equipment for the march and in deploying the equipment upon completion of the march; manuals on the organization, execution, and support of a march were studied; and all necessary supplies and equipment were prepared. Training activity was organized for the vehicle drivers to study the order and peculiarities of transporting combat equipment in conditions of minimum visibility. Also, they were all acquainted with the march assignment.

A meeting of the podrazdeleniye personnel was held with the order of the day, "We will execute the march well organized, without accident or equipment damage."

From the projected aims of the training, the training supervisor noted the following operations stages on his plans: announce readiness No 1 and carry on combat against targets; prepare the equipment for march; complete a march by vehicle transport to the concentration area;

prepare the podrazdeleniye for ferrying loads across the water barrier and for a march by vehicle transport to the launch area; deplo50X1-HUM ment and prepare it for combat; analyze the training.

After the combat readiness of the podrazdeleniye was checked, the personnel "destroyed" three simulated targets which flew at different altitudes. The officers who were assigned as fire control officers handled this assignment well. They gave commands accurately and skillfully guided the actions of the command post crews.

Then the training supervisor ordered that the equipment be prepared for the march. The pdrazdeleniye commander gave this assignment to the officers and then they gave it to the personnel. The officers paid strict attention to the handling of the equipment so that it was not damaged as it was prepared for the march.

The well trained soldiers did not require much time to get the equipment ready for the march. Under the leadership of the officers, Sgt GERASIMOV's crew correctly and quickly dismantled the antennae and Sgt TIMOFEYEV's and Jr Sgt PROKHOROV's crews packed up their equipment sooner than the time whichthey were allowed.

Soon the podrazdeleniye was in column ready to march. The podrazdeleniye commander in his march order gave the personnel basic information on the enemy, determined the assignment ahead, indicated the time to be ready to open fire, assigned personnel to the movement security detachment and formulated their assignment, starting time, and route. He also pointed out the concentration area and the time for arrival there; the time for passing the initial point and the control boundaries; the daily rest area; the organization and order for maintaining radio communications; the beginning and order for crossing the water barrier; the time for arrival at the launch position; and the march signals. He also revealed the order for observation and alarm, what personnel should do in case of an "enemy" aerial attack and in case of "enemy" employment of weapons of mass destruction. The places for brief halts and for daily rest were indicated and the intervals between vehicles and their speed were established. At the appointed time, the column commander gave a signal with a lantern and the column began its movement.

After a while, a short halt was called. Here the column commander and the vehicle commanders checked the condition of the column, examined the hitches of the tractors hauling combat equipment and the truck beds to see how well the loads were riding, and checked the brakes and undercarriages. This checking was called for by the long and difficult route which lay ahead. Everything had to be checked down to the smallest detail.

After the halt, the column moved ahead. Its movement was regulated according to the control lines. Communications were maintained for the march by radio. Three radios were used for this: one on 50X1-HUM column commander's vehicle, a second in the middle of the column, and the third at the rear of the column.

During the march, the training supervisor gave information to the column commander and the personnel. For instance, one bit of information was formulated as follows: "Two kilometers from the population point N the "enemy" has caused chemical contamination of the terrain."

Having received the information, the column commander, before arrival at the contaminated area, sent out three men in a "GAS - 69" jeep as a chemical reconnaissance patrol. The patrol was assigned to determine the type of toxic agent and the area of contamination.

When the column commander had heard the reconnaissance report from the patrol commander, he ordered that the contaminated portion of the route ahead be decontaminated, that chemical defense equipment be put on, and that the march continue.

After a while, information was received concerning an "enemy" aerial attack on the column. The column commander gave this information to the personnel by radio and ordered the vehicle commanders to increase the intervals between vehicles and to increase the speed of the column.

A problem concerning radioactive contamination of a large part of the road was also successfully coped with. Having crossed this area under all precautionary measures, the column was halted in order to decontaminate the equipment and personnel.

The vehicle commanders rigidly fulfilled their duties, paying careful attention to the observation of intervals between vehicles and to the movement of the column. They were aided very much in their work by a booklet written especially for them, "Responsibilities of a Vehicle Commander," and by column movement diagrams which indicated basic population points on the route, the time for passing through them, and the distances between them. The column commander also used a march schedule which had similar data.

Those assigned to the rear of the column executed their assignments well. They were ready to give first aid and to help in urgent equipment repairs.

The traffic control personnel observed the movement of the column and facilitated the movement of the podrazdeleniye through dens 50X1-HUM populated areas and past forks in the road.

The skillfully planned training leading up to the march enabled the podrazdeleniye to arrive in the concentration area on time and allowed the march to be executed without accidents or equipment damage.

As soon as the period for daily rest in this concentration area was indicated, the podrazdeleniye commander gave the order for dispersing and camouflaging the equipment, for organizing a commandant's service, for providing rest and food to the personnel, for examining the equipment, and for correcting possible equipment disrepair. All of this was done within the established time limits.

After studying the complexity of the forthcoming assignment of crossing the water barrier, the podrazdeleniye deputy commander for political affairs helped the Komsomol Bureau prepare and carry out a Komsomol meeting with the order of the day, "We will ferry across the equipment and complete the march to the launch position without accidents or equipment damage."

The podrazdeleniye commander and the embarkation commander calculated how the equipment should be loaded on the ferries and established the time needed for the ferrying operation. Then the podrazdeleniye commander informed the officers in detail concerning the order for moving to the embarkation point, for the ferrying operation, and for debarking. He also gave orders for the column movement to the launch area, for the organization of the commandant's service, for the loading of the first ferry and for completing the ferrying operation.

Before the equipment was concentrated in the halt area, an attentive check of the condition of the access routes was made, a moorage was laid, and the freight-carrying capacity of the bridges was determined. The work duty officer and the embarkation commander acquainted themselves with the weight and sizes of the combat equipment and noted a plan for its distribution on the ferries. The podrazdeleniye commander took charge of the general loading.

The launch crews encountered some difficulty in loading. The height of their combat equipment when positioned exceeded the height of the ferry overhead clearance. The load had to be redistributed to conform to the clearance. This was done quickly and correctly by Sgts SYRYKH, UKADOV, CHERNIKOV, and other soldiers.

The equipment was tied down by the ferry deck crew. Three soldiers led by an officer aided them. To accompany the equipment durin 50X1-HUM crossing, the commander appointed special crews for each ferry. They systematically examined fastenings and corrected shortcomings when found.

Thanks to the skillful organization, the podrazdeleniye successfully crossed the water barrier and arrived at the debarkation point at the appointed time. The march was continued from there to the launch position in three vehicle columns and was as well organized as was the first part of the training.

After arriving in the launch position area, the podrazdeleniye personnel took up combat positions, camouflaged the equipment, and readied the equipment for combat. Many rocketeers were outstanding in this work. The commander deemed it necessary to note those officers who quickly prepared the operatins sites, positioned the crane vehicle, and with Sgts GERASIMOV and MOISEYCHIK and Pfc KARNAUKHOV set up the antennae at exactly the appointed time. Sgt TIMOFEYEV's crew worked nimbly at the launcher and soon had it ready for combat.

This training showed that with attentive preparation of personnel and equipment, with skillful organization of the march, the rocket podrazdeleniye can successfully complete a maneuver over a long distance and preserve its high combat readiness.

(A captioned photograph by F. KONSTANTINOV showing Capt NESIDOV working on a surface-to-air rocket appears on page 44).

Use of the Simplest Teaching Devices -- by Col A. P. YUSAKOV (Pages 45-48) 50X1-HUM

Text:

Increasing requirements for training specialists in all kinds of military activity due to the vigorous development of combat technology are in evidence at present. Since contemporary equipment is much more complex than that which was earlier supplied to the armed forces, but the amount of time set aside for the mastery of this equipment by personnel has hardly been increased in comparison with past years, old training methods are no longer suitable. New, more progressive and more effective methods are needed. Thus it is not by chance that much attention has been paid recently to the question of how to give a maximum amount of training to trainees in the shortest possible time. This question is being studied not only in military training institutions, but also directly among soldiers in the field. Various cybernetic equipment and other aids which enable mastery of programmed material within a minimum amount of time and simplify the study of several subjects by trainees are more and more being put to use in the training process.

A description of one of the simplest mechanical devices which can be used to train soldiers and to check how much of the study material they have mastered is presented in this article. With its simplicity and low cost, it can be prepared and used by any podrazdeleniye or training group. As shown by first experience, use of the proposed device not only significantly activates the training method itself, but it also shortens the amount of time needed to train specialists.

One of the shortcomings of the method of training which was prevalent in the past is that with the lecture method of training there is no feedback to the training supervisor from the trainees, i.e., it is not possible to constantly and effectively check how the trainees have mastered the study material during the course of training. Skillful use of the proposed device allows the checking of the quality of mastery of material by whole groups of trainees with a minimum time expenditure.

Also, the device allows an active method of training to be used with a certain amount of time set aside for each subject. To do this, the study material must be programmed. This is done in the following manner. All of the study material is measured out, i.e., it is divided into small parts in a determined logical sequence. For each such part (theme), questions are composed, each having several answer variants (four for the device under consideration here). We will examine the programming order by concrete example. For programming the basis of radio and radar equipment, the questions and answers might include the following:

Question: On what does the voltage intensity for firing ga50X1-HUM discharge devices depend?

Answers:

-- type of gas, size of electrodes, distance between electrodes;

-- distance between electrodes and type of gas;

-- type of gas and pressure;

-- type of gas and pressure, distance between electrodes and their shape, cathode and material.

Question: Find the crest voltage at the output of a RC circuit R = 10 kilohms and C = 100 microfarads, if during time t = 40 seconds the linear building voltage at the input has reached 200 volts.

Answers:

-- 10 volts;

-- 15 volts;

-- 20 volts;

-- 5 volts.

Among the four answers in the indicated examples, there are correct, incorrect, and incomplete answers. Trainees can locate correct answers and feed them into the device only when they have studied conforming material well.

It stands to reason that several other varieties of programming are not excluded. Thus, in programming material containing questions concerning radiocircuitry operation, voltage and current sketches formed from various parts of circuits can be used as answers. For brevity and ease in stating questions and answers, certain points of a circuit can be numbered. When composing answers concerning current carrying circuits in radiocircuitry, they can be written as a sequence of numbered circuit points, etc.

The effectiveness of the use of various teaching and checking devices depends to a significant extent upon the quality of material programming. Therefore, all officers should master the skills involved in programming. The skills acquired in the process of using the simplest teaching devices is a fine base for transferring to the use of complex cybernetic machines in the training process.

We will discuss the proposed training device. It is a mechanical device. Its operation is based on the principle of comparison of an answer which is applied to the device by the student by means of an answer standard. The device consists of a perforated panel made of any solid, opaque material (Duralumin, wood, plastic, etc.). The number of openings in the panel is determined by the size of the device. In the device cited here, there are 270 openings making 30 vertical rows with nine openings in each. This means that 30 cards with nine questions on each can be used. Each vertical row of openings is numbered from No 1 to No 30. There are 30 pegs along both the top and the bottom of the perforated panel; which are used to fasten the rule opposite the corresponding row of openings. The number of each pair of pegs (top and bottom) corresponds to the number of a card.

50X1-HUM

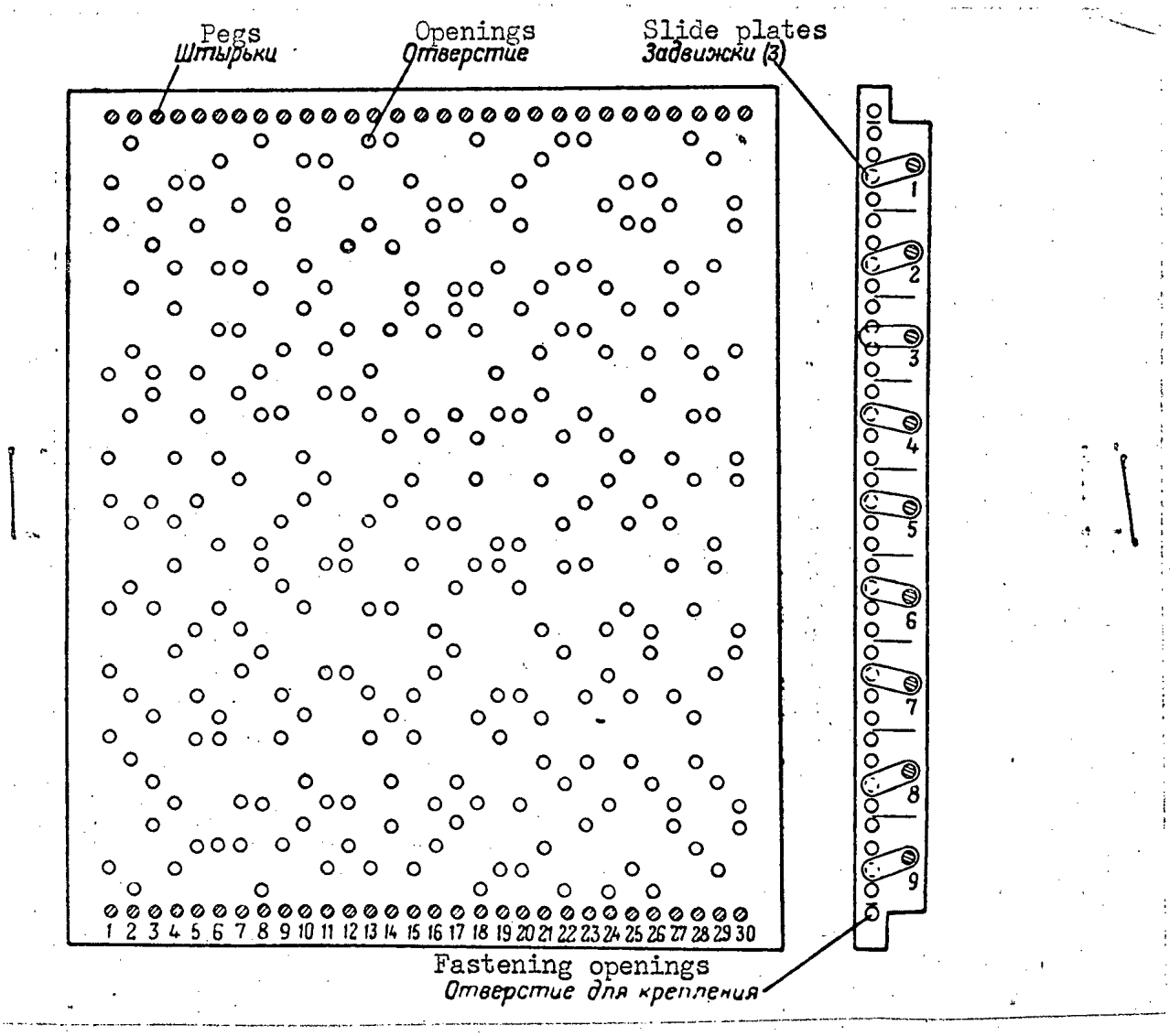


Fig 1. Perforated panel and rule

The panel is fastened by screws to a wooden box. Several flashlight bulbs are mounted inside the box to illuminate the openings in 50X1-HUM and the rule when checking answers. The light bulbs can be powered by a flashlight battery or through a stepdown transformer. The lights are turned on by either a tumbler or a switch on the side of the box.

The second element of the device is the rule which the trainees use to present answers. It can be made of the same material as the peforated panel. The rule has an opening at each end to fasten it to the pegs on the panel (fig 1). Nine groups of openings with four openings per group are located along the rule. The diameter of the openings is the same as the diameter of the openings in the panel. The number of groups (nine in our device) conform to the number of questions per card. Each of the openings of a given group conforms to one of the answer variants to one question. Alongside of each group of openings on the rule is fastened a metallic slide plate to cover any of the four openings of the group. The slide plates are numbered 1 to 9 from the top of the rule to the bottom. These numbers conform to the question numbers of a card. As many of these removable rules are needed as there are vertical rows of openings in the panel of the device or else there are as many as there are trainees in a group. All of the rules are identical.

Evaluation of learning is done as follows. The trainees are given rules and cards. Each one finds the correct answer for each question on his card and moves the slide plate for the corresponding question number so that it covers the opening corresponding to the correct answer for the given question. The openings for each group are counted downward. The answers are recorded on the rule for all nine questions on the card in the same way. Then the trainee gives the rule to the supervisor who fastens the rule to the pegs on the panel which correspond to the card number. He then turns on the light. If correct answers have been given for all of the questions, none of the openings in the rule will be illuminated. If an answer is incorrect, light will come through that opening thereby signaling the question which was not correctly answered. The supervisor evaluates the trainee by the number of correct and incorrect answers.

For programming, there should be a table to locate the openings in the panel:

50X1-HUM

Card number and panel opening location

Question number / № вопросов	Номер билетов и расположение отверстий в панели																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	3	1	4	3	2	2	4	1	4	2	2	3	1	1	3	4	4	1	4	3	2	1	1	4	3	3	4	1	2	4
2	1	4	2	3	1	3	3	4	1	3	4	2	1	2	4	1	4	4	3	1	4	3	3	4	1	1	3	4	3	1
3	4	3	4	1	4	2	2	4	3	1	3	2	4	2	1	2	1	2	4	1	3	2	2	3	1	3	1	3	4	3
4	4	2	1	4	2	4	1	2	2	4	1	1	2	3	2	3	2	3	2	2	1	3	2	3	4	1	4	2	2	4
5	2	3	2	3	2	4	1	4	3	2	1	4	3	2	1	3	3	1	4	4	1	3	2	1	3	2	3	1	4	1
6	3	2	3	1	4	3	4	1	2	3	1	1	3	3	1	4	2	1	1	2	4	1	1	4	3	4	1	3	1	4
7	2	3	4	1	3	4	2	1	3	4	2	2	3	4	3	2	1	4	3	3	4	1	3	2	3	1	3	4	2	1
8	1	2	3	4	1	1	4	4	1	3	4	4	1	3	1	4	3	4	1	4	2	3	2	4	2	3	4	2	3	4
9	3	4	1	3	2	2	2	4	2	1	3	2	3	1	3	2	1	4	3	3	2	4	1	4	3	4	1	2	3	1

The proposed device can also be used for independent training and checking.

The size of the device can be increased four times if needed by making it possible to turn the perforated panel over. Then, it can use 120 cards with nine questions each, i.e., it will be able to handle 1,080 questions. The size of the device can also be increased by having several additional, removable perforated panels with different codes.

There is no doubt that there are other types of training devices and machines, from the simplest to the most complex, among our Armed Forces. It would be expedient to bring to light any experience in their preparation and use for our Armed Forces in the pages of Vestnik protivovozdushnoy oborony.

50X1-HUM

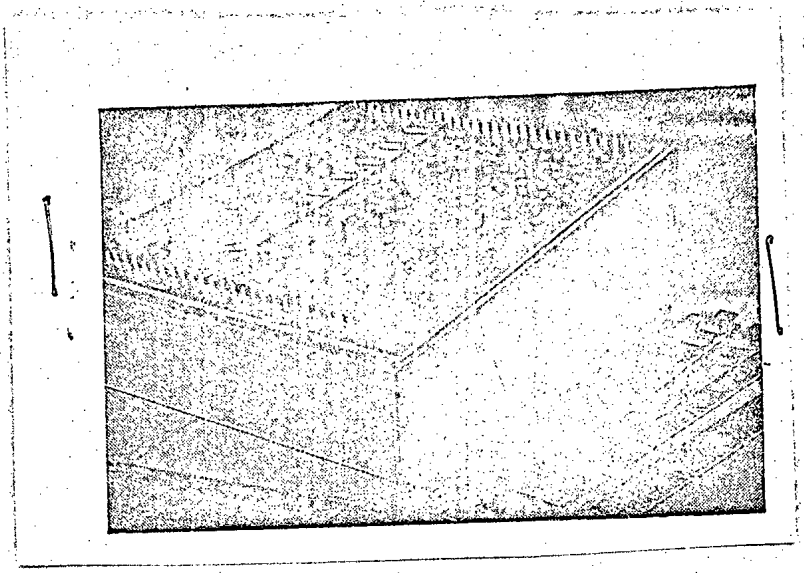


Fig 2. A general view of the training device.

(A captioned photograph of Maj N. NIKISHIN, commander of a radio-communications podrazdeleniye and specialist first class, appears on page 47).

EQUIPMENT AND ITS USE

50X1-HUM

Careful Preservation of Radar Equipment -- by Engr-Col V. A. ZHURIN
(Pages 49-52)

Summary:

Deep theoretical knowledge and firmly implanted equipment usage skills are required of all PVO Strany personnel to maintain equipment in combat readiness. The better education of personnel in equipment usage, the initiative shown by engineer and technical personnel, the development of new equipment operation methods, and the implementation of technical improvements have all improved the operation of equipment, lowered the frequency of equipment failures, and lengthened operation periods between overhauls for all types of radar equipment. Experience shows that combat equipment usually operates faultlessly in those chasti and podrazdeleniya where all personnel direct their strength toward accomplishing high-quality equipment operation and where more progressive methods of equipment operation are constantly searched for, developed, and put into practice.

However, in some podrazdeleniya and chasti timely equipment maintenance is not carried out and the checking of equipment is done carelessly. This usually occurs when commanders do not know how to organize equipment maintenance and station crews have not been trained in the independent care and repair of equipment. It is in these podrazdeleniya that officers request the aid of technical services personnel, when the detection and correction of malfunctions require neither special tools nor highly trained personnel.

Presently, important work is being carried on in radar chasti and podrazdeleniya to prolong operation periods between overhauls for equipment, to increase the time of apparatus service, and to economize in all aspects of radar operation. The experience of leading podrazdeleniya shows that this type of movement originates and is successful where all personnel actively support and disseminate patriotic movements. It is well known that purposeless operation of a radar even for only a few minutes a day leads to a considerable expenditure of fuel and consequently to equipment deterioration. The expenditure of any resources should therefore be placed under the strict supervision of commanders.

Unfortunately, there is not sufficient attention paid to this matter in some podrazdeleniya. It should not be necessary to point out that turning on a radar long before it is used in actual operations shortens the life of the set to a significant degree, but this practice is carried on.

Presently, although new radar equipment is being supplied, older radars are still in use. These older radars represent a huge cost in material and are sufficiently sophisticated to have a determined function in combat operations when they are properly utilized in conjunction with newer equipment. Therefore, attention should be paid to their preservation. But some officers unfortunately have the opinion that these older radars are obsolete and do not give proper attention to their maintenance. This attitude is decidedly incorrect and must be stopped. Personnel should be taught that all equipment has its military place and must be maintained in order to assure high combat readiness.

Equipment maintenance has been vastly improved lately by thoughtful issuing of spare parts and electronic equipment which when coupled with careful training allows for many equipment repairs to be done at the radar station rather than to have to send defective assemblies to higher maintenance organs. Another important factor in radar maintenance is that technical services personnel must know the daily operation characteristics of the equipment for which they are responsible so that they can perform preventive maintenance. The well trained engineers and technicians who are in the PVO Strany Troops today can successfully perform this assignment. Innovation work, technical conferences, and proper dissemination of technical information are other necessities for maintaining equipment in the best possible operating condition, which must be achieved to maintain constant combat readiness.

(A captioned photograph by I. RYBIN, showing Lt V. LOPUKHIN watching Pvt R. KINZYAKAYEV tune a radar, appears on page 51).

(A captioned photograph by F. KONSTANTINOV showing Capt G. OSTROPOL'SKIY and Sgt U. SEBRIS working with a teletypewriter appears on page 52).

Initiative of a Communications Engineer -- by Lt Col D. Z. LEVKIN (Pages 53-56)

Abstract:

Discusses the role played by Lt Col Vladimir Mikhaylovich VSHELYAKI in improving the technical operations of a communications chast'. VSHELYAKI, through self-criticism and discussions with the chast' commander, the chast' deputy for political affairs, and the secretary of the chast' party committee, took an active part in technical discussions at party meetings, became active in and led innovation work, organized technical conferences, initiated classes for the technical training of officers, and became a leader in organizing maintenance work.

(A captioned photograph of VSHELYAKI appears on page 54.) 50X1-HUM

(A captioned photograph by L. LUKST showing Maj Tech Serv B. MOROZOV adjusting equipment to be used in training officer candidates appears on page 56.)

Higher Technical Culture in the Work of Aviation Specialists -- by Engr-Lt Col V. R. PAKHOMOV (pages 57-60)

Abstract:

Discusses the necessity of perfecting the technical knowledge, both theoretical and practical, of aviation technicians and mechanics to increase flight safety.

Captioned photograph on page 60 by V. KRISTALINSKIY shows Tech-Sr Lt G. PEROV conducting preflight inspection on aircraft.

How We Organize Innovation Work -- by Col P. K. KHARCHIKOV and Engr-Lt Col N. B. LEVIT (pages 61-63)

Abstract:

The authors discuss the importance of "innovation work" in military educational institutions and describe the manner in which such work is organized at their school. They tell how the school's headquarters, party committee, and commission for innovations and inventions plan the work of technical study groups and organize competition between them.

The following personnel are identified in the article: Lt Col VAL'CHUK, Lt Col Tech Serv SLABTSOV, Maj Tech Serv GERASIMCHUK, Engr Capt PODGAYNYY, Capt AVDEYEV, Officers LUR'YE, TIMOSHIN, PETRUSHENKO, and Officer Candidates ROMANOV, SLAVNOV, DESHIN, PALIY, and PONOMARENKO.

Automatic Gain Control Circuits -- by Engr-Sr Lt V. A. NAZARENKO (Pages 64-68)

Text:

Testing shows that some officers do not know the physical essence of the operation of radar reception equipment well, especially that of automatic gain control circuits [ARU] (agc). While this circuit is the most complex in the receiver component, it carries out a most important assignment. It enables a precise envelope of pulse signal amplitude to be achieved. In light of this, every officer who works with radar equipment should learn about the agc circuit.

The relationship of maximum amplitude of input voltage to necessary for normal operation of reception equipment can grow to very large proportions. Therefore a receiver must convert and amplify a received useful signal in such a way that distortion of the signal is avoided. This is achieved by means of an agc. Of course, this cannot be done without manual gain control (RRU) which is accomplished by the operator. The agc carries out required amplification with comparitively rapid changes of received signal intensity and manual gain control corrects slow changes of amplification which occur because of changes of reception equipment amplification cascade parameters. Also by means of manual gain control, an operator makes blips visible on the radar screen which is necessary for operations.

There are many different agc circuits. All of them are constructed in such a way that they provide steady operation, eliminate the harmful effects of feedback on the radiofrequency signal, and create constant voltage at the agc circuit output. The sequence of elements shown in Fig 1 is always included in a block diagram of an agc circuit.

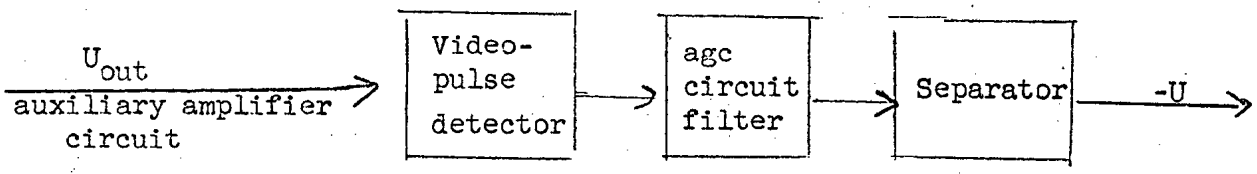


Fig 1. agc circuit block diagram

The videopulse detector produces a signal with a videopulse modulation frequency and an amplitude proportional to the percentage modulation and to the videopulse magnitude. In other words, it is designed to separate the pulse signal envelope. Such a detector constantly produces voltage corresponding to the actuating videopulse envelope at its input.

If a peak detector is considered from the point of view as a transmitter of a videopulse envelope, it is equivalent to an aperiodic (inertial, relaxation, single capacitance) RC unit. This unit is often found in various automatic control circuits with a time constant characterizing the speed of the output intensity establishment process. A characteristic peculiarity of an aperiodic unit is that it includes an element which stores energy and an element which diffuses it. From the amplitude and frequency characteristic K (w) and the phase and frequency characteristic (w) of the aperiodic element shown in Fig 2, it is evident that concerning its sinusoidal action the unit acts as a low frequency filter which regenerates low frequency oscillations without attenuating amplitude and shifting phase, but significantly attenuating high frequency oscillations and shifting their phase by almost 90%.

Besides the above considered peak detector, a peak detector with a preliminary discharge can also be used. It is different in 50X1-HUM before the arrival of each subsequent pulse or "packet" of pulses, a full discharge of capacitance by passing the detector load is realized. A circuit of this detector is shown in Fig 3.

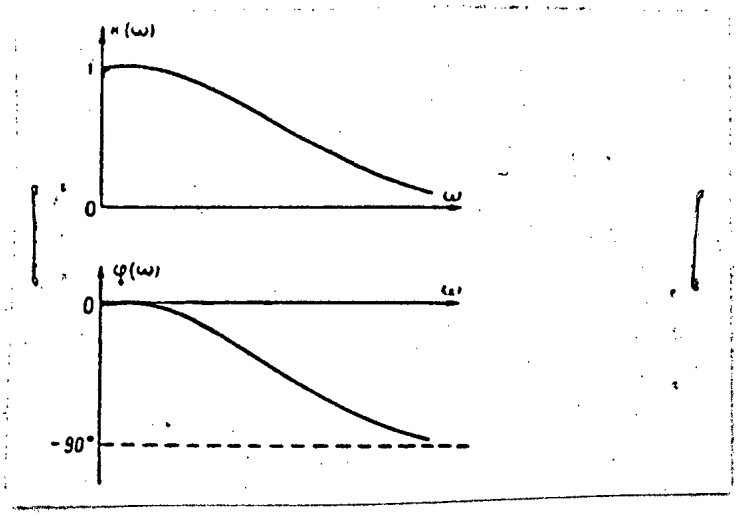


Fig 2. Aperiodic unit frequency characteristics

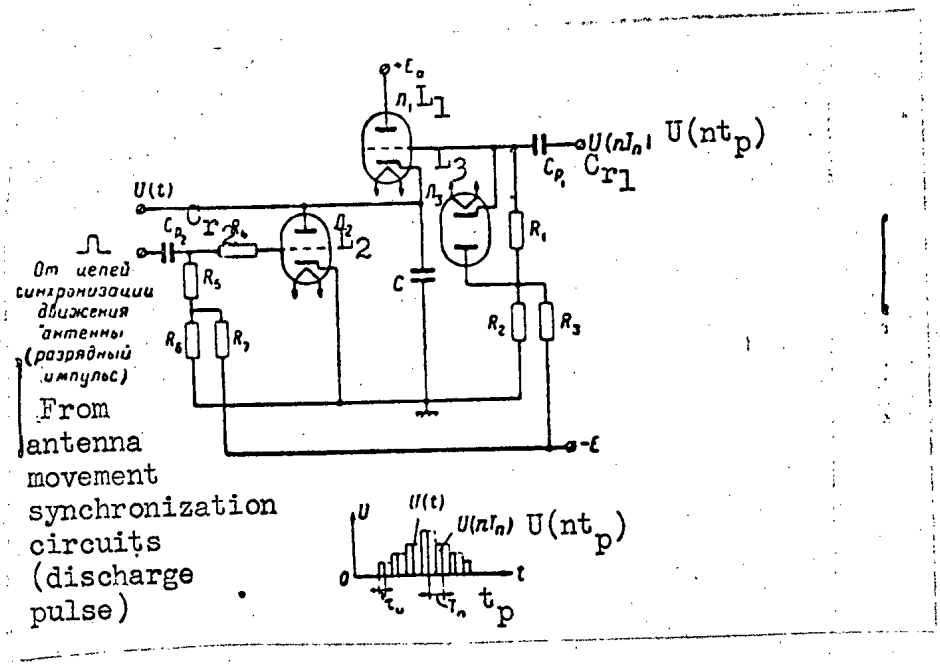


Fig 3. One of the possible variants of a type detector with preliminary discharge

If a pulse signal of the aspect U (nT_p) is supplied to the input of this detector, a continuous signal with the aspect U (t) is at its output as shown in Fig 3. Signals of positive polarity U (nT_p) are supplied through the separation capacitor C_{r1} to the control grid of the triode L_1 which in its initial position is cut off at the control grid by bias voltage from the divider R_1, R_2, R_3.

The moment a positive pulse is supplied to the input of L_1, the tube is opened and the reservoir capacitor C which is included in the triode cathode is charged up to the amplitudic value of the pulse. Capacitor C conserves its charge practically unchanged in the interval between pulses since the bypassing action of the closed discharge tube L_2 is very small.

Until a second videopulse is supplied to the L_1 input, tube L_2 which was cut off by bias voltage from divider R_5, R_6, R_7 in its initial position is opened by the discharge pulse and a full discharge of the reservoir capacitor occurs along the circuit: plus C - L_2 - ground - minus C. Then, Capacitor C is again charged up to the amplitudic value of the next videopulse supplied to the input of L_1, etc.

It is not difficult to see that a peak detector with preliminary discharge increases the space factor to 1. With this, the transmission coefficient becomes equal, K = 1, i.e., a detector of the type considered above can be considered as a non-inertial unit.

Diode L_3 serves as a restorer of the input pulse signal constant component and is the ordinary circuit for the diodic establishment of the zero level for the bottom of the pulse (Fig 4a). With the L_3 diode, a gradual storage of capacitor charge does not occur as usually happens for example in an RC circuit. For any moment of time, the total voltage at the capacitor and at the circuit output is equal to the input voltage, i.e.,

$$U_{out} + U_c = U_{in}$$

From this

$$U_{out} = U_{in} - U_c$$

To the end of interval t_1, the capacitor is charged to voltage ΔU_c, and the output voltage is reduced to that intensity

$$U_{out} = U_{in} - \Delta U_c$$

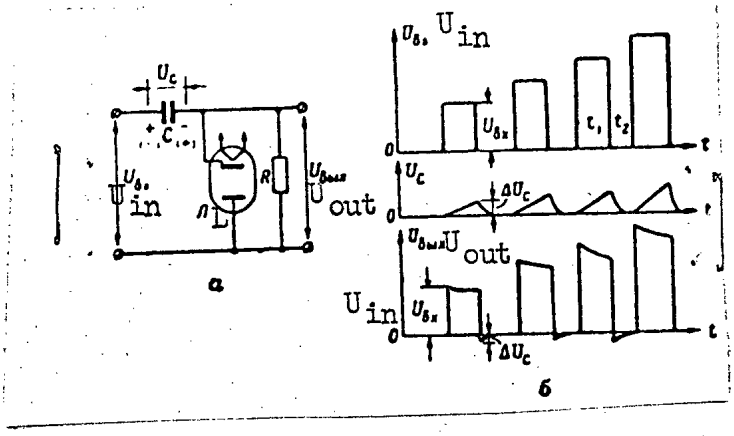


Fig 4a - circuit for the diodic establishment of the zero level; 4b- diagram of voltages in the circuit under the influence of voltage with changing amplitude at the input.

As is evident from Fig 4b, output voltage is altered upward from the zero level. Distortion of the shape of U_{out} will be smaller, the greater the time constant of RC, $t = RC$. If the inequality, $5t_r$ smaller than t_2, is not achieved, a charge will be gradually accumulated at the capacitor and the initial level of U_{out} will not be established.

The next important element of an agc circuit is the $R_f C_f$ filter which divides the voltage constant component which is supplied through the separator (usually a cathodic repeater) to the control grids of the variable cascades as additional negative bias. This filter is shown in Fig 5.

If there is no filter or if it is of small power, the control voltage (negative voltage) will be altered not only with a change of the signal input level, for example as a consequence of its being cut off, but also with more rapidly changing signal voltages under the influence of modulation. This leads to a drop of the signal modulation coefficient (demodulation). To avoid demodulation of received signals, an agc circuit must have a determined speed of operation, i.e., it must be inertial which is accomplished by the elements $R_f C_f$. Both single-mesh and more complex multi-mesh low frequency RC filters are usually used for agc filters.

Besides the detector, filter, and separator, a l-f amplifier [UNCh] can be included before the filter or an i-f amplifier [UPCh] m50X1-HUM included after the filter in an agc circuit. Circuits with amplifiers in the agc circuit are called agc amplifier circuits.

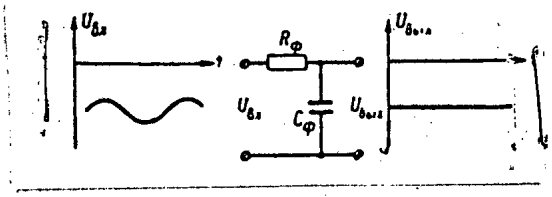


Fig 5. agc filter circuit

Consider the operation principle of the agc of a radar receiver. Here, an i-f amplifier, a detector, and the auxiliary amplifier circuit [VUS] of a receiving channel are used to form a control amplifier. A peak detector with a delay mounted at the diode with the load in the anode circuit is used as a restorer in the agc circuit. The delay is developed at the resistance connected to the dc voltage source. To the diode cathode is connected a voltage divider which aids in establishing the necessary agc operation threshold, the intensity of which is selected equal to the intensity of the nominal level U_{nout} of signal voltage at the receiver output. A single-mesh filter R_f C_f is used as the agc filter.

A cathode repeater is assembled at the triode to carry out the functions of a separator to develop a small time constant in the control tube grid circuits because its output resistance R_{out} is small. All of this enables normal operation of the i-f amplifier control cascade under the influence of significant pulse signals which are received with main pulse power leakage at the receiver input and which produce grid currents in these cascades.

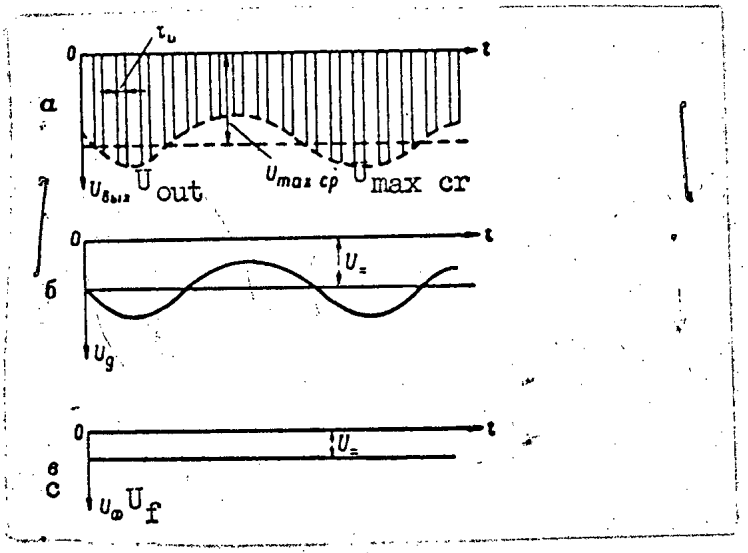


Fig 6. agc circuit voltage diagrams.

A signal is supplied from the control amplifier output (Fig 6a) to the peak detector input. If the amplitude of the input signal (videopulses) does not exceed the established operation threshold $U_{[i]}$ of the peak detector, the agc circuit is open and control voltage U_r in this case equals zero. Under the influence of a signal (videopulse) at the peak detector input, which has an amplitude which exceeds the operation threshold, the diode is opened when the pulse leaves the auxiliary amplifier circuit and capacitor C_i is charged along the circuit: diode internal resistance R_i - auxiliary amplifier circuit load resistance R_a. Voltage is formed at capacitance C_n as a result of the videopulse signal detection. Its intensity depends on the selection of R_n. Usually R_n is sufficiently large. As a result, the negative voltage shown in Fig 6b is separated at the peak detector output. Its shape repeats the videopulse sequence envelope. The agc filter R_f C_f separates only the direct component as shown in Fig 6c since its time constant is significantly larger than the period of videopulse amplitude modulation. This large filter time constant enables the required independence of intensity and phase of the reference voltage from the reflected signal amplitude to be achieved.

In this way a negative dc voltage proportional to the average level of the output signals is supplied to the cathode repeater input. As a result, the anodic current of the cathode repeater tube is decreased which leads to the appearance of negative control voltage U_r at the agc circuit output. This voltage decreases the amplification factor of the control cascades to the intensity necessary to achieve a normal signal level at the receiver output.

In stations where target direction is determined by the maximum "packet" of signals reflected from the target, there cannot be any envelope distortion. In order to avoid distortion, the receiving apparatus must have a constant amplification factor when the reflected "packet" is received, i.e., this radar sets forth inflexible conditions to the receiver agc circuit not to disturb the "packet" shape and to maintain a necessary intensity and level of the receiver output signal in spite of the input signal level fluctuating within wide limits.

A specific peculiarity of such an agc circuit in relation to the one considered before is that not a constant videopulse sequence, but a pulse "packet" is acting at its input and the repetition period of the "packet" is much greater than the repetition period of the main pulses of the radar transmitter. This superimposes additional demands on the agc circuit for the preservation of a determined receiver amplification and for the preservation of its constant for the next "packet."

50X1-HUM

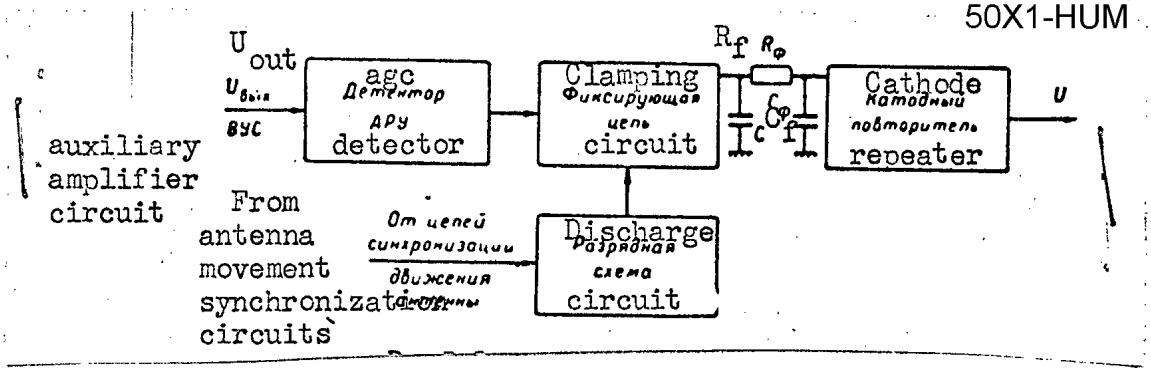


Fig 7. agc circuit with clamping circuit

An agc block circuit diagram with what is called a clamping circuit is shown in Fig 7. It enables the execution of the requirements indicated above. The operation principle of the circuit consists of voltage being supplied from the receiver auxiliary amplifier circuit output to the agc detector where each pulse of the "packet" is detected with subsequent pulse integration. The total voltage from the detection of all of the "packet" impulses is divided at the output of the clamping circuit "C," where a dc voltage is supplied through the agc filter R_f C_f to the cathode repeater which creates a small time constant in the circuit of the control grids of the control tubes. From the cathode repeater output, the voltage goes to the i-f amplifier tube grids.

In order to bring about fine integration of each "packet" pulse, a sufficiently large time constant for discharge of capacitor "C" is selected. Thus it is necessary to take special measures to assure normal passage of weak pulse "packets" which follow strong ones. So, before each subsequent "packet" arrives at the integrator input, capacitor "C" is discharged by an ordinary discharge circuit, i.e., a drop occurs as a result of the integration of the previous "packet". As a result, voltage at the integrator output will conform to the absolute value of the amplitude of a given "packet" and control voltage U_r supplied from the agc to the i-f amplifier tubes will be determined by the intensity of only those pulse signals which were in the previous pulse "packet."

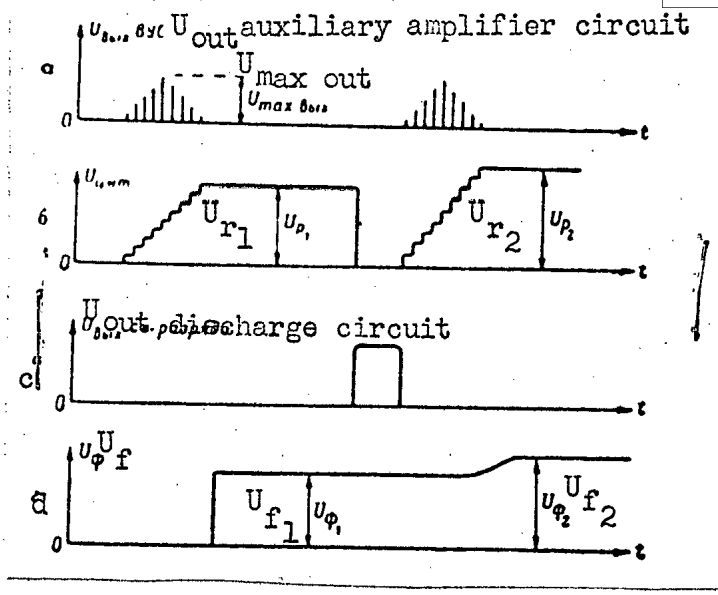


Fig 8. agc with clamping circuit voltage sketches

The operation of an agc with a clamping circuit is shown in the sketches in Fig 8. Voltage U_{r1} formed from the first pulse "packet" (Fig 8a, b) determines the receiver amplification while the next, second "packet" is being received. Voltage U_r2 formed from the second "packet" determines the amplification factor of the receiver while the third "packet" is being received, etc. In the given situation, the agc circuit has considerably less inertia in comparison with agc circuits in radars with beam conical lobing.

The considered agc circuit allows study of the changes in signal intensity which occur during periods of antenna beam scanning. The small time constant of an agc circuit with a clamping circuit makes it possible for a sufficient stability of "packet" pulse voltage to be achieved at the crossbar system input and to preserve the "packet" envelope during rapid and significant signal changes at the receiving apparatus input. All of this enables precision in determining target angular data to be increased since in the given case the "packet" envelope is similar to the directivity diagram antenna arrangement.

(A captioned photograph by Z. SORKIN appears on page 68. The photograph shows Maj P. SOPIN and four other officers discussing nuclear physics.)

For More Reliable Engine Operation -- by Engr-Capt A. N. KONOVALOV (Page 68)

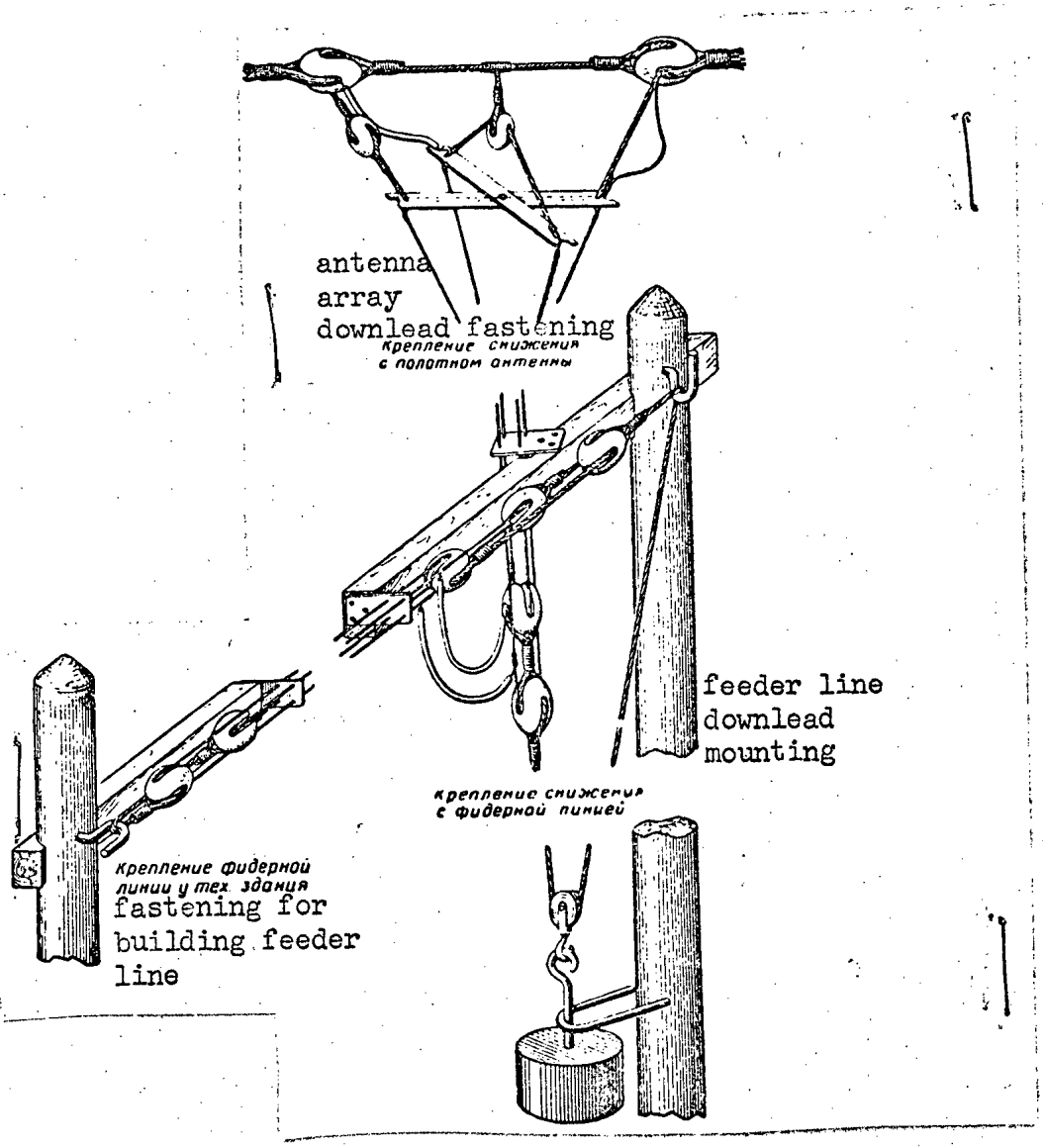
Abstract:

Presents a method for lubricating the 1D6 diesel engine.

Antenna and Feeder Line Downlead Mounting -- by Engr-Maj V. N. TERNOVSKIY and Engr-Capt K. N. SMUREYEV (Pages 69-70)

Abstract:

Describes and explains advantages of antenna and feeder line downlead mounting methods proposed by the authors.



Frequency Tuner -- by Capt I. A. CHERNYAKHOVSKIY and Sgt (Res) I. P. YADZHAK (Pages 70-71)

50X1-HUM

Abstract:

Describes the construction and operation of a model of a radar frequency tuner used in training. (A circuit diagram of the model is shown on page 70 and a kinematic diagram of the model is presented on page 71).

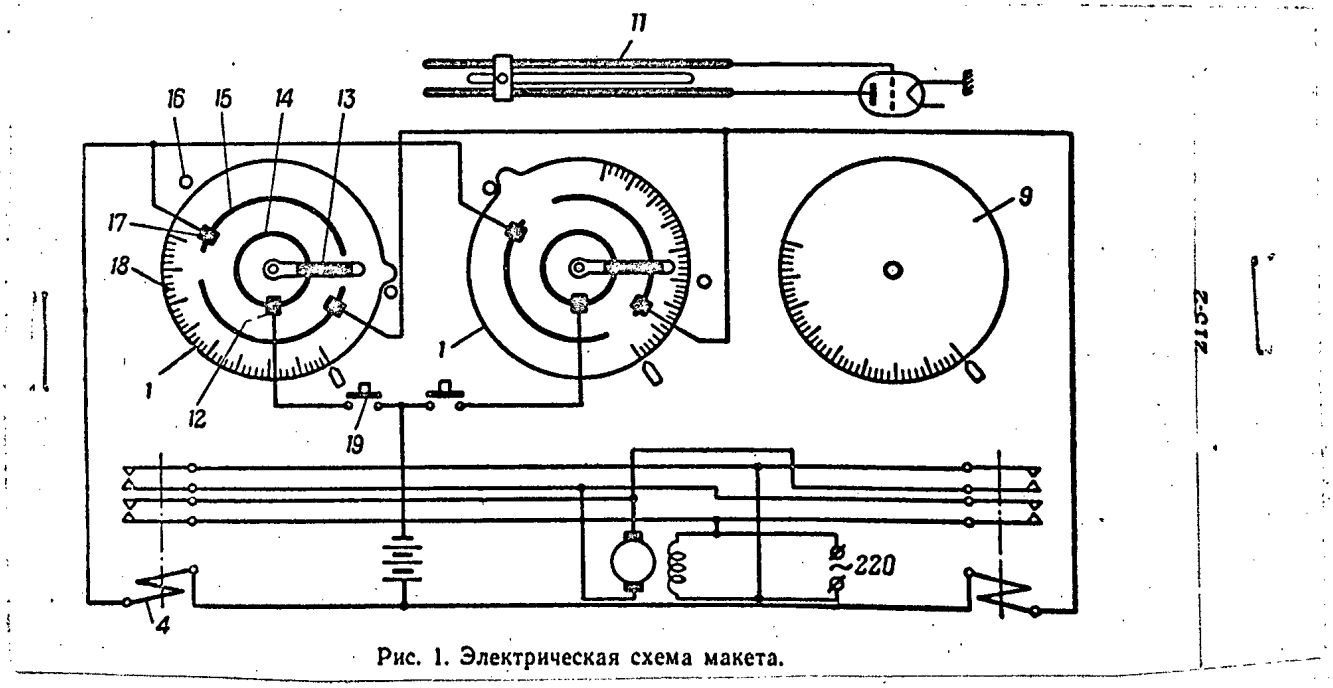


Рис. 1. Электрическая схема макета.

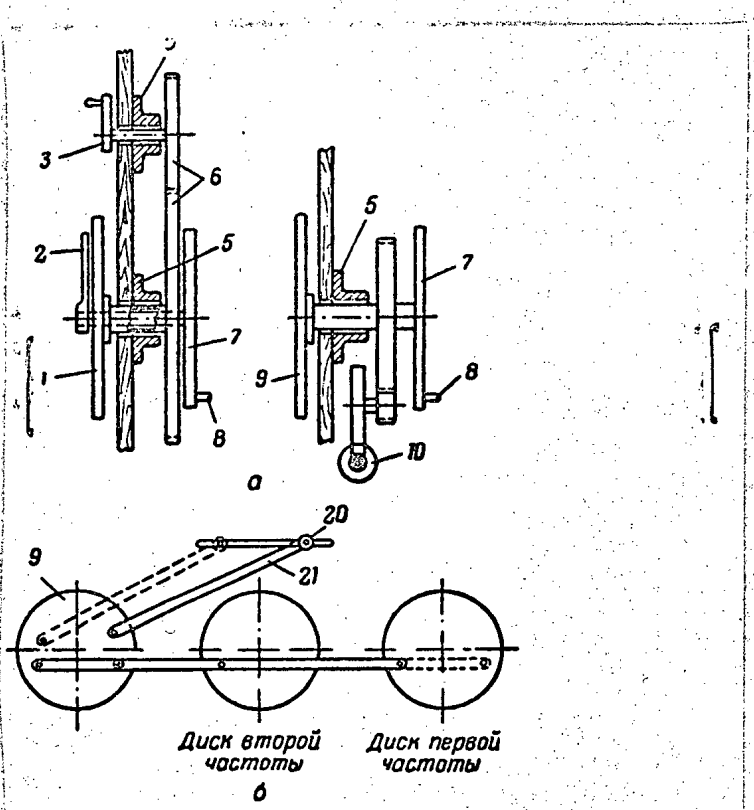


Рис. 2. Кинематическая схема:
а — привода дисков; *б* — шатунного привода.

ROCKET DEFENSE

50X1-HUM

Target Indication Station -- by Engr-Maj A. I. KORNIYENKO, Candidate of Technical Sciences (Pages 72-74)

Text:

(According to foreign press materials)

As is known, the Nike-Zeus rocket defense centers consist of a radar complex, several batteries of antirocket rockets, and a battery control post. Target indication radars, recognition radars, and tracking radars are all part of the radar complex. We will discuss the ZAR target indication radar.

The target indication radar plays the role of intermediate element between the defense center and superlong range detection posts. It searches in the direction of expected intercontinental ballistic missile (ICBM) [MBR] flights, detects them, and supplies data to defense computer centers where information is collected on all targets moving at speeds of from 6 to 10 kilometers per second (km/sec). From the computers this information is transmitted over communication channels to recognition and tracking radars and is used for radar plotting and for determining which antirocket rocket battery will be most effecting in the forming situation.

The range of a ZAR station is approximately 1,600 kilometers (km) which meets the requirements necessary for a Nike-Zeus system to independently battle ICBMs without using information from superlong range detection posts. The indicated range is achieved through large radiation power in the transmitting system and the use of methods for optimum reception of reflected signals. Generators with a power of from 21 to 50 megawatts (Mw) [Mvt] are used in the radar. Signal processing is accomplished by the Chirp method. [1]

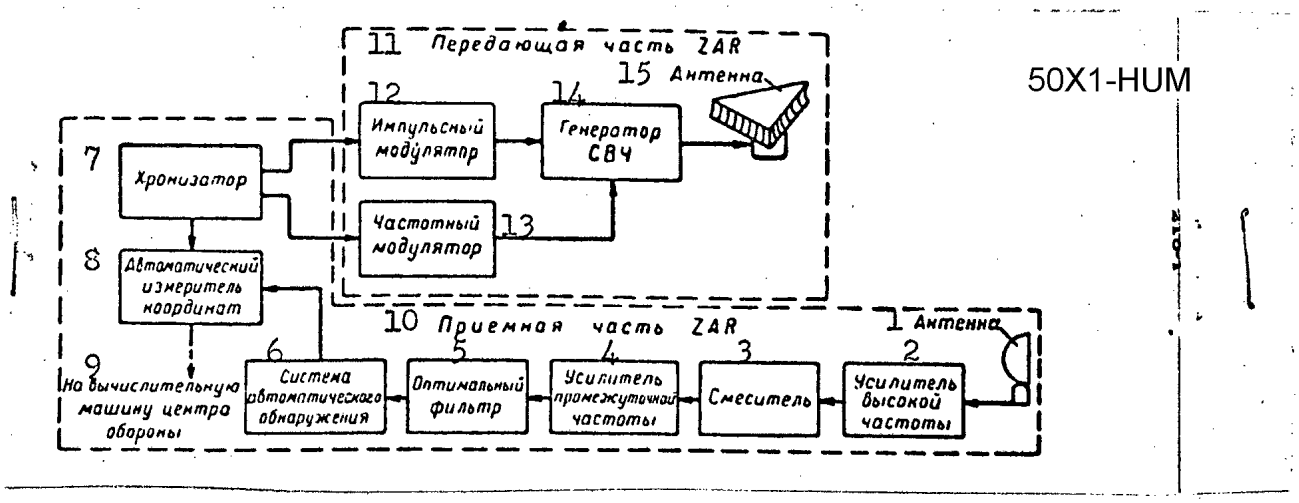


Fig 1. ZAR target indication radar functional chart: 1. antenna; 2. high frequency amplifiers; 3. mixer; 4. intermediate frequency amplifier; 5. optimum filter; 6. automatic detection system; 7. timer; 8. automatic coordinate measurer; 9. to defense center computer; 10. ZAR reception section; 11. ZAR transmission section; 12. pulse modulator; 13. frequency modulator; 14. superhigh frequency generator; 15. antenna.

We will consider the construction and operation of individual elements of the station with the functional chart shown in Fig 1.

The receiving and transmitting sections of the radar station each have their own antennae which are spaced 300 meters [m] from each other. The beams produced by these antennae are coincidently beamed into space. Two antennae are needed because of the difficulty of bypassing reception and transmission channels of the station.

The transmitting antenna consists of three radiation arrays which form an equilateral triangle. The length of each of them is 24 meters and their widths are about 4 meters. The array dimensions indicate that the produced beam is narrow horizontally and wide vertically which allows the use of an amplitude method for measuring azimuth. Either an amplitude or a phase method can be used to measure elevation.

The transmission antenna is located on the roof of a two-story building with a transmitter inside (Fig 2). The building is encircled by a mettalic array with a height of about 20 meters (Fig 3). This array eliminates reflections from nearby objects and is involved in the formation of radiation patterns. The station transmission section antenna rotates at the rate of 10 revolutions per minute [ob/min].

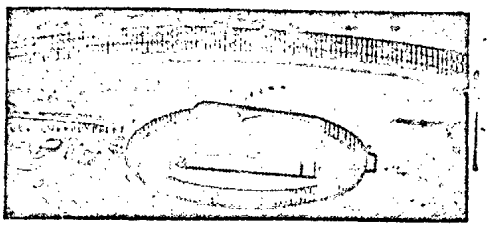


Fig 2. ZAR target indication radar transmission section.

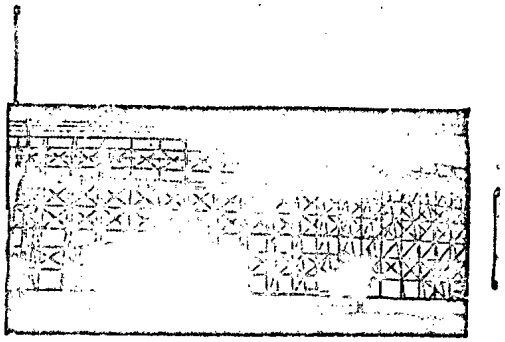


Fig 3. Shielding enclosure of a ZAR radar transmission section.

The reception antenna is a Luneberg lens which is more efficient than an antenna with parabolic reflectors. This is because terminal oscillations create side lobes in ordinary antennae rather significantly. This does not permit received power to be used fully. Also, the presence of a radiator in front of the reflecting lens on a parabolic antenna leads to distortion of the shape of the major lobe. Lens antennae, which include the Luneberg antenna, are less subject to this shortcoming. The formation of a cophased field in the aperture is accomplished by changing the refraction coefficient of the material used in the construction of the antenna. A foam layer impregnated with metal is used for this material. The distribution of the metal particles in the antenna is irregular and is determined by a specified law for changing the refraction coefficient. Foreign specialists believe that the particles can be so distributed that there will be a cophased distribution of the electromagnetic field in the aperture, i.e., the antenna will operate like an optical lens and the radiation pattern will resemble the beam from a projector (Fig 4).

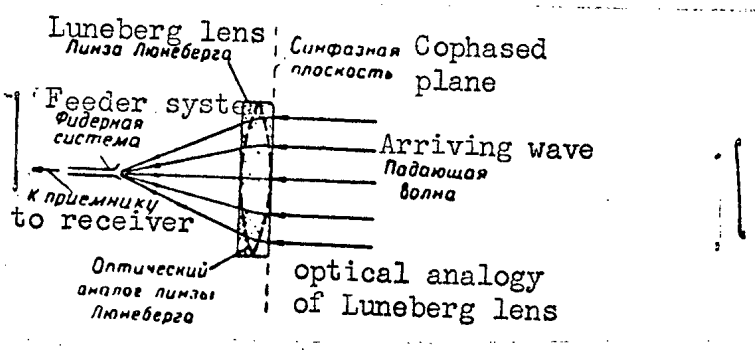


Fig 4. Luneberg lens beam formation

The receiving antenna is constructed as an unbroken hemis[illegible] 50X1-HUM a diameter of 24 meters. It is made of foam layer cubes which measure 45 centimeters (cm) [sm]. The gross weight of the antenna is 1,000 tons [t]. It is located inside of a protective dome which has a diameter of 33.5 meters.

The station transmitter radiates pulse frequency modulated oscillations. High frequency generator modulation is achieved by pulse and frequency modulators. Powerful floating-drift klystrons are used as high-frequency oscillation generators. It has been reported in the foreign press that the ZAR station operates in the ten meter wave band.

A constructional peculiarity of the station reception system is that a high frequency molecular amplifier and an optimum filter are used in it. This has allowed the sensitivity of the station reception system to be increased to twice that of ordinary radar receivers. The optimum filter has allowed the use of the Chirp method for processing pulse frequency modulated signals. The filter is called optimum because it provides a maximum ratio of signal to noise at its output.

The operation of the filter and subsequently the operation of the station receiver can be explained as follows. As is known, the range of a radar is proportional to the energy of an emitted signal:

$$W = P_i t$$

where W is the signal energy,

P_i is the pulse power,

t is the pulse duration.

Therefore, foreign specialists believe that a protracted pulse radiation regime is energetically advantageous although its use is considered to be unfavorable for the resolution capability of a station. The optimum filter of a radar operating by the Chirp method, by maintaining a constant pulse energy, brings about a decrease in its duration which leads to amplification of power at the output and to an increase in resolution capability. This is explained by that a signal with the frequency changed from f_1 to f_2 is supplied to the receiver input (Fig 5).

The optimum filter provides a large delay of high frequency components in the pulse beginning in comparison with the low frequency components at its end. For frequency components in the middle part of the pulse, the delay is proportional to the frequency.

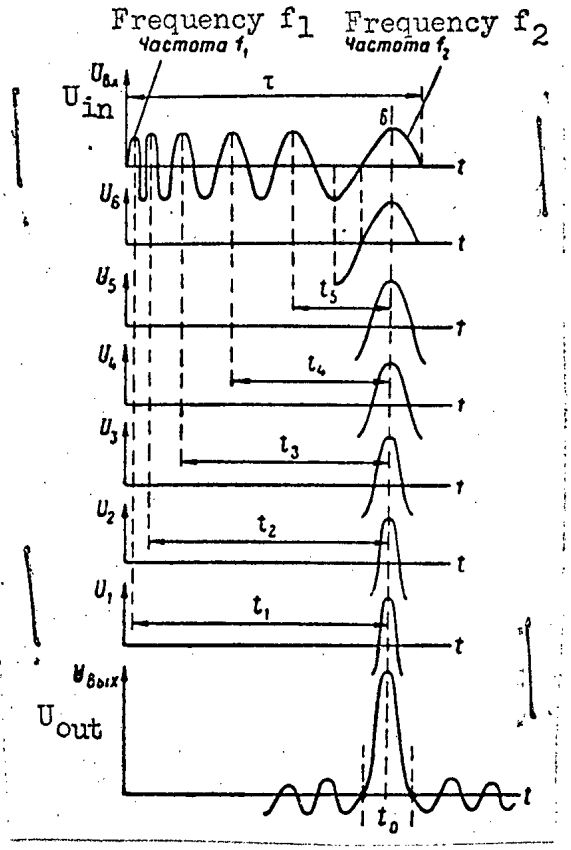


Fig 5. The pulse compression process in the ZAR radar optimum filter

To explain what has been said, let us divide the frequency50X1-HUM pulse into parts each one composing one oscillation period. Suppose that the sixth part is not retarded, the fifth is retarded for time t_5, the fourth for t_4, the third for t_3, etc. The delayed components are accumulated at the filter output. As a result of this, a large signal voltage peak is achieved with the phase coincidence of all components at moment t_o. In the remaining time moments when there is no phase coincidence, the components mutually compensate for each other. The pinal result of the operation of this filter is to compress the pulses in time. Then the pulse power is increased in a proportional ratio to the duration of the pulses at the filter input and output, i.e.,

$$\frac{P_{out}}{P_{in}} = \frac{t_{rad}}{t_{com}},$$

where P_{out} is the power at the filter output,

P_{in} is the power at the filter input,

t_{rad} is radiated impulse duration,

t_{com} is compressed impulse duration.

The resolving capability of a ZAR station is determined by the duration of the compressed impulse. Since it is possible to compress a pulse 100 times, a one kilometer resolving capability can be achieved with a 630 microsecond radiated pulse duration.

A signal goes from the optimum filter to an information extraction system which is a complex of devices for automatic detection and measurement of coordinates. This devices allow a signal to pass on only in those cases when it exceeds a predetermined level of false alarm probability. After it passes this system, a signal goes to a coordinate measurer which determines the position of the ICBM in space and transforms this position information so that it can be fed into computers at the defense center.

These, in short, are the constructional and operational features of the target indication station of the Nike-Zeus rocket defense complex.

1. "Electronics," No 4, 1960. (See page 52)

50X1-HUM

FROM THE HISTORY OF PVO TROOPS

Winged Hero -- by Col (Res) N. F. MINEYEV (Pages 75-76)

Abstract:

Describes World War II aerial combat exploits of Capt Sergey Gavrilovich LITAVRIN, HSU. (A captioned photograph of LITAVRIN dated 1942 appears on page 76)

In Defense of the Skies of Moscow -- by Col M. V. MIKHAYLOV (Page 77)

Abstract:

Describes actions of antiaircraft artillery personnel against German aircraft over Moscow in 1941. (A captioned photograph of V. KOZLOVSKIY on a rooftop with a pair of binoculars, dated 1941, appears on page 77).

Volga Stronghold -- by Col (Res) P. I. GREKHNEV (Page 78)

Abstract:

Concerns acts of heroism by communications personnel against the Germans in 1942.

REVIEWS AND BIBLIOGRAPHY

Flight Medicine -- by Maj Gen Med Serv F. Ya. GUR'YENKOV (Pages 79-80)

Abstract:

Reviews the book, "Medical Problems of Flight Safety," which was translated from English and French and published by Voyenizdat in 1962. The 149-page book costs 50 kopecks. The only criticism of the book is that it does not refer to any Soviet work in the field of flight medicine. The work is recommended for medical, flight, and engineer-technical personnel in aviation chasti and schools.