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[The following are translations of selected articles in the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow. Refer to the table of contents for a listing of any articles not translated.]

Military Reform, Air Force Military Educational Institutions

91UM0112A Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 2-3

[Interview with Colonel-General Aviation A. Goryainov, deputy commander-in-chief of the Air Forces for military educational institutions and chief of Air Forces Military Educational Institutions Directorate]

[Text] [AVIATSIYA I KOSMONAVTIKA] Comrade Colonel-General, today our armed forces are on the eve of radical reform. For what changes should the Air Forces military educational institutions [VUZes]?

[Goryainov] The impending military reform will directly affect the activities of educational institutions of the Air Forces. It will touch upon such issues as reorganizing the structure and reducing some and enlarging other military institutions. In connection with the possible decrease in appropriations for needs of the Army, and the Air Forces in particular, we are looking for ways to achieve the maximum effect with minimum material expenditures. We have already done a certain amount of work here, since the directorate's staff has been involved in restructuring the training and education process for more than 2 years now. A determining direction in the work being done is to raise the quality of the professional training of graduates of flight, engineering, and technical VUZes.

The primary task facing us is to prepare new training plans and curriculums which, taking into account the qualification characteristics of the graduates, provide for greater independence of educational institutions in determining the volume and content of the tasks being carried out.

[AVIATSIYA I KOSMONAVTIKA] Recently, the journal published quite a number of articles on new approaches in training flight and engineer-technician personnel that make it possible to improve this process considerably. What can you say in this regard?

[Goryainov] I take great interest in all articles in the journal concerning the life of VUZes and improving the training and education process. I am glad to see the authors' desire to examine our problems from positions of the achievements of military science and psychology and the departure from forced-stereotype instruction with orientation on the pedagogics of cooperation, introduction of individual forms of instruction, and intensification.

Departments of engineering VUZes, in particular at the Kiev and Riga schools, for a number of years have been conducting practical classes on map tasks; students are given individual assignments aimed at their professional improvement. The methods of V. Shtalov and M. Shchetinin, conducting independent training of students under the supervision of an instructor and classes under individual training plans for upper-class students are being widely introduced.

The Yeysk Higher Military Aviation School for Pilots [VVAUL], the Chernigov VVAUL, and the Voroshilovgrad Higher Military Aviation School for Navigators [VVAUSh] are experimenting with the "RITM" (development of individual creative thinking) system. It is based on a point-rating of students' knowledge, abilities, and skills. Its purpose is to stimulate their daily training, scientific, and social work.

I must note that there are no normative documents indicating to do things just this way and no other. Each instructor is free to choose those teaching methods and techniques which he considers the most effective. To this end, we have repeatedly arranged for the best innovative instructors to share their experience.

But this concerns flight instruction to a lesser degree, although the Chernigov VVAUL has 4 years of experience in working with students under new flight training programs and instruction methods on the ground and in the air. Its positive aspects are reflected in a new course which uses the differentiated approach to training pilots. For example, it plans for the minimum necessary number of check and introductory flights intended not for the weak student but for the strong student.

This is by no means a complete list of the work being done within the framework of the restructuring that has begun. There is a positive return from them; however, for it to be even more significant, it is necessary to increase the professionalism of all categories of instructors.

[AVIATSIYA I KOSMONAVTIKA] Our readers continue to be concerned about the problem of "excessive paperwork," in flight training in particular. Normative documents newly created in your directorate, in addition to the elements of positive experience, continue to bear echoes of the time of stagnation ("checking knowledge according to notes" and so forth). In your opinion, what is the reason for their tenacity?

[Goryainov] In all likelihood, you have in mind the draft Guide for Organizing and Conducting Student Flight Training. This document is not the whim of the directorate staff but the result of joint work of personnel of all schools. The need to revise the old guide resulted from the appearance of new normative documents and the transition to a different system of flight training in military educational institutions of the Air Forces.

The draft was prepared taking into account experience amassed and the desires and proposals from the localities, and all "excessive paperwork" in it has been eliminated. Based on the experience of flight VUZes, this document determines the face value of normative requirements imposed on trainees during their preparation for flights, including for making notes of certain information. As far as the procedure for preparation of

the necessary documentation by students is concerned, resolution of this issue has been completely passed on to the scientific councils of the schools.

[AVIATSIYA I KOSMONAVTIKA] What do you propose to do to increase the interest of instructor pilots in their work? I have in mind precluding alienation from the results of labor and the desire for improvement not associated with training students, a differentiated approach to payment for his contribution to training future pilots, moral incentives, and so forth.

[Goryainov] We have developed and spelled out proposals for proficiency rating of flight instructors, providing incentives for their work, and raising the prestige of this profession. Views on this have been submitted to the Ministry of Defense. Today this problem has grown so acute that its resolution can no longer be put off until the future.

[AVIATSIYA I KOSMONAVTIKA] How is the question of the qualification model of a VUZ graduate—a sort of state order for a specialist—and its implementation being resolved today? Are you finding mutual understanding with combat training, aeronautical engineering service, and other concerned organizations?

[Goryainov] Graduate qualification models, which are characteristics for each specialty, have been developed with the direct participation of clients and approved by the Commander-in-chief of the Air Forces in December 1989. They are based on an activity approach—ensuring training most closely approximates working conditions in the corresponding position and concentrating attention on studying those questions which are necessary for rapid acclimatization of graduates in the troops.

Today, in accordance with the requirements of the USSR Minister of Defense and the Deputy Commander-in-chief of the Air Forces for Cadres, professional goals of instruction have been clearly formulated and new training plans and curriculums are being intensively developed.

[AVIATSIYA I KOSMONAVTIKA] Many aviator-readers doubt the feasibility of dual subordination of schools: to the district air forces (air armies) and the Air Forces Military Educational Institutions Directorate. In their words, such a system does nothing more than further impede renovation.

[Goryainov] In this case, the concept of "dual or triple subordination" is not at all suitable. As we know, in the Army, the Deputy Commander-in-chief of the Air Forces for Military Educational Institutions—the Chief of Air Forces Military Educational Institutions and his staff—are charged with direct supervision of training aviation personnel in all VUZes of the Air Forces by the corresponding order of the Commander-in-chief of the Air Forces. Direct supervision of military educational institutions located on the territory of military districts is accomplished by the commanders of aviation formations.

The subordination system determines for each management element its specific future and current tasks and precludes, in principle, duplication of them. There is a common end goal—to ensure a high level and quality of training of aviation personnel.

The basic directions in the activities of the staff of the Air Forces military educational institutions include: drafting a concept for development and improvement of the training and education process, training plans and curriculums, new instruction methods, and a future model of graduates of our schools based on field requirements, and the study and dissemination of progressive experience...

Commanders of formations directly organize the training and education process at schools through their departments of combat training and VUZes and provide the schools with all types of food, for which they have the appropriate bodies in their tables of organization. Unfortunately, many aviators do not know this and make various requests to higher echelons, although most often problems can be resolved locally.

Getting back to the subject of subordination, I would like to emphasize that we achieve the best results only when the Air Forces Military Educational Institutions Directorate and also the departments of combat training and VUZes of formations work in close contact. That is, provided that the officials have the professional and business qualities to be able to understand and supplement one another and provide effective assistance to the schools through joint efforts.

For the time being, I cannot say that the problem of staffing the departments of combat training and military educational institutions of formations with highly skilled personnel has been resolved. We still have much to do here. That includes revising the modest tables of organization of these departments and setting up an effective system for training specialists.

Therefore, it seems to me that it is not the complex system of subordination of VUZes that is an "impediment" to restructuring, but the specific people and their desire and ability to work in their assigned area.

I can add that the question of creating a single supervisory body for training aviation personnel is now being examined, true, only in theoretical terms.

[AVIATSIYA I KOSMONAVTIKA] Many of our readers do not quite understand the feasibility of creating independent centers for training flight personnel in combat aircraft. Their arguments: the impossibility of sufficient theoretical accompaniment of retraining; additional financial expenditures for supervisory personnel; and subordination to the Air Forces Military Educational Institutions Directorate. What is your opinion of this problem?

[Goryainov] As far as these centers are concerned, the practice of completing the training of graduates of flight

VUZes and the initial comments from line units concerning those that have undergone retraining there have shows that, as a whole, this system is proving its worth today, and we will not alter it.

Supplying the centers with aviation equipment, funds, and equipment is another matter. It is still far from what we counted on when setting up these institutions. The state is still unable to provide us everything necessary in short time periods, including a sufficient number of modern aircraft. In turn, this affects the training of young pilots.

In the future, I think these centers will be tasked with distributing school graduates by branches of aviation, depending on the professional qualities of the young pilots and the needs of line units.

The question of subordination of these institutions is not insolvable and in time will be eliminated.

[AVIATSIYA I KOSMONAVTIKA] Aleksey Semenovich, implementation of military reform, including radical restructuring of the work of Air Forces VUZes, will increase the role of the journal as a collective organizer and propagandist in the structure of bodies of the Air Forces. How does the leadership of the Air Forces VUZes plan to use the capabilities of AVIATSIYA I KOSMONAVTIKA in the interests of further improving the training of flight and engineering and technical personnel?

[Goryainov] First of all, I would like to note that I am a member of the editorial board and, naturally, am closely associated with the editorial staff. I am interested in both the journal as a whole and the quality of individual articles. If the readers do not find interesting and useful material in an issue of the journal, this is the result of unfinished work of both the journalists and the editorial board members. We now strive to see that empty, dull articles do not get the journal off course. I am firmly convinced that AVIATSIYA I KOSMONAVTIKA must be at the forefront of the reform being conducted, or better yet, somewhat ahead of it, influencing the course of events.

Certainly, this wish for the journal itself and other editorial board members also pertains to coverage of subject matter concerning military educational institutions. I cannot say that I am completely satisfied with work in this direction yet. The rubric "From the Life of VUZes" should not only be permanent but also combine the most diverse materials encompassing literally all aspects of the life and activities of aviation schools and line units.

Teachers, instructor pilots, and students should be given a chance to speak more often so they can share their experience, raise problems concerning them, and propose their solutions. In short, I favor the closest linkage and active cooperation of the journal not only with the Air Forces Military Educational Institutions Directorate but above all with a wide range of readers from VUZes. I see this as one of the factors of increasing the power of AVIATSIYA I KOSMONAVTIKA, its popularity, and prestige.

[AVIATSIYA I KOSMONAVTIKA] In conclusion, please tell us about the main stages of your service in the Air Forces and about yourself.

[Goryainov] My life does not differ much from that of many people who have devoted their life to aviation. I was born in 1934 in the city of Kursk. I graduated from the Kursk Special Air Forces School in 1953 and from the Stalingrad Aviation School for Pilots 4 years later.

I have served in positions from pilot to corps commander and was chief of staff of the Moscow Military District Air Forces. Later I was commander of the Transcaucasus Military District Air Forces and of the Group of Soviet Forces Germany. I have been deputy commander-in-chief of the Air Forces for military educational institutions since 1987. I graduated from the Military Air Academy imeni Yu.A. Gagarin and the General Staff Academy. I am married and have a son. He is an officer in the Soviet Army and is serving in the Tank Troops.

Ground-Attack Aircraft over the Battlefield

91UM0112B Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 6-7

[Article by Colonel V. Tkachev, candidate of military sciences: "Ground-Attack Aircraft over the Battlefield]

[Text] Ground-attack aircraft are intended for direct support of ground and naval forces by engaging small and mobile ground (surface) targets from low and extremely low altitudes primarily in the tactical and immediate operational depth of the enemy troop dispositions by using bomb, missile, and artillery armament.

Marshal of Aviation A. Yefimov, a ground-attack aircraft pilot and Twice Hero of the Soviet Union, emphasizes in one of his books: "The determining factor for a ground-attack aircraft is its great firepower, its ability to bring pointblank pressure on enemy installations on the battlefield, and its ability to continue combat operations. Of less importance are flight range and all-weather, day-night operation... Ground-attack aircraft must be optimized as aircraft adapted as much as possible to the conditions of engaging all targets on the battlefield, especially mobile, armored, and other targets, and also for destroying similar enemy aircraft and helicopters in the air." ?? These tenets contain the basic conditions that determine the nature of the behavior of ground-attack aircraft crews, subunits, and units in combat, operational methods, and tactics. Engagement of targets in the direct proximity of friendly troops and in the tactical depth makes it necessary for them to cooperate closely

with Ground Troops subunits and units and also with other air components, especially army aviation.

In a specific situation, groups of ground-attack aircraft and combat helicopters, each separately, have their strong and weak points, resulting from the characteristics of the combat equipment. Their capabilities can be realized to the maximum extent by using in combat only those subunits which are most effective in given conditions or by joint use of air components and Ground Troops to carry out a general combat mission. Experience of military exercises and the results of computer modeling have made it possible to bring to light the optimum variants of distributing functions (individual missions) among ground-attack aircraft and combat helicopters.

When engaging targets in the forward edge and in the direct proximity to the line of contact using mixed groups, neutralizing antiaircraft weapons and covering friendly helicopters against enemy attacks becomes the primary mission of ground-attack aircraft. Compared to the actions of a uniform group of the same numerical strength, the damage inflicted on the enemy by a mixed group increases by 12-15 percent. Friendly losses from air defense weapons are one-third to one-fourth as much, and the probability of helicopters penetrating air defenses increases from 0.46 to 0.83. Other variants of joint operations have a lesser effect: either the damage inflicted on the enemy decreases, or friendly losses increase.

Division of functions among subunits of ground-attack aviation, other air components, and the Ground Troops can be accomplished not only by missions (for example, neutralizing air defense weapons and engaging targets impeding the advance by troops) but also within the framework of accomplishing one mission. An example of this is detection, target designation, and laser illumination (by forward air controller) of enemy objects from the combat formations of Ground Troops and launch of missiles with laser homing heads by ground-attack aircraft crews, which makes it possible to double the launching range of guided missiles and considerably increase the accuracy of their guidance.

However, this precludes discrimination of reflected signals, which puts a number of limitations on simultaneous use of several missiles from different aircraft against targets located close together. The shortest distance between the illuminated targets is registered when attacking from minimum range and a direction perpendicular to the line of disposition of the enemy objects. As the launching range increases, the permissible distances increase from 70-80 to 400 meters.

To preclude missile launches against an unplanned target or a target illuminated by enemy laser systems, before the homing head locks on the laser spot, the pilot must make a rough aiming, using characteristic reference points and signals emitted by ground forces using pyrotechnics, lights, and other means.

Division of functions of illuminating the target and destroying it between aviation and the Ground Troops makes it possible to lessen the adverse effect of dust and smoke in the area of combat operations. As a result of making missile-artillery and air strikes, fires, and the functioning of troops and objects, solid zones of smoke and dust are formed which are 500-1,000 meters high and have a visibility of 500-1,200 meters in them. The clouds that emerge move in the direction of the wind with a divergence of the boundaries at an angle of about 15 degrees, gradually clearing some objects and covering others. The visibility in the zones improves in due course. It is possible for ground-attack aircraft to make attacks using weapons that have a small carry (bombs with deceleration devices) 30-40 minutes after the end of intensive artillery fire, cannons and unguided rockets 50 minutes later, and guided missiles 60-70 minutes later.

The greatest amount of air defense assets, including low-altitude surface-to-air missiles with thermal homing heads, is concentrated in the tactical depth of the enemy's defenses, which is the main area of operations by ground-attack aircraft. Making strikes against targets without using tactics which reduce the effectiveness of these weapons can result in large losses and failure to accomplish the combat mission. Flying to the target at maximum low altitude (in a number of cases at 15-20 meters) considerably reduces the total area controlled by air defense weapons and turns it from a solid area into one with large uncovered zones.

To use weapons in the target area, the necessary altitude is gained with an energetic maneuver, and a diving attack is made from the direction of the sun, if possible, or with a subsequent departure toward the sun, in the direction of illuminated clouds, or mountain (hill) slopes. For air defense weapons with optical sights, the conditions for detecting attacking aircraft and using surface-to-air missiles with thermal homing heads worsen due to powerful solar radiation. Simultaneously with using natural interference, ground-attack aircraft use individual electronic warfare gear and also are protected by jamming aircraft from airborne alert zones.

The experience of combat operations indicates the need to destroy targets on the first attack, since aviation suffers great losses from air defense weapons in subsequent passes. However, fulfillment of this requirement is unacceptable for ground-attack aircraft which have a large number of weapons. When using the entire payload on one pass, a considerable portion of the weapons does not hit the target due to its small size. In this connection, it is advisable to attack enemy targets by making several passes over friendly combat formations and using ground target designation. When the distance from the targets to the front line does not make it possible to attack from friendly airspace, it is necessary to engage several closely located targets in succession on one pass using part of the ammunition carried on each target.

The required degree of destruction is ensured by increasing the number of crews in the total strike group

or by increasing the damage inflicted by alternating actions of several groups from various directions. The minimum distances between successively attacking aircraft are achieved by using weapons with a small carry and using suspended cannon mounts for firing backwards. Engaging several targets on one pass using guided missiles, even when launched at minimum range, is possible with a distance of more than 4 km between groups.

It is advisable to use no more than 10-12 100-kg aerial bombs, 200 cannon rounds, or 96 small-caliber aircraft rockets from one aircraft against each successively attacked target, since a further increase in munitions expenditure does not result in a noticeable increase in damage.

When engaging advancing motorized infantry, tanks, and artillery, ground-attack aircraft make strikes jointly with army aviation, initially destroying advancing reserves in battalion and company columns. At the line of deployment into extended line, the ground-attack aircraft use minelaying (using antitank and antipersonnel mines) to force the enemy to halt, since negotiating a minefield without disarming it results in large losses. One aircraft is capable of impeding the advance of five tank or motorized infantry platoons. Located over friendly combat formations or briefly moving into enemy airspace, helicopters or ground-attack crews engage the halted equipment by using antitank guided missiles.

When making strikes in the tactical depth, ground-attack aviation is forced to be located in the lethal area of small-caliber antiaircraft artillery and antiaircraft machineguns for an extended period. To reduce losses and fulfill the basic mission, it is recommended that the crews alternately attack air defense weapons simultaneously with striking the assigned target. The crews (pairs) switch targets on the second pass.

Such a tactic was successfully used during the Great Patriotic War. Its essence involves decreasing the number of rounds from antiaircraft weapons by exerting psychological pressure on combat crews and destroying weapons. Even if small-caliber antiaircraft artillery is accidentally in the zone of ground-attack actions, the accuracy of its firing drops by a factor of 1.5 and 2-2.5 during purposeful attacks.

During the course of supporting the Ground Troops, ground-attack aircraft may carry out a number of missions not associated with firing on the enemy: laying smoke screens; mining the terrain; minefield clearing by detonation (clearing lanes through minefields); and diversionary actions.

Success in modern combined-arms combat will be determined largely by the results of combating enemy antitank weapons. Engaging a considerable number of small antitank weapons dispersed over a large area is difficult, which dictates the need to take steps to reduce their effectiveness. These include laying blinding or masking smoke screens. One ground-attack aircraft with a full load of 100-kg or 500-kg smoke bombs is able to mask from 110 to 160 pieces of armored equipment. The required duration of cover is ensured by a timely repeat laying of a screen at a new line. To do this, ground-attack aircraft must be in the airborne alert zone.

Minefield clearing or clearing lanes in minefields is accomplished by ground-attack aviation supporting Ground Troops by using high-explosive munitions. Bombs are dropped in a volley or series on terrain sectors (corridors) marked by ground forces.

These examples do not exhaust the entire diversity of using ground-attack aircraft when supporting the Ground Troops. Making strikes against ground targets does not stand up to stereotype in actions, since it leads to unjustified losses and nonfulfillment of assigned missions. It is necessary to use new tactics in each specific case, taking account of the situation at hand and taking advantage of weak points of enemy air defense.

Letter to Editor, Response

91UM0112C Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 8-9

[Letter to the editor by N. Drik and response by Lieutenant-Colonel Yu. Yarin, deputy chief of the political section: "Where Is the Mercy?"]

[Text] DEAR EDITOR! The wives of servicemen from aviation units of Military Transport Aviation [VTA] are turning to you in the hope of making a public statement to call attention of the leaders of the state, the Ministry of Defense, and the command authorities of the Air Forces to those social difficulties which we are experiencing.

Our husbands are the first to respond to the appeal: "Help is needed!" Fulfilling their military and human duty, often risking their lives, they rush to areas of natural disasters, accidents, and catastrophes, and political and national tension in order to save people and deliver food, medicine, equipment, and other necessary cargo. It is impossible even to imagine how all these missions could have been carried out without the participation of military transport aviation.

Carrying out duty assignments and staying away from home for a long time, they think that command authorities, political bodies, rear services, and, finally, city authorities will look after their families. Unfortunately, their hopes are not realized. We live as refugees: without housing, without work, without protection.

There are more than 200 people on the waiting list to obtain an apartment, and it moves very slowly. Priority is given to flying personnel and Afghanistan veterans. And the rest have to wait and wait, although there are

quite a few officers on the overall waiting list who have just recently left flying positions.

The available housing space near the aviation camp is not controlled by rear services. It is occupied mainly by pensioners or people who have nothing to do with the military unit, many of whom speculate in apartments and exchange them for others, while flying personnel are forced to rent places to live and spend hours in order to get to work. We, the wives of officers and mothers of future soldiers, understand that it is difficult to increase a unit's combat readiness in such a situation.

Service members' request to command authorities to give the available housing near the camp the status of official housing, which a service member discharged into the reserve must turn over to the military unit, is not finding understanding. For the time being, this housing is managed by the city executive committee [gorispolkom]. But it is not concerned either about maintaining it in a normal sanitary condition or about providing public services and amenities. For example, the kindergarten located here has been under repair for a year now, and the end of the work is not in sight. Parents have to get their children up at 5:00 or 6:00 in the morning to take them to another kindergarten where our children are temporarily registered. Then the parents themselves need to have time to get to work.

That same gorispolkom that is in charge of allocating housing space is in debt to the unit. The debt is not being paid, new reasons are found, new deadline are cited, and the number of families of service members without apartments continues to grow.

If someone is lucky enough to get an apartment from the gorispolkom, it usually requires so much repair that the people simply lose heart.

The command authorities of the unit and the higher political body, of course, know about this disastrous situation, but show no activeness or concern about correcting it. Glasnost in this matter is quite limited, and some decisions of the housing commission are still unknown to us. We hear only one thing: again something has fallen through with housing, it did not turn out, someone did a bad turn, did not assign housing, and so forth.

Among the large number of unfortunate ones are eight large families who are authorized benefits, but are not receiving them. They do not see even elementary attention or human involvement on the part of the command authorities or the political section. To whom does our charity extend, which lately has become so fashionable to talk about, to the population of other countries?

Four large families have temporarily taken up residence in a health center for flying personnel. Adults and children are huddled in one room, which also contains the bedroom, kitchen, bathroom, laundry room, and drying room. There are no conditions for the service members to rest and no activities for the children. The ceilings leak, and the walls have mildew. The children get chronic illnesses from the constant dampness and psychological disorders from the noise. Given all that, the families living a precarious existence in the health center cannot even object in their own defense, being totally dependent on rear services and servicing personnel. They are threatened with being put out on the street.

We cannot reproach someone of the officials of the unit or garrison for self-interest or unwillingness to do something. We have been in various garrisons during our husbands' long service. The situation with daily life and housing is pretty much the same there. The problem here is not just with the immediate commanders and chiefs. The problem is with the system of the criminally indifferent attitude toward the needs of service members and their families that has taken shape in the Air Forces. The results of this are apparent: our husbands, suffering themselves and seeing the suffering of the people nearest and dearest to them, cannot fully switch to resolving official questions and are in psychologically depressed. There is no need to say what this leads to in aviation. The most despaired do not want to serve in the army any longer...

Both our husbands and we, their wives and children, are patriots of our homeland and of the armed forces. But this sacred feeling cannot be exploited for decades without answering for it at all.

Is there any way out of the most difficult situation with housing for servicemen of the Air Forces and their families?

We await your response.

On behalf of family members of servicemen not provided housing, N. Drik (Moscow Military District)

From the Editor

Dear Natalya Petrovna, the editorial office receives numerous letters similar to yours. It is impossible to read them without being disturbed; likewise, it is impossible to ignore them.

Why has such a situation with apartments take shape? What is being done to correct it? Are there causes impeding resolution of this problem in the garrison?

Lt Col Yu. Yarin, deputy chief of the political section of the large unit, responds to the questions we posed.

The reproaches of the servicemen's wives are justified. A difficult situation indeed has taken shape in the garrison: about 300 families of servicemen do not have housing. Several years ago, the situation was more or less tolerable. But in 1987-1988, by decision of the commander of the Moscow Military District, a considerable portion of the housing allocated by the gorispolkom for a specific purpose was turned over to other units of the Moscow Military District Air Forces. We immediately felt a critical shortage of apartments.

The situation was exacerbated by the fact that the gorispolkom gave us more than 2,000 square meters of living space less than it was supposed to. The chairman of the ispolkom and other officials give promises in response to persistent appeals from the command authorities and military people's deputies. What is more, the gorispolkom turned down VTA units in the construction of housing using share holding.

Our military camp is not closed; therefore, it is fairly difficult to resolve the question of moving discharged service members and their families. Many are kept here by a good apartment, an orderly life, the relatively healthy ecological situation, and affection for fellow soldiers. One can understand all this, but the housing occupied by them is not compensated by anyone.

The command authorities and the political section know about the housing problem and are trying to resolve it. The health center and officers' dormitory are being used to accommodate arriving servicemen and their families. Naturally, they cannot satisfy the everyday requirements of people. But for the time being this is the only possibility to house those in dire need, since it is difficult and expensive to rent an apartment in the city.

The question of re-equipping the health center and dormitory has not been posed because there are plans to build a 200-bed dormitory in the camp in 1992. In addition, a 66-flat apartment building will be turned over for operation by the end of the year, and there are plans to build two 145-flat apartment houses next year. Thus, this will alleviate the criticality of the problem.

However, there is too little persistence by command authorities and the political section, adherence to principle by housing commissions, and openness in the decisions they make, and insufficient rights of people's deputies to resolve the problem once and for all. There is often a blank wall of a lack of understanding between them and the city authorities. The legal acts determining their mutual relations are far from perfect and require revision.

The command authorities and housing operation department of the district also cannot help us resolve these problems and do not seek to do so, devoting more attention to combined-arms units.

The question of greater independence of VTA units in using funds received for transporting national economic cargo is also slowly being resolved. For example, this year we had money and had contractors willing to conclude a contract with us for construction of apartment buildings. But the obstacle was the Central Finance Directorate of the USSR Ministry of Defense, which saw such actions as "squandering" people's assets. Finally, we were able to reach a general agreement. However, we had lost time. We still hope to implement our plans for building housing, provided that a clear-cut regulation will be worked up giving us the right to independently dispose of a portion of the money earned.

The problem of providing housing to servicemen and their families has been widely heard. It was again stated in speeches by M.S. Gorbachev and D.T. Yazov to exercise participants in the Odessa Military District. We agree with them entirely. But we are waiting for concrete assistance and to be given real rights in resolving this problem.

Combat Training, Flight Safety Problems

91UM0112D Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 10-12

[Article by Lieutenant-Colonel A. Zhilin, editor for the Flight Safety Department, and Major A. Ziziko, military pilot first-class: "A Gordian Knot of Military Aviation Problems. Will a Sword of Damocles Be Found for It?"]

[Text] The military pilot profession is just less than 80 years old. This completely new, unexplored area of human activity has also determined a special approach to selecting those wishing to participate in it. They must possess to a sufficient extent such qualities as innovation, an unusually keen sense of duty, and good psychomotor coordination. Petr Nikolayevich Nesterov was perhaps the most striking and well-known representative of the military pilot profession of that time.

The prospect of using aviation in armed conflict served as a powerful impetus for development of technology for it. In turn, its constant improvement invariably also increased the demands on the human factor, the bearer of which is the air warrior.

Each successive spiral complication of aviation equipment, both abroad and in our country, imposes, besides previous ones, additional demands on the pilot which are legally consolidated in regulations on the selection process.

Whereas before the airborne vehicle was simply called an aircraft, today it is called an aviation system, an air ship. In form, they are the same. The difference is in content. It lies primarily in the quantitative and qualitative characteristics of the technical systems, the considerable complexity of their functioning, and also the expanding capabilities of their interaction with a great number of other land-, air-, and, in the future, space-based systems. This again is directly linked to the demands imposed on aviators.

Thus, with the development of information and technical equipment, in addition to an increase in quality, the amount of input information coming to the pilot as an operator in the "man-machine" system also increases. Take, for example, the aircraft flight control system. In the opinion of Japanese experts, it passed through the following stages after formation: 1920-1940—mechanization; 1940-1960—electrification; 1960-1980—automation; the period 1980-2000 will be

defined by computerization; and then the creation and development of artificial intelligence will begin.

The experience of using fourth-generation aircraft systems during combat training confirms the correctness of the assumption that the waging aerial combat in an aircraft whose level of computerization in the flight control system is higher (and this decreases the mental workload) has the advantage over his opponent piloting an aircraft with similar performance characteristics.

It has become obvious that further expansion of the combat performance characteristics of the "pilot-aircraft" system, as well as its safe functioning, is possible only by improving the linkage of the input and output channels of the man and machine interface. The problem is that when carrying out the basic tasks, the load on the combat pilot is already near the limit defined for him by nature.

The design limitations of earlier-generation aircraft made it impossible to maneuver at g-loads dangerous to the human organism without the threat of damage to or and even failure of the airframe. The military pilot was "protected" by the weakness of the aircraft design. Later, winged vehicles made it possible to create g-loads of 4-6, enough to "damage" the human organism (loss of consciousness), which is the upper limit of an unprotected organism (just for supplying blood to the cortex). Modern fighters permit flying with g-loads of 9-10 (to 12 in the near future), which exceed the natural capabilities of man for other indicators, too.

Use of an aircraft with such characteristics is possible only with the use of a set of protective measures, but they also assume bringing the human organism to the limit (for all these physiological indicators in total). The limitation is both for flight safety and for the pilot's life.

The need to acquire practical skills with maximum use of the combat capabilities of the equipment often results in a comprehensive influence of various loads on the pilot, which even on a training flight determines not only its result but also safety.

Thus, an American pilot lost his mind after making an extended flight at maximum low altitude. In the process of mastering the F-16, there were a number of accidents and near-accidents associated with flights at high g-loads and also with large gradients of g-load increase, resulting in the pilots being totally or partially disabled. In the experience of combat training of our pilots, there occurred a number of accidents and near-accidents associated with exceeding the permissible angle of attack in a modern fighter.

Statistics indicate that approximately two-thirds of the total number of accidents are not the result of pilot error. For quite understandable reasons, we are not citing the precise number. True, in our view, there cannot and must not be either military or state secrecy here. Truth, objectivity, and openness should be given priority in such an important matter as flight safety, at least in aviation collectives. At the same time, we are confident that officials will be found for whom secrecy in this matter is simply convenient, since it covers up the really low level of training of flying personnel, for which the organizers of combat training must bear responsibility. In addition, the official data themselves on "pilot error" and "not pilot error" evoke great doubts from the standpoint of their objectivity.

The situation in which a pilot is blamed for all the problems indicates the flagrant lack of professional protection for a military pilot. In essence, this problem has several interrelated aspects: the aviation equipment, the human factor, and the algorithms of combat training. Let us touch upon each of them in sequence, if only in general terms.

1. Aviation Equipment

It is known that the number of accidents, and that means the lives of pilots, is directly dependent on the reliability of the equipment coming to the line units.

Let us ponder the meaning of the words stated by Col Gen Avn (Ret) V. Skubilin, former chief engineer of the Air Forces: "What was the negative influence of the period of stagnation on the Air Forces? If we are talking about equipment alone, we must admit clearly and honestly that at that time the line units received aviation equipment that had serious flaws in reliability and service life. Weapons systems and equipment often were incomplete, and sometimes some of them were lacking altogether... The leadership of the procurement directorates, under 'pressure from above,' accepted and paid for this equipment. Sometimes they even paid for those aircraft which did not roll out of the shop. Engineering and technical personnel and flying personnel were forced to complete work on these aircraft at airfields and in repair subunits. This period of fixing and completing the work on the aircraft took a long time and involved considerable material expenditures." ("For What Is the Slogan to Blame?" KRASNAYA ZVEZDA, 23 Aug 1989)

How do things stand today. The international air show at Farnborough, England. We are ahead! The international aerospace show at Abbotsford, Canada. A high degree of competitiveness! Le Bourget-89 in France. The main exhibits are from the USSR! Hurrah!

Indeed, let us rejoice in the fact that the technical equipment of our military aviation corresponds to the best world models. At the same time, Col Gen Avn V. Shishkin, chief engineer of the Air Forces, noted in responding to a question from AVIATSIYA I KOSMONAVTIKA: "I must say frankly that the quality of the equipment and armament, monitoring and repair systems, and operating and servicing documents being delivered today does not fully meet the requirements imposed."

Let us look at how in the practical aspect this is reflected in combat training results, safety, and the pilot. There

were three accidents in a comparatively small interval of time during aerobatic maneuvers over the airfield in fourth-generation aircraft systems of the same type that were already in the troops. The aircraft were piloted by experienced, high proficiency-rated specialists: a colonel, inspector, and military pilot-expert marksman; a colonel, test pilot first class; and a major, pilot-researcher, and military pilot-expert marksman. In all cases, the "reverse roll response" phenomenon was the cause of the accidents.

It is possible that no one knew about the phenomenon inherent to the combat aircraft that had been delivered to the troops? No way! The designer, the firm's test pilots, as well as the military test pilots could not help but know. Then what was the problem? Is it possible that this was, say, that fatal inevitability which led to the death of test pilot Bakhchivandzhi when he passed the transonic area of the speed of sound? Perhaps there were no reliable barriers to this dangerous phenomenon which were legally secured by the appropriate documents at the appropriate echelons?

By no means! To protect the pilot, there are (or listed?) a number of institutes that have military test pilots (who are called upon to evaluate the suitability of new aviation equipment for line service, in doing so guided by quite specific documents—orders), Aviation Flight Safety Service of the USSR Ministry of Defense, and other organizations. In turn, the documents governing the requirements for equipment not only mention the impermissibility of a reverse response in a combat aircraft, but also specifically limit the minimum angular roll velocity, taking into account the need in the process of combat employment (unlike aerobatic maneuvers) to aim, maintain a place in the combat formation, and so forth.

A question naturally arises: Why, in defiance of all this, was the aircraft put into operation? The answer, in our opinion, was stated fairly accurately and briefly, as you remember, by Col Gen Avn (Ret) V. Skubilin: "Under pressure from above." And this "above" is beyond the competence of the Air Forces command authorities (we repeat—this is our personal opinion). Moreover, the levels of authority listed above are by no means independently subordinate to "above."

Overall, the dynamics of such a state of affairs are as follows. A firm is interested in putting its aircraft into service. To fulfill for the "machine" element the provisions of the "Overall Technical Requirements of the Air Forces" which guard the safe functioning of the "man-machine" system, it sometimes means that the firm lowers the indicators of this element (i.e., aircraft) below those set by the customer and, as a result, shows its independence to some extent. So the firm "pushes" its brainchild with its flaws into service, thanks to the monopolism of our aviation industrial complex, using levers under the general and accurate name of "pressure from above."

There is a clever aspect in our domestic aircraft construction industry. As long as an aircraft is experimental, unfinished work on it is called design flaws. As soon as the aircraft enter series production and are transferred to the troops, this unfinished work automatically becomes a particular feature of the technique of piloting and operation. Is that not cunning? You see, the design bureau and Ministry of the Aviation Industry actually force the pilot to correct the fault!

Accidents and near-accidents naturally take place when they are mastering this aircraft. This results in bans. We want to emphasize here: as can be seen from what was stated above, the bans come namely from above, not from below, as some officials sometimes conveniently make it appear. As a result, when mastering new aircraft, military pilots recall the commander-in-chief and his deputies with a "good-natured silent word," blaming them for all the mortal sins. And during this time the Ministry of the Aviation Industry remains on the sidelines. And in the chips...

It happened in the same way in the case we cited: additional restrictions were introduced for further use of the combat aircraft in the line units, which not only objectively do not make it possible to use the new reduced area of performance characteristics of the aircraft, but also reduce the value of the combat training process itself. Once again, the responsibility for all the flaws is unconscionably placed on the pilot (because of his lack of protection).

Before going to a new section, we would like to caution pilots of line units against undeserved accusations toward their colleagues—military test pilots—for the evaluation given by them for the aircraft received. The problem is, they themselves are under this "pressure from above," under the existing state of affairs sometimes acting only as formal representatives of our protection.

The Human Factor

In the air forces of NATO member-countries, much attention is given to identifying at an early stage among those who wish to fly individuals who have the makings to become good pilots. The goal of this selection process is to increase the quality of the air force (by increasing combat readiness and safety) against the background of saving resources needed for training. This is helped to a considerable extent by the high prestige of the profession of military pilot, which makes it possible to select the best of the best.

In our country today, both among aviators and in the mass media, there is talk about the decline in prestige of the title of military pilot, which is by no means without foundation. This has resulted in a decline in the quality of candidates entering schools. The number of students with average capabilities has increased. This means that even if the level of technical equipment is the same as aviation of NATO member-countries, the quality of our

air protection is decreasing. After all, with cuts being made in the USSR Armed Forces it should, on the contrary, be increasing.

The unbridled anti-army campaign that is being conducted by certain mass media and society's indifference to the problems of the military contribute to the fact that the best specialists, its prime, are leaving aviation. Although some people are trying to present these lads as nothing but drunks and people who have violated the law. If things continue this way, the Air Forces will be deprived of a promising future.

Concerned with the problem of a decline in prestige of the military pilot profession, we conducted an unofficial survey at one of the Air Forces flight schools, requesting instructors to share their thoughts. Here is one of the responses received from a former instructor pilot, now a scientist:

"The nomenclature of those starting school is having a negative effect. Many people have tried to oppose pull. But it must be admitted that the majority of them have "had their teeth broken" by various methods. The problem is that the school is considered the private domain of various chiefs, enabling them to solve many problems of a personal nature.

Picture yourself in their place for a minute. You have raised a nitwit son. Not because you are a bad father, but because you spend day and night at the airfield guarding the homeland and are physically unable to raise the lad. It is not possible to place him in a civilian higher educational institution, and he would not last there anyway. And here you have your own educational institution, your subordinates. What else do you need? And they hold on to the life lines for themselves and their relatives. They do their own bookkeeping of these people; the selection board gives them too high a grade; they retake the exams two or three times; dual-instruction programs are extended to the extreme; and so forth. Another problem is that, looking at the chiefs, those who are lower ranking also engage in this, and they have nothing to do with admission. And we want to ruin all this?!

Data on such categories of "vertebrates" are not advertised, but they are now more than half of those admitted. And if you try to "bring something out in the open," you become disagreeable and one who quibbles. Imagine that I have given you the necessary data. You try to make the data public. But this affects the interests of a group of people, and they immediately ask: "Where did you get this information, and what proof do you have that it is correct?" What will you be able to say? After all, there is no and will be no official confirmation that I can give. Otherwise, this is slander on the higher educational institutions and the restructuring taking place there. The result is well known. Personally, I am for the present restructuring, but I do not see any sense in throwing a grenade under the tank.

In this regard, I would like to say something. There should be officer and flying dynasties. What is more, officers' children should enjoy a certain advantage when enrolling in a military higher educational institution. The issue is for a lad to meet the physical and intellectual conditions. You see, it is blasphemous to place a young man in a flight school knowing that the poor fellow is unable to become a pilot...

It is worth commenting on the essence of the decline in prestige against a background of the disdainful attitude toward the selection process, but we will limit ourselves to an example that graphically confirms the meaning of what was stated above and the consequences to which such a state of affairs is leading. Major B. (we will not give his name so as not to traumatize the person) was at an age and in a position in which it can be said: "A pilot in his prime." Behind, it would seem, is a rich 11 years of work experience; specialist first class, and all steps have been passed—from pilot to deputy air squadron commander. Sufficient knowledge has been amassed for further professional and official advancement. He has just successfully completed the academy.

But it was at this stage of his flying career that his fate was determined by a near-accident in a formation flight. Its essence involved exceeding the aircraft's limits for g-loads (being a wingman) and recovering from the maneuver at an altitude below that specified by the mission. The commander, convinced by flight documents of the poor potential capabilities of his subordinate, makes a decision on the officer's professional unsuitability and relieved him of duty. This was the effect, but what was the cause? It was that 15 years ago this person who lost his profession today could not be accepted at a school because he did not meet the requirements of the selection process. Later on, the aviation commanders who appointed the pilot to higher positions did not have the right to do so, since these positions assume responsibility for the training and flight safety of others—officers subordinate to him.

Alas, no one will assume responsibility for the fact that a person who could not and should not have done so had flown a combat aircraft for 11 full years. As always, the person responsible cannot be found, and we cannot find in our military aviation someone who would reliably stand guard over the professional safeguards of flight personnel, for no one is reliably protected—from the commander-in-chief to the rank-and-file pilot. In other words, the cause here is in the existing system.

In the example cited, as most often is the case, in the end the pilot took the punishment for everything and everyone. There are many similar cases. But in general, these are examples with a relatively happy outcome (for the life of the pilot). It happens that lads also leave for "another world" by another path for a similar reason! For example, those who were "unable to control" the combat aircraft, the legal responsibility for which, as a rule, falls either on the person who perished or on his immediate commander.

Therefore, now we should not even be talking about the prestige of the military pilot profession. One of the priority tasks today is to raise and resolve the problem of protecting aviators (here in terms of the human factor). It is this that is one of the ingredients for raising the quality of our military aviation. Apparently, we must begin solving the problem with an in-depth analysis of the data reflecting the competition of applicants enrolling in the various educational institutions. What is happening with us? Why has the profession of, say, a trade worker become more attractive than that of military pilot? Whom will we put in the cockpit of a fifth-generation aircraft?...

(To be continued)

Aircraft Maintenance Problems Discussed

91UM0112E Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 13-15

[Article by Captain V. Mayorov: "To the Ground, But Why?"]

[Text] **We are feeling the deficit in everything, in all kinds of plans and, at first glance, in serene intentions. And here is the bad luck—in beginning to realize them, we do not always achieve the desired results. Why does it turn out this way?**

What Is Desirable and What Is Real

What is, say, reconstruction of a building? This is primarily breaking and destroying unsatisfactory members and erecting new, more modern and reliable ones. To keep the building from collapsing, one must select load-bearing structures intelligently and with professional competence. It seems to me that we should be guided by roughly the same principle when reforming one or another production system. If reform resembles a bulldozer wrecking a run-down building, we should not expect anything good other than, figuratively speaking, a pile of problems and a din of declarative speeches by the "rebuilders and wreckers" of the system. The main danger is that totally innocent executors of the will of unlucky "architects of perestroyka" may be buried under the "debris."

The same picture can be observed during an experiment being conducted in the aviation engineer service of the Air Forces. I have in mind the creation of aviation technical detachments (ATO) in squadrons. An enticing goal was pursued.

According to the new structure, flight technical maintenance units and servicing and maintenance groups ceased to exist. In place of them, servicing and maintenance crews for preparing aircraft have been organized and include representatives from various specialties. The material-technical support group has assumed all administrative activities. Former squadron engineers have become the detachment commanders.

The procedure for preparing aircraft has also changed. Technicians and mechanics have begun servicing power plants, hydraulic systems, fuel systems, air systems, sighting and navigation equipment, electrical equipment, and radio equipment according to a block system. As a result, one person is totally responsible for checking, for example, the cockpit or another part of the aircraft. That is to say, the duties of various specialists are combined.

Judging by the theoretical calculations offered, the advantages of the new system are obvious. It was created pursuing the main goal—substantially increase the mobility and autonomy of actions of engineering-technical personnel when conducting flights in two shifts and when relocating to alternate airfields. Ideally, these crews should be small, but well-trained and capable of performing any tasks independently. Once this is done, leaders of the aviation engineer service no longer have to rack their brains about whom to send to the forward team, whom to leave in the launch group, and how to redistribute ground equipment. Assign the task to the crews—and that is all there is to it!

At one time there was much talk about technicians and mechanics mastering related specialties, but things never got past the talking stage. Now, it seems, there is a real opportunity to put this into practice. Or let us recall, how many copies were broken around technical training, the organization of which in the units did not stand up to any criticism? Today, with the introduction of ATO engineer positions by specialties there are prospects for increasing its effectiveness considerably. And organizing flights by shifts holds considerable reserves for increasing the raid and intensifying combat training.

Everything is so on paper, but here is the trouble: neither the first, nor the second, nor the third is being put into practice. So, forward teams are being formed in the old way. Related specialties are slow to be mastered. Technical training was and has remained in a state of neglect. Flights by shifts have not brought the desired results, and they are often rejected. In short, you cannot win for losing.

Naturally, the question arises: was it worth making a fuss if all the good ideas remained declarations? This question should be addressed to the creators of the new system, and while they think about it, we will try to understand on our own why it is not effective.

Practical Workers Versus Theoreticians

Let us begin with a curious fact. At the urgent request of leaders of the aviation engineer service in the unit where Lieutenant-Colonel Z. Dmitruk serves, those who developed this system arrived at the remote town. The conversation that took place was critical and, frankly, not

altogether pleasant for the theoreticians. Their brainchild was subjected the harshest criticism. No, the local comrades were not at all engaging in faultfinding. They simply sought to report their problems and prove, based on specific experience, that the detachment system was not working in conditions of the Transbaykal.

The scientists countered all the arguments of the practical workers with one argument: they said that this was not the variant they had originally conceived. They said the staffs were reduced. But their opponents objected that this had not made it easier for them. If you have developed a system, you should have defended it at the appropriate levels. After all, aviators are not guinea pigs, and aviation is not a sphere of human activities in which "experiments" can be conducted. They just threw up their hands in response.

Why, at first glance, did the plan fail? The first and main reason was the shortage of warrant officers. This is a chronic problem for the Transbaykal, as well as for other remote regions, and there is no hope that it will be solved in the near future. Warrant officers are a free people. You will not entice them to the airfield with low pay, lack of housing, and severe cold.

For example, in the unit in which Officer A. Shumskiy serves, there is only one (!) warrant officer for all the aviation technical detachments. Things are not that much better with mechanics who are in their compulsory term of service. A soldier in aviation is not a technician assistant. He goes on details, stands guard duty, and performs administrative work. He appears on the flight line as clearly as sunlight. The entire system begins to break down if there are no people. This is an axiom which scientists were obligated to take into account. Or in their Moscow offices did they completely forget about the difficulties of line units?

The regulations on organizing aircraft maintenance by servicing and maintenance crews clearly state: "Performing preflight of aircraft by under-strength servicing and maintenance crews in which the number of aviation specialists is less than the number of blocks of a given type of preparation for a specific flight is prohibited." But they have to fly. In order to observe this requirement, they have to work with two crews on one shift in order to make up for their manning shortages. And what happens? The engineers of the detachments sometimes work as...mechanics (?!). The aircraft technician is forced to go to his colleague as a mechanic in order somehow to observe the legitimacy of the flight shift. And one cannot even dream about organizing flights by shifts: as they say, why should we worry about the luxuries, when we have all we can do to get by.

Of great interest is the document which the Transbaykal aviators passed to Colonel-General A. Borsuk, deputy commander-in-chief of the Air Forces for Combat Training. In it the authors, pointing out the shortcomings which were in part mentioned above, conclude that use of the proposed organization and establishment in units located in the Far East and the Transbaykal is not feasible. In particular, it has resulted in the Aviation Engineer Service at times being unable to maintain aviation equipment combat ready. Aviation engineer service specialists have to perform a certain part of the work formally, which sooner or later will result in a decrease in the reliability of systems and assemblies and the precision characteristics of aviation systems, and in the end will adversely affect flight safety. Many violations of production discipline and near-accidents are the result of the fact that recently, due to the lack of manpower and assets, supervisory personnel of the Aviation Engineer Service was forced to make concessions to the commanders, forcing subordinates, in essence, to violate the procedure for preparing and launching aircraft and to close their eyes to flaws, since it is otherwise impossible to ensure the required raid. Due to the critical shortage of specialists, work on removable equipment from time to time. The lack of training of aviation mechanics and the impossibility of teaching them complex operations in such a short period of time also have an adverse effect on the state of affairs. The saddest thing is that the words of the leaders, like it or not, are at variance with deeds. On the one hand, they convey to subordinates the requirements of directives and orders on reinforcing procedures and observing rules while working on aviation equipment; on the other hand, they permit unconcealed ignoring of laws of flight activities.

What solution is proposed in this situation? First of all, it is being proposed to create administrative and security subunits in the regiments so as not to divert specialists from servicing and maintaining aircraft. Second, if we cannot hope for additional warrant officers and trained mechanics from among the soldiers for the collectives, it is advisable to replace two warrant officer positions (or two or three soldier positions) with one officer position: in the future it is desirable to have 1.5 the complement of specialists. Third, authorize the substitution of absent warrant officers with employees of the Soviet Army. Finally, it is necessary to provide material incentives to people for constant overtime work. The proposals, of course, are controversial. But we must listen to them.

Incidentally, there is another uncertainty. Each crew is supposed to have test equipment by specialties. But there is authorized equipment only for the work of one service-maintenance group. How can it be shared among crews when everyone requires it for flights simultaneously? Moreover, how is it to be handled during redeployment basings? In short, quite a paradoxical situation has emerged: we have managed to reduce the already limited forces and assets, and now we are surmounting the difficulties which we created for ourselves.

A "Time Bomb"

It would be logical to conclude from the above that the experiment is not succeeding just because of a shortage of people. However, we will not be in a hurry to make conclusions, although this factor for the Transbaykal, I emphasize, is decisive and cannot be ignored. The

problem is that a mass of problems has emerged as a result of the innovations, even in those subunits that have a full complement of specialists.

Some Aviation Engineer Service leaders went to one of the aviation units of the Carpathian Military District to gain experience. It turned out that their colleagues had a new system, as they say, although they had no reason to complain about the lack of warrant officers. Why?

I will be so bold as to assert that this new system has turned out not to be thought out and premature. It is possible that this also predetermined its rejection by line units. What is more, in the near future, apparently, it will cause the most undesirable consequences, the main one of which is the disqualification of engineer and technical personnel, that is, it will be a "time bomb."

Before, the squadrons had servicing and maintenance for all specialties. On the whole, these small, but fairly solid collectives successfully coped with assigned tasks. It was here that the young specialist not only mastered all types of preparation of aircraft, but also learned to eliminate fairly breakdowns and malfunctions on his own. There existed at least some continuity of knowledge and experience, which unquestionably is a most important condition of quality training of technicians and mechanics. The chief of the group was, as they say, vitally interested in bringing the novice up to the necessary professional standards as quickly as possible and was for him the commander and educator. Even with a manning shortage in the group, knowing the degree of training of his subordinates, he sought the optimal placement of manpower and equipment on the flights. Sudden defects in the operation of equipment did not disrupt the rhythm of the aviators, for the chief could quickly regroup personnel and equipment, that is, he was in control of the situation. Moreover, the squadron buildings had group laboratories where the test equipment was stored and everything necessary for performing repair and maintenance at the line unit level. Such collectives are a thing of the past, and along with them goes many years of experience that proved their viability.

Now, for example, a technician of the former Servicing-maintenance Group for Aviation Equipment is also responsible for checking certain electronic equipment systems, and the "radioman," in addition to performing his main task, often services and maintains the sighting and navigation system. It would seem that this is the desired mastering of a related specialty. However, several "buts" immediately arise here.

That same "radioman" does not know, and cannot thoroughly know, the design and operating characteristics of the sighting and navigation system. At best, having mastered testing skills, he will be able to ascertain that there is a malfunction, but he is unable to analyze it, much less correct it. It makes no difference, the former sighting and navigation system specialist will do this work.

Of course, one can allege that the onboard systems function in close interaction with one another; therefore, a technician, learning something new for himself in another specialty, better learns his own specialty, and the repair groups created in the crews can eliminate malfunctions. But it is obvious that such shuffling of personnel creates certain difficulties, since it impossible to understand what the repair workers are to work on when there are no malfunctions. And is it possible to tear them away from preparing aircraft for sorties, when specialists are so overloaded?

In addition, due to the increased complexity of aviation equipment, it is not possible to train a specialist who has an equally good understanding of electronic equipment, aviation equipment, sighting and navigation equipment, and armament. For the time being, the military educational institutions of the Air Forces are not planning to switch to a new system of instruction. Even training engineers and technicians for a "narrow" specialty, they graduate fairly "rough" specialists. And we want to train a general specialist in field conditions?! This does not happen. Therefore, the so-called multiple-discipline of the aviator inevitably will lead to a leveling off of his knowledge and skills.

Here is what Captain S. Druganov, an engineer in an aviation equipment detachment, had to say concerning this: "The groups were broken up, and the people began to lose their skills. Before, they were united by specialty and common tasks. When I was a group chief, I knew each subordinate's level of training and was interested in his training. Now, when a replacement officer arrives, it is difficult for me to determine what kind of a specialist he is. And the officer, strange as it may sound, is even interested in hiding his good training so that he is not called upon to correct malfunctions once again. In 1 year, we already felt that laziness and lack of initiative were taking over some technicians."

Lieutnenant-Colonel M. Sapegin is of the same opinion: "I am concerned that people are losing enthusiasm. Before, on arriving at the flight line, I could gather the aviation equipment specialists together, discuss something with them, verify, and give instructions. Now they are subordinate to the crew chief, and he has his own work plan. Later on, how can he monitor them and train them if he clearly does not have an understanding of aviation equipment?"

Sighting and navigation system specialists expressed special concern. Preparing a sighting and navigation system is the most complex process. Before, several specialties were represented in the servicing and maintenance group. Working in close contact, they ensured the reliable functioning of the complex systems. The necessary experience was gained bit by bit, and a collective of persons holding the same views was gradually formed. And now they have broken up these collectives. Captain I. Gruzdev, an engineer in a sighting and navigation system detachment, stated frankly: "If we still manage to maintain the system in a quality manner, it is

thanks to old ties and firmly established relations. After a while, people will be replaced, young officers will arrive, and it will become very difficult to work." Colonel A. Ryabitskiy, senior engineer of the district Air Forces, continued his thought: "Depersonalization has begun. We are losing the best specialists. Whereas before malfunctions were corrected basically in the squadrons, now this is usually done at the technical maintenance unit. But the workload is so heavy that they spend the lion's share of the time on completing work according to bulletins. In short, we have lost the sighting and navigation system specialty. This will soon come back to haunt us!"

But perhaps the crew chiefs are experiencing the greatest difficulties now. Judge for yourself. Whereas before many of them, being chiefs of technical maintenance units of flights, monitored the aircraft and engine preparation of combat aircraft and supervised only aircraft technicians, now they are responsible for organizing all the work and have all crew personnel subordinate to them. The workload has increased severalfold. However, there is no incentive or compensation at all for this. There is another question. Can they, for example, determine if an operator who is responsible for a specific block performed his functional duties in a skilled manner? The answer is obvious.

It turns out that Lieutnenant-Colonel M. Sapegin is right: the crew chief is unable to evaluate the actions of subordinates and, as an organizer, he ends up in a difficult position. After all, the crew chief, as is stated in the corresponding document, supervises the actions of technicians and mechanics and is obligated on a daily basis to conduct technical debriefings and summarize and analyze the personnel's work experience on aviation equipment. There frequently are blunders, when he plans some measures, and the ATO engineer plans others. Misunderstandings and jitters arise. Captain N. Vdovich candidly admitted: "Sometimes you go to flights in fear because you do not know what to expect or what may happen." Similar statements were heard from Captain Yu. Ogurtsov, Captain V. Artomonov, and other officers.

There is another very important aspect. The aircraft technician has become the main controlling person; he is the one who determines the degree of readiness of an aircraft according to reports from the specialists. Onboard equipment and also selectively ATO engineers and aviation engineer service leaders monitor the work of operators on the block. Thus, in my opinion, we have actually abandoned monitoring by operation, about which there was so much talk and which we persistently put into practice.

But selective monitoring is not monitoring.

In general, the experiment has posed quite a number of problems. It would be naive to assume that there would be no complications or contradictions. It is important to find out: Is it useful, or does it have no future? For the time being, experience indicates the latter.

Criticism of Marxism Discussed

91UM0112F Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 16-17

[Article by Lieutenant-Colonel (res) G. Drugoveyko: "Everything Would Be Fine, But Marx Is 'Interfering'"]

[Text] No matter what is said and written today, I am confident that millions of people awaited the results of the 28th CPSU Congress. Some were hoping to find out how to solve complex social and economic questions in today's conditions, and some were hoping to find out what path the party should chose to get out of the crisis.

Perhaps for the first time following decades of feigned unanimity, each had his own special interest.

Most important for me was everything that is linked to confirming the ideological and theoretical platform of CPSU activities. The priority of namely such an interest was dictated by two circumstances. First, many difficult aspects of the current state of our society were caused primarily by neglect of the theory of its development. Second, Marxism, as a world view, is being subjected to bitter criticism from all sides today. Both the permanent opponents and his recent "loyal subjects" are attacking Marx.

In the Resolution on the Political Report of the CPSU Central Committee to the 28th CPSU Congress and on Party Tasks, the congress confirmed that it was against authoritarian thinking, for creative development of the legacy of Marx, Engels, and Lenin, and for an in-depth comprehension of the historical experience of the 20th century and the achievements of world social thought. This means that the party has not lost its ancestral political definition.

As far as the assessment of the present wave of anti-communism is concerned, at the forum of communists, unfortunately, it was indecisive and low-keyed. In my view, the creative development of fundamental social science assumes "clarifying relations" with ideological opponents: in particular, it is impossible to defend the scientific legacy of Marx without countering them intellectually.

This is in no way a matter of the inviolability of its ideas. Modern interpretation of the "eternal" truths is natural and could be theoretically productive and practically useful if the theses attributed to Marx were rethought, and rethought in the context of the historical reality in which he lived and worked. But something else is happening. A struggle is being waged against a Marxism that was turned into a dogma. The timeless Marx, translated into our contemporaries, is being refuted...

The campaign of the subverters is unusually diverse—from a poet-parodist to the rector of the Moscow Higher Party School. But A. Tsipko, doctor of philosophical sciences, is perhaps among the most active critics. It is difficult to find a popular publication that does not make contain an extensive anti-Marxist article by him: the journals NAUKA I ZHIZN, RODINA, and NOVYY MIR and the weeklies SOBESEDNIK and MOSKOVSKIYE NOVOSTI. I would like to engage in polemics with him, not because he is so active, but because he typically uses the methodology of denying the scientific nature of Marxism.

Thus, just how does the doctor of philosophy administer theoretical justice to Marx, performing a crucial, critical mission?

Most often, the shortage of humanism, allegedly inherent to Marxism, is subjected to an attack. For example, Tsipko maintains that "it is not the belief in the self-value of the human personality in that it cannot be a means and expresses the specific nature and distinction of Marxism." Really... It seems that the author does not know that the ideal of Marxist communism is the all-round, harmonious development of the personality, and "an association in which the free development of each is a condition of the free development of all." It is as if it is a secret for the philosopher that Marxism saw namely the highest self-value of man as the ultimate (mentally comprehensible) goal of the historical process. Finally, Marx's main work, if you wish to give it a sociological and not a political-economic title, would be called "Man as a Means" because "Das Kapital" is devoted to the theoretical criticism of namely this role degrading man and ways of replacing it with a truly human status.

But are there weak points in Marxist study of human nature? Certainly. First of all, Marxist study of human nature is not concluded and is incomplete. Very many human criteria have not been exhaustively elaborated. Only extremely general categories of the theory of personality have been denoted. All possible flaws of psychological nature have not been studied: envy, selfishness, greed, and the dangerous consequences of this "deterioration." However, is it legitimate to reproach a scientist for the limited nature of his creative results, when you consider that the lives of geniuses are also limited? Another question is legitimate: Does the study of human nature which have a promising future if it select Marxism as its ideological source?

In one of his articles, Tsipko simply passes sentence on Marx for the belief that "there exists only one means to reduce, simplify, and concentrate the blood-thirsty agony of the old society and the bloody pangs of the generations of the new society, and only one means—revolutionary terrorism." The critic is indifferent to ascertaining the true (specific—historical) meaning of the thesis: What, in response to what, and to what end does Marx propose? The truth is not important to the critic—it is important to prove the antihumanism and inhumanity of the revolutionary doctrine. For sure, he has managed to do this. Today we are permeated with contempt for all kinds of terrorism. No trace remains in the consciousness of the quotation that was read, or most likely, the left portion of the thesis. Only two words are printed: revolutionary terrorism. That is how the deformed intellectual-moral stereotype developed: Marxism is the essence of the substantiation of terrorism.

What unmasking anger is raining down on the "dictatorship of the proletariat!" But Marx was a dialectician. And he thought dialectically. In light of this fact, when the social and political-economic concept of "dictatorship of the proletariat" matured in Marx's head, this concept contained the entire profusion of dialectics: self-development, historicism, and self-denial. Marx's dictatorship is temporary, transient, self-denying, and varying. This very complex category of revolution takes on a completely distinctive meaning when other people use it. Stalin, for example. Or the revolutionary worker of the late 19th and early 20th century. Or Nina Andreyeva, or Aleksandr Tsipko.

But the highest achievement of the criticism is contained, one must assume, in bringing to light the "insolvable contradiction of Marxism: the insurmountable chasm between materialistic and idealistic sources of the doctrine, which cannot be combined into something unified." This is a surprising reproach on the part of a doctor of philosophical sciences. It turns out, there are insolvable contradictions. It is interesting: What is the mechanism of this insurmountability? Have we come together and come to a standstill forever? It is hard to imagine such a possibility. Opposite tendencies of any process are capable of surviving a great number of miraculous transformations, and only one attitude is foreign to them—equilibrium (naturally, other than a temporary, relative, and unstable unity). One must assume that it is the same with the contradictory nature of Marxism. In any case, the insolvable contradictions of any theory are fertile grounds for the scientific creativity of followers (supporters or opponents). But 100 years have passed, and the only thing that A. Tsipko recorded is the insolvability.

Further, the following critical passage is offered. Marx, they say, initially viewed the "development of economic formation as a natural historical process" and later was the "first among thinkers of the new times to call upon philosophers to interfere in the natural course of events." Was Marx disgraced? We will not be hasty—we remember better. What does natural historical process mean when society is the object of analysis? If we turn to Marxism, this is the actions of people (individuals, social groups) pursuing their own goals and interests. Here there is no complete likeness to the natural process. The social form of movement is specific. And when the goals and interests intertwine, intersect, and clash in a way that conditions are created for a break in the gradual nature, a revolution arises—no less natural than its prepared evolution. In addition, in places where a

person, a conscious being is active, consciousness participates in the process as an active factor. So, Marx is not responsible for the fact that in certain conditions the consciousness becomes revolutionary. He merely developed the consciousness of the masses, saturating it with science. And revolutions are the result of the development of the lives of people becoming aware of their life, their position in it, and themselves. Revolutions can be called the madness of a nation, an apocalypse, and so forth, but these are only metaphors that do not reflect the essence of historical events. Emotional and beautiful (or frightening) images are nothing more than that.

As far as the contradictory nature of the essentially ideal and material is concerned, is it not in a constant ascent toward a more precise resolution of this contradiction and toward surmounting the contrast between the two realities of being at a higher level of theoretical cognition and social practice, and there is a source of development and a motive force of social progress? Does mankind not have science in order to resolve the contraction between the ideal and material for the good of the people?

One can cite many examples of criticism of Marxism that strives for absolute denial of this doctrine. The main flaw of the methods that are typical of practically all critics is that there is a confusion of the levels of the fragment of Marxism being criticized and the counter-argument being advanced. When there merely an idea elaborated by Marx, the argument is conducted on a conceptual level. When a number of concepts are set out, opponents use reasons by which Marx would be guided. Such criticism cannot in principle be productive and degenerates into vain, unsubstantiated denial.

But why has such criticism intensified?

The situation is unusual. Society has indeed reached a point where it must make a choice determining the direction of movement over the course of many years to come.

Given the easily detectable differences on many issues, all the party forums that have been held—the Leningrad Congress, the Constituent Congress of the RSFSR Communist Party, and the 28th CPSU Congress—are united on one issue: Communists choose Marxism-Leninism as the basis of a world outlook. This is an unpleasant fact for opponents of the social variant of perestroyka. That means the masses must be separated from the communists. Rejecting the ideological basis of the Communist Party is timely among all possible methods. This tactic of anticommunism is not accidental. Much here can be accepted on faith. It is sufficient to create an anti-Marxist mood, and millions of citizens will refuse to trust communists. In conditions of forming a multi-party system, when the time has come for actual (not imposed "from above") political self-determination of the personality, ruining interest in Marxism is a great chance for rapid growth not only of the communist but also the anti-communist movement.

Of course, party members have concerns, and they are more critical than a struggle with ideological opponents. After all, so little has been elaborated in communist social science after Marx and Lenin. And if we turn to them, it is not to follow their strategy, tactics, and programs. This is all in the past. But the enormous methodological potential of knowledge of social life, social forecasting, and planning, which is contained in the works of our spiritual pioneers, is as essential for communists today as air.

Doubt is legitimate: What is this mysterious force—Marxist-Leninist methodology? They always recall it when the need arises to compliment a perpetual doctrine. Perhaps there is no special value in this theory? Let us ponder a specific example together.

The young philosopher Marx discovers the crying injustice of modern society. He searches for and finds the cause of this injustice—alienation of the worker from the results of his labor. The next step of the quest: How to overcome the alienation?

The answer is found—only a communist system for mankind ensures returning man to his essence, to himself. How to reach communism? Here is where Marx undertakes planning a route to bright future and studying the basis of a society's life—economics. For years to come, actually until the end of his days, the philosopher became absorbed in economics. The main subject of his scientific interest became the study of private property, in all its parameters, manifestations, and tendencies, with exhaustive completeness and comprehensiveness—to the level of the "elementary cell." There were, certainly, some problems discovered and resolved or merely noted along the way. But Marx's scientific specialty was still the study of private property. It was this reality he studied with understandable exhaustiveness during his time and looked at social forecasts resulting from the functioning process of private property.

Today, the main question which unites and separates fellow countrymen is private or public property. Their mutually exclusive opposition or interaction? For the time being, this problem, with so much depending on the correctness of its analysis and resolution, is being resolved—alas!—by voting and not by scientific research.

That is precisely why the task of creatively independent scientists is seen as developing and applying Marxist-Leninist methodology (or one's own, if it exists) to the knowledge of the "elementary cells" of our society in its modern state. Criticism of Marxism-Leninism, moreover so violent and absolute, is fruitless from the standpoint of practical usefulness. Its only political result is formation of a dictatorship of a new conformity of ideas, that is, another impasse of thought, void of contradictoriness. Of course, the personal interest of the enlightened authors is to find the image of great radicals.

Thus, what is the constructive zeal of these remarks? It is simple: Marxism deserves that each person determine his attitude towards it independently, without transferring this spiritual work to anyone. Here, a tete-a-tete with Marx himself, not with his interpreters, is appropriate.

Legal Support of Military Reform

91UM0112G Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) p 18

[Article by Colonel Justice Yu. Kazanchev, candidate of juridical sciences, and Lieutenant-Colonel of Justice A. Pchelintsev, candidate of juridical sciences: "Legal Support of Military Reform"]

[Text] The concept, content, and radical nature of the transformation that has begun of the military system existing in our country make it possible to talk about the lack of an alternative to military reform, the main purpose of which is to bring defense organizational development and the armed forces in strict conformity with the adopted doctrine and the principle of reasonable sufficiency for reliable protection. All this is the result of changes taking place in the military-political, military-economic, strictly military, and other areas of the state's affairs.

Soviet law, as an instrument of perestroyka in the army, is called upon to play a significant role in carrying out what is planned. This will make it possible not only to give it a purposeful and planned nature, but also to build truly law-governed armed forces.

In practice, we have already taken this path. The decision of the Soviet state on unilateral reduction of its armed forces, announced at the UN in December 1988, was made official by a legislative act. The USSR Law on Defense is being prepared, which consolidates the principles of its organizational development, the nature of Soviet military doctrine, the fundamentals of and procedure for economic support of the renovated military system of the Soviet Union, the powers of state authorities, and the rights, duties, and responsibility of Soviet and public organizations and citizens for carrying out defense measures. We have to draw up draft USSR laws on compulsory military obligation and military service, on status of service members, and on providing them living space, a Regulation on Performance of Duty by Officer Personnel in the Armed Forces, and a number of other normative acts. In particular, the USSR Supreme Soviet has already passed and on 1 January 1991 puts into force the USSR Law on Pensions for Service Members.

On the agenda are legal consolidation of democratization of relations within the army, broad involvement of social institutions of the army and navy (officer meetings, comrades' courts of honor) to achieve this goal, and expansion of the functions of certification boards. The forms and methods of ensuring glasnost in the army need to be regulated. It seems necessary to discuss and pass a law on conversion, on the basis of which there would be a planned restructuring of the military-industrial complex and a reduction in the production of arms without detriment to the country's defense capability.

In addition to passing a "package" of legislative acts regulating the process of implementing military reform, we should, in our opinion, already be engaged in working up a legal model for organizing the life and activities of the armed forces in today's conditions. Based on the USSR Law on Defense, it is expedient to pass an independent legal act on the armed forces. It is desirable to consolidate in its norms the goals of their creation, the missions, and fundamentals of combat employment. An urgent requirement of the times is to prohibit the use of army and naval forces without the decision of the highest bodies of state power of the Soviet Union or for purposes not indicated in the USSR Constitution.

Organizing support of comprehensive legal regulation of the process of command and control of the armed forces is an important task. Never has the legislator turned to this before, referring such questions to departmental jurisdiction. Among such questions is regulation of combat and other employment of the armed forces. The notion that existed until comparatively recently that establishing an organizational structure, training of military personnel, material and technical supply of the army and navy, and so forth can be accomplished just by using governmental decrees and orders and directives of the USSR Ministry of Defense has not withstood the test of time. A qualitatively new approach to implementing, for example, questions of manning the armed forces has required changes and additions to be made to the USSR Constitution, the USSR Law on Compulsory Military Service, and the Law on the USSR Council of Ministers. It is quite understandable that the resolution of other equally complex problems will require passage of acts of the highest legal force.

Creating a solid legal basis for the activities of the armed forces is closely linked to the need to recognize the juridical nature of the political aspect of Soviet military doctrine. Taking into account the fact that it reflects the official views of the goals and nature of a possible war and their influence on organizational development of the army and navy and preparation of the country for defense, it is advisable in a legislative manner to establish a procedure for revision and approval of the military doctrine of the Soviet state by the USSR Supreme Soviet. This would meet the approach to such a very important document as the military doctrine from positions of new political thinking, necessary openness, and glasnost. From the legal standpoint, recognizing the juridical nature of the political aspect of Soviet military doctrine would mean consolidating the tasks and functions of the USSR Armed Forces as obligatory, violation of which would be impossible on the part of any state bodies or officials.

The task of creating a precise legal mechanism of material and technical supply of the USSR Armed Forces, legislatively determining the optimal requirements of the army and navy, and establishing the main sources of their financing and supply is quite urgent. Certainly all these issues should be resolved in laws on the budget and finance rights of the USSR and union republics and on state planning. But legal support of the procedure of discussion (above all in the USSR Supreme Soviet Committee on Defense and State Security) and passage of the military budget and programs for the development and production of arms based on the principle of reasonable sufficiency is already now an obvious and critical problem. It seems that this problem should be resolved in Regulations of the USSR Supreme Soviet.

The appropriate juridical cadres of scientific and practical workers are required for developing scientifically sound and checked draft laws, and in the implementation stage—to monitor and oversee absolute and precise observation of them. Unfortunately, it must be stated that military jurists are clearly not being used sufficiently for preparing draft laws. In the armed forces there is not any serious scientific-research juridical subunit at all which would have accumulated in itself all the problems for improving Soviet military legislation.

It seems that the functions for drawing up draft laws promoting military reform could be assumed by a specially created Center of Military Legal Research. It is objectively needed; though temporarily, for 3-4 years, it is needed. Otherwise, preparation of the above-mentioned legislative acts will drag on for years to come, and there is a danger that military reform itself will become another long-term project. Why not promulgate for army-wide discussion the draft concepts of military reform, one of which has been prepared, let us assume, by a group of USSR people's deputies and military scientist, and another by the Ministry of Defense? They need to be discussed openly, for the times dictate this.

Aircraft Engine Problems Discussed

91UM0112H Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) p 19

[Article by Major-Genersl Aviationn V. Oleynik and Lieutenant-Colonel A. Khvostov: "Will Tragedy Become a Lesson?"]

[Text] Almost one year has passed since the crash of the Il-76MD military transport aircraft over the Caspian, in which, due to disintegration of an engine, fire, and the subsequent loss of lift qualities of the wing, nine crew members and 46 paratroopers perished. Although the main link in the chain of cause and effect that led to the tragedy was determined by an authoritative board—the crash occurred "as a result of torque failure of the low-pressure turbine shaft due to breakage of a shaft bearing"—the main question remains open. Why did the disintegration of one engine of a multiple-engine propulsion system, despite the crew's courageous and competent actions, result in such serious consequences?

There have been numerous cases in aviation of the country's armed forces of successful completion of a flight with an engine failure. Thus, six minutes into a flight in a Su-27, the annunciator panel warned Military Pilot 1st Class Major V. Trelyukhin: "Throttle back right engine," which indicated a breakdown in operation of the engine. When the signal came again, he immediately shut down the engine, aborted the mission, and landed at the airfield with one operating engine. An inspection showed that the failure occurred due to torque failure of the low-pressure turbine shaft, which resulted from breakage of its forward support bearing.

In both of these cases, the same technical cause was to blame for everything. The main danger in such a failure is that when there is torque failure of the shaft, the turbine remains at no-load, and its rotational speed almost instantly increases to a speed at which the disks and blades disintegrate. The scattering fragments can damage the engine casing, the airframe, and aircraft systems, and cause a fire.

But why were there such different consequences with similar failures?

The problem is that the crews received information about the health of the propulsion system by fundamentally different methods. The power plant in the Su-27 is equipped with a built-in onboard system for monitoring each engine. It relayed the necessary information to the panel to the pilot, which enabled him to take timely steps. The commander of the Il-76MD, Col A. Kalmykov, learned about the failure only from a report by the senior aerial gunner, Warrant Officer A. Andriyash, who noticed flames under the wing. Subsequent use of fire-extinguishing devices did not help.

Statistics indicate that most flying accidents and near-accidents are due to engine trouble. Practically all generations of jet engines lack high reliability. This primarily pertains to the compressor and turbine. In particular, the D-30KP and D-30KU two-shaft bypass engines, with a structural configuration typical for power plants of both military and civilian aircraft, have an inherent serious shortcoming—a weak intershaft bearing.

Whereas they have not managed to prevent engine failures, quite a number of design measures have been developed to reduce the severity of their consequences, namely: equipping the jet engine with built-in sensors, an urgent change in operating conditions and deceleration of the turbine disk when its coupling to the shaft rotor is lost, and shielding engine casings, which limits the area affected by the disintegrating parts.

As we can see, there are possibilities for decreasing the likelihood of aircraft accidents. But why have they not been put together into a single set that is mandatory for all designers? To some extent, the different ways engines

are equipped with systems for enhancing safety can be explained by the fact that they were developed at different times. But where is the passing on of experience of various design bureaus, the widespread introduction of progressive ideas and achievements, and the conduct of necessary measures to eliminate design flaws? Perhaps departmentalization and unhealthy "secret" competition plays a part here?

The problem must be resolved. We cannot allow military aviation to have power plants that are so dangerous in operation.

Incidentally, aviators are also concerned about the "splash" of malfunctions when mastering new aircraft. As analysis has shown, the main causes of the malfunctions originate during design and production. All this requires a large amount of modifications. But these measures, in the opinion of representatives of the Air Forces, also do not significantly increase reliability, which was confirmed by the disaster over the Caspian. You see, increasing the volume of additional work also increases the cost of technical maintenance and servicing, which rapidly approaches the cost of the aircraft, and exceeds it with extended operation.

There is another very important aspect of this problem, which directly affects flight safety. Design and production flaws often are compensated for by an additional workload on specialists of the aviation engineer service for testing and inspecting assemblies and parts, which also interferes with the planned activities of units and subunits.

To keep from repeating the tragedy, we must halt the practice of operating "unfinished" products, no matter how it is justified. Only through the joint efforts of the Ministry of the Aviation Industry and the Air Forces can we solve the problem of ensuring flight safety, which concerns everyone. We must finally understand that excessive concern about "honor of the uniform" and reluctance to admit mistakes and incomplete work only makes the situation in aviation worse and leads to new losses.

Memory Improvement Discussed

91UM0112I Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 30-31

[Article by Major Medical Services S. Aleshin, candidate of medical sciences (continuation of article; for beginning see AVIATSIYA I KOSMONAVTIKA No 7, Jul 90): "Improve Your Memory"]

[Text] **Structuring Information**

The essence of the methods and techniques of improving memory involves organizing the input of information into long-term memory, where it is stored in the form of information structures. Consequently, in order to firmly retain training material in the memory, it is necessary to put it into optimum form.

The effectiveness of memorization, in addition to developing thinking and interest in acquiring new knowledge, lies at the basis of instruction methods. Sometimes innovators also make a mistake by relying on only one of the rules of memory. Declaring their methodical findings to be a panacea for all problems in teaching, they try to discard all that has been achieved earlier. Actually, such methods have their area of application that is determined by specific conditions and objective. The maximum effectiveness of instruction is achieved only with a systematic consideration of all theses of the psychology of memorization.

One of them is structuring of information: semantic breakdown; singling out semantic supporting points; using graphic examples; comparison with already existing knowledge; efficient repetition.

The main contradiction of instruction lies in the fact that, as a rule, there is a large amount of new material, but the volume of the short-term memory is small. However, any training material has only several leading thoughts, around which the entire content is structured. Therefore, above all it is necessary to identify the basic micro-topics and break down the text into parts according to them. As a result, first of all, a clear-cut semantic structure; second, it provides an opportunity to memorize it quickly in parts.

It is convenient to form such a structure of new material by compiling "self-plans" or block outlines, which reflect the main thoughts and relations between them. This process becomes easier when relying on external signs in the text: headings, key clauses that are emphasized or printed in special type, the beginning of new thoughts with a centered line, and so forth. However, semantic grouping is made difficult and requires reading more than one when textbooks or instructions are written and put together poorly, when the sections are too long, and so forth.

The results of breaking down training material and singling out what is most significant in it are recorded in semantic supporting points (SOP). They are nothing other than points (elements) of the "self-plans" or block outlines being compiled. The SOP's sort of concentrate the meaning of the material being mastered. In the words of psychologist A. Bergson: "Progress in memorization is based on increasing ability to reduce all ideas, all images, and all words into the same point."

This law was used by pedagogue V. Shatalov in creating the famous method of supporting signals.

Text headings, short theses, independently devised section names, questions, sketches, examples, numerical data, unfamiliar and strange terms, emotions which reflect the attitude toward the information being mastered, and so forth can be used as such points. They

record the results of one's own thought activities, which are not always understandable to another person. One must strive to see that the number of SOP's is not too great. It is good if all points can be present in the consciousness simultaneously. For this to happen, the number of them should not exceed the capacity of the short-term memory—7 plus or minus 2 units.

The productivity of memorization increases if the meaning of the training material is reflected using graphic visual examples in the form of drawings, diagrams, and so forth. These images are characterized by an exceptionally high density of information. It was this particular feature that Col Ye. Borodkin used in his methods when he developed a set of symbols for studying aviation equipment and preparing students for flights.

Each of us is capable of developing his own supporting signals expressing the "personal vision" of the training material. Independent graphic reflection of the meaning speeds up memorization and makes it more lasting compared to drawings and diagrams offered by the instructor or textbook.

Comparing information being memorized with already existing knowledge serves an an important condition for increasing memory effectiveness. It is in this manner that the inclusion of new data in the information structures of the long-term memory takes place. After all, to explain means to reduce the unknown to the known.

That which must be firmly memorized should be examined from various aspects, using the maximum of concepts and graphic images already existing in the consciousness to interpret new information. Every new connection during comparison leads to its more complete inclusion in the information networks of the long-term memory.

The speed and firmness of memorization increase substantially with efficient repetition. It means performing thinking activities with the material being memorized and its independent reproduction from memory. This is largely characteristic of speculative playing through of a flight.

Active repetition helps to understand more thoroughly the information being memorized and improve its semantic organization. A. Smirnov, a well-known Soviet psychologist in the field of memory, wrote the following in this regard: "Sometimes just repetition for the first time makes it possible to understand the information as a whole and to comprehend it as something unified."

Let us illustrate the use of the above rules by using the example of studying actions in the event of failure of the flap lowering system on landing approach.

"With an unsymmetrical lowering of flaps, the aircraft begins an energetic bank in the direction of the flap that is not lowered as a result of unequal lift on the right and left half-wings. As a rule, the effectiveness of lateral control is insufficient to compensate for the bank. Therefore, at the moment of lowering the flaps, it is necessary to be ready to retract them immediately in the event the aircraft banks. Simultaneously (usually as a reflex action), the pilot deflects the stick in the direction of the bank. If aircraft trim is not achieved (flaps are not raised), it is advisable to deflect the pedal against the bank, using the appearance of rolling moment as a result of slip. The aircraft's response to deflection of the rudder is especially effective in delta-wing or swept-wing aircraft.

"After trimming the aircraft, it is necessary to make sure that it is possible to land the aircraft or decide to make a missed approach, for which the engine speed is increased, the gear is retracted, and another attempt is made to retract the flaps at an altitude of at least 200 meters. If it is not possible to stop the spin, it is necessary to eject from the aircraft immediately, which should be done in the direction of the upper hemisphere."*

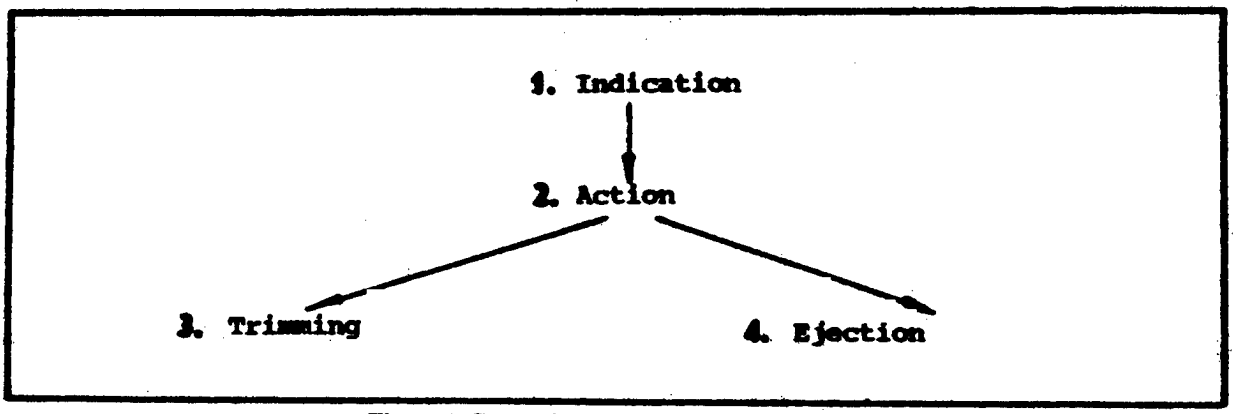

Figure 1. Semantic Breakdown of an Emergency

This text can be broken down into four parts (see Figure 1). The first SOP in the block-diagram reflects the manifestation of indications of unsymmetrical lowering of flaps in flight. The second reflects the pilot's actions and the aircraft's behavior when compensating for the banking. The third shows what must be done if trim is achieved. The fourth reflects the need to eject if the spin continues. In the end, we obtain picture of the overall semantic structure of the training material.

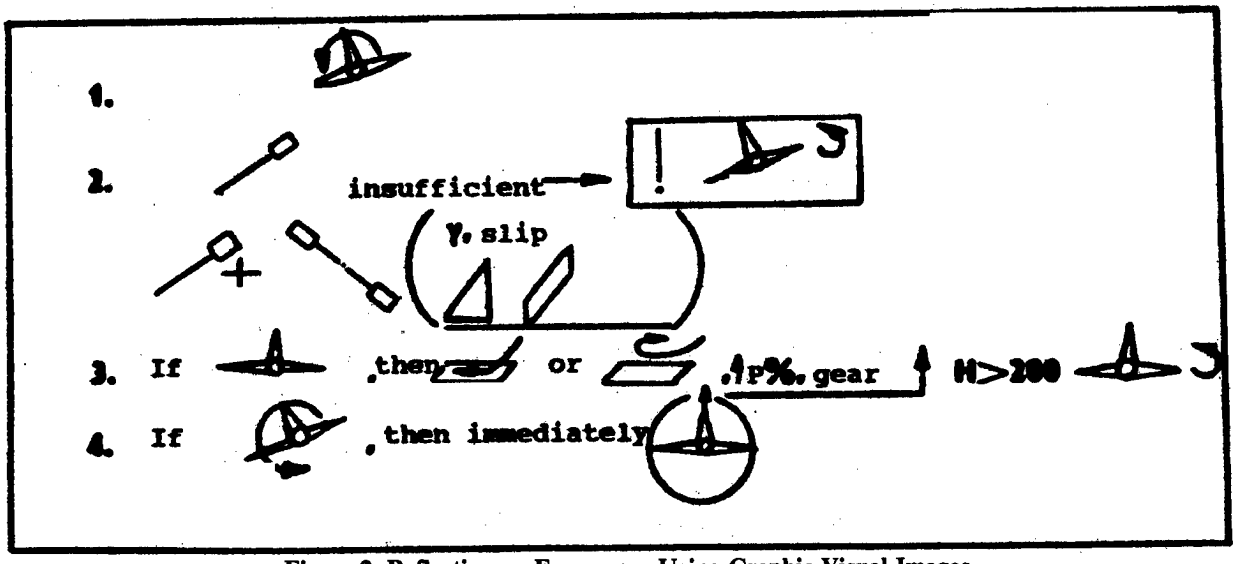

Figure 2. Reflecting an Emergency Using Graphic Visual Images

We will use graphic images (see Figure 2) to memorize its content by parts according to isolated micro-topics. What they mean becomes understandable when compared with the initial material. The proposed form of writing down differs noticeably from the still widespread mechanical making of an abstract when preparing for flights, although this also uses similar symbols, for example, V, H, and γ.

One's own images are also important for comparing new material with the contents of the memory. After all, the marks and symbols which are used to interpret the text are designed based on information already known. Therefore, they play the role of a "needle" which is used to "sew" new data into the structure of the long-term memory. This is the advantage of one's own images over means of visual presentation.

The process of comparison will be more effective when you pose clarifying questions to yourself. For example, why is the effectiveness of lateral control insufficient during unsymmetrical lowering of the flaps? It is also useful to compare the description of other failures accompanied by aircraft spin.

Study is concluded by mental repetition of the material and picturing it in images. When possible, it is very good to retell the topic aloud to your comrades and answer their questions. It is desirable to look over your notes before a readiness check or on the eve of an examination.

Today, as a rule, the teacher arranges the material in a form convenient for memorization. But the students should also become a part of this. Such an approach enables them to make the fullest use of the memory's reserves for improving one's professional skills.

(To be continued)

Footnotes

*"Prakticheskaya aerodinamika manevrennykh samoletov" [Practical Aerodynamics of Maneuverable Aircraft], edited by N. Lysenko, Moscow, Voyenizdat, 1977, 432 p.

First Soviet Atomic Bomb Detonation Discussed

91UM0112J Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 36-37

[Article by Lieutenant-General Aviation (Retired) N. Ostroumov: "In the Zone of a Nuclear Strike"]

[Text] **On 14 September 1954 at 0933 hours, a nuclear weapon was used for the first and only time in the history of our armed forces and Air Forces at a range in the southern Ural Military District during a field training exercise. An atomic bomb with an average-yield warhead was dropped from an aircraft platform from an altitude of 8,000 meters. The detonation took place at the assigned altitude of 350 meters. Deviation from the target center was 280 meters.**

Now, 36 years later, it seems to many that such an exercise should not have been conducted at all. But the need for it was dictated by harsh reality. By that time, the United States and England had already similarly worked out questions of combat employment of nuclear weapons and protection against them. These data were strictly classified. In the event of unleashing of another war or military conflict, the experienced gained gave them an indisputable advantage. Therefore, the task of mastering techniques and methods of actions in extreme conditions by personnel of our ground forces and aviation was not only research but also political in nature.

Organization of the exercise ensured the total safety of ground forces and aviation at the moment of the detonation. Specially equipped Tu-4 aircraft and crews experienced in flights carrying atomic bombs were assigned to make the nuclear strike. They were to operate from a regular airfield located 680 km from the range. A flight route was chosen which avoided large populated areas. Considering the monotonous nature of the steppe terrain, pyrotechnics posts were set up on the main sectors of the range, where orange-colored smoke pots, discernible from an altitude of 9,000 meters, were to be ignited. Homing beacons were set up at three points. It was also intended to use the electronic equipment of the closest airfields and the broadcasting stations of cities.

To ensure precision bombing, the target was designated by three corner radar reflectors and a chalk square with a cross in the middle and well-defined corners. The nearly 700-meter "mark" was visible at a distance of 50-60 km. Two more corner reflectors were set up on the route 72 km from the target. In short, everything possible was done for the aircraft to reach the target area without error and for bombing with both optical (for visual range) and radar bombsights.

Flight personnel trained from 6 August through 7 September. The primary and alternate crews each made 13 training flights, including to the range with a dummy atomic bomb and dropping simulated ordnance. Crew actions in the air and the radio communications procedures were practiced. Only the commanders and copilots had full documentation. The rest of the crew members had excerpts which pertained to them. This ensured strict mutual control and precluded accidental omission of any elements of the mission during the flight.

Radio communications called for transmitting short information signals about the status of the bomb and conditions in the bomb bay—temperature, humidity, and other information. Academician I. Kurchatov, located at the Air Forces operations group command post, emphasized that the atomic bomb is a "living being" and its status during the flight must be known. Similarly, data on weather conditions in the target area were transmitted using short radio signals. Based on their analysis, the crew was to make the decision to bomb using the optical and radar sights or using the "RYM-S" system.

Crews of four escort, filming, and weather reconnaissance Il-28 aircraft, six MiG-17 cover aircraft, and two Mi-2 liaison and relay helicopters underwent training simultaneously with the "bomb-carrying" crews. A bomber division (Il-28 aircraft), a ground-attack division (MiG-15bis aircraft), a fighter division (MiG-17 aircraft), and a reconnaissance regiment (Il-28 and MiG-15bis aircraft) were used from frontal aviation. Flight personnel prepared for operations with conventional weapons after the nuclear detonation. All aviators were warned about the need to use light filters to preserve sight. For 20 minutes after the detonation, the pilots were forbidden to enter the radioactive cloud, approach it closer than 5 km, or fly under or over it.

Crew interaction in the air and cooperation of aviation with ground forces were carefully worked out. Flight personnel's attention was directed to the fact that changes in the nature of the terrain are possible after the detonation. Party-political work conducted was aimed at instilling confidence in personnel, the ability to overcome fear of the unknown, and strict and precise accomplishment of assigned tasks and safety measures.

The command post of the exercise director's staff, where an Air Forces operations group was also located, exercised command and control. Near the observation post, an open observation post was set up on a wooden platform; it had direct communications with the command post. A shelter with view ports was located nearby. Representatives of the USSR Ministry of Defense, the exercise director and his deputies, and also ministers of countries of the socialist community (the Warsaw Treaty Organization did not yet exist at that time) were located at the command post.

Direct control of the aircraft carrying the bomb was accomplished from the command post of the departure airfield. All information was relayed by ground communications to the primary command post. Radar control data were displayed there on a large plotting board. Those present were informed by loudspeaker about the progress of the flight.

Direction of the actions by frontal aviation was organized from the command post of the headquarters operations group of the air formation which was then commanded by Gen B. Sidnev. A control post was deployed near the command post of the commander of the rifle corps whose advance was being supported by aviation. Prior to the start of the exercise, its director, MSU G. Zhukov, personally assessed the meteorological situation and the nature of its possible changes: it was important to take into account wind direction to secure the population and the troops against radioactive fallout.

The morning of 14 September happened to be clear. A fain southwesterly breeze did not hamper execution of the plan. The crew of the delivery aircraft took off at 0628 hours. The back-up Tu-4 then occupied the runway, ready for immediate takeoff. After the primary crew passed the flight departure point, the "stand-by" aircraft went to Alert Condition 1.

At 0920 hours, after obtaining more specific information on the meteorological situation, the exercise director signed the protocol with the decision for delivering a nuclear strike. The delivery platform received the command authorizing the bomb to be dropped. Ten minutes before command execution, warning of a nuclear attack was given on the ground, and the troops occupied the shelters.

A bright flash and then two powerful sounds—one from the detonation of the bomb in the air and one reflected

from the ground—announced the nuclear strike. The shock wave reached the observation site, and ...the marshals and generals located there were hatless in an instant. A golden-white cloud rose swiftly upward and to the side, and a column of dust stretched after it. In literally an instant the upper edge of the cloud reached a height of 700 meters. Its horizontal size was roughly the same. The Tu-4 had time to leave ground zero. However, the shock wave reached it and threw it 50-60 meters. The pilots did not sense any special load on the aircraft's controls. No deviations in the operation of onboard systems were noted.

The "all-clear" signal was given at 0935 hours. Exercise participants left their shelters and prepared for "combat operations." Artillery preparation began 5 minutes after the explosion. At the moment the nuclear strike was made, part of the bombers were airborne 100 km from the target. The pilots saw the explosion well. The fighters at this time were 30-35 km from ground zero.

At 1000 hours, bomber aviation, consisting of 86 Il-28's covered by 42 MiG-17's, made a real bombing attack against a strongpoint from an altitude of 5,000 meters. Of the 688 high-explosive fragmentation and high-explosive 250-kg bombs dropped, 583 hit the target. As a result, 44 percent of the "enemy" weapon emplacements and 25 percent of the mannequins were destroyed or damaged.

Approximately 30 minutes after the explosion, 39 Il-28's and 6 MiG-17's were forced to cross the column of the atomic "mushroom" so as not to disrupt the overall combat formation. In doing so, a slight shaking of the aircraft was observed. Instruments and engines operated normally. Visibility when crossing the column was 100-300 meters. Observing safety measures, the crews covered the cabin pressurization valves before entering the cloud.

Ground-attack aircraft of the attacking side provided air support for the attacking troops. Taking into account the limited visibility, strikes were usually made against targets in small groups. In doing so, the following incident occurred. A flight of MiG-15bis aircraft, detecting areas of fires and a column of dust, decided not to continue the straight flight, turned 90 degrees to the left, and them made the same maneuver to the right. The flight commander decided not to drop the bombs, but the crew misunderstood him and dropped the bombs off target. This fact graphically showed what can result from low moral and psychological qualities of combat aircrew members in a complex situation.

Between 1029 hours and 1046 hours, 30 MiG-15bis ground-attack aircraft of the defending side made a retaliatory strike against the advancing troops. They operated in pairs from a dive, beginning it at an altitude of 2,000 meters. The airborne crews maintained stable radio communications with the command post both during and after the atomic blast.

Radiological monitoring on the ground showed a comparatively low level of contamination of aircraft that passed through the radioactive cloud. Official data are given in Table 1.

Table 1

Aircraft Type	Level of Radioactive Contamination, roentgens/hour			
	Inside Cockpit	Fuselage	Engines	Tail Unit
Il-28	0.02-0.03	0.2-0.3	up to 1	-
MiG-17	-	0.4 (nose)	1.1	1.0

After partial radiological decontamination, the degree of contamination was cut in half. All personnel at the airfields supporting the flights underwent decontamination procedures.

Twenty La-15, 22 Il-10, and 2 Li-2 aircraft were arranged to determine the degree of contamination of aviation equipment on the ground from the shock wave and thermal radiation in the vicinity of the explosion. Five La-15 aircraft located more than 2,000 meters from ground zero and three Il-10 aircraft located more than 3,500 meters from ground zero were not damaged. The rest received various degrees of damage. The most powerful effect on aircraft from the shock wave and thermal radiation from the medium-yield atomic bomb was noted in the zones shown in Table 2.

Table 2

Aircraft Type	Distance from Ground Zero, meters
La-15	1100-1500
Il-10	1400-1700
Li-2	4000-4200

On the whole, the exercise was instructive. The first experience was gained in the practical preparation and employment of aircraft atomic weapons, as well as the use of ground forces and air forces in conditions close to actual conditions in a nuclear war. The actions by aviation units and large units in the zone of the nuclear explosion showed that in a modern war, moral and psychological conditioning of personnel is a determining condition for effective accomplishment of combat missions.

Space Program Problems Discussed

91UM0112K Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) pp 42-43

[Article by V. Nikolayev: "Tomorrow Will Be Too Late"]

[Text] In conditions of an imbalanced economy, an overall deficit, and a shortage of everyday goods in the country, resources are being redistributed in favor of sectors engaged in production of consumer goods.

The decision is quite controversial, since it is impossible to take resources (with a lack of reserves) from some and transfer them to others without a sufficient study and

substantiation of a strategy of economic development of society and without seeing the possible ultimate effect. Of course, such a "transfusion" can improve the situation for a while, but will lead to large losses in the future. No subsidy will yield results without changing the conditions of the economy's functioning which lay the basis for a constant increase in its efficiency. From these positions we should approach the evaluation of priorities of cosmonautics, which we generally recognize as our advanced sector.

Let us try to understand this problem. Today, we often hear statements that we must cut spending for our space programs since, they say, the programs are unprofitable and do not provide a direct national economic return. Unfortunately, one must partially admit the correctness of such opinions. Up to now there have been no reliable methods in cosmonautics of calculating its economic impact. There are various simplified methods of estimating it, but they also show that, on the whole, the return from space vehicles is small.

What is the reason for the low national economic effectiveness of cosmonautics? There several reasons here. These include the high cost of space equipment, its low capabilities, and the inability and sometimes the reluctance of a number of departments to make use of the modern scientific and technical achievements of this sector in the interests and for the good of Soviet people.

The high cost is the result of the expenditure mechanism of our economy that has existed for many years. However, this does not at all mean that all space programs must be curtailed, packing the arbitrarily reduced budget. Any direction of science and technology associated with national defense, as a rule, receives intensive development, without looking at the costs. And there is nothing unusual about this; it is done this way in many countries in the name fulfilling a vitally important mission—ensuring their security. In conditions of a priority in receiving resources of the ministry and department which are charged with developing space hardware, we went the way of monopolization and secrecy of the development, manufacture, and testing of equipment. There was no mention of any coordination or broad exchange of experience. As a result, the overall cause suffered, since implementation was not always objective. It turned out that the one who was most authoritative won the order.

Each ministry, and often each department and even enterprise, has its own insufficiently efficient production capacities which manufacture blanks, parts, and assemblies which could also be used at other enterprises. The degree of unitization and standardization is low. You see, many components can be made somewhere at one place and supply the entire space industry. But we do not have a unified space industry. We have a collection of departments. Each has its own leadership which justly believes that if it has to count on deliveries from another, it most likely will receive products of insufficient quality and late. In addition, they can request additional funds for the construction and use of their own capacities. In these conditions, where is the incentive to reduce production and development costs? If they are to be reduced, everyone has to do it simultaneously. So far, no decrees and directives have been able to do this. And they will not, probably, until all organizations involved in cosmonautics are economically combined into one complex either directly or through an organization which, based on a program for development of cosmonautics, would begin placing orders in the appropriate sectors on competitive principles.

The extensive use of manned vehicles in space increases costs. Their cost is an order of magnitude greater than the cost of similar automatic vehicles for performing the missions. The unbalance is explained by the inability so far to create all the necessary automatic systems which function without human intervention or observation. Most likely, no one doubts the expediency of continuing and expanding the number of manned flights, but standard national economic and defense tasks should be carried out by automatic satellites, and they should perform the majority of such tasks.

A unified space complex, which is self-financing, would begin to be concerned about creating a broad national economic infrastructure, which will result in a decrease in the costs of programs by increasing the effectiveness of equipment, improving its operation, and determining an efficient collection of platforms and space vehicles.

Underestimation in technology, particularly in the area of the component base of electronics and in using modern materials, has resulted in the fact that we have massive space vehicles with a short active life and whose functional capabilities are often lower than many foreign analogs. As a result, it takes a larger number of platform launches to carry out assigned missions. All this is bad not only due to the large costs. Many components of rocket fuels are highly toxic substances. Their use does not help prevent an ecological crisis on earth.

Much has been said in the mass media about the development of Soviet cosmonautics for peaceful purposes. This was done to please ideology. If cosmonautics indeed was being developed in the interests of the national economy and was effectively carrying out its tasks, we would not have to talk about its unprofitableness today. Objectively, nothing has interfered with such use of satellites. Only an understanding of the urgency of these problems is lacking in the appropriate departments.

Communications, television broadcasting, and weather satellites have operated in the interests of the national economy. Cosmonauts have compiled crop forecasts and conducted surveying for terrain mapping. However, we have not utilized the unique capabilities to sell objective and quality information and space hardware abroad, competing with other powers in this, or to launch foreign objects with our platforms.

There are many ways for cosmonautics to become profitable. Using satellites, we can provide ourselves and any interested country information about water and forest resources, views of crops, actually planted areas, harvest progress, the radiological and ecological situation, and many other things. It is

possible to update cartographic material fairly often and support communications and navigation for any consumer, right down to the pedestrian. It is much more expensive to perform these tasks by other means.

Everyone knows that more skilled specialists are concentrated in the space industry and science, that they are better equipped than other sectors, and that new technologies and equipment are developed and used earlier here. Already now we can introduce all this much more extensively into the national economy, increasing its level and competitiveness. The cost of implementing new technologies will be lower with mass production. New opportunities will be revealed in the process of declassifying part of the work. As we can see, there are large reserves here, and it is necessary to organize their effective realization immediately. As profits appear, the space sector could switch to self-financing.

A new direction was adopted some time ago for improving our economy—conversion of defense sectors. Every enterprise was obligated to make consumer goods, saturate the market, and ensure employment of workers. In practice, this led to the fact that the costs of producing extrinsic goods in most cases began to be shifted to defense orders. This is a very dangerous trend, since the quality of defense and space hardware does not improve in these conditions.

It would seem that an enterprise should specialize in producing some product or organize separate production of consumer goods. Then it would be efficient. Alas, this does not happen. The level of wages decreases, workers become uncertain about the future, and they strive to transfer to other sectors, especially since the work there is often less critical.

Thus, part of the most active and capable specialists are leaving enterprises involved in creating space hardware. How will make it more efficient if this process is not stopped?

This question has already been answered in principle. We need a decisive reorganization of the space industry, with monitoring of the expenditures and results obtained by the USSR Supreme Soviet and the Council of Ministers; development of a comprehensive research program that ensures completion of defense tasks; and an increasingly broader direct and indirect use of cosmonautics in the national economy. Only this will benefit everyone, including those who presently advocate reducing appropriations for space, and will preserve and provide an opportunity for much more efficient use of the scientific and technical potential amassed in cosmonautics.

Extravehicular Activity

91UM0112L Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) p 46

[Table by G. Glabay: "Outside the Ship"]

[Text]

Table*

No.	Astronaut, Country; Spaceship, Orbital Station	Date and Duration of Stay	Basic Results
29	O. Garriott, USA	7 Aug 1973, 6 hrs 31 min; 24 Aug 1973, 4 hrs 30 min; 22 Sep 1973, 2 hrs 45 min	Astronauts performed extravehicular activities [EVA] three times. During the first EVA, O. Garriott and J. Lousma installed a new heat shield to insulate the hull of the station against solar radiation. They replaced tape cassettes in the set of astronomical instruments.
30	J. Lousma, USA;	7 Aug 1973, 6 hrs 31 min; 24 Aug 1973, 4 hrs 30 min	During the second EVA, these astronauts used for a connection a cable connecting spare gyroscopes with the computer, which made it possible to set up an alternate channel in the station orientation system.
31	A. Bean, USA; Apollo—Skylab	22 Sep 1973, 2 hrs 45 min	During the third EVA, A. Bean and O. Garriott performed special work.
32	E. Gibson, USA	22 Nov 1973, 6 hrs 34 min; 29 Dec 1973, 3 hrs 29 min; 3 Feb 1974, 5 hrs 19 min	The astronauts—E. Gibson and W. Pogue, G. Carr and W. Pogue, and G. Carr and E. Gibson—accomplished EVA four times to perform special work.
33	W. Pogue, USA	22 Nov 1973, 6 hrs 34 min; 25 Dec 1973, 7 hrs 1 min	
34	G. Carr, USA; Apollo—Skylab	25 Dec 1973, 7 hrs 1 min; 29 Dec 1973, 3 hrs 29 min; 3 Feb 1974, 5 hrs 19 min	
35	G. Grechko, USSR	20 Dec 1977, 1 hr 28 min	EVA to inspect and check the condition of external members of the Salyut-6 station and the docking assembly.
36	Yu. Romanenko, USSR; Soyuz-26—Salyut-6	20 Dec 1977, 1 hr 28 min	

*Continuation. See issue No 8 for beginning.

Medical Diagnosis Improvements

91UM0112M Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) p 47

[Article by Senior Lieutenant Medical Service A. Vasilyev, candidate of medical sciences: "Ultrasonic Examination"]

[Text] The mass media today often and justly criticize cosmonautics for its isolation and separation from human needs. It must be recognized that a considerable portion of the blame belongs to those who utilize its results but do not inform the public sufficiently about this. This material is a small compensation for our failure to do this.

Seemingly, what is there in common between clinical practice in medicine and a scientific experiment on studying the planet Venus and Halley's Comet? It turns out that a barely perceptible commonality does exist between the work of specialists whose areas of activity are far apart. Both groups of specialists conduct their research in the X-ray and ultrasonic band. They also experience similar difficulties in processing information.

Points of contact enabled them to come to the idea of creating an automated system which would free physicians from routine information processing, give them time for improving their professional skills, further the effectiveness of medical research, and, consequently, move us closer to the cherished goal: total and comprehensive clinical examination of people.

An initiative group of specialists of the USSR Academy of Sciences Space Research Institute and the TsVNIAG, made up of L. Chesalin, B. Borisenko, S. Shchunyayev, A. Kozlovskiy, and the author of this article, began implementing an idea conceived in 1986, using as the basis the "SVIT" system, which was used earlier for the "Venus-Halley's" program. The idea became a reality, and today the TsVNIAG has a program complex with a special X-ray and ultrasonic image digital processing system for flight-surgeon examinations. But this does not mean that it is not used for diagnosis of ailments of other hospital patients. I would note that the complex helps to reveal barely noticeable changes, which is particularly important for a person.

The first public demonstrations of the work of its mock-up model and software for radiation diagnosis took place at the all-union exhibition "Computerization in Medicine" (1989) and at the international exhibition "Automation-89".

The complex includes: a personal computer, a processor and video display, a color TV monitor, and an applications package. It is distinguished by the following: a high degree of flexibility, involving the possibility of processing any type of diagnostic image, and a high data processing speed; a fundamental capability to automate all processes; compact archiving of images; and forming and maintaining a data bank. The complex makes it possible to introduce to the color monitor screen any image from the X-ray or ultrasonic apparatus, observe the results of its processing, obtain quantitative image characteristics, conduct further transformation of the object of study, and to output processing data to external media. Practically any physician, even one without special training, can operate it.

The processing process represents a continuous man-machine dialogue. The physician activates one or another program, and a "menu" appears on the monitor screen—the sequence of impending operations.

Another important characteristic of the program complex must be noted: it can display practically any picture in color, which significantly enhances the information content. The human eye perceives a black-and-white image according to the principle of contrast, and small details differing only in half-tones can go unnoticed. But a physician-specialist sees them firmly in a color picture. Thus, with ultrasonic examination of a gall bladder and a color display of it, the physician is able to estimate the degree of spreading of the bile, including parietal, which is impossible on a black-and-white image. In creating the automated processing system, the experience of specialists of foreign countries in revealing the most important pathology of organs of the abdominal cavity and the retroperitoneal space was also taken into account.

After conducting ultrasonic and X-ray examinations of flying personnel and cosmonauts, the results are stored in the form of images of the organs examined both in a dynamic and static form. This means that dynamic medical supervision of them is possible throughout their professional activities. Thus, even the relatively small set of equipment being used for space research considerably increases the capabilities of practical medicine, which confirms the absolute necessity for further use of the achievements of science in the area of space to strengthen man's health.

Articles Not Translated from AVIATSIYA I KOSMONAVTIKA No 9, Sep 90

00000000 Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 90 (signed to press 24 Aug 90) p 1

[Text]

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ERRATUM: Detachment of Air Forces' Comsmonauts

91SV0003P Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 90 (signed to press 4 Apr 90) pp 46-47

[Unattributed listing under the rubric "At the Request of Readers": "Detachment of Air Forces' Cosmonauts".]

[Text] The following are pages 46-47 of AVIATSIYA I KOSMONAVTIKA No 5 1990, omitted from JPRS-UAC-90-009 published 11 October 1990:

Over a series of years many readers in their letters to the editor have asked that the personnel of the Soviet teams of cosmonauts and their biiographical data be named and that information on their fields of subsequent activity be given. Now this is possible.

In the USSR cosmonauts are trained in the Air Forces, the NPO (scientific-production association) "Energiya", the Flight-research Institute MAP and the Biomedical Institute of the USSR Academy of Sciences. Each of these departments has their own detachment of cosmonauts, their own equipment and training goals. However, each of them passes through the stage of direct training as part of a crew at Star City.

We are publishing material on cosmonauts from among Air Forces' personnel prepared by S. Yegupov and I. Karpenko, workers of the TsPK imeni Yu. A. Gagarin

Detachment of Air Forces' Cosmonauts

No.	Military Rank	Date of Birth	Date Removed from	Field of Activity
	Last name, First, Patronymic			
1	2	3	4	5
First Group Selected (February—April 1960)				
1.	Sr Lt ANIKEYEV, Ivan Nikolayevich	12 Feb 1933	17 Apr 1963	Served in AF units. Reserve Officer.
2.	Sr Lt BYKOVSKIY, Valeriy Fedorovich	2 Aug 1934	2 Apr 1988	USSR Pilot Cosmonaut. Director, Soviet Science & Cultural Club in city of Berlin. Reserve Colonel.
3.	Sr Lt GAGARIN, Yuriy Alekseyevich	9 Mar 1934	27 Mar 1968	USSR Pilot Cosmonaut. Killed 27 Mar 1968 in aviation disaster.
4.	Sr Lt GORBATKO, Viktor Vasilyevich	3 Dec 1934	28 Aug 1982	USSR Pilot Cosmonaut. Major-General of Aviation. Department Head, Air Force Engineering Academy imeni N.Ye. Zhukovskiy.
5.	Sr Lt NELYUBOV, Grigoriy Grigoryevich	31 Mar 1934	4 May 1963	Served in AF units. Died as a result of an unfortunate accident.
6.	Sr Lt NIKOLAYEV, Andrian Grigoryevich	2 Sep 1929		USSR Pilot Cosmonaut. Major-General of Aviation. First Deputy Chief of the TsPK imeni Yu. A. Gagarin.
7.	Capt POPOVICH, Pavel Romanovich	5 Oct 1930	26 Jan 1989	USSR Pilot Cosmonaut. Major-General of Aviation. Director, VNITs "AIUS-agroresursy".
8.	Sr Lt TITOV, German Stepanovich	11 Sep 1935	17 Jul 1970	USSR Pilot Cosmonaut. Colonel-General of Aviation. Leading Specialist on Outer Space of the USSR Ministry of Defense
9.	Sr Lt KHRUNOV, Yevgeniy Vasilyevich	10 Sep 1933	25 Dec 1980	USSR Pilot Cosmonaut. Reserve Colonel.

Detachment of Air Forces' Cosmonauts (Continued)

No.	Military Rank	Date of Birth	Date Removed from	Field of Activity
	Last name, First, Patronymic			
10.	Sr Lt SHONIN, Georgiy Stepanovich	3 Aug 1935	28 Apr 1979	USSR Pilot Cosmonaut. Lieutenant-General of Aviation. Chief of TsNII.
11.	Lt LEONOV, Aleksey Arkhipovich	30 May 1934		USSR Pilot Cosmonaut. Major-General of Aviation. Deputy Chief, TsPK imeni Yu. A. Gagarin
12.	Capt Engr KOMAROV, Vladimir Mikhailovich	16 Mar 1927	24 Apr 1967	USSR Pilot Cosmonaut. Killed 27 April 1967 while testing the space ship "Soyuz".
13.	Sr Lt VOLYNOV, Boris Valentinovich	18 Dec 1934		USSR Pilot Cosmonaut. Colonel. Commander, detachment of cosmonauts of the TsPK im. Yu. A. Gagarin
14.	Sr Lt FILATYEV, Valentin Ignatyevich	21 Jan 1930	17 Apr 1963	Served in AF Units. Reserve Officer.
15.	Sr Lt ZAIKIN, Dmitriy Alekseyevich	29 Apr 1932	25 Oct 1969	Reserve Colonel. Works in the TsPK im. Yu. A. Gagarin
16.	Sr Lt VARLAMOV, Valentin Stepanovich	15 Aug 1934	6 Mar 1961	Served in the TsPK im. Yu. A. Gagarin. Died in 1980.
17.	Sr Lt RAFIKOV, Mars Zakirovich	30 Sep 1933	24 Mar 1962	Served in AF units. Reserve Officer.
18.	Maj BELYAEV, Pavel Ivanovich	26 Jun 1925	23 Jan 1970	USSR Pilot Cosmonaut. Died in 1970.
19.	Sr Lt BONDARENKO, Valentin Vasilyevich	16 Feb 1937	23 Mar 1961	Died 23 March 1961. Cause of death—burn shock, received during training in an anechoic chamber.
20.	Capt KARTASHOV, Anatoliy Yakovlevich	25 Aug 1932	7 Apr 1962	Served in AF units. Thereafter, test pilot. Reserve Officer.
Group of Female Cosmonauts Selected (March—April 1962)				
1.	Pvt KUZNETSOVA, Tatyana Dmitriyevna	14 Jul 1941	17 Oct 1969	Lieutenant-Colonel. Serves in TsPK im. Yu. A. Gagarin
2.	Pvt SOLOVEVA, Irina Bayanovna	6 Sep 1937	1 Oct 1969	Colonel. Senior Scientific Associate, TsPK im. Yu. A. Gagarin.
3.	Pvt TERESHKOVA, Valentina Vladimirovna	6 Mar 1937		USSR Pilot Cosmonaut. Colonel. Instructor, Cosmonaut-testor. Chairman of the Presidium of the Union of Soviet Societies, Friendship and Culture connected with foreign countries.
4.	Pvt YERKINA, Zhanina Dmitriyevna	6 May 1939	1 Oct 1969	Served in TsPK im. Yu. A. Gagarin. Reserve Lieutenant-Colonel.
5.	Pvt PONOMAREVA, Valentina Leonidovna	18 Sep 1933	1 Oct 1969	Served in TsPK im. Yu. A. Gagarin. Works in USSR Academy of Sciences. Reserve Colonel.
Second Group Selected (January 1963)				
1.	Maj Engr ARTYUKHIN, Yuriy Petrovich	27 Jul 1930	24 Dec 1987	USSR Pilot Cosmonaut. Reserve Colonel. Senior Scientific Associate, NPO "Molniya".
2.	Sr Lt Engr BUYNOVSKIY, Eduard Ivanovich	26 Feb 1936	11 Dec 1964	Served in troop units. Reserve Colonel. Works in the USSR MVD.
3.	Capt VORONOV, Anatoliy Fedorovich	11 Jun 1930	25 May 1979	Reserve Lieutenant-Colonel. Works in the State Center "Priroda".
4.	Maj VOROBYEV, Lev Vasilyevich	24 Feb 1931	11 Apr 1973	Served in TsPK im. Yu. A. Gagarin. Reserve Colonel.
5.	Maj GUBARYEV, Aleksey Aleksandrovich	29 Mar 1931	1 Sep 1981	USSR Pilot Cosmonaut. Served in AF units. Reserve Major-General of Aviation. Deputy General Director of the association "Shchelkovavtotrans".
6.	Sr Lt Engr GULYAYEV, Vladislav Ivanovich	31 May 1937	6 Mar 1968	Served in TsPK im. Yu. A. Gagarin. Reserve Colonel.
7.	Lt-Col Engr DEMIN, Lev Stepanovich	11 Jan 1926	13 Aug 1983	USSR Pilot Cosmonaut. Scientific Associate of "Yuzhmorgeologiya". Reserve Colonel.

Detachment of Air Forces' Cosmonauts (Continued)

No.	Military Rank	Date of Birth	Date Removed from	Field of Activity
	Last name, First, Patronymic			
8.	Maj DOBROVOLSKIY, Georgiy Timofeyevich	1 Jun 1928	30 Jun 1971	USSR Pilot Cosmonaut. Killed 20 June 1971 during completion of the flight of the space ship "Soyuz-11".
9.	Sr Lt Engr ZHOLOBOV, Vitaily Mikhaylovich	18 Jun 1937	13 Jul 1971	USSR Pilot Cosmonaut. Reserve Colonel.
10.	Capt Engr KOLODIN, Petr Ivanovich	22 Sep 1930	20 Apr 1983	Reserve Colonel. Works in TsUPye.
11.	Sr Lt Engr KUGNO, Eduard Pavlovich	1935	16 Apr 1964	Served in AF units. Reserve Officer.
12.	Maj KUKLIN, Anatoliy Petrovich	3 Jan 1932	15 Sep 1975	Served in AF Main Staff. Reserve Colonel.
13.	Capt Engr MATINCHENKO, Aleksandr Nikolayevich	4 Sep 1927	19 Jan 1972	Served in AF units. Reserve Lieutenant-Colonel. Works in Ministry of Aviation Industry.
14.	Maj FILIPCHENKO, Anatoliy Vasilyevich	26 Feb 1928	19 May 1988	USSR Pilot Cosmonaut. Reserve Major-General of Aviation. Deputy Director, Kharkov OKB.
15.	Lieutenant-Colonel SHATALOV, Vladimir Aleksandrovich	8 Dec 1927		USSR Pilot Cosmonaut. Chief of the TsPK im. Yu. A. Gagarin. Lieutenant-General of Aviation.
16.	Col BEREGOVOY, Georgiy Timofeyevich	15 Apr 1921	3 Jan 1987	USSR Pilot Cosmonaut. Lieutenant-General of Aviation, retired. Works in VITs "Lidar" of the USSR Academy of Sciences.
17.	Lt-Col LAZAREV, Vasiliy Grigoryevich	23 Feb 1928	27 Nov 1985	USSR Pilot Cosmonaut. Reserve Colonel.

(To be continued.)

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