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FOREIGN MILITARY REVIEW

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The Party: Initiator and Leading Force of Restructuring

18010451a Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 3-6

[Lead article]

[Text] The fourth year has begun since the April 1985 CPSU Central Committee Plenum proposed to the party and people a new strategic course for improving socialism—a course toward accelerating the country's social-economic development, increasing its contribution to the campaign for peace and international security, and resolving other problems common to all mankind.

The party's elaboration of this course in the process of preparing for the 27th congress demonstrated that its realization requires a revolutionary restructuring of all spheres of domestic life and of the international activities of Soviet society. It became clear that without such a restructuring Soviet society cannot emerge from the stagnant precrisis condition it was in at the beginning of the 1980's.

Therefore creation of restructuring theory and policy became an urgent and most important immediate task of the party, and the party resolutely took up this matter. Following the April 1985 CPSU Central Committee Plenum the Central Committee, Politburo, Secretariat, Central Committee staff, and republic and local party committees unfolded active work in search of ways to restructure and in selecting the directions and methods of work. Party committees and primary party organizations were initiators in conducting numerous experiments for these purposes. The entire army of party members over 19 million strong began to join in the work of elaborating restructuring theory and policy.

Resolutions of the 27th party congress and of subsequent Central Committee Plenums contain a specific program for restructuring party work in accordance with contemporary requirements. Its essence is that each party organization (the party has over 440,000 primary party organizations) must live in an atmosphere of search for a renewal of forms and methods of its activity. This can be done only through the efforts of all party members along the path of a comprehensive development of democracy within the party itself by implementing at all levels principles of collective leadership, development of criticism and self-criticism, control, and a responsible attitude toward the job.

The CPSU immediately defined the objective and course of revolutionary restructuring precisely and clearly: more socialism, and not a drift away from its values, ideals and achievements. The party persuaded the Soviet people that at the present stage of development there is no path outside of revolutionary restructuring for realizing the ideals and historic objectives of the Great October Socialist Revolution. The party headed up nationwide preparation for the 70th anniversary of October under the badge of an analysis of our entire path from the standpoint of historical truth without belittling the great historic achievements of all preceding generations of the Soviet people and without bypassing dramatic and tragic pages in their history.

A bold, truthful analysis of history permitted the CPSU to uncover deep-seated roots of stagnant phenomena in Soviet society and the reasons for deformations and deviations from genuine socialist ideals and values. The roots of these phenomena lay in the system of command-administrative methods of managing the process of building socialism and in the stubborn desire of Stalin and his closest entourage to improve the low social-economic effectiveness of these methods at any cost including even the broad use of repressive measures.

At the same time a scientific analysis of historical experience permitted the party to draw a substantiated conclusion that revolutionary restructuring which had unfolded in the country is a continuation of the cause of the Great October. Its most important objective is to restore the Leninist concept of socialism as a genuinely humane and democratic social system. In a speech at the February 1988 Central Committee Plenum M. S. Gorbachev emphasized that "we are striving to revive the Leninist makeup of the new system under present-day conditions, purge it of stratifications and deformations and rid it of everything that shackled society and did not allow it to fully realize socialism's potential. Most important, we are striving to give socialist society a new quality with consideration of all realities of the modern world."

The party created the restructuring concept in less than three years. This concept took shape not as an abstract theoretical construction insufficiently linked with life, which happened at one time with the theory of developed socialism, but on the basis of public discussions, a socialist pluralism of opinions, and with the participation of millions of party and nonparty members. The broadest glasnost and a comparison of viewpoints on the theoretical conclusions, opinions, and practical proposals which were advanced were assured. This decreased the likelihood of a separation of theory from practice. The party arrived at the seriously verified conclusion that the heart of restructuring consists of a line which contains two interrelated, interdependent aspects. They are the democratization of all public life and a radical economic reform.

Having developed the concept, theory and policy of restructuring, having defined the principal directions and tasks, and having received nationwide approval and active support, the CPSU thus ensured the transition to a new second stage of restructuring—the stage of practical realization of its objectives and tasks.

The moral-political atmosphere in society changed thanks to party efforts. A process of normalization of the economy began and a new attitude toward the social sphere and toward man's social-economic and spiritual interests began to be established. Spiritual and ideologial life became more complex and richer, and its potential began to grow appreciably. Soviet citizens' political and civic activeness rose sharply. A campaign unfolded against corruption, bureaucratism, unwarranted levelling and other phenomena alien to socialism. The public apathy, passiveness and free-ride mentality which had become widespread in the period of stagnation began to be overcome. Administrative-command methods and their corresponding work style were crowded out and a process began for a transition to economic methods of management as well as to a democratization of processes of personnel selection and advancement. At the same time all the cumbersomeness and inertia of the mechanism that was retarding and narrowing the scope of realization of socialism's principles and its constructive, creative potential was revealed in the course of restructuring.

The second stage of restructuring objectively required a further intensification of activeness by the party itself, a deepening of the restructuring of its own activities, and an increase in its role in the nationwide movement for a revolutionary renewal of our life. M. S. Gorbachev notes that "today as never before the attainment of our goals depends on how successfully the CPSU fulfills the role of society's political vanguard. The fate of restructuring depends to a decisive extent on how the CPSU, the party Central Committee, the union republic Communist Party central committees, each party committee, the party organization, and every party member will act."

An increase in the party's role and that of every party member in supporting restructuring and activation of the party's political, organizational, and ideological activity and personnel work represent the decisive condition for successful development of the second stage of restructuring and for Soviet society's movement toward a qualitatively new status.

Having proclaimed a course toward a qualitative renewal of society, the CPSU began the restructuring with itself, with a restructuring of all aspects of its activity. This work is complex and responsible. It requires a break from obsolete, ineffective methods of activity, a search for new and more advanced forms of party work, and mastery of work skills under conditions of genuine democracy, glasnost, and increased activeness of the masses. This is not done all at once. It was V. I. Lenin who warned about this. In a speech at the closing of the 11th party congress on 2 April 1922 he said: "The entire crux of the matter now is for the vanguard not to fear to work on itself, to remake itself, to openly acknowledge its insufficient preparedness and insufficient ability" ("Polnoye sobraniye sochineniy" [Complete Collected Works], Vol 45, p 137).

The party values its authority and its enormous services to the people and history, but it views them from the standpoint of responsibility for the effectiveness of its work in directing a deepening of restructuring. Therefore the party made the attitude toward restructuring and the desire and ability to restructure, to participate and play a leading role in the restructuring of labor collectives and all groups of the country's population the principal criterion in evaluating the activity of a specific party member, party organization and party committee of any level.

In its organizational work the CPSU strives to resolutely rid itself of relapses of command-administrative methods and of substitution for soviet and economic organs and public organizations. The party fulfilled the role of organizer of the Soviet people at all stages in the building of socialism and in defense of its achievements because party members faithful to Lenin's principles and the Leninist style of conducting party work remained among party cadres. Command-administrative methods led to substitution for and duplication of functions of soviet and economic organs and public organizations by party committees and organizations, but this did not contribute to a growth of party, political and ideological influence on the activity of these elements of Soviet society's political system and led to an ineffective expenditure of efforts of party members, party committees and party organizations. The party considers scientific distribution of functions among elements of Soviet society's political system, and above all assurance of sovereignty of the soviets, to be one of the important directions of restructuring.

A thorough mastery by all party members of the ideology of restructuring and their active ideological indoctrination work in labor collectives, with the youth, in families, in public organizations, and in informal associations has become one of the key tasks of party work under present-day conditions. Experience shows that the general course of restructuring seriously depends on the process of spiritual renewal, which is one of the most important objectives of restructuring but is also one of the decisive means for implementing it. People's activeness in matters of restructuring depends on their awareness and their political and moral-psychological mind-set.

Experience has shown that the spiritual life imposed by command-administrative methods possesses a great force of inertia. Overcoming the dogmatism imposed by such methods is a complex and at times painful process.

An incorrect opinion that allegedly the Soviet people achieved such outstanding historic achievements as building the foundations of socialism in the prewar years, victory in the Great Patriotic War, restoration of the national economy, attainment of military-strategic parity between the United States and USSR, and progress along the path of improving socialism's material-technical base in a number of directions during the 1950's-1970's specifically because of these methods

(methods moreover elevated to the absolute) and not in spite of them became firmly established in the consciousness of a certain part of Soviet citizens, including party members and party cadres.

Even the precrisis situation is perceived by adherents of command-administrative methods not as proof of their incompatibility with the nature of socialism but allegedly as the result of their ineffective application. Hence the illusory hopes for correcting the state of affairs by improving these methods, and in some people even a yearning for times of their unlimited application and for "order," and justification of facts of bureaucratic arbitrariness and even repression allegedly because of higher interests of socialism and the people.

Soviet society's approach to the precrisis point in the early 1980's forced party members and nonparty persons to think of ways to get out of the situation at hand. In April 1985 party leaders and the party Central Committee chose the path of a critical reinterpretation of all historical experience in building and improving socialism, the path of a creative solution to new domestic and international problems facing Soviet society. An analysis of the existing situation and processes which led to it showed that the system of command-administrative methods not only had fully outlived its day by the early 1980's, but never even conformed to the democratic and humane nature of socialism and the interests of ensuring its security and the development of weighed relations with the world community.

Having set the course for restructuring, the CPSU produced new political thinking on problems of world development. From the standpoint of this thinking the CPSU took a new approach to questions of war and peace and the campaign for international security, to provisions for national defense, to military organizational development, and to activities of the Soviet Armed Forces. The CPSU introduced fundamental changes to military doctrine, advancing as its main objective the prevention both of nuclear and conventional war. This provision has been included in our military doctrine for the first time in such a direct statement. Of course the campaign against war was envisaged in the USSR's military activity even earlier, but at the present time, when war is tantamount to catastrophe for all mankind and when it creates a threat to the existence of civilization, this task has been moved to the foreground in our doctrine.

The CPSU essentially developed a concept for restructuring the functions, missions, structure, and internal life of the Armed Forces. The principal goal of structural restructuring is to bring the Armed Forces' organization into strict conformity with the defensive character of military doctrine. A renewal of internal troop life is called upon to ensure development of democratic norms and principles and of glasnost, an increase in the personnel's activeness and responsibility for combat readiness of military units and ships, and strict compliance with the norms and requirements of military discipline.

By overcoming inertia Army party organizations are deepening the restructuring of their activity. Those which have advanced further than others have rid themselves of formalism and empty, unbusinesslike fuss in organizational and ideological indoctrination work to a greater extent and have added appreciably to their influence on life and on end results of the work of military collectives. Efficiency and discipline have become considerably stronger; the culture of relations among superiors and subordinates as well as of relations between nationalities and the solidarity of multinational military collectives have grown; attention and businesslike efficiency in resolving social problems have intensified; and there has been a noticeable increase in the level of military-professional training of all categories of personnel and a resulting increase in the quality of combat readiness. Demands on each party member for results of official activity and for his or her moral-psychological makeup is becoming firmly established and a spirit of genuine party comradeship is developing in such party organizations.

Accounts of elective party organs about their activity in directing restructuring became an important event for unfolding restructuring in the Army and Navy. These accounts showed that the course of restructuring in military units, aboard ships, on staffs, and in other elements of the military organization deeply concerns party members, who express many valuable suggestions and practical observations. Most important, the party members demonstrated the desire to restructure their personal practice and to campaign for restructuring in their military collectives. This is characteristic of all CPSU members regardless of their position or military rank.

Today the party member's authority in a military collective and respect shown him by comrades in service depend on his ability to defend new things courageously by word and action, to take on the most difficult burden in common affairs, not to hide in the shadows when different positions clash, and to enter into an argument when the party approach is being distorted and when harm is being done to the cause or injustice is being committed. The number of party members for whom restructuring has become the meaning of life, a matter of personal honor and dignity, is growing in the Army and Navy. The time is past for passive nonacceptance of the period of stagnation and a "comfortable" life for those whom it suited. Today the party member is a fighter on the front line of restructuring.

Preparation for the 19th All-Union Party Conference was a powerful stimulus in elevating the CPSU's vanguard role in implementing restructuring. The party conference will give a specific evaluation of the fulfillment of this role by the entire party and by its specific organizations, including Armed Forces party members. There is no question that existing reserves will be uncovered and that further directions and tasks of party work for deepening restructuring in all sectors of public life will be defined. This is why party members, all Soviet citizens, and Armed Forces personnel are preparing for and await the All-Union Party Conference with such interest and enthusiasm. They are confident that this will be a major event of this stage for the movement of Soviet society along the course of restructuring toward a qualitatively new status based on a revival of the Leninist makeup of socialism.

It is clear today that only by restructuring and directing the restructuring can the CPSU fulfill its mission as the vanguard, the leading force of the Soviet people in their aspirations for peace and the improvement of socialism.

6904

Fundamentals of Logistic Support of NATO Allied Armed Forces

18010451b Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 7-12

[Part 1 of article by Lt Col M. Seliverstov]

[Text] Militaristic circles of the North Atlantic Alliance have not given up plans for achieving military supremacy over Warsaw Pact states despite positive improvements achieved in the international situation and the historic turn seen toward nuclear disarmament. NATO countries are carrying out large-scale military programs aimed at further building up the military power of their armed forces, which are outfitted with contemporary models of weapons and military equipment and which are being shifted to a new organizational structure. At the same time the system of strategic deployment of NATO Allied Armed Forces is being improved and methods of conducting operations [operatsii] (combat actions [boyevyye deystviya; Note: term normally translated as "combat operations" but here translated as "combat actions" to distinguish from "operatsii"]), which have taken on a more and more clear-cut offensive character, are being revised.

A very important condition for achieving success in war and for realizing the increased combat capabilities of bloc troops is considered to be their timely support with everything necessary for conducting combat actions and maintaining vital activities, including delivering all kinds of supplies, repairing weapons and military equipment, accomplishing military movements, restoring combat effectiveness of personnel casualties and so on. Logistic support of bloc armed forces is organized for this purpose. Accomplishment of this mission occupies one of the important places in the entire system of NATO military preparations. The North Atlantic Alliance's military-political leadership constantly gives serious attention to developing rear theory, elaborating general principles for organizing comprehensive support of NATO Allied Armed Forces, as well as improving the structure and technical outfitting of rear services.

In the opinion of foreign military specialists, the essence of troop logistic support consists of timely and complete satisfaction of their material, repair, transportation, medical, personal-service, and other needs in the interests of maintaining combat effectiveness and performing assigned combat missions. This is achieved by carrying out a set of measures for receiving, preparing and issuing to the troops the resources allocated by NATO member states.

In accordance with the theory and practice of organizing logistic support which has taken shape in NATO it is customary to believe that it includes material, technical, transportation, medical, airfield and other kinds of support as well as personnel services (personal services, bath and laundry services) and operational and logistic preparation of theaters of military operations. In addition, it includes administrative measures chiefly involving formalization of the receipt of resources from the civilian sector, their financing, assurance of the rear's survivability, and organization of logistic support management.

In the views of NATO specialists, troop logistic support above all must meet the principal demands of providing units and subunits with everything necessary for performing their assigned missions and eliminating everything that can reduce their combat effectiveness and mobility. It is considered especially important that requisite supply items be delivered to a designated area in the necessary quantity precisely at the prescribed time and in a serviceable condition.

Under present-day conditions there is a sharp increase in scope and complexity of logistic support missions and at the same time there are worsened conditions and reduced time periods for accomplishing them in connection with the outfitting of armed forces with fundamentally new systems of weapons and military equipment and an expansion in spatial scope and growth in the dynamic nature of combat actions.

NATO developed general principles for organizing logistic support of large and small units with consideration of demands which were based on views of contemporary bourgeois military theorists and the experience of past wars, the latest armed conflicts, as well as special exercises and studies. The most essential principles are considered to be the national principle for organizing logistic support of the NATO Allied Armed Forces, gradual integration in the logistic area, conformity of operations (combat actions) plans to the status and capabilities of the rear, economical and efficient use of personnel and equipment, optimum location of rear installations and establishments, mobility, flexibility, continuity, timeliness, inclusion of resources of the civilian sector, assurance of the rear's survivability, and reliable command and control.

The **national principle for organizing logistic support of the NATO Allied Armed Forces** presumes complete responsibility of command authorities of bloc country armed forces for comprehensive supply of their own troop (naval force) contingents transferred to operational subordination of the NATO leadership in peacetime and wartime. North Atlantic Alliance countries are responsible for allocating necessary logistic resources, while usually maintaining their own control and sovereignty over them. It is believed that this principle is fundamental at the present time and should not undergo radical changes in the foreseeable future.

But the scattered and disconnected national logistic support systems are incapable of effectively providing for the groupings of coalition armed forces operating under a unified command in the interests of attaining common military-strategic and military-political objectives in a war against Warsaw Pact countries. Therefore soon after the NATO bloc was established its command authority concluded the need for forming an allied system of logistic support with its complete transfer to operational subordination of coalition command authorities. To this day, however, even though that long-range objective officially has not been removed from the agenda this system just has not been established. This has been hampered by the stubborn opposition of industrial and financial circles of bloc member countries, which feared infringement of their own economic interests and sovereign rights. The NATO Allied Armed Forces command authority was forced to seek other ways of unifying efforts in logistics.

Integration in the logistic area provides for a gradual convergence and adaptation of national logistic support systems to NATO requirements and the organization of coordination among them based on decisions made together. Integration is being accomplished along several interrelated avenues, which include above all the establishment of individual elements of the allied rear (coalition management organs and unified systems for certain kinds of support); development [razrabotka] and introduction of joint models of weapons and military equipment; standardization of logistic support methods, logistic equipment and other material and technical means; establishment of a number of unified normative requirements for the rear; and organization of various kinds of troop (naval force) support on a multilateral basis (Fig. 1 [figure not reproduced]).

Conformity of operations (combat actions) concepts and plans to the status and capabilities of the rear is considered a very important condition for achieving success. It is stressed that insufficient consideration of this factor leads to the defeat even of well armed and well trained troops. In the opinion of NATO specialists, this principle predetermines high requirements for the rear's mobilization readiness, productivity, survivability, mobility and other indicators ensuring that it is not a bottleneck blocking full realization of troop (naval force) combat power.

Economical and efficient use of rear personnel and equipment is considered necessary since there never has been a surplus of logistic resources. Therefore rear entities are faced with an important task: to attempt to find methods and ways of organizing logistic support with minimum outlays under all situation conditions. The principal directions for achieving economy are considered to be extending the service life of weapons and military equipment by quality maintenance and repair; introducing contemporary models of arms with a reduced requirement for periodic technical servicing and restorative work; making efficient use of transportation by precluding a counterflow of shipping [vstrechnyye perevozki]; and adopting progressive methods of organizing logistic support, means for mechanizing loading and unloading operations, automated data processing systems and so on.

Optimum location of rear installations and establishments must facilitate the continuous, stable support of troops under various situation conditions in all variants of the preparation and conduct of operations. It is recommended that where possible rear personnel and equipment be located as close as possible to the supported units and subunits. At the same time their excessive forward advance should be avoided in connection with the fact that this can increase the risk of rear entities being hit by enemy fire or of interference with their functioning on the part of friendly troops (for example, as a result of a maneuver of units and subunits).

Mobility consists of the capability of concentrating efforts of rear services on given axes for providing everything necessary to troops (naval forces) under all situation conditions. This is achieved above all by raising the mobility of rear services, which must be the very same as for the supported troop formations. Especially rigid requirements are placed on lower rear elements—they must perform their missions when combat actions are being conducted at a fast pace, under conditions of bad roads and so on.

Flexibility presumes the rear's capability of accomplishing support to troops (naval forces) under conditions of a sharply changing situation characterized by a frequent change in kinds of combat actions, by a shift of axes for concentration of primary efforts, by a surprise transition to the use of weapons of mass destruction and so on. Different logistic support plan variants are developed and corresponding advance training of all rear elements is conducted to achieve flexibility.

Continuity of logistic support in all phases of operations (combat actions) above all requires high combat and mobilization readiness of the rear and optimization of its operational subordination. The latter ensures a transition from peacetime to wartime status without a radical restructuring and permits the necessary build-up of efforts in the course of mission execution.

Timeliness is achieved by precise organization and proper choice of the time for beginning the entire set of measures for advance and immediate preparation of the rear for war. These measures include placement of orders and procurement of logistic support means, establishment and echelonment of logistic support stores in theaters of military operations (Fig. 2 [figure not reproduced]), covert mobilization and deployment of rear entities in a period when the situation becomes aggravated, organization of the delivery of supplies to troops (naval forces), and so on.

Inclusion of resources of the civilian sector, in the opinion of NATO specialists, is inevitable in connection with the fact that a modern war will require mobilizing all resources of bloc member countries, including those not initially intended for military purposes. It is believed that everything must be prepared in advance back in peacetime with consideration of the economy's real capacities for supporting its normal functioning in the interests of the armed forces and for satisfying the population's minimum needs.

Assurance of the rear's survivability includes the organization of security and defense of control posts and of rear personnel and equipment against enemy ground and air strikes and of their defense against weapons of mass destruction, as well as the camouflage and dispersal of rear installations on the terrain, assurance of logistic autonomy of troop (naval force) groupings, and duplication and redundancy of supply sources and transportation routes. The most rigid requirements are placed on survivability of personnel and equipment of forward rear echelons operating directly in combat zones, in connection with which contemporary models of rear equipment being delivered to troops of principal bloc countries essentially come close to models of combat equipment in their degree of protection and mobility.

Reliable command and control of logistic support can be organized on the basis of an optimum combination of centralization and decentralization of rear command and control with consideration of the specifics of its subordination. On the one hand there must be assurance of coordination of operations (combat actions) plans at the earliest stage of their elaboration and establishment of continuous monitoring of the status of rear personnel and equipment on the part of the NATO Allied Armed Forces command for the purpose of promptly taking necessary steps to maintain their continuous operation. On the other hand, it is deemed advisable to transfer authority for decisionmaking on current "routine" measures conforming to effective plans and norms to the very lowest level of leadership such as to the commanders of rear units and subunits. In the opinion of foreign specialists, because of this the organs of command and control of troops and the rear at the highest level are relieved of the need to decide numerous nonfundamental questions, which will permit them to concentrate efforts on a general assessment of the status and capabilities of the rear and on preparation of necessary decisions.

In connection with the fact that there are no provisions for making the rear operationally subordinate to the NATO Allied Armed Forces command either in peacetime or wartime, the principle of unity of command and control of troops and the rear, which is recognized in the majority of bloc countries and which must be exercised by one command echelon within limits of a specific geographic region, is not presently being realized. The NATO command is attempting to compensate for the forced departure from this principle by creating an appropriate set of plans, agreements and legislation governing the activity of national rear entities in the interests of coalition troops. Already in peacetime the NATO command determines allied troop groupings' needs for rear personnel and equipment in their execution of approved operations plans and it exercises supervision over their allocation by bloc countries as well as over the combat readiness of national rear entities. Recommendations and proposals of NATO Allied Armed Forces staffs on these matters assume a mandatory nature for execution and are the basis for concluding treaties among NATO member states and for placing in force corresponding laws, administrative instructions, and other legal acts in bloc countries. Based on this, coalition rear entities agree on the product list and quantity of supplies to be produced in member countries, decide questions of standardization in logistics, develop plans for logistic support of NATO Allied Armed Forces in the form of annexes to operations plans with all necessary explanations, and determine the logistic authority of commanders of troop groupings in peace and war.

Resources are mobilized and placed at the disposal of national or allied armed forces of NATO on the basis of agreements and laws entering into force in wartime. Coordination groups staffed by representatives of corresponding bloc and member country management entities are deployed at all echelons to coordinate activities of the rear and of coalition management entities. In addition, coalition management entities can be granted certain authority to redistribute a portion of national resources during combat actions based on agreements reached in peacetime.

One requirement for logistic support management is planning simplicity, since in a combat situation it is difficult to fulfill complex plans involving considerable expenditures of time and efforts for deciding various organizational matters. In some cases this requirement can be considered an independent principle of rear activity.

It also should be noted that other principles can be given a different interpretation in different bloc countries with consideration of features of the existing theory and practice of organizing logistic support of national armed forces. The application of wordings and terms differing from those above, consolidation of certain provisions, and so on are possible here. In all instances it is recommended that the principles be applied with consideration of the existing situation, giving them a broad interpretation and avoiding any stereotype.

A significant role in organizing logistic support of NATO Allied Armed Forces is played by the commonality or proximity of views reached in the bloc on the rear proper, on its place in the armed forces structure, on missions of rear entities in a contemporary war, and on use of the material base.

It is believed that the armed forces rear of each NATO member country represents a special mechanism performing the functions of a connecting link between the troops (naval forces) and the national economy. As part of the armed forces, the rear is subordinate to the military command authority and has a corresponding organizational structure which includes establishments (management entities), units and subunits (supply, repair (Fig. 3 [figure not reproduced]), transportation, medical) which have been brought up to strength in personnel and logistics according to the unit detail list.

At the same time, in the opinion of western specialists the rear represents a relatively independent organization not purely military in nature and not completely subordinate to laws of military hierarchy. Above all this is explained by the presence of numerous relationships of the rear with the economy, which become more inseparable as the importance of the management echelon increases; in higher echelons the line between rear and economy essentially is erased and they merge into a single whole. Therefore it is natural to view the rear as a specific economic system possessing means of production, a labor force, and finances. On the other hand, its activity does not have a commodity character and is not connected with the market but is completely subordinated to the interests of maintaining troop (naval force) combat readiness.

In the opinion of NATO specialists, the close relationship of the rear and economy in NATO member countries was one of the primary reasons for rejecting the establishment of a NATO allied rear. It is believed, however, that despite the incompleteness of integration processes in their sphere of activity, the rear entities included for supporting the NATO Allied Armed Forces should not be viewed as a simple conglomerate of national rear services operating in isolation from each other. In contrast to all previously existing military coalitions of imperialist states, the task of consolidation and efficient joint use of logistic resources is accomplished on a practical basis in NATO. While they are not subordinate to the allied command authorities and they retain considerable differences in organization, capabilities, and principles of operation, the national rear entities are in constant readiness to support national troops (naval forces) and under certain circumstances also allied troops (naval forces) in accordance with the bloc's general requirements and norms.

The agreements reached and which enter into force during NATO's immediate war preparations make provisions for mutual logistic support of troops (naval forces) of different national affiliation and for joint use of transportation and infrastructure facilities. It is planned to make wide use of host country rear entities for supporting the reinforcing troops moved to European theaters of military operations from the United States, Canada and Great Britain. These entities are obligated to supply arriving troops with fuel and ammunition, service aircraft and tanks, billet and supply provisions for troop personnel, and use host country civilians for receiving military cargoes at airfields and in ports as well as for accompanying them to their destination and warehousing and servicing them.

(To be concluded)

6904

U.S. Army Aviation

18010451c Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 17-23

[Article by Col G. Vasilyev]

[Text] U.S. militaristic circles are accelerating a build-up in power of general purpose forces under the pretext of the "overwhelming" superiority of Warsaw Pact countries over the NATO bloc in conventional arms. They are giving special attention here to ground forces, considered the principal striking force in military operations employing conventional weapons. The foreign press notes that contemporary weapons including precision weapons and military equipment are coming into the inventory of large and small units of ground forces, the organizational structure is being improved, and optimum methods of employing their growing capabilities are being explored. Great importance is attached to the development [razvitiye] of army aviation, which in the course of its existence has been transformed from an auxiliary means into one of the principal and prospective means of warfare.

Army aviation (ground forces aviation) is the most mobile and versatile arm of the U.S. Army. It is intended for performing fire, reconnaissance, assault transport, and special missions (mining, EW, support of command

and control and communications, search and rescue) in the combined-arms battle (operation). Its inventory includes helicopters of various types and light aircraft.

According to the American FM 1-100 field manual, **organizationally** army aviation personnel and equipment are placed in brigades, regiments, battalions and companies of divisions, army corps and U.S. Army commands in a theater of military operations. The type army aviation brigade of the light division includes an antitank helicopter battalion, reconnaissance battalion, and two general purpose helicopter companies; that of the "heavy" division includes four battalions: two antitank helicopter battalions, a reconnaissance battalion and a general support helicopter battalion (in the future it is planned to have two general purpose and support helicopter companies). It is planned to include three helicopter regiments each (two antitank regiments and one assault transport regiment) in the army aviation brigade of "heavy" ("light") army corps being formed. Company level helicopter subunits exist in the reconnaissance and EW group and in the medical brigade of each army corps, and army aviation of the U.S. Army theater command can include 3-4 helicopter battalions of different purposes (see table). In addition, the Army has the 6th Separate Antitank Helicopter Brigade (Fort Hood, Texas), which presently is in a stage of reorganization.

As a rule, division antitank helicopter battalions are type battalions in organizational structure; each consists of four companies (headquarters company and three antitank helicopter companies). Reconnaissance battalions have five companies: headquarters, two helicopter reconnaissance companies, and two reconnaissance companies (with combat reconnaissance vehicles and 106.7-mm self-propelled mortars), as well as a deep reconnaissance detachment. The helicopter reconnaissance battalion of the separate armored cavalry regiment

U.S. Army Aviation Units and Subunits, Number of Helicopters and Aircraft

Army Aviation Units & Subunits (Authorized Subordination)	Helicopters					Aircraft	Total
	Fire Support	General Purpose	Reconnaissance	Assault Transport	EW		
Army Aviation brigade ("light" division)	29	36	31	—	3	—	99
Army Aviation brigade ("heavy" division)	50	30	54	—	12	—	146
Army Aviation brigade (army corps)	126	132	113	64	—	5	440
Antitank helicopter regiment (army corps)	84	12	52	—	—	—	148
Reserve antitank helicopter regiment (army corps)	42	6	26	—	—	—	74
Assault transport helicopter regiment (army corps)	24	35	90	64	—	5	218
Reconnaissance helicopter battalion (army corps separate armored regiment)	26	18	27	—	3	—	74
Air reconnaissance & EW company (army corps reconnaissance & EW group)	—	—	—	—	—	12	12
Air reconnaissance company (army corps reconnaissance & EW group)	—	—	—	—	—	14	14
Medical battalion (army corps medical brigade)	—	36	—	—	—	—	36
Army Aviation group (U.S. Army command in poorly prepared theater)	42	59	31	32	—	8	172
Army Aviation formations (U.S. Army command in prepared theater)	—	37	20	59	—	34	150

of the army corps includes six companies: three helicopter reconnaissance companies, two anititank helicopter companies, and one general purpose and support company. Each army aviation formation includes a headquarters and headquarters company regardless of echelon and authorized subordination. American military experts note that the organizational structure of army aviation was worked out so that it would be possible to create tactical helicopter groups based on different types of helicopter subunits for accomplishing missions applied to a specific situation.

Helicopters of different types and modifications are the basis of the inventory of army aviation subunits (units). They can be consolidated into five groups according to their specific purpose: fire support, reconnaissance, general purpose (multirole), assault transport, and special (EW, command and control and communications, search and rescue).

Fire support helicopters are intended for destroying tanks and other armored targets, giving close support to subunits on the battlefield, and escorting assault transport helicopters. In addition, they can be employed to deliver strikes against combat formations and various area and point targets and for engaging the air enemy.

The principal fire support helicopters are AH-1 series helicopters, which have been in the inventory since 1977 (there is a total of around 1,800 of them). The foreign press reports that based on the experience of troop exercises the AH-1S Cobra-TOW fire support helicopter (Fig. 1 [figure not reproduced]) equipped with eight TOW ATGM's can engage 2-3 armored targets on the battlefield. The AH-64A Apache fire support helicopter with 16 Hellfire ATGM's (Fig. 2 [figure not reproduced]), coming into the Army inventory beginning in 1984, has combat capabilities that are considerably increased. It is planned to procure a total of around 700 such helicopters. The probability of hitting an armored target at a distance up to 6 km is 0.9-0.95 regardless of terrain relief. Subsequently a quality renewal of the helicopter inventory is proposed through modernization (improvement of equipment for night operations and in adverse weather conditions as well as improvement of on-board armament) and creation [sozdaniye] of new-generation helicopters.

Reconnaissance helicopters are employed for aerial reconnaissance, battlefield surveillance, target detection, spotting the fire of airborne and ground weapons, and supporting command and control and communications. The Army has a total of 350 OH-6A Cayuse (Fig. 3 [figure not reproduced]) and 1,800 OH-58A, C and D Kiowa helicopters.

General purpose helicopters (multirole helicopters) are intended for transporting servicemen and various cargoes, landing tactical airmobile assault forces, evacuating the wounded, laying minefields, providing command and control and communications, as well as engaging ground targets and performing search and rescue operations.

The principal general purpose helicopter is the UH-1 Iroquois of various modifications. Large and small units are being equipped with the new UH-60A Black Hawk helicopter (Fig. 4 [figure not reproduced]). Each of these helicopters can carry 7-11 fully equipped servicemen or up to 3,600 kg of cargoes. They can have different weapon options including ATGM's depending on missions to be accomplished. The Army has a total of 3,500 UH-1 Iroquois and 800 UH-60A Black Hawk helicopters (it is planned to additionally procure around 300 of such helicopters).

Assault transport helicopters (over 500) are used for transporting and landing personnel and cargoes, including heavy weapon systems, and for evacuating the wounded and damaged military equipment. The maximum load of the CH-47D Chinook helicopter (Fig. 5 [figure not reproduced]) is over 10 tons, and that of the CH-54 is up to 7 tons.

EW helicopters are intended for jamming radio communication systems and for electronic suppression of ground radios and radars. The Army inventory includes EH-1 and EH-60A helicopters (over 60).

In addition, army aviation has 275 TH-55 training helicopters and light aircraft of various types which are basically used for aerial reconnaissance, surveillance, target designation, spotting, providing command and control and communications, as well as accomplishing other auxiliary missions. The Army has a total of up to 9,300 helicopters and 5,300 aircraft for various purposes.

Employment of army aviation in the principal kinds of battle. The foreign military press notes the following basic principles for employing army aviation units and subunits in the battle (operation [operatsiya]): conduct of combat actions [boyevyye deystviya; Note: term normally translated as "combat operations" but here translated as "combat actions" to distinguish from "operatsiya"] usually as part of combined-arms tactical groups; a combination of fire and maneuver; optimum use of combat capabilities of units and subunits of other arms; neutralization of enemy weapons and air defense means; surprise of actions; concentration of personnel and equipment at the decisive period of battle and on the decisive axis; skillful use of terrain; preservation of flexibility of actions; periodic change in concentration areas and forward ammunition and fuel replenishment points; coordination with ground troops and tactical aviation; centralization of command and control; and uninterrupted logistic support.

In the *offensive* helicopter subunits (units) can operate as part of screening troops, the main body, or the combined-arms reserve of the army corps (division).

As part of the screening troops they perform missions of uncovering the enemy's location, composition and nature of actions; inflicting maximum possible losses on him; and supporting the deployment and maneuver of friendly forces. Helicopter subunits also can seal off the defending enemy at his positions for subsequent envelopment by advancing subunits (units). Army aviation subunits displace to preselected positions to ensure effective fire support of advancing army corps (division) personnel and equipment.

As the offensive develops, principal efforts of helicopter subunits (units) are to be concentrated on engaging the defending troops, especially tank subunits, with the objective of damaging them, breaking up combat formations, interdicting the advance of second echelons (reserves), and preventing restoration of combat effectiveness. Army aviation subunits can execute a vertical envelopment of enemy defensive positions or take advantage of reserves [sic; "gaps" probably intended] (breaches) formed in them in the interests of fire effect on the enemy in the depth of the defense. The duration and depth of such fire effect on the enemy depend on his composition and defense alignment, nature of terrain, weather conditions, and degree of ammunition and fuel support to helicopters.

Helicopter subunits (units) operating as part of a combined-arms reserve are to be used above all for repelling tank counterattacks.

In the exploitation of success and in the pursuit army aviation can be used to deliver strikes by executing a swift maneuver to the flanks of withdrawing enemy troops, giving combined-arms units (subunits) assistance in consolidating captured positions, as well as landing tactical airmobile assault forces, moving supplies, and supporting command and control and communications.

It is evident from American field service regulations that in addition to this, during an offensive army aviation subunits can take part in making raids into the enemy rear, conducting a reconnaissance in force, and performing feints and diversions. It is emphasized that regardless of the forms of maneuver used, these subunits must continuously perform reconnaissance and surveillance and neutralize detected enemy weapons and personnel, concentrating main efforts on destroying tanks and other armored targets, air defense means and elements of the command and control system, and continuously coordinate their actions with field artillery fire and tactical air strikes.

In the *defense* army aviation formations can accomplish the following primary missions: halt (delay) the advance and deployment of enemy (especially tank) units and subunits; split up, isolate and damage advancing enemy units; and disorganize and interdict the commitment of enemy second echelons (reserves). According to the American command's views, execution of these missions is supported by performing continuous reconnaissance, delivering simultaneous strikes against enemy forward and subsequent echelons in the process of deep fire engagement, laying minefields remotely on routes of advance of enemy troops, employing EW means, executing swift maneuvers to the enemy flanks and rear, landing tactical airmobile assault forces, and reinforcing the firepower of interworking combined-arms units (subunits).

Helicopter units (subunits) operating in the army corps (division) security zone can be employed for performing reconnaissance and surveillance ahead of the front and on the flanks of the defensive zone, delivering strikes, and reinforcing combined-arms formations or providing air cover for secondary terrain sectors from the air with the objective of freeing up personnel and equipment for repelling enemy attacks on the main axis.

When the main defense area of a large strategic formation (large unit) is being held, it is advisable to use army aviation to hit attacking tank (mechanized) units and subunits, prevent the enemy's penetration into the depth, screen the flanks, reinforce and increase the maneuverability of combined-arms units and subunits, and control secondary sectors (axes).

Helicopter units (subunits) operating as part of the combined-arms reserve reinforce formations of ground troops assigned for security and defense of the army corps or division rear area, participate in conducting counterattacks, localize a penetration of enemy tanks and destroy tactical airbone assault forces.

The **operating tactics** of army aviation units and subunits depend on the existing combat situation and character of missions they are accomplishing. It is believed that they can operate as a component of tactical groups (combined-arms, helicopter, or helicopter-aircraft) or be attached to brigades (battalions), and sometimes receive personnel and equipment of other arms in their operational subordination. In the views of foreign military specialists, it is most expedient to include helicopter subunits in *combined-arms tactical groups* for the period of combat actions. Their potential capabilities are used most effectively by mutually complementing each other. For example, the type brigade tactical group can consist of an armored (mechanized) brigade, antitank helicopter battalion and other subunits; the battalion tactical group can consist of a tank (mechanized infantry) battalion, a mechanized infantry (tank) company and an antitank helicopter company. It is emphasized that maximum combat effectiveness is achieved when helicopter (especially fire support helicopter) subunits are used at battalion strength. The smallest organizational unit of army aviation which can be made part of a combined-arms tactical group or be attached to formations of other combat arms is the helicopter company.

Based on the experience of American troop exercises, authorized personnel and equipment of the antitank helicopter battalion can be employed by three methods: by simultaneous, continuous, or phased fire effect on the enemy. In the first case all three antitank helicopter companies of the battalion deploy simultaneously at assigned combat positions with the objective of concentrating maximum possible firepower on a certain sector. In the second instance (continuous fire effect or the "one-third" rule), one antitank helicopter company engages planned targets, a second is en route to deliver a fire strike, and the third is at forward ammunition and fuel replenishment points. The third method provides for a successive build-up of fire effect: the company delivering strikes against the enemy is reinforced by a second company in phases; after the ammunition or fuel of one of these companies has been expended, the third company is committed.

The battalion's antitank helicopter companies usually operate as *helicopter tactical groups*. Such a group (three reconnaissance and five fire support helicopters) can accomplish assigned missions at full strength or be divided into two groups (1-2 reconnaissance helicopters and 2-3 fire support helicopters in each group). In the assessment of the American command, in the latter instance there is an opportunity to deliver coordinated surprise strikes against a target area from two directions. In addition, simultaneous actions of two or three such subgroups on a firing line can provide for concentrated antitank fire against a large area and considerable damage to the enemy in a short time interval. With such operating tactics, however, there is a substantial reduction in capability for continuous fire effect, which involves the need to replenish ammunition and fuel (another helicopter sortie to the firing line is possible in 40-60 minutes).

Deployment of fire support helicopters for executing combat missions usually has the following sequence: flying to a waiting area, establishing coordination with reconnaissance helicopters, occupying combat positions and receiving target data, detecting and engaging targets, and occupying alternate firing positions or returning to the waiting area. Fire support helicopters exert continuous fire effect on the enemy by alternating at the positions. It is believed that they must operate covertly and hit the enemy from the maximum range of on-board weapon systems while outside the effective zone of enemy weapons.

During combat actions reconnaissance helicopters can be used for performing battlefield surveillance, reconnoitering the enemy, selecting necessary combat positions, coordinating fire support helicopter actions, calling in and if necessary adjusting indirect fire and tactical air strikes, and screening fire support helicopters while they are engaging enemy targets.

Features of tactical employment of army aviation subunits as part of *helicopter-aircraft groups* reduce to the following. Reconnaissance helicopters update strike targets, after which fire support helicopters in coordination with field artillery destroy uncovered enemy air defense weapons, and then a group of A-10A attack aircraft delivers strikes against specific targets. Another attack by fire support helicopters is conducted for complete execution of the combat mission. According to calculations of foreign military specialists, the effectiveness of joint actions of such groups increases 2-3 times and helicopter and aircraft losses are cut in half.

Along with accomplishing missions as part of mixed tactical groups, helicopter subunits can remotely lay mixed minefields, and with air-to-air guided missiles included in the inventory they can engage enemy helicopters and aircraft.

Judging from western press announcements, the experience of local wars and exercises of American troops indicates that although operating tactics and the missions performed by army aviation in the modern battle (operation) may vary, its tactical employment must be based on the main rule: always attack by surprise, deliver a strike from several directions simultaneously, and appear in the zone of likely detection for no more than 50 seconds. To execute this it is necessary for the concentration and waiting areas, primary and alternate positions, as well as other elements to be carefully chosen and prepared. For example, the concentration area can be 50-70 km from the opposing sides' line of contact; it is intended for preparing helicopters for a combat mission, for their maintenance and repair, and for replenishing supplies. A waiting area is selected along helicopter flight routes to the forward edge for their assembly and concealed take-off to combat positions and firing lines. As a rule, helicopters are in a hover mode in such an area. Forward points are specified for each antitank helicopter company 20-25 km from the opposing sides' line of contact and are used for replenishing the unit of fire and for refueling the helicopters. Firing lines can be planned at a distance of 3-10 km from a target or objective and the helicopters' combat positions are specified within their limits. Helicopters occupy such positions in advance or in the course of combat to ensure surprise of the attack, a sufficient sector of fire, maximum range of fire, and concealment of the flight to alternate positions. When operating from ambush helicopters can deliver strikes in a hover mode when targets approach the maximum range of engagement. In other cases the attack can be executed from other flight modes.

In a period of combat, helicopters can execute a level flight at low or extremely low altitude (including with cover) with nap-of-the-earth flying or by using protective terrain features. Speed and altitude change depending on the enemy's position, weather, and terrain conditions. Level flight at a height of around 15 m is accomplished when helicopter subunits advance from the depth and in a maneuver within friendly troop rear areas. In approaching the rear boundary of first echelon divisions, helicopters shift to a nap-of-the-earth flight mode, which hampers their detection by enemy radars. Routes are chosen between elevations and wooded areas and along rivers and hollows. Flights are made at a height of 3-5 m over combat formations of first echelon brigades (battalions) and ahead of the friendly troop frontage.

And so according to foreign military press data the U.S. Army command continues to carry out a broad set of measures for further building up army aviation's combat capabilities. Efforts being made by the Pentagon to improve army aviation combat equipment and to improve the organization and establishment of its subunits (units), and the search for optimum methods of their employment pursue the principal objective of raising ground forces' combat capabilities.

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Japan's Armored Equipment

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[Article by Lt Col A. Miroshnikov]

[Text] Japan's ruling circles continue to follow a policy of building up armed forces military might and broadening the military alliance with the United States. Cloaked in the myth of the "Soviet military threat," this country's militaristic forces are striving for a considerable increase in appropriations for military purposes. The foreign press notes that Japan already has moved into fifth place among the principal capitalist states in level of military expenditures.

At the present time the country is implementing a 1986-1990 program for building the armed forces which provides for a substantial increase in their combat capabilities, including their outfitting with modern weapons and combat equipment. An important place is given to the Army, which is the largest component of the so-called Self-Defense Force. Ground troops have been placed in one armored division, 12 infantry divisions, 13 separate brigades and several separate groups. Their fighting strength is around 180,000 persons.

In the initial stage of the origin of the Japanese Army (1950's) it was equipped primarily with Americal materiel. Later Japan organized the production of weapon and military equipment models of domestic development [razrabotka]. Considerable efforts were made to produce armored equipment. Its principal developer is the firm of Mitsubishi Heavy Industries.

In the opinion of foreign specialists, models of armored equipment being produced by Japanese industry are not inferior to American and West European analogs, but they are being developed with a considerable lag in time periods compared with leading capitalist countries. For example, the new "90" tank presently being created [sozdavat] is comparable in performance characteristics with the Abrams M1 (USA) and Leopard-2 (FRG) tanks, but the latter already have been in series production for 8 and 10 years respectively.

Models of armored equipment created [sozdat] in Japan and in its army inventory are examined below. Their performance characteristics are given in the table.

Development [razrabotka] of the first postwar generation of tanks began in Japan in 1954. Prototypes were manufactured three years later and in 1961 the tank was accepted in the inventory and designated the **"61"** (Fig. 1 [figure not reproduced]). Its prototype was the American M47 tank used in the aggressive war in Korea.

The American 90-mm rifled gun produced in Japan under license is used as the main armament and a coaxial 7.62-mm machinegun and 12.7-mm antiaircraft machinegun mounted on the commander's cupola are the secondary armament on the "61" tank.

Performance Characteristics of Models of Japanese Armored Equipment

Model Designation	Combat Weight in Tons / Crew (Mounted)	Dimensions, m: Height / Length x Width	Weapon Caliber, mm: Gun / Machineguns	Engine Power, hp	Maximum Speed, km/hr / Range, km
"61" tank..........	35 / 4	2.7 / 6.3 x 2.95	90 / 7.62; 12.7	600	45 / 200
"74" tank..........	38 / 4	2.5 / 6.7 x 3.2	105 / 7.62; 12.7	750	53 / 300
"90" tank, experimental..........	50 / 3	2.4 / 7.5 x 3.4	120 / 7.62; 12.7	1500	70 / 500
"60" tracked APC...	12 / 2 (8)	2.3 / 4.85 x 2.4	— / 7.62; 12.7	220	45 / 230
"73" tracked APC...	13.3 / 3 (9)	2.2 / 5.8 x 2.8	— / 7.62; 12.7	300	60 / 300
"82" wheeled command & staff vehicle	13.6 / 2 (6)	2.4 / 5.7 x 2.5	— / 7.62; 12.7	305	100 / 700
"87" wheeled combat reconnaissance vehicle	13.5 / 5	2.4 / 5.37 x 2.5	25 / 7.62	305	100 / 500

The gunner is accommodated to the right of the gun, the commander is behind him, and the loader is on the left. The driver-mechanic's place is in the front right part of the hull. In contrast to the one-piece hull of the aforementioned American tank, the hull is welded in the "61" tank. The turret is cast. While a gasoline engine was used in the M47, a V-12 diesel engine with turbo-supercharging was installed in the "61" tank. The system is air-cooled. Two blowers are located above the engine. The gear-box has five gears forward and one reverse.

The running gear includes six road wheels and three top rollers on each side. It has individual torsion-bar suspension. Telescopic hydraulic shock absorbers are installed on the two front and two rear rollers. The tracks (500 mm wide) consist of metal track links with a rubber and metal articulated joint. Removable rubber pads can be fastened to them.

The "61" tank was produced up to 1972 and presently remains in the Japanese Army inventory (there is a total of around 450 of them). A tank bridgelayer, engineering vehicle, and armored recovery vehicle were created [sozdat] on its basis.

In 1962 Mitsubishi Heavy Industries began developing [razrabotka] a main battle tank, designated the "74" after being accepted in the inventory in 1974. The requirements advanced for creators of the new tank were to increase its firepower, protection, and mobility.

The **"74" tank** (see color insert [color insert not reproduced]) has a classic configuration with engine and transmission accommodated in the rear. Its hull is welded from armor plates and the turret is cast. Ballistic protection is improved by use of a streamlined turret and large angles of slope of the hull's armor plates. Maximum armor thickness of the hull front section is 110 mm with a 65 degree angle of slope.

Japanese specialists placed great emphasis on improving the tank's mobility, taking into account that almost impossible sectors are encountered in many areas of Japan (muddy rice fields, mountains and so on). Country roads are narrow and the bridges on them have a low load capacity. All this limited the tank's combat weight, which is 38 tons. The tank has a relatively low silhouette, successfully maintained by use of a hydropneumatic suspension which permits changing vehicle clearance from 200 to 650 mm and tilting the tank to the right or left either completely or partially depending on terrain relief. The vehicle is tilted by adjusting four hydropneumatic suspension points located on the first and fifth road wheels on each side. The running gear has no top rollers. The overall road wheel play is 450 mm. Tracks can be tensioned by the driver-mechanic from his seat using a track tensioner hydraulic drive. The tank uses two types of tracks (550 mm wide) with rubber and metal articulated joints: training tracks with rubberized track links, and combat tracks—all-metal with reinforced grousers.

The tank engine and transmission are made in one block. A two-stroke multifuel air-cooled 10ZF V-10 diesel engine is used as the power plant. It is fitted with two turbocompressors connected with the crankshaft by pinion drives. The compressors have a combination drive (mechanical from the engine and using exhaust gases). This significantly improves the two-stroke engine's pick-up. Two cooling system axial-flow fans are situated horizontally between the cylinder blocks. With maximum rotation frequency (2,200 rpm), 120 hp is expended to drive both blowers, which reduces engine power from 870 to 750 hp. Dry engine weight is 2,200 kg. In addition to ordinary diesel fuel, it can operate on gasoline and aviation kerosene. Fuel consumption is 140 liters per 100 km. The Mitsubishi Cross-Drive MT75A hydromechanical transmission provides six gears forward and one reverse without stepping on the clutch pedal, which is used only when starting out and stopping the tank.

The "74" tank is equipped with a system for protection against weapons of mass destruction. It can cross water obstacles up to 4 m deep with the help of underwater driving equipment.

The tank's main armament is the British L7A1 105-mm rifled gun, stabilized in two laying planes. The gun is produced under license by the firm of Nippon Seiko-Jyo. The recoil system was modernized. The gun can fire 105-mm ammunition used in armies of NATO countries, including the new American M735 armor-piercing discarding-sabot projectile produced in Japan under license. The unit of fire is 55 rounds, 14 of which are accommodated in a recess at the rear of the turret. Loading is manual. Gun vertical laying angles are from -6 to +9 degrees. They can be increased using the hydropneumatic suspension and can be from -12 to +15 degrees.

The secondary armament of the "74" tank includes a 7.62-mm coaxial machinegun located to the left of the main gun (unit of fire 4,500 rounds). A 12.7-mm antiaircraft machinegun is mounted in the open on a bracket of the turret between the commander's and loader's hatches. It can be fired both by the loader and by the commander. The machinegun's vertical laying angles are from -10 to +60 degrees. The unit of fire is 660 rounds. Three grenade launchers for laying smoke screens are mounted along each side of the rear part of the turret.

The fire control system includes a laser sight-rangefinder, gunner's main and secondary sights, gun stabilizer, ballistic computer, commander's and gunner's control panels, and laying drives.

The commander uses a combination (day and night) periscopic sight with a built-in ruby laser rangefinder which measures distance in the range from 300 to 4,000 m. The sight has 8x magnification. There are five periscopic observation devices mounted around the perimeter of the commander's hatch for all-around observation.

The gunner has a main combination (day and night) periscopic sight with 8x magnification and an auxiliary telescopic sight. The night vision devices are of the active type. Illumination is by a xenon searchlight.

A digital ballistic computer is mounted between the commander and gunner by which corrections for gun laying angles are introduced to the commander's and gunner's sights by means of input data sensors (ammunition type, powder charge temperature, bore wear, trunnion axis tilt angle, wind velocity). Data on range to target are input automatically to the computer from the laser rangefinder.

The two-plane gun stabilizer has electromechanical drives. The gun and coaxial machinegun can be laid and fired both by the gunner and the commander using similar control panels. In addition, the gunner is equipped with back-up manual drives for laying the gun in elevation and rotating the turret.

The loader has a rotating (360 degrees) periscopic observation device installed ahead of his hatch. The driver-mechanic is accommodated in the driving compartment in the left front part of the hull. He has three periscopic observation devices.

It was planned to conclude production of "74" tanks at the end of the current year. By this time the army will have approximately 850 such machines. The "75" 155-mm self-propelled howitzer (it outwardly resembles the American M109 howitzer) and the "78" armored recovery vehicle, characteristics of which correspond to the West German Standart armored recovery vehicle, were created [sozdat] on the basis of this tank.

According to foreign press reports, the firm of Mitsubishi Heavy Industries in Japan presently has created [sozdat] a prototype of the **"90"** third-generation tank (codenamed TK-X, Fig. 2 [figure not reproduced]). Its development [razrabotka] was begun back in 1976. It is expected to arrive in the inventory in the early 1990's. In creating [sozdaniye] the new tank Japanese specialists attempted to bring its combat properties up to the level of contemporary Leopard-2 (FRG) and M1 Abrams (USA) tanks. The vehicle's classic configuration was preserved. Hull and turret have multilayer spaced armor. An automatic gun loader is used on the tank, and as a result the crew was cut to three persons.

The 120-mm smoothbore gun of the West German firm of Rheinmetall, also installed on the Leopard-2 and M1A1 Abrams tanks, was selected as the main armament. The primary unit of fire of the automatic loader is 20 rounds (there is a total of 50 rounds). A 7.62-mm machinegun is coaxial with the main gun and a 12.7-mm antiaircraft machinegun is mounted on the commander's cupola. The fire control system includes the gunner's and commander's sights, laser rangefinder, ballistic computer, and thermal-imaging devices for operations in hours of darkness.

An air-cooled 1,500 hp 10-cylinder diesel engine is installed in the tank. The transmission is hydromechanical. Running gear suspension is combination: hydropneumatic on the front and rear road wheels, and torsion-bar on the remaining ones. Maximum highway speed is 70 km/hr.

The Japanese Army uses the "60" and "73" tracked APC's to transport infantry (there is a total of around 600 of them).

The **"60" APC** (Fig. 3 [figure not reproduced]) was created [sozdat] in the late 1950's. It has an enclosed armored hull. The driving compartment is in its right front part and a 7.62-mm hull machinegun is mounted on the left. A second machinegun of 12.7-mm caliber is mounted on a rotating ring mounting ahead of the gunner's hatch. Access to the assault compartment is through two armored doors at the vehicle rear.

The "60" APC uses an air-cooled V-8 diesel engine. It has torsion-bar suspension. The running gear includes five road wheels and three top rollers on each side. Driving sprockets are in front.

The 81-mm and 107-mm self-propelled mortars were created [sozdat] on the basis of this APC.

In 1967 Mitsubishi Heavy Industries began developing [razrabotka] an amphibious tracked APC, which was accepted in the Japanese Army inventory in 1973 and designated the "73" (it is planned to have 225 of them by the end of the current year).

The **"73" APC** (Fig. 4 [figure not reproduced]) has a welded hull made of anti-small-arms aluminum armor. The rear plate is a hinged ramp for the assault force to mount and dismount. A splash panel, which elevates when the APC enters the water, is installed in front of the vehicle hull. It moves afloat (at a speed up to 7 km/hr) by rotating the tracks.

The driver-mechanic is accommodated in the right front part of the vehicle, and to his left is the gunner for the 7.62-mm hull machinegun on a ball mount on the hull front plate. Behind them is the commander. There are six glass blocks around the perimeter of his cupola for all-around observation. A 12.7-mm machinegun is installed in the second rotating cupola, fired by one of the assault personnel. Two three-barrel smoke grenade launcers are mounted along the sides of the vehicle rear.

The assault compartment carries nine fully equipped infantrymen, who can fire small arms through T-shaped ports located in the rear and along the sides of the rear part of the hull. The APC is equipped with an air filtration plant. There are infrared devices for operations under nighttime conditions.

The diesel engine and transmission are made in a single block mounted on the left side behind the hull machine-gunner's seat. It takes around 30 minutes to replace it. Running gear suspension is torsion-bar. Forward road wheels have hydraulic shock absorbers.

The tracked chassis of the "73" APC was used in creating [sozdaniye] the "74" 105-mm self-propelled howitzer and the "75" multiple launch rocket system.

Since the early 1980's Japan has been working to create [sozdaniye] an infantry fighting vehicle [IFV], which tentatively has been designated the **"88"**.

The IFV hull will be of aluminum armor. Its forward part contains the engine-transmission compartment and driving compartment. Ports are provided along the sides of the assault compartment for small arms fire.

A 35-mm automatic gun of the Swiss firm of Oerlikon and a 7.62-mm machinegun coaxial with it will be mounted in the two-place armored turret. It is planned to install ATGM launchers (with laser guidance system) on the turret sides for fighting tanks. The machine will be equipped with a modern fire control system as well as night vision devices.

The IFV running gear includes six road wheels and three top rollers on each side with driving sprockets situated in front. The suspension is torsion-bar. The machine is nonamphibious. It is planned to equip it with an air filtration plant.

Interest in wheeled armored vehicles has increased in Japan in recent years. A decision was made in the late 1970's on equipping ground troops with wheeled (6x6) armored vehicles of two types: the "82" command and staff vehicle and the "87" reconnaissance vehicle. Both machines have 80 percent standardized assemblies and machine units, including an identical power plant. The latter includes a four-stroke water-cooled 305 hp 10-cylinder diesel engine and a hydromechanical transmission providing six gears forward and one reverse. The wheel suspension is coil spring with hydraulic shock absorbers. The machines are fitted with an air filtration plant.

The **"82" command and staff vehicle** (Fig. 5 [figure not reproduced]) has an enclosed welded armored hull. The driver is accommodated in the right front part. On his left is the second crew member, who can fire the 7.62-mm machinegun fastened on the roof in the forward part of the hull. Behind him is the engine and transmission compartment. Work stations for officers (six persons including the commander) are outfitted and all necessary equipment, including communications equipment (three radios), is installed in the raised rear part of the vehicle. Two armored doors, one in the left side and one at the vehicle rear, are used for access to this compartment.

Six periscopic instruments are mounted in the commander's cupola for all-around observation. To the right of the cupola is a hatch, ahead of which is mounted a 12.7-mm machinegun.

The "82" vehicles have been delivered in small lots beginning in 1982. By the end of the current year the ground forces should receive all 137 units ordered. It is planned to have ten such vehicles in each division.

The **"87" combat reconnaissance vehicle** (Fig. 6 [figure not reproduced]) is still in the prototype stage, with the prototypes already having gone through plant and troop testing. It is planned to procure eight such combat reconnaissance vehicles by the end of 1988 and to deliver a total of some 60 units to the ground forces.

In contrast to the command and staff vehicle, the "87" combat reconnaissance vehicle has a different configuration. The engine-transmission compartment is located in the right rear part of the hull. A two-place armored turret with 360-degree rotation is located in the center part. A West German 20-mm automatic gun and 7.62-mm machinegun coaxial with it are installed in the turret. Series models will be produced with the 25-mm automatic gun of the Swiss firm of Oerlikon, being produced in Japan under license. Grenade launchers for laying smoke screens are mounted along the turret sides.

The combat reconnaissance vehicle is equipped with necessary observation and aiming devices for operations in daytime and nighttime conditions). It has radios. The vehicle's combat weight is 13.5 tons and it has a crew of five (commander, gunner, driver, radio operator and observer).

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Rapier-2000 Short-Range Antiaircraft Missile System

18010451e Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) p 30

[Article by Col V. Viktorov]

[Text] The firm of British Aerospace is working to create [sozdaniye] the new Rapier-2000 short-range antiaircraft missile system for engaging prospective airborne targets which will appear in the 1990's, including cruise missiles, drones, high-speed aircraft and combat helicopters performing missions under conditions of the active use of EW means. The contract for developing [razrabotka] and producing the prospective antiaircraft missile system in the amount of one billion pounds sterling was let by the British Ministry of Defense in 1986. Taking into account the possibility of a war conducted using nuclear weapons, one of the requirements placed on this antiaircraft missile system is the protection of all its elements against the electromagnetic pulse arising from a nuclear explosion.

The system (see photo [photo not reproduced]) will include surface-to-air guided missiles, a launcher, airborne target aquisition and tracking radar, target tracking and missile guidance radar, and control equipment.

According to a foreign press announcement, the surface-to-air missile will be produced in two versions. Missiles will be equipped with percussion fuzes in the first version, intended for engaging aircraft and helicopters; surface-to-air missiles with proximity fuzes will be used in the second version, designed for engaging small targets (cruise and antiradar missiles). The new Rapier-2000 antiaircraft missile system launcher has eight missiles ready for launch. An electro-optical guidance system is mounted on it. In engaging a target the operator has to select the type of missile in advance. It is noted that the Rapier-2000 will be able to fire against two airborne targets simultaneously.

The British firm of Plessey has a contract for developing [razrabatyvat] a new airborne target acquisition and tracking radar (at a cost of 75 million pounds sterling) which will be used in the system. It has a phased antenna array and the radar equipment uses large-scale integration. The radar is intended for detecting and measuring the position of airborne targets in three coordinates (range, azimuth and elevation) and for tracking a large number of targets (both high-speed as well as slow and low-flying above the Earth's surface). It uses all known methods of protection against active jamming and has the Mk 12 IFF system.

The Blindfire-2000 radar, a modernized version of the Blindfire set presently being used in the Rapier antiaircraft missile system, will be used for tracking a selected airborne target and guiding the surface-to-air missile to it.

It is planned to mount system elements on standard trailers towed by half-ton Land Rover vehicles. At the same time, a variant of accommodating this antiaircraft missile system on self-propelled tracked or other wheeled chassis is being studied.

It is planned that the Rapier-2000 antiaircraft missile system will enter the inventory of the British Army and Royal Air Force. In the first case it will be employed as a troop air defense weapon and in the second for defense of such installations as airfields, radar positions, troop supply centers and so on. Troop deliveries of this antiaircraft missile system are planned for the mid-1990's.

6904

NATO Air Defense in the Central European Theater of Military Operations

18010451f Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 31-36

[Article by Col Yu. Vasilyev, candidate of military sciences, and Lt Col G. Mikhalychev]

[Text] Considering the inevitability of a retaliatory strike being delivered by aviation of Warsaw Pact countries, the NATO military-political leadership is paying special attention to improving and increasing the effectiveness of air defense in the Central European TVD [theater of military operations], where the principal striking forces and the most important military, administrative-political and industrial installations of the North Atlantic Alliance are concentrated. At the present time air defense personnel and equipment included in the air and ground forces of member countries in this region are employed for their protection and for repelling air strikes in close coordination with the air defense of bloc allied naval forces in the Baltic Straits zone. The organization, personnel and equipment, command and control, views on combat employment, and prospects for development of NATO air defense in the Central European Theater are examined below based on data published in the foreign press.

Organization, personnel and equipment. The Central Air Defense Zone, boundaries of which coincide approximately with theater boundaries, is deployed in the Central European Theater. It is divided into two air defense areas: the 2d Allied Tactical Air Command [ATAC] (operations center in Maastricht, the Netherlands), which takes in the northern part of the territory of the FRG, Belgium, and the Netherlands and part of the water area of the North and Baltic seas washing them and includes the 1st and 2d sectors with operations centers in Brockzetel and Uedem (both in the FRG); and the 4th ATAC (Kindsbach, FRG), which occupies the central and southern parts of the territory of the FRG and Luxembourg and includes one (3d) air defense sector.

The main personnel and equipment of the NATO allied air defense system deployed in Europe are concentrated in this zone. The fighting strength of this system's active forces includes air defense fighter aviation and surface-to-air missile and AAA units and subunits.

The fighting strength of fighter aviation of the Central Air Defense includes:

—From the U.S. Air Force European Command—the 36th Tactical Fighter Wing (three F-15 squadrons, Bitburg Air Force Base, FRG), 32d Separate Fighter Squadron (F-15's, Soesterberg Air Force Base, the Netherlands);

Table 1. Performance Characteristics of Air Defense Fighters

Designation	Crew	Maximum Speed, km/hr*	Service Ceiling, m	Radius of Action, km / Flight Range, km	Armament
F-4F	2	2400	22000	1200 / 3700	4 Sparrow guided missiles [GM] or 2 Sparrow GM and 4 Sidewinder GM, 20-mm cannon
F-16	1	2300	18300	925 / 3700	2-6 Sidewinder GM, 20-mm cannon
F-15	1	2650	21000	1000 / 4600	4 Sparrow GM, 4 Sidewinder GM, 20-mm cannon

*At high altitude.

—From the FRG Air Force—74th Fighter Squadron (F-4F's, Neuburg Air Base) from the 2d Air Defense Division, 71st Fighter Squadron (F-4F's, Wittmundhaven) from the 4th Air Defense Division;

—From the Belgian Air Force—1st Fighter Wing (F-16's, Beauvechain);

—From the Dutch Air Force—322d and 323d fighter squadrons (F-16's, Leeuwarden);

—From the Royal Air Force Command in the FRG—19th and 92d fighter squadrons (Phantom-FGR.2's, Wildenrath, FRG).

In addition, the following are included from the air forces: from the FRG—1st Improved Hawk Surface-to-Air Missile Regiment (Freising), 2d Nike-Hercules Surface-to-Air Missile Regiment (Lich), 31st and 32d electronic support regiments (Messstetten and Birkenfeld respectively), all these units being in the 2d Air Defense Division; 3d and 4th Improved Hawk surface-to-air missile regiments (Heide and Bremervoerde respectively), 13th and 14th Nike-Hercules surface-to-air missile regiments (Soest and Oldenburg), 33d and 34th electronic support regiments (Goch and Schleswig), all from the 4th Air Defense Division; from Belgium—9th and 13th Nike-Hercules surface-to-air missile wings (36 launchers); from Great Britain—4th Rapier Surface-to-Air Missile Wing (four squadrons of eight launchers each).

Over 300 (USA) and 48 (Belgium) Nike-Hercules, Patriot (Fig. 1 [figure not reproduced]) and Improved Hawk launchers have been transferred from ground forces of NATO countries to the order of battle of the Central Air Defense Zone.

The NATO Central Air Defense Zone has a total of over 250 fighter-interceptors and over 1,200 surface-to-air

Table 2. Performance Characteristics of Surface-to-Air Missiles

Designation	Range of Fire, km: Maximum / Minimum	Target Engagement Altitude, km: Maximum / Minimum	Launch Weight, kg	Missile Dimensions, m: Length / Diameter	Maximum Missile Speed, m/sec	Guidance System
Nike-Hercules	140 / •	30 / 3	4800	12.6 / 0.8	940	Radio command
Patriot	60 / •	24 / •	1000	5.18 / 0.41	1800	Radio command on mid-leg of trajectory, semiactive radar on terminal leg
Improved Hawk	40 / •	18 / 0.03	625	5.08 / 0.37	900	Semiactive radar
Roland II	6.2 / 0.26	5.5 / 0.015	62.5	2.4 / 0.16	500	Radio command
Rapier	5 / 0.5	3.6 / 0.03	43.5	2.24 / 0.13	650	Radio command

missile launchers. Performance data of the principal aircraft and surface-to-air missiles are given in tables 1 and 2. In addition to those indicated in the tables, a portion of the forces of tactical aviation, self-propelled and portable surface-to-air missile systems, and small-caliber AAA of the ground forces can be used for accomplishing air defense missions in the Central European Theater.

Command and control. Personnel and equipment of NATO air defense in the Central European Theater are subordinate to the theater allied air forces commander, who at the same time is commander, Central Air Defense Zone. Command and control is exercised through operations centers of the air defense zone, areas and sectors with the help of the NADGE automated control system, which supports the intercept of airborne targets at altitudes up to 30 km and at speeds up to Mach 2 and which is closely tied in with the American 485L tactical air control system in the Central European Theater, the French STRIDA-2 air defense automated control system, the UK Linesman air defense automated control system, the FRG Lars system for detecting low-flying targets, as well as with E-3A aircraft of the NATO AWACS Command (Fig. 2 [figure not reproduced]).

Coordination of actions of air defense personnel and equipment on each operational axis is the responsibility of operations centers of air defense sectors.

Views on combat employment. The NATO command believes that combat employment of air defense groupings in the Central European Theater will be planned as a component part of an air operation. An air operation is taken to mean a set of battles and engagements coordinated by objective, place and time conducted by fighter aviation and by surface-to-air missile and AAA units and subunits under a unified concept and plan, as well as in the course of day-to-day combat operations. The principal objectives of the air operation consist of disrupting the enemy command's plans for delivering air strikes and of creating favorable conditions for successful actions by theater groupings of armed forces.

The operation is planned in accordance with views of the leadership and command authority of bloc armed forces on the nature of employment of air forces of the opposing grouping and with consideration of available information about its order of battle. Overall direction of the air operation is exercised by the commander in chief of NATO Allied Armed Forces through the commander of Allied Air Forces in the theater.

The bloc command envisages two kinds of air operation: offensive and defensive. According to foreign press reports, it is planned to use personnel and equipment of the Central Zone of the NATO Allied Air Defense System in Europe as well as tactical aviation of the 2d and 4th ATAC, ground forces air defense units and subunits, and the NATO AWACS Command to perform missions of a *defensive air operation* in the Central European Theater.

Fighter aviation will operate on the axis of main attack of the opposing side's aviation.

Considering the fact that the NATO Allied Armed Forces still have no common IFF system, the employment of fighters over enemy territory is planned at all altitudes, and over friendly territory outside surface-to-air missile system impact zones.

Principal efforts of NATO ground forces air defense weapons will be directed at neutralizing strike groups of aviation operating against troop groupings. Here the mission of destroying air attack weapons flying at low and extremely low altitudes is the responsibility of short-range air defense weapons (Roland-II and -III—Fig. 3 [figure not reproduced], Rapier, Stinger), and engagement of targets at medium and high altitudes will be accomplished by long-range and medium-range Nike-Hercules, Patriot and Improved Hawk surface-to-air missile systems.

A defensive air operation in the Central European Theater, which may be conducted for three days or more, will consist of several phases. This is determined to a considerable extent by the nature of the opposing air force grouping's actions and the command authority's plan for conducting the defensive air operation.

It is believed that a defensive air operation may begin by delivery of a strike against airfields and air control posts of the opposing grouping while simultaneously repelling mass air strikes. The length of this phase will be from several hours to a day. It will conclude with measures to restore the disrupted air defense system and with considerable regroupings of personnel and equipment in preparation to conduct subsequent phases of the defensive air operation with the objective of inflicting such losses on the opposing air force grouping as to force its command authority to give up further active operations. To achieve this the NATO command proposes to make active use of tactical aviation. Foreign authors direct attention more and more often to the need for comprehenisve employment of all personnel and equipment at the disposal of allied air forces in the course of the defensive air operation.

A significant role in the defensive air operation is given to the maneuver of surface-to-air missile and AAA subunits. The American FM-44-15 field manual requires that a change of positions by Patriot surface-to-air missile batteries be accomplished at least once every 24 hours, but a position can be changed simultaneously by no more than two batteries or by one battery and the battalion CP.

Development prospects. Subsequently the U.S. and NATO commands intend to reinforce the principal active air defense weapons (surface-to-air missiles and fighter aviation) and ensure reliable radar coverage of the territory of the Central European Theater, i.e., considerably increase combat capabilities of surface-to-air missile groupings and fighter aviation units. To this end the Patriot, Roland-II and -III and Rapier (self-propelled) surface-to-air missile systems as well as the Tornado, F-15 (see color insert [color insert not reproduced]) and F-16 (Fig. 4 [figure not reproduced]) will enter the inventory. It is planned to improve the effectiveness of air defense weapon systems by modernizing on-board aircraft armament and improving sighting systems and ground radars.

A special place belongs to the United States and FRG in rearming air defense units and subunits in the Central European Theater. For example, the Patriot surface-to-air missile is entering the inventory of U.S. Army Europe's 32d Air Defense Command and the FRG Air Force. In the assessment of NATO specialists, compared with other surface-to-air missile systems the Patriot is more effective in combating airborne targets, especially under conditions of electronic jamming. In the 1990's it is planned to have around 600 launchers for such surface-to-air missiles as part of the U.S. Army in the Central European Theater and 288 in the FRG Air Force. It is also planned to have the Patriot surface-to-air missile system in the inventory of air defense units and subunits of Belgium and the Netherlands. In addition, the Bundeswehr plans to procure 175 Roland-II surface-to-air missile launchers (of these 95 are for the Air Force and 20 for the Navy).

Patriot surface-to-air missile systems are placed together in battalions. A battalion consists of six batteries (eight launchers in each). A battery tracks up to 100 airborne targets simultaneously and can conduct fire against eight of them, which is approximately three times better than combat capabilities of an Improved Hawk surface-to-air missile battery.

By accepting prospective short-range surface-to-air missile systems (self-propelled Rapier, Roland) in the inventory, it is planned to substantially improve combat effectiveness of air defense groupings of bloc countries in the Central European Theater in combating low-flying targets.

In accordance with the new concept of tactical employment of surface-to-air missile forces included in the NATO Allied Air Defense System in the theater, it is planned to reject the stationing of units equipped with the same type of surface-to-air missiles in one belt and create a forward belt of so-called concentration zones of different types of surface-to-air missiles (Improved Hawk, Patriot and Roland) in place of the Improved Hawk surface-to-air missile belt, and a rear belt of the very same kind of surface-to-air missiles in place of the Nike-Hercules surface-to-air missile belt.

Large and small units from one or more NATO countries having corresponding surface-to-air missile weapons on FRG territory are assigned as part of surface-to-air missile forces in the zones. For example, surface-to-air missile units of the Bundeswehr Air Force will be represented in 8 of 11 zones. Operational direction of all zonal surface-to-air missile units as a rule will be the responsibility of the command authority of the country which will assign the greatest number of surface-to-air missile weapons. For example, in accordance with the plan operational direction will be the responsibility of the Bundeswehr Air Force in six zones and of the American command in two others (with the participation of FRG surface-to-air missile units). Foreign press publications point out that command and control of surface-to-air missile weapons will be accomplished in the future from mobile control posts, for which a system of the necessary means of transportation, gear and equipment presently is being developed [razrabatyvatsya] in NATO.

Bloc leadership is giving special attention to employment of E-3A Sentry AWACS aircraft for accomplishing missions of air space surveillance and warning about actions of enemy aviation. Under combat conditions warning about the approach of enemy aircraft to screened installations will come from this aircraft to sector operations centers, control and warning centers, command posts of fighter air wings and surface-to-air missile battalions of the air defense system, control and warning centers of the tactical air control subsystem, and early warning aircraft in adjacent patrol areas. This will considerably expand capabilities of the air defense system for detecting, identifying and destroying airborne targets as well as for command and control of the system's active means.

With simultaneous vectoring of fighters to other aircraft, the radar of the E-3A is capable of tracking around 100 targets. It can detect them at high altitudes at a range of over 600 km, and at low altitudes up to 400 km and vector fighters to 15 airborne targets simultaneously. E-3A patrol endurance at a distance of 1,300 km from the air base without aerial refueling is 8-10 hours, and with refueling it is up to 24 hours.

Three E-3A aircraft patroling in the area of the FRG's western borders monitor the air space above a considerable part of the territory of Warsaw Pact countries. NATO strategists believe that in a threat period and during war these aircraft together with ground radars will have to create a continuous broad zone (of several hundred kilometers) of long-range radar acquisition of airborne targets at all altitudes along borders with socialist countries.

The NATO AWACS Command that has been formed has 18 E-3A aircraft, a considerable portion of which can be used for command and control of air forces and air defense in the theater, according to bloc command views. In addition, Great Britain and France purchased seven and three E-3C aircraft respectively, which will substantially supplement the capabilities of that command.

NATO specialists assume that realization of the above and certain other measures will permit an appreciable increase in combat capabilities of the NATO Allied Air Defense System in the Central European Theater.

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Security and Defense of FRG Air Force Bases

18010451g Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 36-38

[Article by Lt Col A. Aleksandrov]

[Text] The Bundeswehr command places much emphasis on creating a reliable security system for combat aviation base airfields on FRG territory both in peace and wartime, considering it a very important condition for uninterrupted air base functioning and thus for ensuring a high degree of Air Force combat readiness.

According to the foreign press, the FRG military leadership fears that even in a period of increased tension there will be a "threat" of disruption of normal activity of many military installations on FRG territory, including air bases, above all because of various kinds of protest demonstrations arranged by "radical" or "leftist" elements, as well as direct acts of sabotage and subversion. The Bundeswehr Air Force command believes that with the beginning of combat operations the nature and scale of the threat to air bases and other Air Force installations will rise sharply as a result of possible delivery of missile and bombing strikes against them by the enemy, as well as the landing of airborne assault forces and sabotage-reconnaissance groups.

It follows from foreign press publications that provisions for security of air bases and other installations of the FRG Air Force is taken to mean the organization of their security, ground defense and air defense. On the whole, responsibility for ensuring air base security is borne by the commanders of air squadrons stationed at the bases while immediate elaboration and implementation of security and defense plans is the responsibility of chiefs (commandants) of corresponding installations (airfields, depots, military compounds and so on) located on or near base grounds. In an emergency situation or with the onset of combat operations the air squadron commander appoints a person responsible for base security and defense. At combat aviation airfields these functions will be assigned as a rule to the airfield service battalion (group). An officer responsible for organizing security and ground defense (as a rule the security company commander) and an officer responsible for installation air defense are directly subordinate to him.

Special subunits (security companies and separate security platoons) have been created for providing security and ground defense of installations in the Air Force, and AAA batteries and antiaircraft machinegun platoons have been created for air defense. West German military press reports emphasize, however, that these forces will be clearly insufficient in case of war. Therefore during combat operations it is planned to use (where possible) forces and equipment of other branches of the armed forces situated in the vicinity of Air Force installations to provide for air base ground and air defense. To establish close coordination with these forces all installation chiefs (commandants) are instructed to agree on and coordinate in advance the defense plans of Air Force installations with corresponding plans of ground forces for defense of the territory, and installation air defense plans with plans of the national air defense system.

It is also planned to coordinate in advance measures for ensuring order near the location of Air Force installations with local police organs under various situation conditions both in peace and wartime. It follows from foreign press publications that assurance of such order is taken to mean preventing and breaking up antiwar demonstrations and protest rallies at installation locations, isolating (arresting) activists of progressive democratic organizations, preventing violent actions toward Bundeswehr property, and not allowing approach routes to secured installations to be sealed off.

With an aggravation of the situation and preparation for the beginning of war, air base security and air defense subunits are placed in higher degrees of combat readiness and filled out to wartime tables of organization. According to the West German press, to accomplish missions of security and air defense of Air Force installations it is planned to have around 220 security companies and separate security platoons, over 50 AAA batteries and up to 60 antiaircraft machinegun platoons.

Air base security and air defense subunits presently are armed with 20-mm twin AAA mounts, 7.62-mm machineguns and automatic rifles, 9-mm submachineguns, 40-mm and 84-mm handheld antitank rocket launchers, hand grenades, and various radios. A considerable amount of armament of the above models presently is at depots at locations of skeleton security and air defense subunits or in places where new subunits of this sort are to be activated according to the mobilization deployment plan.

The foreign press notes that security subunits train for conducting a defense of their assigned installations in any situation (regardless of time of year, day and night, and with enemy employment of weapons of mass destruction along with conventional means of warfare).

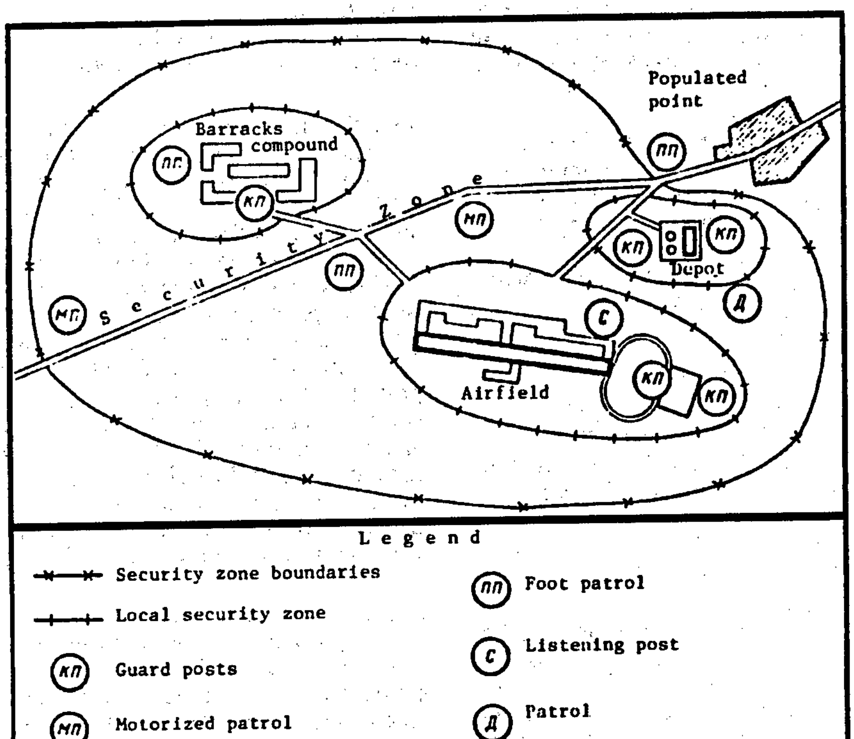

Diagram of air base security and defense organization

They must be in a condition to combat airborne assault forces and sabotage-reconnaissance groups and must have a well organized command and control system and sufficient mobility.

The security and ground defense of an air base are built in the following schematic manner (see diagram). A security zone is established around the base (its size and configuration depend on the area of base territory, surrounding terrain features, and presence of populated points and military and other secured installations in the vicinity). Surveillance is organized within the zone with the help of foot or motorized patrols. Local security—sentry posts, foot and mobile patrols, and listening posts—is set up around individual installations within the zone (airfields, depots, barrack compounds for accommodating personnel and so on). Finally, the third element of the security system is immediate security of the installation itself, i.e., around-the-clock or nighttime guard posts with appropriate equipment (guard towers, searchlights, barbed-wire fences and so on). As a rule, positions for defense of such installations are prepared in advance near the installations.

To provide security and defense of an air base at which aircraft that are nuclear weapon platforms are stationed, the territory set aside for the base is broken into the following zones: general purpose (security zone), flight support, alert duty, special weapon storage.

Security of the latter zone is accomplished by Bundeswehr subunits and weapons are issued by the Americans. Two-man patrol details with guard dogs and stationary sentry posts are assigned to perform the mission. In addition, the territory on which a depot is located is equipped with technical security and signalling equipment.

According to the presently existing FRG Air Force organization and establishment, each air base has one skeleton security company and one skeleton AAA battery. In peacetime the security company has from one to three fully manned platoons (depending on the situation, importance of the installation, its size and security conditions), and the AAA battery has one platoon used primarily as a training subunit. In addition, servicemen from other base (squadron) service subunits as well as security personnel from among civilian employees are used in peacetime for air base installation security. During immediate preparations for combat operations or on the announcement of mobilization these subunits are transferred to the regular category and are brought up to strength of wartime tables of organization in personnel and materiel.

The foreign press emphasizes that approximately 30 percent of the total number of reservists who are to be called into the Air Force in case of mobilization are earmarked for manning existing skeleton security and air defense subunits and for forming new ones. Considering the high degree of dependence on reservists for manning these subunits, the West German Air Force command element is taking a number of urgent steps to improve the system for training and maintaining the professional training of this group of reservists at a high level. In particular, the category of "Air Force security subunit reserve officer" has been introduced and their training is accomplished by regularly including them in mobilization exercises of Air Force units [soyedineniye and chast].

The western press notes the systematic increase in the contingent of reservists included in Air Force exercises (held under conditions approximating combat conditions to the maximum). During the exercises reservists perform those specific functions for which they are intended under the table of organization. For example, during an exercise of the 8th Air Force Supply Regiment (Mechernich) held in April 1986 under the codename Eifelstein (550 reservists were called up to take part in it), skeleton security subunits practiced the following missions: patroling in the security zone, local security of installations within the security zone, combat against enemy sabotage groups, destruction of an airborne assault force. Antiaircraft subunit teams practiced repelling raids by fighter-bombers and attack helicopters. A portion of the aforementioned missions were practiced under conditions of the enemy's employment of weapons of mass destruction.

The foreign press reports that at the present time the command element is considering a number of measures for improving the organization and establishment of these subunits as well as for increasing the effectiveness of the system of training reservists earmarked for them and their degree of outfitting with weapons and military equipment in order to place the skeleton security and air defense subunits in a combat-ready status as quickly as possible in case of Air Force mobilization deployment. In particular, the question is being decided of accepting in the inventory of those subunits self-propelled Roland-II surface-to-air missile systems, special AIM-9L Sidewinder air-to-air guided missile launchers for use as an air defense weapon, improved rocket launchers and other weapon models.

6904

All-Weather Weapon Systems for Engaging Ground Targets

18010451h Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 39-42

[Article by Col V. Prokofyev, candidate of technical sciences]

[Text] While speaking out for arms reduction, U.S. and NATO imperialist circles continue to intensively develop [razrabatyvat] weapons both with nuclear and conventional warheads. Among the latter much attention is being given to development [razvitiye] of precision air-to-surface weapons, among which western specialists include guided missiles, bombs and bomb clusters. All types of these weapons are being perfected in the direction of increasing the accuracy of hitting the target, increasing the casualty effect of warheads, improving speed and maneuver characteristics, and increasing the antijam capability of guidance systems. Special significance is attached to the possibility of employing weapons day and night under all weather conditions, since this ensures aviation of continuity in conducting combat operations in a modern war.

Foreign military specialists note that with the exception of missiles with radar guidance systems, the majority of models of precision air-to-surface weapons presently in the armament of tactical aircraft have significant limitations for employment under adverse weather conditions and in hours of darkness. To eliminate these limitations the United States and other NATO countries are developing [razrabatyvatsya] various special devices to ensure the acquisition and recognition of targets, guidance of weapons to them, and their destruction under such conditions. Such devices include in particular on-board infrared target acquisition systems and thermal-imaging homing heads of guided missiles and aerial bombs. The capability of thermal-imaging systems to convert objects' infrared emissions into a visible image permits acquiring targets in real time under nighttime conditions. Reliability of acquisition depends both on the receiver's sensitivity and on the system's resolution. It is believed that with the contemporary level of resolution that has been achieved (equal to approximately one angular minute) and receiver thermal sensitivity of around 0.1 degree Centigrade it becomes possible to detect targets such as a tank in simple weather conditions with a probability close to 1 and identify it at a range up to 3 km.

The first aircraft forward-looking infrared [FLIR] systems were created [sozdat] in the United States in the early 1960's and were used for night reconnaissance of targets for their subsequent engagement in close air support. Since then such systems have become rather widespread abroad. As a rule they have two fields of view (a wide field for observation and acquisition of targets and a narrow field for their identification), a television standard of 875 lines, thermal sensitivity to the surrounding background of 0.1-0.5 degrees Centigrade, and a resolution of 1-4 angular minutes. For example, the American AN/AAQ-9 FLIR developed in 1977 under a U.S. Air Force order is installed in the AN/AVQ-26 Pave Tack weapon control system pod suspended on F-4 and F-111 fighter-bombers. The same pod accommodates a laser rangefinder-target designator, power supply units, and electronic gear providing communications of the Pave Tack system with a central computer, radar, and aircraft navigation gear. Surveillance of targets under nighttime conditions and during the day in the presence of haze and thin fog is conducted on the display screen in the crew cockpit. Detected targets are engaged with guided missiles and bombs with laser guidance systems, and targets are illuminated by the laser target designator, which has an optical axis lined up with the line of sight of the IR set. The foreign press emphasizes that aircraft equipped with the Pave Tack system are capable of effectively engaging small targets under nighttime conditions. Given as an example is the participation of F-111 fighter-bombers with the Pave Tack system in a night raid on Tripoli in 1986, during which a strike was delivered with 2,000 pound guided aerial bombs with laser homing heads against the two-story building of the Libyan leader's presumed headquarters.

In the opinion of western experts, IR systems can be used successfully for 90 percent of the year under European conditions. Results of a study conducted in the United States show that an aircraft equipped with FLIR will be able to fly an average of 2.25 combat sorties a day in the winter period. Specialists include among deficiencies of the thermal-imaging systems the impossibility of determining distance to detected targets. Therefore these systems are used in the majority of cases together with laser rangefinders-target designators, which also illuminate targets in addition to measuring distance. That principle is realized both in the Pave Tack system and in the LANTIRN sighting-navigation system.

LANTIRN system equipment is accommodated in two suspended pods. One contains navigation equipment (a terrain-following radar and FLIR) and the other contains target acquisition and weapon control equipment (FLIR, laser rangefinder-target designator, and device for issuing data for missiles). American specialists place LANTIRN among the most important aircraft weapon systems created in recent times inasmuch as it enables single-place tactical aircraft to make low-altitude flights and employ weapons against ground targets day and night in all weather conditions. Effectiveness of combat employment of the system together with Maverick missiles has been evaluated repeatedly during test flights and exercises. Pilots who have flown at night unanimously noted that with this system they were able to use the very same tactics and the very same flight profiles in delivering weapons to the target as under daytime conditions. Over 700 sets of the LANTIRN system are to be delivered to the U.S. Air Force before the end of 1992.

Judging from foreign press reports, modernization of models of missiles and aerial bombs already in the inventory is one of the directions of creating munitions for all-weather employment. For example, a variant of the Maverick AGM-65D air-to-surface guided missile with unified thermal-imaging homing head was developed under U.S. Air Force order (the GBU-15 guided glide bomb has the very same head, and the latter is planned for use in the Hellfire ATGM). After receiving a target designation from the FLIR the thermal-imaging homing head locks onto the target and then after launch is guided to it autonomously without crew participation. The homing head is made as a separate module with an IR-transparent fairing covering the input window of the objective lens. Thermal emission of targets enters the objective lens, falls on a deflecting mirror and goes from it to the IR detector array. A scanner is used to make a line examination of the homing head field of view. After amplification, input signals from the IR detector array go simultaneously to the display input in the aircraft cockpit and to the input of the target position indicator logic device. After detecting and identifying a target with the help of the IR set, the pilot orients the missile homing head on the target, gives the command for target lock-on and then for missile launch. Subsequent target tracking is done by the logic device, which is a correlator. A frame-by-frame comparison of target images with the determination of the correlation function and output of guidance error signals selected by the guided missile autopilot is performed in the logic device. Foreign specialists note the rather high target hit accuracy of this variant of the Maverick guided missile. For example, 18 out of 19 missile launches at the U.S. Nellis Air Force Base (Nevada) from F-4, A-7 and A-10 aircraft in 1985 ended with a direct hit on the target.

The AGM-65F variant of the Maverick guided missile was developed on assignment of the U.S. Navy. It uses a somewhat modified thermal-imaging homing head and powerful blast-fragmentation warhead with massive steel case providing for penetration of a ship hull without ricocheting. The warhead is detonated with a certain delay, selected depending on the nature of the target. Specialists of Hughes (developer of the Maverick guided missile) proposed to equip the Harpoon antiship guided missile with the thermal-imaging homing head from the Maverick, which will increase Harpoon's jam-resistance to electronic warfare means.

Foreign experts include among advantages of thermal-imaging systems their passive principle of operation providing covertness of employment and high resistance to jamming. Developers link a further development of thermal-imaging systems with the use of latest achievements of microelectronics, above all with the creation of mosaic IR receivers. The western press notes successes of the American firm of General Electric, which developed a mosaic receiver in the form of a square matrix 6.4 cm^2 in size made up of 128x128 elements with preamplifiers and signal processors located around the perimeter of the frame. Such a matrix has increased sensitivity and greater target acquisition range in comparison with a scanning circuit. In the opinion of the firm's specialists, the mosaic sensor simplifies signal processing and reduces false-alarm signals to a minimum.

In addition to the United States, Great Britain and France are actively working to create thermal-imaging systems. In particular, the British firm of GEC Avionics has created [sozdat] the Atlantic pod system based on standard thermal-imaging modules and intended for F-16 aircraft. It is also reported that along with a FLIR, British specialists are testing a television camera operating under low-light conditions as a night vision sensor; the camera permits detecting targets in moonlight and starlight. In the course of studies specialists concluded the advisability of supplementing the FLIR and television cameras operating under low-light conditions with night vision goggles. They provide the pilot with a wide field of view and make it possible to observe the outer expanse without restricting abilities to keep track of instrument readings, including information from the IR set displayed on the background of the cockpit's windshield. In addition, with such goggles the pilot can see the laser rangefinder-target designator spot.

France has completed development [razrabotka] and testing of the ATLIS 2 weapon control pod system, intended for supporting the employment of missiles and aerial bombs with laser homing heads day and night from single-place F-16, Mirage-2000 and Jaguar aircraft. Target acquisition is performed with the help of a dual-spectrum camera operating in the visible and near-IR bands, and target illumination with an yttrium-aluminum-garnet laser rangefinder-target designator emitting at a wavelength of 1.06 microns. French AS-30L guided missiles and BGL aerial bombs with laser homing heads were used in system flight tests. Missiles were launched at speeds of 1,100 km/hr, at flight altitudes of 70 m and at ranges up to 9.7 km.

In the opinion of western experts, capabilities of airborne weapon systems rose substantially with the appearance of CO_2 lasers operating in the IR band of wavelengths (10.6 microns). Not only rangefinder-target designators, but also multifunction laser radars which can be used simultaneously for battlefield surveillance and for guiding weapons to selected targets now are being developed [razrabatyvatsya] on the basis of CO_2 lasers. In contrast to the on-board radar, the laser radar has enormously higher resolution, and it is inconspicuous and has better jam-resistance because of an extremely narrow beam. By registering the Doppler frequency shift of reflected pulses using the laser radar, it is possible not only to detect a displacement of the target and its individual parts (ring mounts, turrets, tracks), but also to register tank hull vibration. All this together with information about an object's range, outline and size sharply increases the likelihood of correct target identification. Compared with passive FLIR systems the laser radar permits picking out targets against background terrain more reliably. It is believed that under conditions of haze or light fog the precision of target images observed by an IR system gradually decreases as weather worsens, while the laser radar allows obtaining a contrasting image as long as a reflected signal is observed. The image has volume because of its three-dimensional nature, although the IR system provides a more realistic image. Aligning the images provides the most complete information about the object observed.

A significant deficiency of the laser radar is the short range of action compared with the radar due to attenuation of IR emission by the atmosphere. Maximum range of action of the laser radar with transparent atmosphere is approximately 10 km, but both systems are very effective under all weather conditions with the exception of very dense fog for typical tactical conditions where terrain is being viewed for a distance of 3-5 km ahead of the aircraft.

In addition to performing the functions of rangefinder-target designator, the laser radar can be used for guiding high-speed missiles, and the problem of multichanneling is effectively solved. For example, the Micos laser radar of the American firm of Vought is capable of guiding up to 30 hypersonic missiles to 10 different targets simultaneously.

In the opinion of foreign military specialists, laser radars will find wide use in cruise missile guidance systems, and the use of such systems for guiding antiship missiles will make it possible to realize the method of automatic target acquisition and selection on the missile's flight trajectory as well as to direct it to the most vulnerable part of a ship. As part of the on-board equipment of the prospective bomber being created under the ATB (Advanced Technology Bomber) program it is planned to introduce a laser radar with an automatic target acquisition system, which will permit accomplishing the task of identifying targets according to their set of revealing signs.

Despite all advantages of the aforementioned systems, however, adverse meteorological conditions sharply limit their combat employment. Therefore the U.S. Air Force command advances as a mandatory requirement for prospective airborne weapon systems that their working capacity be independent of weather, dust, smoke and other interference. It is planned to take multifunction on-board radars operating both against airborne and ground targets as the basis of future all-weather weapon systems. Against small targets they will function with superhigh resolution provided by a synthetic-aperture antenna mode. Information being received from the radar will be processed by a processor, the speed of which will be 1-2 billion operations per second, which is 50-100 times faster than the speed of the F-15 fighter's processor.

American specialists proposed to use the radar with synthetic-aperture antenna for direct weapon guidance to detected ground targets. Back in 1978 demonstration tests of such a set for guiding air-to-surface guided missiles were conducted at Eglin Air Force Base (Florida). The expensive and cumbersome radar and its processor were accommodated on a platform aircraft (AC-130) and a monopulse radar antenna, multiplexer, radio-frequency amplifier and two-channel communications line with the platform aircraft were installed on the missile. Realization of that system stumbled on a number of difficult problems, however, particularly involving the impossibility of using a synthetic beam for direct missile guidance, a resolution (3-7 m for both coordinates) not high enough for reliable identification of small targets, and so on. In this regard great hopes are resting on millimeter wave technology, which because of a number of features is well suited for creating [sozdaniye] all-weather airborne weapon systems, but difficulties involving the element base prevented this for a long time. The latest achievements in the sphere of microelectronics and SHF instruments in the millimeter band permitted getting right down to developing models of such weapons.

With consideration of the atmosphere's characteristics, four principal spectral windows are used for models being created, corresponding to the wavelengths 8.5, 3.2, 2.1 and 1.4 mm (the frequencies 35, 94, 140 and 220 GHz). The models retain working capacity in the spectral windows day and night in the presence of fog, dry snow, smoke and dust over the area of combat operations, although heavy rain substantially reduces their range of action. The shorter operating wavelength compared with wavelengths of synthetic-aperture antenna radars permits achieving higher resolution with enormously lesser antenna diameter, which is especially important for homing heads.

Millimeter band homing heads are being developed [razrabotka] most actively by the American firms of Hughes, Martin Marietta and Sperry. For example, Hughes created a homing head 12.5 cm in diameter for short-range and long-range guided missiles. The homing head wavelength is 3.2 mm, parabolic antenna radiation pattern width is 1.5 degrees, solid-state transmitter output is 4 and 10 watts (100 watts in the future). The homing head can function in active and passive modes. In the active mode it operates as a radar and in the passive mode as a radiometer, receiving radiometric emission from targets and the background. Tests of the homing head in the active and passive modes demonstrated better characteristics than for thermal-imaging homing heads under conditions of fog and dense clouds.

A model of the Martin Marietta active homing head operates at a wavelength of 8.5 mm with radiation pattern width of 4.3 degrees and an antenna diameter of 15.2 cm. Output of the solid-state transmitter is 4 watts. The homing head provides for automatic target search and lock-on on the trajectory with range gating. Sperry is working out different methods of active and passive guidance of airborne weapons using homing heads functioning at the 3-5 and 10 mm wavelength. The firm plans to create a homing head 10-18 cm in diameter, 30-40 cm long and weighing 4.5-6.5 kg. In the opinion of the firm's specialists, the homing head for GBU-24 guided glide bombs is closest to realization. Under the Paveway IV program a homing head is being created for these munitions with a programmable device which will enable aircraft crews to bomb with simultaneous autonomous homing of each aerial bomb on its own target.

The United States links practical employment of such homing heads with mastery of the technology of obtaining monolithic millimeter band circuits and with introduction of digital signal processing with large-scale integration. Much attention is given to accumulating a data bank of reflective signs of different targets (primarily armored) in the millimeter waveband under varied target observation conditions. This will subsequently permit solving the problem of automatic target recognition.

Judging from foreign press reports, the American firm of Lockheed is conducting experiments to create [sozdaniye] a passive radiometric guidance system for prospective air-to-surface guided missiles launched in a standoff mode. Such a system will be a passive area correlator of the millimeter band (9.0-8.34 mm) in which current information being received on terrain with the help of radiometers is compared with information stored in memory. Commands for correcting a missile's position are produced based on comparison results.

Development [razrabotka] and practical use of on-board millimeter-band radars is going more successfully than that of homing heads. This is explained by the less rigid limitations on weight and dimensions and by the broader range of tasks to be accomplished by the sets. Narrow-beam terrain scanning with rapid data processing by a digital processor permits obtaining a detailed image of the area being observed and of objects in it, which makes it possible to use the radar for precise navigation, weapon guidance, and detection of inconspicuous obstacles (such as power transmission lines) during extremely low altitude flights.

Active work to create [sozdaniye] all-weather millimeter-band weapon systems also is being done in Great Britain, France and the FRG. For example, the British firm of Marconi is developing [razrabatyvat] an active millimeter-band homing head for antitank weapons, the FRG together with the United States is testing a sensor for drones, and France and Great Britain are completing the development of a radar for helicopters and aircraft.

The western press notes that the most important trend in creating [sozdaniye] all-weather weapon systems is the integration of sensors operating in different bands, which permits more effective use of their advantages and a substantial reduction in deficiencies. Because of this, very sophisticated multifunction on-board systems and munitions with combination homing heads are entering the aviation inventory. Development of the technology of new sensors and systems presumes mandatory use of high-speed processors and powerful computers; this involves the appearance of weapons of fundamentally new types with elements of artificial intelligence.

6904

Outfitting of 'Observation Island' Missile and Space Object Tracking Ship

18010451i Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 43-44

[Article by Col V. Pavlov, candidate of military sciences]

[Text] U.S. militaristic circles continue work within the scope of the SDI program to create [sozdaniye] both space attack arms as well as means for intercepting ballistic missile re-entry vehicles, and to study data on signatures of tested re-entry vehicles with the objective of finding an effective solution to the problem of identifying them in the earliest flight stage. The special "Observation Island" vessel is used for these purposes, above all for tracking test launches of ballistic missiles with re-entry vehicle impact area in the Pacific Ocean.

This vessel (full displacement 17,000 tons, length 171.7 m, beam 23.2 m, maximum speed 20 knots) was built in 1953 and until the early 1970's was intended basically for supporting test launches of Polaris and Poseidon missiles. Development of the concept of using her to monitor Soviet ballistic missile re-entry vehicles began in 1977, in accordance with which it was planned to create [sozdat] a specialized radar. To this end the U.S. Air Force command let a contract in early 1979 with the American firm of Raytheon for developing [razrabotka] a phased array radar codenamed Cobra Judy. In 1981 the Cobra Judy radar was installed in the after part of the "Observation Island" in a cubic superstructure 11 m high (Fig. 1 [figure not reproduced]; it weighs around 270 tons.

The diameter of the phased array antenna is around 7 m. The array aperture contains 12,288 active elements powered from traveling wave tubes (TWT's), broken into two groups of eight. Water cooling is used to maintain the normal temperature regime of operation of the TWT's and other radar elements. The active elements and TWT's are interconnected by flexible waveguides of special design. The Cobra Judy radar operates with a complex set of radar signals. Digital data processing and pulse compression are used in it in particular. In the opinion of foreign experts, this permits ensuring high resolution and using data received in synthesized algorithms for identifying ballistic missile re-entry vehicles to solve the problem of their intercept by prospective ABM defense weapons being developed [razrabatyvat] within the scope of the "star wars" program. The zone of coverage of the Cobra Judy radar is 270 degrees in the azimuthal plane and from 0 to 90 degrees in elevation. Both electronic scanning of the phased array antenna radiation pattern in azimuth and elevation as well as the radar's mechanical rotation in azimuth by a hydraulic servo system is used to survey space [prostranstvo]. The radar operates in the 10-cm band (2-4 GHz).

Modernization work began on the "Observation Island" in October 1982 during which one more radar was installed on her, this one operating in the 3-cm band (8-12.5 GHz), and the parabolic antenna of this radar around 9 m in diameter (Fig. 2 [figure not reproduced]) was installed in the vessel's mid-section. American specialists believe that accommodation of two radars on the vessel operating in different bands can provide an opportunity to realize multifrequency target location, which will permit obtaining more detailed information about their signatures in the interests of creating qualitatively new identification algorithms, including on the basis of radar images of targets and precision trajectory measurements obtained through use of these radars in the phasemeter mode.

Two radiometric system antennas beneath radio-transparent domes each 9 m in diameter located in the ship's mid-section are for receiving telemetry signals in the decimeter waveband. These antennas are trained on objects based on data from the radars. After detecting emissions of telemetry transmitters on an object, the antennas perform autonomous tracking of it.

The vessel uses the Cyber 174-112 computer for controlling radar operation and for digital processing of radar data. The automated radar-operator work stations are equipped with two display units around 55 cm in diameter. Data collected are transmitted to the continental United States in real time over satellite channels of the FLTSATCOM communications system. For this the vessel has corresponding antenna arrays and the AN/WSC-3 transceiver equipment, basic parameters of which are given below.

Frequency band, MHz	225-399.975
Number of fixed frequencies with 25 Hz separation	7000
Of these, pretuned	20
Kinds of modulation	FM & AM
Power output, watts:	
In FM mode	100
In AM mode	30
Data transmission rate, bits per second	75; 9600
Equipment weight, kg	67.1
Overall dimensions, mm	311x483x588

Navigation support of the vessel is by the Transit satellite radionavigation system and the LORAN-C ground radionavigation system. The former provides position finding of the vessel at any point in the ocean with an accuracy of around 100 m. The antenna system of the Transit radionavigation system receiver-display unit is installed on the Cobra Judy radar superstructure.

The LORAN-C system includes ground transmitters and control stations as well as on-board display units. Station signals are radio pulses 10 milliseconds long transmitted with an accuracy of 0.001-0.01 cycles at a frequency of 100 kHz. Work is being done to stabilize the shape and phase of emitted signals in order to improve position finding accuracy using LORAN-C system equipment. In particular, variations of pulse forming time do not exceed 50 nanoseconds and their amplitude variation is no more than 3 percent. This work permitted bringing the accuracy of determining position coordinates to 30-360 m depending on distance from ground transmitters. American specialists assume that this provides a sufficiently accurate determination of re-entry vehicle impact locations and parameters of their flight trajectories.

The "Observation Island" presently is being used basically for tracking ballistic targets on the final leg of the trajectory and it operates together with the Cobra Dane radar located on Shemya Island in the Aleutian Islands (its operating range is over 4,000 km). She has a crew of 142, of whom 60 operate the radar equipment.

6904

Radio-Absorbing Materials and Stealth Technology

18010451j Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 45-46

[Article by Col Yu. Belyayev, candidate of technical sciences]

[Text] In making efforts to create [sozdaniye] new-generation airborne weapon systems, leading NATO countries are placing reliance on use of radio-absorbing materials in the construction of aircraft and missiles and introduction of "Stealth" technology, which is understood to mean ensuring an object's inconspicuousness regardless of the physical principle of its revealing signs.

Judging from foreign press reports, greatest attention is being given to work on use of "Stealth" technology in creating new-generation aircraft. Cited in particular is the example of the notorious Lockheed F-19* fighter. A squadron of them allegedly is based at Nellis Air Force Base (Nevada) and individual fighters are being moved in Galaxy C-5 military transport aircraft to various regions outside the American continent for operational use.

Specialists in the sphere of "Stealth" technology in Great Britain (particularly in the firm of Plessey) believe that a solution to the problem of low radar signature based on use of materials which scatter illumination energy in a direction different from the direction to the source of emission (the radar) can have an effect only with respect to monostatic but not bistatic radars. Therefore with an eye to the future British experts assume that the use specifically of radio-absorbing materials is more effective. In their opinion, such materials should be broadband and rather light (up to 1-2 kg/m^2). Properties of some radio-absorbing materials of the British firm of Plessey are given in the table. Their characteristic features are as follows. LAO material has a gently sloping dependence of the reflection factor on frequency in the 4-36 GHz band with its maximum value -25 db in the 12-28 GHz band. The two-band material provides best absorption at frequencies of 9 and 3 GHz, and in the 2-12 GHz band its reflection factor is not over -12 db. The three-band radio-absorbing material K-RAM has similar features: a reflection factor of -20 db at a frequency of 3 GHz, around -35 db at 10 GHz and around -33 db at 13 GHz, and in the 2-18 GHz band it is not over -7 db. The ADRAM material is designed for use under conditions of linear and circular polarization at various radar illumination angles.

It is possible to give materials radio-absorbing properties on the basis of several principles. One of them is that two reflection surfaces are created in the material. By choosing the distance between them depending on the estimated illumination frequency it is possible to achieve a state where signals reflected from each of the surfaces are mutually attenuated. Such materials are called resonance radio-absorbing materials, they are narrowband and designed for use under conditions of known illumination frequency. It is believed that the frequency band for using such materials can be broadened if, for example, they are made multilayered. These layers should be designed for different absorption frequencies. Judging from the assessment of western specialists, however, this method of creating broadband radio-absorbing materials is far from the best. A more effective method is considered to be special impregnation of the base material. For example, impregnating polyurethane foam with carbon plastic [ugleplastik] leads to a reduction in reflection effect because of dielectric signal losses. It is assumed that radio-absorbing properties can be given to any base materials and thus they can be used as structural or protective materials.

In speaking of prospects for using structural materials when they are given radio-absorbing properties, foreign specialists also note deficiencies of such materials. They give the example of using materials with carbon fibers in aircraft constructions. Inasmuch as electric conductivity of carbon fibers is close to that of metals, it is very difficult to give the constructions in which materials with such fibers are used good radio-absorbing properties.

Foreign specialists are considering prospects for using radio-absorbing materials together with the development [razvitiye] of radar acquisition equipment inasmuch as the effect of using such materials in the final account lies in a reduction of the target's radar cross-section. It is assumed that the radar cross-section of a single-engine aircraft can be reduced to several tenths of a square meter, and this problem is solved more simply for higher

Radio-Absorbing Materials of British Firm of Plessey

Material	Sheet Size, mm: Length x Width / Thickness	Weight of 1 m² of Material, kg / With Sheet Thickness, mm	Reflection Factor, db / at Frequency, GHz	Note
ADRAM	610 × 610 / 0,7 — 2	1,7 / 1,5	— 6 / 8 — 10	Narrowband material. Has good absorbing properties with large illumination angles
LAO	600 × 600 / 12 & 20	0,85 / 12	— 15[1] / 4 — 36	Broadband material (4-36 GHz), foam plastic
		0,95 / 20	—20[1] / 6 — 36	
			— 15[2] / 6 — 36	
			— 20[2] / 12 — 32	
•	460 × 460 / 7	28[3] / 7 ; 28,5[4] / 7	— 15 / 0,15[5]	Narrowband material (0.95-1.15 GHz), made on basis of natural rubber
•	915 × 610 / 3,6 — 4	16,5 -- 17,5 / 6	— 15 / 0,6[5]	Narrowband material (2.6-3.95 GHz), made on basis of natural or neoprene rubber
•	610 × 610 / 6,5	15 / 6,5	— 15 / 2,6 — 3,5	Dual-band material (2.6-12.4 GHz), multi-layer sheets on basis of natural rubber
	610 × 610 / 4,3		— 15 / 7 — 11	
	610 × 610 / 2,2		— 20 / 3 & 9	
DX20	600 × 900 / •	1,2 / •	— 15 / ± 0,5[6]	Narrowband material (8.2-12.4 GHz), sheets with backing of aluminum foil
K-RAM	300 × 300 / 5 — 10	7 — 15 / 5 — 10	— 20 / At 2-3 resonant frequencies	Broadband material (2-40 GHz), has high mechanical strength. Carbon plastic backing, aramide fiber filler

1. Sheet thickness 20 mm
2. Sheet thickness 12 mm
3. Without backing
4. With wire gauze backing
5. Frequency bandwidth
6. Interval relative to nominal value

frequencies. Inasmuch as an aircraft's radar cross-section can change by many times depending on angle of illumination, it is believed that a sign that an aircraft belongs to craft made using "Stealth" technology is the size of its radar cross-section, which does not exceed 1 m² regardless of the angle of illumination.

According to a statement of representatives of the American firm of Hughes, air defense system radars it created [sozdat] operating in the frequency band of 2-4 GHz are capable of detecting targets with a radar cross-section reaching 1 m² with high probability at a distance of over 370 km. Over-the-horizon detection of low-flying targets is considered a special problem. Reducing radar cross-sections by wide use of radio-absorbing materials has practical limits. It is assumed, for example, that the radar cross-section of an antiship missile construction can be reduced to a level where the effect of radar signals reflected from the rocket motor's tongue of flame will be more considerable than the effect from the construction's radar cross-section. Therefore some foreign experts are giving attention to the fact that in solving this problem it is preferable to use air-breathing jet engines in the power plants of antiship missiles. In this case there is considerably less ionization of atmospheric air by engine exhaust, which determines the missile's radar cross-section based on this factor.

Footnotes

*For information on this fighter see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 10, 1985, p 76—Ed.

6904

Organization of Flights Aboard U.S. Navy Carriers

18010451k Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 47-52

[Article by Capt 1st Rank A. Georgiyev]

[Text] A wide range of naval warfare missions facing the American Navy is assigned to carrier forces, which include multipurpose aircraft carriers and deck-based aviation. Even in peacetime carrier striking forces plough the seas and oceans with the objective of ensuring U.S. Navy presence, whipping up tensions and carring out direct aggression against independent states. Operational training flights of aircraft and helicopters are regularly made from the carriers to practice delivering strikes against naval, ground and airborne targets, conducting reconnaissance and performing other missions.

The organization of flights aboard carriers represents a complex process and requires a high degree of coordination of operations of the air wing and carrier departments, above all the air, aircraft equipment repair and maintenance, and weapons departments.

The **air wing** consists of 8-9 squadrons of aircraft and helicopters of various types, of which 2-3 are attack (fighter-attack) squadrons, two are fighter squadrons and there is one squadron each of early warning, EW, and ASW aircraft and ASW helicopters as well as a detachment of tanker aircraft. An air wing numbers up to 90 aircraft and helicopters. Its strength is over 2,500 persons, including around 200 flight personnel. The wing commander is subordinate to the carrier commander in questions of day-to-day activities, and he is subordinate to the commander of the carrier striking force in questions of combat employment.[1]

The *air department*[2] includes the following divisions: administrative; aircraft and helicopter flight deck towing; take-off and landing gear servicing; hoisting (lowering) aircraft and helicopters to the flight (hangar) deck; and fueling. Department specialists support the flights of air wing aircraft and helicopters and service corresponding technical equipment (catapults, arresting gear, emergency barrier, aircraft elevators and so on).[3] Overall strength is up to 650 personnel.

The *air equipment repair and maintenance department* is represented by the following divisions: administrative (supervision of repair quality and guaranteed supervision over air equipment operation); aircraft and helicopter repair; flight support systems repair (catapults, arresting gear, prime movers, loaders and so on); and aircraft and helicopter armament and flight equipment repair and servicing. This department includes well trained, skilled technical personnel including representatives of the firms which manufacture the air equipment and armament. Strength of the permanent party is 300-350 persons, and that of temporary personnel 30-50.

The *weapons department* assists aviation-technical personnel in suspending missile and bomb armament and repairing aircraft (helicopter) on-board weapons.

Preparation for flights begins on the evening before the upcoming flying day after the carrier and air wing commanders draw up a plan and the carrier force commander approves it. The plan indicates the time for beginning and ending flights; missions of the wing's squadrons; number of aircraft-sorties; sequence of take-offs and landings; procedure for communications, control, and aerial refueling of aircraft; and so on. The flights plan is announced over the carrier loudspeaker system and is posted at the principal air control battle stations.

Pilots and crew members undergo a preliminary briefing under the direction of squadron commanders during which they clarify missions for the next day, after which they go to bed.

That night planned-preventive inspections of aircraft hardware are conducted in the hangars, and then the prepared machines are delivered to the flight deck ("topside") with the help of aircraft elevators.

At 0700 on the flying day air department personnel make the rounds of the flight deck (Fig. 1) for a visual inspection and a check of the condition of its covering (a rubber-base material providing reliable cohesion with aircraft tires even when sea water and fuel get on the deck) and the absence of foreign objects on it which could get into and disable engine air intakes. Start-up of aircraft engines is permitted after this.

With the announcement of the beginning of flights, only flight personnel and aviation-technical personnel taking a direct part in the flights or in supporting them are authorized to go topside. Depending on specialty, everyone present on the flight deck wears jackets of different

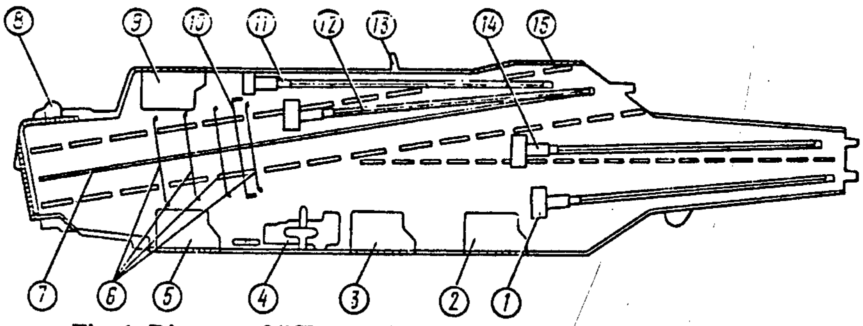

Fig. 1. Diagram of "Chester W. Nimitz"-Class carrier flight deck

Key:
1. Catapult No 1 gas jet deflector
2. Aircraft elevator No 1
3. Aircraft elevator No 2
4. "Island"
5. Aircraft elevator No 3
6. Arresting gear cables
7. Centerline of angled deck
8. Visual landing control officer's station
9. Aircraft elevator No 4
10. Emergency barrier
11. Catapult No 4 shuttle
12. Catapult track No 3
13. FLOLS optical landing system
14. Initial position of aircraft on catapult No 2
15. Angled deck boundary line

colors: aircraft technicians wear brown, specialists servicing catapults and arresting gear wear green, controllers of aircraft taxiing on the deck wear yellow, prime mover and loader drivers wear blue, weapons specialists wear red and so on.

All flight deck operations are directed by the air department head from a control post in the upper part of the aircraft carrier superstructure (the "island"). At the post is a flight deck plotting board with models of aircraft which are preparing for flights; the board is used to monitor the sequence of their take-off and landing.

By the moment flights begin the carrier usually picks up speed and heads into the wind so that the air flow velocity above the flight deck reaches 40-50 km/hr. An SH-3 Sea King helicopter takes off before the flights; it flies a standing patrol at angles astern the carrier to assist crews of aircraft in distress. Aircraft can take off (or land) with a sea state up to 6-7 on the scale.

Preflight preparation of the aircraft is performed 2-3 hours before the beginning of flights by aircraft technicians and personnel of the air and weapons departments. It includes a check of aircraft systems, fueling, and suspension of missile and bomb ordnance. After a preflight briefing pilots inspect the aircraft and accept them from their aircraft technicians 45 minutes before take-off.

An aircraft prepared for take-off taxies in response to signals of the taxi controller (Fig. 2 [figure not reproduced]) to the point for catapulting, where the starting position of the catapult mechanism shuttle is located. The landing gear nose strut is fastened to the shuttle by a guide clamp. After the aircraft has been placed on the catapult a deflector of the gas jet from aircraft engines rises up behind it. The strut also is fastened with a rod to the so-called flight deck retainer in order to prevent the aircraft's premature movement under the effect of engine thrust. The rod's calibrated ring ruptures when a certain force is reached with the beginning of shuttle movement. The prepared aircraft is weighed before take-off. This is done to determine steam pressure in the catapult, which must conform precisely to the aircraft's take-off weight. One of the catapult operators lights up its side number and exact take-off weight on a special display board. After the pilot confirms the correctness of these data the appropriate pressure is set in the catapult.

On receiving the signal from the deck that the aircraft strut clamp has engaged the catapult shuttle, the pilot brings the engines to full power, releases the brakes and gives the signal to attendant personnel about the aircraft's full readiness for take-off (at night he turns navigation lights on and off). At this same moment the officer who is in charge of the group attending to the catapult gives the signal to the control station operator for switching on the catapult by touching the deck with his hand (or by a green lantern at night). Two to three seconds go by from the time the "launch" button is pressed until the catapult mechanism is triggered, after which the shuttle begins moving along the catapult track and accelerates the aircraft to a speed sufficient for its take-off—200-300 km/hr (depending on type). This moment is the most critical in the entire catapulting process, since in case the catapult does not develop sufficient power the aircraft will not reach necessary unstick speed and will fall into the sea. The take-off of heavy aircraft such as F-14A Tomcat fighters (maximum take-off weight 33,700 kg), which are forced to switch on engine afterburners, is especially complicated. From his station the air department head can interrupt the catapult mechanism's triggering in an emergency even after the "launch" button has been pressed. After the aircraft takes off the shuttle returns to the starting position for launching the next aircraft. When all four catapults are in use a carrier is capable of sending up aircraft every 20-30 seconds in turn in daytime conditions, and a group of 20 aircraft can be sent up in 5 minutes. The aircraft take-off sequence depends on the nature of missions facing the air wing.

As a rule carrier aviation combat training is conducted under training programs in everyday conditions. Each program cycle provides for flights of a group of different types of aircraft to perform various operational training missions. A typical group includes 6-8 attack aircraft (fighter-attack aircraft, Fig. 3 [figure not reproduced]), 4-6 fighters, one EW aircraft, one radar early warning aircraft, 2-4 ASW aircraft and helicopters each, and 1-2 tanker aircraft. Five or six such cycles are conducted in a flying day, each lasting up to two hours, during which 100-120 aircraft-sorties are flown.

Two aircraft—an E-2C Hawkeye early warning aircraft and S-3A Viking ASW aircraft—usually are in the air when a carrier is in a combat patrol area. Two fueled F-14A Tomcat fighters or two F/A-18 Hornet fighter-attack aircraft are on alert on the carrier deck near aircraft elevator No 3 in five-minute readiness for take-off (the pilots sit in the cockpits, air-to-air missiles are suspended on the pylons); two other aircraft are in 15-minute readiness (the pilots are on duty in a special room) and 2-4 in 30-minute readiness (the pilots are in their cabins). In case the E-2C Hawkeye aircraft or a radar picket ship detects an airborne target, one pair of aircraft takes off and a second pair is shifted from 15-minute readiness to 5-minute readiness or into readiness for immediate take-off. In the latter instance the aircraft with engines operating is placed at the catapult starting point and fuel is continuously supplied to it by a hose from the nearest fueling point. After a command is received the hose is disconnected and the aircraft takes off.

After climbing to 1,200 m and being more than 10 km from the carrier the aircraft leaves the subordination of the air department head and its activity begins to be directed by the air traffic control center. The aircraft proceeds to the rendezvous area. The following groups can be formed depending on assigned missions: a reconnaissance group (E-2C Hawkeye, EA-6B Prowler, F-14A Tomcat or F/A-18 Hornet aircraft equipped with suspended pods with TARPS reconnaissance gear); an air defense penetration and neutralization group (F-14A Tomcat fighters with Phoenix and Sidewinder air-to-air missiles, F/A-18 Hornet fighter-attack aircraft and A-7E Corsair attack aircraft with HARM missiles and Maverick air-to-surface missiles); a strike group (A-6E Intruder and A-7E Corsair attack aircraft with Harpoon antiship missiles, Maverick guided missiles and bombs of various types and calibers). According to foreign press data such groups were formed in particular from air wings of the carriers "Coral Sea," "Saratoga" and "America" in March-April 1986 during the delivery of strikes against Libyan shore targets.

After performing assigned missions aircraft of the air groups must fly over one of the carrier escort ships so that the absence of enemy aircraft in the group can be monitored from the ship. In addition, according to safety requirements they usually jettison unused live bombs into the water before landing.

Returning aircraft (2-4 in a group) approach the carrier from angles astern. At this time the carrier is on a heading so that her angled deck is against wind direction. On approaching to within 10 km of the carrier the aircraft come under control of the air department head. The aircraft descend to 350 m, proceed on the carrier's heading along her starboard side, and turn to port ahead of the ship. After the group is disbanded the aircraft come in for a landing one by one at one-minute intervals at a speed of 200-280 km/hr.

Under conditions of good visibility the pilot monitors his position on the glide path with the help of the FLOLS automated optical aircraft landing system. If the aircraft is descending precisely along the glide path the pilot observes an orange light in the center and at the same level as a horizontal line of green lights. When the aircraft is higher or lower than the optimum trajectory the orange light "moves off" upward or downward respectively from the horizon line.

After lowering flaps, landing gear and hook, the pilot lands (Fig. 4 [figure not reproduced]). It is believed that the landing is done "excellently" if the hook catches the second or third cable (the first is 50 m from the after edge, cables are raised 10-12 cm above the deck, and the distance between them is 12 m). Engagement of the first or fourth cable indicates a pilot's inaccurate calculation in coming in for the landing. All phases of take-off and landing are automatically recorded on video tape recorder for subsequent viewing and critique. There is a competition among pilots for quality of landings, which is encouraged by the air wing command and noted in the carrier's periodical press. A pilot can be punished by a monetary fine for a landing of poor quality.

In receiving aircraft on the deck an important role is given to the visual landing control officer, who at this time is on a special platform on the port side in the after part of the carrier. Signals given by this officer (a pilot by specialty) are mandatory for pilots making a landing. If he sees that an aircraft has not engaged a single arresting gear cable with its hook he turns on red lights on the FLOLS system, sending a visual signal to the pilot about the need to go around again (the command can be duplicated using UKV [VHF or UHF; not apparent from context] communications equipment).

At the moment the aircraft landing gear touches the carrier deck the pilot immediately shifts engines to a full power setting in order to have an opportunity to take off if the hook does not engage a single cable and red lights are on on the FLOLS system. If engagement occurred the visual landing control officer signals this to the pilot by a green light; the pilot shifts engines from full power setting to a "stop" mode and lowers the air brakes. Under the effect of forces of the arresting gear's hydraulic brake arrangements (cable tension is figured by computer for each type of aircraft depending on its weight and landing speed), the aircraft stops after traveling 50-70 m in 2-3 seconds. Personnel attending the arresting gear disconnect the aircraft hook from the cable and it taxies to a safe section of the deck near aircraft elevator No 1 or 2. In case the brakes fail during taxiing the pilot must turn on navigation lights, lower the landing hook and proceed to the angled deck to halt the aircraft by engaging the hook on the arresting gear cable. A minute after an aircraft lands the arresting gear is again ready to receive the next aircraft. After each landing the cable is carefully inspected and after the 100th landing it is replaced with a new one.

Under good visibility conditions a group of 20 aircraft can make a landing on a carrier in a regime of radio silence in 18-20 minutes.

In case it is impossible to receive an aircraft coming in for a landing on the carrier deck the flight operations officer sends it a radio message: "Delta-4 (5, 6, ...)." The figure denotes the number of minutes (minimum of 4) by which the landing is being postponed. The aircraft is obligated to return to a waiting zone, where it must remain until expiration of the indicated period.

Under emergency circumstances metal struts are raised (under ordinary conditions they are flush with the deck) between the third and fourth arresting gear deck cable with the help of a hydraulic linkage for an aircraft's emergency landing and an emergency nylon barrier is unfolded between them (6-7 m high), grabbing the aircraft with its lower cable and stopping it. After such a landing repair service specialists can restore its combat readiness aboard the carrier in one or two weeks. Placing and removing the net as well as freeing the aircraft from the net disrupts the normal rhythm of the landing process.

During a night landing aircraft await their turn in a waiting zone up to 40 km away from the carrier. On command, aircraft closest to the carrier come in for a landing at one-minute intervals. To facilitate the landing, landing lights are switched on on the after edge and along the center and boundary lines of the carrier's angled deck.

Under conditions of limited and zero visibility a landing is made using various radiotechnical equipment, including TACAN system radio beacons. Carriers also have an automatic landing system but according to the American press pilots prefer to make a landing with the help of manual control under all conditions.

In addition, the aircraft landing is supported by the SH-3 Sea King helicopter flying a standing patrol in the air off the starboard side of the carrier, by firefighting specialists, physicians and other technical personnel.

Aerial refueling using KA-6D Intruder tanker aircraft is used actively during the flights, which permits increasing time in the air by 1.2-1.5 times. During flights two tanker aircraft usually are on deck in readiness for take-off. Aerial refueling lasts 8-10 minutes from the moment of contact until uncoupling (1,200-1,500 liters of fuel can be transferred in a minute).

If necessary, take-offs and landings of aircraft can be conducted simultaneously on the carrier deck. In this case only catapults No 1 and No 2 are used.

Despite great experience in employing deck-based aviation, the 75th anniversary of which was celebrated in 1986, conduct of flights on carriers continues to be a complex and rather dangerous process. According to the American press, the number of category A flying incidents (death of personnel or material damage amounting to over $500,000) involving aircraft and helicopters of carrier-based aviation exceeds by 1.3-1.5 times the number of the very same kinds of incidents involving shore-based aircraft and helicopters.

Footnotes

1. For more details on new type variants of the order of battle of air wings see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 8, 1987, p 50—Ed.

2. For more details on the air department's support of deck-based aircraft flights see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 6, 1981, pp 68-71—Ed.

3. For more details on technical flight support equipment see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 4, 1982, pp 66-70—Ed.

6904

Submarine On-Board Automated Combat Control Systems

18010451l Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 52-57

[Article by Capt 2d Rank P. Seredyushin]

[Text] Command authorities of the U.S. Navy and navies of other NATO countries are devoting much attention to building submarines and improving the effectiveness of their combat employment by a qualitative improvement of weapons and technical equipment,

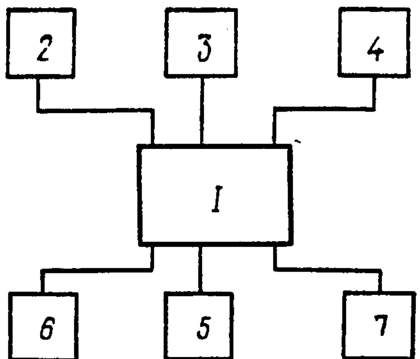

Fig. 1. Model of ACCS with centralized structure:

Key:
1. Data processing subsystem (1-2 computers)
2. Sonar
3. Radar
4. COMINT and ELINT equipment
5. Navigation subsystem
6. Data display consoles and equipment
7. Weapon subsystems

including on-board automated combat control systems [ACCS], while actively following a course toward constantly building up the power of fleets. The development of ACCS resulted above all from the fact that the course of contemporary combat operations at sea is characterized by a sharp increase in the amount of information which must be processed in real time aboard a submarine and then taken into account in decisionmaking for employing weapons and for further operations in the situation at hand.

On-board submarine combat control systems have undergone a significant evolution over the last three decades from distributed nonautomated systems through stages of centralized and federalized systems to distributed ACCS. The kinds and make-up of ACCS aboard modern submarines vary depending on the submarine's displacement, on-board weaponry, type of power plant and shipboard situation coverage equipment. Three basic types of ACCS (existing and planned) are conditionally identified.

The first type includes ACCS with a classic centralized structure (Fig. 1). In them the situation coverage and weapon subsystems and other subsystems are connected with a central computer according to a "star" principle. The ACCS of American "Los Angeles"-Class and "Ohio"-Class submarines (with partial federalization), the British TIOS system and others are such ACCS. One basic drawback of this type of ACCS is low reliability, since a central computer failure leads to the entire system going down. Considerable difficulties can arise in case of modernization and replacement of their subsystem equipment, since this will involve a replacement of the central computer and software of the entire ACCS.

The second type includes centralized ACCS with federalization and partial and topological distribution (Fig. 2). A portion of the subsystems which make up the

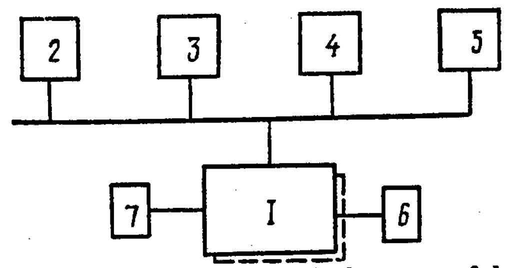

Fig. 2. ACCS model with centralized structure, federalization, and partial topologic distribution:

Key:
1. Data processing subsystem (1-2 computers)
2. Sonar
3. Radar
4. COMINT and ELINT equipment
5. Navigation subsystem
6. Data display consoles and equipment
7. Weapon subsystems

system are connected to the data transmission line, which is redundant to increase reliability. The central computer functions as a main processor and as specialized processors, as well as an input-output dispatcher. The second type of ACCS has inherent deficiencies involving a low potential capability for buiding up productivity and storage capacity. This type includes the DCC and KAFS (UK), GIPSY (Italy) and SINBADS (the Netherlands) systems. For example, the DCC, intended for Royal Navy "Upholder"-Class (Type 2400) submarines being built, uses two 32-word FM 1600E Ferranti computers as central computers. Each computer is capable of processing the very same amount of data (including calculating the motion of up to 24 targets) as the entire ACCS. Therefore only one computer is in operation and the other is kept in a state of "hot reserve," but it can be used to solve individual data processing tasks in the interests of situation coverage and weapon control. The KAFS ACCS (Fig. 3 [figure not reproduced]) is an export version of the DCC system (particularly for Type 209/1400 submarines of the Brazilian Navy being built). The KAFS includes one FM 1600E central computer and three Argus M700/20 microprocessors connected by a digital data transmission line. The productivity of this system rises because of built-in processors: it can automatically track 35 targets simultaneously. A simplified version of the KAFS ACCS is the COMKAFS system (there are four modifications: COMKAFS-A, -B, -C and -D), in which all data is processed by Argus M700 microprocessors connected by a data transmission line. If necessary its make-up can be supplemented by a matrix processor, which increases the effectiveness of processing data from data sources because of the use of correlation methods. The COMKAFS-D model will be installed in the "Oberon"-Class submarine (UK) and should provide for automatic tracking of up to 35 targets and guidance of torpedoes to two targets simultaneously.

In the first two types of systems the operator consoles and data display devices are coupled directly with the central computer; in the ACCS the computer ("intellectual") part of the consoles is installed in the same racks as the central computer. These systems are characterized by an absence of unification of equipment and software, they have significant weight-size characteristics, and they do not conform to contemporary requirements for prospective submarines.

American specialists point out that the following general demands are placed on prospective submarine ACCS:

—Use of a common processor;

—Use of multifunction operator consoles of the same type for all subsystems and at all levels;

—Realization of the concept of distributed data processing with wide use of microprocessors and microcomputers in situation coverage subsystems (sonar, radar and others), which reduces data losses and makes it possible to use correlation methods of processing data from different sources;

—Comprehensive integration of all submarine electronics based on the concept of distributed data processing in subsystems and use of a high-speed local computer net;

—Unification of equipment in the interests of improving its reliability and repairability and sharply reducing the need for spare parts;

—Creation [sozdaniye] of software in the standard ADA high-level programming machine language (adopted in the U.S. Defense Department in 1980 as standard for control systems with built-in computers; in the Navy it will replace the CMS-2 language);

—Increase in ACCS failure-resistance by redundancy of hardware and/or software as well as of digital trunks;

—Back in the stages of designing and creating ACCS, a study of capabilities for a significant build-up of hardware and software for the entire life cycle of systems (according to some estimates, initially around 25 percent of the capacity of the local computer network must be activated);

—Modular construction of ACCS hardware and software for flexibility of its topologic structure and possibility of obtaining a new system variant without substantial changes either in hardware or software.

In the assessments of American specialists, greatest difficulties may be encountered in the question of realizing the first requirement—use of a common processor. All subsystems must be designed with consideration of the use of a processor of the same type with common topologic structure. Implementation of this requirement is obstructed, however, by the need for using specialized processors in different subsystems and by contradictions existing between different manufacturing firms. For purposes of at least partially overcoming these obstacles as well as for standardizing hardware, the United States has developed [razrabotat] and placed in series production standard computers for the Navy's ACCS (the AN/UYK-43 minicomputer, AN/UYK-44 microcomputer and M68000 microprocessors), which are used aboard "Los Angeles"-Class and "Ohio"-Class submarines and are intended to be base computers in prospective systems.

To satisfy certain other of the above requirements for ACCS, high-speed local networks are being created [sozdavatsya] using data transmission lines in the form of buses at various hierarchic levels in systems of the third type (Fig. 4). At the upper level this will be the main system data transmission bus (Combat System Highway) which unites various subsystems of the ACCS, and at the lower level it is the bus of the computer itself; both horizontal as well as vertical connections can be made between lines at different levels. Contemporary systems use coaxial cables in data transmission lines, but it is planned to use fiber-optic cable for prospective ACCS with real time data processing.

The creation of systems realizing the distributed data processing concept is largely facilitated by rapid progress in development [razvitiye] of computer technology and the appearance of relatively inexpensive minicomputers and microcomputers as well as microprocessors which provide maximum proximity of processing equipment to the data sources and are built into the equipment of situation coverage subsystems.

The prospective ACCS will allow high-speed real-time processing of a large amount of data, short reaction time and high survivability. Systems of this type include the FY89 Combat System and the SCCS Mk 2 (USA) as well as the MSI-90U (Norway).

FY89 Combat System. Creation of this system was begun under the SubACS (Submarine Advanced Combat System) program. This program provided for integration of all submarine electronics using a local computer network. It was proposed to install the system created under the SubACS program aboard "Los Angeles"-Class submarines (beginning with SSN 751 "San Juan") and "Ohio"-Class and "Seawolf"-Class submarines and have to three principal variants respectively—SubACS-Basic, SubACS-A and SubACS-B. The hardware make-up of the SubACS-Basic, intended for the SSN "San Juan" and subsequent "Los Angeles"-Class submarines, initially was to include 12 standard built-in AN/UYK-44 microcomputers, 6 AN/UYS-1 signal data processors, and M68000 microprocessors (as a data bus controller). It was planned to include 18 and 24 AN/UYK-44 computers respectively in the SubACS-A and SubACS-B. A fiber-optic bus was to become an important component of the integrated submarine electronics system. It was

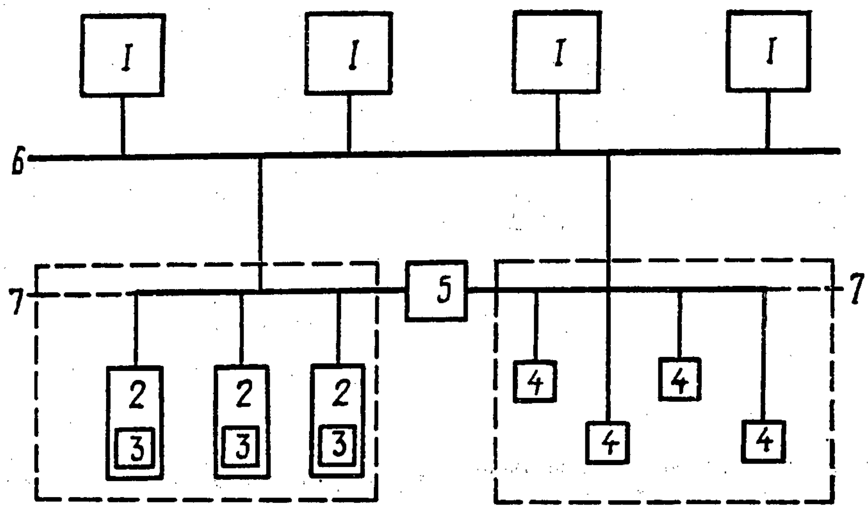

Fig. 4. Model of ACCS realizing the principle of distributed data processing:

Key:
1. ACCS "subscribers" (situation coverage, navigation, weapon and other subsystems)
2. Multifunction consoles
3. Built-in processors
4. Principal data processing equipment (minicomputers, microcomputers, microprocessors)
5. Interbus communications controller
6. System data transmission line
7. Subsystem data transmission bus

envisaged that in the future the new ACCS would ensure modernization of situation coverage subsystems (new sonars with aperture and towed antennas), weapon subsystems and so on.

In 1985, however, a number of problems (technical, financial and organizational) arose during realization of the program. Manufacturing firms did not ensure readiness of the ACCS at the moment construction concluded on the SSN "San Juan" (there were difficulties in creating fiber-optic bus components and software). Therefore the Navy command was forced to revise the previous program with the objective of creating a prospective ACCS for the SSN in two stages. In the first stage the AN/BSY-1 ACCS is being created for the SSN "San Juan" and subsequent "Los Angeles"-Class submarines within the framework of SubACS-Basic; in the AN/BSY-1 the distributed topologic structure will be replaced by a traditional one using the AN/UYK-43 central computer. In the second stage, for submarines where construction will begin to be financed in 1989, the FY89 Combat System ACCS will be created with realization of all ideas of SubACS-A and -B, including the distributed data processing concept. It is proposed that around 30 submarines of the new "Seawolf"-Class and the 8 final "Los Angeles" series SSN's will be equipped with this system.

SCCS (Submarine Combat Control System) Mk 2 is an ACCS developed by the Librascope Division of Singer (USA) for diesel submarines of any displacement. It is a fully integrated ACCS with modular construction of hardware and software. The type make-up of the system includes up to eight multifunction operator consoles, a commander's console with display, data converters for situation coverage subsystems and for weapon subsystems with built-in processors, and recording equipment. All equipment is consolidated in a common network using a redundant fiber-optic data transmission bus.

Each system multifunction console has a screen with two-dimensional display (diagonal dimension 485 mm) for showing a picture of the tactical situation and commands to be executed and for issuing graphic and alphanumeric report formats; it has a type display; and it has a keyboard for data input-output and for a dialogue with the system. The principal processing devices in the ACCS are the built-in M68000 microprocessors and Motorola 68881 processor. The SCCS Mk 2 system provides for processing and generalization of data from different data sources (sonar, radar, COMINT and ELINT stations, and external sources) using correlation methods and makes it possible to automatically track 25 targets. An attack maneuver can be made simultaneously against four targets using torpedoes as well as antiship missiles.

MSI-90U (Fig. 5) is an ACCS intended for Norwegian "Ula"-Class (Type 210) diesel submarines and West German Type 211 submarines.

The MSI-90U is a data processing system with distributed topologic structure. It includes main computers and

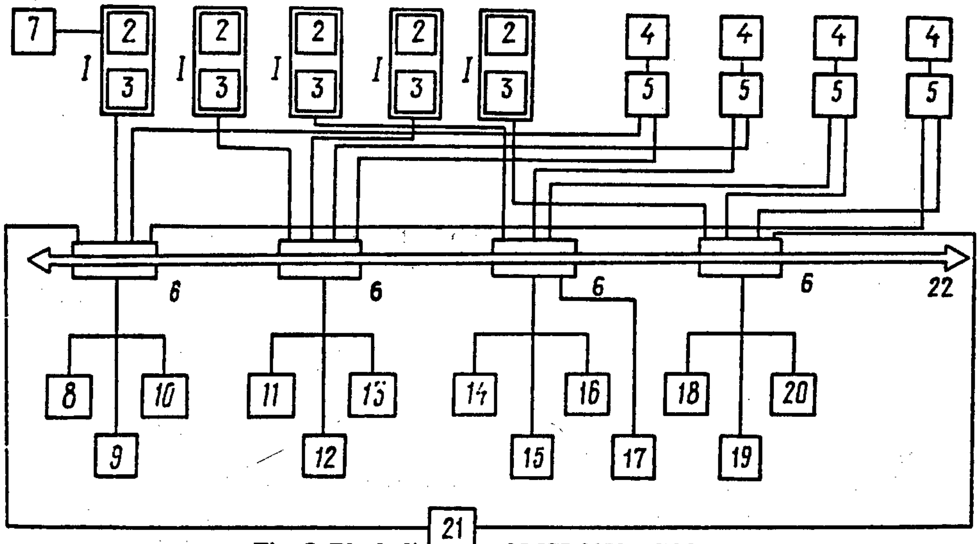

Fig. 5. Block diagram of MSI-90U ACCS:

Key:
1. Multifunction consoles
2. Console display units
3. Built-in processors (microcomputers)
4. Data recorders
5. Main computers
6. Multiplexers and bus controllers
7. Radar
8. Sonar
9. COMINT and ELINT equipment
10. Gyroscopes
11. Altiperiscope
12. Identification set
13. Log
14. Passive sonar
15. Ship propulsion control panel
16. Attack periscope
17. Radionavigation satellite system receiver
18. Gyrocompass
19. Automatic position plotter
20. Echo-ranging set
21. Weapon subsystem interface device
22. Data transmission line

processors built into individual racks. Data is displayed on two-dimensional color displays in the multifunction consoles. Data transmission and its exchange among subsystems are supported by the BUDOS 32-word bus (capacity of one channel is around one megabit per second).

Basic system components are the KS-900F microcomputer (created in Norway using M68000 microprocessors); KMC-9000 multifunction consoles (Fig. 6 [figure not reproduced]), one of which is intended for the submarine commander; as well as a data transmission bus with four multiplexers for interface with various subsystems. Each KMC-9000 console includes a KS-900F microcomputer; in addition, the main computers include three KS-900F in a separate rack equipped with a recorder. Overall storage capacity of the MSI-90U ACCS reaches 15-20 megabytes.

According to foreign press reports, NATO countries also are working to create other prospective ACCS based on integration of all submarine electronics into a common system with realization of the distributed data processing concept. In particular, the British COMKAFS-D system forms a unified system of submarine electronics when combined with the Triton sonar and when using a data transmission line at the level of ACCS subsystems. The Netherlands created the Spectrum ACCS for prospective Australian submarines which consists of ten main processors and over 25 microprocessors connected with the help of a fiber-optic bus. In Great Britain the firms of Plessey Marine and Gresham-CAP are developing systems for new-generation submarines. The firm of Krupp Atlas-Elektronik (FRG) created the ISUS (Integrated Sensor Underwater System) ACCS, which includes 23 distributed processors, a data bus and 3-6 multifunction consoles (depending on the submarine's size). The ISUS system is capable of automatically tracking up to 24 targets and supports the employment of ship weapons against three of them simultaneously. Similar work is being done in the navies of France, Italy and other West European countries.

In the assessments of leading naval specialists of the United States and NATO, prospective ACCS will permit increasing the combat capabilities and employment effectiveness of submarines as well as the reliability and flexibility of the systems themselves; reduce reaction time, weight-size characteristics and cost; and simplify operational and personnel training. It is believed that further improvement of on-board ACCS will involve the use of "artificial intelligence" principles and an understanding of a natural language, as well as the introduction of image recognition subsystems.

6904

American Shipboard Radars

18010451m Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 58-60

[Article by Capt 1st Rank N. Starov under rubric "Reference Data"]

[Text] See pages 38, 39

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6904

Belgium's Civil Defense

18010451n Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 71-75

[Article by Col (Res) V. Yemelyanov]

[Text] Western military specialists place Belgium's civil defense [CD] among the most developed of the Central European states. The country's military-political leadership considers measures to improve CD to be an integral part of general military preparations. Being an active member of the NATO bloc and invariably favoring its strengthening, Belgium is persistently realizing a program for further development of the CD system and preparation of the populace for actions under conditions of the use of weapons of mass destruction.

The first government decrees on organizing Belgium's CD were adopted soon after the end of World War II and it was in the 1950's that its presently existing structure essentially began to be created. In 1954 it was specified by royal decree and in 1963 it was updated by the law on protection of the civilian populace.

Overall direction of CD is the responsibility of the Minister of the Interior. He determines basic directions for development of CD forces and equipment and their use both in peace and wartime; he organizes the interworking of regular CD formations with armed forces; he announces a call-up to the CD system (in case of a lack of volunteers); he plans resources for CD purposes; and he distributes them to provinces and communes. A General CD Administration is subordinate to him which exercises direction over CD measures on a national scale.

The **General CD Administration** is headed by a general director. It includes the main CD directorate and a general inspectorate. The former directly works out basic directions for CD development, handles personnel training and is responsible for communications and warning. The latter organizes coordination among civil defense, the armed forces and civilian ministries and departments; performs research in CD interests; and coordinates basic aspects of activities with corresponding NATO services and a number of West European countries.

The *Main Directorate* of civil defense includes a secretariat and two offices—administrative and operations, which consist of sections, divisions, departments, and services.

The *General Inspectorate* includes committees—Consultative, Research, NATO Liaison, Bilateral Agreements, Composite, Medical Assistance to the Civilian Populace, Shelter Preparation (Fig. 1).

The Consultative Committee gives recommendations on using for CD interests the work of scientists and engineers who are not directly engaged in this system. In its subordinate laboratories the Research Committee organizes a study of such problems as the effect of radiation on the human body, structures' resistance to the effect of a blast wave, fire-resistance of materials, as well as other problems. The NATO Liaison Committee determines directions in the sphere of Belgium's CD on the basis of recommendations received from directing organs of the North Atlantic Alliance. When necessary, groups are formed within the committee's framework for performing research together with other states and for studying specific questions such as improving the warning and observation network, sheltering the population in shelters, firefighting, the refugee problem and so on. The Bilateral Relations Committee draws up draft agreements which specify in particular the procedure for the population to cross state borders of NATO member countries, conditions for receiving evacuated refugees and passing them through under emergency conditions or in case of combat operations, and other issues.

The composite committees take up questions of coordination between CD and the armed forces and other organizations not a part of CD. They consist of representatives of CD, the armed forces and civilian departments—specialists in different areas. The committees also are responsible for peacetime preparation of CD forces and equipment necessary for restoring facilities demolished in a period of combat operations. The Committee for Medical Assistance to the Civilian Populace closely cooperates with the Ministry of Health. Its task is to provide the CD medical service, or the "900 network" (the name arose from the telephone number 900 dialed in emergencies), with medical establishments and stores

American Shipboard Radars

Designation	Purpose	Frequency Band, GHz / Pulse Repetition Frequency, Hz	Peak Power, kw	Platforms
1	2	3	4	5
AN/SPG-48	Fire control	8—10 / •	250 / •	"Annapolis" (Canada), "MacKenzie" (Canada), "Restigouche" (Canada), "St. Laurent" (Canada) class frigates
AN/SPG-53	Fire control	8—10 / •	250 / •	"Truxtun"-Class nuclear powered guided missile cruisers, "Belknap" and "Leahy" class guided missile cruisers; "Kidd", "Coontz" and "Forrest Sherman" class guided missile destroyers
AN/SPG-55[1]	Fire control	4—6 / •	1000 / 50	"Truxton," Bainbridge" and "Long Beach" class nuclear powered guided missile cruisers; "Belknap," "Leahy," "Vittorio Veneto" (Italy) and "Andrea Doria" (Italy) class guided missile cruisers; "Coontz" guided missile destroyer
AN/SPG-60	Fire control	8—10 / •	• / 05	"Virginia" and "California" class nuclear powered guided missile cruisers; "Kidd"-Class guided missile destroyers; "Spruance"-Class destroyers; "Tarawa"-Class general purpose amphibious assault ships
AN/SPS-5	Surface target acquisition	4—6 / 680	170—350 / 40	"Cannon" (Philippines) and "Charles Lawrence" (Taiwan) class frigates
AN/SPS-6	Airborne target acquisition	1—2 / 150—600	500 / 150	"Dedalo" ASW carrier (Spain); "Fletcher" (Brazil, Greece, Spain, Taiwan, Turkey), "Allen M. Sumner" (Brazil, Taiwan), "Gearing" (Taiwan, Turkey) and "Rudderow" (Taiwan) class destroyers
AN/SPS-10	Surface target acquisition	4—6 / 625—650	190—285 / 30	"Chester W. Nimitz" and "Enterprise" class nuclear powered multipurpose carriers; " "Hancock," "Midway," Forrestal" and "Kitty Hawk" class multipurpose carriers and "Essex"-Class ASW carriers; "Iwo Jima"-Class amphibious assault ships; "Tarawa"-Class general purpose amphibious assault ships; "Blue Ridge"-Class amphibious command ships; "Long Beach," Bainbridge," Truxtun" and "California" class nuclear powered guided missile cruisers; "Leahy" and "Belknap" class guided missile cruisers; "Brooklyn"-Class cruisers (Chile); "Brooke," "Coontz" and "Charles F. Adams" class guided missile destroyers (USA, Australia); "Forrest Sherman" and "Fletcher" class destroyers (Brazil, Greece, South Korea, Taiwan, Turkey); "Allen M. Sumner"-Class destroyers (Brazil, Greece, Iran, South Korea, Taiwan, Turkey, Chile); "Gearing"-Class destroyers (Brazil, Greece, South Korea, Pakistan, Taiwan, Turkey); "Carpenter"-Class destroyers (Turkey); "Bronstein," "Garcia," "Glover," "Knox," "St. Laurent" (Canada), "Restigouche" (Canada), "MacKenzie" (Canada), "Annapolis" (Canada), "Savage" (Philippines), and "Berk" (Turkey) class frigates
AN/SPS-12	Airborne target acquisition	1—2 / •	500 / 120	"Hancock"-Class multipurpose carriers; "Brooklyn"-Class cruisers (Chile); "Impavido"-Class guided missile destroyers (Italy); "St. Laurent" (Canada) "Restigouche" (Canada), "MacKenzie" (Canada), "Bergamini" (Italy) and "Alpino" (Italy) class frigates
AN/SPS-29	Airborne target acquisition	0.25—0.5 / •	750 / 460	"Coontz", "Charles F. Adams," "Forrest Sherman" and "Amatsukaze" (Japan) class guided missile destroyers; "Allen M. Sumner"-Class destroyers (Taiwan)
AN/SPS-30[1]	Target heightfinder	3—4 / •	• / •	"Hancock" and "Coral Sea" class multipurpose carriers; "Exxex"-Class ASW carriers

American Shipboard Radars [Continued]

1	2	3	4	5
AN/SPS-37	Airborne target acquisition	0.2—0.25 / •	• / 550	"Kitty Hawk" and "Forrestal" class multipurpose carriers; "Bainbridge"-Class nuclear powered guided missile cruisers; "Forrest Sherman," "Allen M. Sumner" (Brazil, Iran, South Korea, Taiwan, Turkey, Chile) and "Gearing" (Greece, Spain, Philippines, Taiwan, Turkey) class destroyers
AN/SPS-39A[1]	Airborne target acquisition	2—3 / •	1000 / 280	"Andrea Doria"-Class guided missile cruisers (Italy); "Charles F. Adams" and "Impavido" (Italy) class guided missile destroyers
AN/SPS-40	Airborne target acquisition	0.4—0.5 / •	200 / 400	"Virginia," "California" and "Truxtun" class nuclear powered guided missile cruisers; "Belknap," "Leahy," "Vittorio Veneto" (Italy) and "Andrea Doria" (Italy) class guided missile cruisers; "Charles F. Adams" (USA, Australia) and "Forrest Sherman" class guided missile destroyers; "Spruance," "Gearing" (Brazil, Greece, South Korea, Pakistan, Turkey), "Allen M. Sumner" (Greece, South Korea, Taiwan, Chile) and "Carpenter" (Turkey) class destroyers
AN/SPS-43[1]	Airborne target acquisition	0.2—0.25 / •	• / •	"Chester W. Nimitz"-Class nuclear powered multipurpose carriers; "Hancock," "Midway" and "Forrestal" class multipurpose carriers; "Essex"-Class ASW carriers; "Leahy" and "Belknap" class guided missile cruisers
AN/SPS-48[1]	Airborne target acquisition	2—3 / •	• / 400	"Chester W. Nimitz" and "Enterprise" class nuclear powered multipurpose carriers; "Kitty Hawk," "Forrestal" and "Midway" class multipurpose carriers; "Virginia," "California," "Truxtun" and "Long Beach" class nuclear powered guided missile cruisers; "Belknap" and "Leahy" class guided missile cruisers; "Kidd," "Coontz" and "Forrest Sherman" class guided missile destroyers; "Blue Ridge"-Class amphibious command ships
AN/SPS-49	Airborne target acquisition	0.5—1 / •	280 / 460	"Chester W. Nimitz" and "Enterprise" class nuclear powered multipurpose carriers; "Kitty Hawk" and "Midway" class multipurpose carriers; "Iowa"-Class battleships; "Long Beach"-Class nuclear powered guided missile cruisers; "Ticonderoga," "Belknap" and "Leahy" class guided missile cruisers; "Coontz" and "Halifax" (Canada) class guided missile destroyers; "Oliver H. Perry"-Class guided missile frigates (USA, Australia, Spain)
AN/SPS-52	Airborne target acquisition	2—3 / •	• / 440	"Bainbridge"-Class nuclear powered guided missile cruisers; "Vittorio Veneto"-Class guided missile cruisers (Italy); "Charles F. Adams" (USA, Australia), "Audace" (Italy), "Tachikaze" (Japan) and "Amatsukaze" (Japan) class guided missile destroyers; "Tarawa"-Class general purpose amphibious assault ships
AN/SPS-53	Surface target acquisition	8—10 / 750—1000	40 / •	"Kidd"-Class guided missile destroyers; "Casco"-Class frigates (Philippines)
AN/SPS-55[1]	Surface target acquisition	8—10 / 750—2250	130 / •	"Virginia"-Class nuclear powered guided missile cruisers; "Ticonderoga"-Class guided missile cruisers; "Kidd"-Class guided missile destroyers; "Spruance"-Class destroyers; "Oliver H. Perry"-Class guided missile frigates (USA, Australia, Spain)
AN/SPS-58	Airborne target acquisition	1—2 / •	• / •	"Forrestal"-Class multipurpose carriers; "Iwo Jima"-Class amphibious assault ships
AN/SPS-62	Airborne target acquisition	• / 2280—3040	240 / •	"Blue Ridge"-Class amphibious command ships

1. External view of radar antenna shown in figures [figures not reproduced]

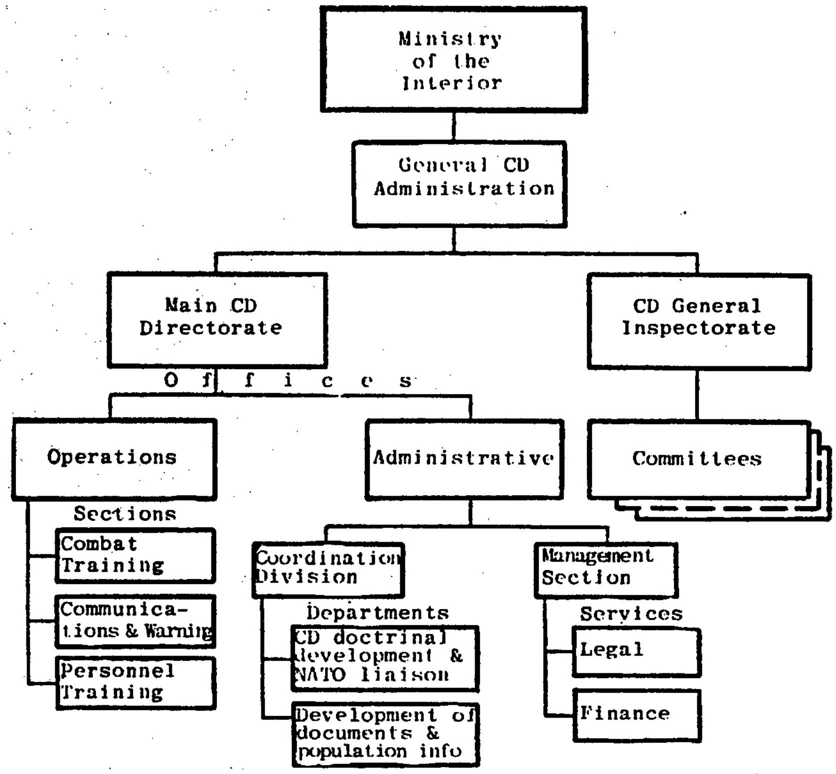

Fig. 1. Diagram of central organs of Belgian CD

of medicines, instruments, and equipment in case of combat operations. This committee has responsibility for forming medical subunits for serving additional hospitals being deployed.

The Shelter Preparation Committee draws up recommendations for constructing shelters and adapting buildings for protection against weapons of mass destruction. It is guided in its work by provisions adopted in NATO. The principal recommendations reduce to the following: the possibility of using subway stations, underground passages and other such structures must be considered in building new shelters; it is necessary for buildings having basement spaces which can be used as shelters to be appropriately marked; the warning system and location of protective means must provide the population with conditions requiring a minimum of time to occupy shelters.

CD planning bureaus have been established under the principal ministries, including Foreign Relations, Interior, Justice, Economic Affairs, Communications, Public Works and Public Health. The position of mobilization officer is provided in other ministries. The bureaus and mobilization officers are called upon to draw up and coordinate their departments' plans for shifting subordinate sectors from a peacetime to a wartime footing, monitor implementation of such plans, and prepare the civilian populace for actions under emergency conditions.

The foreign press reports that primary efforts in the sphere of Belgium's CD are concentrated on fulfilling the following tasks: protecting the population and training it in methods of self-defense against weapons of mass destruction; training CD formations to perform rescue and emergency restoration work; and improving the warning system. The Ministry of the Interior is directly responsible for carrying out these directions of activity. Medical support for the population under conditions of an emergency situation is the responsibility of the Ministry of Public Health assisted by the Belgian Red Cross Society.

The Belgian press notes that CD measures in the country are conducted at three levels—national, provincial and communal. At the upper level the general director of the General CD Administration directs the formation of mobile emergency rescue columns of central subordination and organizes the national warning system and population protection against weapons of mass destruction. Central organs have central CD shops and warehouses as well as a National CD School under their purview.

Mobile emergency rescue columns at the disposal of the general director are intended for giving prompt, skilled assistance to the populace in large cities and industrial centers. According to western press data, a total of four such columns have been formed and one more is in the stage of formation. In addition, in the future it is planned

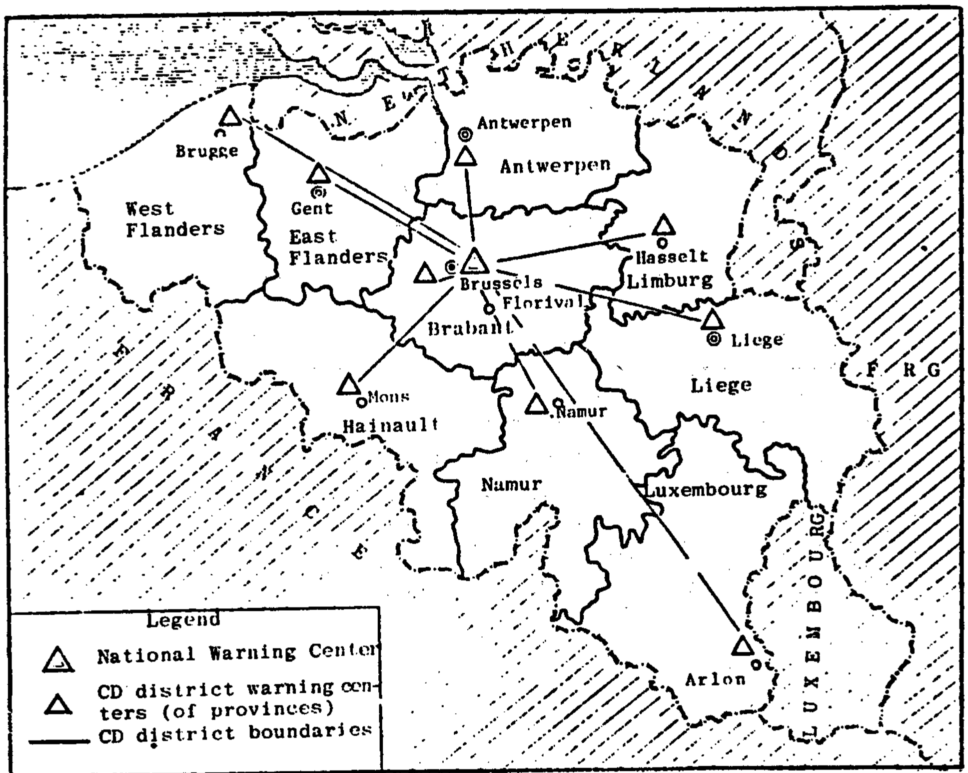

Fig. 2. Diagram of CD districts

to deploy four new columns so that each province has such a subunit. A column numbers around 150 persons, of whom 35 are officers and noncommissioned officers. Organizationally a column consists of three platoons, which alternate on duty at their base. A column has up to 100 pieces of various equipment in its inventory, including trucks, fire trucks, vehicles equipped as command posts, refrigerator trucks, fuel tank trucks, mobile hospitals, hoisting cranes, special equipment for performing chemical and radiological decontamination work, and so on. Column personnel are outfitted with means of individual protection against weapons of mass destruction.

Principal coordination on CD matters among CD organs, armed forces, the police, industrial companies, public health organs and other organizations and services is carried out in CD districts (Fig. 2), the boundaries of which coincide with those of provinces (there is a total of nine). At this level CD is directed by a commissar under whom a consultative committee (which includes the provincial governor, burgomasters of major cities, the senior police chief, representatives of the firefighting service and public health, as well as of other services) and a CD office are established. Each district is divided into CD areas (47) and these in turn into CD subareas (199). A subarea includes the territory of 10-14 communes.

Mobile CD formations—specialized platoons numbering 40-50 persons each—are established from volunteers in the largest cities of the provinces. It is planned to bring the overall personnel strength of these formations to 25,000 in an emergency situation.

In the communes overall direction of CD is the responsibility of the burgomaster, who is the chairman of the consultative committee established under him. A CD chief and commune CD staff are appointed for immediate direction of CD measures.

Emergency rescue formations based on local fire protection subunits are established in CD subareas as well as in large communes numbering 7,000 or more residents. The country has a total of over 360 fire brigades, which include 11 professional brigades, 23 composite brigades (manned by professional firefighters and volunteers) and around 330 volunteer brigades. According to the foreign press, the brigades total over 16,500 firefighters, including 5,000 professionals.

Self-defense groups numbering 40-50 persons each are set up in populated points. In an emergency situation it is planned to activate over 5,000 such groups.

In peacetime the CD formations, and above all the mobile emergency rescue columns of central subordination as being the best trained and outfitted with necessary technical equipment, are used to mop up the aftermath of natural disasters, production accidents and catastrophes.

According to Belgian press data, the warning service in the national CD system includes a national warning center, 9 provincial warning centers, 27 inter-area warning centers and 150 warning points. Radio and television as well as sirens (some 1,500 of them have been installed) are used for directly getting out the warning signals. They are turned on for a check throughout the country at 1230 hours on the first Thursday of every month.

Judging from foreign press materials, 150 stationary posts have been prepared for conducting radiation, chemical and bacteriological reconnaissance and dosimetric monitoring on the territory of Belgium. They usually are prepared in basement spaces of public buildings (city council buildings, schools, fire brigade barracks and so on). Depending on its importance and location, such a post is manned by a team of 2-12 persons. Actually, however, in the opinion of western CD specialists its make-up will not exceed four persons with consideration of length of time on duty and other factors. The posts are equipped with dosimetric instruments, including for determining the radiation level without going up to the surface, indicators for determining the epicenters of nuclear bursts, and communications equipment. Necessary stores of provisions, other life support means, medicines, and individual antichemical and antibacteriological defense sets have been established at the posts.

In addition to the stationary posts, there are also provisions for using mobile radiation reconnaissance and dosimetric monitoring posts, which in peacetime are fully provided with necessary supplies and are manned at half strength with trained personnel. Similar posts function at some industrial enterprises and enterprises of the energy complex where fissionable materials are used.

Information on the radiation situation is transmitted by the posts to higher centers, and from there to the national radiation situation evaluation center, which is linked with similar organs of the FRG, France, Great Britain, the Netherlands and Luxembourg. Operation of the network for evaluating the radiation situation is periodically checked during NATO exercises.

Western specialists state that the weakest link in Belgium's CD system is the insufficient number of protective facilities for the population. Shelters of World War II times have been preserved in a number of cities and are planned for use in the interests of CD, but the majority of them are not equipped with life support systems and are not adapted for a lengthy stay of residents in them.

Construction of new protective facilities is very limited. The program adopted for identifying spaces suitable for fall-out shelters and their appropriate modification as well as the creation of shelters in basements of buildings under construction is not being carried out due to a shortage of funds allocated for CD. Such shelters are being built only in some state and private establishments and in industrial enterprises. Belgian specialists believe that the presence in the country of primarily two- and three-story stone, brick and reinforced concrete buildings provides for their rapid modification for protection against radioactive fall-out. All existing subway stations and stations being built in large cities such as Brussels, Antwerpen, Liege, Gent and Charleroi are outfitted in the fall-out sense.

Evacuation as a method of protecting the populace against weapons of mass destruction is not a determining factor in Belgium's CD system because of the high population density, saturation with industrial enterprises and relatively small territory. As in a number of other countries of Central Europe, according to foreign press data its military-political leadership adheres to the "Stay Put" concept, i.e., in case of an emergency situation it recommends that the populace remain in place and occupy spaces suitable for fall-out protection. Evacuation is provided only for individual areas close to installations connected with the production and storage of fissionable or chemical substances. Appropriate agreements have been reached with contiguous countries for the case of uncontrollable refugee flows.

Some 1,500 various medical establishments numbering over 70,000 beds can be used for organizing medical support for the population. Major hospitals and other medical establishments situated at a distance of up to 10 km around them form medical centers which are associated in groups.

CD organs and formations in Belgium are manned on a mixed basis, i.e., by calling up a certain contingent from reservists, chiefly persons released from service in the armed forces for various reasons, and by bringing in volunteers. Persons called into CD organs perform duty here for two years. Citizens including women in the age from 19 to 50 are used as volunteers. Initially they sign a three-year contract, which subsequently can be extended for another three years or more at their desire.

The National Civil Defense School established in the city of Florival in 1953 prepares leaders for this system. The training course is designed for 2-6 weeks depending on the training profile. Each year up to 2,000 persons undergo training at the school. In addition, a training center has been established in each province for personnel of local emergency rescue formations. The training course there includes 74 hours of theoretical and practical classes. The largest communes have equipped training areas at which local CD subunits and self-defense groups practice skills in performing emergency rescue work, extinguishing fires, giving first aid and so on.

The military-political leadership attaches great significance to organizing and conducting planned daily preparation of CD forces and equipment, which is carefully coordinated within the NATO framework. The largest activities on this plane are the Wintex/Simex integrated exercises of the NATO Allied Armed Forces, the yearly

NATO Intex CD exercises and the special Fallex ["Faliks"] exercise of NATO CD and Allied Armed Forces in Europe. Both planning and coordinating organs as well as CD subunits take part in them. Questions of organizing coordination among various services of the armed forces and CD under emergency conditions and during combat operations are practiced in the exercises. For example, in the Intex exercise in addition to CD directors there is the chairman of the National Defense Problems Commission (executive organ of the defense committee handling in particular civil defense and preparation of the economy for mobilization), representatives of the CD planning bureaus of various ministries, branches of the armed forces and the gendarmerie, and representatives (officers) of all NATO countries at Belgium's national CD command post in the city of Walem (40 km north of Brussels). Since 1985 all situation information coming to the command post at Walem is automatically transmitted to the headquarters of internal forces.

The population is trained to give first aid and self-help at special courses by CD organs and the Red Cross Society. Instructors of national and provincial CD schools give lectures, and practical classes usually are conducted by instructors and specialists of the middle level of CD. Popular pamphlets on CD matters are published in mass printings. In particular they give recommendations on modifying people's residences for creating shelters and refuges in a period of threat or even in advance and they explain how to store necessary stocks of provisions under household conditions. Once every two months the journal PROTECTION CIVILE (CIVIL DEFENSE) is published in Brussels.

On the whole, in the assessment of western specialists in the CD area, the intensity and planned nature of comprehensive preparation of Belgium's CD forces and their participation in mopping up the aftermath of natural disasters, industrial accidents and catastrophes permit keeping the country's CD system in a sufficiently high degree of readiness for actions in an emergency situation.

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Radar Early Warning Aircraft for the Swedish Air Force

18010451o Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) p 77

[Article by Col V. Zabolotnyy]

[Text] Sweden's military leadership plans to have several radar early warning aircraft to expand capabilities of the system for monitoring air space contiguous with national territory, especially at low and extremely low altitudes, as a supplement to the deployed network of coastal radar posts. The possibility of their employment not only from permanent airfields but also from small landing strips and sectors of freeways, and low cost and operating expenses are among basic requirements which the Swedish Air Force command is placing on these aircraft in addition to the desired characteristics of their on-board radar and other equipment (airborne target detection range, accuracy of determining their coordinates and so on).

Based on this the Air Force command decided to create such an aircraft on the basis of the Metro-3 light turboprop transport. Based on its order the American firm of Fairchild modernized one Metro-3 for installing in it the Swedish RS-890 radar and communications and other equipment necessary for it to perform functions as a radar early warning aircraft (after this the western press designated it the Metro-AEW).

The following changes were made to the aircraft airframe during modernization (see color insert [color insert not reproduced]):

—A fixed pod was installed above the upper fuselage for accommodating over 200 modules of a phased array radar antenna;

—An attachment point for an auxiliary power unit was made beneath the center wing section, intended for producing supplementary electric power (to that produced by organic generators) for the radar and other special equipment (if necessary this unit can be jettisoned in flight);

—The size of the tail fin was increased and additional vertical aerodynamic fins were installed on the upper and lower surfaces of the stabilizer (this was because of the need to improve the aircraft's heading stability, which was disturbed due to antenna installation).

In addition, there was a modification of the load-bearing frame of the cargo compartment and a periscope was installed in the ceiling of the pilot cockpit for observing the status of the antenna. The system for supercharging, pressurizing and ventilating the cockpit and on-board equipment units was modernized.

The western press notes concerning the RS-890 radar that it is a pulse-Doppler set with electronic beam scanning. It will be possible to "view" air space in 120 degree sectors (in azimuth) from both sides of the aircraft with its help.

Judging from foreign press announcements, the flight test program of the Metro-AEW aircraft envisages 53 flights (with an overall flying time of over 116 hours) at the Fairchild plant airfield (San Antonio, Missouri). Then it will be moved to Sweden, where it is to be tested for 2-3 years after the radar and other special equipment is installed and only after this is it planned to make a final decision on building series aircraft.

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American Bell-406CS Light Helicopter

18010451p Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) pp 77-78

[Article by Lt Col V. Nelin]

[Text] The American firm of Bell has developed [razrabotat] a reconnaissance-attack version based on the OH-58D Kiowa reconnaissance helicopter. It was designated the Bell-406CS (Combat Scout) and differs from the base model chiefly by the make-up of on-board equipment and weapons. According to a statement by firm representatives, it is intended especially for export (above all to countries of the Near East and Africa) and is capable of conducting combat operations under conditions of a hot climate and high-mountain terrain. The helicopter's performance characteristics are given below.

Crew	1-2
Weight, kg:	
Empty helicopter	1035
Design take-off weight for performing typical mission (crew of 2, 4 TOW ATGM's, maximum fuel reserve 345 liters)	1910
Maximum take-off weight	2040
Flight speed, km/hr:	
Maximum	230
Cruising	220
Maximum flight range, km	400
Endurance, hrs	2.5
Maximum rate of vertical climb with take-off weight of 1680 kg, m/sec	9.1
Static ceiling with take-off weight of 1910 kg under conditions of international standard atmosphere +20 degrees C, m:	
Not counting earth effect	2800
Counting earth effect	4270
Maximum weight of cargo carried on external suspension, kg	900

The Bell-406CS design is a single-rotor arrangement with four-bladed main rotor and two-bladed tail rotor of composite materials. In addition to two seats for crew members, four seats can be installed in its cabin to accommodate transported personnel. The power plant is a 735 hp Allison 250-C34 turboshaft engine.

This helicopter can be equipped with various easily removable suspended armament (see figure [figure not reproduced]), accommodated on two general purpose folding brackets situated along the sides of the fuselage. A gyrostabilized optical sight with laser rangefinder, installed above the crew cabin on the left, is used for aiming weapons.

According to reports of the journal INTERAVIA, the Bell-406CS made its first flight in June 1984. It underwent flight testing on the territory of Saudi Arabia and was demonstrated in Pakistan. The developing firm does not exclude the possibility of its purchase by the U.S. Army for use as a multipurpose reconnaissance helicopter.

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FRG Coast Guard

18010451q Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 6, Jun 88 (signed to press 7 Jun 88) p 78

[Article by Col L. Shirkhorin]

[Text] Ensuring the integrity of the FRG's state land and sea frontiers is the responsibility of the Federal Border Guard (Bundesgrenzschutz—BGS), which numbers over 20,000 persons and is subordinate to the Ministry of the Interior. The BGS has a separate "sea" group, the Bundesgrenzschutz/See—BGS/S, with headquarters in Neustadt (Land Schleswig-Holstein), responsible for protection of sea frontiers. In addition, it is assigned missions of observing coastal shipping and detecting violations of environmental protection laws.

Organizationally the BGS/S consists of a headquarters and training division [divizion], two patrol boat divisions (four boats each) and a coast guard company which includes two airmobile platoons (three helicopters attached to each) as well as a platoon on light armored vehicles (eight vehicles). The authorized numerical strength of the group is 524 (of whom 37 are officers).

In its inventory the BGS/S has motor patrol boats built during 1969-1970 with a displacement of 203 tons, a speed of 30 knots, armament of two 40-mm automatic guns, and a crew of 24. Boats with hull numbers BG 11-14 are part of the 1st Motor Patrol Boat Flotilla, and those with hull numbers BG 15-18 are in the 2d Flotilla.

The BGS/S gives principal attention to patroling Mecklenburg and Luebeck bays. Two patrol boats each are sent alternately into the North Sea with the primary mission of ecologic monitoring. The other patrol boats are constantly in the Baltic; as a rule, one is on patrol.

The western press has published reports of the proposed assignment of one more patrol boat for the BGS/S which is supposed to operate together with the so-called 9th Border Guard Group (Grenzschutzgruppe 9—GSG9), which performs counterterrorism missions.

Foreign specialists note that when an emergency situation arises both BGS/S motor patrol boat flotillas are to be moved into the North Sea and used for protecting convoys on the final stage of their route to ports of the FRG and the Netherlands, and for combating saboteurs. Exercises for combating subversive actions and sabotage, in which the Navy also takes part, are held regularly at the BGS/S base in the city of Neustadt.

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Articles Not Translated from ZARUBEZHNOYE VOYENNOYE OBOZRENIYE No 6, June 1988

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