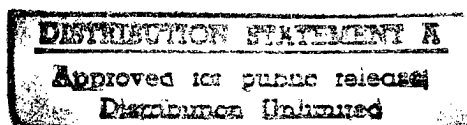


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AVIATION AND COSMONAUTICS

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AVIATION AND COSMONAUTICS

No 3, March 1989

AF Political Directorate Chief Gives Perestroika Pep Talk

91441205a Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 3, Mar 89 (signed to press
14 Feb 89) pp 1-3

[Article by Col Gen Avn L. Batekhin, member of Military Council, chief of Air Forces Political Directorate, delegate to 19th All-Union Party Conference: "Working to Master Political Methods of Leadership"]

[Text] One month from now it will be four years since adoption by the April (1985) CPSU Central Committee Plenum of the historic decisions pertaining to perestroika and acceleration of our country's socioeconomic development and achievement on this foundation of a new qualitative state of Soviet society. Unquestionably time will provide a fuller and more precise assessment of the significance of this turning-point event for the destiny of socialism and world civilization, but today it is already clear that the April wind of changes is propelling the ship of perestroika with increasing force along the designated strategic course.

The present stage of implementation of the goals and tasks defining the program of revolutionary renewal is characterized by transition by the policy of perestroika to a plane of practical implementation. This process encompasses literally all aspects of our country's economic, social, and intellectual affairs, as well as military organizational development.

Last November's CPSU Central Committee Plenum and the special 12th Session of the USSR Supreme Soviet, 11th Convocation, gave the green light to the radical reforms specified by the decisions of the 19th All-Union Party Conference. The laws adopted at this session signify a major step along the road of building the Soviet society's political system, its further democratization, securement of the full authority of the Soviets, and building of a socialist state governed by rule of law.

New Soviet peace initiatives presented to the United Nations by Comrade M. S. Gorbachev, General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet, and implementation of the party conference guidelines focused on primarily qualitative parameters in Armed Forces organizational development and training introduce substantial adjustments in planning, organization, and support of activities in the military, including the Air Forces. Troop reductions should under no circumstances result in decreased combat readiness and fighting efficiency on the part of our units and subunits.

The present critical period in the affairs of the party, state, and Armed Forces advances new tasks to the forefront, tasks to be performed by Air Forces political

agencies and party organizations. It is essential to master all forms and methods of political leadership and effective influence on the course and final results of restructuring processes in the units and subunits.

The importance of persistent, purposeful work in this area is dictated first and foremost by general party requirements. The report at the 19th All-Union Party Conference stressed: "Of enormous importance for understanding the role of the party as a political vanguard in present-day conditions is a correct resolution of the matter of a clear-cut delineation of functions of party and government leaders.... Resolution of this question also essentially determines revamping of our political system and the success of perestroika as a whole."

I do not believe that anybody has any doubts about the fact that a great deal depends on the work style and methods of political agencies and party organizations and on their influence on the professional and civic activeness of party members. The fact that at times they function not as agencies of political leadership but as redundant backups to command personnel also explains both what in many instances is weak party-political leadership and the unhealthy atmosphere in certain military and party collectives.

This situation was encountered at the Yeysk and Kacha higher military aviation schools for pilots, at the Chelyabinsk Higher Military Aviation School for Navigators, at the Perm Military Aviation Technical School, and at certain other service schools. Engaging in all kinds of activities, but not in performing their immediate functions, the political agencies and party organizations at these schools do not find time for the main thing—exerting via party members daily influence on personnel and on the processes taking place in these military collectives. Hence an attitude of total dependence on others and an inability to find ways to exert influence on assimilating new curricula, adoption of active forms of training and indoctrination, and computerization of the learning process. In addition, the positive experience of political influence is sometimes inadequately studied and disseminated.

For example, the navigation department party organization at the Yeysk Higher Military Aviation School for Pilots has done and is doing a great deal to mobilize party members to assimilate and apply in a practical manner the elements of the method devised by famed educator-innovator V. Shatalov. As a result they succeeded in boosting the average student grade from 3.5 to 4.2 and in decreasing by a factor of five the number of air mishap-threatening situations through the fault of temporary assignment personnel.

This is a fine, necessary activity. But we must state that once again it is being sustained through volunteer efforts. The party committee of the school's training section, headed by now former secretary Lt Col B. Pushkov, accomplished practically nothing as regards drawing the attention of party organizations and leader-Communists

of other departments to beneficial experience. Nor did the political section get involved.

Practical experience indicates that one of the reasons for shortcomings in performing various tasks facing military aviation personnel lies in an inability to make use of the wealth of reserve potential and the possibilities of the human factor. This frequently occurs due to the fact that some political agencies do not at present possess adequate mastery of methods which make it possible to make dozens and hundreds of individuals active participants in collective labor. We see and feel this from the pace and quality of conversion training by the personnel of certain units and subunits over to new aircraft and from slow changes to the better in ensuring flight safety and strengthening discipline and organization.

Improvement in end results is more and more frequently being impeded today by negative processes due to inadequately developed moral qualities and poor activeness on the part of aviation personnel and little motivation on their part to achieve certain goals. That is, we are dealing here with spiritual and intellectual processes. And yet many political agencies and party organizations fail to take these points into consideration in their work, since at the present time they do not possess a mastery of political methods of leadership.

Here is just one example. In the last 12 to 18 months several serious in-flight near-mishap situations occurred in Air Forces units and subunits (in the North Caucasus Military District), in which the human factor played a negative role. This is confirmed by flight data recorder tapes. One might ask what additional cues did political agencies and party organizations need in order to sound the alarm and resolutely to purge indifference and unprincipledness from the moral-ethical atmosphere of military and party collectives? But the fact is that habituation to half-measures and waiting for orders "from above" proved stronger than common sense. It is not surprising that a military air transport aircraft crash which was reported in the press took place in this military district, on the Sea of Azov. Only after this incident did the political section and party organization come to their senses.

The complexity of this problem is seen in the fact that departure from political functions and methods is something of a tradition which formed over the course of decades in some high-echelon party agencies. Even purely psychologically it is no easy matter to overcome it. In addition, there are difficulties connected with insufficient theoretical substantiation of this problem, especially as applied to the current tasks of military aviation personnel.

As we proceeded to develop variations of applying political methods of influence specific to the Air Forces, we already sensed what a complicated task this was. But it cannot be postponed. The current pace of development of the processes of political and societal affairs is

such that one could end up in the unenviable role of a late-arrival passenger attempting to catch up with his departing train.

There is no doubt about the fact that optimal solution can be found only through the collective efforts of air commanders, political agencies, party organizations, and all aviation personnel sincerely interested in the success of perestroyka in the Air Forces. And a successful search is impossible without a clear idea of its goals, content, and tasks. Without claiming a comprehensive encompassment of the issues in question, we should like to share with the readers some thoughts on the subject of our conversation.

What should one have in mind? Toward what should one strive in the course of the work which has commenced? First of all I believe that it is essential to impart adequate depth and directional thrust to the activities of political agencies and party organizations pertaining to implementing the decisions of the 19th All-Union Party Conference, the November (1988) CPSU Central Committee Plenum, and the special 12th Session of the USSR Supreme Soviet, 11th Convocation. One must avoid an oversimplified view of the highly complex processes of restructuring of people's consciousness, leadership methods, and other changes taking place in our country and, wherever required, one must change trends toward short-lived efforts and erroneous views on restructuring of the political system of society as an act of tactical significance and applying only to the moment.

It is important for political agencies and party organizations to grasp in a new manner, in the spirit of the party conference, the reasons for the shortcomings of the system of party-political leadership which had become established in the Air Forces and the fact that it was poorly focused on political functions and methods. Without understanding past mistakes it is difficult to understand what must be restructured and why.

The next goal, which is of pivotal importance, is to draw up a list of recommendations and requirements on political agencies and party organizations pertaining to mastering political functions and leadership methods.

But before demanding something of people, they must be taught techniques and methods of performing their assigned job. Therefore one of the paramount tasks is to teach political workers to employ methods of political leadership and a work style corresponding to the guidelines of the party conference. And, of course, it is important to get people going with serious independent study. These and other measures should promote greater independence on the part of political agencies and help improve their work methods.

In the course of many get-togethers and discussions with military aviation personnel, one's attention is drawn by the following fact: even among political workers and party activists one observes disagreements in definition and interpretation of the terms "political methods of

influence" and "political methods of leadership." Sometimes they are confused with or equated with methods of training, indoctrination, command and control.

In order to avoid misapprehensions and possible errors it is necessary to gain a clear grasp of the following: just as political leadership is a broader and less regimented domain than training, indoctrination, or command and control, so too methods of political leadership are more diversified and flexible in comparison with the methods of other domains of human activity.

There is one more item, on which it is important to share a unified opinion from the very outset. Implementation of each political function requires uniqueness in application of methods of political leadership. Let us say, for example, that party propaganda methods are inadequate to methods of party influence on work with cadres, etc. If one fails to take this into consideration, it is very difficult to elucidate the actual reasons for weak political influence on the part of political agencies and party organizations in each area in their activities, and it is even more difficult to elaborate methods of political leadership which would produce maximum results for each area.

What we need is not abstract methods, not a universal key to the hearts and minds of Air Force men, usable for all situations, but rather specific, effective political methods of further increasing operational readiness, lowering the accident rate, strengthening military discipline, developing people's creative activeness, and normalizing the moral and ethical atmosphere in Air Forces collectives.

Today we fairly frequently criticize political agencies and party organizations for their sometimes weak influence on indoctrination processes, including on development in party members and all military airmen of a sense of internationalism and respect for one another and those around them regardless of ethnic affiliation. We have deficiencies in this area.

But then the great disaster in Armenia occurred. And Air Force personnel of many ethnic affiliations were among the first to come to the aid of the people of this brother republic. For example, soon after the disaster the men of the unit with which officer A. Kostin serves proceeded with the business of rescuing victims in a very organized and vigorous manner. Many of the men displayed selflessness. Private Vishnevskiy, for example, operated a crane clearing rubble for five days straight, with very brief rest intervals. Warrant officer Ostranyan, risking his own life, made his way into the basement of demolished School No 9 and rescued 14 children, pulling them out through a passage he had cleared through the rubble. Sergeant Akopyan and Pfc Mikotin rescued 20 children. Warrant officer Sundukov and Private Galipov, operating a prime mover, at great risk to themselves, removed an entrance archway from a half-demolished building and opened up access to go in and rescue people.

We could cite a great many such examples. Helicopter crews, military air transport pilots, tower and en-route ATC personnel, as well as aviation engineer service, rear services, and communications personnel labored selflessly. I am sure that if it had been necessary, all Air Forces personnel would have pitched in working on recovering from the earthquake at the behest of their heart, out of a feeling of brotherhood, without any compulsion.

The point is that in spite of considerable deficiencies in party-political work, the healthy seeds that have been sown are falling onto rich soil and are producing healthy shoots. Political methods of influence should help us activate the human factor to an even greater degree.

How can one describe in general terms efforts pertaining to renewal of political and party methods of influence, for example, on combat training of Air Force personnel?

I believe that political workers and party activists of combined units and units must first and foremost work hard on studying the method of interpreting the general party principles of perestroika in terms of Air Forces combat readiness. It is useful here, in my opinion, to turn to the experience of efforts aimed at its intensification and to take a look at what new elements have appeared in methods of influence by political agencies and party organizations on resolving this root problem in development and improvement of the Air Forces, and how to push these efforts further.

We must also give thought to development of methods of party influence on forming and shaping combat training plans and schedules. Political sections and party committees must seek to ensure that the ideas and principles of perestroika are from the very outset incorporated into plans and schedules, rather than catching up as plans are implemented. One should not forget that increase in the end results of combat training should be ensured by means of appropriate planning. But once again it is not enough to call upon party activists to approach handling of these matters in a conscientious and innovative manner. It is important to teach them and to arm them with party-political methods of influencing the quality of planning.

Method of influence via party members working in command and control agencies and public organizations is called determining in party conference documents. It is also important to attach the proper emphasis to such traditionally Leninist methods of party leadership as ensuring a vanguard role by CPSU members in carrying out orders and directives of higher command authorities, current and future tasks, comparing the practical activities of party members, including commanders, with the party's political line. This also includes methods of open political appraisal of achieved results from the standpoint of the "lesson of truth," reliance on advanced know-how and innovator efforts, and drawing of moral-political conclusions from mistakes and errors.

Methods of determining the opinions of CPSU members on ways and means of optimal accomplishment of assigned tasks, party oversight, answerability, etc should become an effective instrument of party influence. But one must definitely bear in mind that they will truly work only when the political agency and party organization master, not in words but in deeds, the method of imposing their political demands on the party member and learn to achieve their absolute implementation.

There has been noted in the activities of Air Forces political agencies and party organizations an upturn toward ensuring high quality and safety of flight operations. But today this is not sufficient. Positive changes and trends should become the norm of daily life and work in the military.

The Air Forces Political Directorate and political agencies of combined units, units, and military educational institutions are conducting research efforts with the aim of seeking effective, practical measures and recommendations pertaining to accelerating the process of changes in these priority-emphasis areas of development of the Air Forces. And, we must say, practical realities have confirmed the correctness of selection both of the principal points of application of our efforts and the methods of their implementation. In this case we are talking about methods of individual party indoctrination in the squadron and at regimental and combined unit headquarters.

Their effectiveness is obvious. Appreciable improvement in basic indicators of quality and effectiveness of personnel work efforts has been achieved in the military units with which party members V. Baranov, V. Vereshchagin, and V. Vovchenko serve as political workers in large measure thanks to skilled organization of indoctrinational work with individuals by political agencies and party organizations.

The process of flight training and combat training on the whole is today proceeding smoothly, with a steady trend of improvement in qualitative indices, in the units with which party members B. Konstantinov and S. Sedov serve. Political agencies and party organizations in these units are actively influencing development of initiative and innovativeness on the part of personnel and are persistently seeking and incorporating the most effective methods of influencing quality and the time required by flight personnel to master new aircraft and modes of combat employment of new aircraft.

Commanders, political workers and party activists in the combined unit with which officer E. Zaytsev serves devote considerable attention in their daily activities to ensuring a vanguard role and personal exemplariness by party members in combat training and work duties, and they are influencing the state of affairs in the units and subunits through party members. One can judge the effectiveness of such influence from the fact that for about 10 years now the people in this combined unit have been operating without air mishaps. They have also

made appreciable changes for the better in strengthening military discipline and observance of regulations.

At the same time, one unfortunately becomes convinced in the course of working in units and subunits that many squadron party organizations are giving lip service to carrying out recommendations on restructuring work with individual party members. Mistakes precisely in individual indoctrination are revealed almost every time when one analyzes air mishaps and near-mishap incidents.

The appropriate political agencies must carefully analyze why this is happening and to what degree elementary lack of follow-through, the inertia of the old thinking and, perhaps, pedagogic bankruptcy as well are being manifested here, and then on the basis of specific conclusions find ways decisively to correct the shortcomings. I am convinced that we have no other way than rebirth of Leninist principles and methods of individual indoctrination of party members in our party organization. Turning to the individual is the essence of all restructuring of party-political work.

I should like to add to the above that the more deeply and quickly political agencies and party organizations understand their initiative role in devising methods of political leadership and responsibility for their correct, that is democratically organized application, the stronger will be their influence on the quality and end results of Air Force personnel combat training. In other words one must learn to act, relying not so much on one's own decision as on the opinion of the majority of party organization members.

There also remains hard, intensive search and organizational work for political agencies and party organizations to master methods of ensuring a priority pace of restructuring of party-political work, increasing the effectiveness of cadre factors in the system of political leadership, and improvement of the system of ideological-moral indoctrination in other areas.

Renewal of the methods arsenal of party-political work is an essential and decisive condition for implementation of the program guidelines of the 19th All-Union Party Conference and November (1988) CPSU Central Committee Plenum aimed at democratization of leadership activity and party internal affairs. The goal of the initiated reforms, including in Air Forces political agencies and party organizations, is resolutely to eliminate everything which fails to produce effect, which for years had been done for the sake of that vaunted "checkmark" in performance reports and, on the other hand, to give free rein to everything which is new and which produces results.

In revising party work methods, we should first and foremost reexamine its goals. In the past it has been evaluated, and even today is still sometimes evaluated, solely on the basis of total flight hours logged, weapons delivery results, state of affairs regarding flight safety, military discipline, etc. And I would say that these

indices should continue in the future to be given considerable importance. But the question is being stated in a totally new way: how, by what means will political agencies and party organizations in present-day conditions achieve high-quality performance of tasks assigned Air Force units? Here too I believe that it is very important clearly to determine who is supposed to do what and for what each commander, political worker, and party organization secretary is supposed to be responsible.

I believe that departure from purely administrative, executive, housekeeping management and other functions somewhat afield will enable political agencies and party organizations to concentrate their attention and efforts on performing indoctrinational tasks and handling social matters. I should like once more to emphasize that turning toward the individual, his spiritual and intellectual aspirations and material needs is today becoming our paramount task. Our principal commissar duties lie here, and our main area of party work lies here.

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Psychologist Discusses Requisites for Career Aviator

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in Russian No 3, Mar 89 (signed to press
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[Interview, published under the heading "Following a Policy of Perestroyka," with Maj Gen Med Serv V. Ponomarenko, professor and corresponding member of the USSR Academy of Pedagogic Sciences, by AVIATSIYA I KOSMONAVTIKA correspondent: "Spiritual Reference Points Are Needed"]

[Text] It was noted at the All-Union Conference of Workers in Public Education: "In order for continuous education to become reality, one must have an essential foundation, on which the entire pyramid of education is built." A conclusion suggests itself: substantial reorganization of education in this country is needed in order to achieve this.

As for incoming Air Forces replacement personnel, fundamental changes are to be made in initial training of future Air Force personnel. It will be organized at DOSAAF flying clubs and glider training schools. Of course it will be necessary to optimize career counseling activities. What direction should it follow? How can we prevent adverse conservatism and an oversimplified approach in this promising activity? After all, we can remember the times when young people were enthralled by the romance of flying. This was fostered by numerous parachute jumping groups and flying clubs. Then a period of "dead calm" set in....

Maj Gen Med Serv Professor V. Ponomarenko, corresponding member of the USSR Academy of Pedagogic

Sciences, answers questions connected with restructuring of the training of future pilots in an interview with our correspondent.

* * *

[Correspondent] Vladimir Aleksandrovich, from the standpoint of the military psychologist, what career counseling work is needed at the general-curriculum school?

[Ponomarenko] One's career of course begins with mastering a trade or profession. For a young person a trade or profession is his future. What will the future bring? A great deal depends on how clearly an ideal is formed in a young man's consciousness. And not simply in the form of a pragmatic element, but as spiritual and intellectual culture, an inexhaustible moral wellspring. During his years of formative education a child should assimilate the fact that professionalism is an aggregate of specialized, personality, job-related, moral and ethical qualities. This is why "applied" training, as a component part of school education, should be aimed not only at acquiring work skills but also at forming a sensory-contemplative image of one's future trade or profession. This requires creation of new pedagogic conditions whereby knowledge is transformed into skills and principles to live by, and thought is transformed into action. I am convinced that vocational instruction in the fundamentals of a trade, grounded on a sufficient depth of school-learned knowledge and on the prior-learned value of truthfulness, is capable of transforming the energy of adolescents into purposeful actions.

[Correspondent] These are general, basic elements, so to say. But what about aviation career counseling in particular? After all, not all boys who dream about flying possess the aptitude for flying or, if you will, the talent.

[Ponomarenko] I believe that career counseling activities should pertain to all aviation career specialization areas, from actual flying to design, engineering, psychology, meteorology, medical, etc. In particular, the foundation of psychologists' work in aviation should reduce to the highest moral principle: be prepared to emerge victorious in modern combat while ensuring flight safety.

In aviation labor and moral education are bound by a truly vital knot. Career counseling on behalf of aviation should begin with forming and shaping of the intellectual and spiritual countenance of the flying profession. In aviation one cannot work solely "for oneself," and one must work innovatively. To do otherwise would be contrary to the meaning of this profession.

We encounter here man's need to rise above the earth, relying on activation of a higher value—man's creativity. The spiritual wellspring of aviation consists precisely in its popular spirit: there were legends, dreams about flying, religious prohibitions, and there was fear of nature. From early days a pilot, confirming himself as a social being, expressed the popular idea that man would fly. Thus a meaning of the profession was born—to serve

the dream of mankind. Even today we endeavor to see in an aviator first and foremost nobility and purity of thoughts.

This is logical. Aviation is a special profession distinguished by a strong sense of citizenship. Aviation's spirit of citizenship lies in the efforts of the many people who send a pilot into the air. In an aviation collective professional ethics and morality are a condensed expression of the results of all specialist personnel manifested in the professional honor and skill of the pilot.

[Correspondent] In March 1985 the Ministry of Education adopted a decision to encourage students to take part in DOSAAF club activities. In particular, fifth-graders are to take part in glider flying. How do aviation psychologists feel about this?

[Ponomarenko] As you know, practical experience is a criterion of truth. The experience of the Great Patriotic War demonstrated that those pilots who were Heroes of the Soviet Union and who survived had for the most part entered service school after receiving training in flying clubs. The combat activities of Ivan Nikitovich Kozhedub are a vivid example of this. The best test pilots had begun as glider pilots. Glider schools, aviation clubs, young designers clubs, and amateur inventing activity all constitute a training school and foundation of aviation. Unfortunately in this country this foundation was seriously disrupted at one time in the past.

Forming and shaping of the individual's directional thrust toward a trade or profession is a central psychological element. In other words the individual's personality and its integral character are first "constructed," for without this it is impossible correctly and definitively to determine one's life path. In a pedagogic respect, for example, designing and building one's own model aircraft or original-invention flying machine is an effective mode of practical application of acquired knowledge. A schoolchild should become emotionally permeated with the thought that he has taken an independent step, that he has stepped from the domain of consumption into the domain of creation. Control of this process is an important task of educational psychology.

As for flying proper, this is a special area of psychological-pedagogic activity.

Advance preparation of young people to enter flight school is first and foremost a matter of considerable economy. As we know, even today some cadets are washed out for a lack of aptitude for flying. Considering the fact that training a pilot is very expensive, it becomes obvious that the problem of selection and training of flight personnel is of considerable importance to the state.

Glider schools and flying clubs are a productive way to combat financial waste. At the same time a glider school should not be viewed as a sieve where those who are unsuited for flying are sifted out. The spiritual and intellectual reference points of aviation are laid down

here. Future aviators need excellent qualities: industriousness, unselfishness, ability to take a risk, emotionally sharing the successes and failures of one's comrades, and the need for emotional satiation by victory over the elemental forces around us. We should recall that prominent Soviet scientists and designers Tupolev, Antonov, and Korolev had been involved in soaring. This confirms once again that glider schools are capable of producing highly-skilled aviators.

[Correspondent] Flying any craft involves a certain risk. Will this not frighten teenagers away from flying? Will this not be detrimental to young boys' health?

[Ponomarenko] The flying profession is for bold and courageous individuals. But it is also unquestionable that the danger a pilot encounters is not inevitable. The question should be examined more broadly, that is, linked with preparing an individual to encounter emergency situations. Today the problems of training and instilling psychological preparedness in an individual to respond in an emergency situation proceed directly from the needs of people's job-related activities. We know that up to 80 percent of erroneous actions in emergency situations are the result of professional unreliability of specialist personnel. To this we should add that the cost of mistakes has increased immeasurably with complex systems of machinery.

Today one observes a new phenomenon which is characteristic of the majority of industrial operations—high speed. Hence the demands on emotional stability, motor response, and speech. A person's ability to "take charge of the situation" has become particularly valuable. The ability independently to make a critical decision is a primary psychological quality in a modern industrial machinery operator. Flying labor and the labor of aircraft maintenance personnel is a fine school in this regard for the younger generation.

Take glider schools, for example: the training of a young pilot to respond to abnormal and emergency situations, in addition to the job-related element, can also exert strong indoctrinational influence on the ethical and moral domain of students. Training and preparation for a hazardous situation is not merely forming and shaping character and developing will and courage. In the hands of educators it involves instilling compassion and willingness to come to the aid of persons in trouble. An example of this is helicopter pilots, who frequently take off in very bad weather to go to the assistance of geologists, sailors at sea, the snowbound, and the sick.

Glider instruction, with the correct psychological support environment, can become a pedagogic form of combining labor and moral indoctrination. Formal glider instruction naturally will involve various unexpected, unplanned situations. The conditions of such instruction will engender the development of creative abilities.

Teaching preparedness to act in unusual situations is aimed at psychological awareness by the trainees of the

need for self-improvement of their mental and emotional qualities and properties. A young man will learn to generate for himself the idea of self-indoctrination of those professionally important qualities without which he cannot achieve the summit of skill. One cannot last long in aviation with bad habits which undermine one's health. Therefore glider school not only will not worsen one's health but, on the contrary, will create the requisite conditions for steadily strengthening health over the long haul.

[Correspondent] Modern aircraft constitute complex automated technical systems. Are sailplanes and recreational lightplanes not a far cry from commercial passenger aircraft and military combat aircraft?

[Ponomarenko] Indeed, today's aircraft is controlled for the most part by automated systems, while the pilot for the most part monitors and adjusts the actions of his "iron partners." In contrast to ground operators, however, the pilot must not only control automatic equipment but also fly, and this means gain three-dimensional situational awareness. He does not merely read the instruments but, on the basis of instrument readings, and also relying on his knowledge, experience and so-called noninstrument information, forms spatial orientation and a mental picture of his position, attitude, and movement in space. Gliders and lightplanes are the best for learning to see the ground, to gain a sense of the aircraft and to control it, that is, to form that which is called sense of flying.

The ability to sense an aircraft or to perceive and process all information arriving from analysors, and the ability of spatial orientation comprise the psychophysiological basis of pilot reliability. The next level is intellectual interaction with onboard computers. In this connection providing schools with new equipment in the form of computers fully reflects practical labor requirements, including in the field of aviation.

Actions connected with programming are indispensable to today's pilot as he solves navigational or tactical problems. For this reason technical teaching devices should comprise various kinds of simulation of the operational conditions of "flexible" job-related tasks. Today the computer, the computer display, and automatic control are as much part of an aircraft as are the engine, airframe, and instruments. Today's schoolchildren will be flying fifth-generation aircraft which will be controlled primarily with onboard digital computers. Not merely new knowledge will be required, but a new level and modes of abstract thinking. Man will be working with simulation models....

[Correspondent] What role is played by education psychology in aircraft career counseling?

[Ponomarenko] First of all it would seem that education psychology should establish closer contact with engineering psychology, which studies and provides support in addressing the problem of "man-machine" interrelationships. Simultaneously with learning engineer work

techniques, young designers must be taught the fundamentals of flying psychology from a psychological-pedagogic standpoint. The terms "aesthetically pleasing," "convenient," "easy," "simple," "pleasant," and "happy" should be filled with specific technical content of design thinking. Within the vocational training system the schoolboy will learn to model elements of the "man-machine" system, for which he needs knowledge from the field of engineering psychology. How a person processes information and how much, what laws and mechanisms govern the mind when reacting to sound and light, what is feedback and the significance of feedback signal, and how is a future situation image formed—all this knowledge will commence performing the unique function of psychologizing young men's technical thinking. It is one of the tasks of pedagogic engineering psychology to psychologize the technical thinking of the novice designer.

Famed aircraft designer Antonov once said: "We shall learn to build aircraft when we realize that they are designed not with the cargo in mind but rather the person who flies them." Engineering psychology has a single social task as regards the vocational education of future aircraft engineers and designers: to develop them into worthy patriots of aviation.

[Correspondent] I believe that our young people would like to know what qualities today's pilot should possess.

[Ponomarenko] Twenty years practical experience in psychological aptitude screening of more than 20,000 secondary-school graduates and the results of studies of the actions of more than 500 pilots in routine and emergency flight situations aboard modern aircraft of 15 different types enable scientists to assert that there are special personality traits and physiological properties which determine success in flying under normal and emergency conditions.

As an example I shall cite a list of qualities which are essential to the successful pilot. In the area of job-related health: the ability to restore an altered functional state within a limited time, and the availability of reserves in conditions of effect by extreme factors of an aggressive living and working environment. In the area of psychology: the ability to predict a situation in conditions of uncertainty, the ability to perform combined actions in the presence of equally-motivated tasks, and a high resistance to interference. In the area of social traits: cognitive activeness, the presence of feelings of sympathy and compassion, a tendency toward altruism, risk-taking, activeness, kindness, humor, candor, approachability, and emotional perception of one's job, that is, all that which falls within the term "integrity of character."

As we see, we have plenty of things not only to restructure but also to build from the ground up. The main thing is not to stray onto the path of an oversimplified approach and to free ourselves of the old shackles.

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Interethnic Friction in Turkestan MD AF Regiment

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[Article, published under the heading "Problems of Training and Indoctrination," by Maj V. Bashinskiy and Capt V. Davydik: "Following the '1 + 2' Formula"]

[Text] For our party organization and all the personnel of our technical maintenance unit, the past training year and the beginning of the current one have been characterized by appreciable positive changes in accomplishing the tasks of achieving a radical turning point in the state of military discipline, ensuring observance of regulations, and strengthening friendship and cohesiveness of the multiethnic military collective in conditions of democratization of military affairs, party work, and further development of glasnost, criticism and self-criticism.

In our subunit there have been no accidents, criminal offenses, or instances of patent manifestation of mutual relations contrary to regulations. Compared with the same period last year, the total number of military disciplinary infractions has declined by 80 percent.

Normalization of moral-ethical microclimate is having a favorable effect on people's mood and attitude toward their work. Quality of routine inspection, servicing and maintenance has improved, and orderly procedure has improved in the laboratories and at maintenance personnel work stations.

The changes taking place in the technical maintenance unit are a result of persisting, purposeful work on the part of the command element, party and Komsomol organizations to carry out the instructions of the CPSU Central Committee, USSR Minister of Defense and commander in chief of the Air Forces pertaining to the need for further strengthening discipline as a foundation for combat readiness and an important condition for the success of perestroyka.

The program guidelines and practical recommendations of the 19th All-Union Party Conference have deepened our understanding of the fact that unaccomplished old tasks and new ones arising in the course of perestroyka cannot be accomplished with the aid of customary forms and methods of indoctrination, because in most cases they constitute a repetition of or addition to the aggregate of administrative fiat and pressure methods of running military collectives and exerting influence on people and the results of their job-related, party, or volunteer activities. Having become obsolete and exhausting their mobilizing capabilities, in the new conditions they are no longer capable of providing anything to activate the human factor.

The party conference called for party work to correspond to the aims and tasks of perestroyka not only in content

but also in methods and for party policy to be implemented exclusively through organizational, cadre, and ideological work with the strictest observance of democratic principles of societal affairs. Naturally we also had to consider these demands.

The party organization, headed by Capt V. Orlovtssev, has rendered and continues to render effective assistance to technical maintenance unit chief Capt S. Mironov and other supervisor personnel in mobilizing party members and all personnel to achieve every possible improvement in discipline and organization and in preventing negative phenomena, including interethnic conflict situations. This is greatly promoted by reorientation of party work toward predominantly individual forms and methods of indoctrination.

We must state that the subunit's party members paid close heed to the recommendations of the meeting of party activists of the Turkestan Military District pertaining to practical incorporation of the "1 + 2" formula into the practical indoctrinational activities of party organizations. This formula is a symbolic expression of one of the methods of strengthening party influence on indoctrinational work with individual Air Force personnel. It consists essentially in the following: a party member, either on his initiative or as a party assignment, takes under his wing two party-affiliated servicemen who need to be helped and watched by their senior comrades. This system, which has been tested in a number of units and party organizations in the district, has enabled its initiators to achieve appreciable improvement in discipline and observance of regulations as well as strengthening of friendship among servicemen of different nationalities. Since this is the case, technical maintenance unit party members reasoned, we should ourselves try out and utilize this formula.

The party buro, taking upon itself the role of organizing element, focused party members on an innovative approach to indoctrination work with those individuals taken under their wing. The thrust of this intercommunication between party members and young servicemen was seen not to be in excessively close supervision and not in constant psychological pressure on the young airmen, but rather in the ability of the older comrades to establish genuine contact with a given warrant officer, sergeant, or primary-rank enlisted man, to understand the motives for their actions, and to convince people of the necessity of strict observance of regulations, moral and ethical standards, and observance of the principles of internationalism.

The party buro's guiding and directing role is manifested in selection of party members capable of conducting indoctrinational work with individuals, in giving them methodological assistance, in studying and synthesizing experience in patronage activity, as well as in many other items requiring collective decisions and opinions in order to avoid mistakes and miscalculations.

Work in this direction has been continuing for more than a year now. As already stated, results are encouraging. The "curve" of infractions and instances of display of ethnic arrogance has dropped off sharply, which is of importance for stabilizing the situation in the subunit and for concentrating the principal efforts of aircraft maintenance personnel on accomplishing the tasks of increasing operational readiness and improving flight safety. In addition, party members are acquiring increasing experience in exerting influence on specific individuals and aggressively eliminating gaps in the indoctrination of enlisted personnel and Soviet Army civilian employees. Good advice and timely help by older comrades have enabled many young airmen to become more efficient and improve their adherence to work procedures and on-duty discipline.

Some time back a nervous, heated atmosphere formed in the squad led by Sgt S. Kayashov. As experience in the military indicates, this kind of atmosphere provides fertile soil for mutual relations contrary to regulations. Kayashov was also himself partly to blame, as he had begun confusing one-man command with immunity to normal rules and regulations.

Capt V. Orlovtshev, taking two sergeants under his wing, including S. Kayashov, painstakingly analyzed the reasons for the conduct of his charge. He determined that weaknesses of character—a quick temper, pridefulness, and arrogance—were coming to the surface due to a lack of oversight over his actions and daily assistance by the group chief and other supervisory personnel. The sergeant's stripes on Kayashov's shoulder boards gave him authority over his subordinates. Many forgot, however, that there was still a good deal of work to be done with Kayashov himself.

In his conversations with Kayashov, Orlovtshev endeavored to fill in the gaps in his knowledge and the sergeant's notions about the role, place and responsibility of an NCO. The officer taught him that demandingness on one's subordinates without concern for them, without attention toward the men's needs and aspirations, and without a commander's personal example in all things has never earned anybody respect, authority, or success in accomplishing assigned tasks.

Capt V. Orlovtshev devoted considerable attention in the process of individual indoctrination work with sergeants to the situation method of passing on experience and know-how. Discussing and analyzing with the NCOs typical and possible situations in the daily activities of Air Force units, the party member helped his charges look for and find optimal solutions to disputes and conflicts. He counseled them to show particular tact, restraint and patience in instances of aggravation of relations between servicemen of different nationalities, since any quarrel over trivial matters, if not handled promptly, can escalate into a serious interethnic conflict.

As he worked with Sergeant Kayashov, Captain Orlovtshev made a fairly thorough study of the daily lives

of the men in the inspection and maintenance group, and he looked into the problems of the collective. It was for good reason that a discussion of the work style of group chief party member Dmitrus was conducted at a party meeting. Technical maintenance unit supervisors and members of the party buro gave the group chief necessary help. This subunit is now successfully performing its assigned tasks.

Party members A. Gorbach, V. Kuligin, L. Nikitin, and other of our comrades are working together with Capt V. Orlovtshev, carrying out party assignments pertaining to individual indoctrination work with airmen. Many interesting and instructive things could be related about each of them. But since this would be difficult to do within the confines of a single article, we should like to devote more attention to certain practical aspects of organization of individual indoctrination work by party members following the "1 + 2" formula.

In performing a party assignment, many individuals have encountered a lack of information on the individual traits of their assigned charges and the conditions of their pre-military indoctrination and upbringing. At a meeting of the subunit body of party activists we discussed our difficulties and reached a consensus: it is essential to maintain extremely close contact with the families, workforces, and schools where our junior aircraft maintenance personnel grew up, worked and studied. A conscientious attitude on the part of Communist-indoctrinators toward correspondence with the men's families and their sincere desire to help each individual become a good person and a skilled specialist evoked fine response in the men's loved ones and comrades.

"The results of the correspondence have exceeded all expectations," stated technical maintenance unit chief Capt S. Mironov. "Dozens of individuals, organizations and institutions are responding to the letters written by our party members. In many cases the information we have received has been extremely valuable to the indoctrinators."

Pvt A. Kuznetsov, for example, prior to being drafted into the military had a record of juvenile delinquency. He had been drunk in public on numerous occasions. Aware of this fact, Capt L. Nikitin took pains to ensure that Kuznetsov had no opportunity to obtain alcohol. A corresponding adjustment was also made in the indoctrinational and explanatory work with this enlisted man.

While on the whole giving a positive assessment of their former pupil, the teachers at the school which Pfc I. Kim had attended prior to the military directed Sr Lt V. Kudigin's attention to the fact that Kim was quite susceptible to the influence of his companions and that "for the gang" he was capable of performing both good and reprehensible deeds. In view of this aircraft mechanic's character traits, the officer, his comrades and superiors endeavored to make sure that the best privates

and sergeants in the technical maintenance unit kept "company" with Kim. To date he has not caused any problems.

Letters from various parts of the Soviet Union and get-togethers with soldiers' parents who have come to visit their sons foster improved organization of internationalist indoctrination of the young airmen. As for indoctrination work by party members with individual compulsory-service personnel, almost all discussions contain the topic of internationalism.

The observations and impressions of officers, who have seen a great deal in their years of military service, are readily accepted by the enlisted men. After all, let us be frank: frequently interethnic quarrels and conflicts arise out of ignorance and lack of any idea or opinion on the item under dispute. Party members endeavor, to the extent of their ability, to fill in such "blanks" in teaching young people respect for all the nationalities and ethnic groups of our multiethnic country and a sense of a united family of Soviet peoples and a microcosm of that family—the technical maintenance unit.

Of course a year is not a very long time for a comprehensive evaluation of the effectiveness of the "1 + 2" formula. A good beginning has been made, and we shall now see how things should proceed from here. One thing is clear even today, however: a great deal will depend on the position taken by the party buro and each individual party member. Why is this?

Amassed experience convinces one that the effectiveness of individual indoctrination work according to the "1 + 2" formula is determined in large measure by the responsibility of party members for quality and the end result of party assignment performance. We too have some problems in this respect. Officer V. Smolko, for example, proceeded with enthusiasm on individual work with his charges, but he began to lose his ardor when he realized how difficult the task was. It is true that the other party members did not allow him to "cool off" entirely.

There is a second lesson which proceeds from the first one: the party organization should keep the entire system of party member individual indoctrination activity under continuous, unrelenting oversight. Up to the present time we have used for this purpose the traditional party member accountability reports and summary reports at party buro sessions at party meetings. It is evident that we must also seek other forms both of verification and assistance to the indoctrinators.

There are many other organizational and methodological issues, including one of the most important—raising the ideological and cultural level and teaching skills of the indoctrinators themselves. Therefore much work lies ahead for technical maintenance unit party members and party organization activists. Even though not everything is working smoothly at present, and we make considerable use of the trial-and-error method, it is important that people transition from words and good intentions to concrete actions which are in conformity

with the party's program guidelines for restructuring of the system of indoctrinational work and the role and place of primary party organizations in this work.

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Trade Union Official Discusses Union's Functions

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[Article, published under the heading "Following a Policy of Perestroyka," by V. Kalosha, Central Committee secretary, Trade Union of Aviation Workers: "Key Element—Practical Actions"]

[Text] Revolutionary renewal of our lives is proceeding across the board, entering all domains. The trade unions are taking active part in this process. The Third Plenum of the All-Union Central Trade Union Council, held in the latter half of last year, discussed the tasks of the trade unions proceeding from the decisions of the 19th All-Union CPSU Conference, defined their role and place in carrying out progressive reforms in this country, focused the members of trade unions on direct participation in the economic and political reform and democratization of Soviet society, and on achieving decisive changes in the social domain.

The entire organizational activities of the aviation workers trade union and its union bodies, from the Central Committee to the shop committees and union groups, are concentrated precisely on these mainline efforts. Work is being done in many areas. I should like to discuss the principal areas in greater detail: participation by trade union organizations in the economic activities and production processes of workforces, and in performing the protective functions assigned to them by the state.

Trade union organizations of military units, higher educational institutions, establishments, and enterprises work in close contact with the command element, political agencies, and party organizations to achieve the main goal—all-out increase in Air Forces combat readiness.

A transition to principles of economic accountability and development of democratization and self-management positively affect the accomplishment of assigned tasks. This affects the economic and social development of Air Forces workforces. More than half of the workers in our branch of industry, and all economic-accountability industrial enterprises, have shifted to the new conditions of labor remuneration, which is also positively affecting the results of the labor activities of workers and employees.

As was stressed at the 19th Party Conference, however, more could have been accomplished in the main areas of perestroyka in the time which has passed since the April

(1985) CPSU Central Committee Plenum. This conclusion also applies in full measure to Air Forces workforces. An analysis of unresolved issues indicates that many deficiencies are due to the still weak organizational work on the part of supervisor personnel and trade union agencies, and sometimes are due to their low degree of competence as well.

The new methods of economic management are not yet producing appreciable movement forward. And how can one achieve genuine economic accountability and self-financing when some trade union committees and enterprise executives are marking time on such an important matter as adoption of internal economic accountability and the group and lease contract in brigades, sections, and shops? The reform will not get moving or produce the expected results if it does not deeply affect the personal interests and become the vital concern of each and every worker. At the present time, however, trade union committees, enterprise economic services, and workforce councils are displaying what I would call timidity about adopting aggressive forms of organization of labor and labor incentive. For this reason only one fourth of the brigades at Air Forces industrial enterprises are operating on the basis of internal economic accountability, while only three percent are working on a contract basis.

When one examines the state of affairs locally, one frequently comes to the conclusion that territorial and trade union committees, managers and supervisors are doing a very poor job of studying and adopting advanced know-how. This is why the Trade Union of Aviation Workers Central Committee Presidium specifically studied the practical experience of extensive application of the group contract at the enterprise headed by party member S. Samsonov. At this enterprise 82 percent of production brigades are already entering into contracts with management. Positive results of activating the human factor are also in evidence. Last year labor productivity was 111 percent in this workforce, 351,000 rubles worth of unneeded equipment was freed up, and 240,000 rubles of above-target profit was generated.

We should emphasize that success of perestroika depends in large measure on personal initiative, purposeful and specific efforts on the part of trade-union activists. At this enterprise, for example, Trade Union of Aviation Workers Central Committee member brigade leader A. Kochkalda was an initiator in adoption of the group contract. Labor productivity in his brigade has increased by almost 30 percent.

Volume of manufacture of civilian goods production, including consumer goods, has increased sharply in recent months at our industrial enterprises. It is the task of the trade unions to explain to workers and employees the importance of accomplishing these paramount tasks. Good experience has been amassed in the collectives led by comrades V. Kupch, P. Voronko, and V. Nikonov, and where comrades V. Zhukovetskiy, V. Solovyev, and V. Sergeyenko serve as trade union committee chairmen.

They have adopted a substantially tougher target for the current year in this indicator.

Nevertheless we must acknowledge that sometimes trade union committees and workforce councils take a not entirely correct position. For example, fairly recently representatives of a certain enterprise—trade union committee chairman Comrade A. Aksenov and workforce council chairman Comrade P. Tikhonov—appealed to the Central Committee of the Trade Union of Aviation Workers. They requested a substantial adjustment downward, by more than a factor of 10, of the plan target for 1989 for consumer goods manufacture.

In view of the urgency and social significance of this most important task assigned by the party and government, the trade union Central Committee of course could not support their request, particularly since it was determined that the enterprise possesses every capability to meet the target. All they need to do is approach the matter in a more thoughtful and businesslike manner, with the desire to resolve the problem. But apparently not everything has been thought through by this workforce, which explains their appeal to the trade union Central Committee.

Renewal of fixed productive assets, one fifth of which is obsolete and worn out, remains a serious and complex problem at enterprises. At the same time the annual rate of renewal of fixed assets is only half the standard figure. A further widening of the gap between the development of aircraft and the means and capabilities of repairing and overhauling them clearly cannot be permitted.

In connection with this one should also not close one's eyes to the fact that the percentage share of manual labor continues to remain very high in this industry due to poor initiative both on the part of economic management and trade union bodies, as well as failure to appreciate the importance of adoption of new equipment and the latest advances in science and technology. This is why at the present time we are concentrating the attention of trade union committees and economic managers on speeding up evaluation of work stations and making them more efficient. This is a necessary job and should be completed during the current five-year plan.

Workforce councils are called upon to play an important role in handling the problems of economic reform and making it possible for the new mechanism of economic management to operate. Air Forces trade union agencies have taken direct part in establishing workforce councils and are continuing actively to assist them in their development, in order that these councils become genuine self-management bodies and an effective form of worker participation in accomplishing the vital tasks of the workforces. The Trade Union of Aviation Workers Central Committee is drawing up a program for joint training of workforce council and trade union committee chairmen, using for this purpose instructional facilities available in the trade unions. This approach will help

establish coordination between the councils and trade union committees and the establishment of close, businesslike relations between them.

With the existence of workforce councils, trade union committees have the opportunity to settle matters of a production nature primarily through the councils, while themselves concentrating attention on the main area of trade union activity—social tasks, protecting and defending the rights and legitimate interests of the workers, utilizing the entire force of the powers and authority with which they are invested. It was clearly stated in the keynote address at the 19th All-Union Party Conference that protection by trade unions of the socioeconomic interests of the workers, particularly in the area of safe and healthy working conditions, safety procedures, social insurance, and organization of recreation and leisure time, is today taking on ever greater significance.

Experience indicates that wherever concern about working people stands at the forefront, things work out well and there is a healthy moral-psychological environment in the workforce, making it possible to achieve excellent end results. At the enterprise directed by officer P. Voronko, for example, every subunit has well-equipped employee services facilities, locker rooms, recreation and meal facilities. There is always cleanliness and order at this enterprise. The enterprise has the use of a sanatorium, a therapeutic rest facility, and a Pioneer camp. A number of other enterprises possess approximately equal facilities.

Unfortunately some managers and trade union leaders are very sluggish in their efforts to advance the social domain at the plant. At the facility directed by Comrade A. Glushchenko, for example, the roof leaks and it is cold in the work area of one of the subunits. Water is constantly collecting on the floor and getting into work stations. Lighting is inadequate, and there is no place to take meals. At the end of last year one of the workers was injured on the job due to a lack of order and proper procedure at this enterprise.

Such cases are not isolated. They are also encountered at several other enterprises and at various facilities of a number of rear services units, especially at aircrew and ground personnel mess facilities. They attest to a callous attitude by management toward the workers and employees and to the total inability of the trade union committees to defend their legitimate interests.

Once again it is time to address serious deficiencies in provision of meals and supplying workers and employees with groceries and manufactured goods. At a number of enterprises the capacity of worker dining halls remains only from 35 to 50 percent of the workforce. Things are even worse as regards providing meals for civilian employees at a number of units and Air Force bases. Many complaints are lodged over the unfair distribution of some goods. Certain commanders and even political agencies at times ignore the needs of the civilian

employees, while trade union officials, elected bodies and commissions display intolerable indifference.

In May of this year the 6th Trade Union of Aviation Workers Central Committee Plenum will be addressing problems of providing essential working conditions for workers and employees. One assumes that the plenum will properly criticize deficiencies in this area and in the performance of economic managers and trade union committees. There is no point in waiting for decisions and instructions, however. Things to correct matters should be done locally.

Trade unions should play a no less important role in performing protective functions in the area of safe and healthy working conditions and safety procedures. Last year the technical labor inspectorate of the branch trade union had to shut down nine shops and 22 production sections and forbid the operation of 1,220 machine tools and other pieces of machinery due to the threat to people's lives and health. In all these cases disciplinary and administrative measures were taken against the specific guilty parties, and the appropriate managers and all trade union organizations were informed. A high level of injury on the job has become practically chronic at the enterprises under the jurisdiction of certain Trade Union of Aviation Workers territorial committees, in particular those chaired by comrades G. Sudnishnikov, F. Rakitin, and A. Dudarev.

Proceeding from the social demands proclaimed at the 19th Party Conference, during the current five-year plan all Air Forces trade union bodies must concentrate attention on bringing working conditions into full and absolute conformity with current standards, taking an uncompromising stand and achieving a qualitatively new level of working conditions for workers and employees.

We are also concerned by the problem of strict observance of labor laws. Measures taken by the Trade Union of Aviation Workers Central Committee have made it possible to achieve a reduction in gross violations of labor laws. We have not yet reached, however, a radical turning point in this area.

An analysis of letters and complaints from workers and employees to central administrative bodies and the print media attests to the fact that there has been an increase in the number of appeals and complaints pertaining to worker dismissal, quota setting, setting of pay rates, and wages. The reasons are obvious: an economic reform is in progress, people have begun working under the new conditions, and for this reason they now are taking notice of every tiny nuance in their work activities and in the daily life of the workforce.

One point of concern is the fact that, in violation of the established procedure, at certain enterprises and organizations under the trade union territorial committees headed by comrades N. Redyukhin, A. Rakovskiy, A. Kuznetsov, and others, matters connected with release, certification and pay rating of employees were settled

on something other than a democratic basis, without wide publicity, within a narrow group of representatives of management and public organizations. Errors were made as a result.

In order to correct the situation the Trade Union of Aviation Workers Central Committee has taken additional steps to improve organization of work procedures and to ensure strict observance of labor laws. Volunteer legal consultation units are being formed locally. Legal inspectorates on a volunteer basis are already in operation under each trade union territorial committee. Instruction has been provided to these units. It has been suggested to the Air Forces command authorities that greater knowledge of the law be provided to those officers supervising civilian employees. I believe that through joint efforts we shall achieve the desired results in this area as well.

The very scale and complexity of the tasks facing trade unions in conditions of restructuring of Soviet society place great responsibility on trade union cadres. Air Forces trade union body officials include many individuals who are thinking and acting in the new manner. These include Comrade V. Savateyev, trade union committee chairman at the Voronezh Higher Military Aviation Engineer School, overhaul depot trade union committee chairman Comrade V. Zhukovetskiy, trade union territorial committee chairmen comrades A. Petrov and V. Volosnikov, plus others.

The work performance of every trade union official could stand improvement at the present time, however. An official should be able to make a political assessment of any activity, phenomenon, or process, he should be able to look to the future, and he should approach the resolving of specific problems in a party manner. The trade union official at every level should possess the ability to work with others, to rely on the body of activists, to make decisions based on substance and not mere lip service, and to avoid applying unfair pressure and dictating his will. Only on such a foundation is mutual trust formed and respect for the official heightened.

We have a great deal of work to do to democratize everything within the trade union, to broaden the rights and independence of primary trade union organizations, and to increase their activeness. It is these practical deeds which should strengthen perestroika.

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Particulars of Enterprise Economic Accountability Detailed

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[Article, published under the heading "Economic Reform in Action," by Col N. Karasev, doctor of economic sciences: "On Principles of Economic Accountability"]

[Text] Organizing operations at Air Forces aircraft overhaul enterprises and scientific research establishments on principles of full economic accountability and self-financing enhances the significance of indices characterizing the end results of their production-management activities. These indices include first and foremost profit, revenues and balance-sheet income, and net output. Let us examine the procedure and content of economic accountability reporting.

Pursuant to the USSR Law on the State Enterprise (Association), Air Forces aircraft overhaul enterprises and scientific research establishments, with authorization from the higher command authority, can use one of two economic accountability models: based on standard distribution of profit or on standard distribution of revenues. It is more advisable to employ the former in conditions of adopting the new mechanism of economic management. It is constructed by means of sequential calculations of interrelated indices.

The input element here is calculation of product sold, that is, product of the enterprise or scientific research establishment delivered to and paid for by the client (customer). The amount for product sold includes the cost of manufactured and sold finished items, partially-processed goods, and the product of auxiliary shops. This indicator also includes cost of major overhaul of enterprise-owned equipment and transport vehicles. When figuring product sold, one also takes into account changes in goods on hand in storage and in shipped goods as of the beginning and end of the plan-covered period. Goods produced from raw materials and supplies provided by the client and paid for by the manufacturer are included in the total volume of the manufacturing enterprise's goods sold. Sales volume does not include the value of plant internal goods turnover, that is, the value of plant-produced items intended for subsequent processing within a given enterprise.

Plan-scheduled output sales volume is determined in current enterprise wholesale prices adopted in the plan (taking into account price premiums and discounts specified in price lists). Actual volume of sold goods is determined in two kinds of prices: those actually in effect in the period in question and enterprise wholesale prices adopted in the plan.

In condition of full economic accountability, sold goods of Air Forces aircraft overhaul enterprises and scientific research establishments are calculated taking into account fulfillment of contract obligations. This indicator is determined by excluding the value of contractual-obligation undelivered goods from the sales volume figure. In connection with this it was necessary substantially to simplify the procedure of settlement of accounts between contracting parties so that manufacturers can receive as soon as possible money that is due and payable. In particular, this issue was vigorously addressed at the enterprise at which officer I. Pavlov works.

After determining the sold goods total figuring in contract deliveries, as the next step one must calculate the enterprise's replacement fund, that is, that part of produced product going for replacing means of production consumed in the process of creating material goods. The replacement fund includes means of labor designated for replacing worn-out machinery, equipment, buildings, other structures, etc, as well as objects of labor—raw materials and basic supplies, fuel, and energy needed for renewal of the production process. The replacement fund provides replenishment of production material outlays, production renewal, and continuation on the previous scale.

When constructing a first full economic accountability model, the value of the replacement fund is subtracted from the value of goods sold, which is determined taking into account contracted goods deliveries. As a result we obtain the enterprise's net product.

The next step is calculation of payroll fund. This indicator is determined according to the net production standard established by the higher organization. Let us examine a fictitious example. The enterprise's payroll fund is formed according to net product standard increment: base fund plus 0.3 percent for each percentage point of net production growth. With a base payroll fund of 15,300,000 rubles, for example, and a net production growth of 9 percent, the actual payroll fund will total 15,713,000 rubles.

The calculated payroll fund is then subtracted from the value of net product. What remains is enterprise profit, which plays an important role in economic accountability relations and provides incentive for each enterprise to meet its production plan with the least expenditure of manpower and resources. Enterprise profit is subject to the standard distribution with a first model of economic accountability.

First of all obligations pertaining to the state budget and higher agency are met from profit, on the basis of standard rates, and interest on extended credit is paid. Net profit remaining after these obligations are met is placed at the disposal of the workforce, and economic incentive funds are formed with this profit on the basis of approved standard figures: production development, science and technology, social development, and wage bonus.

The sum of the above-enumerated economic incentive funds together with the payroll fund comprises the enterprise's cost-accountability income—the principal source of its production and social development and payroll. This income is fully at the disposal of enterprises, is used by them independently, and cannot be taken from them or redistributed.

Standard rates for determining each of the economic incentive funds are calculated by enterprises independently on the basis of a specially devised method. We shall examine this with the example of calculation of material incentive funding standard rate.

First of all one determines the total amount of money being channeled into this fund in conformity with five-year plan calculations. The planned-profitable enterprise material incentive funding standard amount is determined by dividing the amount contributed to it in conformity with five-year plan calculations by the amount of profit remaining at the enterprise's disposal. Standard contributions to the corresponding fund are averaged by years of the five-year plan in order to ensure stability of planned-profitable enterprise operating conditions. For this, the total amount of the material incentive fund for all years of the five-year plan is divided by the amount of profit remaining at the enterprise's disposal for this same period.

In addition to the basic indices examined above, certain other indices must also be determined when organizing full economic accountability: contributions to social insurance, balance of unrealized revenues, expenditures and losses, and enterprise financial reserve.

The success of Air Forces aircraft overhaul enterprise and scientific research establishment operations in conditions of transition to full economic accountability and self-financing depends in large measure on the degree of completeness and accuracy of performed calculations.

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Advantages of Tactical Inventiveness Emphasized

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[Article, published under the heading "For a High Degree of Combat Readiness," by Military Pilot 1st Class Maj V. Shcherbina: "A Tactical Concept Requires Creative Thinking"]

[Text] Squadron commander Maj Yu. Nikitin felt that the exercise director had made a mistake: the mission he had been assigned was obviously impossible. But he should not be in an excessive hurry to present his case. His doubts should be well bolstered by argument, not by feelings but by precise calculation. A few minutes later the squadron commander turned to the higher commander: "Calculations indicate that the mission assigned to the squadron is unrealistic. The standard force required to achieve the specified degree of damage to the target leaves nothing to combat air defense assets. But without that we shall not make it through to the targets."

The tactical air exercise director replied calmly and explicitly: "No mistakes were made in stating the mission. Actual combat may not conform to standards. Think about it. Find a solution. You have been given more time to prepare for the mission than specified by standards. There is a reason for this. The mission is indeed not an easy one."

Major Nikitin informed his men about the mission and asked: "What are we going to do?"

"An interesting problem.... We can't avoid 'mixing it up' with air defense. But that will require so much of our force that there will be nobody left to attack the target," executive officer Maj V. Zolotov expressed his opinion on the situation in which they would be "fighting."

"A persuasive conclusion, but unacceptable. The target must be destroyed. It may even be logical to proceed from other considerations, but not logical to us. In a tactical air exercise, just as in war, there is only one logic—the logic of the mission," stated the squadron commander, as if removing all doubt. "This applies to us as well."

"We must come up with an unconventional move," mused subunit deputy commander for political affairs Maj V. Makarov.

The pilots turned toward him. Their commissar had recently returned from Afghanistan, and for this reason, alongside personal prestige and respect, the political worker possessed a good deal of combat experience.

"I am entirely in agreement," the squadron commander said in support of the deputy commander for political affairs.

"So all we have to do is find that unconventional move," commented the executive officer with some irony.

"We already have an idea in a most general form," said Makarov. "Since our forces are just about sufficient to destroy the primary target, we are going to have to ignore air defense. Let's work out a strike plan which allows us to reach the target without exchanging fire with air defense."

Major Makarov quickly sketched out a rough diagram of penetration to the target.

The general plan consisted essentially in giving the "adversary" a false impression that the subunit's combat interest was focused on another area. They would deliberately fly a route which would merely brush the air defense radar detection zone. Then, moving out of the radar-covered area, they would proceed in a different direction. They would then break up the squadron into three force elements, which would disperse along different routes. A few minutes later they would simultaneously reach the "battle" area.

Intensive jamming was to be used, independently but on a rigorously coordinated basis, in order to penetrate air defense. Up to the moment of attack they would observe complete radio silence. In addition, they would approach the target at low level and at maximum speed.

Additional protective effect was also expected from hitting simultaneously from three directions. It would not only be difficult for air defense forces to provide target designation, but also, with swingarounds and additional attack runs, when crossing of flight paths of the strike elements and their secondary maneuvering

sectors was inevitable, the "enemy" would encounter the necessity of constantly retargeting.

The pilots calculated a strike model under the guidance of the squadron commander, with active organizational work by the deputy commander for political affairs.

The executive officer, at his own initiative, drew up a special radio communications table, which was used as a means of adjusting tactical coordination among the force elements and as an additional guarantee of safety during maneuvering in limited airspace.

The subunit navigation officer, in addition to traditional navigation calculations, worked up a detailed external visual scan procedure. On the forthcoming mission it would play not only the role of attack coordination element but would also promote mutual safety.

...It was a difficult mission. Everything depended on a high degree of pilot professionalism. Precision flight by all force elements along their designated routes, simultaneous approach to the target, precise coordination, and accurate fire on each target pass demanded skill, tenacity, and a strong sense of responsibility. But their intensive efforts were rewarded: they fully accomplished the tactical air exercise mission.

Here is another example. A fighter element led by Lt Col I. Potashov was about to engage in air-to-air "combat," the third such engagement in the course of the exercise. On the first two sorties they had succeeded in very effectively utilizing the actions of decoy elements.

A reliable, tested and proven trap. Nevertheless just before the final sortie the squadron commander felt somewhat nervous.

"We were successful once, twice.... It can't go on indefinitely," Potashov thought to himself as he was about to give the final briefing on execution of the overall mission and the specific missions of the tactical elements.

A solution seemed to come immediately. Or, more correctly put, a change in the mission plan. He immediately reported to the regimental commander. The latter approved: "Go ahead and do it that way. Repeating the same tactic could be costly indeed."

It took a few minutes to brief the pilots on the new plan. After a short final briefing he quickly ran through the mission with the tactical control officers. Finally they were departure-ready.

After takeoff the strike element formed up as the first wave, while the decoy element took up the position usually designated to the strike elements. The plan was as follows. The "enemy" would assign a small portion of his forces to the element flying out ahead, and would concentrate the main attack on the trailing element (taking it to be the strike element).

The "enemy" took the bait. He sent only a single two-ship element against the strike force proper, while several flights headed out to intercept the trailing element.

The phony "decoys" designated one two-ship element to "engage." The rest of the strike-element pilots descended to low level and, having been briefed on the planned feint maneuver by the actual decoy force, ended up in an ideal position to hit the "enemy" in the flank. The engagement was brief and devastating. The most important thing, however, was that Lieutenant Colonel Potashov's squadron sustained no losses. They received a mark of excellent on the exercise.

What do the above incidents tell us? I believe they tell us first and foremost that tactical risk is valuable in combat.

Let us imagine for a moment that Major Nikitin's subunit would ignore hostile air defense from one mission to the next in an actual combat situation. Would there be many such bold missions flown? Not likely. But here an unconventional move was employed which ran contrary to normal procedure. It was this which ensured accomplishment of a mission which could not be accomplished with standard procedures: they did not have enough forces available. This means that reasonable risk can multiply available resources. Everything depends on accuracy of calculation and the pilots' flying skill.

But what would have happened if the "enemy" had figured out Lieutenant Colonel Potashov's plan? And if he had deliberately given the appearance of taking the trailing element to be the strike element? At best heavy fighting would have erupted, in which victory would have depended to a considerable degree on chance and blind coincidence of particular circumstances. And if we consider the stress caused by the failed stratagem, the "adversary" would have a psychological advantage.

But the stratagem succeeded. The risk proved justified. Because it had been precisely calculated: the "adversary" had become accustomed to a specific pattern of actions. It was precisely the unexpected change in logic of behavior in "combat" which resulted in success.

Herein surely lies the art of the commander, to be able to put himself in the adversary's place, to enter his pattern of tactical thinking, and abruptly to propose an unforeseen plan of battle. And this must be done with precision, fitting it to a specific sortie.

There is one other thing we frequently forget. When one is considering tactics, for some reason it always seems that better has to mean more complicated and more dangerous. I feel that tactics is a domain of essentially simple devices which are difficult to figure out in their details and particularities. And there is probably nothing higher for a commander planning combat operations and leading men into combat than a well-developed sense of measure and harmony, between the complexity of a plan and its practical feasibility.

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Air Force Base Women's Council Functions, Activities Described

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[Article, published under the heading "Implementing the Decisions of the 19th All-Union CPSU Conference," by Maj (Res) V. Trifonov: "What Can a Women's Council Accomplish?"]

[Text] You wouldn't call it a remote air force base. It is quite a distance, however, to the nearest rayon administrative seat, and transportation is irregular. The base does not yet have its own school or kindergarten. There are certain difficulties regarding housing and finding jobs for the wives of military personnel, although the command element and party organization are taking steps to speed up construction of housing and provide suitable services and amenities at the base.

The women's councils of the units stationed here take active part in handling life's daily problems and in forming an objective attitude on the part Air Force personnel and the members of their families toward deficiencies. Noting this fact, officer-political worker V. Telegin, other military personnel, the members of their families, and everybody with whom I spoke expressed satisfaction with the fact that recently the activities of the women's councils have become more purposeful, specific, and closely linked to the daily life and activities of the units, their training and indoctrination tasks, and with the concerns and needs of the men's families. Examples convince one that this is indeed the case.

In the squadron under the command of Lt Col V. Kupryshkin, there had been a substantial turnover of flight and ground personnel within a short period of time. Training tasks remained complex and critically important. Successful accomplishment of these tasks would determine in large measure how quickly they would succeed in achieving smooth coordination among aircrews and flights and cohesiveness and unity within the unit, which contains so many new men.

In order to become acquainted and to get to know one another better, the women's council suggested organizing a group excursion to a recreation area on the next day off and took upon itself the bulk of the burden of making plans and preparations. The goal which party member-supervisors and the women's council had set for themselves was achieved. This was followed by other interesting activities, which helped draw the wives of officers and warrant officers into the sociopolitical and cultural affairs of the squadron and regiment and helped the families of newly-arrived military personnel become adapted to the new conditions. All this greatly helped unify the collective and, as a result, helped achieve successful accomplishment of assigned tasks and adopted socialist pledges.

Engaging in a campaign aimed at firmly establishing sobriety in the garrison, the command element and party organizations of the units and subunits were counting on the assistance of the women's councils. And their hopes were not in vain. Declaring war on boredom, red tape, and time spent on useless diversion, the women set to work in a persistent manner and with initiative. They began holding "Ogonek" [name of popular magazine] and discotheque entertainments at the officers' club and canteen, as well as special-topic evening activities and amateur talent performances. The anti-alcohol film lecture organization stepped up its activities. Group excursions to theaters, museums, and the circus are being held more frequently.

In spite of the fact that, following the example of the women activists, the officers' club council now has a good deal more to do, its chairman, Capt V. Andreyuk, is pleased: people have shown an interest in culture and art. These include individuals who in the past preferred to brighten up their leisure hours with carousing. In the past year, according to the garrison command element, they have succeeded in achieving substantial improvement in the moral-ethical climate and in strengthening military discipline. The women's council activists unquestionably deserve some of the credit for this.

It is a well-known fact that the atmosphere in the family and attitude of Air Force personnel toward their job is appreciably affected by the wife's employment. Up until recently the wives of military personnel took whatever job they could get. But some wives, for various reasons, cannot commute dozens of kilometers to work, while others have small children.

The women's council, gaining the support of the command element, local party and soviet agencies, and management at a number of enterprises, found a partial solution to this problem by arranging for women to work at home. There is currently operating in the garrison an entire in-the-home operation involving the making of knitwear items, attractive embroidery, and certain other articles.

"It is very convenient," commented Svetlana Ivanyushina, as she briefed me on organization of at-home work. "The children are under supervision, and the wife has employment. And also from the standpoint of morale, you feel useful to society."

A mass-production commission, mass-cultural commission, and a commission on work with children work on implementing the plans and decisions of the women's council. The last-named commission is perhaps the busiest. The school is located off base, and the children's grades and conduct are of concern to all parents, and not only to the parents. For this reason the women's council works in close contact with the teachers, particularly since they include wives of officers and warrant officers from the air force base. Constant monitoring of the children's studies and purposeful indoctrination of the

children are combined with their active involvement in school and garrison volunteer, cultural and sports activities.

Air Force officers take active part in educational activities for the children. They head the marksmanship and chess-checkers sections as well as the photography club, give lessons at school on courage, lectures on the flying profession and on the lofty duty of defender of the homeland, and talk on the heroism displayed by military personnel in the course of rendering internationalist assistance to the people of Afghanistan. The women's council in turn arranges for the members of the families of military personnel to visit the airfield, where they see their husbands and fathers at work. And this helps them gain a better understanding of the complexity of work in the military and the need for constant concern with the off-duty activities, rest and recreation of Air Force personnel.

The women's councils are also displaying increasingly more persistence and initiative in matters pertaining to daily life. For example, the range of services offered to people living on the air force base is constantly growing. Many families are now taking advantage of a rental service. Those household items which are not immediately available can be ordered and obtained within a week's time.

The opinion of the women's council is also heeded when assigning housing. A representative of the base women's council now sits on the housing board. The wives of military personnel are also concerned with conscientious maintenance and proper treatment of housing. When the cold season sets in they regularly organize tours of inspection to determine how well the buildings and apartments retain heat and how economically electricity is being used, as well as checking the condition of heating systems and water supply. The results of these tours of inspection are publicized in the wall newspaper put out by the women's council, BOYEVAYA PODRUGA [Service Wife].

Nevertheless many problems pertaining to the organizational and educational work of the women's councils are not being resolved at the base as the command element and the women would like.

The separate airfield technical support battalion women's council is rightly considered to be the best women's council at the present time. On the other hand the regimental women's council, a much larger group and with greater organizational and innovation capabilities, is unable to regain its past fame. What is the reason for this?

"It is a matter of personnel, specifically the women's council leadership," states officer V. Telegin. "Several years ago the women's council was more active. The pace was set by its chairman, Podshivalova. She endeavored to follow every matter through to the end. And she had good assistants: Belova, Petrova, and others. But then

Podshivalova left the base, as did several other women's council activists, and things started to decline...."

It would appear that the Air Force regiment's leader-Communists, following the concerned and persistent G. Podshivalova, at times have been not at all unhappy with the inactivity on the part of the new leadership of the women's council. Even timid signs of initiative have failed to evoke support on the part of the command element, political workers, and chiefs of the various services. The women's council suggested setting up a children's playground, for example. The command element promised to help, but word has not yet been translated into deed. The women organized a health group. And all they asked was for the regimental physical training officer and regimental flight surgeon to give them methodological assistance in determining individual exercise routines. Unfortunately the request has been ignored.

The women whom I interviewed cited many such examples. And some of them asked that their names not be mentioned, so that criticism directed at the women's councils and command element not affect their relations with the other women as well as... their husbands' career. I would think that this fact should ring a warning bell for command personnel, political workers, and party activists, for if people are afraid to speak the truth right out, this means that the atmosphere on the base does not foster frankness or commitment by people to improve things—restructuring of the activities of the women's councils, and not just these organizations.

I believe it is time to get moving and get the base women's council functioning more smoothly. It was emphasized at the 19th All-Union CPSU Conference that the role of public organizations, including women's organizations, is increasing significantly today. This is confirmed by practical realities.

As I was interviewing Lyudmila Viktorovna Besprozvanaya, I asked her what she considers to be the functions of a women's council and what changes should be made above all else.

"First of all," she replied, "we need our own, permanently-assigned offices. We need a public women's organization headquarters, where we could gather, discuss important issues, and hammer out solutions. Women could come here at whatever hour was convenient for them and present to the women's council member on duty a request, complaint, or suggestion. The garrison's moral-ethical atmosphere and people's mood should be determined not by rumors and tales of gossipmongers but rather by reliable information, firm statement by the command element and the collective opinion of the women's council."

The women's council also would dearly like to establish a volunteer women's club with its own council and body of activists. Possible activities would include a number of educational and informational tasks. For example, one meeting of the women's club could be devoted to

working with children, another could be devoted to young families, and still another could be dedicated to newly-arrived families....

Focusing of attention on resolution of issues to which the majority of women are committed is seen as one of the main conditions for effectiveness of the garrison women's council and increasing its prestige. For example, at the present time there is no kindergarten or nursery school; they could organize assistance to young mothers in caring for their children. Qualitatively new approaches are also needed in resolving problems of improving mass-political, cultural and sports activities as well as living conditions, services and amenities.

The garrison women's council is capable of accomplishing these things. And if words are followed by deeds, and if a lip-service attitude and a flood of red tape does not block the view of actual people with their needs and concerns, all plans and dreams will without question come to fruition, for an active, militant women's council operating in close contact with the command element, party and public organizations can accomplish a great deal.

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AF Unit Party Organization Nominates People's Deputy Candidate

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[Article by Capt V. Voylovkov: "26 March 1989—Elections to the USSR Supreme Soviet"]

[Text] Election of candidates for USSR people's deputies from the CPSU in party organizations of the units of our garrison was conducted in a vigorous manner. Nine party members spoke at a preelection meeting to present their platforms. We were to select one of the nine candidates.

Following discussion of the candidates' platforms and heated debate on the strong points and deficiencies of each of the candidates, spokesmen for the party organizations expressed their consensus that Maj V. Laptev should be nominated as candidate for people's deputy.

Air Force personnel and their families know Vladimir Vasilyevich and respect him for his genuine warmth, his responsiveness, and his attitude of implacable opposition to everything that hinders restructuring both of personnel training and party work, as well as of all types of garrison operations supporting activities. As head of the unit political section party commission, he firmly and consistently implements party policy directed toward enhancing the role and influence of party organizations through party members working in headquarters, combat, and service subunits on the quality and end results of the military labors of Air Force personnel.

More than 20 years experience of serving in various positions in Air Force units, in Komsomol and party work enables Maj V. Laptev readily to find common ground with every category of military personnel. It is interesting to note that, having begun his career in this unit as an extended-service junior sergeant and parachute instructor, 15 years later he returned to his old regiment as a political worker. But he had not abandoned his hobby, which subsequently became his profession. Airborne instructor Laptev has made more than 350 jumps to date.

The fact that he is not merely a visitor at the airfield during flight operations, exercises, scheduled jump activities or parachute competitions strengthens the prestige of this party commission secretary with Air Force personnel. And this enables him to see and assess party members and party-unaffiliated military personnel on the job and to associate with them other than across the "field" of his office desk. The men know that Laptev is a man of action. This quality played perhaps the decisive role in his nomination as candidate for people's deputy.

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Medical Specialist Discusses ATC Controller Attributes

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[Article, published under the heading "Flight Safety and the Human Factor," by Lt Col Med Serv A. Medenkov: "Air Traffic Control: Problems of Reliability"]

[Text] The editors continue to receive responses to the article by Maj Gen Avn A. Sidorov, entitled "Give Yourself Orders," which appeared in the January issue. Readers are unanimous: it is high time to start solving the problems of flight safety not by rule by administrative fiat, divorced from human psychology, but via the human factor. The author of the following article discusses an important element—readiness for air traffic control—precisely from this position.

In the air traffic control center operations room the telephones are constantly jangling, warning lights flashing, buzzers sounding, and radio callups coming in. Requests and reports prompt terse replies, competent commands, and concise instructions. One is immediately struck by the sense of order prevailing here.

The route charts contain numerous, at first glance chaotic lines extending thousands of kilometers, rigorously subordinated to the tasks of Air Force combat training and the inner logic of a specific flight. This logic is a known quantity both at those points where each flight commences and terminates, and in this operations room, where they understand the logic of all flight routes.

The personnel here know the air situation at every specific moment in time and predict what it should be at any point in the future. This is an essential condition for ensuring air traffic safety.

The room contains a great deal of data display and communications equipment. The traffic aloft is displayed on the surveillance radar screen as target returns, including blips representing individual aircraft. They do not always look as clear and comprehensible as at the present moment. Frequently the screen becomes filled with interference at the most inconvenient moment, and it becomes very difficult to identify the target returns. But even when this happens, the ATC specialist must know the location of aircraft. Based on aircrew reports at the moment of passage of specified en route points, he constructs a picture of and assesses the mutual position of aircraft aloft. Without this he cannot determine in a prompt and timely manner the possibility of aircraft approaching dangerously close to one another and make a correct decision.

Work in air traffic control is one of the most complicated types of professional activity, which requires specialized training, skills in evaluating the air situation, and the ability to make critical decisions in conditions where time is of the essence, when the cost of a mistake is measured in human lives and enormous financial loss.

The specific features of the job place ATC specialists in a particular status. Effectiveness of air traffic control is determined in large measure by their professional competence and ability to make what is sometimes the only correct decision in a conflictive situation. Nevertheless knowledge and professional skills do not always guarantee reliability of actions.

An important role here is played by the ability to function in a stress environment. And this depends in no small degree on the individual psychological features and functional state of the ATC specialists and their preparedness to handle the problems which can arise at any time.

Taking into account individual features and peculiarities and an individual's functional state in order to make him psychologically prepared to control air traffic is a most important task of ATC center commanders and political workers. Doctors and psychologists can assist them greatly in this.

In the final analysis this work helps diminish the probability of erroneous, delayed and less than optimal actions by ATC controllers, helps them maintain self-confidence in various situations, and reduces to a minimum the effect of the element of surprise when the air environment becomes increasingly more complicated.

Otherwise a sudden situation change can evoke uncertainty, hesitation, and can lead to psychophysiological stress and pronounced emotional reactions. And this has a negative effect on the outcome of events aloft.

...An ATC controller peers at the radar screen. It is almost time for an aircraft to be handed off as it enters the center's airspace. It is necessary to know precisely which blip on the screen represents that particular aircraft. Sometimes a flight is not monitored by ATC radar. In such a case the ATC controller determines the aircraft's current position from calculations and pilot en route reports. Effectiveness of air traffic control is determined by how accurately his picture of the air situation corresponds to actuality.

What blip on the screen represents the aircraft which is entering the center's airspace? As a rule precise control handoff time is determined by landline. If there is any question about whether the aircraft's position agrees with the flight plan, the controller can call the aircraft by radio. A call comes in: "Bogatyy [center's callsign]! This is 32715. Over!"

"32715, this is Bogatyy."

"32715 requests enter your airspace at 42 minutes at flight level 9100.... Acknowledge."

"32715 is cleared to enter center airspace at flight level 9100."

There was practically no pause between request and clearance. The ATC controller gave his callsign, followed by clearance to enter center airspace and flight level. His professional and psychological preparedness to control an aircraft was manifested in this.

This is the way it goes when an ATC controller has precise knowledge of the airspace utilization plan, knows aircraft handoff time, has a clear picture of the traffic situation in center airspace and the traffic situation change trend. Precisely these qualities distinguish officers A. Ziborov and V. Samakin, for example. They are effective air traffic controllers and make prompt decisions when a problem arises. But not all the controllers work as effectively. Another aircraft is just calling in: "Bogatyy, this is 35020. Over!"

But there is no reply, because the controller is hastily reading the flight plan information for the aircraft with callsign 35020. The callup is repeated: "Bogatyy! This is 35020, over!"

Now there is a response: "35020, this is Bogatyy."

Radio communication has been established, but with a delay, indicating that the ATC controller was not prepared for the call.

Could this be an erroneous conclusion? The pilot then makes a clearance request: "Request enter your airspace, flight level 9100...."

And the cautious reply: "Stand by!"

Thus we see that the ATC controller was indeed unprepared for the call. He did not have a clear picture of the flight plan and the current traffic picture, and he needed

time to determine how things stood along the route of the aircraft which was entering center airspace.

An air traffic controller's psychological reliability depends in large measure on those who interact with him during his duty shift. A call came in, with heavy static: "...Request enter... 9600..."

"Say again your callsign!"

"This is 15102. Request...."

What is the problem? Why has the radio communication dragged on? It seems that the crew was not sure that its callsign had been understood. Having failed to receive ATC acknowledgement of radio contact, the pilot proceeded to request clearance and ...failed to receive it. An ATC controller must know precisely to whom he is giving clearance to enter center airspace and specifying flight level. Mistakes cannot be tolerated here.

Various factors affect quality of air traffic control. When scheduling airspace utilization, these factors must be considered. A person's ability to process, remember, and subsequently to utilize information is not unlimited. Depending on level of automation and ATC data support, a center controller is capable, for example, of reliably controlling several aircraft at the same time. This number decreases, however, if he has lost skills or if his functional state deteriorates in the course of his duty shift.

When he has not worked ATC for a while or when he is working a new sector, even an experienced air traffic controller is hard put to handle six aircraft simultaneously. It is also hard to handle aircraft if their routes differ substantially from customary routings and are characterized by variable profile, intersecting airways and terminal airspace.

It has been determined that a person's work efficiency varies depending on degree of fatigue as well as in connection with daily cycle of dynamics of functional state. Extended periods of low level of work activity also tend to diminish reliability.

It is a known fact that not all persons have a well-developed ability to think in graphic images and simultaneously to see the entire situation and separate situation elements. In order to control air traffic reliably, one must be able to picture the mutual position of aircraft aloft and construct air traffic prediction plots. These professionally important qualities are developed by practice and drill, but to a minor degree. He who does not possess these qualities evaluates the air traffic situation by sequentially determining the position of different aircraft, frequently updating their position coordinates. We are dealing here with an individual work style, which requires special means of displaying the air traffic situation. This should also be taken into consideration when drafting air traffic control procedures and work algorithms. Otherwise the discrepancy between the generally utilized technical means and the individual

work style of persons with an inadequately developed capability of graphic representational thinking can cause erroneous and untimely actions. This is why it is advisable to select ATC controllers on the basis of graphic representational thinking ability.

A picture is formed of the air traffic situation aloft as a result of perceiving information from the radar display, analysis of flight plan and navigation calculations, comparison of time of aircraft entry into airspace and establishment of radio contact with the current time, precise location and altitude determination, actual and forecast weather. And the ATC controller continuously monitors his own actions in order to ensure that flight safety is guaranteed.

But what about the following?

"35102, this is Bogatyy!"

"Bogatyy, this is 35102, over."

"35102, this is Bogatyy. After passing... descend to flight level 8600."

The controller, analyzing the situation, noted that the time interval at the point of intersection of the assigned routes of two aircraft flying at the same altitude was less than prescribed by regulations. Quickly assessing the situation, he made the decision to separate the aircraft by assigning one to a different flight level. This is what being psychologically prepared for an emergency situation means.

If the air traffic situation gradually becomes more complex and there is sufficient time for decision-making, the center controllers make a thorough analysis of the traffic situation. But many times this is not the case. A circumstance which complicates the air traffic situation, figuratively speaking, bursts into the ATC operations room without warning. And in conditions where time is of the essence, psychological preparedness is manifested in the ability to "snatch" the standard aspect of the situation on the basis of available information and to select a reasonable solution.

A number of important points follow from this. Air traffic controllers must first of all learn correctly to analyze and evaluate an air traffic situation from its elements. It is also essential to devise an algorithm for selecting a reasonable solution on the basis of possible means, ways and methods of accomplishing it. Persons who easily become confused in an emergency situation and who are predisposed to uncontrolled emotions should not be allowed to handle air traffic control.

It is not always possible to model conflict situations in the process of air traffic control. Nor can one form preparedness solely on the basis of classes on theory. For this reason it is necessary to develop in ATC controllers a psychological preparedness to function in emergency situations by means of specific-purpose practice drills on specialized controller position simulators and modules. Materials derived from periodic analysis of recorded

radio communications with aircrews, especially when in-flight emergencies occur, can serve as a basis for theoretical critique and analysis.

One should bear in mind that psychological preparedness, which is a characteristic of a person's functional state, diminishes as a result of limitation of the system's adaptive capabilities due to illness. Therefore the medical check prior to going on duty should be rigorous, and the air traffic controller's work and rest regimen should be as efficient and well-conceived as possible.

Studies show that chronic illnesses have differing effect on air traffic control performance. Deterioration of hearing, visual acuity, and speech defects are potential causes of erroneous actions. A number of ailments (high blood pressure, for example) cause premature fatigue on the job and lead to diminished alertness and a state of monotony. Persons with such ailments should not work as air traffic controllers.

One of the directions being taken in achieving further automation of air traffic control is the timely identification and prevention of conflict situations and prompt, flexible development of a 24-hour airspace utilization schedule. It is essential to enable ATC controllers to predict events in the air during the scheduling stage. In addition, it is advisable to automate the process of aircraft identification and determination of situations requiring intervention or heightened attention by duty controllers.

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Using Computers In Personnel Assessment, Preparing Efficiency Reports

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[Article, published under the heading "Military Educational Institution Affairs," by Maj Gen Avn G. Molokanov, professor and doctor of Technical Sciences: "Computer Evaluates Man?"]

[Text] A good, promising officer.... What does this term mean, and how much time is required for a superior adequately to assess his subordinate? And how does one handle an officer if he has just reported to the unit on reassignment and his new commanding officer has only his personnel record and efficiency report?

Of course there is a simple and flawless answer to this question: time will tell. But can this be considered suitable for all occasions? For example, fresh service school graduates have reported to the unit. They must be broken in, paired with a senior comrade, and assigned to flight and technical elements. The wise principle of "time will tell" is not really so wise in this context.

Consequently there is just one answer: study personnel assessments and efficiency reports in detail. We read, we

study.... One officer is "persistent, purposeful, truthful." Another is "strong of will, high-principled, with self control." Can one compare these officers and reach a conclusion on the uniqueness of the personality of each man by examining such assessments?

The idea of using a computer in the preparation of efficiency reports was born at our faculty in connection with two things. Several researchers have been working on this problem for several years now, on their own initiative. Even the very first results produced exceptionally interesting material and such a strong social effect that those who have become accustomed to determining the future career of their subordinates with an authoritative sweep of the pen: "Appoint," or "take no action," or "inadvisable"—found it very difficult to "digest" this.

We faculty administrators and educators have long been troubled by a certain strange thing. Frequently graduates of ours who, according to our prognosis, are very promising officers get stuck for a long period of time in a line-unit position and, after graduating from the academy, make their way up only one or two career advancement levels and then remain stuck there for the rest of their careers.

Of course this does not constitute a tragedy, but does our common cause benefit with this handling of personnel matters? The opposite has also occurred. An officer with extremely modest abilities does not walk but literally flies up the military career ladder.

What is going on here? Can an officer make such a sudden and abrupt change in his person after graduating from service school? For three years he was lazy, passive, sluggish, and without initiative, and then suddenly, outstripping the vanguard officers with ratings of excellent, he rises to increasingly more important command assignments, which demand a strong and diversified set of general military and job-related qualities.

We therefore came to the conclusion that there is a need to give serious thought to the objectivity of evaluating the traits and qualities of our students, and correspondingly those personnel assessments and efficiency reports which we prepare and which they take with them when they leave us to embark upon that important and difficult officer career.

It was at this point that we also gave thought to the question: what does it mean to be a good officer? We gradually arrived at a conclusion: it is essential to devise a scientifically substantiated set of those "elementary qualities" which "make up" the human functional unit. Following a persistent collective search, sharp debates, presentation and refutation of a great many arguments, 60 particular individual characteristics which must mandatorily be evaluated remained in the list of these qualities.

But we were unable to stop at this. Gradually another conviction formed and strengthened: one and the same officer may be characterized by a differing degree of

development of a given mandatory quality. For example, an individual can have extremely strong willpower, very strong willpower, strong willpower, insufficient willpower, or no willpower. As a result of subsequent study we reached agreement that it is necessary to consider a gradation of development of each of the 60 characteristics. The best procedure is to introduce six levels for each of a subject's 60 character and personality traits.

It seemed that superior officers and instructors had finally been given a decent guide for studying and forming "images" of their subordinates. Initial attempts at actual preparation of an efficiency report indicated, however, that subjectivity had not been eliminated and that personal likings, antipathies, and the pleasant or unpleasant experience of personal relations were getting into the scientifically substantiated process.

A solution was found in employing a method of expert evaluation. We feel that objectivity is assured (apparently maximum objectivity) if individuals who look at a person from different positions take part in writing personnel assessments and efficiency reports.

These persons would include, for example, the class supervisor, the training squad commander, the tactical supervisor, the party organization secretary, and one of the members of the training group party bureau. We feel that such a makeup of experts ensures maximum objectivity and independence of random factors.

Thus we now had at our disposal a "dictionary of evaluation characteristics," consisting of 60 specific character and personality traits, each with six gradations.

I shall cite several examples, so that the reader can have a clear picture of what we are talking about. Our "Dictionary" contains the characteristic "Combination of societal and personal interests." The levels of development of this quality are as follows: always places interests of society above personal; places interests of society above personal; as a rule places interests of society above personal; sometimes places personal interests above interests of society; as a rule places personal interests above interests of society; always places personal interests above interests of society.

Or take another characteristic: "Attitude toward studies." Here we have the following gradations: extremely conscientious in his studies, displays solid, thorough knowledge of the studied material, an excellent student; conscientious in his studies, displays consistent, good knowledge of the material; selective attitude toward his studies, devotes attention only to those subjects which he considers essential for duties in line units; has a conscientious attitude toward studies, but has not achieved particular success as a consequence of poor overall preparation in theory; while possessing a high level of overall preparation in theory, he has not shown diligence in his studies; he is indifferent toward his studies, does not particularly apply himself, does not work at full effort.

It would seem that right at the outset we must make one important comment. In preparing our "Dictionary" we were proceeding not from what pleases or displeases us but rather from those qualities and gradations which directly influence a person's job performance and its end results.

We shall not discuss the methodological details of computer-processing evaluation materials, not due to the complexity of the process itself (there are no particular mathematical complexities or secrets in our method), but rather due to the purely specialized directional thrust of this aspect of things. Of course people who deal with the mathematical aspects of personnel evaluation should possess a consummate mastery of "machine technology." For the experts, however, that is, those officers who take part in preparing personnel assessment and efficiency report texts, it is sufficient to understand the basic idea of using computers. The main thing for this group is to learn to utilize the "Dictionary" and to seek to achieve maximum objectivity.

It appears one should also consider three additional "secrets" of group work on personnel assessments and efficiency reports. First of all, if a very contradictory averaged text is produced (computer processing of the input materials obtained from the experts consists in averaging the gradations of each quality of the subject officer), it is best to reject the final product and to repeat the evaluation process with a different group of experts. There is always the possibility that the second version will also be unacceptable. If this occurs, the subject officer should be carefully scrutinized in order to determine whether his character and personality are extremely contradictory. This may not necessarily be a bad thing, for contradictoriness may become a source for further improvement. In any case such an officer must be approached in a highly individualized manner. Perhaps a third reevaluation should be performed, with a new group of experts, or perhaps a special discussion should be held with the experts on the need for particular objectivity in this unusual human situation.

A second "secret" is also important. Practical experience indicates that many officers, given the status of experts who determine the future of a comrade, and fearing to be subjective, tone their assessments too much to the average. I believe personnel should be warned against this. It is necessary to be impartial but not indifferent, truthful but not cold, sincere but not totally disinvolved.

And, finally, the main "secret." The text of a personal assessment or efficiency report is in the final analysis approved by the commanding officer. We feel that he also has the final choice, the determining vote, and the final authority. The commanding officer can approve a "computer" evaluation, can add to or rewrite the entire text, totally ignoring what the computer has produced.

Incidentally, it is necessary to be clearly aware that the computer does not actually place a single item in the text but merely impartially processes that which has been

selected by the experts from the "Dictionary," which of course was not created by a machine. And processing does not mean averaging. Nothing of the sort! No neutralization occurs, because if the experts disagree by two or more gradations on the same quality, the computer "refuses" to process the material, or it specifically "announces" that the experts are in considerable disagreement. The response depends on the program being run, that is, is once again subject to human volition.

What can be said about the first practical experience of using computers in personnel performance evaluation? Clear advantages of the expert method of evaluation were determined: greater objectivity in comparison with the traditional approach; improved level of comprehensiveness of assessment of an officer; consideration of the opinion of a large number of persons with whom the subject interacts in various areas of his daily life; enhancement of the role and responsibility of the collective in evaluation, selection, and placement of officer cadres. This strengthens the indoctrinational effect both of the process and of the results of personnel evaluation, promotes greater openness and a healthier moral-psychological climate in military collectives, as well as fostering democratization of relations in the Armed Forces.

There are also additional confirmations of the usefulness of the work that has been done. For example, all students have copied into their "precious" notebooks the entire "Dictionary of Evaluation Characteristics" with all gradations for each quality. Many officers have made the statement, gratifying to the method developers, that finally they have precise points of reference to that professional and character ideal toward which one must strive.

Our view is somewhat more moderate. It may not be the ultimate ideal, but we feel that the "Dictionary" can claim the role of a useful beginning. At the very least the question: "Who can be considered a good officer?" has taken on a certain substance of content and semantic specificity.

Does our method have adversaries and problems? Of course it does. And, strange as it may seem, it is the personnel people who show the greatest resistance. Why is it most difficult for them to agree that the personal assessment and efficiency report (and in some measure this represents a person's future career fate) is ceasing to be the product of the will of a single superior.

What is being presented in refutation? The very first criticism is that the process of personnel evaluation has become formalized and that evaluation texts have become uniform. But formalization is not always a bad thing. And when formalization stands in contrast to the traditional "formalism" [excessive attention to form with detriment to content], we are wholeheartedly in favor of strengthening formalization of this kind. Perhaps we should recall that science (and it is science which blazes the trail for practical application) is impossible

without formalization, which is defined (which applies to our computer-assisted personnel evaluation process) as a certain simplification of the object of investigation and extraction of its principal and determining properties from the great wealth of concrete vital manifestations.

It is true that our "computer" evaluations lack flowery expression and verbal maneuvering. But let us carefully read traditional "human" personnel evaluations. Now let us try to draw a conclusion about the subject of the evaluation. Is it a bit difficult? It is much easier to reach a conclusion on the basis of dry "machine" assessments, because an officer's actual qualities are revealed fairly fully and accurately, although in a more unassuming language.

A second objection is that individuality disappears. To this we respond that the commanding officer and any of the experts may add and is obliged to add to the report any additional information about the subject.

The third objection is reminiscent of that traditional question: "And just who do you think you are?" What gives a machine the right to evaluate humans? I believe that it is clear from what we have stated above that people are doing the evaluating, while the computer is merely helping to process the results of their labor. And we can give a single reply to this question. Who—is an entire group of individuals who are familiar with all aspects of the subject officer.

Apparently the main reason for the objections raised by the personnel people lies in loss of the monopoly power to determine an officer's future, following the principle of "cadres determine everything." With this arrangement officer cadres pass from the hands of their job and daily life into the hands of two or three individuals who, frequently knowing nothing about the officer, make all the decisions both for him and frequently for his superiors as well.

The tasks which today face the entire Soviet people and the Armed Forces are so important as regards newness and complexity that, while not denying or negating anything from the vast amount of positive experience and know-how acquired in past efforts, it is nevertheless necessary to reevaluate, reexamine, and improve a great deal. I am convinced that restoration of objectivity of approach to all things, and to people in particular, while not promising to solve all the problems which have amassed, will help promote achieved success in our overall efforts.

And for this reason there is hope that our search for a solution to a specific problem is not in vain, that it will get the attention of those who are involved in such a difficult reality as the human factor.

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Hip Pilot Extracts Wounded Troops in Afghanistan

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[Article, published under the heading "Problems of Development of Young Officers," by Maj V. Zdanyuk: "Beyond the Boundaries of the Possible"]

[Text] The two-ship element led by section commander Capt Ye. Smirnov was assigned a routine mission: fly a group of officers over from Kabul.

After climbing to a safe altitude, the helicopters turned to their en-route heading. The Jalalabad highway snaked along down below them, villages and vineyards stretching along the road. Mountain ridges glowered darkly far off on the horizon, white cloud masses piling skyward above the peaks.

The rebels had built strong fortifications in this area, with the help of foreign instructors. Hostile weapons covered every gorge, the roads and trails were sown with mines, and weapon positions were sited on the mountaintops.

The helicopters arrived at the destination on schedule. Smirnov and his wingman discharged their passengers and took off. Just as at Kabul, they had to climb out to altitude by spiraling above the landing area. Otherwise they might take a round or a surface-to-air missile hit. After completing two 360 degree turns in their spiraling climbout, they received radioed instructions from the command post to pick up wounded air assault troops on the way back to their home field.

"Roger," Smirnov calmly replied. "Instruct the assault troops to mark the landing site with smoke."

He glanced over at copilot-navigator Sr Lt Popik and crew chief Lieutenant Gorshkov. Both had heard the radio conversation. Did they realize the difficulty of this new mission? They would have to find the landing area in the Black Mountains and land under fire.... This was the first time Gorshkov and Popik and flown with the section commander. Both were newcomers to Afghanistan. Sasha Gorshkov had yet to smell his first whiff of gunpowder, so to speak. He had recently conversion-trained over to what was for him a new helicopter. The veteran officers had taken the young lieutenant under their wing and were looking out for him. But the section commander's crew chief had taken ill, and they had replaced him with Gorshkov.

Captain Smirnov gave his wingman the order to commence descent. It would not do to fly high as they approached the extraction site—they would immediately make a good target for the mujahideen marksmen. They could get through only by flying low down the gorge, exploiting the element of surprise and using their flying skills.

Huge rocks flashed by dangerously close. The rotor blades were churning the rarefied air over the high-elevation mountain terrain quite close to the darkly-looming sheer rock faces. The wingman's helicopter flitted after Smirnov like a shadow.

As he was emerging from the gorge, Smirnov did a "pop-up"—climbing about 150 meters. He immediately spotted smoke up ahead on the mountainslope. The assault troops were marking their location.

"Cover me," he tersely instructed his wingman and headed swiftly toward the area adjacent to the cloud of smoke.

The pilot was able to put all three wheels down. The commander of the air assault element ran up, out of breath. He was waving his arms and trying to tell them something. Due to the engine noise Yevgeniy could not understand what he was shouting about. Lieutenant Gorshkov jumped down onto the ground in order to hear what the air assault element commander was saying. It seems that they had not yet made it to the landing site with the two seriously-wounded troops. They were about a kilometer away, on the mountainside.

Smirnov lifted off. Barely had the helicopter risen above the ridge when the chatter of machineguns commenced. Smirnov dipped groundward again. From the low height it was difficult to select a new landing site, but he went ahead and took the chance. He nudged the craft toward a small piece of bare ground surrounded by rocks. He was only able to put down his left main and his nose gear. His right main gear remained suspended in the air.

Yevgeniy does not precisely remember how long he held the helicopter in that position. It must have been 10 or 12 minutes. Those minutes seemed an eternity to him. It was incredibly difficult to hold the craft on two wheels in conditions of high-mountain terrain, especially when the troops loading the wounded aboard would step across the cargo cabin and shift the weight and balance. It seemed that at any moment he would lose his grip on the controls and his hand would start shaking.

After the last man was aboard and the door shut, Smirnov swooped downward into the gorge. This is what saved him. This was the only way the pilot could gain the necessary airspeed and avoid hostile fire.

He proceeded to climb out in a spiraling path. It seemed that the greatest danger now lay behind them. They would be heading for Kabul. Smirnov glanced at his instruments. The engines were at maximum power. But something in their mighty roar seemed suspicious. He could hear what sounded like strained notes. Suddenly everything fell silent. The pilot glanced at the tach: both pointers were on zero. Engine failure....

It was as if the helicopter had collided with an invisible wall. It lost airspeed and began settling. Within seconds the heavy craft would plunge groundward. Smirnov quickly set the aircraft up in an autorotation descent,

preventing an uncontrolled drop out of the sky. He reported back to the command post: "Both engines out. Making forced landing."

The pilot assessed the situation. It was about as bad as you could get. Mountains below, and not a square inch of flat ground. Required procedures in such a situation are quite explicit. But he had eight assault troops on board, two of whom were gravely wounded. They had no parachutes. What kind of procedures and regulations could he hide behind if something were to happen to these boys?

"Copilot and crew chief, bail out!" Captain Smirnov ordered.

Senior Lieutenant Popik glanced over at the pilot. Meeting his determined gaze, he jerked hard on the cockpit right side window emergency handle. The copilot-navigator, followed by the crew chief, parachuted to the ground.

Smirnov remained alone in the cockpit. There were eight other hearts beating nervously and hopefully back in the cargo cabin. Yevgeniy became as one with the helicopter. The rotor blades continued to turn from the flow of air up through the rotor system, keeping the craft from stalling and entering a spin.

Suddenly the pilot spotted a flat area on the mountainslope. Should he risk it? There were no rocks, and the rotor blades would not strike the cliff face....

The ground was rapidly approaching. The helicopter had lost practically all forward speed. The pilot wrestled with the controls, maintaining his controlled descent. "Come on, baby, a little more, just a little more, don't let me down," he said to himself. "Just a little more, just a little more...." And the helicopter obeyed. He cleared a pile of talus and was now just a few meters from the prospective landing site.

The helicopter had done its job; now it was up to the pilot. In order to avoid a heavy ground impact, the captain slowed his sink rate. The helicopter froze in the air for a second, and then smoothly settled onto the slope.

Yevgeniy was barely able to speak into the microphone as he reported to the command post: "Have made forced landing in grid square...."

Exhausted, he settled his head onto his seat back and closed his eyes. He was brought back to reality by the voice of the air assault element commander. Standing behind him, the officer asked: "Are you alright, captain? Are you hurt?"

Smirnov smiled. Everything is fine, lad. The worst is behind us. Rejoice at being alive....

He climbed out of the cockpit, walked a few steps away from the helicopter and sat down on a rock. A helicopter was clattering overhead. His wingman was coming in for a landing.

His wingman took the assault troopers aboard, while Captain Smirnov stayed with his helicopter. He took a look around and saw where he had landed. A steep slope, at least 30 degrees. Huge rocks along both sides of the landing site. The only damage to the helicopter was a sheared-off bolt on the left gear, done while landing.

Soon a helicopter delivered maintenance technicians to the site. They worked all night to the light of portable lanterns. By morning the helicopter was ready.

For this courageous deed Military Pilot 1st Class Capt Ye. Smirnov was awarded the Order of the Red Banner.

...We interviewed Captain Smirnov in the pilot lounge shack. He spoke deliberately, weighing every word. His features were soft, relaxed. He did not seem to be any different from anybody else. But there was something special about him. Composure, determination. At a critical moment these qualities were clearly manifested, helping him forget about the danger and enabling him to take upon himself responsibility for the lives of others.

Smirnov was born in the village of Khlebnikovo in the Mari ASSR. In the spring the village smells of birdcherry blossoms, ripe grain in the summer, and apples in the fall. It has been many years since Yevgeniy left his parents' home, and he has traveled a great deal all over the country, but even today these aromas come to him in his dreams and stir his soul....

He became a helicopter pilot following the example of a school chum. He enrolled at the Syzran School on the heels of his friend.

Military service was no bowl of cherries for Smirnov. He was stationed in the Far East for 10 years. A harsh climate and poor living facilities and conditions. He had plenty of experiences. Once he lost tail rotor control during flight. Later, back on the ground, it was ascertained that the flight technician [crew chief] was at fault, having failed to check cable tension following repairs. The cable had become slack and came free....

Smirnov fought to keep the rotorcraft under control. The helicopter refused to turn, insisting on flying straight ahead. Nor was there anyplace to put down: the terrain below was taiga and mountains. The young aircraft commander then hit upon the only solution. He accelerated, and then abruptly cut the power back. This resulted in the helicopter turning slightly in the direction of an airfield. He repeated this process, again turning the heavy helicopter in the desired direction. He landed the aircraft safe and sound at an alternate field.

Captain Smirnov is now stationed in the Red-Banner Belorussian Military District. He is flying with a squadron in which many are acquainted with him from a tour of duty in Afghanistan.

...Helicopter pilots have unexpected encounters. While on TDY Captain Smirnov happened to meet the air assault troops officer who had been in command of the element which had gotten into a mujahideen minefield in the Black Mountains. They recognized each other, embraced, and got to talking. Yevgeniy asked about the lads he had picked up at that time. He was pleased to learn that they were all alive and well.

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Air Support of Armor Forces in World War II

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[Article, published under the heading "Experience Born in Combat," by Col Ye. Tomilin: "Supporting Mobile Task Forces"]

[Text] Extensive employment of tank armies and mechanized cavalry groups as front mobile task forces working in close coordination with air made it possible to achieve considerable strategic results in such major operations as the Korsun-Shevchenkivskiy, Belorussian, Lvov-Sandomierz, Iasi-Kishinev, Vistula-Oder, East Prussian, and Berlin operations by Soviet forces during the Great Patriotic War.

An analysis of combat operations indicates that large tank formations operating 30-80 km separated from the main body of front forces found themselves in a rapidly-changing situation. In these conditions air became virtually the sole means of providing them support and protection against hostile attack from the air and of exerting significant influence on the development of events. During this period from 30 to 40 percent of the forces of air armies were assigned to the tank support role, plus large long-range bomber forces as well in the Orel, Berlin, and other operations.

In support of front mobile task forces, air combined units provided air support, air cover to ground troops, thwarted orderly withdrawal by the enemy, hindered enemy forces from taking up intermediate defensive positions, struck approaching reserves, conducted air reconnaissance, and airlifted supplies to armored forces.

Many factors affected the quality of organization and conduct of combat operations by air forces in support of front mobile task forces. The principal factors included a high rate of advance by forces at operational depth and the complexity of shifting bases and moving air assets.

For example, when a tank army was advancing at a rate of 30-50 km per day or more, supporting air assets frequently were unable to redeploy to new fields, which resulted in diminished reliability of air support. During the Lvov-Sandomierz Operation, for example, air combined units and units were delayed in redeploying assets as the 3rd Guards Tank Army advanced. As a result armor was forced to operate with little fighter cover and

virtually without close support by ground-attack aircraft. When fighting their way across the San River in July 1944, Soviet armor was hit by bombing attacks and sustained losses.

A similar situation developed during the crossing of the Vistula River by combined units of the 1st, 3rd Guards and 4th Tank armies of the First Ukrainian Front on 29 July near Sandomierz. They were provided air cover by only a portion of the forces of the 7th Fighter Corps, which was based 80-120 km from the river.

The command authorities had to take immediate measures. Troops were given the mission of capturing at operational depth enemy airfields and areas of terrain suited for the rapid preparation of airstrips. Reinforced airfield engineer battalions and airfield operations and services units advanced with the tank troops formations for this purpose. The 260th and 663rd airfield operations and services battalions advanced at the heels of forward detachments of the 29th and 3rd Guards Tank Corps, for example, in order to ensure uninterrupted air support for the 5th Guards Tank Army in the Belorussian Operation. In the course of the operation these battalions prepared eight to nine temporary field airstrips each. These measures helped ensure prompt and timely maneuver of air assets, helped bring fighter and ground-attack bases closer to the advancing ground forces, and made it possible to maintain continuity of command and control and precise coordination with armor which was advancing at a rapid pace.

As the effective combat strength of the air armies grew, the percentage of air forces assigned to the mobile task force support role steadily increased. In the counteroffensive at Kursk, for example, a ground-attack division and a fighter division of the 2nd Air Army were assigned to provide close air support and air cover to each of two guards tank armies of the Voronezh Front, the 1st and 5th, while in the Vitebsk-Orsha Operation of the Third Belorussian Front, the 5th Guards Tank Army was provided close air support and air cover by the 1st Guards Bomber Corps, the 3rd Ground-Attack Corps, the 1st Guards Aviation Corps, and the 2nd Fighter Corps. And in the Berlin Operation the 1st Guards Tank Army of the First Belorussian Front was provided air support and air cover by the 9th Ground-Attack and 6th Bomber Corps, the 188th and 221st Bomber and 283rd Fighter divisions.

Air operations in support of mobile task forces were as a rule highly effective. In the Belorussian Operation, for example, during encirclement of enemy forces near Bobruysk and east of Minsk and during maneuver by the 2nd Tank Army of the First Belorussian Front from Deblin down the right bank of the Vistula to the suburbs of Warsaw, with air support the average rate of advance on Praga was as much as 50-70 km per day on some days.

During conduct of combat operations by tank troops at operational depth, engaging approaching enemy reserves was one of air support's principal missions. This mission

would be performed in support of the front's entire forces but, in view of the fact that the tank armies were on the main axes of advance, out of contact with the main body, the enemy's reserves would be focused primarily against these tank armies. Therefore air efforts were directed chiefly at disrupting orderly maneuver, at forcing the Hitlerite command authorities to engage reserves piecemeal, at thwarting concentration of enemy forces in assembly areas, and at inflicting maximum damage. Approaching reserves were engaged most aggressively in the Donbass, Zhitomir-Berdichev, Bereznegovatoye-Snigirevka, Vyborg, Iasi-Kishinev, and Vistula-Oder operations.

Aerial reconnaissance performed an invaluable function during an offensive drive by tank armies and mechanized cavalry groups. At a high rate of advance aerial reconnaissance alone was able to provide the most complete information on the enemy deep in the defense. Reconnaissance aircraft would determine the enemy's defensive system, spot concentration of enemy artillery and troops in the zone of advance of the tank formations and combined units, would determine the presence of reserves and the nature of maneuver by reserves at operational depth, would spot the commencement of withdrawal and observe the withdrawal of enemy forces, would observe the condition and traffic capacity of roads and crossing sites, and would spot weak points along lines of communication. Intelligence obtained by aerial reconnaissance helped study in advance the enemy's artificial and natural antitank obstacles, artillery assets fire plan, and helped in planning maneuver routes in order to bypass difficult terrain and enemy weapon positions.

Pilots flew tactical and operational-level air reconnaissance missions in support of tank armies. Tactical air reconnaissance missions would be flown by air combined unit aircraft assigned to provide armored forces air support and air cover. Operational-level reconnaissance would be conducted according to the air army headquarters air reconnaissance plan, by special reconnaissance aviation subunits. Intelligence would be radioed to the tank army commander's command post. In certain instances reconnaissance aircraft would land in the areas where the armored forces were disposed, and the aircrews would report directly to the command element on the results of the air reconnaissance flight. This made it possible to determine the enemy's intentions in a prompt and timely manner and to make correct decisions.

In the Vistula-Oder Operation, for example, units of the 16th Air Army and 2nd Guards Tank Army thwarted an attempt by retreating enemy troops to cross the Vistula in the Wolka Przybojewska and Wyszogrod sectors. The isolated forces were routed before they were able to withdraw westward and dig in on the Bzura River. A counterattack by the Grossdeutschland Panzer Corps, which had hastily been redeployed from East Prussia to the Lodz area, was also broken up. Under attack by air and armored forces, it was compelled to withdraw with

heavy losses. Air reconnaissance also reported the smashing of large enemy forces at the Rawa Mazowiecka, Strudzianka, and Inowlodz strongpoints, and at river crossings near Skorniewice.

When tank forces were advancing swiftly it was extremely important to supply them by air in a prompt and timely manner, especially during the muddy season. Civil Air Fleet air transport regiments, long-range bomber combined units and air army combined units were enlisted to airlift ammunition, POL, and provisions to armored forces. In the Bereznegovatoye-Snigirevka Offensive Operation by the Second Ukrainian Front, for example, during the spring muddy season in 1944, over a period of 17 days approximately 670 tons of various supplies, primarily ammunition, were airlifted to tank combined units.

The volume of air transport movements was steadily growing. In the Korsun-Shevchenkovskiy Operation the pilots of the 326th Night Bombardment Division of the 2nd Air Army flew 822 sorties between 8 and 16 February, flying Po-2s, airlifting 49 tons of gasoline, 65 tons of ammunition, and 525 rocket projectiles to the 2nd and 6th tank armies, while in the Belorussian Strategic Offensive Operation 1182 tons of fuel, 1240 tons of ammunition, and approximately 1000 tons of accessories and spare parts for armored vehicles were airlifted to mobile forces.

The developing ground and air situation, weather conditions, availability of air assets, and distance to bases directly affected choice of modes of air combat operations in support of front mobile task forces. In those cases where forces would be engaging intermediate defensive positions or crossing rivers, as was the case when the 5th Guards Tank Army was fighting its way across the Berezina during the Belorussian Operation, air combined units would shift to continuous air support. During pursuit of enemy forces, the enemy's troops and combat equipment proceeding along roads would be constantly attacked from the air, usually by small groups of aircraft (Korsun-Shevchenkovskiy, Nikopol-Krivoy Rog, Proskurov-Chernovtsy, and other operations). In some operations (Belorussian, Vistula-Oder) concentrated strikes would periodically be delivered on rail installations, major crossing sites, and troop columns.

In the 1942 operations (Orel, Belgorod-Kharkov and others) tank armies would be provided air cover by CAP fighters, as a rule assigned to zones above the tank army dispositions. Comparatively large forces were assigned to this mission. In the Vistula-Oder Operation, for example, the 2nd Guards Tank Army was provided air cover by a fighter corps and a fighter division. Fighters continuously patrolled above the armor dispositions and over enemy-held territory. Whenever necessary their forces would be augmented by subunits on strip alert.

Coordination between mobile task forces and air would be handled both according to the principle of air support and on the basis of operational subordination of air

combined units and units to tank armies and mechanized cavalry groups for the entire duration of fighting at operational depth. The air support principle remained predominant. Assigned air assets would generally be those air combined units which had already worked with the ground units in previous operations.

In organizing joint activities particular efforts would be devoted to activities involving vectoring, target designation, and mutual recognition and identification of air and mobile ground forces. For example, procedural instructions issued by headquarters of the 214th Ground-Attack Air Division pertaining to coordination between ground-attack aircraft and mobile forces during exploitation of a breakthrough and during fighting at operational depth stated that target designation for and control of supporting air were to be handled via a traffic regulating point and a vectoring, target designation and air combat control station (PNTsUVB). In addition, ground troops were to point toward an airstrike target with arrows laid out with ground panels, with flares and artillery fire (colored smoke rounds).

Detailed plans would be drawn up as a rule for one or two days. Air and tank army efforts would be coordinated by lines, objectives, and missions. Modes of coordination would be spelled out, as well as manner and procedure of calling for air and assignment of air support missions, and mutual recognition and target designation signals would be established. Common prearranged message codes would be prepared in advance, as well as maps with code names assigned to terrain features, symbolic markings easily visible from the air would be painted on tanks and self-propelled artillery, and forward air controllers equipped with communications and target designation gear would be deployed in the tank unit dispositions.

Command and control of air combined units and units would be handled by a tactical command and control team led by the air combined unit commanding officer. The team would be deployed at the tank army command post. In certain cases it would be headed by the air army deputy commander. Aviation corps tactical command and control teams would usually contain from 8 to 10 officers with from 5 to 6 radios, while an air division team would contain from 5 to 7 officers with 2 or 3 radios. Ground-attack aircraft and fighter actions above the battlefield would be directed personally by the commanders of the corresponding combined units. In the operations of the concluding period of the Great Patriotic War, a widespread practice was to provide vectoring of aircraft to targets by guidance officers positioned in the first-echelon brigades and in the forward detachments of armored forces. In certain instances tank radios were used to control supporting aircraft and to assign missions to strike elements aloft.

Thus matters pertaining to organization for and conduct of combat by air combined units in support of mobile forces operating out of contact with the main body of a

front's forces were thoroughly developed and put to the practical test in the Great Patriotic War.

Experience indicated that air efforts were particularly effective if they were conducted in strict conformity with the general plan of a front offensive operation and were precisely coordinated with the actions of armored forces during exploitation of a breakthrough and at operational depth, which helped achieve the end objectives of front offensive operations.

The effectiveness of air support of and air cover for mobile forces at operational depth depended on the tactical operating radius of the aircraft and weather conditions, which imposed high demands on aircrew flying and tactical proficiency. Preparation of an airfield network was of great importance, and in certain instances of determining significance. This depended entirely on whether airfield subunits had the proper equipment at their disposal.

The experience of Air Forces combat operations in support of front mobile task forces during the Great Patriotic War has retained its significance right up to the present day. This experience must be studied, and everything which is suited to present-day conditions should be utilized in the practical combat training of aviation units.

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New Pilot Training Technique Proposed

91441205m Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 3, Mar 89 (signed to press
14 Feb 89) pp 22-25

[Article, published under the heading "Into the Military Airman's Arsenal," by Military Instructor Pilot 1st Class Col N. Litvinchuk, candidate of technical sciences: "Once Again About Reference Points"]

[Text] Uniform method.... We are accustomed to this being an ideal toward which everybody involved in the education process must strive. But is it really an ideal? Could it possibly be nonsense? Every pupil is a unique individual. Every teacher is an individuality. But method should be uniform?

Or take the following aspect. A teacher-innovator has developed a methodological improvement. Should this new innovation be applied immediately? Should one wait until the new innovation legitimately acquires the right of citizenship in the realm of uniform methodology? One would surely have to wait a long time. Discussion, understanding, acknowledgement, and adoption will take years.

But what if the subject being taught is multifaceted and conflictive? Will cognition of this subject grounded on a single approach be effective?

This is the present situation with the method of reference points (OT) in teaching pilots flying technique. We have

differing views on the essence of OT and the applicability of the very method and technique of its utilization in the process of flying an aircraft.

There is a great diversity of conflictive opinion here. There are a great many variations in views on OT. There are even more opinions on the manner of incorporating a method based on OT into the process of flying an airplane.

This situation is probably natural at a moment of active search for answers to complex aspects of pilot activity during flight. Each approach makes its own reasonable contribution to theory of functioning of the "pilot-aircraft-environment" system.

Nevertheless there is one general shortcoming in OT method which is inherent in virtually all interpretations of this method. This deficiency is the static nature of OT. Such a point is always rigidly bound to some rigorously fixed moment in time and point along the flight path. A number of informational attributes apply to it. And a specific sequence of actions is prescribed when there is full conformity between current flight information and predetermined parameters of motion.

The flaw in such approaches is obvious: the focus on standard maneuvers. This is a logical procedure during initial mastery of flying skills, but it offers the pilot nothing in combat maneuvering. In addition, the set of informational attributes is always large. A great deal of time is required to perceive and process it, time which the pilot as a rule does not have.

But what if we look at OT method in a different manner?

We shall take as a basis not a fixed moment during flight but rather a segment, which we shall define as a flight path segment characterized by constancy of flight parameters.

We shall define constancy of flight parameters as invariability of principal motion parameters or their derivatives. An OT will then be a boundary between two flight segments, where a pilot transitions from one set of parameters to another. An OT is not bound rigidly and unequivocally to some one moment but is essentially a floating point.

This approach requires introduction of the term "onset information," which signals transition from one set of parameters to the next. It is the appearance of onset information which determines the location of an OT.

Let us examine application of the proposed method with the example of execution of a loop (Figure 1).

Segment 0-1 involves preparation to execute the maneuver. Onset information on the possibility of loop entry—presence of requisite entry parameters (OT-1).

Segment 1-2—loop entry. Onset information on completion of entry—reaching a G-load corresponding to the selected pattern of flying technique (OT-2).

ПУСКОВАЯ ИНФОРМАЦИЯ

3



Рис. 3. Средне суточные значения скорости ветра — 1960 г.

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Key:

1. Figure 1. Segments and OT When Flying a Loop.
2. Figure 2. Diagram of Operation of "Pilot-Aircraft-Environment" System.
3. Feedback and monitoring of flight parameters
4. Pilot
5. Task
6. Receipt of information
7. Processing of information and decision making
8. Executing movements (decision execution)
9. Aircraft control activities by pilot
10. Aircraft
11. Forces on and displacement of controls
12. Control deflections
13. Engine rpm, angle of attack and slip angle, angular velocity
14. Bank, forces and G-loads
15. Flight path (speed) parameters
16. Parameters of position (relative to the ground)
17. Figure 3. Diagram of Piloting Process.
18. Pilot's actions in flying the aircraft
19. Receipt of flight information (distribution and switching of attention)
20. IMP
21. Processing of flight information (elaboration of piloting decision)
22. KMP, OMP
23. Execution of piloting decision (manipulation of controls)
24. Aircraft (response by control linkages to deflection of controls)

Segment 2-3—maintaining a constant load factor. Onset information—any phenomenon attesting to the need to adjust G-load (OT-3).

Segment 3-4—maintaining a constant angle of attack. Onset information—deviation of angle of attack from a constant value (OT-3). And so on.

This method does not bind the pilot to an entire set of flight parameters at an OT. It suffices to know the onset information and to transition from one set of flight parameters to another in conformity with the advent of this information. I feel that only this method of flying is acceptable during combat maneuvering.

But when flying standard maneuvers, while retaining the general principle of segments, it is easy to transition to a method of "pure" OT, since this is a particular instance of the proposed method.

Aircraft control constructed on the basis of designating flight segments explains well a pilot's actions when correcting deviations. A detected difference between the current value of some one parameter and the required value according to the current conditions serves as onset information. Then a control decision is made, aimed at "returning" to the correct parameter value, proceeding from the interests of tactics and flight safety.

The problem of selecting segments and OT is an interesting one. Flight can be viewed as a set of closely-interlinked parameters which change with time. Each current set of motion characteristics constitutes a sum total of change in the preceding characteristics over a specified period of time (Figure 2). A pilot's actions to maintain a specified pattern of change in flight parameters constitute the process of flying (Figure 3).

Obviously flying the aircraft is simplified if while maintaining the pattern of change in parameters it is possible to keep some one parameter constant. When flying a loop, for example, in order to curve the flight path in the vertical plane it suffices to maintain (continuously or sequentially) a certain pattern of change in forces on the

controls or angle of attack, or G-load, or angular velocity, or their derivatives.

These characteristics, changing with time, may remain constant on certain segments. It is such moments of constancy which form the basis of selection of segments and dominant parameters (graph n_y , $\alpha=f(\Theta)$ in Figure 1).

But how many reference points are needed for the normal process of flying? Their total number for an individual flight is determined by the nature of change of all parameters (Figure 2)—beginning with forces exerted on the controls and ending with position indicators, but the actually required number is determined by the pilot's level of proficiency.

For a student pilot OT must be linked with change in all flight criteria. As a pilot acquires flying skills and ability, displacement of controls and maintaining of specified forces, angles of attack, slip and bank, rpm and load factors gradually transitions to the subconscious. Corresponding OT do not necessarily have to be included in the execution scheme when preparing to perform a flight assignment.

We should note that OT, flight segment, and checkpoint methods are not new. They always have been and continue to be the foundation of flight training. It is merely that sometimes these methods have been used without focusing attention on their theoretical substantiation.

The following confirms the fact that this is the case. Any pilot who has mastered flying technique and essentially understands OT can easily place reference points on any aerobatic or other flight maneuver. In addition, all military pilots involuntarily use such methods to one degree or another. But if one approaches this in a knowledgeable manner, thoroughly understanding the various methods, nuances, advantages and drawbacks, then the training process will become genuinely effective. There is probably no particular reason to focus attention during training on the fact that an OT is

located precisely at this point. It is more reasonable simply to state the onset information for each flight segment.

It might seem that an attempt at scientific analysis of these items does not have great importance and cannot produce a practical result. This is not quite the case, however. Development and deepening of views on this methodology are closely linked with improving such a comparatively young science as theory of piloting, which makes it possible to "construct" flying technique in a purposeful manner.

But what is the essence of this "construction"?

When preparing to perform a new flight procedure or maneuver, one specifies the conditions of its executability and determines the optimal dynamics of change in motion characteristics. One then selects those parameters (or their derivatives) which remain constant during certain segments of flight and which are easily monitored by the pilot.

When necessary, to simplify the flying process, a number of parameters are artificially stabilized during certain segments. These parameters will be directly controllable by the pilot and will be dominant, while flight path segments with constant values of these parameters will be designated flight segments. Transition from flying on the basis of one principal criterion to flying on the basis of another is prescribed by the moment of appearance of onset information. Thus an OT acquires functional substantiation.

The problem under discussion is multifaceted. It is directly linked with improving the quality and effectiveness of flight training and with reducing material expenditures on this complex process.

Here is an additional consideration. At the present time there is no specialized organization in the Air Forces whose job it is to determine, analyze, and synthesize in a skilled manner, grounded on science, those new things which are constantly being produced by military aviation, which is rich in ideas, and to incorporate such new ideas into practical flight training. For this reason felicitous methodological innovations acquired through flying experience as well as innovative and progressive concepts are lost. They depart together with the individuals who created them. And frequently the persons who deal with methodology of flight training, a highly complex area of education science, are doing this on a chance or casual basis. They themselves have created nothing, and they do not acknowledge the innovations of others.

It is precisely these persons who consider the ideal to be the only possible methodology. Everything has been determined once and for all. Everything has been predetermined and is unequivocal for everybody. There are no changes. You say the experiment has been scientifically validated? You say that major positive results are anticipated? What kind of results? In the pilot training system? Come back next week. For the present we shall

have a uniform methodology. We shall have a uniform and inviolable methodology, but will we have success?

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Air Force Disaster-Relief Airlift To Armenia Described

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[Article, published under the heading "The Reader Requests," by AVIATSIYA I KOSMONAVTIKA special correspondents Lt Col V. Bezborodov and S. Skrynnikov: "In Time of Need"]

[Text] Life is gradually returning to normal in the earthquake-stricken cities, towns and villages of Armenia. Rubble has been cleared, and many sick and injured have been put back on their feet. Enterprises which survived the earthquake are beginning to operate again. Tenants have returned to buildings which could be reinforced and repaired, and electricity is being restored. City rebuilding master plans have been drawn up and submitted for public discussion. Construction of earthquake-resistant buildings has commenced.

The tragedy is receding further into the past. Gone, but not forgotten.... People want to learn the details of these events and the names of those who were the first to come to the aid of the Armenian people.

In their letters our readers ask us to tell how military aviators helped the earthquake victims. Our special correspondents were in Armenia on the first days following the earthquake. We publish their comments below.

* * *

It began at 11:41 a.m. local time. Powerful tremors within the earth raised up and split the ground open, split rock faces, crumbled bridges, and twisted railroad tracks. Buildings began to collapse, burying tens of thousands of persons under rubble. In the schools recess would have begun in 4 minutes, and the children would have been out of the buildings. They did not have time to evacuate....

Soon the entire country learned of the tragedy in Armenia.

The alarming news was passed on from the Air Forces Command Center to many air force bases. Engines fired up, dozens of airplanes and helicopters took off and set course for Yerevan, Leninakan, Kirovakan, and Spitak. Among the first to arrive at Leninakan were Mi-6 helicopters flown by Maj. Yu. Batrakov, A. Kirichenko, Ye. Nikolayev, A. Shubenin, and N. Vasilevich, Capt. N. Trukhin, A. Khurtin, and A. Pupochkin, An-26 aircraft flown by Maj. A. Leus and D. Zayniyev, and Mi-8 helicopters flown by Lt Col A. Makarov and Capt. V. Protopopov and A. Kritskiy. Crew members included

Russians, Ukrainians, Belorussians, Georgians, Bashkirs, and members of other ethnic groups. Shaken by what they saw, these military aviation veterans, who had seen death on more than one occasion and who had displayed examples of courage and valor in Afghanistan and at Chernobyl, vowed to do everything they could for these people.

Deputy squadron commander Maj Yu. Batrakov later stated: "When we landed at Leninakan airport, the first injured victims were ready for evacuation. Cries for help, blood.... But the worst thing is when a person has fallen silent forever.... We realized that every minute counted. The helicopter crews did not waste any time. Every crew member manned his assigned station, knew his job, and took direct part in loading victims aboard and rendering first aid. Each of our helicopters evacuated several hundred persons. There was no place to sleep or eat. Nor were we thinking about ourselves. If the doctors had not insisted, probably nobody would have even closed his eyes during the first four most difficult days. Air traffic control was well organized, and the communications people did an excellent job. In short, a fine job was done by all those who arrived in the disaster zone at the very outset."

Col V. Mironov's eyes were red from fatigue, and his voice was hoarse from lack of sleep during these many days and nights. He went the first 72 hours without any sleep whatsoever. He received and dispatched airplanes and helicopters, and he took situation reconnaissance flights. He was one of those who during the first hours after the earthquake directed the establishment of an unprecedented continuous airlift. The task was incredibly difficult. Airplanes and helicopters were landing one after the other. The traffic capacity of the airport, which itself had been partially destroyed, was increased by a factor of more than 20. And this was in fog conditions, with visibility reduced to 1,000 meters! But flight operations could not be shut down. Later, when reinforcements arrived and runway lighting was set up, things got easier.

"Our main concern was the injured," stated Vitaliy Vasilyevich. "And of course supplies and equipment, particularly cranes. At first we tried to raise the structural slabs with helicopters, using external slings. But we were forced to give this up: there was too much dust, and the slabs would not work free from the rubble.... What we needed was cranes, in quantity, as well as welding equipment and jackhammers. It would be inconceivable to extract victims without this and a great deal else."

One cannot overstate the importance of assistance to the civilian population rendered by military and civilian aviators during those difficult days, for the roads were earthquake-damaged and clogged with vehicles. You couldn't move an inch. Things could be moved only by air....

Heavy military transport aircraft flown by Lt Col Ye. Zelenov and Maj I. Saburov as well as big Aeroflot

passenger aircraft arrived at Leninakan with supplies literally just a few hours after the quake. A continuous airlift was in operation from this moment on.

Maj M. Kozlov flew food, tents, and medical supplies from Baykonur, bringing a truck-mounted crane and a fuel tanker truck on his second run. Capt A. Sobol flew in blood plasma, welding equipment, compressed gas cylinders, and a specialist rescue team from Tselinograd. Maj V. Boboshin hauled tons of food supplies, while Maj V. Shiman flew in a truck-mounted crane, a KamAZ truck, and a compressor.... Thousands of personnel, dozens of field kitchens, power generators, trucks, and bulldozers were brought in by air....

Literally all air force bases responded to the emergency. Every garrison wanted to help in some way. Information on airlift flights, collected money and warm clothing, and volunteer blood donations was reported to the command and control team at Air Force headquarters. Within two days after the earthquake military airmen and their families had contributed approximately half a million rubles to the Armenian Relief Fund. People were working on their days off and crediting these earnings to the earthquake victims relief fund. Children were donating their favorite toys. Adults were giving whatever they could.

The scale of the relief effort and its organization required enormous efforts at the very highest echelon. CPSU Central Committee General Secretary M. S. Gorbachev, chairman of the Presidium of the USSR Supreme Soviet, CPSU Central Committee Politburo commission members N. I. Ryzhkov, N. N. Slyunkov, D. T. Yazov, and others personally flew to the disaster area. The situation was taken under oversight, and the effectiveness of rescue and relief activities increased sharply.

Everything delivered by aircraft and truck was immediately dispatched to distribution points in the stricken towns and villages so that people could be provided necessities as quickly as possible. Field kitchens swung into action. Tent cities sprang up on boulevards and plazas. But a great deal still remained to be done in order to accomplish complete recovery from the earthquake.

Apparently-intact buildings stood like islands among the rubble along Shirakatsi, which had been Leninakan's most attractive street. The stairwells had collapsed in the majority of these buildings, however, and there were gaping cracks in the walls. From a distance the building housing the Leninakan Shoe Factory looked like a fantastic creature with skin stripped off and ribs protruding. The collapsed exterior panels laid production and service spaces bare. Equipment was standing on all floors, looking as if the workers had just gone out for lunch and would soon be returning to the job. But many will not be returning to the production shops when the factory is rebuilt, for many of the workers perished.

Among the rescue personnel we saw a lad wearing a military field overcoat with light-blue shoulder boards. Vartan Akopyan, a cadet at the Irkutsk Higher Military

Aviation Engineering School, just as many other military personnel who were natives of the earthquake-stricken areas, was on short leave pursuant to an order issued by the USSR Minister of Defense.

"I am looking for a friend, Artur Paramuzyan. He was working on the first shift," said Vartan in a tired voice. "I hope he is alive. Cranes have arrived; now things will go faster."

"What about your family?"

"They were injured. They were all evacuated to Yerevan by helicopter. They're now convalescing. I am grateful to the pilots. I am grateful to everybody. I am proud that I too am an Air Force man."

"Shnorhakalutyun!" his brother Ashot interjected, and then translated: "Thanks! If it weren't for your boys, there would have been many more fatalities. Pass on to them our thanks and gratitude for their help."

At the corner of Shirakatsi and Gertsen streets a mound of rubble stood on the site of a building in which the families of military personnel had resided. Rescue personnel standing atop the mound included persons in military uniform. Lts B. Fedosin and A. Bulatnikov had been transferred to the unit several days prior to the earthquake, while WO V. Pogorelyy has been serving with the garrison for quite some time. The tragedy took place before their very eyes.

"I could see buildings collapsing, and I myself barely made it out of the quarters and utilities office on the first floor, where I had come to pick up an officers' quarters billeting order," related Lieutenant Fedosin. "I will never forget the cries for help by people pinned under beams. We have been picking apart rubble for several days now. We shall continue as long as it is necessary, for wives and children are buried here. Sr Lt Valeriy Yakushev was also killed. None of those whose families were killed left their post."

We pick from the crumbled concrete rubble a crumpled photograph which had survived by some miracle, apparently from a family album. The photograph showed an attractive young woman and a little girl about 10 years old, with a serene and happy smile on their faces. What had happened to them? We wanted to believe that they had been rescued, for the military and civilian specialist personnel, Soviet citizens and foreigners had come to Armenia precisely for this purpose.... They had accomplished so much!

We were departing by air for Yerevan with another load of injured. The cargo cabin of Maj Yu. Batrakov's helicopter was filled with old men, women, and children. Some were able to sit up without assistance, while others were lying on litters. The reddish setting sun was reflecting on the cockpit side windows. A troubled, uneasy sun. That is the way it appeared to us during those days in Armenia.

We landed at Zvartnots Airport. The doors opened even before the rotor blades had come to a stop. The steps were lowered. Ambulances were driving right up to the helicopter. Hurry! Hurry! The ambulances headed swiftly for town, lights flashing and sirens wailing. A few more persons had been saved from death.

While cargo was being readied for the return flight to Leninakan, the crew handed the helicopter over to the ground maintenance people. Squadron deputy commander for aviation engineer service Maj A. Klepcha personally inspected the aircraft and calculated figures for the engine log. Detachment aircraft maintenance unit chief Sr Lt S. Astashkin and group chief Capt A. Ovchinnikov checked the helicopter's equipment and systems. Ground crew personnel also had an enormous burden: fueling and periodic inspections. And all this had to be accomplished without the slightest error, with no allowance for the fatigue caused by working around the clock. They did their job well. There were no equipment malfunctions or squawk-sheet entries.

We headed back for Leninakan. Meeting new people. Command post communications personnel Sr WO S. Rymarev, his son, WO V. Rymarev, Sr WOs V. Voloshin and K. Khochev, and WOs V. Turaliyev and Yu. Isayev, who were ensuring uninterrupted communications by the aircraft communications center, worked with selfless dedication. Maj V. Belenkov, Sr Lt Z. Tatanashvili, and Lts O. Solovyev and D. Petukhov had done an outstanding job of setting up communications.

The chief medical officer had warm words of praise for medical officers V. Purtov, A. Kishlar, and A. Medzhiyev, who had set up and were performing medical monitoring of aircrews, assistance to earthquake victims, epidemic-prevention measures, and sanitary and hygiene inspection of food service and personnel quarters.

We heard much praise for Maj A. Tuluzov, separate airfield technical support battalion deputy commander for logistics, as well as cook Yevgeniya Fedorovna Dyba, who had been feeding 300 persons daily.

"Many military airmen merit mention," we were told by Lt Gen Avn A. Arkharov, who headed the operations group to organize assistance to the earthquake victims. "People were working to their very limit."

This was indeed the case.

We returned from Leninakan aboard an Antaeus [An-22], flown by Military Pilot 1st Class Maj V. Radivilov. He had just delivered cranes, medical supplies, and blood transfusion equipment to Leninakan and was now returning to pick up another load. A great deal of work remained to be done to rebuild what had been demolished by the earthquake....

We were flying above the boulder-strewn terrain of Armenia. There is a saying in Armenia: before planting, one must clear rocks. There is no doubt about the fact

that the hardworking, courageous Armenian people, thanks to the fraternal assistance of all our country's peoples, will be able to heal the wounds caused by the disaster, rebuild its cities and villages, and restore life on this land.

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Making Aircraft Maintenance More Effective, Efficient

914412050 Moscow AVIATSIYA I KOSMONAVTIKA
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[Article, published under the heading "The Army's Strength Lies in Discipline," by Lt Col P. Stepanov: "Guarantee of High Quality"]

[Text] Capt V. Konoplev was flight-testing an aircraft following an engine replacement. Upon reaching the specified altitude, he pressed the thrust augmentation button. But there was no increase in thrust. Repeated attempts failed to produce the desired result. He was forced to return to the field. Back on the ground they checked thrust augmentation system operation. Everything was normal. And the maintenance people drew what subsequent events indicated was an erroneous conclusion: the pilot had lit the afterburner at a wrong airspeed for reliable afterburner ignition.

The malfunction repeated when the aircraft was taken up again. An inspection indicated that the thrust augmentation interlock microswitch was defective. It seems that a mechanic, when checking out the engine control system prior to engine installation, had "shortened" the microswitch stem. Subsequently this "trivial item" led to the in-flight malfunction.

How could this have happened? Was this an annoying mistake or the logical result of slackness and lack of discipline on the part of an aircraft maintenance unit mechanic? It is the latter, I believe.

Sometimes aircraft maintenance group chiefs, content with achieved success, begin overlooking "minor" breaches of military discipline. "As long as the men work well and follow procedures as prescribed in the manual," they reason. Daily practical experience demonstrates, however, that one cannot replace kindness and a trusting attitude toward one's subordinates with excessive tolerance toward violators of military discipline.

In the radio communications and navigational equipment maintenance group headed by Sr Lt N. Pelishenko, mechanic Ye. Kovtsur would frequently report for duty late and not in proper uniform. But the group chief took no action. In time this mechanic also began treating too casually the observance of proper maintenance procedures. Once an in-flight emergency almost occurred due to his fault.

The mechanic and group chief were duly punished. The aircraft maintenance unit chief and his deputy for political affairs, after giving both of them a severe dressing down, explained to them the error of their ways. In particular, in a talk with Senior Lieutenant Pelishenko they stressed that they were of the belief that by working hard he would be able to restore his good name. The group chief was given an object lesson on how to work with individual personnel and how to use his disciplinary authority in a practical way.

Today precise engineering calculation and scientific organization of labor are being extensively adopted in the aircraft maintenance unit. Smoothness and regularity in operations have been achieved by unswerving observance of the schedule for taking in aircraft for maintenance. The schedule is drawn up on the basis of scientific methodology and advanced technology. It provides for a smooth, uniform flow of aircraft into the aircraft maintenance unit and technically-validated alternation of types of maintenance operations.

In the past, for example, several aircraft might simultaneously be brought in for work requiring considerable mechanic labor. This created difficulties in utilization of test benches and testing equipment. Now one type of maintenance operation is alternated with others. This has resulted in a smooth flow of work and better adherence to the maintenance schedule.

Each month necessary changes are made in the schedule, changes due to progress in meeting the schedule of staggered replacement of equipment based on reaching the end of its service life. The results achieved through these changes are promptly communicated to the squadrons.

The strict rhythm of aircraft maintenance unit operations disciplines personnel. It has become more difficult for maintenance personnel to explain away their failure to observe proper procedures as well as other mistakes by claiming deficiencies in organization of the process of maintenance operations, as sometimes happened in the past.

The following would occur, for example. Group chiefs would report: "Inspection and maintenance procedures completed, paperwork completed!" But upon inspecting the aircraft, squadron specialist personnel would spot problems.

The entire aircraft maintenance unit collective, party and Komsomol organizations have now been mobilized to eliminate the causes of deficiencies. First and foremost the subunit's work operations had become smoother. This has made it possible to "pack" work time and to perform procedures strictly according to maintenance procedures schedules. Now every maintenance man knows the moment to begin his work, and the group chiefs know the maintenance intermediate procedures inspection check time. In the new conditions they have begun correcting spotted deficiencies more quickly and efficiently.

A rigorous accounting of malfunctions fosters more accurate evaluation of the job performance of the maintenance groups and each individual maintenance man. Personnel exchange accumulated experience and know-how at technical analysis sessions.

An optimal schedule of daily routine is strictly observed in the aircraft maintenance unit, and matters pertaining to distributing personnel among work shifts have been resolved. Changes have been made in the maintenance procedures schedules. This has been done on the basis of the requirements of regulations, manuals, and other guideline documents. In order to ensure a steady rhythm to the work process, the daily detail is made up entirely of technical maintenance unit personnel.

At the present time each group is divided into two shifts. The makeup of the shifts is determined in advance. Usually more than 60 percent of the maintenance personnel form the first shift, with the remainder going to the second. Why is this? Let us say that today an aircraft has been brought to the aircraft maintenance unit. The group chiefs not only inspect the systems but also thoroughly check them out operationally. Then first-shift maintenance personnel proceed with disassembly. These are laborious operations. For this reason the group chiefs and the majority of maintenance personnel work from the morning of the first day. The second shift deals chiefly with testing equipment on test benches in the aircraft maintenance unit laboratories. Mechanics work under the supervision of the group technicians. Second-shift personnel also work on landing gear and control surface hinge assemblies when there are no specialists available in the maintenance bays.

The following day, from morning on, all equipment is reinstalled and tested with circuits energized. During the second shift the fighter is inspected, any detected problems are corrected, and it is returned to the squadron.

The maintenance intermediate inspection check process has also improved. In the past two mechanics would sometimes complete their work simultaneously, and while the group chief checked off one mechanic, the other one would be waiting his turn. Now there are fewer maintenance personnel in the group, and they perform maintenance procedures of varying laboriousness in a specified sequence. For this reason the maintenance intermediate procedures inspection check no longer causes delays. This helps increase labor productivity and helps improve work quality.

Activating the human factor and strengthening the organization and discipline are like lighting the afterburner. And the technical maintenance unit people understand this well. Today they see this as a guarantee of high quality and effectiveness of their work.

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Criticism of Poor Radio Communications Procedures

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14 Feb 89) pp 32-33

[Article, published under the heading "Flight Safety: Experience, Analysis, Problems," by Lt Col Yu. Andronov: "Radio Discipline"]

[Text] What pilot is not familiar with requirements pertaining to radio communications procedures? All military pilots know that one must initiate radio contact with the ground at a specified time and at specific phases of a flight. Nevertheless pilots frequently violate established communications callup procedures. The reasons for this vary: poor preparation on the ground, carelessness in the air and, finally, lack of elementary communication skills. And yet the degree of preciseness and conciseness of instructions and inquiries and the degree of coordination between aircrews and ground controllers determine in large measure not only the quality of performance of a flight assignment but also the level of flight safety. Let us cite some examples.

...Flight operations were being conducted in instrument weather. Following liftoff fighters would immediately disappear into the low overcast. It was solely the navigation and targeting avionics which enabled the pilots to maintain their bearings. In such situations aircrews and ground controllers are under considerable psychological stress. Precision in all things, including radio communications, helps reduce this stress, or at least helps keep it from increasing. However....

"This is 201, on departure heading," the voice of the pilot flying the interceptor which had just taken off came over the tower speaker.

Some time later the tactical control officer communicated that it was time to switch him over to the GCI frequency. Glancing at his stopwatch, the flight operations officer was about to key his microphone to radio the frequency change instruction when another pilot's voice broke in. A long, confusing request followed. The flight operations officer, impatiently looking at the stopwatch sweep hand, heard out the radio communication, which did not require any prompt decision, transmitted a response, and only after this did he instruct the interceptor pilot to change frequency. As a result time was lost, and the intercept took place other than at the predetermined point.

Here is another example. Officer A. Romanenko, while on a cross-country flight, decided to determine his exact location and switched to an ADF frequency. He forgot, however, to switch his radio to the ATC frequency. Because of this the air traffic controller temporarily "lost" the pilot. It took some time to reestablish radio contact.

It is quite understandable that the numerous attempts to reestablish radio contact clogged the frequency and created an additional burden both for the controller and the other aircrews aloft, for if any of the pilots had encountered an emergency and had requested ground assistance, it is unlikely that he would have been able to obtain it promptly.

It has been noted that when flying dual, pilots conduct long conversations over the intercom. Of course during this time they are "switched off" from the ground. Once again an attempt begins to find the "lost" aircrew. A nervous atmosphere is created both on the ground and in the air.

And yet at today's airspeeds any slowness or delay in air-ground communications is fraught with serious consequences. It is this which dictates the responsibility of airborne personnel and those controlling them for strict observance of proper radio procedures. During flights, and particularly during tactical air exercises, various instructions or signals are radioed to aircraft aloft. Therefore even seemingly insignificant violations of proper radio procedures diminish the effectiveness of aviation personnel labor.

Sr. Lt. A. Proskurov was flying advanced aerobatic maneuvers in the practice area. Another aircraft would soon be passing in the vicinity at low altitude. The flight operations officer informed the pilot of this fact and proceeded to wait for a reply, but another pilot cut in: "052, passing compass locator. Altitude.... Heading...."

At this same time Proskurov radioed acknowledgement of the traffic advisory. His reply was drowned out, however, by 052's transmission. The flight operations officer had to call Proskurov again, which took time. The other pilot's mistake consisted in the fact that he had proceeded to transmit without waiting for communications between the tower and Proskurov to end. In such cases veteran pilots, before keying their mike to transmit, not only make sure that the frequency is clear but also make sure that their transmission is brief and to the point.

Speaking of following proper radio procedures, we must also mention shortcomings in tower and command post radio communications performance. Practical experience indicates that complications aloft, which diminish the quality of performance of flight assignments due to failure to observe correct radio communication procedures, arise not only through the fault of aircrew but also due to mistakes by tactical control officers.

The following illustration confirms this. Once a command post had to vector a large number of fighter-interceptors at various altitudes and speeds. This was being done on a single communications frequency. It would seem that brevity of commands would be most essential in such a situation. Tactical control officer Capt V. Demin, however, in spite of his many years of experience, kept asking pilots things which were not directly related to their intercept. He would key his mike

and then wait for some time, thinking, before starting to talk. As the intercept neared he would be late in instructing the fighter to turn on afterburner and commence maneuver. The pilot would end up quite some distance from the target, and the intercept would not take place.

The casualness of Captain Demin's preparation prior to flight operations was a factor. Apparently counting on his past knowledge and skills, he overrated his own ability. This officer had failed to consider the fact that these would not be your normal practice intercepts, when one can sometimes repeat instructions, take time to think things over, and ask a pilot to repeat a transmission. What was required here was particular precision in the job performance by all specialist personnel and a high degree of coordination in the actions of the tactical control officer and the pilot.

Teaching air and ground personnel radio communications procedures has always been an important element of training in all air components. This holds particularly true today, when radios, radars, semiautomatic and automatic radio systems, and other electronic equipment are being more and more extensively used in flying, navigation, and control. Attentiveness, conscientiousness, and precise procedures are essential here. It is wrong to rely totally on the avionics and forget the human operator.

Here is a story my father told me. It was 1944. Soviet forces were advancing. Fighters, supporting ground units, were based near the front lines. Following completion of a successful mission, a pair of Soviet fighters was returning to a field at which the regiment had set up operations just the day before. The pilots were conversing with one another over the radio, sharing the joy of victory in combat. Neither of them gave any thought to the fact that the front lines were close by and that their radio transmissions could easily be intercepted and utilized by the enemy. They were also ignoring instructions by the air unit command element regarding strict secrecy pertaining to location of forces and conduct of combat operations from a field which was unknown to the enemy, and they were ignoring proper procedures of radio communication in air and ground radio nets. It was permitted to use transmitters only in emergencies.

The Hitlerites took advantage of this opportunity and got a DF bearing on the new field. It was only thanks to the skill of the veteran night-fighter pilots and the vigilance of the alert-duty antiaircraft gun crews that the airfield was successfully protected from an air raid. This was the result of failure to observe proper radio communications procedures in combat conditions.

Everybody taking part in flight operations and in flight operations support activities must observe proper radio procedures. It is important that every flight operations officer, pilot, tactical control officer, and approach controller think through in advance what he is going to say

during his radio transmissions, ensuring that it is clear, concise, and covers the situation.

Practical experience persuasively indicates that this result is achieved when adequate attention is devoted to working on radio communications when preparing for flight operations shifts, for every sortie, every type of combat flying is also grounded on execution of signals and instructions both between aircraft and from the ground.

I would say that a detailed analysis of the quality of execution of assigned tasks suggests an expedient form of determination of level of preparation on the part of the air traffic control team and the pilots. A post-flight critique and analysis session which includes listening to tape-recorded radio communications between aircrews and the ground helps objectively determine level of preparation. One can also precisely determine correctness of radio communications procedures and observance of radio discipline in the air, and therefore one can also take steps to correct deficiencies.

Flight personnel, for example, attentively listened to radio communications between Military Pilot 1st Class Capt S. Ivanov and the tactical control officer. He reported his actions precisely and concisely, and he used the prescribed radio communications terminology. The tactical control officer did likewise. As a result the clearly-understandable transmissions contained nothing but the essential instructions. It is not surprising that the air intercept was given a mark of excellent.

It is apparent that commanders should be more strict in demanding that their men observe proper radio procedures, for otherwise the air will be filled with chatter, which can only do harm.

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Pilot Attempts Air Start Contrary to Emergency Procedures

91441205q Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 3, Mar 89 (signed to press
14 Feb 89) pp 36-37

[Article, published under the heading "Recommendations of Science Into Operation and Maintenance Practices," by Lt Col A. Suganyako and Maj A. Khvostov, candidate of technical sciences: "Air Start"]

[Text] Employment of turbofan engines with thrust augmentation (TRDDF) was a decisive factor in increasing the speed and range, maneuverability and load-carrying capability of modern aircraft. They are provided with a high degree of operational reliability to a large degree by a TRDDF equipped with combined monitoring systems which make it possible promptly to detect problems in engine operation, both on the ground and in the air, and to prevent possible engine malfunctions.

The parameters which characterize condition and status of engine systems and assemblies are continuously "queried" during flight by built-in sensors, the readings of

which are recorded by on-board devices. The difficulty of identifying a deviation (within specified limits) in these parameters and the need to free the crew from monitoring engine signs dictated the development of airborne automatic built-in monitoring systems. Slight deviations in engine parameters are compensated for with the aid of automatic control devices.

Thus the operation of modern engines and complex engine adjustment systems, which are being increasingly more extensively utilized in aviation, virtually eliminates the possibility of wrong procedures by the aircrew, which in this case are assigned the job of monitoring vitally important parameters of the modern TRDDF. If parameters go beyond acceptable limits, the aircraft's built-in warning systems provide annunciator display of the necessary information. Subsequent pilot actions should be in strict conformity with the available information and prescribed operating procedures. The following must always be borne in mind: during operation one and the same warning signal may characterize different engine problems. It is not always possible to determine in flight the actual cause of a problem, and therefore any deviation from the prescribed operating procedures as a rule leads to serious consequences.

As an example I shall cite an instance of manipulation of aircraft controls by Military Pilot 1st Class Maj V. Trelyukhin. Six minutes into the flight the warning "Reduce RPM Right Engine" lit up on the annunciator panel, indicating a problem with the engine. The pilot altered the engine's power setting somewhat. The warning message flashed off. But when he then proceeded to increase rpm (contrary to prescribed operating procedures), the warning flashed on again. When he again reduced turbine rpm, engine vibration began to increase. Major Trelyukhin shut down the engine by moving the thrust lever to the "Stop" position. He then (again contrary to prescribed procedures) attempted to restart the engine. The attempt was unsuccessful and resulted in a slight increase in compressor rotor rpm and an increase in exhaust gas temperature above the redline (the "Right Engine Overheating" warning message flashed on). Only after this did the pilot shut down the engine, abort the flight and return to the field on one engine.

What happened during flight? How should the pilot have responded in this situation? An examination of the condition of the engine components indicated that the malfunction had been caused by fan-driving turbine shaft failure at the turbine forward bearing. This also explains the unsuccessful air start, for the fan, no longer driven, was turning at a speed determined by autorotation for the given flight conditions and failed to drive a sufficient flow of air into the compressor inlet and engine combustion chamber.

But did the pilot have any chance of starting the engine? In order to answer this question, a calculation was performed using a mathematical model reproducing change in engine gas-dynamic parameters in the process of fan-driving turbine shaft failure. They analyzed the nature of change in the engine operating process during

onset of shaft failure as well as its effect on engine operating conditions, and determined quantitative deviations in

engine parameters from normal parameters with possible consequences of the shaft failure.

The calculations were made using the flight data recorder tapes. Figure 1 contains curves of change in TRDDF parameters: thrust lever setting $\alpha_{руд}$, by the pilot (a); fan shaft rpm $\bar{n}_в = n_в / n_{вmax}$ (b); compressor rotor rpm $\bar{n}_к = n_к / n_{кmax}$ (c); change in jet nozzle critical section area $\bar{F}_c = F_c / F_{cmax}$ (d); gas temperature at primary gases outlet $T_{1вых}$ (e). Situation (b) corresponds to change only of fan shaft rpm beginning at 20 seconds. The fact is that turbine disconnection occurred as a result of shaft failure, while the rpm sensor is placed on the fan shaft.

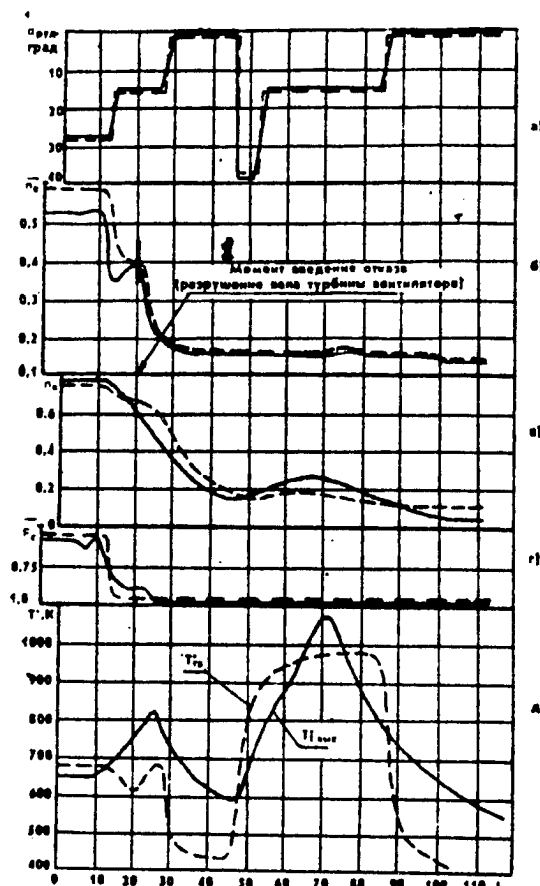


Figure 1. TRDDF Parameters Recorded by On-Board Devices (solid lines) and Obtained by Calculation (dashed lines).

Key: 1. Moment of onset of failure (fan-driving turbine shaft failure)

On the basis of on-board recording of parameters and results of examination of the condition of engine components, the simulation was run with the following boundary conditions: setting was made in conformity with the sequence indicated by the dashed line (Figure 1a); change in fan rpm (minus turbine) was specified in the model in conformity with the actual process, indicated by the solid line (Figure 1b) after the 20th second on the graph time axis; air parameters at engine inlet were taken in relation to altitude and airspeed at the moment preceding onset of engine failure;

fan-driving turbine rpm was determined with the assumption that power expended on increased friction between coupled engine parts runs 5-15 percent of the total power produced by this turbine and that fan-driven turbine inertia is 25 percent of low-pressure rotor inertia.

An analysis of the results obtained by the simulation indicated that the difference in nature of change $\bar{n}_x$ (c) is due to the approximate statement of amount of turbine power lost to contact friction following shaft failure, while the difference in change in calculated gas temperature downstream of the fan-driving turbine T_{TB}^* (e) and measured at TRDDF primary gases exhaust point T_{BMX}^* is due to the fact that the calculation was performed at a point different from that where the thermocouples are located. Their time lag was not taken into account.

In addition to the above parameters, the mathematical model made it possible to estimate changes in margin of gas-dynamic stability of fan ΔK_{yB} , compressor ΔK_{yK} , and fan-driving turbine rpm (Figure 2) following rotor shaft failure, as well as change in gas-dynamic parameters at monitoring points.

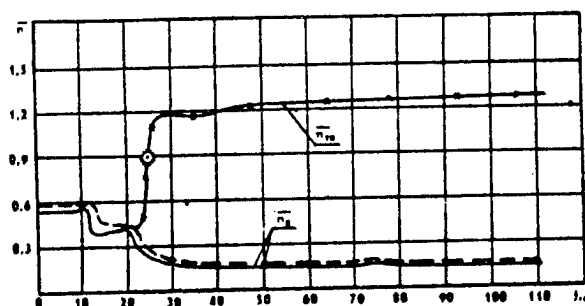


Figure 2. Fan rpm Change Corresponding to b in Figure 1, and Change in Fan-Driving Turbine rpm $\bar{n}_0$ Following Shaft Failure and Pilot Actions Contrary to Prescribed Procedures.

Calculations confirmed that the undertaken air-start attempt was not advisable under the conditions: the throttling effect exerted by the fan-driving turbine on engine parameters prevented development of power by the compressor-driving turbine. In addition, the engine start process was accompanied by excessively high gas temperature, which resulted in overheating in the engine's hot section. But the main hazard lay in the fact that, with the turbine no longer driving the fan, its rpm increased greatly, and this, in conditions where the turbine was out of balance, was the reason for the engine case and rotor damage.

The consequences could have been more serious if the fan-driving turbine, released from the fan load, had broken up under the effect of centrifugal force and, breaking through the casing, had damaged aircraft systems, which usually causes fire. The fact that a real danger had arisen was confirmed by the condition of some of the engine components, which were heavily scored in a circular pattern, bore an iridescent tarnish, as well as directional nicks and dents.

In the Air Force unit in question, substantial conclusions were drawn from the incident. Engineer and technician supervisors conducted classes with aircrews on proper aircraft operating procedures. Attention was focused on strict observance of procedures as prescribed in the aircraft operating manual, according to which, on the twin-engined aircraft in question, when the "Reduce RPM" warning flashes on, the pilot is to abort the mission and adjust power on the problem engine until the warning light goes out and, if the light stays on when the thrust lever is throttled back to idle, the pilot is to shut down the engine.

The warning message "Reduce RPM" indicates a serious malfunction in the engine. The pilot's response actions should be exact, precise, honed to the level of automatic

response. Attempts to increase engine rpm, and particularly to restart the engine after shutdown, can lead to serious consequences involving additional damage to the engine and its systems as well as the possibility of fire.

An understanding of the physical substance of an emergency situation, a clear picture and grasp of the situation, as it were, is a useful methodological device for increasing the preparedness of aircrews for such problems, which can be encountered in the process of mastering new aircraft. As practical experience indicates, all this greatly diminishes or even totally eliminates the effect of one of the main factors in any emergency situation—the element of surprise.

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Meaning of Democratization in Military Discussed

91441205r Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 3, Mar 89 (signed to press 14 Feb 89) pp 38-39

[Interview, published under the heading "The Reader Continues the Discussion," with Maj A. Rybakov, M. Shemkov, V. Shchelkov, V. Kuznetsov, and Yu. Shulga by AVIATSIYA I KOSMONAVTIKA volunteer correspondent Lt Col V. Pavlov: "In the Mirror of Democratization"]

[Text] Maj Gen Avn A. Bystrov's article "Democratization of Command and Control: Ways and Methods" (AVIATSIYA I KOSMONAVTIKA, No 1, 1989) aroused the interest of many of our readers. A first response to it appeared in the February issue. The article was also discussed at the correspondence faculty of the Military Political Academy imeni V. I. Lenin. Aviation regiment political section chief Maj A. Rybakov (Carpathian Military District), helicopter squadron commander Maj M. Shemkov (Far Eastern Military District),

squadron deputy commander for political affairs Maj V. Shchelkov (Transcaucasus Military District), political section senior instructor for party organizational work Maj V. Kuznetsov, and separate communications and electronic support battalion deputy commander for political affairs Maj Yu. Shulga (Group of Soviet Forces in Germany) stated their position on the issues raised in this article. All these officers have a great deal of life and military service experience, have gone through trial by fire in Afghanistan, and have been awarded medals and decorations. The following is an interview conducted by AVIATSIYA I KOSMONAVTIKA volunteer correspondent Lt Col V. Pavlov.

* * *

[Pavlov] In the opinion of Maj Gen Avn A. Bystrov, running military units by administrative fiat and pressure is one of the principal mechanisms of impeding perestroika in the Armed Forces, and in the present system of relations stifles initiative and engenders negative phenomena. What are your thoughts on this question?

[Rybakov] Initiative and an innovative approach to things has always been supported in word. In actual deed, however, sometimes relations flourish which foster spread of the disease of bureaucratism into all the tissues and organs of the military organism. But is that not the basis of the highly ironic sayings: "Whoever has more power is right" and "The boss is always right"? Perhaps they sound a bit harsh, but they reflect the true state of affairs. Up to the present time a great many regulations have been in effect, which attend our every step. While seemingly for the purpose of ensuring a high degree of combat readiness, they frequently enter into conflict with the demands of operational readiness. As a result people are taught according to a oversimplified scheme.

In peacetime we employ excessive caution, in order to avoid air mishaps, while in combat we pay a very dear price for such cautiousness. And where is the authority to take a reasonable risk, to conduct actions maximally approximating actual combat? This is merely a declaration, but it is not carried out in practice, because this suits the existing system of command and control.

[Shchelkov] In my opinion we should be discussing not method or system of command and control but rather style. One commander emphasizes lung power and the force of authority of position, while another relies on group opinion and counts on a sense of responsibility by each individual for his assigned work area. I had the good fortune to serve under Colonel Lipatov. I do not recall a single occasion when Vyacheslav Nikolayevich raised his voice, read anyone the riot act for making a mistake, or made unflattering comments about a subordinate, and yet his instructions were always carried out precisely, promptly, and to the letter. He knew how to persuade people and to inspire them with the common cause. All of us considered it unworthy conduct to let our commanding officer down, even in a minor matter.

[Shemkov] Yes, there have been, are now, and will continue to be superiors and subordinates, orders and instructions. And the word "komandnyy" pertaining to methods of command and control will continue to exist. Whether it involves dictatorial arbitrariness or is democratic depends entirely on the commander, his worldview, and his degree of awareness and civilized sophistication. In other words it depends on his degree of humanity.

Anybody who has been in the Far East knows what a harsh region it is. Military service is difficult there, as is one's daily living. Perhaps this placed its imprint on the regiment, which did not shine either in its proficiency or discipline. Air mishaps also occurred. But then Colonel Kotlov took command of the unit. He literally turned things around. Within a year the regiment was rated excellent. The men began to have faith in their own ability, trusted and followed Mikahil Sergeyevich. Even our base was literally transformed. It was as if there was more light in the windows. Everything was spruced up. They came up with the idea, for example, to build a children's playground—and on days off the commanding officer and his son would be the first out on the job. The others would follow.

It seemed that we had begun living in some other dimension. We would go to work as if on a holiday outing, and we became proud of the regiment. It is extremely essential that the officers and men take pride in their unit and value its honor.

What is the secret of success? The majority of Kotlov's predecessors worked according to the "tightening the screws" method. Kotlov, however, took his men as allies and won the battle against complacency and tolerance of shortcomings.

[Kuznetsov] Perestroika has placed a focus on the individual. Perestroika is moving forward through the individual and his attitude toward the job. We should also address this aspect of the problem.

After all, it is not the enemy who sends to us people who, upon taking up a high position, then ask: "Well, do you expect me to do your thinking for you?" Let us consider how many hours at our military educational institutions are allocated to study of military education science and psychology and to ethics. It will then become clear why such a large percentage of our officers are unable to work effectively with others, and we shall see the source of the bureaucratic indifference to other people's concerns.

As for the so-called "sensitive element," the presence of this element does not guarantee against manifestations of despotism. Studies will produce little if one does not draw any conclusions from them. What is needed is social protection of the rights of all military personnel, regardless of rank, position, or seniority. How is this to be achieved? That is the 64-dollar question.

[Shulga] Cadres and running of military units is an important aspect of the problem. I shall add another

saying to the ones quoted earlier: "Cadres have decided. And that ends the discussion!" [humorous variation on Leninist saying "Cadres determine everything"]. Bureaucrats of every stripe strengthen the bureaucratic edifice. And it is no easy matter to get them under control. They justify their existence with the piles of incoming and outgoing papers and reports, created and understood only by the bureaucrats themselves, papers which propagate and multiply to the detriment of the actual business of society and to the detriment of people's training, education, and indoctrination. In my opinion the forthcoming reduction in Air Force personnel is unlikely to thin out their monolithic structure to any significant degree, for it is they who will be determining the fate of others and reporting execution of instructions from the higher echelons. Who is going to voluntarily eradicate himself?

[Pavlov] The "sensitive element" which Maj Gen Avn A. Bystrov proposes introducing into the system of running a military unit may be subject to debate, but it is an attempt to deepen democratization in the military. How is it combined with the policy of further strengthening one-man command on a party foundation? In what way is democratization of the military being specifically manifested in your unit?

[Rybakov] Only bold individuals, genuine devotees of perestroika are capable of deepening democratization. But they are presently least of all protected against the despotism of bureaucrats because, in seeking out new solutions and new approaches, they frequently come into conflict with the requirements of current regulations and procedures. Even during the Afghanistan conflict, if a pilot unsuccessfully performed a complex maneuver, this would unleash numerous inquiries and criticism leveled at "Afghan" methods. It was good that even after this our commanding officer did not lose his enthusiasm for innovation and initiative, for he could have simply shrugged his shoulders and said: Who needs it? Our lives would be much poorer if it were not for persons whom the weight of circumstances cannot bend!

I am convinced that democratization strengthens one-man command, but only if it is constructed on a party foundation. This holds in check high-handed commanders who see people only as cogs in the machine. In Afghanistan one such officer (I don't want to mention his name) suffered a fiasco. "I'll chew you up and spit you out!" was the usual extent of his "reasoned argument." He maintained this attitude when his command was taken away from him, feeling insulted, failing to understand that he was not fit to command others. Alienation occurred here, in combat conditions, like the dying of a diseased branch. In peacetime conditions, however, wherever the party organization is not militant or where the party organization secretary is in the commanding officer's pocket, such a bureaucrat makes it through to retirement and leaves the military to take his "well-earned rest" with a feeling of duty performed. But how many careers can he ruin over the course of these years? This is where the military community at large should state its substantial word.

[Shemkov] Colonel Kotlov, whom I mentioned above, by democratizing things in our regiment, supported by the collective, and by virtue of concrete deeds, strengthened the image and authority of the commanding officer, which had been lost by his predecessors. When people saw and felt that they were masters, not cogs, that their voice would definitely be heard and initiative supported, when they became convinced that many items pertaining to combat training and performance of job duties would be resolved in a just, fair and solicitous manner, they really got behind their commanding officer. I have no doubt that with another commanding officer as well the men will not remain silent if they encounter injustice and crude boorishness. One of our officers was proposed as a candidate for a squadron commander slot in another unit. In some units they would simply send the officer along for the promotion. But in our unit people approached the matter with integrity and spoke up against such an appointment, amicably and in a friendly manner: "He doesn't deserve it. Work on improving yourself and correcting your deficiencies."

[Kuznetsov] Democratization is a sure way to strengthen one-man command not only in peacetime but in a combat environment as well. In Afghanistan we had a battalion commander who tried to gain his men's favor using unworthy methods. Of course this failed to produce tangible results. Lieutenant colonel Yuzhakov, who replaced him, behaved differently. He could always be found where things were toughest. He was hardworking and energetic. He mobilized the men for performance of combat training missions by force of personal example. He spent every free moment with his men. Frank discussions would be held on the most current topics, and there would even be contests to see who was the fastest in preparing pelmeni [Russian ravioli served in a broth soup]. Aleksandr Petrovich saw nothing demeaning in this. His closeness to the men only made them respect him more. And this produced results. What did I learn from my combat experience in Afghanistan? We have outstanding people. It is merely necessary to gain their interest and enlist them as allies. Then we shall be up to any task. We have stepped up the activities of the NCO council. We hold evening activities honoring excellent performers in training, we hold contests for best in MOS, and we organize field trips and excursions. We have gotten our unit moving. The men have begun to think, decide, and suggest. And things have been going much better.

[Shchelkov] Of course democratization is not an end in itself but merely an important device which will enable us to accomplish defense organizational development primarily through qualitative parameters and will help get people moving and will help overcome feelings of alienation. Everybody must learn to work under the new conditions. We are counting heavily on our command personnel.

[Shulga] There can be no democratization without discipline, and vice versa. In our work we extensively utilize collective opinion to "heal" ills in relations among military personnel which arise from time to time. We

devote considerable attention to internationalist indoctrination. We are studying civilized practices and standards of interethnic intercommunication. In our discussions we point up vivid examples of friendship among the peoples of the USSR, such as in earthquake recovery efforts in Armenia.

Nevertheless in my opinion we shall be able to address genuine democratization in a truly serious manner only when every member of a military collective becomes intolerant toward persons who commit breaches of discipline. We must achieve a collective guarantee of order and orderly procedure in the subunit. How is this to be accomplished? We are giving thought to this question and seeking an answer.

One more thing. Afghanistan taught me that there is no substitute for personal example by the commander, political worker, officer, and warrant officer as regards power of effect, nor can there be an alternative. For this reason I advocate the slogan "Do as I do, and learn to do better than I do."

[Rybakov] Democratization creates a new sociopsychological atmosphere in the collective, which helps reveal the best qualities of each individual. On the other hand everything superficial and alien is removed. The processes of deepening of democratization exert direct influence on disciplinary practices in the subunit and unit. Bringing public opinion to bear prevents persecution for criticism and prevents violation of the principle of social justice.

We must think through the matter of how to provide people with material and moral incentive to strengthen discipline, and at the same time we must distinguish between a pilot's contemptuous disregard of regulations on the one hand and warranted risk-taking on the other. There should be severe financial penalties for accident-threatening situations involving indiscipline.

[Kuznetsov] The new trends have made it possible to eliminate many areas which were in the past exempt from criticism, the mere fact of which clears the air in the collective and helps prevent political protection and favoritism. At the same time increased political section support of party activists at the local level and increased accountability demanded of leader-Communists are already producing tangible results in accomplishing the tasks of radical strengthening of military discipline.

We also have unresolved problems. I should like to draw attention to the intolerable practice of punishment across the board for infractions by subordinates. An accident has occurred, for example, and immediately there is a call from "upstairs": "What has been done?" The response: "Measures have been taken!" is in conformity with this telephone style. This is followed by an enumeration of who has been punished and how. If after this a board of inquiry does not pay a visit, soon everything is forgotten until the next accident....

Is such an approach to things beneficial? Of course not. Nor have we yet overcome the obsolete practice of softening punishment in relation to the status and position of the guilty parties.

[Shemkov] Strengthening of discipline and democratization are two sides of the same coin. I have already stated that things in our unit changed radically when Colonel Kotlov assumed command. Everybody became aware of how much they knew and how much they could accomplish. And they began generously sharing their experience and know-how with others. This atmosphere of kindness helped some regain their good name and take their rightful place alongside the others. Such was the case, for example, with Captain Kapytin. There was a time when things were not going well for Dmitriy Kuzmich. They had expelled him from the party and were about to get rid of him altogether. The new commanding officer saw in this pilot an unquenchable love of the sky and of flying. He found the right approach to this officer. He succeeded in getting the collective to change its mind. The captain was returned to flight duty. There are also other examples where people regain their bearings with the help of the collective.

From the Editors: Perhaps all the participants in the interview, in spite of a quite understandable and natural difference in point of view on a number of issues, were united by a common idea: democratization in the military will help improve combat readiness on the part of Air Force units and subunits and will help strengthen military discipline and vigorous implementation of the fundamental party thesis that effectiveness of Soviet military organizational development should be achieved primarily by means of qualitative parameters in respect both to equipment and personnel.

The editors would like this discussion to continue. Esteemed comrades, we await from you additional letters containing advanced know-how in perestroika, as well as suggestions and critical comments.

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Soviet Space Shuttle Launch Detailed

914412t Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 3, Mar 89 (signed to press 14 Feb 88) pp 40-42

[Article, published under the heading "Space Flight Support," by Col Gen A. Maksimov: "Operation Buran"]

[Text] One frequently reads phrases such as the following in various newspaper articles, magazine articles, and newsbriefs: "Soyuz TM spacecraft with crew on board has gone into orbit..." "The cosmonauts have returned to Earth..." and "The cosmonauts have landed near..." These phrases are highly imprecise.

In actual fact both the launching of spacecraft into orbit and the landing of spacecraft are not self-contained operations. They are supported by hundreds and thousands of civilian and military specialist personnel working at the Baykonur space launch facility, at many control and telemetry facilities located along the flight path, aboard USSR Academy of Sciences research vessels, and in the landing areas. Clearly we must relate stage by stage about these people who perform critical and frequently very hazardous, physically-demanding basic support work, casting off the artificially created fog of secrecy around that which the entire world knows about except for our readers.

In preparing this article, I should like to discuss some aspects of the stage of direct preparations for the 15 November 1988 launch of the Energiya-Buran multipurpose reusable space transportation system [space shuttle].

Every launch is a critical task, and for that reason launch preparations and execution are organized as a large-scale operation, with precise interaction and coordination of all services and subdivisions taking part in the operation. Direct preparations for Operation Buran commenced on 1 February, when an order was issued pursuant to State Commission decisions, in which order specific tasks were spelled out for all workforces, duties were allocated, responsible individuals were designated, and a launch readiness timetable was specified. This order, for example, assigned preparation of the launch complex, assembly and testing building and all its systems, as well as testing of the launch vehicle and the aerodynamic orbital vehicle [shuttle craft] to a special team headed by a representative of the USSR Ministry of Defense, Candidate of Technical Sciences Maj Gen V. Gudilin.

The launch was to be from a new permanent launch complex which differs substantially from that from which the Energiya booster was launched on 15 May 1987. Any new piece of equipment must be tested and checked out in conditions close to actual operational conditions. Sometimes a simple relocating of a cable from one place to another leads to serious consequences. Suffice it to say that the design of that ill-fated azimuth correction instrumentation board because of which the 29 October 1988 Energiya-Buran system launch was aborted had been checked time and again, both in independent and combined tests, but without cryogenic fuel components. And we paid for our error of omission: board withdrawal went beyond its time frame. This "trivial item" resulted in aborting the launch of a highly complex system and to a standdown order to Mission Control, hundreds of support services, control and telemetry facility subdivisions, Academy of Sciences ships deployed in the Pacific and Atlantic, and military subunits.

The order paid particular attention to reliability of electric power supply. The Baykonur space launch facility consumes as much electric power as a medium-sized oblast administrative-center industrial city. There

is more than enough electric power available at the space launch facility to launch the Buran. But it was essential not only to ensure that there would not be even a brief interruption but that electrical parameters would be maintained.

Approximately 2,000 tons of the most powerful, highly-explosive cryogenic fuel is used in the launch vehicle and the shuttle craft, and loss of electric power during fueling, thermostatic control, and topping off leads directly to an explosion with a large radius of destructive damage.

It is for this reason that a special operations team was formed, containing representatives of the V. Barmin Design Office, the Ministry of Power and Electrification, and Kazakhenergo. This team, under the direction of Vitaliy Grigoryevich Sokolov, by 10 May 1988 had worked out a special arrangement for switching power circuits as well as organizational procedures aimed at eliminating the possibility of chance surges or distortion of the parameters of the incoming power.

The order assigned tasks to the various services: aviation, weather, communications, SEV [sistema yedinogo vremeni? (single time system?)], rear services, rail, motor transport, engineering, monitoring and mode, organization of safety at the launch site and along the flight path, preparation of rocket debris impact areas and preparations for evacuation of the people from hazardous areas, the ground command, control and telemetry system, and the landing system. One can judge the enormity of this job just from the fact that several thousand people had to be evacuated. And all of them had to be housed, kept warm, and fed.

At the same time orders were given to form combined teams at all facilities of the space launch complex and command, control, and telemetry system, to form command and control teams, search and rescue teams, and command posts, to conduct practice drills, combined training drills, to conduct certification and testing of thousands of specialist personnel from these teams for the purpose of issuing authorization to performed assigned functions.

We were aware of the enormous forces with which we were dealing and the consequences of possible emergency situations. For this reason everything was checked and rechecked again and again.

On 23 May the mated Energiya-Buran unit was transported to the launch pad for combined tests. Hauling out the huge 4,500 ton erector by means of four powerful, synchronized diesel locomotives was also an operation involving the participation of many space launch services and subdivisions.

Up to 10 June intensive combined testing of all mechanical, hydraulic, compressed-air and power systems and components was being conducted. Although test results were positive on the whole, some abnormalities were noted, such as in coordination of the shuttle craft's and

launch vehicle's onboard control systems. The mated unit was returned to the assembly and testing building.

A good deal of painstaking work lay ahead. An outstanding job was done by the specialist personnel under A. Andryushchenko, who quickly found a solution to the problem of "fine tuning" and combining the control system. It was also necessary to check control system algorithms on combined test beds, to apply all corrections to the onboard equipment, and once again to check out all systems through the entire sequence. This very laborious job, requiring the highest degree of concentration and a strong sense of responsibility, was accomplished within a few days.

At the same time readiness tests were performed on the shuttle craft integrated propulsion system, in the course of which repeated changes were made both in the burn sequence schedule and in propulsion system design.

Many industrial plant shops worked around the clock fabricating additional equipment. Testing team personnel as well as scientific and technical specialists at all echelons, right up to the State Commission, also worked around the clock.

Finally it seemed that all problems had been corrected. They checked and rechecked to make sure that everything was right, and on 10 October the decision was made to move the mated launch vehicle and payload out to the launch pad and commence launch preparations. A readiness report was submitted to the USSR Council of Ministers, which gave its approval.

Our readers are already familiar with launch complex preparations from an article by V. Karashtin (AVI-ATSIYA I KOSMONAVTIKA, No 7, 1988); I shall therefore discuss the activities of the space command, control and telemetry system and other services.

The plan prescribed using Raduga and Gorizont geosynchronous satellites to relay data obtained from the Buran orbital vehicle during its two-revolution orbital flight to the receiving stations of the system's telemetry monitoring facilities, with the data forwarded from these facilities to Mission Control. In connection with this, these satellites were repositioned by ground command.

On 5 October the ship "Marshal Nedelin" steamed out of Petropavlovsk-Kamchatskiy and on 25 October took up a position in the Pacific Ocean at latitude 45° south and longitude 130° west, between Australia and the southern extremity of South America, in the so-called "roaring forties." It was tasked with relaying received data to a Raduga communications relay satellite which was currently positioned in geosynchronous orbit at longitude 133° west. From the Raduga the signal would be relayed on to a telemetry monitoring station in Petropavlovsk-Kamchatskiy, from where it would be forwarded by landline to the command, control and telemetry system control center, and from there to Mission Control.

The ship "Kosmonavt Georgiy Dobrovolskiy" steamed from the South Atlantic to that same spot in the Pacific. This vessel would use a Gorizont communications relay satellite to pass on data to an Orbita receiving facility of the USSR Ministry of Communications at Petropavlovsk-Kamchatskiy, from where it would be relayed via Molniya-1 satellite to a telemetry monitoring facility at Medvezhi Ozero near Moscow and on to Mission Control via Ministry of Communications lines.

In addition, two vessels, the "Kosmonavt Vladislav Volkov" and the "Kosmonavt Pavel Belyayev," were deployed in the Atlantic (latitude 5° north and longitude 30° west, latitude 60° north and longitude 21° west respectively). These vessels would be passing on data received from Buran via Raduga communications relay satellites to receiving stations near Moscow, which would continue via landline to Mission Control. An additional flow of data would be proceeding from the Buran shuttle craft to the Kosmos-1897 relay satellite, and from there to receiving facilities in the Soviet Union.

This rather complex (but there was no other option!) but reliable communications arrangement was devised by highly-skilled military and civilian specialists and was precisely executed on launch of the Energiya-Buran. The reader will note that four satellite communications systems were being used.

To ensure that this entire complex system of receiving, processing, and transmitting data functioned with precision, timetables, schedules, and working figures were prepared, methodological documents pertaining to work sequence and procedure, coordination and tasking responsibility were drawn up, and dozens of local and combined practice drills were conducted. All personnel were required to take qualification tests and receive certification authorizing them to perform these work assignments. In addition, at the insistence of the State Commission, several final combined training drills were conducted under the supervision and with the participation of State Commission members. These drills were for the purpose of verifying launch readiness.

Special attention was focused on safety in the launch area and along the flight path. The launch area was subdivided into four zones. All specialist personnel were to be evacuated from zone 1 (out to a radius of 2 kilometers) at T minus 12 hours. Persons involved in the launch were to be inside special airtight protective bunkers which were fitted out and provisioned for an extended stay. All operations pertaining to fueling, launch preparation, and launch execution were to be controlled from these bunkers. The bunkers afforded protection even if the rocket were to fall directly onto them.

Zone 2, to a radius of 5 kilometers, was to be cleared when the countdown reached T minus 8 hours, when hydrogen fueling commenced. Two emergency rescue

teams organized by the space launch facility would be standing by at the zone boundary until fueling was completed.

Zone 3, out to a radius of 8.5 kilometers, was determined on the basis of personnel safety in case of launch vehicle explosion during ignition or liftoff. This zone was to be cleared 4 hours prior to launch.

A final zone, out to a radius of 15 kilometers, was established by the space launch center's traffic control service and was for the purpose of ensuring safety of exposed personnel in case the launch vehicle were to plunge to the ground shortly after liftoff. Evacuation from this zone was to be completed at launch minus three hours in the countdown sequence. Traffic would be halted on the roads leading into this zone, and all-terrain vehicles would be patrolling the perimeter. Red flags would be raised at all posts. Emergency rescue teams would be deployed on the boundary of this zone.

Evacuation of people from the 15-kilometer zone commenced at T minus 72 hours, since it was necessary to relocate several thousand persons to other accommodations at the space launch center.

As for safety along the launch vehicle flight path, Civil Defense manpower and equipment as well as manpower and resources of the military districts across which the boost segment flight path lay were brought to a state of readiness by launch time in response to a directive issued by the USSR Minister of Defense. The Air Force allocated sufficient manpower and resources to airlift men and equipment to possible emergency sites if the need arose.

This entire massive, elaborate operation was organized by the corresponding Ministry of Defense staffs, and by R. Fatkhutdinov directly at the space launch center.

Finally everything was ready. The main thing that determined launch readiness was successful completion of all prelaunch checks and procedures at the launch complex by combined teams under the direction of chief designers V. Barmin, B. Gubanov, and Yu. Semenov, Maj Gen V. Gudilin, and N. Kavzalov.

The State Commission received launch readiness reports from the team leaders and support service supervisors, all designers, readiness assessments by lead institutes and military acceptability determination teams, representatives of the ministries and agencies involved in development of the Energiya-Buran system. There was repeated reverification to ensure that nobody had the slightest doubts or questions. The decision was made to launch on 29 October 1988.

The heavy steel doors in the launch pad bunkers swung shut on 28 October at 2100 hours Moscow time. Things appeared to be very calm. Work proceeded smoothly. Everybody was in an optimistic mood, but everybody was quite tense deep down inside.

...The 10-minute launch sequencing button was pushed. From this point on the launch sequence could be halted only by stopping this automatic countdown. Everything was proceeding according to previously-written, thoroughly-tested programs running the automated launch preparation and execution system. The system would issue commands, verify execution, and issue subsequent commands. If an "abnormal situation" were to arise, the launch sequence computer contained a well-considered and tested response algorithm.

The count advanced to T minus 51 seconds, the point at which withdrawal of the azimuth correction instrumentation board had been late. The abort of the launch naturally was a disappointment, caused by an essentially trivial item. And Operation Buran, with all the support services and tens of thousands of personnel, proceeded to execute the abort and standdown process. But nobody lost heart. On the contrary, they marshaled their energies and went right back to work.

Today, looking back, I would like to recall once again how selflessly people worked. I remember the launch preparations and launch of the first satellite and of the first man in space, Yuriy Alekseyevich Gagarin, and I can state that the morale and optimistic enthusiasm of all persons involved was no less, and perhaps greater. All launch preparations the second time around were virtually completed on 12 October. But it was decided that a couple of days would not make any difference. People had to be given a chance to get some rest, to get enough sleep, and to check through everything once more.

And now it was again night in the bunker. The launch sequence the second time through was proceeding smoothly, like after a major dress rehearsal, but the weather was deteriorating rapidly. How badly we wanted the low-pressure system to be delayed or at least pass a bit further north of us. We could feel the tension. Weather reports, weather reports every 30 minutes.... A weather reconnaissance aircraft was conducting observations 200-300 kilometers out and was reporting the latest information.

The State Commission decision-makers went up to the launch vehicle ignition control room and took seats behind the technical supervisors. It was time to push the 10-minute automatic launch sequencing button, but the meteorologists were pressing forward and handing B. Gubanov a gale warning and waiting for him to sign acknowledgement of receipt. He stood up and proceeded toward Andrey Savvich Gonchar in the back of the room. The latter got together with his specialists and determined the margin of safety, and agreed to go ahead. Boris Ivanovich went over to the State Commission people. We could tell from his arm gestures, stance, and the forward lean of his head that he felt we could proceed with the launch. We were in agreement. He smiled radiantly, sat down next to V. Gudilin, and gave the order to launch.

The seconds ticked off on the wall display.... Suddenly all TV monitors showed flames billowing, followed by the status report: "Engine readings normal," "Boost phase nominal," "All systems reading nominal." That was it! Now everybody's attention went to Mission Control! How would Buran's propulsion system perform? Reports were coming in; both ignitions were normal. All thoughts now shifted to the question of how and where the shuttle would land. Trucks and support vehicles proceeded to head out toward the landing site. They alone were permitted to leave the shelter—they would be the first to approach the shuttle craft and commence servicing procedures.

Fifteen minutes before shuttle touchdown USSR Council of Ministers Deputy Chairman I. Belousov, CPSU Central Committee department chief O. Belyakov, Minister of the Aviation Industry A. Systsov, and I requested permission to leave from State Commission Chairman Vitaliy Khusseynovich Doguzhiyev and headed swiftly over to the landing site. The weather was miserable! Wind velocity was up to 20 meters per second, but fortunately the wind direction was almost parallel to the runway. A good deal has been written about the shuttle landing, and a fair amount was shown on television. Nevertheless you really had to see it! An enormous thrill!

The escorting fighter swung past the shuttle craft, executed a 180-degree turn, flew one last pass over Buran, and headed off to another airfield. Buran was still on its landing roll when orange vehicles from A. Gurov's

subunit proceeded to head out toward it. They surrounded the shuttle craft, smartly chocked the wheels, trained a blast of air onto the landing gear, and headed back to the trucks. They were waiting for the fuel to be burned up in the auxiliary propulsion unit. The craft stood poised like a gyrfalcon, drooping its head toward the ground and puffing bright flashes from its tail.

Finally the fuel was exhausted, the flashes ceased, and teams in gas masks and protective suits went to work. When they were finished, all hell broke loose! Everybody rushed toward Buran, hugged and kissed one another; many were unable to hold back tears. 12 years of labor by hundreds of thousands of Soviet citizens had ended in brilliant fashion.

At this point it was quite clear to all of us that our country had plenty of clear heads and skilled hands. What people were experiencing was undescrivable joy. It is worth living and working for the sake of one such instant.

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Listing of Soviet Manned Space Mission Crews

91441205t Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 3, Mar 89 (signed to press 14 Feb 89) p 43

[Table: "Spacecraft Crews"; continuation of listing appearing in AVIATSIYA I KOSMONAVTIKA, No 2, 1989]

[Text]

Table

Number	Primary Crew	Backup Crewp	Radio Callsign	Spacecraft, Orbital Station	Date and Duration of Mission
1	2	3	4	5	6
27.	Leonov, Aleksey Arkhipovich; Kubasov, Valeriy Nikolayevich	1. Filipchenko, Anatoliy Vasilyevich; 2. Romanenko, Yuriy Viktorovich; 3. Dzhaniybekov, Vladimir Aleksandrovich; 4. Andreyev, Boris Dmitriyevich	Soyuz	Soyuz 19 - Apollo	15 July-21 July 1975, 5 days 22 hours 31 minutes
28.	Volynov, Boris Valentinovich; Zholobov, Vitaliy Mikhaylovich	1. Rozhdestvenskiy, Valeriy Ilich; Zudov, Vyacheslav Dmitriyevich; 2. Gorbato, Viktor Vasilyevich; Glazkov, Yuriy Nikolayevich; 3. Berezovoy, Anatoliy Nikolayevich; Lisun, Mikhail Ivanovich	Baykal	Soyuz 21 - Salyut 5	6 July-24 August 1976, 49 days 6 hours 24 minutes

Table

Number	Primary Crew	Backup Crewp	Radio Callsign	Spacecraft, Orbital Station	Date and Duration of Mission
1	2	3	4	5	6
29.	Bykovskiy, Valeriy Fedorovich; Aksenov, Vladimir Viktorovich	1. Malyshev, Yuriy Vasilyevich; Strekalov, Gennadiy Mikhaylovich; 2. Popov, Leonid Ivanovich; Andreyev, Boris Dmitriyevich	Yastreb	Soyuz-22	15 September-23 September 1976, 7 days 21 hours 52 minutes
30.	Zudov, Vyacheslav Dmitriyevich; Rozhdestvenskiy, Valeriy Ilich	1. Gorbatko, Viktor Vasilyevich; Glazkov, Yuriy Nikolayevich; 2. Berezovoy, Anatoliy Nikolayevich; Lisun, Mikhail Ivanovich	Radon	Soyuz 23	14 October-16 October 1976, 2 days 7 minutes
31.	Gorbatko, Viktor Vasilyevich; Glazkov, Yuriy Nikolayevich	1. Berezovoy, Anatoliy Nikolayevich; Lisun, Mikhail Ivanovich; 2. Kozelskiy, Vladimir Sergeyevich; Preobrazhenskiy, Vladimir Yevgenyevich	Terek	Soyuz 24 - Salyut 5	7 February-25 February 1977, 17 days 17 hours 26 minutes
32.	Kovalenok, Vladimir Vasilyevich; Ryumin, Valeriy Viktorovich	Romanenko, Yuriy Viktorovich; Ivanchenkov, Aleksandr Sergeyevich	Foton	Soyuz 25	9 October-11 October 1977, 2 days 45 minutes
33.	Romanenko, Yuriy Viktorovich; Grechko, Georgiy Mikhaylovich	Kovalenok, Vladimir Vasilyevich; Ivanchenkov, Aleksandr Sergeyevich	Taymyr	Soyuz 26 - Salyut 6	10 December 1977-16 March 1978, 96 days 10 hours
34.	Dzhanibekov, Vladimir Aleksandrovich; Makarov, Oleg Grigoryevich	Kovalenok, Vladimir Vasilyevich; Ivanchenkov, Aleksandr Sergeyevich	Pamir	Soyuz 27 - Salyut 6	10 January-16 January 1978, 5 days 22 hours 59 minutes
35.	Gubarev, Aleksey Aleksandrovich; Vladimir Remek [CSSR]	Rukavishnikov, Nikolay Nikolayevich; Oldrich Pelcak [CSSR]	Zenit	Soyuz 28 - Salyut 6	2 March-10 March 1978, 7 days 22 hours 16 minutes
36.	Kovalenok, Vladimir Vasilyevich; Ivanchenkov, Aleksandr Sergeyevich	Lyakhov, Vladimir Afanasyevich; Ryumin, Valeriy Viktorovich	Foton	Soyuz 29-Salyut 6	15 June-2 November 1978, 139 days 14 hours 48 minutes

U.S. Imaging Orbital Surveillance Platforms Reviewed

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in Russian No 3, Mar 89 (signed to press
14 Feb 89) pp 46-47

[Article, published under the heading "The Pentagon's Orbital Arsenal," by Col A. Radov: "Imaging Reconnaissance Satellites"; based on materials published in the foreign press]

[Text] A retrospective analysis of evolution of the U.S. space program convincingly demonstrates that long before the launching of the first satellites, U.S. political leaders and industrial corporations were intensively studying the possibilities of utilizing space for military purposes.

Research and development efforts connected with observing from space the territory of the USSR and the activities of our Armed Forces, and particularly the development of strategic weapon systems, their testing and deployment, acquired particular importance to the United States in conditions of nuclear confrontation.

Back in 1954 the U.S. Air Force established a future reconnaissance systems research and development program. In 1956 Lockheed Aircraft became the primary contractor for this program, within the framework of which two independent surveillance satellite designs subsequently were developed: Samos, controlled by the U.S. Air Force, and Corona, controlled by the CIA.

The United States commenced regular launches of Samos satellites at the end of 1960. Soon activities connected with satellite imaging reconnaissance were classified. The Air Force and CIA assigned the code name KH (Keyhole) to the project involving subsequent development of these systems. First-generation Samos satellites were assigned the designation KH-1, while Corona vehicles were designated KH-4. More than 100 of these satellites were put into orbit over a 13-year span. Modifications were made on three occasions. Satellite operating life was increased from several days to several months, which made it possible to reduce the annual number of launches from 9 to 2-3.

Imaging surveillance platforms are used to conduct reconnaissance of objects and installations of strategic and operational-tactical designation for the purpose of obtaining a detailed determination of their performance characteristics and operating features, as well as of crisis areas. They are launched from the U.S. Air Force's Western Test Range (Vandenberg AFB, California) into low polar orbits with an inclination of 96-97 degrees and an altitude of 125-140 km at perigee and 330-450 km at apogee. It is believed that conduct of surveillance from polar orbit provides capability to obtain images of any point on the earth's surface.

Space vehicles in orbit are controlled by the U.S. Air Force Consolidated Space Operations Center (CSOC). Exposed film is returned to the earth in special canisters,

which are ejected from the satellite and enter the atmosphere controlled by their own propulsion system. After deceleration a parachute system deploys and the canister descends to earth in the vicinity of the Hawaiian islands, where it is retrieved in midair by a specially-equipped C-130 aircraft.

Today the Samos and Corona satellites are considered obsolete. Foreign specialists claim that launches ceased in 1972 and 1984 respectively.

In 1971 the United States commenced deploying new-generation imaging reconnaissance vehicles—the KH-9 series, designated LASP and Big Bird in the foreign press. By this time U.S. leaders had acknowledged not only the operational-tactical but also the military-economic significance of satellite imaging surveillance. An acknowledgement by former President Lyndon Johnson attests to this. He stated that the high degree of reliability of satellite-obtained intelligence enabled the Chief Executive to make validated decisions with complete confidence in matters of organizational development and equipment of U.S. military forces.

The LASP satellite is tasked both with imaging (both detail and general surveillance) and with collecting signals intelligence (wide-area). In design and construction it is a modified Agena rocket stage. The satellite, 15.2 m in length and 3.05 m in diameter, is equipped with two solar panels and a 6 m diameter receiving and transmitting antenna. It weighs 11,400 kg.

Wide-area photography is done with a camera with a focal length of 610 mm (film with a resolution of 180 lines per mm), which provides a ground image resolution of not less than 1 meter. The film, processed aboard the satellite, is laser-beam scanned, with the results converted into electrical signals and radio-transmitted to CSOC ground stations.

Detailed photographs are taken with a camera with a focal length of 2,440 mm. U.S. specialists claim a ground target resolution of 0.3-0.5 m. The exposed film (400 lines per mm resolution) is returned to the earth in special canisters, which number no fewer than six.

LASP satellites are boosted into orbit by the Titan IIID rocket. They are placed into orbits with a perigee of 114-169 km, apogee 186-336 km, inclination 96.5 degrees. This satellite has an operating life of from 52 to 275 days. After a satellite ceases operation, a self-destruction system is triggered by ground command. The destruction is timed so that the fragments produced by the explosion will reenter the atmosphere above the ocean in order to avoid possible impact by fragments on the territory of foreign countries.

A total of 18 satellites were put into orbit between 15 January 1971 and 20 January 1983. It is noted that in many instances ferret SIGINT satellites were launched together with LASP satellites, the former subsequently transferred into higher (700-1,300 km) orbits.

An attempt to launch the last of the LASP satellites took place on 18 April 1986. During the boost phase, however, it was discovered that the launch vehicle had gone off course. The booster and satellite were destroyed by ground command. The U.S. Air Force has no more satellites of this type; production ceased in 1981.

Production of these satellites was ended in connection with replacement of film-type cameras with optoelectronic surveillance systems. They provide spectrozonal surveillance capability, including in the infrared band, and provide capability to make objects stand out more distinctly against the terrain, to detect camouflage, and to obtain additional information about the object of interest.

Another advantage of optoelectronic satellite surveillance systems is the fact that they employ digital methods of reading and real-time transmission of images, which permits extensive employment of computer methods of processing data for forming and correcting images received by ground stations.

According to reports in the foreign press, the United States has developed and since the beginning of the 1970's has been operationally utilizing algorithms for computer processing of imaging satellite surveillance data for generating images. Simultaneously with forming an automated data bank, there is capability to correct geometric distortions, substantially to increase image contrast, and to increase the clarity of object outlines.

Launching of optoelectronic surveillance satellites, designated KH-11, commenced on 19 December 1976. Initially they weighed 10,800 kg, which was boosted to 13,500 kg following upgrading at the end of the 1970's and beginning of the 1980's; dimensions were 19.5 x 2 m. The satellite is equipped with its own maneuvering propulsion unit for adjusting orbital path with a periodicity of no less frequently than once every 3 months. These satellites are designed for 3 years of operational service in orbit. Linear resolution of KH-11 equipment is about 30 cm straight-down with absolute target contrast.

KH-11 satellites are extensively employed to conduct immediate detailed surveillance of various parts of the world, particularly regions of crisis situations and local conflicts. In addition, the obtained data is used to prepare digital terrain maps for cruise missile guidance.

Regular space shuttle launches commenced in 1981. This opened up for the U.S. Department of Defense the attractive possibility of using these craft not only to place high-priority military satellites into orbit but also to perform preventive-maintenance inspection and refueling of military satellites in orbit and if necessary to retrieve them, return them to earth and relaunch them following maintenance and upgrading. Development of more sophisticated imaging reconnaissance satellites has begun: on the KH-12 and the Indigo-Lacrosse. Production of the KH-11 was terminated in 1983 in this connection. Eight of the nine satellites built have been

launched to date. At the present time two KH-11 satellites are in operation, launched into orbit on 27 October 1987 and 6 November 1988 respectively.

We should note that U.S. specialists are widely publicizing successes achieved in the area of development of orbital reconnaissance hardware. The U.S. Government provides its allies with satellite-obtained intelligence whenever this is in the direct interest of the United States. Intelligence obtained by U.S. satellites was used by Israel, for example, during the Arab-Israeli conflict. The United States was literally caught in the act of conducting improper activities as it was supplying Israel with satellite-obtained intelligence. An Egyptian tracking station near Cairo intercepted video signals transmitting to Israel images of military installations in Egypt and Syria. A copy of one of the intercepted images was attached to the protest lodged with the United States by the Egyptian Government.

Later, during the Anglo-Argentine conflict over the Falkland Islands (Malvinas), Washington provided orbital surveillance data to its closest NATO ally. The Argentine cruiser *General Belgrano*, which was located outside the combat zone, was spotted by a U.S. surveillance satellite. The warship's coordinates and course were passed on to British military authorities. On 2 May 1982 the British submarine *Conqueror* torpedoed the Argentine cruiser and sent it to the bottom along with 368 crewmen.

The KH-12 platform is a further modification of the KH-11 and is tasked with surveillance of ground targets, including mobile targets, with surveillance of areas of local conflicts, and with obtaining data for producing digital terrain maps. This satellite may also be used for space surveillance and inspection of space objects. It is planned to establish a four-satellite system. These satellites, it is noted in the foreign press, will work in pairs. One will conduct wide-area surveillance, while the other will perform detailed surveillance imaging on the basis of target designation provided by the first, monitoring targeted objects with a frequency of at least twice every 24 hours.

The satellite weighs 18.5 tons, 4 tons of which consists of fuel for maneuvering. In-orbit refueling capability is being provided. Maximum orbital altitude is 1,000 km. The platform can "dip" to an altitude of 120 km. It has a designed operational life of 5 years and can provide a ground surface resolution of 10-15 cm. The spectral range of the optoelectronic instrumentation carried by the KH-12 encompasses the visible spectrum, the near (0.4-1.1 micron) and far (8-14 microns) infrared bands. Information is to be real-time transmitted via a TDRS communications relay satellite. Launch of the KH-12 is scheduled in the first half of 1989.

Claiming an "acute need" for current monitoring of treaty compliance, the U.S. Department of Defense is working actively on the development of fundamentally new means of orbital surveillance. Evidence of this is the

launching of an Indigo-Lacrosse imaging reconnaissance satellite during the 27th space shuttle flight (3 December 1988).

This satellite was developed by Martin Marietta under contract with the CIA. It carries synthetic-aperture radar and conducts around-the-clock all-weather surveillance of the earth's land and ocean surface. The satellite is in the form of an octahedral prism measuring 8 x 4 m, to which a large antenna, 27-31 meters long, is attached on a metal beam pointing toward the earth. The solar panels span 46 m, and the satellite weighs more than 18 tons. Because of its weight and size, this satellite can be launched into orbit, in folded-down configuration, only by the space shuttle or Titan IV booster.

Operational deployment of satellites of this type could substantially increase U.S. capabilities to conduct surveillance through cloud cover and at night as well as capability for more effective utilization of Keyhole-type orbital platforms for detailed imaging of newly-detected objects and installations. Resolution in 700 km operational orbits is about 3 meters. Obtained imagery would be real-time transmitted to earth via a TDRS communications relay satellite, with subsequent computer processing. Foreign experts estimate that the cost of an Indigo-Lacrosse satellite is 500 million dollars. It has an operational life in orbit of 5-7 years. This satellite was launched into an orbit with a 57 degree inclination to the plane of the equator, which provides surveillance coverage of 80 percent of the USSR.

U.S. DOD plans call for developing a network of orbital imaging reconnaissance assets which would include up to 8 optoelectronic and radar surveillance satellites. There have been disturbing reports from abroad concerning the planned utilization of Indigo-Lacrosse satellites to provide target designation in the future to B-2 bombers and mobile ICBMs, since integration of these assets into a single system could lead to the development of a strategic reconnaissance-strike system. And this

enhances imaging orbital reconnaissance platforms to the status of strategic offensive weapon components, which contradicts claims by U.S. military officials that these platforms are specifically intended for the purpose of monitoring arms control and treaty compliance.

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Articles Not Translated From AVIATSIYA I KOSMONAVTIKA No 3, March 1989

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Interrupted Flight (A. Kopeykin) pp 30-31

First Jet Aircraft pp 34-36

Putting One's Heart Into It (P. Loshakov) p 48

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