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FOREIGN MILITARY REVIEW

No 3, March 1989

NATO: Forty Years on a Course of Confrontation and Militarism

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[Article by Col I. Vladimirov, candidate of historical sciences]

[Text] The ministers of foreign affairs of 12 states of Western Europe and North America signed a treaty in Washington on 4 April 1949 establishing the North Atlantic Alliance. Initial parties to the bloc were the United States, Canada, Great Britain, France, Italy, Belgium, the Netherlands, Luxembourg, Denmark, Norway, Portugal and Iceland. Greece and Turkey joined NATO in 1952, the FRG in 1955 and Spain in 1981. Today, as this strike force of imperialism celebrates its 40th anniversary, the West has no shortage of laudatory speeches about it, in which it appears almost as the bulwark of peace and the hope of mankind. The Alliance's official propagandists and western leaders of various ranks depict all its acts as a display of genuine peaceableness. To believe them, were NATO not in existence the world would have been plunged into the abyss of nuclear war and the "red hordes" would have seized Western Europe long ago.

In an attempt to conceal this bloc's aggressive essence, its creators gave it the form of an agreement over a defensive alliance. Today it is clearly apparent, however, that this bloc is what has constantly served over past decades as a source of serious threat to peace and a tool of intervention in the affairs of other countries and peoples.

Over four decades the NATO bloc has undergone considerable changes in adapting to new conditions of the international situation, to improvements in the balance of forces between socialism and capitalism, and to the appearance of new means of warfare. Its organizational structure was improved, methods of ideological and psychological pressure became more refined, and military-strategic concepts were modified. One thing remained unchanged—the desire to make a fundamental change in the course of history, to gain revenge, and to throw socialism down from the heights of world influence. The desire to get back what was irretrievably lost and to turn back the wheel of history has been and is the motive force of NATO policy.

In order to implement schemes of social revenge, from the very beginning the NATO leadership made the policy of acting "from a position of strength" and nuclear blackmail the basis of this grouping's political and military planning. Military budgets of bloc states, which unleashed an unchecked arms race, became truly astronomical. A NATO Council session decision has been in force since 1978 about a mandatory annual increase of member countries' military expenditures by three percent in real terms. New short-term and long-term military programs are constantly being adopted and carried out at accelerated rates.

The following facts indicate the rates of military potential buildup by the North Atlantic Alliance. In 1949 the NATO command had only 12 divisions at its disposal. Now, however, the bloc has 94 combat-ready divisions outfitted with the most modern kinds of weapons and combat equipment and capable of conducting combat operations with nuclear weapons being employed. The first American tactical nuclear weapons appeared in Western European NATO countries in the early 1950's. Its nuclear arsenal now amounts to 4,600 weapons according to official data. The first atomic howitzer appeared on West German territory in October 1953. In the words of Gen J. Galvin, Supreme Allied Commander Europe, the North Atlantic Alliance presently has over 2,000 atomic artillery pieces at its disposal.

Probably the most openly aggressive character of NATO aims is traced in the bloc's military-strategic concepts. Despite various names, the strategies of "shield and sword," "massive retaliation" and the present "flexible response" have one thing in common—reliance on unleashing nuclear war against the USSR and other states of the socialist community. The chief principle of these strategies is nuclear deterrence, which determines the entire practice of bloc military organizational development, the structure and organization of its Armed Forces, the direction of their combat and operational training, and the outfitting of forces with appropriate kinds of weapons.

In attempting to implement this principle, NATO's leader, the United States, has placed the world on the brink of nuclear catastrophe more than once. The United States has resorted to nuclear threat 19 times in the postwar period, and in ten of these instances placed its strategic aviation in a state of combat readiness and sent it to the borders of the USSR and other socialist states.

In June 1982 the USSR unilaterally pledged not to be first to employ nuclear weapons. By this act of historic importance our country once again confirmed the immutability of its peaceful intentions, but NATO's leaders did not follow the noble example. The insistent striving of the United States and NATO to strengthen their security not along with others, but at the expense of others, to ensure military superiority for themselves along the path of the arms race, and to open up new directions of that race also continues to be seen. Hence the rejection of real nuclear disarmament and refusal to pledge not to be first to use nuclear weapons. NATO's reliance on delivering a nuclear first strike shows that those who make policy in the West are not thinking about nuclear weapons in a defensive aspect at all.

An enormous apparatus of military violence has been created within the framework of NATO in the 40 years of its existence. Armed forces of bloc countries in Europe and in adjoining water areas number more than 3.6 million persons, over 30,000 tanks, 7,000 aircraft, and around 700 submarines and combatant ships. A far-flung system of directing entities—commands, staffs, and permanent and temporary committees—has been formed to manage this gigantic military machine. Its purpose is indicated most clearly by the direction of operational and combat training of staffs and troops, which has undergone essentially no substantial changes even after entry into force of the 1986 Stockholm Document on Confidence-Building Measures and Security in Europe.

Large-scale exercises bearing an openly provocative nature assumed a systematic character. They are held simultaneously on the territories of several states against a general operational-strategic background and are united by a common concept. The annual Autumn Forge fall maneuvers, which usually include 20-25 command and staff, operational-tactical and special exercises with participants numbering from 250,000 to 300,000 overall, hold a special place. For almost three months the territory of Western European NATO states, inland seas of Western Europe and contiguous waters of the Atlantic are turned into an enormous training area for practicing the latest versions of initiating and waging war against countries of the socialist community.

In recent years NATO's militarist activity has been coming right up to the borders of Warsaw Pact member states. During the Autumn Forge maneuvers over ten divisions and just as many brigades and large and small support units move up practically simultaneously to forward lines in the immediate vicinity of state borders of the GDR and CSSR.

Each year the arms race conveyer started four decades ago by the NATO leadership has picked up a faster and faster tempo. Major programs for building up the military potential of bloc countries have been adopted essentially every decade. As early as 1954 there were 25 combat-ready and 25 reserve divisions in the Central European sector, the infrastructure had been substantially broadened, and in particular over 100 airfields had been built and a far-flung communications system created.

NATO began preparing for the next phase of the arms race in the late 1960's. In December 1970 a NATO Council session approved a ten-year program for organizational development of bloc Armed Forces known as "Alliance Defense in the 1970's" (AD-70). It set the task for significantly reinforcing firepower and striking power of NATO Allied Armed Forces, rearming them with new and more advanced technology, and substantially increasing the financial contribution of bloc countries. A large role in implementing the AD-70 program was set aside for Western European NATO member countries. Having united within the framework of the Eurogroup, which was created especially for this purpose, they began implementing a special program for upgrading European defense. About one billion dollars over previous pledges were allocated for it additionally over a five-year period. "Europackages" have been approved annually since 1971, under which a considerable quantity of arms and military equipment is delivered to forces of Eurogroup countries and militarist expenditures increase above previously planned levels. As a result, Eurogroup military expenditures have increased 34 percent in real terms in the years of its existence.

In 1978 the NATO leadership adopted a long-range program for organizational development of bloc Armed Forces calculated up to 1995. In its scope it surpasses all previous militarist efforts by the Alliance. Drawing a broad picture of NATO military preparations, then U.S. Secretary of Defense H. Brown frankly said: "If all necessary funds for planned NATO programs are allocated, this Alliance should achieve a clear military superiority in the military sphere by the mid-1980's."

With the Republican administration's arrival in power in the United States in 1981, the trend toward building up militarist preparations, which never had let up in NATO, received a powerful new impetus. In May 1985 the Military Planning Committee added the so-called "defense initiative in the sphere of conventional arms," called upon to become the material base of new military-strategic concepts, to the long-range 1978 military program. This militarist plan, calculated to the year 2005, is aimed above all at a qualitative improvement in NATO Armed Forces by providing them with the latest precision long-range weapon systems intended for a follow-on forces attack. The dangerous nature of schemes of the NATO militarists is clearly confirmed by a 1986 Military Planning Committee resolution on modernizing the bloc chemical arsenal. According to western press announcements, it is planned to produce 760,000 155-mm artillery rounds and 28,000 aerial bombs equipped with binary charges. This resolution radically contradicts resolutions adopted at the January 1989 Paris International Conference calling for conclusion of a convention on a total ban and destruction of chemical weapons in the very near future.

But it is not only in Europe that the press of militarist activity of bloc countries is being felt. "The entire world is a matter for NATO" is the demand the United States presents to its allies. Although the American leadership has not yet succeeded in achieving an expansion in the North Atlantic Treaty area of operations, its official boundaries never have been a serious deterring factor for bloc member countries. Many examples can be cited of their joint aggressive actions taken over the last 40 years which left a bloody trail on various continents of our planet.

The ink barely had time to dry under the treaty creating the North Atlantic Alliance when American imperialism unleashed a war against North Korea in which forces of Great Britain, France, Canada, Turkey and Greece took part in addition to the U.S. Armed Forces. The NATO bloc stood behind the Dutch colonizers in their destructive wars in Indonesia; behind the French in Indochina, Tunisia, Algeria and Morocco; and behind the Portuguese in Angola and Mozambique. In 1956 Great Britain and France, together with Israel and supported by other bloc participants, committed aggression against Egypt. In 1964 the United States, Great Britain and Belgium carried out armed intervention in the Congo to suppress the national liberation movement of the Congolese people.

NATO countries undertook open armed intervention in Zaire during 1977-1978 to defeat rebels in Shaba Province. French and Belgian parachutists were airlifted to this country from Western Europe aboard U.S. military transport aviation aircraft. The FRG allocated necessary funds for supporting the aggressors with ammunition and fuel. The entire operation was coordinated by the staff of the Supreme Allied Commander Europe. Events in Chad unfolded under a similar scenario in 1983.

Operations by Great Britain in the South Atlantic in 1982 also are on this shameful list. The United States, which presented its bloc ally with weapons, bases and intelligence, acted on Great Britain's side in the Anglo-Argentine conflict over the Falkland (Malvinas) Islands. Other NATO countries ceased giving Argentina economic and military assistance. The year 1986 was witness to U.S. piratic action against Libya, committed with Great Britain's direct participation and with the tacit approval of other bloc countries. The Pentagon's aggressive act against this country in January 1988 was supported in the United Nations by Great Britain and France.

In the first half of the 1980's NATO's directing entities adopted a number of resolutions on activating bloc policy outside the limits of Europe; these resolutions are viewed by the West as the basis for joint armed intervention in the affairs of developing states. Special significance is attached to understandings reached during 1982-1983. A decision of the Military Planning Committee (May 1982) determining the procedure for coordinating bloc country actions outside the limits of its zone and the degree of their participation in planned aggressive actions should be singled out among them above all. In particular, it served as the basis for reaching an agreement making installations of the infrastructure in Western European countries available for supporting movements of the American Rapid Deployment Force from the continental United States to areas of the Near and Middle East.

As is obvious from resolutions of bloc supreme entities, the NATO "big stick" policy now is constructed according to the formula: "Those allies capable of supporting the deployment of forces outside the limits of the Treaty's effective zone can do so on the basis of a national decision." It presents full freedom of actions to Atlantic adventurers and justifies their armed intervention outside the limits of Europe for the purpose of imposing "order and strengthening regional stability." As a matter of fact, it is a question of open acts of violence against sovereign states and of overt attempts to overthrow legitimate governments. The clearest example of the display of such a policy is the invasion of Grenada by American forces.

This same wording permitted the United States to involve individual Western European countries for realizing its policy of "neoglobalism." For example, subunits of the armed forces of Great Britain, France and Italy were stationed in Lebanon together with the American Marines. International naval forces consisting of ships of the United States, Great Britain, France, Belgium and the Netherlands were knocked together under the pretext of a need to ensure freedom of navigation in the Persian Gulf. Squadrons of NATO countries also appeared in the Caribbean, creating a serious threat to peace and security of peoples of the western hemisphere.

Interventionist "fire brigades" were established in Great Britain, France and Italy in the image of the American Rapid Deployment Force. It is proposed that an allied Rapid Deployment Force be formed in which essentially all bloc countries will be represented for carrying out punitive operations outside the limits of the NATO zone. There are plans to establish NATO Allied Naval Forces in the Indian Ocean which will include combatant ships of the United States, Great Britain, the FRG, Italy, Portugal and the Netherlands. It is noteworthy that all these countries have a rich colonial past saturated with predatory wars. The chronic habit of colonizers to resort to the pressure of power is assuming a collective form under new conditions.

Viewing Japan as a far-eastern member of the bloc, NATO leaders are attempting to draw that country into their policy aimed at achieving world domination. Since 1979 Japan has been drawn ever deeper into the process of military-political consultations of bloc countries conducted at the level of defense ministries, the North Atlantic Assembly, and the Parliamentary Council for Comprehensive Security of Japan, the United States and Western Europe, created especially for this purpose in 1982 by Japanese rightist parties. Official contacts have been established between Tokyo and NATO Headquarters. What has been set up is essentially a permanent mechanism for exchanging political and military-strategic information between Japan and NATO, coordinating plans ensuring "Western solidarity," and determining the sphere of strategic employment of Japanese Armed Forces and their missions in case war breaks out in Europe.

Mankind has entered a crucial stage in its development. The question of what the world community will look like in the 21st century is being decided now, and therefore it is so important to make the proper choice. "If we are parts, albeit different parts, of one and the same civilization and if we understand the interdependence of the modern world, then this must be present more and more both in politics and in practical efforts to harmonize international relations," noted M. S. Gorbachev in his speech at the UN. "Perhaps the term 'perestroyka' is not very suitable in this case, but I am in fact coming out in favor of new international relations."

Changes occurring in the world under the influence of the new political thinking persistently introduced by the Soviet Union to the practice of relations among states make the need for revising obsolete stereotypes obvious. One of the latest proofs of such changes was the adoption of the Final Document at the Vienna meeting of parties to the Conference on Security and Cooperation in Europe (35 states) in January 1989, as well as the mandate for talks on conventional armed forces. NATO countries also contributed to their elaboration. Life demands the development of new approaches to solving international problems, but the West displays inconsistency in its policy. NATO leaders seemingly support our peace initiatives in words, but at the same time they harp on a continuing military threat on the part of the USSR. The proposal of socialist states to hold consultations on questions of comparing military doctrines of NATO and the Warsaw Pact is passed over in silence. The idea of the USSR and its allies for establishing a European center for reducing military danger was rejected.

The Soviet Union is taking a bold, decisive step in calling for turning away from the principle of superarmament to the principle of reasonable sufficiency for defense. Over the next two years the strength of the U.S. Armed Forces will be reduced by 500,000 persons on a unilateral basis without any preliminary conditions. Six tank divisions will be withdrawn from the GDR, CSSR and Hungarian People's Republic and disbanded, and assault landing units and a number of other large and small units including river crossing units also will be withdrawn. Soviet forces in these countries will be reduced by 50,000 persons and the number of tanks will decrease by 5,000. The remaining divisions will be given a different structure, which will become clearly defensive. The Soviet Union's Armed Forces will be reduced by a total of 10,000 tanks, 8,500 artillery systems and 800 combat aircraft. That step will considerably reduce military tension in Europe.

Unilateral measures to reduce the strength of armed forces also have been undertaken by other socialist countries—the People's Republic of Bulgaria, Hungarian People's Republic, GDR, Polish People's Republic, Socialist Republic of Romania and the CSSR. These initiatives conform to the general line of Warsaw Pact states on achieving a reduction in the level of military confrontation in Europe without detriment to their own allied obligations of ensuring reliable security of the socialist community. It is now up to NATO. Warsaw Pact countries are setting a good example; following it means acting in the spirit of the times.

But the NATO leadership has taken a dual position with respect to steps by socialist states in reducing military danger. For example, after having formally described the cutback in the Soviet Armed Forces as significant progress, bloc Secretary-General M. Woerner in essence attempted to downgrade its importance and pointed to the Soviet side's allegedly "weak and insufficient" measures. The U.S. military leadership called on NATO member countries to be skeptical of disarmament steps taken by the Soviet Union and demanded beginning a modernization of nuclear and conventional arms of western countries.

A declaration on monitoring conventional arms had been made earlier at the winter session of the NATO Council. Judging from its content, bloc representatives at talks on armed forces and conventional arms in Europe intend to try for reductions in military potential from Warsaw Pact states, while NATO countries for their part wish to limit themselves to purely symbolic measures. The declaration confirms that nuclear deterrence will continue to be the basis of policy and strategy. It is planned to modernize bloc tactical nuclear weapons as compensation for intermediate and lesser range missiles to be destroyed in accordance with the Soviet-American treaty.

According to foreign press reports, modernization of projectiles for 203.2-mm atomic artillery pieces already has been completed and modernization of 155-mm projectiles continues. The NATO command insists on replacing Lance missiles with new operational-tactical means of delivering nuclear weapons and making air-to-surface missiles with a range over 400 km operational.

Attempts are being made at the same time to deprive the INF Treaty of real content by carrying out various "compensatory" measures. Being considered in particular is the possibility of building up the U.S. tactical aviation grouping in Western Europe, outfitting submarines and surface combatants with Tomahawk cruise missiles, and other measures.

The aims of military confrontation laid down by NATO's founders 40 years ago are not in the spirit of the modern era. Today NATO is faced with a choice either of casting off the burden of the past or continuing to rest hopes on force and armed intervention. The favorable opportunities opening up for relaxing military tension cannot be missed. The world awaits a constructive response from NATO.

U.S. Strategic Computing Program

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[Article by Col N. Arinich, candidate of technical sciences; and Capt G. Bakhturin]

[Text] An orientation toward maximum use of the latest achievements of science and technology, above all those connected with computers, is the basic provision of U.S. military-technical policy in the area of creating advanced kinds of arms. In the opinion of American specialists, introduction of computers to force and weapon control systems is the general line for ensuring maximum use of their potential capabilities. This is what explains the U.S. striving to preserve supremacy in the sphere of computer technology both over the USSR and other countries of the Warsaw Pact, as well as over its own European NATO allies.

In the early 1980's further prospects for development of computer technology in foreign countries were determined by the scope of work to create fifth-generation computers. Projects in that area began to be financed in Japan in 1981 and in the European Economic Community in 1983. In connection with this, in 1983 the U.S. Defense Advanced Research Projects Agency (DARPA) came out with a proposal to open up a special program in the field of fifth-generation military computer technology. This initiative was formulated in fiscal year 1984 as the "Strategic Computing Program" (SCP). It is calculated for a ten-year period and proposed appropriations for the first five years will be around $600 million. Industrial firms and universities as well as government and military scientific organizations are taking part in fulfilling the program in addition to DARPA, which is coordinating the research.

The U.S. Defense Department is striving to ensure a concentration of forces and assets within the scope of a unified program which, simultaneously with the creation of fifth-generation computers, would permit demonstrating and assessing their capabilities in accomplishing military missions. Work to demonstrate and assess capabilities of the new equipment is being carried out jointly with branches of the Armed Forces interested in solving these problems and extending the technology being created to their other developments in the future. It is assumed that results of program realization also will find direct application in work being done within the framework of SDI to create autonomous space-based weapon systems and systems for controlling ABM and outer space defense forces.

A typical feature of the new generation of computers is the significant expansion in capabilities for automating "creative" processes, which until recently was considered the prerogative only of man. This is achieved by orienting computers toward executing algorithms constructed on the basis of artificial intelligence methods. Such capabilities permit substantially expanding the spheres of military use of computer technology and simplifying its operation by orienting on interacting with the user in a form that is of maximum convenience for man's perception. The new equipment will have the capability of directly processing data presented in the form of charts, imagery, and documents used by officials in day-to-day work. The equipment will be capable of making logical conclusions based on data at its disposal. In addition, it will contain self-teaching capabilities.

In the opinion of DARPA specialists, those functional capabilities can be realized only on the basis of substantial qualitative advances in the sphere of microelectronics, specialization of computer equipment in a specific sphere of tasks, and orientation on multiprocessor and parallel computers in development.

According to foreign press announcements, creation of fifth-generation military computers under the scope of the SCP program is being accomplished in three basic directions, with work plans in these directions coordinated by dates and objectives.

The *first direction* provides for creating software of various functional subsystems of fifth-generation computers with orientation on application in the military sphere. These functional subsystems are the visual data understanding subsystem, natural speech recognition and synthesis subsystem, natural language understanding subsystem, and a complex of expert systems together with logical conclusion devices.

The *second direction* is the development of fundamentally new computers which would meet the demands of functional subsystems in terms of productivity and main memory volume.

The *third direction* is the creation of a component base which in the future ensures realization of functional subsystems with consideration of satisfaction of demands placed on weight-size characteristics, power consumption, mean-time-between-failures and others.

In addition, it is planned to carry out a number of projects with the objective of a coordinated resolution of technical difficulties arising within the scope of the program and organization of centralized access of program participants to services supporting the production of a component base and assembly of technical equipment based on developers' orders.

The **visual data understanding subsystem** is for interpreting imagery being received, recognizing objects in the field of view of television cameras, and establishing the interrelationship among picture elements. In the opinion of western specialists, work in this area is among the most important and promising, since it will permit self-contained vehicles to solve navigation and reconnaissance problems. The subsystem will support target acquisition, identification, determination of coordinates, and automatic display (generation) of a terrain map when surveyed by television cameras. Special importance is attached to realizing the capabilities of understanding processes occurring with objects in the field of view. It is believed that the subsystem will be able to function in a rapidly changing situation in the presence of computers with a capacity up to 10^{12} operations per second and which include up to one million processor components.

In creating the **natural speech recognition and synthesis subsystem** it is proposed to provide for real-time data input to the computer by voice and the generation of acoustic signals in the form of natural human speech. Two subsystems are planned for development. The first will be characterized by a small dictionary of around 200 words, but it will be able to function in a difficult acoustic situation and with heavy stress on the operator. For example, such conditions exist in the cockpit of an aircraft where the level of interference reaches 115 db and speech is distorted during combat because of the helmet and mask. The second subsystem will have a large dictionary capacity (up to 10,000 words), but will be oriented for use in a satisfactory acoustic situation and with low stresses. It is proposed to use this subsystem as part of command and control system automation equipment complexes. The task set in research is to ensure the possibility of recognizing continuous speech with natural syntax and semantics regardless of an operator's voice characteristics. In the assessment of American specialists, the presence of computers with a capacity up to 10^9 operations per second is necessary to achieve SCP program objectives in this area.

Work in the area of creating the **natural speech understanding subsystem** is being done to simplify the interaction of assigned personnel with data bases and expert systems. It is proposed that such a subsystem will receive commands and queries in natural language, either by voice through the natural speech recognition and synthesis subsystem or in textual form through the keyboard. A number of studies are being conducted to create such a subsystem. First of all, the capabilities of natural speech recognition programs for understanding the context of a dialogue between user and machine are being expanded. This permits shortening the length of the dialogues, since the subsystem will understand the subject from context without leading questions and will prepare appropriate information in advance. Secondly, it is proposed to ensure the machine's development of the most complete responses, because of which the user would immediately receive the maximum amount of useful information. Thirdly, a problem is being posed to develop the means for acquiring additional knowledge, which can expand system capabilities for adapting to changes such as in vocabulary. The ultimate objective is to ensure an understanding of texts with a dictionary of up to 15,000 words. According to calculations of DARPA specialists, a computer power of at least 10^9 operations per second is necessary for the subsystem to function.

The objective of the SCP program in the sphere of **expert systems** is to develop software supporting wide use of such systems in the military sphere. These studies will become the basis of work to supply future weapon systems and weapons with certain "intelligent" capabilities, i.e., under certain conditions they will react to changes in the situation independently based on the established objective of functioning in an automatic mode, or they will be able to prepare a number of possible action variants for an assigned person in an automated work mode. The primary components of the expert system are the set of information about the sphere of the system's functioning as well as rules and algorithms for using this information to obtain logically correct conclusions based on available information. Information on the sphere of functioning comes from experts, people highly knowledgeable in this sphere. This information is written in the computer memory after it is formalized using special methods for presenting knowledge. By using a set of rules for logical deduction, the computer can process incoming data together with the stored set of information, which ensures its "understanding" and determination of a possible reaction to a situation.

The principal studies are aimed at preparing algorithms for carrying out logical conclusions in the absence of a portion of necessary information or in the presence of contradictions; at developing mechanisms for the machine's "explanation" of the actions it is performing; and at creating methods of augmenting information stored by the machine by means of a survey of users conducted by the system itself. The primary characteristics of the expert system are the number of logical deduction rules being used in the system and the supported number of rule applications per unit of time. According to assessments of DARPA specialists, expert systems to be used in autonomous vehicle control systems require on the order of 6,500 rules[1] with a processing rate of 7,000 rules per second. Expert systems for command and control automation equipment complexes are the most complicated, requiring approximately 30,000 rules at a processing rate of up to 12,000 rules per second.

The SCP program also places much emphasis on work on methods of integrating different expert systems into a single integrated system providing an opportunity for an automatic exchange of data between them. In the opinion of DARPA specialists, practical use of expert systems in the military sphere can be ensured in the presence of a computing power of around 10^9 operations per second.

The primary objective of work under the SCP program in the sphere of **developing fundamentally new computers** is to increase the capacity of military computers to 10^9-10^{12} operations per second. This is achieved above all by developing specialized, highly parallel equipment and improving the component base. Different principles of constructing such equipment are analyzed and tested in demonstrating various functional subsystems in the course of studies on the program. In the final program phase it is proposed to develop recommendations for choosing the optimum makeup of basic equipment which will comprise the basis of fifth-generation military computers.

At the present time computers with design principles which, in the opinion of DARPA specialists, provide for achieving the set objectives already are functioning within the scope of the SCP program. They include such data processing equipment as the Warp, Connection Machines, Butterfly, DADO, NON-PHONE, and LISP-machine.

The Warp computer, developed at Carnegie-Mellon University, is a multiprocessor computer consisting of ten series-connected specialized processors with an overall capacity of 10^7 operations per second. In the future it is planned to increase the computer makeup to 100 processor components and provide a capacity of over 10^9 operations per second. By 1990 it is planned to create a small version of the Warp computer consisting of 72 processor components, each of which is contained on a 5x10 cm board with an overall capacity of over 1.1×10^9 operations per second and costing around $72,000. The Warp computer is used in the visual data understanding subsystem for initial processing of video imagery.

The Connection Machines computer (of the Thinking Machines firm) has highly parallel architecture containing 65,536 processor components with an overall capacity of more than 10^9 operations per second. Each processor component contains a microprocessor for processing single-bit words and a main memory of four kilobytes. Processor components are interconnected by means of a special Hypercube switching subsystem. This computer is used for solving various computing problems and processing stereo imagery. It is planned to increase the computer's makeup to one million processor components and bring the capacity up to 10^{12} operations per second.

The Butterfly computer (of the BBN firm) is a multiprocessor computer which can include up to 256 processor components joined by a specialized switching subsystem. Each processor component includes an MC68020 32-bit microprocessor and MC68881 microprocessor for performing operations on floating-point numbers, as well as a main memory of from 1 to 4 megabytes. Its capacity with full makeup reaches 6×10^8 operations per second. The Butterfly computer, consisting of 64 processor components, is used for simulating combat operations and permits accelerating simulation by approximately 20 times.

The DADO and NON-PHONE computers developed by Columbia University are multiprocessor computers with a "tree"-type switching subsystem structure. The DADO computer can contain up to 8,191 MC68020 32-bit microprocessors. It is presently used in a natural speech recognition and synthesis subsystem with a large dictionary volume, and for organizing the functioning of expert systems based on the production method of knowledge presentation. The NON-PHONE computer is planned to be used for image processing.

The LISP-machine (of the TI firm) is a computer specializing in executing programs written in LISP language. U.S. Defense Department specialists presently consider it one of the basic computers for artificial intelligence programs, and so this computer will find wide use in the course of fulfilling the program for organizing "man-machine" interfaces. The LISP-machine is manufactured to satisfy all standards placed on military electronics.

The program's scope places great emphasis on microprocessors with an abbreviated command set. These devices provide a maximum possible increase in speed by reducing the number of types of commands executed and reducing the complexity of the microprocessor structure. At the present time there is already a model of such a microprocessor with a speed of up to 2×10^8 operations per second built using gallium arsenide technology.

The specialized high-capacity Spur computer for running programs written in LISP language is being designed on their basis.

One of the leading places in developing the component base of fifth-generation military computers is set aside for problems of creating fiber-optic connecting lines, converters of light energy into electrical energy, optical multiplexers with time division of channels, and very-large-scale integration circuits based both on silicon technology as well as on gallium arsenide technology.

One of the chief objectives of the SCP program is to demonstrate methods for using developmental computers for solving certain problems in the military sphere. In determining program content, DARPA specialists identified three possible military areas in which a demonstration of the new technology's application could best show its advantages: control of autonomous vehicles, control of force combat operations in a theater, and control of weapons in executing a specific combat mission. Based on this, a narrow range of problems was chosen in each of those areas whose solution would enable making a sufficiently objective assessment of the new technology's capabilities for accomplishing the entire set of problems. As of 1988, methods of applying new-generation military computers are being demonstrated in creating the following prototypes:

—A system for experimentally controlling an autonomous ground vehicle;

—An experimental model of a pilot's electronic assistant;

—An experimental system for analyzing radar and optical imagery;

—Experimental automated control equipment complexes for the nuclear-powered carrier "Carl Vinson" and an experimental fleet control center in the Pacific;

—An experimental automation equipment complex for command and control of U.S. ground forces.

The **system for controlling an experimental model of an autonomous ground vehicle** is being created on the basis of integrating in a single system the visual information understanding subsystem functioning in real time, problem-oriented expert systems, and computers being developed under the program. It is expected that in the concluding phase of the work the control system will permit autonomous vehicles to move over rugged terrain at a speed up to 60 km/hr following a preplanned route, prepare a movement route to reach a set objective, identify various objects, understand their status and behavior, and plan its own behavior depending on the tactical situation.

At the present time the transportation platform on which the control system is being tested is fitted with a color video camera, a five-spectrum scanning laser, acoustic sensors, and the Symbolics 3600, Warp and Butterfly computers. Martin Marietta is integrating various components of the experimental vehicle in a single system on the basis of a 3x4x2.7 m transportation platform.

Results of work to create this system are being directly used within the scope of the Advanced Ground Vehicle Technology Program being conducted jointly by the U.S. Army and DARPA. Contracts have been concluded with the General Dynamics and Food Machinery and Chemical corporations within the scope of the program to develop autonomous combat vehicles. General Dynamics is using the reconnaissance vehicle of the firm of Cadillac Gage for these purposes. Food Machinery and Chemical in turn is oriented toward the M113 tracked vehicle of its own development, which is evaluated as having the capability of performing reconnaissance functions in an autonomous mode.

Artificial intelligence methods and new computers are being used within the scope of work to create the **experimental model of a pilot's electronic assistant**. Their objective is to reduce mental stress on the pilot in accomplishing combat missions and piloting. The basis of the experimental system consists of several expert systems and a "man-machine" interface based on natural speech recognition and synthesis and natural language understanding subsystems being created under the program. The expert systems will provide for solving the following problems:

—Tracking the technical condition of various on-board systems to give the pilot recommendations on possible methods of fixing troubles, and automatic troubleshooting in preconceived situations;

—Collecting data from various on-board sensors about the tactical situation around the aircraft to identify threats to the aircraft, choose the optimum variant of actions to avoid them, and inform the pilot of this;

—Planning actions to update a flight assignment in accordance with the situation at hand;

—Promptly developing responding actions in critical situations.

A test of components of the pilot's electronic assistant is now being conducted in flight simulators in performing individual phases of combat missions. Systems have been created to help the pilot choose methods of combat and solve problems of retargeting when attacking ground targets and choosing the aircraft's flight path to avoid enemy SAM system engagement envelopes. Work is under way to create a system using the data of on-board sensors for identifying airborne targets and determining the sequence of their engagement beyond limits of visibility. Tests to evaluate capabilities of experimental models of the pilot's electronic assistant in functioning under real conditions are planned for 1990.

The **experimental radar and optical image analysis system** is being created to increase reconnaissance equipment capabilities in processing a flow of radar and optical imagery. Results of work in the sphere of understanding visual data, expert systems, and computers with parallel processing are being used in realizing the experimental system.

Three basic projects are planned in this sphere. The ADRIES (Advanced Digital Radar Imagery Exploitation System) envisages the development of equipment for obtaining imagery of tactical targets with the help of synthetic-aperture radars. Project INTACTS (Intelligent Tactical Target Screener) includes a study of problems of using technology components developed under the ADRIES project for real-time imagery processing. Realization of the SCIUP (Strategic Computing for Image Understanding Program) project will permit identifying capabilities for using the Warp and Butterfly computers, a prototype of the visual data understanding subsystem, and the technology of expert systems for automatic surveillance of known target locations in a near-real-time mode.

Work in the sphere of **experimental automation equipment complexes for the nuclear-powered carrier "Carl Vinson" and an experimental fleet control center in the Pacific** proposes creating prototypes for demonstrating a new generation of expert systems, testing natural speech recognition and synthesis and natural language understanding subsystems in real time, as well as working out principles for using Butterfly-type multiprocessor computers.

Five expert systems will make up the basis of the automation equipment complex of the experimental fleet control center in the Pacific:

—FRES (Force Requirement Expert System);

—CASES (Capabilities Assessment) for collecting and evaluating data on capabilities of friendly and enemy forces;

—CAMPSIM (Campaign Simulation) subsystem for simulating combat operations;

—OPGEN (Operations Plan Generation) for automated preparation of plans;

—STRATUS (Strategy Generation and Evaluation Expert System) for automating the development and evaluation of possible variants of actions.

The Vax 11/785 and Symbolics 3670 computers linked by a local data transmission network presently are the technical basis of the experimental center. It is planned to install a Butterfly computer in the center.

The experimental complex of control automation equipment for the nuclear-powered carrier "Carl Vinson" is for realizing experimental systems supporting the evaluation of possible enemy actions in a combat situation (the CAT—Combat Action Teamexpert—system) and processing data on the tactical situation (the SDMS—Special Data Management System). The latter supports the organization and retrieval of data and its display with graphic data. The collective-use display screen [does not] display information not changing over time, particularly on weapon platforms of the potential enemy and allies (their armament, characteristics and external appearance), but information changing over time (location of weapon platforms and so on). It supports the capability of imposing graphic data on nautical charts of various scales on video disks.

The CAT system uses the very same data as the SDMS system. It constantly analyzes data to evaluate various tactical situation categories. In the future CAT is to support various planning assistance functions.

Work to create the **experimental automation equipment complex for command and control of U.S. ground forces** is being accomplished within the scope of the ALBM (Air Land Battle Management) program being conducted jointly by the Army and DARPA. Its basis is a "man-machine" interface based on natural language understanding, natural speech recognition and synthesis, and textual display technology as well as various expert systems. Work under the ALBM program is being carried out in two directions: to develop a complex of expert systems and demonstrate its capabilities in future computers, as well as to create software for automating the development of such systems for most rapid dissemination of program results to all functional spheres of management activity at the operational-tactical level of U.S. Army leadership.

The Butterfly computer, several LISP-machines, and necessary equipment for documenting and displaying data are the technical basis of the experimental complex. The complex presently consists of three expert systems: for planning combat operations of combined-arms units and subunits in the corps and division, as well as for planning fire support in the corps. This complex will permit not only reducing time for preparing decisions, but also ensuring the possibility of evaluating alternative decisions by playing out their consequences with various enemy actions during simulation.

The experimental complex is being tested on the basis of the 9th Mechanized Division at Fort Lewis, Washington to determine problems of introduction and to evaluate the effectiveness of using artificial intelligence systems under combat conditions. To prepare for final introduction of the system to the army corps automated control system that is being developed, work presently is under way to create a command and control training system based on the natural language understanding subsystem and advanced graphic information display equipment, and existing methods of planning combat operations are being analyzed for improvement and automation.

In the opinion of American specialists, fulfillment of the SCP program will make it possible on the whole not only to create a technical base for realizing the new generation of military computers, but also to identify the most acute problems in developing software for it as well as to determine the main ways of introducing it to command and control and weapon control systems. It is believed that capabilities of the new computers will have a determining influence on prospects for developing automated control systems at various levels of U.S. Armed Forces leadership, including systems being created under the "Star Wars" program. In addition, new-generation computers will provide a substantial increase in effectiveness of conventional weapon systems.

Footnotes

1. A rule is a unit used for determining the scope of knowledge as applied to expert systems. A conventional computer performs on the order of 10^3 operations to execute one rule—Ed.

International Reaction and Settlement in Southern Africa

18010679c Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) p 18

[Article by Col A. Osipov]

[Text] The results of many years of armed conflict in Southern Africa demonstrated to the entire world once again the lack of promise of military methods being used by the apartheid regime to attain political goals. But as the result of peaceful diplomatic initiatives advanced by Angolan, American and Cuban leaders, an escalation of combat operations was prevented and favorable conditions were created for fulfilling UN Security Council Resolution 435 on granting independence to Namibia (adopted back in 1978) and Resolution 602 on a withdrawal of South African troops from the People's Republic of Angola (adopted in 1987).

This was facilitated by many rounds of talks among Angola, Cuba and the Republic of South Africa with U.S. intermediation, during which an agreement was signed in 1988 on a peaceful settlement of the situation in South West Africa and an understanding was reached on a cease-fire among forces of the Republic of South Africa, People's Republic of Angola and Cuba. South African troops were withdrawn from Angola last year in accordance with this. In addition, an agreement was concluded in November 1988 on a withdrawal of the contingent of 50,000 Cuban troops from the People's Republic of Angola over a two-year period and its timetable was agreed upon. Cuba began withdrawing internationalists from Angola ahead of schedule in a display of good will. South Africa pledged to withdraw a considerable portion of its troops from Namibia in the future.

But positive advances in settling the situation in Southern Africa do not suit imperialist reactionary circles, which are attempting to hold their positions in this region with the help of roundabout maneuvers. In particular, they are attempting to leave open the question of civil war in Angola itself, which has lasted over 13 years, declaring it an internal problem which therefore cannot be the subject of talks. In addition, the United States confirmed that it does not intend to stop giving comprehensive assistance to the antigovernment UNITA grouping. Some in Washington figure that under pressure of this pro-imperialist organization, the Angolan government will be forced to give it concessions after the removal of Cuban forces from Angola.

On 8 February 1989 subunits of the regular army of the Republic of South Africa again invaded the territory of the People's Republic of Angola. This sortie is a continuation of South Africa's aggressive policy, which, in the words of South African Minister of Defense Magnus Malan, also includes support of UNITA.

It is not only the Angolan people who are experiencing deprivations inflicted by the apartheid regime. Some 2.5 million persons have left their homes as a result of the course conducted by Pretoria toward destabilization of the situation in "frontline" states (Angola, Mozambique, Tanzania, Botswana, Zimbabwe). The apartheid policy, which is the official course of the ruling regime of the white minority, also led to the fact that almost 100,000 citizens of the Republic of South Africa and Namibia were forced to emigrate and over four million darkskinned residents of the Republic of South Africa who were resettled to tribal reservations, the Bantu Homelands, essentially became refugees in their own country.

In an attempt to preserve control over Namibia even after granting it independence, Republic of South Africa leaders used all means to put off the date for implementing UN Security Council Resolution 435 until 1 April 1989.

Southern Africa still has far to go for a peaceful life. Civil wars and racial conflicts wrack this region. Nevertheless, the resolutions reached open up new horizons here for untying political knots.

FRG Field Army

18010679d Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 19- 25

[Article by Lt Col V. Lyudchik]

[Text] The Federal Republic of Germany, one of the most important states of the capitalist world with a powerful economic potential and armed forces numbering a half million, plays a significant role in the North Atlantic Alliance. Fully approving and supporting the aggressive foreign policy course of ruling circles of the United States and NATO, the FRG takes an active part in building up bloc military preparations. This is reflected in particular in a further increase in the Bundeswehr's striking power by constantly improving its organizational structure and by outfitting large and small units with modern weapons and military equipment. In the assessment of foreign specialists, the Bundeswehr presently represents the largest and most combat- ready armed forces in Western Europe. For example, in Central Europe it accounts for 50 percent of ground forces, 60 percent of tanks, 30 percent of combat aviation, and 30 percent of naval forces and assets.

The foreign press reports that the Bundeswehr command devotes special attention to Army development in plans for modernizing the Armed Forces. Organizationally the FRG Army includes a Field Army and a Territorial Army, with the former being the most combat-ready component numbering around 290,000 persons, which is over 80 percent of the FRG Army's overall strength. Even in peacetime it is kept in a high state of combat readiness and is at 85-90 percent strength in personnel and 100 percent strength in weapons and military equipment. All large and small units of the Field Army are earmarked for wartime transfer to operational subordination of the NATO Allied Forces command.

The Inspector (Commander in Chief) of the FRG Army exercises immediate direction of the Field Army through the main staff, the FRG Army central directorate, and staffs of I, II and III army corps as well as of the 6th Mechanized Division.

The Army main staff is headed by a chief of staff and includes the following directorates: ideological work, personnel and combat training; intelligence; operations; organizational; logistics; planning and armament. It is responsible for tasks of elaborating plans for organizational development, operational employment, and combat training of the Field Army; supervising the implementation of these plans; designating stationing locations of large and small units; and directing ideological work among personnel.

The central directorate is subordinate to the main staff and is the supreme command echelon of the FRG Army for directing establishments and military educational institutions. It works out principles of leadership and combat employment of the FRG Army; plans and supervises operational and combat training in staffs and in large and small units, including military educational institutions; organizes the outfitting of large and small units with weapons and military equipment; decides personnel questions; and draws up regulations, manuals and other guidance documents. In addition, the directorate is responsible for practical application of effective field manuals among the troops, for organizing deliveries of weapons and military equipment, and for comprehensive support to activities of military educational institutions and training areas. The personnel directorate, logistics directorate and 17 military educational institutions of the FRG Army with their training units and subunits are subordinate to the chief of the central directorate.

According to foreign military press reports, the Field Army is divided into combat arms, which bring together units and subunits performing combat missions or combat support and logistic support missions. They include the following forces: combat, combat support and headquarters, as well as logistic support.

Combat forces are the principal means of conducting combined-arms combat and include large and small infantry, mechanized, tank, mountain infantry, airborne, antitank and reconnaissance units and subunits. Their greatest effectiveness is achieved in close coordination with combat support forces.

Combat support forces perform missions of fire support to troop combat operations, especially on distant approaches, placing obstacles, supporting the crossing of obstacles, combating enemy aircraft and helicopters, and other missions. The forces include field artillery, tactical air defense, army aviation, engineers, and NBC units and subunits.

Headquarters forces are intended for command and control, reconnaissance, electronic warfare, psychological warfare and so on. They include signal, military police, deep and front reconnaissance, topographic, and psychological warfare units and subunits.

Logistic support forces are called upon to maintain the combat readiness of personnel and military equipment as well as the troops' capability to conduct lengthy combat operations. They include supply; repair, overhaul, and rebuilding; and medical units and subunits.

According to foreign press data, the Field Army presently has 12 divisions in the order of battle: four mechanized (2d, 4th, 6th and 11th), six armored (1st, 3d, 5th, 7th, 10th and 12th), one mountain infantry—1st (8th), and one airborne (9th), which are consolidated in I, II and III army corps (the 6th Mechanized Division is intended for conducting combat operations together with Danish ground forces in the Northern European sector and is not included in the army corps makeup). All three corps are included in operational formations of NATO ground forces in the Central European sector (I in NORTHAG and II and III in CENTAG). These corps are their basic combat component of these formations and are intended for conducting combat operations together with army corps of the United States, Great Britain, Belgium and the Netherlands in the first operational echelon of the NATO Allied Forces grouping in the Central European sector.

According to foreign press announcements, the Field Army inventory includes 24 Lance operational-tactical missile launchers, over 3,000 tanks (of which around 2,000 are the Leopard 2), 2,000 field artillery pieces and mortars, over 2,500 antitank weapons, around 2,300 air defense weapons, and up to 700 army aviation helicopters, including around 200 antitank helicopters.

The **army corps** is the highest large tactical unit of the Field Army and in peacetime can include from three to five divisions of various types and units and subunits of corps subordination, which are consolidated in eight commands (missile forces and artillery; tactical air defense; army aviation; signal troops; engineer troops; supply; repair, overhaul, and rebuilding; and medical services). In addition, organic subunits of corps subordination also include separate deep reconnaissance and front reconnaissance companies and four reserve battalions.

The missile forces and artillery command includes a headquarters, a Lance operational-tactical missile battalion (six or eight missiles), a special weapons delivery battalion, security battalion, and support and service subunits.

The tactical air defense command includes a headquarters, surface-to-air missile regiment (six firing batteries each with six Roland II SAM systems), two AAA battalions (four firing batteries each with six L70 40-mm antiaircraft guns), assets for conducting aerial reconnaissance, and support subunits.

The army aviation command consists of a headquarters and headquarters squadron, three regiments (56 BO-105P antitank helicopters, 48 UH-1D utility helicopters, and 32 CH-53G military transport helicopters), as well as a reconnaissance and liaison squadron (12 BO-105M), and flight support, service and repair subunits.

The signal troops command organizes and provides communications among corps units and performs SIGINT and EW missions. Subordinate to it is a headquarters, two signal battalions, a SIGINT and EW battalion, and support and service subunits with up to 300 radios for various purposes.

The engineer troops command includes a headquarters and the following battalions: four engineer, one amphibious engineer, two ponton, and one NBC. They are outfitted with MLC 60 self-propelled multispan bridges, Hohlplatten 50/80 bridge trains, and other engineer equipment.

The supply command includes a supply battalion and two transportation battalions; around 20 corps depots also are subordinate to it.

The repair, overhaul, and rebuilding service command is made up of three repair, overhaul, and rebuilding battalions (radiotechnical and electronic equipment, armament and technical property, and general purpose) for repairing and maintaining weapons and military equipment.

The medical service command consists of two medical battalions, a medical transportation battalion, and field hospitals.

Foreign military specialists believe that the *I Army Corps* (headquarters in Muenster), which in peacetime numbers over 100,000 persons (in wartime there will be around 140,000), is the most powerful in effective combat strength and armament. It includes the headquarters, the 11th Mechanized Division (Oldenburg) and three armored divisions—1st (Hannover), 3d (Buxtehude), and 7th (Unna)—as well as units and subunits which are part of corps commands. Its large and small units are armed with six Lance operational-tactical missiles; around 1,200 Leopard 1 and Leopard 2 tanks (Fig. 1 [figure not reproduced]); 1,700 Marder infantry fighting vehicles (Fig. 2 [figure not reproduced]), Luchs combat reconnaissance vehicles and M113 APC's; around 600 field artillery pieces and mortars; over 1,000 antitank weapons; 750 antiaircraft weapons; and 56 BO-105P antitank helicopters (Fig. 3 [figure not reproduced]). The corps is intended chiefly for conducting offensive combat operations on the left flank of NORTHAG. In the course of numerous exercises its large and small units have repeatedly practiced problems of conducting both offensive and defensive combat operations under conditions of the North German lowland.

The *II Army Corps* (Ulm) numbers over 80,000 persons in peacetime (around 120,000 in wartime). It is made up of the 4th Mechanized (Regensburg), 10th Armored (Sigmaringen), 1st (8th) Mountain Infantry (Garmisch-Partenkirchen) and 9th Airborne (Bruchsal) divisions, as well as commands similar to I Army Corps. It has eight Lance operational-tactical missiles; around 900 tanks; 1,000 Marder IFV's, Luchs combat reconnaissance vehicles and M113 APC's; around 500 field artillery pieces and mortars; over 860 antitank weapons; 640 antiaircraft weapons; and 56 antitank helicopters.

The *III Army Corps* (Koblenz), which in peacetime numbers 70,000 persons (in wartime 110,000), has the 2d Mechanized (Kassel) and 5th and 12th armored (Diez and Veitshoechheim respectively) divisions, as well as commands of corps subordination. Its large and small units are armed with six Lance operational-tactical missiles; 860 tanks; up to 1,200 Marder IFV's, Luchs combat reconnaissance vehicles and M113 APC's; around 450 field artillery pieces and mortars; 850 antitank weapons; over 600 antiaircraft weapons; and 56 antitank helicopter.

The **division** is the primary large tactical unit of the Field Army. It is capable of conducting combat operations both as part of the army corps and independently. Field Army divisions differ by types of brigades included in them. The organization and armament of brigades as well as of units and subunits of division subordination are of the same type in all divisions.

Mechanized divisions have an identical organization and include a headquarters and headquarters company, two mechanized brigades, one armored brigade, one artillery regiment (18 203.2-mm self-propelled [SP] howitzers, 18 155-mm towed howitzers and 16 LARS-2 multiple rocket launchers), one AAA regiment (36 Gepard self-propelled air defense mounts, see color insert [color insert not reproduced]), 14 separate battalions (one reconnaissance, two infantry, one signal, one engineer, one repair, overhaul, and rebuilding, one supply, one medical, one security, and five reserve), two companies (SIGINT and EW, and NBC), one army aviation squadron (10 BO-105M's) and a front reconnaissance platoon (infantry, reserve and security battalions of all types of divisions are reduced-strength in peacetime).

In peacetime the mechanized division has a total of around 18,000 persons (over 21,000 in wartime), 252 tanks, around 200 Marder IFV's, 34 Luchs combat reconnaissance vehicles, 200 M113 APC's, 90 field artillery pieces (of which there are 72 155-mm and 18 203.2-mm howitzers), 16 LARS-2 multiple rocket launchers, 42 120-mm mortars, around 190 ATGM launchers, 36 Gepard SP air defense mounts, 50 20-mm antiaircraft guns, 10 observation and liaison helicopters, as well as other armament.

The mechanized and armored brigades which are part of Field Army divisions are basically identical in personnel strength, organization and armament. Their difference lies in the ratio of mechanized and armored battalions. Brigades which are part of each division have a strict sequential numbering beginning with 1st (for example, the 1st Armored Division has the 1st, 2d and 3d brigades, the 2d Armored Division has the 4th, 5th and 6th brigades and so on). Mechanized brigades are numbered first in each division, and then the armored brigades: the 1st Armored Division has the 1st Mechanized Brigade and the 2d and 3d armored brigades; the 2d Mechanized Division has the 4th and 5th mechanized brigades and the 6th Armored Brigade. The 10th and 12th armored divisions are the exception. The 10th Armored Division includes the 28th and 29th armored brigades and the 30th Mechanized Brigade, while the 12th includes the 35th Mechanized Brigade and the 34th and 36th armored brigades.

The 1st (8th) Mountain Infantry Division has three brigades: 22d Mechanized, 23d Mountain Infantry and

24th Armored. Units and subunits of division subordination are given the number of the division and subunits of brigade subordination are given the number of the brigade with the addition of a zero. For example, the 5th Reconnaissance Battalion is part of the 5th Armored Division and the 70th Antitank Company belongs to the 7th Mechanized Brigade, 3d Armored Division. The numbers of mechanized, armored and artillery battalions in each brigade begin with 1st and are added to the number of the brigade, with composite mechanized (armored) battalions coming first.

The mechanized brigade (over 3,500 persons) has a headquarters, composite mechanized battalion (13 tanks, 24 Marder IFV's, 12 Milan ATGM launchers), two mechanized battalions (each with 24 Marder IFV's, 21 Milan ATGM launchers, six 120-mm mortars and five APC's), one armored battalion (41 tanks), one artillery battalion (18 155-mm SP howitzers) and five companies: headquarters, antitank (12 Jaguar 1 SP launchers with HOT antitank missiles), engineer, repair, and supply (the composite mechanized and armored battalions of all brigades are reduced-strength).

The armored brigade (over 3,200 persons) includes a headquarters, composite tank battalion (28 tanks, 11 Marder IFV's), mechanized battalion (35 Marder IFV's), 18 Milan ATGM launchers, six 120-mm mortars), two armored battalions (41 tanks each), one artillery battalion (18 155-mm SP howitzers) and five companies: headquarters, antitank (12 Jaguar 2 SP launchers with TOW ATGM's), engineer, repair, and supply.

The *armored divisions* have an identical organization and establishment, have considerable firepower and mobility, and are intended for conducting offensive combat operations above all. They are the best adapted for fighting when nuclear weapons are being employed.

The armored division includes a headquarters and headquarters company, two armored brigades, one mechanized brigade, one artillery regiment (18 203.2-mm SP and 18 155-mm towed howitzers, 16 LARS-2 multiple rocket launchers), one AAA regiment (36 Gepard SP air defense mounts), 14 separate battalions (one reconnaissance, two infantry, one signal, one engineer, one repair, overhaul, and rebuilding, one supply, one medical, one security, and five reserve), two companies (SIGINT and EW, and NBC), one army aviation squadron (10 BO-105M's), and a front reconnaissance platoon. The organization and establishment and the armament of armored and mechanized brigades of the tank division are the very same as for the mechanized division. Numerical strength of the division in peacetime is over 17,000 persons (22,000 in wartime) and its armament consists of 308 tanks, 160 Marder IFV's, 34 Luchs combat reconnaissance vehicles, 200 M113 APC's, 90 field artillery pieces (of which there are 72 155-mm and 18 203.2-mm howitzers), 16 LARS-2 multiple rocket launchers, 36 120-mm mortars, around 160 ATGM launchers (including over 120 Milan ATGM launchers and around 40 HOT and TOW SP ATGM launchers), 36 Gepard SP air defense mounts, 50 20-mm antiaircraft guns, 10 observation and liaison helicopters, as well as other armament.

The *mountain infantry division* is the only one in the Bundeswehr. In the opinion of West German military specialists, because of its organization, armament and level of combat training it can successfully conduct independent combat operations on mountainous terrain, and in coordination with armored and mechanized large units on flatland and moderately rough terrain. The mountain infantry division includes a headquarters and headquarters company; one mechanized, one mountain infantry and one armored brigade; one artillery and one AAA regiment; ten battalions (reconnaissance; repair, overhaul, and rebuilding; supply; medical; security; and five reserve); two companies (SIGINT and EW, and NBC); one army aviation squadron of ten BO-105M's; and one front reconnaissance platoon. In peacetime this division has a total of around 19,000 persons (over 23,000 in wartime). Its armament consists of 252 tanks, over 100 Marder IFV's, 34 Luchs combat reconnaissance vehicles, 150 M113 APC's, 90 field artillery pieces (of which there are 18 105-mm, 54 155-mm and 18 203.2-mm howitzers), 16 LARS-2 multiple rocket launchers, 54 120-mm mortars, over 200 ATGM launchers (including more than 180 Milan ATGM launchers and over 20 HOT and TOW SP ATGM launchers), 17 Jagdpanzer 90-mm antitank guns, 36 Gepard SP air defense mounts, 70 20-mm antiaircraft guns, 10 observation and liaison helicopters, as well as other armament.

The mountain infantry brigade (over 5,000 persons) consists of a headquarters, four mountain infantry battalions (each with 21 Milan ATGM launchers and six 120-mm mortars), one artillery battalion (18 105-mm mountain howitzers), and seven companies: headquarters, antitank (17 90-mm Jagdpanzer SP antitank guns), engineer, supply, mountain pack, medical, and NBC.

The *airborne division* differs considerably in its organization and armament from other large units of the Field Army. It is the Bundeswehr's highest large unit of airborne forces and can be used to reinforce large combined-arms units when they conduct offensive or defensive operations. It has a headquarters, headquarters company, three airborne brigades and a signal battalion. In peacetime it numbers over 8,000 persons (around 9,500 in wartime), 48 120-mm mortars, over 300 ATGM launchers (including more than 120 Milan ATGM launchers and around 180 HOT and TOW ATGM launchers), 150 20-mm antiaircraft guns, as well as other armament.

The airborne brigade (around 3,000 persons) is the primary division combat unit and includes a headquarters, three airborne battalions, one reduced- strength airborne brigade and one reduced-strength reserve battalion as well as five companies: headquarters, mortar (16 120-mm mortars), engineer, supply, and medical. In wartime it is planned to transfer the division's airborne brigades to the operational subordination of army corps (27th to I, 25th to II and 26th to III) and use them as an operational airborne assault force in corps interests, for replacing first echelon units and subunits which have suffered considerable losses from nuclear strikes, and for performing reconnaissance and raiding missions in the enemy rear.

Combat employment of the Field Army. The FRG Field Army is intended for conducting both offensive and defensive operations. In the opinion of the Bundeswehr command, the *offense* is the principal form of combat operations, as a result of which the opposing enemy is defeated, his territory is captured, and favorable conditions are created for further exploitation of success. According to views of West German military specialists, success of offensive operations will depend largely on reliable neutralization of the enemy by nuclear weapons, artillery and tank fire, and air strikes as well as on the decisive operations of large and small units in the depth of the enemy defense. A significant role is set aside here for army corps. According to foreign military press information, they can advance in a zone 50-70 km wide on the axis of main attack and in a zone up to 100 km wide on a secondary axis, the depth of the immediate mission is up to 100 km, and that of the subsequent mission is over 150 km. The combat formation of army corps will be aligned more often in two echelons: 2-3 mechanized or armored divisions in the first and one in the second.

The antitank helicopter regiment is the corps commander's mobile antitank reserve and is employed basically in a decentralized manner: a squadron of 28 helicopters operates in the interests of a division performing a mission on the axis of main attack and is used at full strength to repel counterthrusts or counterattacks of enemy tank forces. The average rate of advance is around 30 km per day. To increase that rate the Bundeswehr command plans to make wide use of airborne assault forces, to conduct combat operations day and night, to preempt the enemy in delivering fire strikes, to regroup forces promptly, and so on.

FRG military specialists believe that the *defense* also is one of the principal kinds of combat operations. Forces shift to it temporarily to disrupt an enemy offensive, to economize forces and assets on some axes and create a superiority over the enemy on others, to hold important lines and areas, to gain time and to create conditions for launching an offensive. In their opinion, the fundamental principle of conducting a modern defense is a bold combination of the maneuver of large and small units with the effective employment of all kinds of weapons, above all nuclear and precision weapons.

The foreign press reports that the army corps can defend in an army group first echelon on the main or secondary axis, be in its second echelon, or be in the reserve of the allied forces commander in the Central European sector. Its actions in a defensive operation are characterized by a combination of two kinds of defense: positional and mobile. The operational alignment of the corps in a defense is executed based on the chosen method of defeating the main enemy force grouping, terrain conditions, assigned combat mission, and probable nature of enemy operations. The army corps organizes and conducts a defense in a zone, the size of which depends on its effective combat strength, assigned mission, nature of terrain, presumed composition of the attacking enemy force grouping, and specific situation. Based on exercise experience, it can defend in a zone up to 80 km wide and up to 120 km deep.

Combat operations of large and small army corps units are practiced in annual exercises which include forces of other NATO member countries. For example, in September 1987 a field training exercise of the FRG II Army Corps was held in the southern part of the FRG under the codename Kecker Spatz with the participation of the French Rapid Action Force (a total of 75,000 persons), during which problems of organizing and conducting army corps defensive and offensive operations were practiced. The foreign press notes that delivery of modern weapon systems and military equipment to the Field Army can considerably increase capabilities of large and small corps units to inflict losses on the enemy at greater distances.

Development prospects. According to information published in the western press, the Bundeswehr command plans to reorganize large and small Field Army units by the mid-1990's and shift to a new Structure-2000 organization and establishment. Above all it is planned to increase the overall number of brigades in the Field Army from 36 to 42 by transferring six separate Territorial Army brigades to them while preserving the existing three army corps and 12 divisions. Under the new structure, of the 42 brigades in the Field Army there will be 16 armored, 12 mechanized, 6 infantry, 1 mountain infantry, 2 security, and 5 airmobile (airborne). It is proposed to include two mechanized and armored battalions each, one artillery battalion each, and separate companies in the armored and mechanized brigades. It is planned that Leopard 2 tanks will be in the inventory of the armored brigades and Leopard 1 tanks in the inventory of mechanized brigades.

Infantry and security brigades will consist of four infantry battalions and the mountain infantry brigade will consist of three mountain infantry battalions and one armored battalion. The five airmobile brigades are to be constituted on the basis of three brigades of the airborne division and army aviation regiments and squadrons of corps and division subordination; four of them will become part of the two airmobile divisions. According to foreign press announcements, these divisions will be subordinate to the I and II army corps, and the airmobile brigade will be subordinate to III army corps. Plans for reorganizing the Field Army envisage that a considerable number of the battalions which are part of the brigade will be at 50-70 percent strength.

The foreign press reports that considering the future decrease in the number of persons of draft age in the country, the Bundeswehr command intends to make wider use of reservists. In early 1988 the Bundeswehr adopted a new concept for using reservists which provides for conducting a set of organizational, technical and other measures for their wider involvement in refresher training, exercises and so on. In particular, it is planned to increase the number of authorized slots held by reservists in the Field Army from 5,000 to 12,000; in the mid-1990's this will permit training up to 300,000 reservists annually. Delivery of modern weapon systems and military equipment to the Field Army also is expected. By the early 1990's it is planned to deliver an additional purchase of 150 Leopard 2 tanks, around 200 MLRS multiple rocket launchers, over 300 Wiesel light armored vehicles, CL-289 reconnaissance drones, and a considerable quantity of ammunition and communications equipment. The active introduction of automated control systems to staffs and forces will continue.

Small Transportable and Portable Satellite Communication Stations

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[Article by Capt A. Skorodumov]

[Text] Western experts believe that achieving a higher data transmission rate and data security is most important at the present stage of the process of further upgrading military communication systems along with ensuring a high degree of antijam capability and reliability of communication equipment under conditions of the use of electronic warfare resources and conduct of combat operations employing both conventional as well as nuclear weapons. In addition, heightened demands are being placed on promptness and flexibility in establishing communications and on mobility of ground stations.

In the opinion of foreign military specialists, these demands can be fulfilled both at the strategic as well as tactical control levels by further upgrading and developing satellite communication systems and equipment capable of supporting continuous and flexible command and control. Therefore in addition to modernizing existing DSCS (Defense Satellite Communication System), FLTSATCOM and AFSATCOM satellite communication systems operating in centimeter and decimeter wave bands, the United States is intensively developing the Milstar global satellite communication system intended for organizing communications in the promising millimeter wave band. This permits a substantial increase in system capacity and assurance of necessary antijam capability and security of communications. In addition, this provides an opportunity to develop and produce a large number of inexpensive mobile stations with small antennas capable of simultaneous operation through an on- board repeater which uses the method of multistation access with channel allocation by request and with on-board signal processing. It is planned to use these stations to outfit mobile command posts at the tactical control level.

The need for using satellite communication stations at the tactical level is dictated (with consideration of the experience of their practical use in the U.S. Army) by the requirement for highly mobile multichannel equipment with increased survivability and reliability capable of providing flexible communications over any distances regardless of terrain relief, weather conditions, and time of year or day.

These requirements cannot be met using the already existing long-range short- wave radio communication equipment, since its operation is substantially determined by the condition of the ionosphere, which changes depending on the season and time of day, while multichannel wire and radio relay communication equipment does not provide necessary mobility and survivability.

It is the opinion of foreign specialists that tactical satellite communications assumes special significance in the initial period of combat operations, when forces are redeploying from permanent station areas. It is believed that satellite communications is the most effective means of controlling subordinate forces to and including battalion from the moment of notification until deployment of a field communication network. This is explained by the capability of rapidly deploying satellite communication stations at predetermined points with subsequent establishment of contact with subscribers, which ensures the functioning of a limited communication network. Such a network permits organizing timely transmission of updated intelligence and operational commands to lower staffs, thus guaranteeing continuous control of them during the first hours of preparation for combat operations, and this is of decisive importance for the outcome of battle. In addition, the mobile satellite communication stations can play an important role subsequently as well in case of a sudden change in the theater situation, when the need arises to reorganize the communication network. Satellite communication equipment also can be used effectively for providing emergency command post communications in case highly vulnerable equipment for tying in to the base communication network is disabled or destroyed, which permits the command post to exercise control functions under the most unfavorable circumstances.

Along with the above tasks, in recent years the United States and Great Britain have placed great emphasis on developing small portable satellite communication stations intended for rapid movement to areas of crisis situations when operations are conducted by the Rapid Deployment Force at various points on the planet, or for providing communications with army subunits performing the most important missions, and with reconnaissance or special teams operating in isolation or at a considerable distance from the main body.

Therefore depending on their purpose, small satellite communication stations can be accommodated on vehicles with improved off-road capability or can be containerized and consist of several units, which permits their rapid airlift with minimum deployment time and with the possibility of units being carried separately by several servicemen. Portable stations designed to be carried and serviced by one person form a separate group. Creation of such stations is closely connected with the latest achievements in microprocessor engineering and with the development of integrated technology. At the same time, decreased weight-size indicators mean reduced capabilities of such stations.

The U.S. Army presently has adopted a family of light satellite communication stations, the **AN/TSC-85A** and **AN/TSC-93A**, for organizing communications at the tactical level such as in the army corps net. They are designed for use as part of the DSCS satellite communication system functioning in the centimeter wave band. Each station is accommodated on two 1.5 ton vehicles, each towing a trailer with power unit. The parabolic antenna is 2.4 m in diameter. It takes a team of four 20 minutes to set up the station.

The U.S. Army and Marines have the **AN/GSC-49** station in the inventory, which provides secure, jam-resistant communications in the centimeter wave band (7.25-8.4 GHz). It is intended for operating in the DSCS satellite communication system. A transport version of the station is accommodated in an S-280 container (2.4x2.4x4.8 m).

The **SCOTT** (Single-Channel Objective Tactical Terminal) mobile terminal station, planned for use at the tactical level from battalion up within the Milstar advanced satellite communication system, is in the development stage. It is planned to produce around 2000 such stations, which provide stable, high-quality communications over one channel in the millimeter wave band. The station is to displace together with forward forces. It is planned to accommodate it on an APC or vehicle used as a mobile command post. It will be possible to provide communications for control of combat operations both while parked and subsequently also in movement. In addition, the station's modular design will permit it to be quickly carried if necessary.

According to foreign press announcements, the station will include a high- voltage power unit, power amplifier, frequency synthesizer and exciter (for pseudorandom retuning), as well as a control panel, display, and small antenna (aperture diameter from 0.35 to 1.7 m). It is planned to use multistation access with frequency division of channels on the "ground-satellite" line and with time division on the "satellite-ground" line with channel switching aboard the satellite in the on-board relay of the Milstar system, which will permit providing communications between any two system subscribers with observance of priority service. In the developers' opinion, signal processing aboard the satellite and the use of pseudorandom retuning of the working frequency will substantially increase the antijam capability of satellite communication lines. Along with the SCOTT station, the United States plans to develop a portable satellite communication station for functioning in the millimeter wave band, which will permit an even greater increase in the number of users, including at the tactical level.

The U.S. Armed Forces presently are using the decimeter wave band in the interests of the majority of mobile satellite communication subscribers, since equipment in this band is sufficiently well assimilated by industry. The latter produces small, inexpensive stations with simple, weakly directional antennas whose requirements for accuracy of being trained on the relay are substantially reduced compared with higher frequency bands, although capacity is limited here (as a rule, communications is accomplished over one channel).

The **AN/MSC-64** satellite communication station created by Magnavox is intended for functioning in the FLTSATCOM system. It can be accommodated in an S-250 container or in three portable packages (45 kg each). The station provides secure telephone and telegraph communications in the decimeter wave band both via FLTSAT, LEASAT and LES as well as within limits of line-of-sight range. There is an antijamming protection mode provided by pseudorandom retuning of the working frequency and a multistation access mode with time division of channels in which it is possible to form up to 13 secure telephone channels for data transmission at a rate of 1.2 kilobits per second or up to seven at 2.4 kilobits per second, which permits serving a large number of subscribers simultaneously. The station is powered from any 28 volt dc source.

The **AN/TSC-102** station (Fig. 1 [figure not reproduced]) is accommodated in a special van with trailer. It can be delivered to the deployment area by air and prepared for operation in 30 minutes. It includes two transceivers (working frequency band 0.24-0.2 GHz), control and monitor units, gear for scrambling digital and telephone communications, and two spiral antennas with disk reflectors 1.2 m in diameter. The station is compatible for operation with the majority of satellite communication equipment in the decimeter wave band. In addition, it can be used to establish line-of-sight communications.

The **AN/USC-39** modular station has been developed for the AFSATCOM system; it is stowed in three portable boxes. Its basic set supports work over one clear telegraph channel at a rate of 75 baud. If necessary, however, a variant of the gear is used for secure telephone communications or data transmission, and for communicating over short distances within line-of-sight. The working frequency band is 0.24-0.4 GHz, there are 32,000 fixed frequencies, and transmitter output is 100 watts. Communications is accomplished via military satellites such as FLTSAT, LES and LEASAT.

Raycal developed the **UK/TSC-502** satellite communication system (Fig. 2 [figure not reproduced]) for the UK Armed Forces; it became operational in the early 1980's. It is part of the ground complex of the Skynet military satellite communication system in the centimeter wave band (7.25-8.4 GHz), in which there are increased demands on accuracy of training the antenna beam on the relay. Security and antijam capability of communications increase in this band compared with the decimeter band due to greater antenna directivity.

According to foreign press announcements, this station was successfully used in combat operations in the Falkland (Malvinas) Islands. It provides telephone and telegraph communications via a geostationary satellite, and with fulfillment of certain conditions it is possible to establish communications with a similar station within limits of line-of-sight range. The modular design of the UK/TSC-502 permits using only the necessary number of units (from three to eight) depending on purpose. The antenna unit consists of a collapsible parabolic reflector 1.7 m in diameter, waveguide feed, rotating mount, and tripod base. A transmission rate of 16 kilobits per second is provided in the telephone mode and 50 baud in the telegraph mode.

The firm of Marconi later developed the mobile MARMOSET (Marconi Mobile Satellite Earth Terminal), designated the **UK/VSC-501**. It is accommodated in the body of a three-quarter ton vehicle. The station's modular design makes it possible to set it up quickly (15 minutes). Equipment redundancy achieves high reliability of operation and minimum repair time. The station provides two channels of secure communications: a telegraph channel with a transmission rate of 50/75 baud and a telephone channel with a rate of 16 kilobits per second, which also is used for high-speed data transmission at a rate of 2.4 kilobits per second. For station operation it is possible to use both its own terminal equipment as well as external terminals. The station switchboard permits connecting external subscribers and the interface unit permits hooking up to civilian communication systems.

The antenna unit includes a parabolic reflector (1.7 m in diameter) with four collapsible panels, and a waveguide feed. A three-quarter ton trailer is attached for transporting spare parts, fuel and the generator.

Subsequently Marconi plans to develop the Martlet station accommodated on a triple-axle trailer. Its forward section will have a Cassegrain antenna; all electronics are in a separate container, which protects the gear from the electromagnetic pulse arising from a nuclear burst. The station is intended for communicating via satellite relays. Scrambling of telephone conversations and data transmission is envisaged, as well as a special unit for pseudorandom retuning of the working frequency for increasing antijam capability. The antenna can be placed in a working condition in 15 minutes.

A mobile station functioning in the centimeter wave band has been created for the French Armed Forces (Fig. 3 [figure not reproduced]). It is designed to operate in the Syracuse satellite communication system via the Telecom-1 satellite on-board relay. It includes a reflector antenna 1.3 m in diameter with offset feed. The traveling wave tube amplifier provides a transmitter power output of 150 watts. Data is processed in the vocoder telephony (2.4 kilobits per second), printer (75 baud) and data transmission (16 kilobits per second) modes. A team of three fully sets up the station in one hour.

The **Compack** small portable satellite communication station (Fig. 4 [figure not reproduced]) was developed in Great Britain by Marconi at the very end of the 1970's. It was intended for establishing reliable jamproof communications in the 7.25-8.4 GHz band. The station (weighing 50 kg) can be transported on any vehicle or carried in dismantled form in three parts. The gear is fully self-contained and can be placed in a working condition in ten minutes. The Cassegrain reflector antenna (1.2 m in diameter) is broken down into six parts for transporting. The secondary reflector is attached by six plastic rods. The antenna mount is a light folding tripod. Manual drives provide antenna orientation of 360° in azimuth and in a sector of 180° in elevation. The low-noise parametric amplifier unit is in a watertight case behind the reflector next to the rotating mount, and the transmitter unit with powerful amplifier is located right on the rotating mount. An automatic power adjustment circuit maintains a constant power output level for the entire period of service of the storage batteries. The station can operate both in simplex and duplex modes, providing one telegraph channel.

The most compact British satellite communication station operating in the centimeter band is the **UK/PSC-505** (Fig. 5 [figure not reproduced]), created by Ferranti Electronics in the mid-1980's. It is designed to be carried by one operator (it weighs 16 kg without batteries). For convenience, all equipment is installed on a frame in a pack. The station can be set up from a traveling position in two minutes. Because of a relatively broad antenna radiation pattern, the beam is trained on a geostationary satellite using a built-in compass, tilt-angle meter, and signal level indicator. The station supports a data transmission mode in the telegraph channel at a rate of 50 baud or transmission of telephone information at a rate of 2.4 kilobits per second. The frequency spectrum increment is 10 kHz. A parabolic reflector 46 cm in diameter is used as an antenna. A stepped adjustment of the power output level is possible within the limits from 0.7 to 2.5 watts. Station equipment also includes a DDT-1 manual data terminal (weight 0.55 kg, size 190x95x30 mm) with a 16-place liquid-crystal indicator, and a miniature printer.

According to foreign press announcements, by the early 1990's it is planned to complete the manufacture and tests of an American pack satellite communication station in the centimeter wave band intended for outfitting landing teams.

The development of portable satellite communication stations in the decimeter band began in the United States in the late 1970's. As a result, Motorola manufactured stations in the **AN/URC-101, -104, -110 and -112** series, which were delivered to the Army and are used for satellite communications in the decimeter band and for line-of-sight communications both in this band and in the metric wave band. The stations can be accommodated on vehicles, in aircraft and aboard ships or carried by an operator. The basic equipment includes a dual-range transmitter, antennas for the decimeter and metric bands, data transmission gear, a remote control panel and storage batteries. The equipment mix can be changed depending on conditions for use.

The **AN/URC-101** station (Fig. 6 [figure not reproduced]) is the base model in this series. Transmitter power output in the decimeter wave band can be adjusted from 5 to 20 watts. A folding cruciform design (two dipole pairs) with DM120 subdish is used as the antenna, and a whip design is used when operating on metric waves. It takes no more than five minutes to prepare the station for operation. A working frequency can be selected from eight that have been prepared in advance and written in memory. The station provides reception and transmission of telephone information as well as telegraph signals (at a rate of 250 baud) both in simplex and half-duplex mode. The number of working frequencies is 8,360 with a 25 kHz interval. In the radio beacon mode (for position finding or in an emergency) the station continuously emits a signal modulated by a low-frequency component with variable frequency from 0.3 to 2.5 kHz. The station can be powered from any 28 volt dc source. The transceiver weighs a little over 7 kg without storage batteries.

The **AN/URC-104** station (Fig. 7 [figure not reproduced]) differs from the base model by a metric working frequency band, which permits interfacing with a larger number of radios (such as the AN/PRC-77) used widely at the tactical level in the U.S. Army. In addition, it has a somewhat larger number of working frequencies.

The **AN/URC-110** station is intended only for transmitting data in the very same frequency bands as the base station. Because of a reduction in the frequency band occupied by one channel, the interval between working frequencies was reduced to 5 kHz, which permitted increasing their number to 41,800.

The **AN/URC-112** station differs from the basic design by a certain change in bands and by the interval between working frequencies, the overall number of which is 12,440.

In approximately these same years the American firm of Cincinnati developed the **AN/PSC-1** station using only the decimeter band for operation. A modified version, the AN/PSC-3 (Fig. 8 [figure not reproduced]), and the AN/VSC-7 in the transportable design presently are being produced. Stations of this series provide satellite communications or line-of-sight communications with ground and airborne (aircraft and helicopter) radios in transmission modes both of telegraph signals at a rate of 300 baud and of telephone signals at a rate of 16 kilobits per second. These signals are processed using a special microprocessor unit (weighing 1 kg), which provides a high-speed mode which hampers the enemy in accomplishing radio intercept and jamming. Transmitter power output for communications via satellite is 35 watts, and for line-of-sight communications it is 2 watts.

A spiral antenna with grid reflector (6 db gain) is used for communications via relay satellites. It can be set up on a light tripod, which permits orienting it in the necessary direction in two minutes. Using a whip antenna (28 cm long), the stations are compatible with radios of this same frequency band, supporting communications with them within limits of line-of-sight range. Any 28 volt dc source can be used for station power.

The American **HST-4A** (Fig. 9 [figure not reproduced]) and **LST- 5B** (Fig. 10 [figure not reproduced]) models appeared as a result of subsequent development of stations in this band. They were created by the firms of Cincinnati and Magnavox respectively. Their volume and weight are approximately half that of the AN/PSC-3. These stations are used for communications via satellite or in line-of-sight range. A choice is possible in the HST-4A station for work on one of four pretuned frequencies, and in the LST-5B on one of nine reserve frequencies. In addition, the power output level is somewhat lower in the first set. Both sets operate either in the 5 kHz band for data transmission at a rate of 1.2 kilobits per second or in a broader band (25 kHz) for transmitting AM or FM telephone signals. All work modes, bands and prepared frequencies are chosen using four buttons. The liquid-crystal display is illuminated at night. Folding designs having weakly directional radiation characteristics are used as antennas. According to the contract concluded by the Pentagon with the above firms, the latter are to supply 188 HST-4A and 194 LST-5B sets.

The western press reports that the United States is developing portable subscriber sets functioning in a multistation access mode with allocation of relay channels at the subscriber's request. In the opinion of American specialists, with the continuing increase in the number of small sets, realization of this principle permits achieving more effective use of a decimeter wave band relay capacity and increasing flexibility and reliability of the satellite communication system as a whole compared with systems using the principle of assigning a radio channel to each station.

An example of such a set is the model designated the **MX-800S**, all equipment of which is contained in a single unit. It includes keyboard, display, printer, microprocessor, transceiver and modem. The station supports transmission of clear and scrambled data both via communication satellite and within line-of-sight range on decimeter band frequencies. Simultaneous display of data with a volume of eight lines (32 characters each) is accomplished on the display (based on a plasma panel). A message (5,000 characters) which has been first composed and edited using a cursor is written in memory, after which it can be transmitted to a subscriber. The transmitter emits 30 watts of power. The set is housed in a small container and is easily carried by one person.

Another set of this type developed by Motorola uses coplanar MOS-transistors and several microprocessors, which along with providing multistation access on request permitted reducing the set's energy consumption to 6 watts from a standard lithium battery. The set occupies a volume of only 2,460 cm^3.

The most compact satellite communication set in the decimeter band was developed in Great Britain. This set was designated the **MIL/UST-1** and underwent troop testing in 1985. The set is intended only for transmission and reception of data at a rate of 50 baud. Its equipment includes a terminal with liquid-crystal display and miniature printer. Since the frequency bandwidth set aside for the channel is only 1 kHz, this substantially increases the effectiveness of using a relay, with an appropriate increase in the number of simultaneously operating subscribers. Transmitter power output is 2 watts and it weighs 1.26 kg (less batteries). A spiral design with grid reflector (weighing 2.2 kg) is used as an antenna. The power source is a lithium battery.

In the opinion of foreign specialists, there will be a further introduction of small mobile and portable satellite communication sets in subsequent years for use both at the tactical level and for communications with separate subunits operating in isolation from the main body. Along with development of gear in the millimeter wave band and new principles of building systems and introducing original technical solutions, there will be continued modernization of existing systems and communication equipment in the decimeter and centimeter wave bands to increase their capacity, antijam capability and mobility based on further development of advanced technology and a new component base, including microprocessor engineering and modules with large- scale integration.

Greek Air Force

18010679f Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 33- 39

[Article by Col V. Kondratyev]

[Text] Greece, which occupies an important strategic position in the Southern European sector, is considered by the NATO military-political leadership as one of the main bases of operation for organizing military control over the Balkan Peninsula, the Eastern Mediterranean and the Near East. Based on this, the NATO Allied Forces command places great emphasis on developing the country's infrastructure and building up the combat power of its Armed Forces, including the Air Force, which is part of the 6th Allied Tactical Air Force [ATAF] of NATO Allied Air Forces in this theater.

The Greek Air Force was established in 1931 as an independent branch of the Armed Forces by consolidating Army and Navy air units and subunits. Its rapid development began after the country joined NATO in 1952 and, judging from foreign press materials, it presently numbers around 600 aircraft and helicopters (including over 300 combat aircraft and helicopters). The personnel strength is almost 35,000 persons, of whom 5,500 are officers. In addition, there are some 20,000 trained reservists of various specialties such as experienced pilots and other flight crew members.

In accordance with views of the Greek Armed Forces command and basic provisions adopted in NATO on combat employment of tactical aviation, the Greek Air Force is assigned the following missions: winning and holding air supremacy (in the area of responsibility); air support of ground and naval forces; covering important administrative-industrial centers and Army and Navy force groupings against enemy air strikes; and airlifting personnel, combat equipment and supplies in the interests of units and subunits of all branches of the Greek Armed Forces and of its NATO bloc allies.

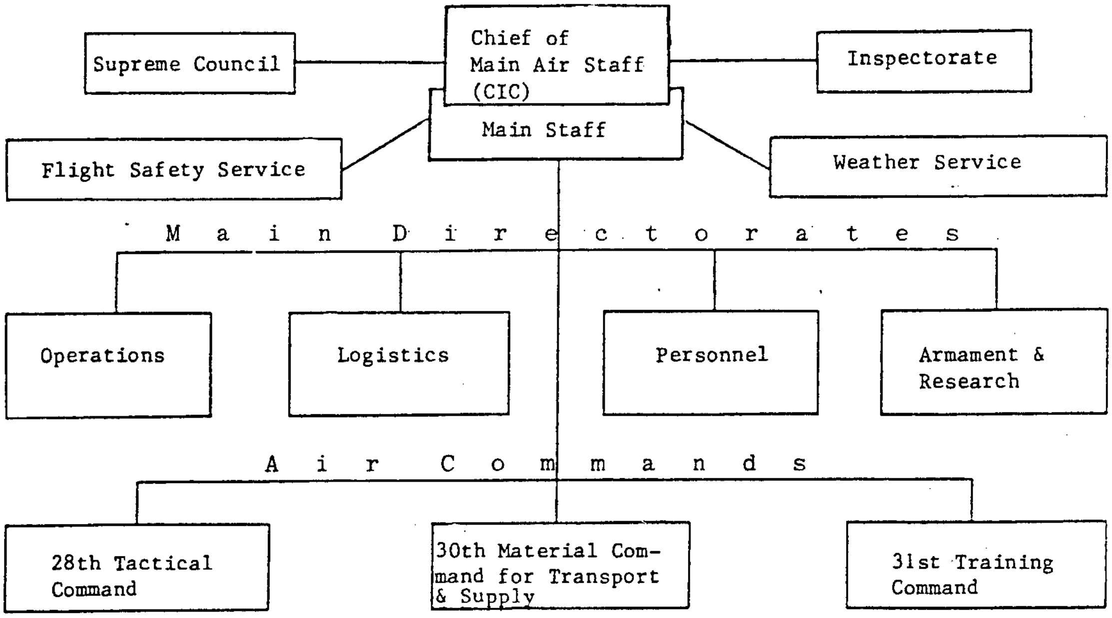
The organization, composition, basing, air defense system, combat training and prospects for development of the Greek Air Force are given below based on western press reports.

Organization and effective combat strength. Leadership of the Greek Air Force is exercised by the chief of the Main Air Staff (under the Greek constitution he is simultaneously commander in chief of the Air Force), who is subordinate to the Ministry of National Defense in administrative matters and to the chief of the Armed Forces General Staff on operational matters. He is personally responsible for constant combat readiness of the Air Force; organizes its operational and combat training and the selection, training and assignment of personnel; and directs activities of central entities and services.

The chief of the Main Air Staff has a consultative entity, a special council consisting of high-ranking officers of the Greek Air Force in the rank of at least major general. In addition, an inspector (inspectorate), flight safety service and weather support service as well as other Air Force organizations and establishments of central subordination are subordinate to him.

The Main Air Staff is the entity for operational control of the Greek Air Force. It handles the following basic matters: drawing up plans for combat employment of forces and assets included in the Air Force; determining

Fig. 1. Greek Air Force organization



the organization and establishment of large and small units and subunits and their combat training plans; directing forces and assets of Air Force intelligence; providing logistic support, including deliveries of new aviation equipment and weapons; organizing research and development; selecting and training personnel, and so on. The Main Air Staff consists of four main directorates: operations (previously called operations and intelligence); logistics; personnel; and armament and research.

Organizationally the Greek Air Force consists of combat and support units and subunits consolidated in three commands: 28th Tactical Air Command [TAC], 30th Air Material Command for Transport and Supply, and 31st Air Training Command (Fig. 1).

The *28th TAC* (headquarters at Larissa Air Base) is the strike nucleus of the Greek Air Force, capable of accomplishing combat missions both independently and in coordination with other branches of the Armed Forces.

The 28th TAC has seven air wings: four fighter-bomber (110th, 115th, 116th and 117th), two fighter (111th and 114th), and one training (113th). In addition, it has a Nike-Hercules surface-to-air missile [SAM] battalion (350th SAM Battalion), the 142d Control and Warning Wing, as well as the 353d Patrol Squadron, which operates in the interests of the Greek Navy.

The air wing is the basic tactical unit. It includes 2-3 air squadrons and ground subunits necessary for supporting their combat operations. The air wing commander is responsible for its combat readiness and logistic support as well as for the discipline and morale of subordinate personnel.

The air squadron is the basic tactical subunit. Its peacetime TOE calls for 18 aircraft, but their actual number varies depending on the availability of combat-ready aircraft.

The TAC has a total of 19 air squadrons: nine attack (fighter-bomber) squadrons with 54 F-4E Phantom II tactical fighters, 54 A-7H Corsair II attack aircraft (including six two-seater TA-7H trainer aircraft, Fig. 2 [figure not reproduced]) and 54 F-104G Starfighter fighter-bombers in the order of battle; six fighter (air defense) squadrons with 33 Mirage F.1 and over 80 F-5A's (including several RF-5A's, which are the two-seater reconnaissance version of the F-5A); two reconnaissance squadrons with 12 RF-4E Phantom II's and 12 RF- 104 Starfighters; one training squadron with 20 T-33's; and one land-based patrol squadron with 12 HU-16B Albatross (operationally subordinate to the Greek Navy).

The 350th Nike-Hercules SAM Battalion consists of four batteries with nine launchers each. It is deployed on the Attica Peninsula and is intended chiefly for covering Greece's capital of Athens.

The 142d Control and Warning Wing (headquarters at Larissa Air Base) handles the outfitting, maintenance and preparation of equipment and personnel for ensuring the functioning of Air Force and air defense control entities.

The *30th Air Material Command for Transport and Supply* (headquarters in Athens) handles troop and cargo airlifts in the interests of all branches of the Armed Forces, logistic support of staffs, large and small Air Force units and subunits, as well as repair and servicing of aviation equipment. Its staff determines requirements; places orders and accepts aviation equipment, weapons, property and other materiel from industry; and organizes their accounting, storage and distribution in accordance with directions of the Main Air Staff.

To accomplish these tasks the command has the 112th Military-Transport Air Wing (three squadrons with 12 C-130H, 16 C-47, 15 Noratlas, 14 CL-215, and 6 VS-11A aircraft) and four helicopter subunits (over 70 Bell 47G, CH-47, AB- 205, AB-206 and AB-212 helicopters), as well establishments, units and subunits directly involved in storing, distributing, repairing and servicing all kinds of equipment, weapons and property and supporting the activities of airfields and so on (depots, repair plants, workshops, and maintenance and motor transport subunits).

The 31st *Air Training Command* trains personnel for the Greek Air Force. The Air Force Academy (Ikaron Higher Air School), two air training wings (120th and 121st) and one combat training wing (113th) are subordinate to it. The 113th is operationally subordinate to the commander of the 28th TAC, and its 343d Squadron is part of the active air defense forces. These air wings have over 100 T-2E, T-37, T-41 and T-33A trainer aircraft as well as 23 F-5A fighters (Fig. 3 [figure not reproduced]).

The Ikaron School flight department graduates up to 150 pilots each year. Their length of training is four years. Cadet basic flight training is accomplished in T-41 trainers at Dhekelia Airfield (trainees average 60 flying hours), primary training is at Kalamata Air Base (T-37's, T-2's, 80 hours), and advanced training is at Sedhes Air Base (T-33A's and F-5A's from the 113th Combat Training Wing, 90 hours).

In the opinion of Greek military specialists, by the end of training a cadet reaches the level of a pilot trained for conducting combat operations in the daytime under simple weather conditions both independently and as part of a pair. School graduates improve themselves in units and subunits of TAC and the 30th Air Material Command for Transport and Supply.

Basing. A broad network of airfields and landing strips has been created for accommodating Air Force units and subunits on Greek territory. Most of them conform to requirements adopted in NATO and are outfitted with modern equipment supporting aircraft flights day and night in adverse weather conditions. Arched shelters for aircraft and depots for storing ammunition, fuel and lubricants, and other supplies have been built at many airfields. The primary airfields are Larissa, Nea Ankhialos, Tanagra, Araxos, Andravidha, Souda (Crete), Eleusis, Mikra and Sedhes. In addition, the country has a number of airfields such as Preveza, Agrinion, Castellion, Heraklion and others which are civilian in peacetime, but military aviation can be dispersed to them if necessary.

The Greek Air Force order of battle and permanent stations of units and subunits are given in the table.

Greek Air Force Order of Battle[1]

Air Wings (Units)	Squadrons (Subunits)	Aircraft (Helicopters) Number	Type	Permanent Station (Air Base)
		28th Tactical Air Command		
110th Fighter-Bomber Wing	337th Fighter-Bomber Squadron	18	F-4E Phantom II	Larissa
	347th Fighter-Bomber Squadron	16	A-7H Corsair II[2]	
	348th Reconnaissance Squadron	12	RF-4E Phantom II	
	344th Reconnaissance Squadron	12	RF-104	
111th Fighter Wing	341st Fighter Squadron	20	F-5A & B	Nea Ankhialos
	349th Fighter Squadron	20	F-5A & B	
	351st Fighter Squadron	20	F-5A & B	
114th Fighter Wing	334th Fighter Squadron	15	Mirage F.1	Tanagra
	342d Fighter Squadron	18	Mirage F.1	
115th Fighter-Bomber Wing	340th Fighter-Bomber Squadron	16	A-7H Corsair II	Souda (Crete)
	345th Fighter-Bomber Squadron	16	A-7H Corsair II	
116th Fighter-Bomber Wing	335th Fighter-Bomber Squadron	18	F- 104G	Araxos

	336th Fighter-Bomber Squadron	18	F-104G	
	. Fighter-Bomber Squadron	18	F-104G	
117th Fighter-Bomber Wing	338th Fighter-Bomber Squadron	18	F-4E Phantom II	Andravidha
	339th Fighter-Bomber Squadron	16	F-4E Phantom II	
113th Combat Training Wing[3]	343d Fighter Squadron	23	F-5A	Mikra
	. Combat Training Squadron	20	T-33A	Sedhes
350th SAM Battalion	4 batteries	36 launchers	Nike- Hercules	Attica Peninsula
Separate squadron	353d Land-Based Patrol Squadron	12	HU-16B Albatross	Eleusis
142d Control and Warning Wing	-	-	-	Larissa
30th Air Material Command for Transport and Supply				
112th Air Transport Wing	354th Transport Squadron	15	Noratlas	Eleusis
	355th Transport Squadron	22	14 CL-215, 6 YS-11A	
	356th Transport Squadron	12	C-130H	
	. Transport Squadron	16	C-47	
Separate squadrons	357th Squadron[4]	15	7 CH-47, 8 UH- 19D	Eleusis
	358th Squadron[4]	7	Bell 47G & AB-212	
	359th Squadron[5]	13	AB-205 & AB-206	
31st Air Training Command				
120th Air Training Wing	361st Training Squadron	25	T-37B & C	Kalamata
	362d Training Squadron	18	T-2E	
	363d Training Squadron	18	T-2E	
121st Air Training Wing	360th Training Squadron	20	T- 41	Dhekelia

1. In addition to those listed in the table, the Greek Air Force has some 60 auxiliary and trainer aircraft (C-47, Do-28 and T-33A) included in separate subunits and air wing headquarters flights.
2. In addition, the Air Force has five TA-7H combat trainer aircraft.
3. Administratively subordinate to the 31st Air Training Command, but operationally subordinate to the 28th TAC.
4. Squadrons of general-purpose helicopters.
5. Search and rescue helicopter squadron.

Greek Air Force aircraft have two kinds of nationality marks (identifying markings): a circle formed by three concentric rings of blue, white and blue (applied to the lower and upper outboard wing panels and on both sides of the fuselage), and a rectangle formed from three vertical bands of blue, white and blue (on both sides of the tail fin, see Figs. 1, 2 and 3 [figures not reproduced]).

Counting separate subunits of central subordination and the reserve, the Air Force has a total of 340 tactical fighters (including reconnaissance aircraft), up to 60 military transport aircraft, around 150 trainers and combat trainers, and more than 50 helicopters.

The **Greek air defense system** is included in the NATO allied air defense system in Europe (the Greek sector of the 6th ATAF air defense area). Overall direction of national air defense is the responsibility of the chief of the Main Air Staff and immediate direction is the responsibility of the 28th TAC commander. He has six fighter squadrons and one Nike-Hercules SAM battalion at his disposal. In addition, two Improved Hawk SAM battalions, Skyguard air defense system subunits and Artemis-30 AAA subunits are operationally subordinate to him (organizationally all of them are part of the Army).

Command and control of air defense forces and assets is exercised from the sector operations center at Larissa Air

Base via a far-flung network of subordinate entities such as control and warning centers and posts and early warning, surveillance and notification posts. The latter are on large islands in the Aegean Sea and, in the opinion of Greek military experts, considerably expand the entire system's capabilities for timely detection of airborne targets.

All primary control and warning centers and posts are outfitted with appropriate equipment and gear, including radars, a multichannel communication system, computers and modern data display devices. The majority of them are connected to the NADGE automated system for controlling forces and assets of the NATO allied air defense system.

Judging from foreign press reports, the Greek air defense system is kept in a high state of combat readiness. Even in peacetime some of its forces and assets are on constant alert duty. As a rule, two fighter-interceptors from each air defense squadron and one SAM battery from each battalion are assigned to the alert forces.

Air Force **combat training** is organized in the process of day-to-day training and its quality is monitored by inspections and in the course of exercises. It is aimed at keeping units and subunits in constant combat readiness; upgrading the training of flight personnel, ground maintenance personnel, staffs and other control entities; and preparing them to conduct combat operations in a varying tactical situation employing conventional weapons as well as chemical and nuclear weapons.

Its basic form consists of exercises of a varying scale conducted under plans of the Greek Armed Forces command authority as well as inspections of combat readiness and practical crew training to improve their flying expertise.

A significant place in the course of combat training is set aside for practicing air defense missions, especially engaging low-flying targets and practicing the coordination of air defense forces and assets which are part of the Air Force, Army and Navy. Much emphasis is placed on improving the personnel's proficiency in repelling massive enemy air raids with the enemy using EW assets. These problems are practiced in such type exercises as Kivotos, Epagrisnisi and so on.

Foreign military specialists note that the accident level in the Greek Air Force is the lowest compared with air forces of other countries. This is explained by the fact that the Greek Air Force command authority places great emphasis on ensuring accidentfree flight operations. This is achieved by thorough preparation of flight personnel and ground maintenance personnel. Concerning the problem of accidentfree flight operations, Greek Air Force Commander in Chief Lt Gen N. Stapas notes that fulfillment of this task as well as an improvement in combat readiness of Air Force units and subunits depend to a considerable extent on the personnel's training level. Therefore aviation specialist training programs are constantly upgraded and in his opinion conform to modern demands. In addition, all air mishaps and preconditions for them are thoroughly analyzed. Appropriate conclusions are drawn and preventive measures taken based on results of the analysis.

On the whole, foreign specialists believe that Greek Air Force combat training ensures keeping its units and subunits in a high state of combat readiness and at a level quite sufficient for performing assigned missions.

As reported in the journal NATO'S SIXTEEN NATIONS, **development of the Greek Air Force** is accomplished in accordance with current and future plans drawn up by Greek military experts and follows four basic directions: modernizing the command and control system, upgrading and replacing the aircraft pool, improving the personnel training system, and strengthening rear entities and air defense.

The western press notes that the question of *modernizing the command and control system* is not raised by chance in Air Force development plans, but is based on the fact that without a reliable command and control system under present-day conditions it is impossible to use available forces and assets effectively. To accomplish this the Greek Air Force takes steps to outfit command and control entities with the most modern communications and data collection, processing and display equipment. Their organizational structure is upgraded at the same time. Concerning the latter, the foreign press reported that the Greek Air Force has begun creating a unified entity consolidating the functions of staffs of the Air Material Command for Transport and Supply and the Air Training Command.

In the opinion of foreign military experts, *upgrading and replacing the aircraft pool* in the Greek Air Force is necessitated by the fact that the inventory of its air units and subunits includes a considerable number of obsolete aircraft and aircraft which are using up their service life such as the C-47, F-5A and so on. This is being done in two ways: deliveries of aircraft being removed from the inventory of air forces of some NATO countries, and purchases of new aviation equipment.

In considering Greece's important strategic position and attempting to reinforce its southern flank, the NATO bloc military leadership continues to supply aircraft to Greece from the air forces of other member countries within the framework of so-called free assistance. For example, a decision was made in the spring of 1988 to transfer to the Greek Air Force 69 F-4 Phantom II tactical fighters (of which 19 were F-4G Wild Weasel) from the U.S. Air Force, 28 F-104G fighter-bombers from the FRG Air Force and 10 F-5 aircraft previously in the inventory of the Dutch Air Force. All will undergo major overhaul and modernization in accordance with present-day demands.

In addition, believing that this help alone is insufficient, the Greek military leadership decided to purchase 40

French Mirage-2000 fighter- interceptors and 40 American F-16 Fighting Falcon tactical fighters (Fig. 4 [figure not reproduced]). Deliveries of the former began in early 1988 and of the latter in late 1988. In the future it is planned to purchase another 20 such aircraft (the question of whether it will be the Mirage-2000 or the F-16 has not yet been decided).

Judging from foreign press announcements, the Greek Air Force command intends to purchase new military transport and trainer aircraft.

Improving the personnel training system. As attested by the western military press, the Greek Air Force is placing much emphasis on training officers for staffs of different levels and for regular units. To this end existing training programs are being revised, special retraining courses are being organized, and new training and practice methods are being introduced. Substantial changes recently were made to the system for selecting officer candidates and to their training program. Such measures also are being taken in the system for training rank-and-file and NCO personnel.

Strengthening rear entities and air defense is being accomplished in accordance with general directions of Air Force development.

Based on this plans have been developed for modernizing rear entities by outfitting them with new aviation equipment maintenance and repair resources; a system of supply accounting, storage and distribution is being set up (based on computers); and the outfitting of the Air Research and New Technologies Center is being improved. Special attention is being given to improving the effectiveness of the Greek air defense system, chiefly by fully deploying an automated system for controlling its forces and assets.

In the opinion of foreign specialists, these and a number of other measures will permit the Greek Air Force command to considerably improve its combat capabilities and combat readiness.

U.S. Aircraft Development Under the Stealth Program

18010679g Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 40- 44

[Article by Col V. Kirsanov]

[Text] Among programs for creating the newest weapons which had priority in the years the Reagan administration was in power, one of the central places was held by developments conducted in deep secrecy on designs of so-called "invisible" aircraft, whose appearance, in the minds of American military experts, should lead to a radical change in forms and methods of warfare.

Despite the veil of secrecy which even now surrounds all work being done by certain U.S. aerospace firms within the scope of such programs financed by the Pentagon, western mass media are publishing various articles devoted to creation of "invisible" aircraft, referring to assessments by prominent military and civilian specialists. Based on articles on this problem published in the foreign press in recent years, this article examines the present status in the sphere of creating "invisible" aircraft as well as the views of foreign specialists on design features of such aircraft and the specifics of tactical employment dictated by them.

The western press customarily consolidates the set of various technical measures being taken to make an aircraft "invisible" or, more correctly, to reduce its detectability, under the term of stealth technology,[1] and aircraft being developed using this technology as stealth aircraft. The history of attempts to create such aircraft, according to the journal AIR INTERNATIONAL, covers more than just a single decade. In the past, however, the campaign against revealing signs always was waged only in individual directions and never was carried on across the entire front at once. For example, camouflage paint was used back during World War I, when German aircraft were coated with a special dark blue or violet paint hampering their detection by optical equipment against the background of a night sky.

In the mid-1930's British scientist R. W. Watt stated that in creating bombers in the future special measures would be taken without fail to reduce the reflectivity of their skin and structural elements. It is common knowledge that an aircraft's reflectivity is customarily expressed by the radar cross- section value, which characterizes the capability of an aircraft or missile to reflect electromagnetic pulses emitted by enemy ground or airborne radars. At that time this idea did not see proper development and bombers of the World War II period and of the first postwar years were built without considering their radar cross-section value.

But even with the development of the B-52 bomber in the United States (late 1940's and early 1950's), the striving to reduce radar cross-section had some effect on its design, albeit not a very appreciable one. With respect to the present-day status, however, the striving to reduce the radar cross-section value to the maximum extent is the basis of a set of measures considered without fail in the design and construction of any new aircraft, judging from foreign press reports. It is assumed that the most important characteristic of a military aircraft is its low detectability in the visible optical and infrared bands as well as in the radio-frequency band of electromagnetic emission. This assumes special significance for those aircraft intended for conducting combat operations involving a penetration of the enemy air defense system.

A reduction in radar cross-section is considered to be the most important direction ensuring reduced detectability of aircraft inasmuch as radars presently are the primary means of detection being used in air defense systems. A reduction in radar cross-section depends to a significant extent on the choice of aircraft configuration and its design features. Abrupt breaks and bends in the transition of one surface to another are excellent sources of reflected signals. First stages of compressors and fans of turbofan engines also are good "reflectors."

In the opinion of foreign aviation specialists, radar cross-section can be reduced by accommodating engines within aircraft structural elements, by a smooth interface of wing and fuselage, and by maximum possible reduction in aircraft cross-section area. Inasmuch as specific volumes are required for built-in engines, for their intakes and exhaust units, and for internal suspension of weapons, the Stealth aircraft configuration must allow allocating additional inner spaces on a larger scale than for an aircraft of equal size built according to a conventional configuration. This factor as well as the desire to eliminate the vertical tailplane prompted designers to choose a "flying wing" scheme as the most likely configuration variant, since this provides not only an ideal interface of wing and fuselage, but also maximum size of useful internal volume. In addition, such a configuration permits reducing the size of the vertical tailplane or even to reject its use entirely, although in this case the use of an automated electro-remote flight control system becomes an unconditional requirement.

Reducing the effect of engines on the overall radar cross-section value is considered very difficult. The classic design of air intakes has an overall negative effect on radar cross-section value inasmuch as this does not preclude "direct access" of radar signals to the compressor first stage, which essentially represents a large rotating metal disk. To eliminate that phenomenon it is deemed advisable to use curved air ducts, within which baffles and deflectors made of radar-absorbing materials are installed.

Conventional flat air intakes made flush with the wing or fuselage skin cannot be used on a supersonic aircraft. On the other hand, vertical wedge-shaped air intakes, which are distinguished by their relative design and technological simplicity, also are considered unsuitable for Stealth aircraft because of their inherent high radar cross-section value. Therefore in the majority of cases preference goes to air intakes with a central semiconical body which are not only sufficiently simple and effective, but also permit keeping a considerable amount of electromagnetic energy out of the compressor first stage.

Accommodating any kinds of weapons on external suspension points also comes into contradiction with the demands of reducing aircraft detectability. The sole exception to this rule is the so-called "conformal" weapon suspension flush with the fuselage surface, where the missile or aerial bomb is semiburied in a recess specially made in the skin and protrudes slightly outside its limits. But that weapon suspension variant is applicable perhaps only for a fighter, inasmuch as it gives the fighter sufficient flexibility of employment under combat conditions, while for bombers the only acceptable solution remains suspending weapons in closed bays within the fuselage.

The next direction in effectiveness of reducing radar cross-section is considered to be the use of composite materials and special radar-absorbing coatings. Even today carbon-containing composite materials are being used rather widely in aircraft construction and western specialists believe their significance will become even more appreciable in the not-too-distant future. Along with composite materials for reducing radar cross-section, it is deemed advisable to use special coatings capable of "weakening" or "eroding" the electromagnetic energy of radar signals. An existing coating of this sort is used in particular on American SR-70 strategic reconnaissance aircraft and promotes a considerable attenuation of the reflected electromagnetic signal.

An aircraft's thermal emission also is a very important factor for which special steps are taken to reduce its effect. Like radars, infrared detection equipment is capable of reliably tracking the enemy from the thermal signature long before he enters the optical surveillance zone. Specialists distinguish three components of the aircraft thermal signature: heat of operating engines; hot gases of the jet stream and thermal emission of on-board machine units and instruments; and the airframe's aerodynamic heating. Various shields, heat- insulating materials, removal of hot gases to the outer part of the fuselage (or wing) for mixing with surrounding air, and two-dimensional propulsive nozzles are used to reduce these factors.

All these innovations of a design and technological nature are being used in the United States to one extent or another in developing new contemporary combat aircraft.

American specialists believe that the early 1970's, when the U.S. Defense Department approved the Have Blue research program, are the actual reference point for the beginning of work to create initially a Stealth fighter and then a Stealth bomber. In late 1973 the Air Force command announced its readiness to examine specific proposals of industrial firms intending to begin creating demonstration models of aircraft built using Stealth technology. The conditions it advanced at that time envisaged that the new aircraft, given the preliminary designation XST (Experimental Stealth Tactical), should meet the following requirements: have a low radar cross-section and be distinguished by lowered engine noise and low exhaust gas temperature. It was also required that the aircraft's aerodynamic configuration not only hamper its detection even at short ranges, but also permit creating sufficient internal volumes for accommodating highly effective EW gear.

After examining proposals received from the firms, the U.S. Air Force command rested its choice on the Lockheed design and signed a contract with Lockheed for building five experimental models of the XST aircraft.

The first demonstration flight of one of the aircraft that was built took place in November 1977 under conditions of heightened secrecy at Tonopah Airfield, part of an installation complex at Nellis Air Force Base, Nevada. Judging from foreign press reports, the XST is about 11 m long and has a wingspan of 5.5 m. It somewhat resembles the American Shuttle spacecraft in planform. Air intakes of the engines (General Electric J85) are situated side by side on the upper wing surface, and two small keels are placed so as to provide additional shielding of the jet stream. The most typical external feature of the design is the rounded nature of shapes and smoothness of transition of one surface to another, which achieves an appreciable reduction in magnitude of the reflected radar signal.

Convinced of the technical substantiation and feasibility of its concepts during flight testing of the experimental XST aircraft, Lockheed signed a contract with the U.S. Air Force in mid-1981 for preparing and organizing series production of a Stealth fighter designated the F-19A.[2]

The first flight of the new aircraft took place in 1982 at Tonopah Airfield, where it was delivered in disassembled form aboard a C-5A military transport aircraft. The F-19A fighter is 16.76 m long, has a wingspan of 10.67 m, and has a maximum take-off weight of 13,600 kg. It is equipped with two modernized F404 5,670 kg(f) nonafterburning turbofan engines, which gives it a speed of Mach 2. Cooling baffles and deflectors are installed in the engine compartment, and slit openings are made around the circumference of the exhaust nozzle parallel to the engine's central axis. The engine housing has a two-layer design; the space between layers is filled with small pyramidal bodies with a base side of 12.7 mm and with apices facing the engine axis, which contributes to a substantial reduction in engine noise.

Among specific features of this aircraft, the foreign press notes the use in its design of a composite fiberloy material developed by the American firm of Dow Chemical. This material, which consists of boron fibers and a plastic base, is used for fabricating skin panels, spars and frames. No more than five percent of aircraft design components are made of metal.

In the opinion of the journal POPULAR SCIENCE, F-19A fighters have been part of the U.S. Air Force order of battle for several years now. According to data of the bulletin DEFENSE DAILY, Air Force units already have 51 aircraft of this type (their production and purchase cost American taxpayers eight billion dollars). Despite the veil of secrecy which continues to surround them, some reports directly confirming the very fact of the existence of these aircraft periodically appear in American mass media. For example, in the fall of 1987 CBS television, and right after it other media, disseminated a report about a fighter built using Stealth technology which crashed 160 km northwest of Las Vegas, Nevada. Official Pentagon representatives categorically refused to announce the type of aircraft that had crashed, but according to the television company, "reliable Pentagon sources confirmed that this was one of ten Stealth fighters deployed at this air base."

The small city of Palmdale is located approximately an hour's drive north of Los Angeles. Its very existence depends almost wholly on the functioning of aerospace industry enterprises situated there. It was here in 1985 that construction began on new production wings in which Northrop intends to begin series production of B-2 bombers.

The Air Force command intends to build 132 B-2 bombers, 120 of which will be in the order of battle, ten in the active reserve and two aircraft will be used for conducting flight tests.

In developing the B-2 bomber under conditions of strict secrecy, the U.S. Air Force command nevertheless announced in advance that the first flight of a prototype was planned for December 1987. In the course of the work, however, the firm encountered a large number of serious difficulties of a technical nature, as a result of which the B-2 test flight was postponed initially to May, then to August 1988 and finally to the beginning of 1989 in general. The official ceremony of presenting the new aircraft to specialists and representatives of the press at the Palmdale plant was held in November 1988. On completion of a thorough check of all on-board systems the aircraft prototype will fly from the plant airfield to Edwards Air Force Base, California, where the U.S. Air Force Flight Test Center is located, and it is planned to hold comprehensive tests of the new strategic bomber calculated for several years.

The B-2 bomber is designed according to a "flying wing" configuration without vertical control surfaces (see figure [figure not reproduced]). Its outlines resemble a boomerang with a flat leading edge, a sweep of around 35° and a saw-tooth trailing edge. Aircraft control on three axes will be accomplished using several aerodynamic surfaces located on the wing's trailing edge. The leading and trailing edges of the wing, coated with a multilayered radar- absorbing material, have a honeycomb construction. Each cell in this construction is a tube of hexagonal cross-section 80-100 mm long, the longitudinal axis of which is situated approximately parallel to the aircraft's longitudinal axis. The inner volume of each tube is filled with radar-absorbing material, the density of which increases in the direction from the forward face of the tube to the rear. Because of this, the energy of electromagnetic pulses coming from radars is partially absorbed by the multilayered coating, then by the tube filler, and finally is attenuated from multiple reflections from the tube's inner walls. It is believed that this leads to a situation where there is essentially no radar signal reflection from the wing's leading edge.

The American press expresses the supposition that by virtue of the natural aerodynamic instability of the "flying wing" configuration, not only aerodynamic surfaces will be used for controlling the aircraft, but also other less traditional methods such as that based on a selective change in individual engine thrust. But no matter what additional control method is used on the B-2 aircraft, it will be based on a highly effective electro-remote control system operating on the basis of a high-speed digital computer. The journal AVIATION WEEK AND SPACE TECHNOLOGY wrote in this connection that developing specialized programs for on-board computers and outfitting the aircraft with advanced automated devices permitted reducing the number of bomber crew members to two.

The power plant of the B-2 bomber consists of four General Electric F118 8,600 kg(f) turbojet engines. The F118 engines will not have an afterburning mode of operation inasmuch as it is assumed that the primary task of the power plant is to provide a lengthy flight at subsonic cruising speed.

According to foreign press reports, the B-2 bomber has the following basic characteristics: take-off weight 136 tons, payload weight 18 tons, combat radius 8,000 km, service ceiling around 15,000 m, length 21 m, height 5.2 m, wingspan 52.4 m.

At the present time six B-2 aircraft are in various stages of construction at the Palmdale plant. All will be used initially for various tests at Edwards Air Force Base, and subsequently five of them are to be transferred to regular units. Deliveries of series aircraft to the U.S. Air Force Strategic Air Command are expected at the very beginning of the next decade. In this connection the Air Force command announced that the first air base at which it is planned to deploy an air wing of the new bombers will be Whiteman Air Force Base, Missouri. Construction work to erect various office spaces there was planned to begin in 1988 and to last over the next 4-6 years. During construction it is planned to erect 34 individual aircraft hangars, auxiliary spaces, and storage spaces. An office building for the 1st Combat Training Squadron, which will be stationed at this air base, will be the lead construction facility. In addition the Air Force command already has decided to create a specialized center for repairing B-2 bombers on the territory of the Oklahoma Logistics Center (Tinker Air Force Base, Oklahoma).

Under the plan of the U.S. Defense Department leadership, completion of deliveries of all 132 aircraft is planned for the second half of the 1990's. Judging from foreign press reports, the program's overall cost will be $36.6 billion in 1981 prices. If we consider inflation as well as an increase in expenses for procuring raw materials and additional equipment, the overall expenses for the program, in the estimate of the newspaper AIR FORCE TIMES, will comprise an astronomical sum of $59.5 billion.

American specialists believe that the unusual tactical performance characteristics of B-2 bombers will permit assigning their crews missions which by virtue of their specific nature hardly can be accomplished by crews of other types of bombers. According to views of Pentagon leaders, one of the most complex and contradictory types of combat missions facing strategic bomber crews is a penetration of enemy air defense for a subsequent flight into interior areas of his territory. This type of mission demands not only excellent technical outfitting of aircraft and high professional training of crews, but can also lead to increased bomber losses during military operations inasmuch as modern air defense installations as a rule are well dispersed and it is far from always that they can be neutralized by SRAM guided missiles. It is assumed that in penetrating air defense B-2 bomber crews will act independently, although their flight routes as well as approach time and time of passing through the engagement envelope of active air defense weapons will be thoroughly coordinated.

The outfitting of B-2 bombers with a high-resolution radar will give the crew an opportunity for confident detection and recognition of various objects at long ranges and under various weather conditions. In a protracted nuclear war such bombers can become the only means for identifying surviving targets from an exchange of nuclear strikes in the initial stage of military operations. For example, it is believed that by patrolling in the air over areas immediately adjacent to the combat zone, B-2 bombers will be able to penetrate there to search for and detect objects not destroyed by American ground-based missile weapons. The U.S. Defense Department leadership includes above all mobile missile systems and mobile radars among such objects. After B-2 bombers deliver a strike with cruise missiles and SRAM guided missiles against the air defense without entering the engagement envelope of active air defense weapons, B-2 bombers will penetrate through the "window" which forms seemingly as a second wave, searching for and destroying undestroyed radars, airfields and underground command posts. On reaching the deep rear, the B-2 aircraft will use aerial bombs to deliver strikes against troop concentration areas and military industrial enterprises.

American military experts assume that to provide greater flexibility of tactical employment, B-2 bombers will be able to carry SRAM II guided missiles and B83 nuclear bombs in various combinations, using the former chiefly to neutralize air defense installations and the latter for destroying small hardened objects such as silo launchers, command centers and command and control facilities. The actual combat load in one sortie hardly will exceed 10-12 nuclear weapons with an overall weight of 9-13.5 tons. Meanwhile, highly placed American Defense Department leaders lately have been insistently emphasizing that along with nuclear weapons, B-2 bomber crews also will be able to employ conventional weapons capable of destroying hardened targets for strikes against installations in the deep enemy rear.

The sober assessments of some specialists who are attempting to cool the premature raptures of admirers of the "invisible" aircraft, which are not yet based on anything for now, are at times not heard at all among the voices giving out immediate advance praise for the new "wonder weapon." For example, the author of an article published in the newspaper AIR FORCE TIMES emphasizes that capabilities of enemy radars to detect the "invisible" aircraft also have been far from exhausted inasmuch as (as shown by studies conducted in the United States) with increased wavelength of an emitted pulse the methods of Stealth technology begin to lose their effectiveness and detectability of aircraft grows correspondingly. In addition, the use of so-called bistatic radars consisting of a transmitter (ground or space-based) and ground receiver separated from each other by great distances may be a future method capable of providing a rather high probability of detecting "invisible" aircraft. An additional advantage of this method is that the receiver operates in a passive mode, i.e., it does not emit electromagnetic energy; in this regard its coordinates essentially cannot be determined by the on-board equipment of bombers flying toward strike targets.

But it is hardly these sober voices that determine policy in Washington today. The majority of specialists and mass media are relishing in every way the capability of B-2 bombers to penetrate the air defense system undetected and "creep" up on the enemy at low altitude following terrain irregularities, detecting and destroying small targets by surprise strikes and turning the enemy's electronic detection equipment into useless ballast. It is essentially a question of the latest attempt by U.S. ruling circles to disturb the existing strategic balance in one way or another and achieve military superiority over the Soviet Union. But historical experience of the last decades permits asserting with full confidence that any attempts by the United States to achieve superiority in strategic kinds of armament will not bring the Pentagon the desired success inasmuch as they are capable only of sharply increasing the danger of unleashing a destructive world war in which, as we know, there will most likely be no winners.

Footnotes

1. From the English "stealth"—cunning, ruse.

2. At the present time some foreign publications are calling this aircraft the F-117A—Ed.

U.S. Air Force Exercise Coronet Warrior-2

18010679h Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 45- 46

[Article by Col Yu. Petrov]

[Text] In the course of combat training for tactical aviation, the U.S. Air Force command devotes great attention to ensuring its readiness to conduct combat operations without replenishing stores of supplies in the initial stage of an armed conflict.

In this connection the Tactical Air Command [TAC] is working to update the list and quantity of logistic items necessary for supporting active combat operations of a tactical fighter squadron when it is independently based at an airfield. TAC units have been holding experimental-test exercises codenamed Coronet Warrior since 1987. The first exercise was conducted in the 1st Tactical Fighter Wing (Langley Air Force Base, Virginia).

In the period from 10 May through 9 June 1988 a second exercise, Coronet Warrior-2, was conducted at Shaw Air Force Base, South Carolina. Its primary objective was to check a tactical fighter squadron's real capabilities to conduct combat operations independently for the first 30 days of an armed conflict. Brought in for the exercise were 24 F-16 aircraft from the 17th Tactical Fighter Squadron, 363d Tactical Fighter Wing, stationed at that air base. The overall number of participants included 521 squadron personnel as well as personnel of maintenance and support subunits. An umpire staff made up of representatives of TAC Headquarters and other Air Force units and organizations was established to monitor and evaluate exercise results; it totalled 60 officers, NCO's and civilian employees.

Preparations for the exercise began immediately after completion of the previous one, Coronet Warrior-1. Results were analyzed and corrections made to the computer program developed by Rand Corporation for simulating this exercise. Following this came a simulation of the expenditure of supplies as applied to conditions of combat operations in Europe. An air squadron with F- 16 aircraft was chosen to actually play out the exercise.

Three days before it began umpires conducted a total inventory of squadron property at its location. All equipment, tools and machine units not planned for use in the exercise were confiscated and sealed up in a separate place. A special marking was placed on those planned for use under the TOE and their numbers were recorded. Special check points were set up to preclude the entry of unmarked supplies into the squadron area. By the beginning of the exercise all personnel and flight support equipment were essentially isolated from other subunits of the air wing.

The umpires' task consisted of a detailed monitoring of actions of squadron personnel and the procedure for using supplies. They were categorically prohibited to intervene in personnel actions, assist them or comment on the progress and results of the exercise.

By the beginning of the exercise the set of wartime stores for the squadron was incomplete—88 percent of storage units (1,154 of 1,308) from the list of necessary spare parts, machine units and tools for F-16 aircraft.

In addition to the primary missions facing the squadron in the exercise—delivering strikes against ground targets located at a varying depth on enemy territory and repelling enemy air raids—a mission was assigned for technical personnel to support the maximum possible number of sorties on every exercise day.

Flight personnel arrived at the aircraft an hour ahead of time and tested engines 45 minutes before take-off while performing a thorough check of the working capacity of on-board systems. If troubles were detected technical personnel remedied them quickly, and a reserve aircraft was used in case it was impossible to do this. Work intensity was dictated by a rigid timetable for aircraft to arrive on target.

The majority (56 percent) of operational training missions were accomplished under conditions of intensive use of electronic warfare assets. On one of the exercise days all squadron aircraft practiced missions for 6 hours at a specially outfitted EW range. Primary attention here was given to checking the effectiveness of the aircraft's individual ECM equipment.

Aerial refueling missions were practiced intensively. During the eight days of the exercise each crew performed 15 refuelings, while under existing TAC norms each tactical aviation pilot is to perform at least two refuelings in six months in the course of combat training.

Despite the rigid standards and high combat intensity, in 30 days of the exercise only two aircraft were deemed noncombat-ready because of an absence of spare parts and did not take part in accomplishing missions (there was a tentative forecast of six aircraft). Meanwhile, according to foreign press reports, each day there were malfunctions of on-board systems and machine units in 24 percent of squadron aircraft. Up to 96 percent of these malfunctions were fixed within 12 hours after detection using authorized supplies. In only one instance were squadron technical personnel permitted to use a welding set not part of the set assigned for the exercise; this was dictated by the need to repair equipment to ensure continuation of the exercise.

A total of 1,077 sorties (1,832.6 hours) were flown in the 30 days of Exercise Coronet Warrior-2. Under ordinary conditions a squadron of F-16 aircraft carries out around 530 sorties per month.

According to a statement by representatives of the heads of the U.S. Air Force Tactical Air Command, results of this exercise permit a more accurate determination of necessary requirements for logistic items for autonomous performance of assigned missions by tactical air subunits in 30 days of combat operations.

The next exercise, Coronet Warrior-3, is planned for the summer of 1989 in a unit of the U.S. Air Force European Command. In addition to problems worked in the previous exercise, special emphasis in this exercise is to be placed on evaluating the effectiveness of using sets of tools and auxiliary equipment, as well as determining measures for ensuring that air units and subunits are completely up to strength.

Modernization of U.S. Tactical Aviation Control System Equipment

18010679i Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) p 46

[Article by Col R. Kazantsev]

[Text] The United States has begun modernizing tactical aviation control system equipment, inasmuch as substantial deficiencies were identified in the course of its operation. American military specialists include among these deficiencies above all the comparatively easy detectability of system components, since control and warning centers and posts are fixed and are situated together with emitters. Litton presently is developing under Pentagon order AN/TYQ-23 mobile command and control facilities to replace the fixed facilities.

A feature of this facility is the accommodation of its electronics in separate transportable modules outside the radar equipment (see figure [figure not reproduced]). The gear is being created using a modern component base and digital signal processing. Each module includes data processing devices, digital data transmission devices, and data display devices; HF and VHF radio communication equipment; operator workstations; printer equipment; and necessary auxiliary equipment. Prototypes of the ANYQ-23 command and control facilities already have undergone troop tests at Eglin Air Force Base, Florida. The beginning of delivery of series models to the troops is expected in 1990.

American experts assume that making the new command and control facilities operational will permit improving the performance of such tasks as collecting, processing and displaying theater air situation data, providing threat warning and controlling tactical aircraft in the air, and supporting coordination with Army, Naval and Marine aviation and with air defense systems.

The Israeli Navy

18010679j Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 47- 51

[Article by Capt 1st Rank V. Khudyakov]

[Text] The Israeli Navy is an independent branch of the Armed Forces and the principal means for carrying out the aggressive policy of the country's Zionist circles. It is headed by a commander who is subordinate to the commander in chief of the Armed Forces (chief of the General Staff), is responsible for its combat readiness and development, and organizes combat training and logistic support. The commander exercises day-to-day direction through the naval staff in Tel Aviv.

The foreign press reports that the Israeli Navy is intended for accomplishing the following primary missions: securing its sea lines of communication [SLOC] in the Eastern Mediterranean; defending the Israeli coast and the country's naval bases and ports; conducting active combat operations against enemy naval ships both independently and in coordination with the Air Force; disrupting enemy SLOC; supporting ground forces operating on a maritime axis; landing tactical assault forces and raiding and reconnaissance parties; conducting reconnaissance; and carrying out blockade operations.

According to data of the reference JANE'S, overall numerical strength of the Israeli Navy is 9,000 persons, including 1,000 officers. Approximately 15 percent of the total number of Navy servicemen are women serving in shore units and subunits. Almost all officers and senior NCO's are cadre military and are persons of Jewish origin.

By early 1989 the **ship order of battle** of the Israeli Navy numbered around 80 combatant ships and small combatants: 3 diesel submarines, 29 missile craft (in the following classes: 4 "Aliya," 8 "Reshef," 12 "Saar-2" and "Saar-3," 2 "Dvora" and 3 "Flagstaff 2"), 40 patrol boats, 3 small landing ships, 6 landing craft as well as several auxiliary vessels.

"Gal"-Class *submarines* ("Gal," "Tanin" and "Rahav," Fig. 1 [figure not reproduced]) were built in Great Britain during 1973-1974 according to the West German Type 206 and transferred to Israel in 1977. Their surface displacement is 420 tons, submerged displacement is 600 tons, and they have a length of 45 m, a beam of 4.7 m, a draft of 3.7 m, surface speed of 11 knots, submerged speed of 17 knots and the following armament: 8 533-mm bow torpedo tubes also used for firing Harpoon antiship missiles. They have a crew of 22.

Missile craft make up the basis of the fleet. The most modern of them are "Aliya"-Class missile craft ("Aliya," Fig. 2 [figure not reproduced], "Geoula," "Romat" and "Keshet"), designed and built in Israel and transferred to the Navy during 1980-1982. The craft have a standard displacement of 450 tons (full displacement 488 tons), a length of 61.7 m, beam of 7.6 m and draft of 2.5 m. The output of the four-shaft diesel power plant is 14,000 hp, maximum speed is 31 knots, and range is 4,000 nm at 17 knots or 1,500 nm at 30 knots. The first two craft are armed with four launchers for the Harpoon antiship missile and four launchers for the Gabriel antiship missile, two 20- mm single guns, a Vulcan-Phalanx 20-mm AAA system, and two or four 12.7-mm machineguns. A hangar is equipped aft for an AB.206 helicopter. There is a crew of 53. The "Romat" and "Keshet" missile craft additionally have a four- container launcher for the Harpoon antiship missile and four single-container launchers for the Gabriel antiship missile as well as an OTO-Melara 76-mm gun in place of the hangar and helicopter pad. The Vulcan-Phalanx AAA system, gun mounts and 12.7-mm machineguns are the same as for the "Aliya" and "Geoula" missile craft. There is a crew of 45.

"Reshef"-Class craft ("Reshef," "Kidon," "Tarshish," "Yaffo," "Nitzhon," "Komemiut," "Atsmout" and "Moledet") of Israeli production became operational during 1973-1980. Their standard displacement is 415 tons (full displacement 450 tons), length is 58 m, beam is 7.8 m and draft is 2.4 m. The power plant is the very same as for "Aliya"-Class missile craft, but it is twin-shaft, has a maximum speed of 32 knots, a range of 1,650 nm at 30 knots and 4,000 nm at 17.5 knots. The armament includes up to 8 launchers for the Harpoon antiship missile and 4-6 for the Gabriel Mk 2 or Mk 3, an OTO-Melara 76-mm gm, Vulcan- Phalanx 20-mm AAA system, two 20-mm Oerlikon guns and two 12.7-mm machineguns. The "Tarshish" has a helicopter pad installed in place of the 76-mm gun. Another ten craft of this class were built in Israel, eight of which were sold to the Republic of South Africa and two to Chile.

"Saar-2"-Class ("Mivtach," "Miznag," "Mifgav," "Eilath," "Haifa" and "Akko") and "Saar-3"-Class ("Saar," "Soufa," "Gaash," "Herev," "Hanit" and "Hetz'-') missile craft built in France were commissioned during 1968-1969. Their standard displacement is 220 tons (full displacement 250 tons), they have a length of 45 m, a beam of 7 m and a draft of 2.5 m. Total output of the four diesel engines is 13,500 hp, maximum speed is 40 knots and range is 2,500 nm at 15 knots or 1,000 nm at 30 knots. There is a crew of 35-40. The missile craft are armed with Harpoon and Gabriel antiship missile systems, 76-mm and 40-mm guns, and 324-mm torpedo tubes. Armament variants include two Harpoon antiship missile launchers, three Gabriel Mk 2 launchers and a 76-mm gun ("Saar-3"); six Gabriel Mk 2 antiship missile launchers and a 40-mm gun ("Saar-2"). One armament variant of "Saar-2"-Class craft can be three 40-mm guns and two 324-mm twin torpedo tubes. This class of missile craft took part in combat operations during the 1973 Arab-Israeli War.

"Dvora"-Class missile craft were built in Israel and became operational in 1979. Full displacement is 47 tons, length is 21.6 m, beam is 5.5 m, draft is 1.8 m and maximum speed is 36 knots. Armament is represented by two Gabriel antiship missile launchers and two 20-mm guns. Total output of the two diesel engines is 5,440 hp and range is 700 nm at 32 knots. There is a crew of ten.

"Flagstaff 2"-Class missile hydrofoils—"Shimrit" and "Livnit" (see color insert [color insert not reproduced]) were supplied to the Israeli Navy by the American firm of Grumman during 1981-1982, and the "Snapirit" was built in Israel in 1985 with U.S. technical assistance. The displacement is 105 tons, length is 25.6 m, beam is 7.3 m and foilborne draft is 1.7 m. Armament includes four Harpoon antiship missile launchers, two Gabriel antiship missile launchers and a 30-mm twin gun. The 5,400 hp gas-turbine power plant provides a full foilborne speed of around 50 knots and a range of 2,600 nm in a hullborne mode at 8 knots. There is a crew of 15. These craft are used to guard the seacoast and intercept fast vessels.

"Dabur"-Class *patrol craft* (31 craft), built in Israel during 1974- 1977, are intended for patrol duty in the coastal zone. There is a full displacement of 35 tons, a length of 19.8 m, a beam of 5.5 m, a draft of 1.8 m and the following armament: two 20-mm guns, two 12.7-mm machineguns and two 324-mm single torpedo tubes (Mk 46 torpedoes). Overall output of the two diesel engines is 1,920 hp, maximum speed is 22 knots, and the range is 1,200 nm at 17 knots. There is a crew of 6-9.

In addition, the Israeli Navy has nine small "Yatush"-Class craft (former American PBR-Class supplied in 1974).

The *group of landing ships* includes three "Ashdod"-Class small landing ships built in Israel during 1966-1967 (standard displacement 400 tons, full displacement 730 tons), three "LCT"-Class landing craft also of Israeli production in 1965 (full displacement 230 tons), and three "LCM"- Class craft transferred from the United States (full displacement 60 tons). The landing transport "Bat Sheva" built in the Netherlands (full displacement 1,150 tons) has been in the Navy order of battle since 1967. During the Israeli aggression in Lebanon in 1982 she was actively used for moving personnel, combat equipment and vehicles to ground forces operating on the maritime axis.

Merchant fleet vessels are a reserve for the fleet forces. In wartime it is planned to transfer some of them to the Navy command and use them chiefly for moving troops and cargoes and supporting combat operations at sea. According to data of JANE'S, the Israeli merchant fleet numbers 62 vessels with a gross tonnage of 514,815 register tons.

Naval aviation is represented by a detachment of Sea Scan land- based patrol aircraft (four; according to other foreign press sources, seven). The aircraft's principal performance characteristics are as follows; cruising speed 870 km/hr at an altitude of 5,900 m, patrol speed 440 km/hr at an altitude of 900 m, and patrol time is over 6.5 hours. There is a crew of four. The aircraft is equipped with the American AN/APS-504 radar, which permits conducting reconnaissance at sea. There is a magnetic anomaly detector and sonobuoys for hunting and detecting submarines.

Screening ships from the air and delivering strikes against naval targets and enemy shore installations is assigned to naval aviation. In this connection, practicing coordination with Navy ships and craft holds an important place in its combat training.

The **Marines** (around 600 persons) are divided into a coast guard group and a reconnaissance and raiding group (the latter consists of commando and frogman detachments). The reconnaissance and raiding subunits are used to perform various terrorist acts against neighboring Arab states.

The principal armament of Israeli Navy missile craft consists of the antiship missiles Gabriel Mk 1 (range of fire 18 km), Gabriel Mk 2 (36 km) and Gabriel Mk 3 (up to 40 km) of Israeli production and the American Harpoon (120 km). The Gabriel Mk 4 antiship missile with a range of fire up to 200 km is being developed. An aircraft version of the Gabriel Mk 3 has been created which can be employed from all tactical fighters operational with the Israeli Air Force. After launch the flight altitude is 100 m on the initial leg of the trajectory, the missile flies at an altitude of 20 m on the mid-course leg, and it shifts to an altitude of several meters after the homing head locks onto the target.

Air defense of "Reshef" and "Aliya" class missile craft is provided chiefly by the 20-mm six-barrel Vulcan-Phalanx Mk 15 close-in weapon systems of American production (range of fire up to 1.5 km) and by the Red Eye portable SAM systems (maximum intercept altitude 2.5 km, range of fire 0.5-3.6 km).

According to the Israeli press, Israel has tested a new Barak 1 short-range shipboard SAM system with a range of fire up to 10 km, intended for engaging low-flying aircraft, helicopters and guided missiles and for firing on ships and shore targets. The Israeli naval command plans to install such SAM systems aboard "Reshef"-Class missile craft (Fig. 3 [figure not reproduced]) and new corvettes ("Saar-5" project).

The **Navy modernization program** for the 1990's envisages purchasing three new diesel submarines and four corvettes for a total sum of $1.3-1.5 billion.

The foreign press reports that talks presently are under way with the United States on building "Saar-5" project corvettes. Their design performance characteristics are a full displacement of 985 tons, a length of 77.2 m, a beam of 8.2 m, a draft of 4.2 m, maximum speed of 42 knots, and armament consisting of eight Harpoon missile launchers, four Gabriel Mk 2 antiship missile launchers, two 76-mm single guns, four 30-mm twin guns, a 375-mm Bofors antisubmarine mortar and two 324-mm triple torpedo tubes. It is planned to have a helicopter pad on the corvette. Cumulative output of the combination diesel-gas turbine power plant is 28,000 hp (LM2500 turbine of 24,000 hp and two 2,000 hp diesels). Range with diesels is 4,500 nm at 22 knots, endurance is 20 days and there is a crew of 45.

New submarines will be built according to the West German Type 209. The possibility of direct involvement of Israeli firms in the construction process is envisaged. It is planned to build one or two submarines at yards in Israel with delivery of hull sections, armament and equipment from the FRG. The deal will be paid for to a considerable extent by the United States from sums allocated to Israel annually for military purposes.

Initially the Navy provided for commissioning 12 "Flagstaff 2"-Class missile hydrofoils, but this part of the plan was delayed because of financial difficulties.

In 1987 Israel conducted tests of a new "Super Dvora" small combatant, which is proposed to be produced both in a missile version and in a patrol craft version with gun armament. The displacement is 51 tons in the missile version and 46 tons in the patrol version. Maximum speed is from 25 to 40 knots depending on purpose. The purchase in the United States of air cushion vehicles which can be used for landing small assault forces is not precluded in the future.

According to western press data, the Israeli Navy received two Dauphin HH-65 helicopters, produced in the United States under French license, for evaluation tests. Subsequently it is planned to purchase one lot of such helicopters and use them aboard missile craft.

Israel has created three naval bases to support the **basing** and day- to-day activity of the Navy: Haifa (main) and Ashdod on the Mediterranean, and Eilath on the Red Sea. Up to 70 percent of the Navy's fleet strength is based at the Haifa Main Naval Base. Naval bases at the same time also are the country's main ports.[1]

The Israeli **shipbuilding industry** is represented by the firm of Israel Shipyards, which has a shipyard and ship repair yard in Haifa. Production capacities of the shipyard permit building corvettes, landing ships, missile and landing craft, and merchant vessels with a displacement up to 9,000 tons. The ship repair yard has a floating dock with a load-lifting capacity of 20,000 tons.

A significant share of military shipbuilding belongs to a daughter firm of Israel Aircraft Industries, Ramta Structures and Systems, which builds "Dabur"-Class patrol craft and "Dvora"-Class missile craft. The small size of the craft permits moving them by motor transport on special flatbeds to the shores of the Mediterranean and Red seas.

In planning **operational and combat training**, the Israeli command takes into account the possibility of joint combat operations with the U.S. Navy within the scope of an agreement on "strategic cooperation" signed on 30 November 1981. In this connection the Israeli Navy works closely together with the U.S. Sixth Fleet. For example, the first joint naval exercise was conducted in June 1984 to practice evacuation of wounded by helicopter from American ships to Israeli hospitals. Naval forces of Israel and the United States conducted an antisubmarine exercise in the Eastern Mediterranean in December of that same year.

In 1986 a detachment of Israeli Navy missile craft took part in joint maneuvers with the United States in the immediate proximity of the coast of Libya. Israeli naval officers have been repeatedly invited to U.S. Navy exercises. Ships of the U.S. Sixth Fleet, including nuclear-powered carriers, actively use the naval bases of Haifa and Ashdod to perform minor preventive maintenance, replenish stores and give personnel a rest.

Combat training of the Israeli Navy is combined with performance of combat missions which include in part patrolling and delivering missile and gun strikes against Palestinian refugee bases and camps. Israeli patrol and missile craft engage in piratic operations in international waters on the pretext of antiterrorism: at their discretion they stop and inspect "suspicious" vessels proceeding to ports of Southern Lebanon.

Footnotes

1. For more details on Israeli ports see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 5, 1988, p 67—Ed.

NATO Standing Naval Force Atlantic

18010679k Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 51- 53

[Article by Capt 2d Rank Yu. Kryukov]

[Text] The NATO military-political leadership attaches great significance to training naval forces as part of multinational task forces to conduct combat operations at sea under conditions approximating a real wartime situation to the maximum. Each year combatant ships and mixed subunits are assigned for these purposes from navies of NATO member countries for operations as part of multinational forces established for the period of exercises as well as on a permanent basis. One such force is the STANAVFORLANT (Standing Naval Force, Atlantic), which was constituted for the first time on 13 January 1968 at the Portland Naval Base in Great Britain by decision of the bloc's Military Planning Committee.

Operational and combat training of North Atlantic bloc naval forces usually was conducted in accordance with national plans up to February 1985. Joint combat training measures were planned relatively rarely. Nevertheless, their results attested to a varying approach to organization of combat training in the countries and to inadequacy of ship crew training levels for conducting combat operations at sea. In this regard the NATO military leadership decided to hold a number of joint exercises under the codename Match Maker lasting up to 6-7 months. By the end of 1967 three such exercises had been held, the results of which were evaluated positively by the bloc command authority. In the course of the exercises combatant ships practiced tactical procedures of sailing in company and the organization of all kinds of force defense on the sea transit using weapons and combat equipment. Based on exercise results, American Admiral Moorer, then Supreme Allied Commander

Atlantic, suggested establishing a permanently operating NATO naval force in the Atlantic on a multinational basis.

Initially the force included the American destroyer "Holder" and three frigates: "Brighton" (UK), "Narvik" (Norway) and "Holland" (Netherlands). Later the naval forces of Canada, the FRG, Portugal, Belgium and Denmark began to assign their combatant ships to it.

Traditionally the NATO Standing Naval Force Atlantic is formed in January at one of the naval bases of NATO countries. It has from four to nine destroyer- frigate type combatant ships permanently in its makeup from naval forces of the above states, which are replaced once every 3-4 months. At year's end the force is disbanded and its ships transferred to national subordination.

Officers in the rank of captain 1st rank from one of the countries which permanently assign ships to its makeup are appointed force commander in turn. Command and control of the force is exercised through a staff which includes 16 officers, NCO's and enlisted persons of various nationalities. Officers who are specialists in matters of operational planning, combat training, intelligence, communications, antisubmarine defense, armament, air defense and logistics are subordinate to the chief of staff (an officer in the rank of captain 2d rank). An interpreters group and press representatives also are under the staff.

Overall direction of the NATO Standing Naval Force Atlantic is exercised by the Supreme Allied Commander Atlantic (an American admiral) with headquarters in Norfolk, Virginia. Immediate direction is the responsibility of NATO Allied Forces commanders in the Western Atlantic (headquarters at Norfolk) or Eastern Atlantic (headquarters at Northwood, UK) depending on missions to be accomplished and the force's area of operations.

According to statements by western military specialists, establishment of the force was dictated above all by military-political objectives—to demonstrate readiness and resolve of bloc countries "to defend their collective interests" at sea by force of weapons. Essentially the NATO Standing Naval Force Atlantic is nothing more than a NATO "fire brigade" which must be ready to exert political pressure on individual countries in case a tense situation arises.

Each year the force combat training plan envisages conducting measures with force combatant ships independently and together with naval forces of bloc countries in Allied Naval Forces exercises, as well as calls on ports and naval bases of member countries for routine maintenance and for replenishing necessary stores.

The foreign press emphasized that the primary mission of the Standing Naval Force is to raise the level of combat training of ships of varying nationality as part of the Allied Naval Forces with consideration of many years of accumulated experience. To this end the personnel regularly train in using all kinds of ship weapons and master areas of operation within limits of the NATO bloc zone of responsibility in participating in various exercises. Combatant ships are at sea for an overall total of over 60 percent of the time they are in the force. Considerable emphasis in combat training is placed on exchanging combat teams and crews of deck-based helicopters for familiarization with the equipment, weapons, and organization of duties of ships of different nationality.

The NATO command gives special attention to determining the optimum force makeup. The force's combat training experience shows that it should include ships with new submarine-hunting sonar as well as with surface-to-air missile weapons providing effective air defense of the force at sea. Therefore combatant ships equipped with sonars with long towed arrays, deck-based helicopters and modern surface-to-air missile systems lately have been appearing as part of the force. In addition it is believed that the presence of a fast supply transport in the force considerably improves its mobility and endurance.

Practice by deck-based helicopter crews in operations at night and in adverse weather conditions as well as when guidance and landing equipment is down takes up much combat training time. The primary mission facing helicopter crews is to practice tactical procedures for hunting, detecting, classifying and tracking submarines and determining their coordinates and target motion in coordination with antisubmarine forces.

One of the most important forms of force training is participation in Allied Naval Forces exercises. Lately the force's combatant ships have been taking part in all main Allied Naval Forces exercises (Northern Wedding, Ocean Safari, Joint Maritime Course, Locked Gate and others). In addition, the force regularly is included in joint exercises of navies of the United States, Great Britain, the FRG and other bloc countries. It is given responsibility for missions of combating enemy submarines and surface combatants and protecting sea and ocean lines of communication. Force ships usually operate as part of ship hunter-killer forces while practicing these missions.

Each year force ships call on up to 30 naval bases and ports of NATO countries to "show the flag," perform routine maintenance and replenish stores. They take part in Sea Day and Navy Day holidays usually attended by supreme military leadership, diplomats, as well as the local populace and tourists. Holiday programs usually provide for demonstration exercises and practices and for demonstrating the crews' teamwork of actions and professionalism in fulfilling tactical procedures of hunting, detecting and destroying submarines, organizing all kinds of defense of ships at sea, and replenishing stores under way. "Open ship" days are held to popularize the Standing Naval Force when combatant ships are anchored at bases and ports.

Judging from foreign press reports, the NATO bloc military-political leadership plans to constitute a larger multinational naval task force on the basis of the NATO Standing Naval Force Atlantic in case of increased tension in the zone of responsibility. This task force would be capable of independently accomplishing missions of antisubmarine warfare, protection of transatlantic lines of communication, as well as reinforcement of NATO forces in individual areas of the theater. Combatant ships, nuclear and diesel submarines armed with antiship missiles, and small combatants and auxiliary vessels can be additionally included in the force for these purposes.

Destroyers

18010679l Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 53- 60

[Conclusion of article by Capt 1st Rank Yu. Petrov and Capt 1st Rank Yu. Yurin]

[Text] Part One of the article[1] told about the status, design features, and basic specifications and performance characteristics of modern destroyers of leading capitalist states and about their crews and antiship missiles. Ship surface-to-air missile, antiship missile, gun and torpedo weapons and power plants are examined below based on open foreign press materials.

Surface-to-air missile weapons. All new classes of destroyers are outfitted with surface-to-air missile systems of zone or local air defense for engaging the air adversary. Modern SAM systems have many advantages, among which foreign military specialists include constant combat readiness, the capability of continuously hunting the enemy over considerable distances, simultaneous acquisition and tracking of several targets, short reaction time (5-15 seconds), automation of the fire preparation process, salvo launch of missiles against several targets, short interval between salvos (by automatic reloading of the launcher), resistance to the effect of unfavorable weather factors, high kill probability, minimum size of "dead space," sufficient antijam capability, and relative simplicity of day-to-day maintenance and combat operation. As a rule, a SAM system is a set of functionally related combat and shipboard equipment intended for engaging airborne targets with surface-to-air missiles. Destroyer SAM systems usually include one or two launchers with surface-to-air missiles; acquisition, identification and target designation equipment as well as missile control and guidance equipment; and electric power sources and auxiliary equipment. Missiles are divided conditionally into four subclasses depending on the range of fire of those used in SAM systems: long range (over 100 km), medium range (20-100 km) and short range (10-20 km) as well as close range (to 10 km). Long and medium range missiles are used in zone air defense SAM systems aboard destroyers, and short and close range surface-to-air missiles are used in local defense systems.

Primarily automatic and to a lesser extent semiautomatic systems are used to guide the surface-to-air missiles. Radio command and semiactive homing systems as well as combination systems are most widespread, but the accuracy of these systems usually is insufficient for a direct missile hit on a highly maneuverable target. Therefore destruction must be ensured by triggering a proximity fuze when the surface-to-air missile flies a certain distance by an aircraft.

Tartar and Terrier zone defense SAM systems with the Standard surface-to-air missile are the most widespread aboard destroyers not only of the United States, but also of the FRG and Italy as well as on some ships of the French Navy ("Cassard"-Class) and Japanese Navy ("Amatsukaze," "Tachikaze" and "Hatakaze" classes). The Standard missile family, which replaced the Tartar, Terrier and Talos surface-to-air missiles, includes several modifications: Standard-1 MR (RIM-66A and B), Standard-1ER (RIM-67A and B), Standard-2MR (RIM-66C) and Standard-2ER (RIM-67C). There is also the RIM-66D modification, which is an antiship missile and can be employed in the absence of Harpoon antiship missiles aboard ship (Fig. 1 [figure not reproduced]). Each of these modifications can have several models. The MR index denotes medium range and ER indicates extended range. A supplementary solid-fuel booster rocket is used on the missile with the ER index, and for this reason it is longer than the MR modification.

In addition to the Standard-1 and -2 missiles, the SAM system includes the AN/SPG-51, -55A and -55B radars, which perform automatic tracking, target illumination and SAM guidance; a magazine for storing missiles; as well as launchers standardized with the Tartar and Terrier systems.

Mk 90 fragmentation-HE warheads which form up to 6,000 fragments on detonation with an initial velocity of around Mach 6 are installed on Standard SAM's to increase target kill probability. The use of a new radar proximity fuze permitted improving the match of its radiation pattern with the dispersion zone of warhead fragments. Test launches of these missiles demonstrated the high reliability of fuze operation when firing on small, fast targets.

The United States has developed the general-purpose Aegis SAM system (included as the main subsystem in a multifunction weapon system of the same name) to repel massive strikes of aircraft and antiship missiles with high performance characteristics. Aboard destroyers this system has, in addition to Standard-2 SAM's, the AN/SPY-1D multifunction radar with electronic scanning, two Mk 41 vertical launchers, as well as various subsystems for fire control and for a check of combat readiness, computing devices, computers and so on. This radar provides simultaneous detection of several targets (not only airborne, but also surface) at a range over 200 nm, their tracking, assessment of the degree of threat, and receipt of necessary data for intercept after they enter the SAM system envelope. Four planar phased arrays installed at an angle of 90° in azimuth to each other are slightly inclined toward the base, which permits conducting an all-around scan at practically any elevation angles. Inasmuch as Standard missiles have an inertial guidance system on the mid- course leg in addition to remote control, there is no need for constant operation of the target illumination radar (AN/SPG-62), which turns on at a signal of the fire control subsystem only after the SAM closes with the target and at the moment the missile's semiactive radar homing head locks onto the target on the terminal leg. The radar operates in a mode of periodic transmitter switch-off to prevent the ship's premature detection from her radiofrequency emissions or the guidance of antiradar missiles to her. The Mk 41 vertical launchers can have containers for launching not only Standard SAM's, but also ASROC antisubmarine missiles as well as Tomahawk cruise missiles (for now only aboard American ships, Fig. 2 [figure not reproduced]). It is planned to outfit the bulk of "Spruance"-Class destroyers (Fig. 3 [figure not reproduced]) with such launchers for firing Tomahawk and ASROC missiles.

Medium-range Sea Dart SAM's are employed aboard British destroyers ("Sheffield" and "Bristol" classes) as part of the system of the same name (GWS-30), which is intended for firing against high-altitude and low-flying airborne targets as well as surface ships.

Among the short-range SAM's, Sea Sparrow missiles of various modifications (RIM-7F, H and M) have become the most widespread on U.S., Japanese and Canadian destroyers. The most advanced, RIM-7M, is equipped with a semiactive radar homing head and digital programmable processor. The highly sensitive gear provides precise target selection at low altitudes under conditions of local interference and electronic countermeasures.

The Aspide short-range SAM is part of the multipurpose Albatros SAM system installed aboard "Animoso"-Class guided missile destroyers. It has a semiactive radar homing head.

Other typical models of short-range and close-range SAM's are the French Naval Crotale and Mistral missiles. The former is part of the SAM system of the same name installed aboard "Georges Leygues"-Class ships (Fig. 5 [figure not reproduced]) and is intended for defense against low-flying antiship missiles in the near air defense zone. The Mistral SAM is used in the Sadral system[2] aboard "Cassard"-Class guided missile destroyers.

Principal specifications and performance characteristics of shipboard surface- to-air missiles are given in Table 1.

Table 1—Principal Specifications and Performance Characteristics of Destroyer SAM's

Name and Designation of Missile (Developing Country), Year Operational	Weight, kg: Launch/Warhead (Warhead Type)[1]	Range of Fire, km[2]/Intercept Altitude, km[2]	Type Motor[3]/Flight Speed, Mach	Missile Dimensions, cm[4]/Guidance System[5]
Standard-1 MR, RIM-66A & B (USA), 1970	590/.(HE-F)	3-45/0.015- 20	SPRM/2.0	448x34x108/SAR
Standard-1 ER, RIM-67A & B (USA), 1977	1,060-1,360/.(HE-F)	6- 65/0.015-25	SPRM/2.5	823x34x157/SAR
Standard-2 MR, RIM-66C (USA), 1980	612/.(HE-F)	3-56/0.015- 20	SPRM/2.0	448x34x108/RCRC, I & SAR
Standard-2 ER, RIM-67C (USA), 1980's[6]	1,360/.(HE-F)	6- 120/0.015-25	SPRM/2.5	823x34x157/RCRC, I & SAR
Sea Sparrow, RIM-7F, H & M (USA), 1973	205/30(HE-F)	1-20 (25)/0.004- 4	SPRM/3.5	365x20x100/SAR
Sea Dart (UK), 1972	550/.(HE-F)	1.1-80/0.015-18	SPRM & Ramjet/3.0	436x42x91/SAR
Aspide (Italy), 1980's	220/33 (HE-F)	3-20(25)/0.015- 6	SPRM/2.0	370x20x80/SAR
Naval Crotale (France), 1984	80/15(HE-F)	0.5-8.5/0.004- 4	SPRM/2.6	290x15x55/RCRC & IR
Mistral (France), 1986	17/3(.)	.-6/.-3	./2.5	180x9x./IR

1. HE-F—high explosive-fragmentation warhead.
2. In the numerator and denominator the minimum and maximum range of fire and intercept altitude are shown separated by a dash, and characteristics of the last missile modifications are given in parentheses.
3. SPRM—solid-propellent rocket motor.
4. In the numerator the airframe length and diameter and the wingspan are shown separated by an "x".
5. RCRC—radio command remote control. I—inertial; SAR—semiactive radar; IR—infrared (homing heads).
6. See Fig. 4 [figure not reproduced]).

Antisubmarine missiles, intended primarily for engaging nuclear- powered submarines, hold an important place in the armament system of modern destroyers. Antisubmarine missile systems are distinguished by high speed in delivering the warhead to the target and are free of many deficiencies inherent to depth charge launchers and torpedoes, the principal one being an insignificant operating radius. The most widespread antiship missile system aboard foreign surface combatants is the American ASROC system, with the Anglo-Australian Ikara and the French Malafon used to a considerably lesser extent (Table 2).

Table 2—Principal Performance Characteristics of Antisubmarine Missiles of Ships of Capitalist Countries

Characteristics	ASROC (USA)	Ikara (Australia, UK)	Malafon (France)
Launch weight, kg	435	294	1,480
Dimensions, m:			
Length (overall)	4.6	3.93	6.15
Airframe diameter	0.325	0.61	0.65
Wingspan	0.76	1.52	3.3
Range of fire, km:			
Maximum	9	15	13
Minimum	1.5-2	.	2

The level of development of antisubmarine missiles of surface combatants (including destroyers) can be seen in the example of the ASROC system developed during 1957-1961 and operational with navies of the United States, the FRG, Italy, Canada, Japan and other states. It includes ASROC antisubmarine missiles, Mk 112 launcher, and the following subsystems: Mk 114 or Mk 116 fire control; storage; feed and reload.

The single-stage solid-propellent ASROC booster rocket has a small antisubmarine torpedo (Mk 44, Mk 46, "73" or their equivalent) or a nuclear depth charge with a yield of from 1 to 10 KT as a warhead. The torpedo is connected with the booster rocket airframe by a special adapter, within which there is a time relay controlling the mechanism for separating them.

The Mk 112 launcher consists of four twin containers, each of which has a separate drive for vertical training from -3 to +85°. The launcher supports simultaneous firing of one missile. A new Mk 26 high-speed automated twin launcher with Mk 116 fire control subsystem became operational with the U.S. Navy in 1974. It permits launching Standard SAM's, Harpoon antiship missiles and ASROC antisubmarine missiles (installed aboard "Kidd"-Class ships). Development presently is being completed on a vertical-launch missile (ASROC-VLS), to be used with the Mk 41 vertical launcher.

After launch, the ASROC missile (Fig. 6 [figure not reproduced]) flies along a ballistic trajectory. Its flight distance depends on the vertical training angle of the launcher and the moment the time relay is triggered, and direction depends on the horizontal training angle. The motor separates in the vicinity of the target at a command from the time relay and the warhead with adapter flies by inertia. The warhead's flight on this leg is stabilized by a fixed tailfin (stabilizer) mounted on the adapter and it is slowed by parachute. Before hitting the water the adapter separates from the torpedo, which enters the water. At this very moment the parachute disconnects and the torpedo motor starts.

At a given depth the torpedo performs a target search using the homing system. After making a full turning circle without detecting the target, it shifts to maneuvering along a cylindrical spiral, submerging to a given search depth and then coming up to minimum depth. The torpedo sinks if the target is not detected, but if the target is detected the torpedo is guided to it by an acoustic homing head. If a nuclear depth charge is used as the warhead, it detonates at a given depth.

The British Ikara antisubmarine missile, created on the basis of the Australian missile in the 1960's by the firm of Hawker Siddeley, is distinguished by the presence of a homing system and modernized launcher with automatic reload. It includes the missile (the warhead is the Mk 46 antisubmarine torpedo or Stingray), launcher, and two subsystems (fire control; storage and reloading).

The Malafon antisubmarine missile developed in France during 1960-1965 also includes the antisubmarine missile of the same name, launcher, fire control subsystem and storage and reload subsystem. The warhead is the L4 antisubmarine torpedo (533-mm caliber) with a range up to 5 km.

Torpedo ordnance. Two 324-mm triple torpedo tubes (Mk 32) for firing small antisubmarine torpedoes guided in two planes are installed on practically all destroyers (except French ships). The most widespread torpedo in world navies at the present time is considered to be the American Mk 46, which belongs to the third generation of small torpedoes and has several modifications. The last modification, Mk 46 Mod 5, became operational in 1979. In its development attention was given above all to creating new homing head elements permitting an increase in range and effectiveness of detecting modern, quiet submarines when they employ passive and active sonar countermeasures. In addition, work was done to reduce the internal noise level, to increase the stability of torpedo movement under conditions of manmade jamming, to upgrade the heading instrument and automatic depth control, to increase capabilities of employing the torpedo in shallow water and its reliability as a whole, and to improve fuel system characteristics.

By producing the Mk 46 Mod 5 torpedo and modernizing previously produced modifications, the U.S. Navy command is attempting to halt their obsolescence until the appearance of new, more advanced models. A total of over 10,000 Mk 46 torpedoes have been produced in the period since 1965. They are used by navies of the United States, Canada, the FRG, Italy, Great Britain, the Netherlands, Greece and other countries. License production of Mk 46 Mod 5 torpedoes in Japan began in 1982.

The most up-to-date antisubmarine torpedo is considered to be the French Murene, which is expected to become operational next year. Development is concluding on new models in the United States (Mk 50), Italy (A290) and Japan (G-RX4).

Principal specifications and performance characteristics of torpedoes of modern destroyers are given in Table 3.

Table 3—Principal Specifications and Performance Characteristics of Torpedo Ordnance of Modern Destroyers

Type Torpedo (Developing Country), Year Operational	Caliber, mm/ Length, m	Weight, kg: Overall/ Explosive	Speed, knots/ Range, km	Maximum Running Depth, m
Mk 46 Mod 5 (USA), 1979[1]	324/2.6	233/45	45/10	Around 500
Mk 50 (USA), 1990	324/2.8	364/45	55/.	600
Stingray (UK), 1983[1]	324/2.6	267/45	40- 45/7.5	Around 700
L5 Mod 1 (France), 1973	533/.	1,000/.	35/.	.
Murene (France), 1992[1]	324/2.9	280-295/50	38 & 50/Up to 10	1,000
A244 (Italy), 1976	324/2.7	215/40	Up to 33/6	Around 450
A244/S (Italy), 1984[1]	324/2.75	235/34	30/6	.
Type 73 (Japan), 1973[1]	324/.	./.	Around 40/Up to 6	.

1. Also can be used as antisubmarine missile warhead.

Gun ordnance. The foreign press notes that the rapid development of shipboard missiles initially shoved guns into the background, but the experience of combat operations in local military conflicts after World War II showed that their role clearly had been underestimated and this led to creation of new ship gun systems abroad. General-purpose single gun systems and automated AAA systems became the most widespread among them.[3] The most widespread calibers among ship gun systems of foreign navies aboard destroyers are 100-127 mm, and several ships are outfitted with 57-76 mm turret gun systems. Gun mounts have much in common in their design execution. One of the primary objectives in developing them was to create reliable automated models with lesser weight. This was achieved by wide introduction of aluminum alloys, modular units and glass-reinforced plastics.

The principal specifications and performance characteristics of destroyer gun systems are given in Table 4.

Table 4—Principal Specifications and Performance Characteristics of Guns of Modern Destroyers

Name or Designation (Developing Country), Year Operational	Caliber, mm/Tube Length, calibers	Gun Mount Weight, tons/Projectile Weight, kg	Range of Fire, km/ Altitude Range, km	Rate of Fire, rounds per minute/ Ready-to-Fire Ammunition	Platform Classes
Mk 45 (USA), 1971	127/54	20/32	24/13.6	20/20	"Arleigh Burke," "Kidd," "Spruance"
Mk 42[1] (USA), 1955	127/54	60/32	24/13.6	40/40	"Coontz," "Charles F. Adams"; "Leutjens" (FRG); "Shirane," "Haruna," "Takatsuki," "Tachikaze," "Hatakaze" (Japan)

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OTO Compact (Italy), 1969	127/54	34/32	23.4/13.6	45/69	"Animoso," "Audace"; "Iroquois" (Canada); DDG 173 (Japan)
Mk 8 (UK), 1971	114/55	25/25.5	22/12	20/15	"Sheffield"
Mod 68 Compact (France), 1980	100/55	17/13.5	17/8	90/.	"Cassard"
Mod 68 Creusot (France), 1959	100/55	24.5/13.5	17/8	60/30	"Georges Leygues," "Tourville," "Aconit," "Duperee"
Mk 75 Compact OTO Melara (Italy), 1969	76/62	7.5/6.2	16.3/11.8	80/110	"Audace"; "Hatsuyuki," "Asagiri," "Murakumo" (Japan)
OTO Melara Super Rapid (Italy), 1985	76/62	7.5/6	16.3/11.8	110/.	"Animoso"
Mk 2 Bofors (Sweden), 1971	57/70	6.5/2.4	17/.	200/.	"Halifax" (Canada)

1. Designated the "73" aboard Japanese ships (produced under license).

The majority of modern surface combatants are outfitted with **deck-based helicopters**, but their characteristics and capabilities are not examined in this article.[4]

Main power plants. Twin-shaft main power plants putting out from 45,000 to 100,000 hp are used aboard modern destroyers. Ships of the "Arleigh Burke"-Class (USA) and DDG 173-Class (Japan) are to be outfitted with main power plants similar to the one used aboard "Spruance"-Class destroyers, boosting it to 100,000 hp. Plants are divided into three types depending on principle of operation and design execution: all-mode gas turbine plants and combination gas and diesel-gas turbine plants (steam turbine power plants are used aboard ships of earlier construction). The special position aboard new ships occupied by main power plants with gas turbines is explained by their positive qualities such as low specific mass, small dimensions, high maneuverability, adaptability for automation, and possibility of replacing machine units. Since an all-mode gas turbine plant was not created abroad before the early 1970's, combination gas- and diesel-gas turbine main power plants began to be used aboard ships with cruising-speed gas turbines and diesels and with full-speed gas turbines in which the combined operation of cruising and full-speed engines was not provided. This was facilitated by the operating conditions of power plants aboard ships, which operate for a large part of the running time at 30-40 percent of full output. Cruising-speed engines must satisfy requirements of high economy and long service life, and full-speed engines must satisfy requirements of low specific mass, quick start and power settings. Specific mass of the full-speed turbines being used is 0.8-1 kg/hp, and cumulative output is in the range of 20,000-28,000 hp.

These plants were used for the first time abroad aboard Canadian "Iroquois"- Class destroyers in the early 1970's and as early as the latter half of the last decade became widespread aboard ships of navies of other countries such as "Sheffield"-Class and "Hatsuyuki"-Class (Japan) guided missile destroyers. Olympus TM3B gas turbines with a maximum output of 28,000 hp are used in this plant as full-speed turbines and Tyne gas turbines of two modifications—RM1A and RM1C with an output of 4,250 and 5,340 hp respectively—are used as cruising-speed turbines. The output ratio of cruising-speed and full-speed engines does not exceed 20 percent. The makeup, principle of operation and configuration of this type of power plant can be examined in the example of the "Sheffield"-Class guided missile destroyer. Two TM3B gas turbines and two RM1A gas turbines operate two five-blade variable-pitch propellers designed with consideration of requirements of impact-resistance and low noise. Each turbine operates a propeller shaft through a double-reduction gear with a divided train and through a release clutch. A primary reduction gear is installed in the front section of the RM1A turbine module for a preliminary reduction in its frequency of revolution. Specific fuel consumption of TM3B and RM1A turbines is 214 and 221 g/hp-hr respectively. Each gas turbine is supplied to the ship as a unified module which includes a compressor, its air receiver, housing, and power turbine with outlet pipes and housing. The plant can operate even in the total absence of electrical power. The main power plant automated control system consolidates three functional subsystems which control the gas turbines (start, stop, power change), the connecting and disconnecting devices (engaging and disengaging clutches and reduction gears), and the variable pitch propeller (changing rotation frequency and angle of blade rotation). The entire power plant is accommodated in four compartments. The forward and aft compartments accommodate auxiliary machinery and two 1,000 kw diesel-generators each. Full-speed gas turbines are installed in the main engine forward compartment and cruising-speed gas turbines and main reduction gears are in the aft compartment.

In contrast to those examined in diesel-gas turbine power plants, LM2500 gas turbines with a maximum output of 27,500 hp are used as full-speed engines and diesels with an output of 4,000-6,300 hp are used as cruising-speed engines (ships of the French "Georges Leygues"-Class, the Italian "Animoso"-Class and the Canadian "Halifax"-Class). According to foreign press data, specialists show no preference for plants either of the first or second type and so they have been used to outfit an equal number of ships in one and the same years. At the same time, the greater economy of diesels and the better weight-size characteristics of gas turbines are noted.

All-mode gas-turbine power plants saw exclusive use aboard American ships ("Arleigh Burke," "Kidd," and "Spruance" classes) and Japanese ships ("Asagiri"-Class). LM2500 gas turbines are used aboard the former and SM1A gas turbines with a maximum output of 17,000 hp are used aboard the latter. Choice of the SM1A is dictated by its greater economy. The efficiency of the SM1A turbine with protracted output of 14,750 hp is 34 percent. For this same reason a plant consisting of TM3B and SM1A turbines was used for "Hatakaze"-Class ships. They operate together in a full-speed mode, but only the SM1A turbines operate in the cruising-speed mode.

A diesel power plant consisting of four 10,800 hp diesels operating two propellers was used for the first time aboard ships of this type ("Cassard"- Class). This is explained by the fact that air-intake and gas-exhaust devices of the gas turbine were incompatible with the adopted weapon mix, above all air defense weapons.

Electrical power is generated aboard ships by 3-4 diesels or gas-turbine generators, which in the majority of cases have a cumulative output of 3,000- 4,500 kw, reaching 6,000 kw on American ships.

Foreign specialists link further prospects for destroyer development above all with the buildup in series construction of "Arleigh Burke," "Cassard," "Animoso," "Asagiri" and DDG 173 class ships. The foreign press notes that the appearance of ships of this type with nontraditional architecture (catamarans) and dynamic support principles (air cushion, hydrofoil) is not expected because of the high degree of technical risk, enormously greater cost and absence of appreciable advantages over conventional hullborne ships.

Footnotes

1. For the beginning of the article see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 12, 1988, pp 60-66—Ed.

2. For more details on this see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 4, 1984, p 77—Ed.

3. For more details on them see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 2, 1989, pp 62-70—Ed.

4. For more details on ship-based helicopters see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 5, 1987, pp 54-62; and No 7, 1987, pp 54-63—Ed.

Containerized Shipments for the U.S. Army to a Theater

18010679m Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 66- 70

[Article by Col G. Germanov, candidate of military sciences]

[Text] Containers are being used more and more widely to ship military cargoes in armed forces of the United States and its NATO partners. The United States attaches special significance to containerization. This is explained by the global nature of American imperialism's aggressive objectives and preparation for deploying large military formations for waging wars on different continents, which requires the delivery of military equipment and other materiel in enormous quantities. In the assessment of specialists of the Pentagon's Unified Transportation Command, up to 80 percent of troop supply items and a considerable portion of ammunition can be transported in containers. Over two-thirds of these cargoes essentially already are being containerized now.

As noted in the American press, the U.S. Defense Department has no doubt as to the feasibility of massive military shipments of containerized cargoes over the country's territory to loading ports. To this end, under contracts prepared in advance, private companies will transfer around 95,000 containers (in the 6-m equivalent) and 60,000 trailers to the Defense Department with the beginning of mobilization. In the opinion of foreign experts, the Unified Transportation Command also will experience no shortage of port equipment for loading containers aboard vessels. The United States presently has the world's largest container inventory and a fleet of containerships which is being developed with consideration of military-technical requirements and Armed Forces' needs. In addition, U.S. NATO allies have pledged to place 400 dry-cargo ships, including 80 containerships, at its disposal in case of a war in Europe. Appropriate documents already have been prepared for their use.

The Army command devotes much attention to organizing military container shipments to a theater. The foreign press notes that the effectiveness of logistic support to U.S. Army combat operations in overseas theaters will depend largely on reliability of containerized shipping, which depends on continuous monitoring of the presence and movement of containers and centralization of control over the container inventory and the status of the transportation system.

Missions of organizing shipping within theaters of operations are assigned to the theater army command. Military movement control centers handle these matters directly; their sphere of responsibility extends to the entire theater, communication zone, rear area, combat zones or army corps rear area depending on the forces and assets involved as well as the volume of cargoes being carried. These centers coordinate the activity of rear services and transportation units or subunits in accomplishing containerized shipping. Immediate direction of containerized shipping is exercised by the Unified Containerized Shipping Office, which accounts for containers and monitors their location and technical condition.

Each unloading point and each consignor and consignee notifies the appropriate military movement control center about all operations of receipt and return shipment of containers. This information goes to the very same kind of center in the theater, an agency of the theater army transportation command, which coordinates the sequence of containerized shipping and container movement routes with the theater army logistic support center.

American specialists plan to use all kinds of transportation to carry out containerized shipping in a theater. For example, rail transportation (where there is a developed rail network actually operating) will play the chief role in delivering a large number of containers from coastal discharge points or ports to the communication zone and rear area of the combat zone. Motor transportation will find widest use in the theater in delivering containers to the combat zone to subunits subordinate to the division support command. The military press also emphasizes that this is the chief ground form of transportation by which containerized shipping is accomplished in the overall system of delivering army supplies in overseas theaters.

It is planned to use inland water transportation for shipping containers from shore loading-unloading terminals to reduce the load on other kinds of transportation. It is especially effective in shipping large lots of containerized cargoes and can be used as a reserve supply channel, but this form of transportation has inherent deficiencies such as low rate of delivery and great vulnerability.

The primary principle of container distribution and use is their delivery as close as possible to forward operating units. The chief factor determining where to send supplies in containers and the types of containers is a supply subunit's capability to receive and issue supply items of a given class in a specific combat situation.

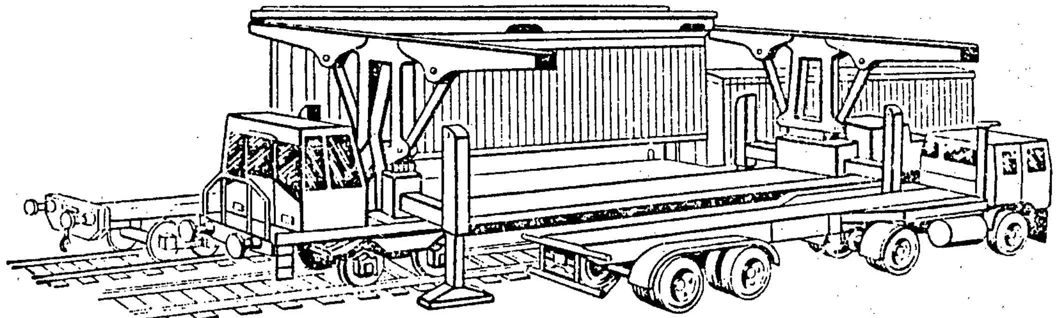
Daily delivery of cargoes to the communication zone and corps rear areas both in military (belonging to the Defense Department) as well as civilian (commercial) standard containers 6.1x2.4x2.4 m and 12.2x2.4x2.4 m in size and with a capacity of up to 25 and 50 tons respectively is envisaged in organizing containerized shipping to a theater of operations. Lightweight 6.1x2.4x2.4 m containers are intended for airlifting cargoes. Transportation of cargoes in the communication zone and corps rear areas from one rear unit and subunit to another as well as from them to division rear subunits can be accomplished in TRICON containers. Containers with especially important and expensive cargoes and container-shelters (intended for storing cargoes) are delivered directly to the recipient from the continental United States.

Approximately 75 percent of orders from division rear subunits for delivery of cargoes from the communication zone are accomplished by assets of division and corps rear, while the rest are satisfied by units and subunits of the higher rear.

All containers are unloaded in a short time as they arrive from the United States to theater ports. Organic and attached transportation units and subunits of the theater army transportation command perform loading and unloading in ports and transport containers to points and areas of operational destination. The headquarters and headquarters company of the transportation command plan the work of receiving and issuing container cargoes at ports, while subunits or battalions from the unloading terminal service team are directly responsible for complete and timely receipt (or issuing) of containerized cargoes in ports.

The service and unloading battalion is made up of two service companies, a lighterage subunit, and an assault landing craft company. The primary operating area of

Fig. 1. Rail container transloader in working position



such a battalion and its subunits is the terminal. In 20 hours of work the service company can unload up to 720 containers in the port or up to 300 over the shore. This subunit allocates containers to lots in accordance with their destination, loads them on ground vehicles, prepares accompanying documents and is responsible for safekeeping of the cargo.

The foreign press notes that the unloading ports and container transportation routes to the recipients are considered to be bottlenecks for containerized shipping in a theater of operations. The United States and other NATO member countries have been intensively exploring various directions in recent years in this connection, placing special emphasis on creating means for rapid deployment of an offshore transshipment point (terminal).

The United States has developed various means for offshore unloading of containerships over the shore. In this case it is planned to use assault landing craft, self-propelled and nonself-propelled pontoons (they also can be used as trestle sections), and lighters for delivering containers ashore. Preference is given to air cushion vehicles, for which it is not necessary to build berths and trestles near shore. The U.S. Army has adopted the LACV-30 vehicle specially developed for these purposes with a cargo capacity of 30 tons and developing a speed up to 40 knots.

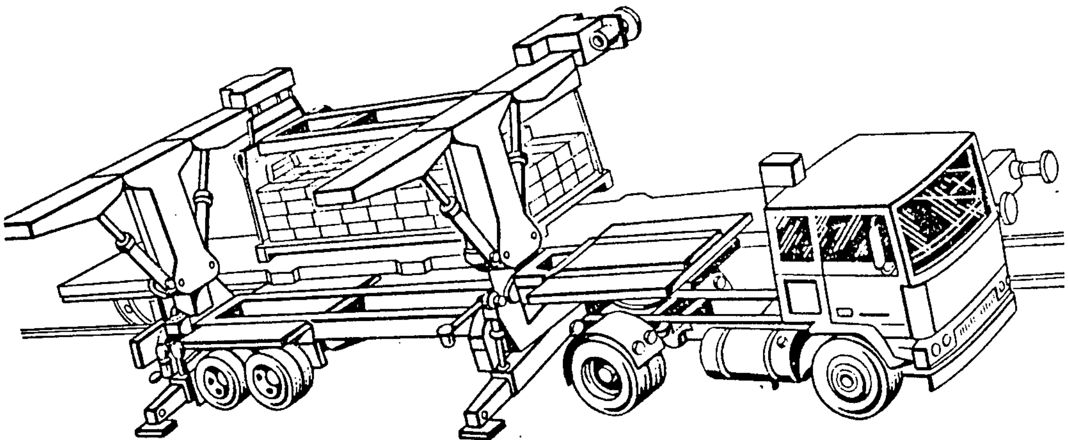
The FRG has designed an amphibious vehicle, the AT400 amphitrack, which can be used as a lighter for offshore unloading of vessels. Its speed in calm water reaches 6.1 knots. The size of the amphitrack (6.3x2.5x2.6 m) permits carrying one 6-m container, and a crane is installed on it for loading and unloading operations.

The Pentagon proposes to use organic Army DC-Long barges of types A (90x24 m in size) and B (45x18 m), on which one crane each is installed, as a highly mobile means of setting up an offshore container terminal. They are delivered to the destination by "Seabee"-Class lighters (each lighter takes aboard four Type B barges). The design of a merchant vessel for carrying two Type A barges also was developed with consideration of U.S. Defense Department requirements. A special exercise was conducted in the United States in 1984 in the vicinity of Fort Story, Washington for offshore unloading of a containership using the crane vessel "Keystone State." One thousand containers were used in the exercise for practicing problems of transloading and transporting over rugged terrain. Their unloading rate reached 300 per day with a wave height up to 1.5 m. Containers were delivered ashore by various floating craft, including ten LACV-30 vehicles. Also tested was a light amphibious container transloader with a cargo capacity of 20 tons capable of receiving 6-m containers from floating craft and delivering them ashore at a speed of 3.6 km/hr with a wave height up to 1.5 m.

American military specialists believe that difficult problems can arise when transporting containers over rugged terrain under roadless conditions. In this connection, in recent years NATO countries have developed container transloaders of several types for operating under such conditions. For example, the FRG is producing KM 26 and KM 32S container transloader vehicles, which are being delivered to the U.S. Armed Forces in West Germany. The Wishbone Company (USA) fabricated a transporter with improved offroad capability capable of receiving containers from floating craft or a berth and delivering them to their destination without using cranes. A special DROPS crane system has been designed in Great Britain for operation at temporary railroad stations and field depots. It can be mounted on the chassis of a vehicle with improved offroad capability and is capable of lifting containers off the surface of the ground. The (Lanks Bos) company created a 25 ton container lift truck with high offroad capability.

In addition, Western European NATO countries have self-propelled rail and vehicular container transloaders. They are intended for rapid loading and unloading of containers and for transloading them from railroad flatcars to motor transport and back. The rail transloader, a line crane (Fig. 1), is suitable for operating anywhere there are two parallel railroad tracks. The transloader consists of a railroad flatcar and two T-shaped hoisting mechanisms installed on it that fold during transportation. It takes four minutes to transload one container, counting the vehicle's movement alongside the train being unloaded. The line crane is transported as part of

Fig. 2. T-lift vehicular container transloader unloads a 6-m pallet from a railroad flatcar



the train, but it can move under its own power at a speed of up to 24 km/hr, towing five flatcars (each 18 m long) loaded with containers.

The T-lift vehicular container transloader (Fig. 2), intended for working at field supply stations, has been developed on order of the British Defence Ministry. The transloader consists of hoisting mechanisms with a cargo capacity of 20 tons mounted on one chassis. The hoisting mechanisms can be folded for transporting. The vehicle's capacity is ten transloadings of 6-m containers or packets of the same size per hour. Around 30 companies of NATO countries are engaged in developing and fabricating military container processing and transportation equipment.

At the present time various supplies are delivered to theaters in containers in the troop logistic support system. Containers with vibration dampers and cargo displacement limiters usually are used for carrying ammunition. Their transportation is organized by military movement offices of various levels in close coordination with theater army logistic centers and army corps support command authorities. The sequence of shipping ammunition is determined based on the real need of troops and capabilities of rear subunits for receiving it.

It is the practice to have direct delivery of containers with ammunition from unloading ports to corps ammunition supply points and transfer points as well as to combat units and subunits (eliminating one or more intermediate echelons). Western specialists consider this method of transportation the most effective and recommend using it in supplying ammunition of higher consumption. It is noted that with maximum use of direct containerized ammunition shipments, the bulk of ammunition will be delivered from the continental United States to depots in the communication zone and army corps ammunition depots. As a rule, it is planned to transport general-type ammunition in 6-m containers. Ammunition is delivered to supply points in the division rear with maximum use of pallets, packets and individual packaging as well as by item. Its delivery to those supply points in containers is prohibited.

Rear subunits have 22.7 ton and 1.8 ton lift trucks as well as mobile unloading platforms with a variable angle of inclination of the working surface for organizing the unloading of ammunition at depots of the communication zone and in the combat zone. Temporary storage of loaded containers at depots of the communication zone and corps rear is permitted only for ammunition of higher consumption. At times, depending on the situation, temporary storage of containers on truck trailers is allowed at corps supply points if there is an appropriate authorization of the theater army military movement control center or the corps rear command authority. The demand for increased mobility precludes temporary storage of containers with ammunition on the ground.

Food, military property and other kinds of supplies can arrive in a theater in commercial 6-m and 12-m containers. They can be delivered to supply subunits of the logistic support group of areas or of the army corps rear. It is planned to use refrigerated containers for delivering food products to corps rear subunits. Further delivery of perishable food products is done in military refrigerated containers 6 m long, which are authorized property of corresponding rear subunits.

Containers with these kinds of supplies are accepted as follows. Supply subunits in the communication zone or corps rear receive notification about the arrival of cargoes from logistics centers. At the unloading sectors transportation equipment is freed of the containers and loaded with empty containers as well as with cargoes to be sent back to the continental United States, and it returns. Containers arriving in division subunits or in units of corps subordination are immediately unloaded and returned on the very same means of transportation. Delivery of supplies from division rear subunits to combat units is organized by the recipients' transportation, with wide use of pallets and packets. As a rule, containers are not used at this delivery echelon. If cargoes are intended for a large number of recipients, they are sent to a unified distribution point, where containers are unloaded and supplies are carried off by the recipient's transportation.

The U.S. Army rear military transportation command developed several of its own data processing systems for monitoring the movement of military containers over general-purpose transportation systems. For example, the Scicon's Scinapse automated shipping planning system provides the consumer with a high degree of coordination with various entities in the course of integrated shipments. The DASPS-E upgraded automated port management system with computer equipment installed in a motor vehicle is one of the latest developments. It is intended for ensuring the coordinated work of different systems for transporting military cargoes as well as of logistic support systems, especially in landing an amphibious assault force.

A need for container repair arises in carrying out military containerized shipping. Appropriate documents specify that all containers being used in the logistic support system in a theater of operations should be repaired if necessary. The volume of work is determined by that minimum necessary for ensuring the delivery of containers to the consignee and back without downtime. Repair is performed by equipment maintenance subunits of operational and combat rear services of theater ground forces and by civilian enterprises under contract. Maintenance work can be done at container areas or directly on the shoulder of the road.

The foreign press notes that containers are used not only for shipping military cargoes, but also for accommodating personnel and various services and establishments under field conditions. Container sets have been developed which are assembled from several units for use as staff spaces, messhalls, kitchens, bathhouses, communication centers, hospitals, workshops and so on. For example, a containerized field kitchen supports the preparation of 500 meals per day, up to ten persons can wash at the same time in a containerized bathhouse, and a container for housing is designed for eight persons (with two-tier accommodation). Great Britain has made a field hospital set with an area of 160 m^2 consisting of seven modules based on standard containers. The United States has created an experimental 400-bed modular hospital (carried in 42 standard troop containers). Work in this area also is being done by other NATO countries as well as by Israel.

These data indicate that along with its allies in the NATO bloc, the United States is creating a developed transportation equipment system for organizing massive containerized shipping to theaters of operation. It is planned to make wide use of special (as applied to wartime conditions) container transportation and processing equipment in the system in addition to commercial container transportation assets.

Independent European Program Group

18010679n Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 72- 73

[Article by Maj V. Surkov under rubric "At the Readers' Request"]

[Text] The Independent European Program Group [IEPG] was formed at a conference in Rome in 1976 with the objective of broadening military- industrial cooperation of Western European NATO countries and involving France, which is not part of the bloc military organization, in this process. At France's demand, the group officially is called "independent," although it operates exclusively in the interests of the North Atlantic Alliance military organization. It includes 12 countries of the NATO Eurogroup (Great Britain, the FRG, Italy, Belgium, the Netherlands, Denmark, Norway, Greece, Turkey, and since November 1972 Spain, Portugal and Luxembourg) and France.

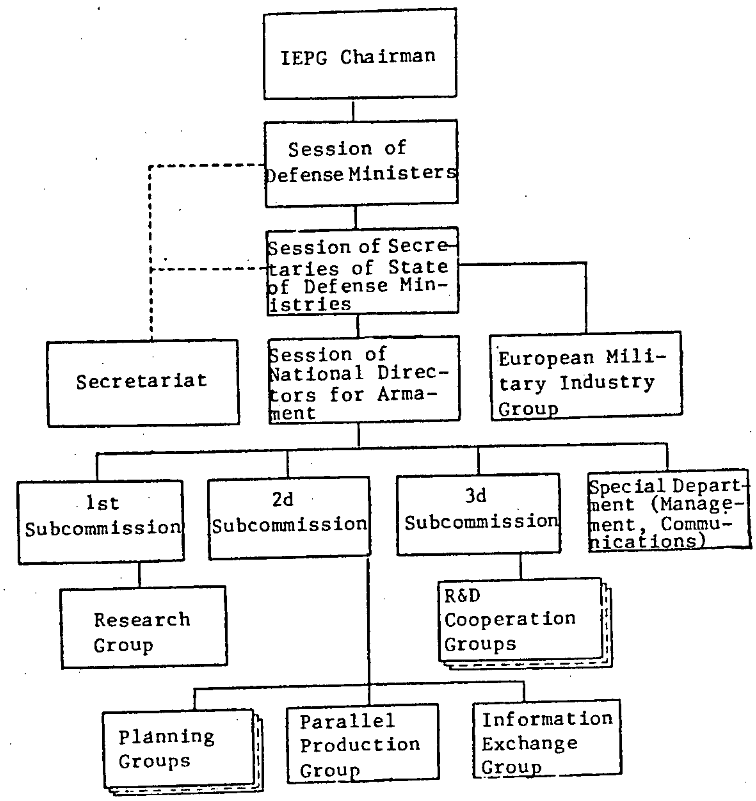
This organization's basic objectives and tasks are to improve the production base of the European military industry and improve its capability to compete in the world arms market; to reduce the dependence of European countries on military deliveries from the United States; to study the needs of European NATO countries for arms and military equipment; to concentrate forces and assets aimed at developing new kinds of armament and producing and creating reserves of weapons and military equipment; to ensure a high level of coordination of national plans for military production, standardization of weapons and military equipment, and the entire production chain from development to the output of manufactured products; and to improve cooperation of European countries with the United States and Canada in the field of arms production.

With the objective of raising its prestige, the group has been headed since 1985 by a chairman at the level of defense minister of one of the member countries, who is chosen in turn for a period of one year.

The IEPG organizational structure is shown in the diagram. The group secretariat is located in Brussels and coordinates IEPG activities in the period between sessions of defense ministers and secretaries of state (deputy ministers) of defense ministries of member countries. The secretariat prepares summit meetings.

The 1st subcommission determines possible directions of military-industrial cooperation of IEPG member countries and, with the assistance of its subordinate research group, draws up directive plans for cooperation.

The 2d subcommission monitors the work of planning groups (their number may vary), which are responsible for realizing specific projects in all phases. The parallel production group and information exchange group also work within the scope of the 2d subcommission.



The 3d subcommission is responsible for technological processes being used by firms of IEPG member countries in the course of joint development and production of military equipment models, and it exercises coordination within the framework of IEPG in conducting joint research and development of technologies through the R&D cooperation groups (established as necessary).

The IEPG has close contact with permanent NATO entities. Representatives of bloc leadership ordinarily attend its sessions. In its work the group is permitted to use results of research performed by the NATO Consultative Committee on Armament, as well as by entities of the Western European Union. Great significance is attached to permanent contact with the United States and Canada for resolving questions of standardizing arms within the framework of the NATO bloc as a whole.

IEPG member states drew up proposals for establishing a "Western European common arms market," which were discussed at a session of ministers of defense of group countries in Brussels in June 1987. What is envisaged is the conclusion of agreements on deliveries of a number of arms models on a competitive basis with compulsory establishment of fixed prices for the entire period of sale of each project. It is planned to establish a centralized card catalogue of potential orders for joint use by firms of states belonging to the IEPG. Special attention is given to the need for establishing a national R&D finance fund based on money allocated from defense ministry budgets to finance major long-range research. It is proposed that its amount initially should be 100 million ECU's (the European unit of account), and then be maintained annually at a level of 500 million ECU's.

At the present time the largest military-industrial cooperation projects are production of a medium-range surface-to-air missile system and creation of a third generation antitank missile system. European cooperation has begun in the sphere of military aircraft construction.

The progressive western press notes that activity of the IEPG as a means of improving the conveyer for producing the latest kinds of weapons will contribute to a further unwinding of the next spiral of the arms race.

U.S. Armed Forces Manpower Acquisition: A Problem of Personnel Quality

18010679o Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) p 75

[Article by Col M. Slobodyan, candidate of historical sciences, docent]

[Text] Lately the U.S. Armed Forces have been devoting more and more attention to qualitative characteristics of personnel. The course toward priority of quality was set back in the 1970's after the failure of the armed adventure in Vietnam. The considerable human losses, numerous cases of desertion and draft evasion, the growth of antiwar sentiments among the troops, and the intensification of drug addiction and alcoholism contributed to a sharp decline in the prestige of military service and to reduced combat effectiveness of officers and men. Along with other factors, the "Vietnam syndrome" forced the American administration to take a new look at the system of Armed Forces manpower acquisition. Since 1 July 1973 force organization of the Armed Forces has been accomplished wholly on the basis of volunteer enlistment in accordance with a special law.

Funds for such a modernization of the Armed Forces were sought in particular at the expense of a reduction in the numbers of personnel and the number of permanently operating air and naval bases. For example, according to the journal JANE'S DEFENCE WEEKLY, while the United States had 2,200 bases around the world in late 1945, now only 759 are being actively operated, with half of them situated along the USSR borders.

Finances freed up in this manner permitted significantly raising the salaries of all categories of servicemen. This noticeably increased expenditures for the support of personnel, which in 1986 was around $75 billion. According to estimates of American experts, in 1989 it is planned to allocate $78,590,000,000 to support over 2.1 million persons in the regular U.S. Armed Forces. Thus on the support of one serviceman averages $140,000 per year, while in France it costs $80,000, in the FRG $60,000 and in Great Britain $50,000.

The significant increase in servicemen's pay under conditions of mass unemployment permitted reducing the shortage of those desiring to serve in the Armed Forces and improving personnel quality indicators, and in particular raising their educational level. While in 1979 only 68 percent of new recruits had a secondary education, now the figure is 93 percent. At the same time demands rose on reliability, professional suitability, physical training and so on. For example, those with AIDS are subject to immediate release from the Armed Forces. The very same concerns persons noted as using drugs. While in 1980 they made up 25 percent of the total number of servicemen, by late 1987 the figure was 5.5 percent. High monetary fines are imposed for drunk driving and for a number of other offenses connected with use of alcohol.

Such requirements on the personnel led to a perceptible strengthening of discipline among the troops. More rigid demands on officer selection also contributed to its increase. The class principle is the basis for forming the officer corps. At the present time 60 percent of Air Force officers and 25 percent of officers in other branches of the Armed Forces are graduates of prestigious universities and other higher educational institutions in which it is too costly for simple folk to study. Black officers make up only 6.5 percent, and there are only a few black generals.

The American command believes that these measures permitted a significant improvement in quality characteristics of Armed Forces personnel, particularly military discipline, industriousness, combat effectiveness, dedication to the bourgeois system, and hatred for socialism.

USA-Australia: Lease of Bases Extended

18010679p Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 76- 77

[Article by Col V. Mitrich]

[Text] Granting territory of the fifth continent for use in the interests of the U.S. Armed Forces is one of the directions of Australia's military cooperation with the United States. The Pentagon has established over 15 military bases and installations here which play an appreciable role in supporting U.S. combat activity.

In late 1988 these two countries extended for another ten years the effective period of an agreement for U.S. lease of military installations at Pine Gap and Nurrunga (the official names are the Joint U.S.-Australian Military Space Research Center and the Joint U.S.-Australian Military Satellite Communication Center). Actually, however, these are centers for collecting intelligence.

The center at Pine Gap for receiving information and transmitting commands to satellites was established on the basis of a 1966 U.S.-Australian agreement. It is located in the country's desert area not far from the city of Alice Springs (Northern Territory) in a spot where least cloudiness on the globe is seen and occupies an area of around 26 km^2. In the mid-1980's over 200 American specialists worked there, some of whom were connected with leading military-industrial forms engaged in producing electronic and space equipment, while the others were associates of intelligence services. Referring to words of a former CIA associate, the WALL STREET JOURNAL wrote that Pine Gap resembles a giant vacuum cleaner which sucks in all possible electronic signals ranging from telemetry data transmitted during tests of Soviet rockets to ordinary telephone conversations.

The center at Nurrunga for receiving and processing data from satellites began functioning in 1971 (in accordance with a 1969 agreement). It is near the city of Woomera, in the state of South Australia. A ground station has been set up here which is part of the American IMEWS space system warning of a nuclear missile attack.

Emphasizing the importance of these installations in announcing the extension of agreements in Parliament, the Australian prime minister noted that these centers play a key role in collecting intelligence. Although officially called U.S.-Australian, the local press notes that in fact they have been repeatedly used by the Pentagon in U.S. interests behind the backs of the Australian people. In order to somehow calm the public and reduce activeness of a protest movement against the presence of American bases in Australia, government circles are attempting to prove that the military installations are becoming more and more "Australian": citizens of this country will become deputy chiefs of the centers and in the next two or three years the proportion of Australians engaged in operational work at Pine Gap and Nurrunga should increase.

Despite such assurances the number of demonstrations against these so-called joint installations on the part of a considerable part of the populace is not lessening. Each year peace proponents travel to Pine Gap to express a demand to remove foreign bases from Australian territory. The extension of agreements announced in December 1988 caused a new wave of protest.

Deliveries of PLRS System to U.S. Marines

18010679q Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 3, Mar 89 (signed to press 9 Mar 89) pp 77- 78

[Article by Col R. Dasayev]

[Text] Troop deliveries of the PLRS (Position Location Reporting System) automated system for position finding, identification and data transmission[1] have begun. Its development has been conducted by Hughes since the mid-1970's. Judging from foreign press reports, intensive retraining of personnel of the 1st Marine Division (Camp Pendleton, California) is presently under way on the new system (a complete authorized set was deployed in its subunits in 1987). During 1988 the PLRS was used under actual field conditions in a period of exercises in Southern California.

According to the assessment of American specialists, the new system will enable continuous monitoring of the location of subunits of friendly forces and assets; getting orders promptly to subordinates and receiving brief reports on the situation from them in a formatted version (as a result of processing the sum total of such data); determining the location of friendly forces on the battlefield, identifying them and transmitting data on the status of those elements to commanders at the operational-tactical level and to their command and control entities; and it will enable commanders to exercise command and control of combat operations.

The foreign press points out that with the PLRS system it is possible to determine the location of mobile equipment and perform a topographic survey of firing positions on the terrain; for a lone infantryman to determine azimuth and distance to his own subunit; to guide aircraft into a given corridor and lead them out of it; to exchange combat information between various echelons in the form of brief formatted reports; and to inform personnel of serious weather changes, natural disasters, the presence of minefields, and routes for bypassing them. Its operation is based on the "question-answer" principle with time division of channels and multiple remote access on one carrier frequency in the decimeter radio wave band. The triangulation method is used for determining the position of friendly forces and assets (with an accuracy to 100 m), particularly for measuring distances between points with known coordinates and points whose coordinates must be determined.

The authorized system set includes two control centers and several hundred (up to 400) transponders, which are portable (see figure [figure not reproduced]) or are installed in combat vehicles, aircraft and helicopters.

The control center synchronizes the operation of all transponders, determines their position, identifies, and transmits necessary data. The transponders, manufactured in five modifications, consist of a data reception, processing and transmission unit as well as an indication and control panel.

The PLRS system is intended for outfitting the Marines at the regiment-brigade level. In the next few years another six system sets including 12 control centers and around 1,600 transponders should be delivered to the Navy.

An improved version of the PLRS system presently is being developed for the Army. It will be part of the ADDS (Army Data Distribution System) integrated data transmission system. Hughes is to supply 11 modernized control centers and over 2,000 modernized transponders to the troops for this system.

Footnotes

1. For more details on it see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 3, 1985, pp 63-67—Ed.

Articles Not Translated from ZARUBEZHNOYE VOYENNOYE OBOZRENIYE No 3, March 1989

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