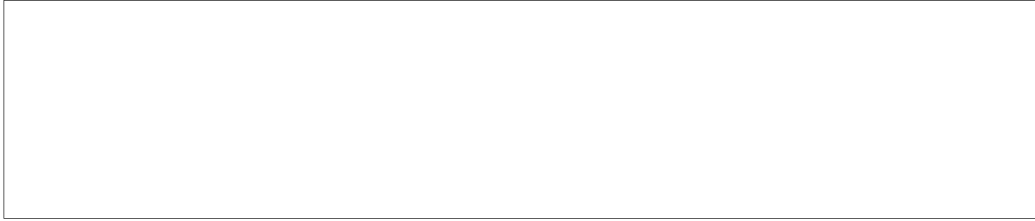50X1-HUM

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SIGNAL TROOPS

Complex Automation in the Control of Troops
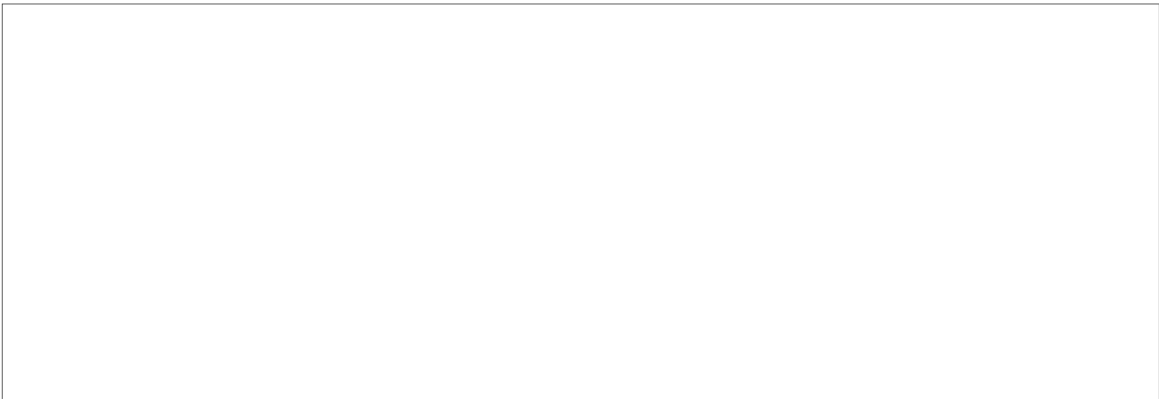
and Communications Problems

by

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There is no need to show that control of troops in modern conditions will be carried out successfully if the commanding officer and the staff have a wide complex of the latest technical means of automation. That is to say, a complex, and not its separate uncoordinated components.

By complex automation we mean automated control at all headquarters levels, in all types of arms, where interlinked electronic computers (vychislitelnaya mashina), computers (schetno-reshayushcheye ustroystvo), television, radar, enciphering equipment, electronic switchboards, duplicators, phototelegraphy, infrared equipment, video-communication equipment, sound recording equipment, etc., are used on a wide scale. The complex utilization of all these means permits the most complete maintenance of contact between commanding officers and headquarters on the one hand and the field of battle on the other. Automation will bring the commanding officers nearer to events affecting the subordinate troops and will give them a chance to influence them in good time on behalf of the common plan and the concept of the battle and the operation.

We shall try to illustrate the component parts of the whole complex of the means of automation and the control of the troops, show their place and significance in this complex, and summarize the operational-technical requirements which they fit.

First of all, as regards the component parts of this complex. In our view there are two of them: the technical means for obtaining primary information and the means of communication.

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The first part may consist of electronic computers (EVM), located in headquarters; the information transmitters (datchik) of those headquarters which are not equipped with electronic computers; equipment for observation and reconnaissance. Let us pause to examine the characteristics of the above-mentioned equipment.

The electronic computers may be used on the one hand for collecting and processing information (for the headquarters which it serves) and on the other as a collector of information for a higher headquarters or the headquarters of a neighboring /one or two words missing/ of some headquarters of electronic computers /one or two words missing/. However, the information collected by these headquarters must /one or two words missing/ EVM of the higher or neighboring headquarters by means of /one or two words missing/ apparatus or of specially developed rapid-acting /one or two words missing/-transmitters, magnetic tapes, and others.

In the technical equipment /one or two words missing/ which must be linked with the EVM, can be included / one or two words missing/ and radar stations, infrared equipment, / one or two words missing/, meteorological stations, and the personnel for topographical tying in. Their linkage with the electronic computers is a rather difficult task. Here /one or two words missing/ technical difficulties, as automatic photo /one or two words missing/ of radar and infrared stations /one or two words missing/ their /one or two words missing/ to the EVM; automatic deciphering /one or two words missing/ memory of the machine"; working out a number /one or two words missing/ it; collation and transmittal of information /five or six words missing/ printing or another EVM; link the equipment /five or six words missing/ of communications, the creation of the necessary channels of communications /three or four words missing/.

The technical means of reconnaissance which /four or five words missing/ component part in the complex of automated /three or four words missing/ the following: radar stations; equipment /one or two words missing/ radar reconnaissance, the transmitters (datchik) for agent intelligence apparatus for aerial radiation, meteorological, and sound-ranging reconnaissance, seismo-intelligence, infrared equipment, etc. There are also some unsolved technical tasks here, similar to those for observation equipment.

None of the difficulties enumerated has been completely overcome at present, and therefore considerable efforts by scientific-research organizations and military rationalizers will be required to overcome them.

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The second part of the automated system complex is communications equipment, without which the first part has no practical value. This includes: the channel-matching (kanaloobrazuyushchaya) equipment (radiorelay lines, radio links, lines of communication, as well as multiplex (uplotneniye) equipment); switch devices (kommutiruyushcheye ustroystvo); terminals; enciphering and linking equipment.

Before formulating any operational-tactical and technical requirements for the channel-matching equipment, one should carry out a careful evaluation and distribution of the whole flow of information going on in all arms of troops and control elements, bearing in mind the sharp changes in the form, content, volume, and frequency of transmission, the quantity of headquarters documents, lists of urgent and non-urgent reports, etc.

It would seem that there will be no "autonomous" communications channels for the various arms of troops and services in a complex automated communications system. There will be no necessity for this any longer.

One cannot, for instance, agree with the situation existing at present: each and every arm of troops and service has "its own" channels and "its own" communications systems. All the information will have to be "sifted through a single sieve". By this means duplication of lines of communications will be eliminated. But, at the same time, interexchange within the headquarters and between the EVM of the various arms of troops and services will be increased, while in some elements they are to exist separately.

Switch devices will be of great importance in an automated communications system. Parallel with the existing automatic and manual telephone and telegraph switchboards, the need will arise for electronic noncontact high-speed switchboards. They will be required for automating communications channels at the main and auxiliary exchanges. A great need for noncontact high-speed switchboards will arise for the practically instantaneous connection of channels carrying information from various installations. Such switchboards should connect the channels carrying information with the EVM; the usual channel with the terminal equipment; the communications channel with the free EVM input, etc.

The high speed of electronic switchboards will probably have to be calibrated to the high speed of the electronic computer itself.

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This requirement will be of special importance for the switch-boards which have to connect communications channels carrying information with the free inputs of the electronic computers. Taking into consideration the high speed of exchange of information between the machines, amounting to thousands of bauds, and the high speed of reading the information from the discriminators (registr) situated between the input and the buffer "memory", the high speed and reliability of such switchboards should be exceptionally high. Probably the types of electronic switchboards will be determined by the control element using the EVM.
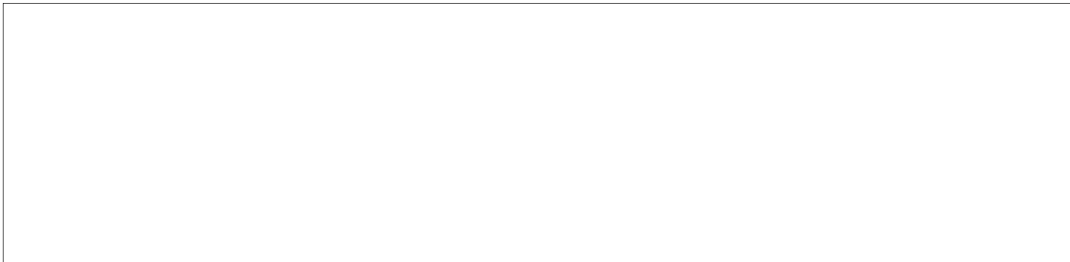
The terminal equipment will be of great importance in a complex automated communication system. According to the methods of reception of information it may be divided into video, documentary, and audio.

The following may be related to video equipment: electronic computers, television, videotelephony; to documentary - electronic computers, phototelegraphy, and telegraphy equipment, tape recording; to audio-telephony equipment.

One should stop to consider the universal applications of electronic computers. They are able to take in the information and reproduce it clearly either for visual reception or in documentary form, they may store, update, fix, and carry out various calculations on the information taken in during the course of the development of the battle and the operation. Such universal application of electronic computers to an automated control system will allow the majority of the information to be stored (zamknut) in an electronic computer acting as terminal equipment of a given point. In this connection, the volume of traffic on such types of communications as the ordinary telegraphy, radioteleprinter, and radiotelegraphy may be greatly reduced. The need for telephone conversations will also decrease considerably.
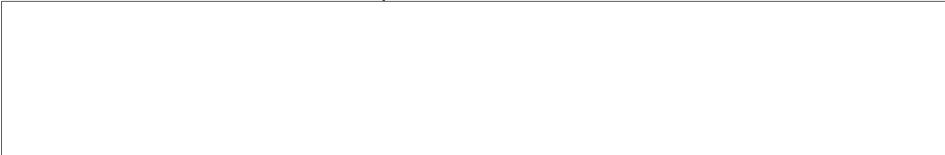
The use in an automated control system of electronic computers, television, and videotelephony, which will provide visual reception of information, will greatly widen the scope of controlling the troops.

Information may be most fully and comprehensively documented with the help of electronic computers operated in conjunction with external documentary equipment. The simplest form of the latter is the ordinary telegraph set. But its low capacity (1600 words per hour) is already incompatible with the enormous capabilities of electronic computers in issuing information. The task is to create

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high-capacity printer equipment. In our country, such equipment capable of printing at a speed of some 2 million symbols per hour, has already been developed. It is true that it is still somewhat bulky. But if the speed were slightly reduced and the design improved, it would be possible to get an acceptable teleprinter device which could be successfully used in field conditions.

At present, in stationary conditions, a number of recorder attachments are widely used in conjunction with electronic computers which draw graphs and record spots (tochka) on paper at appropriate coordinates according to calculation data. Such attachments can be used for producing charts of the regrouping of troops, engineer support, the limits of radioactive cloud spread, the radiation level of terrain, etc.

In addition to electronic computers, information may be documented by means of phototelegraphy and telegraphy, as well as by magnetic tape. For instance, one can record on a magnetic tape not only from the voice but also from telegraphy and even from television. Such recordings can be reproduced over and over again by means of tape recorders. They can be transmitted by any means of communication and either be sound read or rerecorded on tape-recorders located at a great distance from the point of transmission of the information. Information recorded on magnetic tape may be reproduced by telegraphy equipment, a television receiver, etc.

Thus, the terminal equipment is the technical equipment which is located in the immediate vicinity of the place where the general or officer is working. With its help they control the troops and receive information from all levels.

The development of terminal equipment at the present time has a tendency to increase the weight of the equipment giving visual reproduction of information. In our view, the terminal equipment should not be developed one-sidely but as a complex, one type of equipment supplementing the other. The final aim of its develop-ment is to provide the commanding officer with the possibility of visualizing the battle ground as clearly as possible and at the same time enabling him to listen to all the information required by him at a given moment. The development of new types of terminal equipment and technical equipment for observation and reconnaissance should in the main be subordinated to this aim.

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The electronic computer will require special equipment for linking with the ordinary, conventional communications channels (radiorelay, wire, and radio). All the information obtained by means of the various technical means should be fed without human interference into the electronic computers through special linking devices, where it is processed by it, partly fixed in its memory, and partly, in summarized form, transmitted to the people who need it.
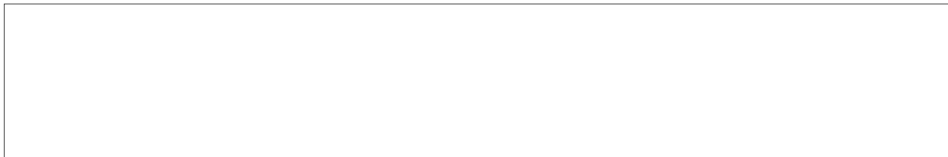
The creation of linking devices which could ensure the feeding of information into the electronic computer in a binary arithmetical system (dvoichnaya sistema schisleniya) is an urgent task for scientific-research organizations.

Having examined the complex of the technical equipment forming an automated system of control of the troops and the prospects of the development of this equipment, it is possible to try to formulate the basic operational-tactical requirements for this system and its components.

First of all, this system, in our opinion, must be the same for all arms of troops and services, and its components should be inter-linked and disposed on a principle excluding the duplication of infor-mation and ensuring the control of combat means. The technical equip-ment for obtaining and transmitting information should be standardized and provide for the information to be transmitted to all types of terminal equipment. The whole complex of equipment of an automated system should be interlinked by one highly reliable and flexible com-munications system. This means that the switching equipment should ensure the automatic connection of any source of information with any echelon of control and should provide for wide maneuvering of communications channels. The communications system, in this instance, should be highly developed and should cover the whole area of combat operations. The fact that any component part of the communications equipment, or communications exchange is out of action should not interfere with the control of the troops.

This system will require the creation of new, more advanced technical equipment for observation and reconnaissance, communications equipment, and terminal equipment. It is essential to envisage a gradual and systematic changeover to these from the existing equip-ment, adapting the latter to new requirements, bearing in mind that they are precursors of the future automated system. In our view, it is essential even now to centralize the direction of all new develop-ments being carried out by all arms of the ground troops and to carry them out as a single complex.
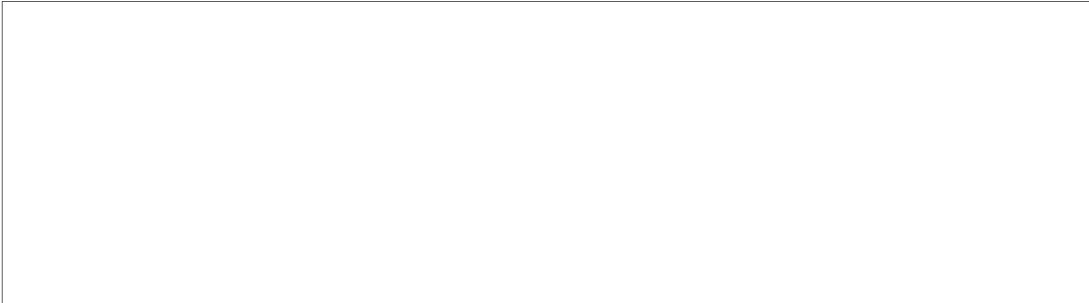
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The creation of an automated complex system of control of the troops will probably lead to the birth of a qualitatively new arm of special troops, to a new organizational structure. Up to now, the control of the troops was ensured in the main by the signal troops. But even now their role is changing radically, as the quantity of equipment destined for ensuring the control of the troops develops. Because the electronic computer, as well as all the other equipment (for observation, reconnaissance, transmission, etc.) will operate in an automated system, i.e., in a complex with a single communication system, and will become its integral part, one should also think in advance of who would operate and service it and who would be responsible for its creation, application, and operation.

We are of the opinion that those best qualified to deal with this equipment are the signal troops. For this reason, it would seem to be advisable to widen their functions and tasks considerably and to include organizationally the technical means of the automated system of control of the troops in the composition of this arm of troops.

From the Editor: The Editor invites officers and generals to discuss in this journal the questions raised in the above article.

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