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

AVIATION AND COSMONAUTICS

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Air Force Chief of Staff Pankin Interviewed

90SV0053A Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) pp 2-3

[Interview, published under the heading "Our Commanders," with Col Gen Avn Valentin Yepifanovich Pankin, Chief of the Air Force Main Staff, by the editors of AVIATSIYA I KOSMONAVTIKA: "'Everything Depends on the Wisdom of the Leader....'"]

[Text] **Col Gen Avn Valentin Yepifanovich Pankin, Chief of the Air Force Main Staff, replies to questions from readers of the magazine AVIATSIYA I KOSMONAVTIKA.**

* * *

[AVIATSIYA I KOSMONAVTIKA] Comrade colonel general, we are presently in a difficult time for the entire country, with perestroyka in progress. One of its main tasks is to dismantle the system of rule by administrative fiat ["command-administrative system"]. But the thought of the Armed Forces without strict, precise, and absolute execution of orders and without one-man command is absurd. At the same time development and utilization of the creative, productive potential of each and every officer is unattainable without democratization of the structure and organization of the military. How can this conflict be resolved?

[Pankin] Perestroyka in this country has taken on an irreversible character, embracing all aspects of societal affairs. The most crucial components of the present reforms include resolute overcoming of stagnation phenomena, smashing of the mechanism of foot-dragging, comprehensive development of democracy and socialist self-government, and broadening of glasnost.

At the same time, if we want to achieve intensification of combat training and an increase in its effectiveness, it is necessary not only to dismantle the command-administrative system but also to strengthen conscious discipline and exemplary order. An important role is also played by a moral and ethical movement toward unity of word and deed, toward an understanding of the fact that rights and obligations are inseparable. And raising the status of honest, quality labor constitutes the foundation of all this.

Perestroyka in the Armed Forces has its specific features. The work style and methods of commanders, staffs, and political agencies are being reexamined. An atmosphere of inquiry, a critical attitude toward things, and refusal to rest on one's laurels is being established in the units. The essence of the reforms can be formulated briefly as follows: apathy on the part of personnel is disappearing, and problems of combat readiness, professional skills and flight safety are becoming the common interest of military aviation personnel. Incidentally, materials appearing in recent issues of the magazine AVIATSIYA I KOSMONAVTIKA also convince one of this.

Not everybody, however, understands the idea of perestroyka in this way. Of the entire wealth of revolutionary renewal, many recognize only democratization, and by this they mean reformation of the fundamental laws according to which the military lives and operates. The result is a mess: everybody is his own strategist, commander, and executing entity. Demagoguery is spreading.

Throughout all times the military has been based on centralized leadership. The fact is that command and control are supposed to ensure maximum organization and discipline, flexibility and swiftness of action, which are absolutely essential in order to accomplish combat missions. Precise and well-defined centralized command and control is also an absolute imperative for the Air Force in present-day conditions, when the success of an operation and combat engagement will depend on joint efforts by the various branches of service and combat arms.

Democratization of the structure and organization of the military should not destroy the principle of one-man command. It is this principle which ensures that the commander is personally responsible to the state for all aspects of the daily life and activities of his subunit, unit, naval ship, or establishment of the Soviet Army and Navy. And this is particularly important in the Air Force, since the core and backbone of the Air Force consists of highly-trained specialists who operate highly complex aircraft. I maintain that the commander who relies on the intelligence and innovativeness of his men but who himself assumes full responsibility achieves greater success in daily combat training, in contrast to the pure administrator. The essence of the matter, the most vivid manifestation of the law of unity and struggle of opposites lies here and here alone.

[AVIATSIYA I KOSMONAVTIKA] Right now the most important military technical problem is that of automation and computerization of command and control processes. How is this problem being resolved in the Air Force? How well prepared are commanders and staffs to accomplish the task? What is the situation as regards technical support?

[Pankin] Yes, modern management of any domain of activity is difficult without automation and computerization. Here in the Air Force, incorporation of means of automation into the process of management, command and control has gone through three stages to date: from the establishment of computer centers at the Air Force Main Staff to the forming of an integral system.

Several years ago a new stage began in this area. It could be called computerization of headquarters staff operations at the level of day-to-day activities. You are familiar with the technical basis of this computerization:

personal computers and local area networks. Of course the state of this country's electronics industry affects to a certain degree the pace and quality of automation of Air Force management, command and control. The weak points of our computers are important factors: they are slow, have limited RAM, are not sufficiently reliable, and are physically large and heavy. Even the best Soviet-made personal computers (YeS-1840, -1841, -1845) contain substantial defects. Nevertheless it is my conviction that there are no grounds for believing that our lagging in this area diminishes combat or operational readiness, improvement in job skills, and effectiveness of employment of air weapons. The state of the Air Force fully assures accomplishment of all its assigned missions. Although this is sometimes achieved by overexertion on the part of personnel....

[AVIATSIYA I KOSMONAVTIKA] Computerization is unquestionably important. It will facilitate such laborious work as gathering and processing of data, storage of information, and commander decision-making. Judging by all indications, however, right now this is a thing of the future. But what should a regimental chief of staff do right today? How can he get his bearings in the massive flood of documents with which he is inundated? The following trend has been noted: Main Staff chiefs of directorates and services seek to channel many documents not to the immediate executing personnel but to the regimental commander, and under the signature of the commander in chief of the Air Force.

[Pankin] I shall state the following about the flood of papers originating from the Air Force Main Staff. At the present time we are seeking to ensure that every directorate or service chief organizes activities in his assigned area via specific executing individuals, activating his structural linkages. For example, the chemical warfare service chief addresses documents not to the regimental commander but rather to the regimental chemical warfare service chief. I personally monitor this process. Only the most important, I would say strategic documents and urgent instructions are sent to the line units bearing the signature of the commander in chief. The greatest number of documents are propagated in the large strategic formations and combined units. We are presently working actively on this problem, and I am sure that it will be resolved.

[AVIATSIYA I KOSMONAVTIKA] Comrade colonel general, what in your opinion is keeping the combat training system from functioning more effectively from the standpoint of end result—a high degree of personnel proficiency? Is there any clearly-marked deficiency in this system which is impeding aviation personnel training?

[Pankin] There is no such defect. Everything depends on the wisdom of the unit, combined unit, and large strategic formation commander. Judge for yourselves. The commanding officer and his chief of staff handle the formulation and workup, for example, of the regimental tactical air exercise. What useful things are learned by subordinate personnel depends on how an exercise is planned and scheduled. If in the course of a tactical air exercise aircrews operate in a monotonous fashion, merely to complete their bomb ordnance delivery or to fire off their rounds, no benefit will be derived. It presents no interest to people, since there is nothing new and no innovation. In order to avoid this, the regimental commander should be given appropriate assistance by the division commander at the tactical air exercise general scenario approval stage. Nor should commanding generals [komanduyushchiye], not to mention their deputies, feel shy about attending regimental training exercises. That is, the structure of combat training should function properly.

When I was commander of a large strategic formation, I would do the following: I would assign a mission problem to the pilots, and they would ready themselves for the exercise and make calculations. Everything was timed down to the second; otherwise you can't make things difficult for air defense. But nobody was forced to put in the work. Take it easy if you like, but at the readiness check you better lay it all out with precision, first at the blackboard and later demonstrating your plan by the "walking it through" method. When everything was "wound up tight" in the regiment, I would go out to the range. I would intervene with the exercise director only if a danger to flight safety was developing. The purpose was to determine where mistakes had been made by me, as commanding general, by the regimental commander, and by the aircrews. I would jot down information, and I would go out to the target range proper and see for myself the results of ordnance delivery.

After this I would return to the airfield and assemble the pilots. I would cover with a screen my diagram depicting the aircrews' actions. I would hear reports, and then remove the screen from my diagram and show the actual picture, analyzing the performance of each crew. In this way I myself learned things, and I taught the regimental commander, his chief of staff, and the pilots.

[AVIATSIYA I KOSMONAVTIKA] The editors receive many letters in which officers ask: which way produces a higher degree of professionalism: resident study or correspondence study at the Air Force Academy imeni Yu. A. Gagarin?

[Pankin] Continuous maintenance of a high level of flying skills and getting involved in science are best achieved by correspondence study. But it is very difficult to acquire thorough knowledge by studying on one's own. Resident study is better for achieving professionalism, and for this reason I consider this form of study preferable.

I should like to say the following to staff-specialization students at the Air Force Academy imeni Yu. A. Gagarin. Learn to plan and schedule combat training, the manner and procedure of employment of men and

equipment. Headquarters is that brain center, that analytical center, on which both the operational readiness and combat capability of line units depend in large measure.

[AVIATSIYA I KOSMONAVTIKA] Comrade colonel general, what problem among those to which the chief of the Air Force Main Staff is constantly giving thought is the most crucial and troubling problem for the Air Force at the present time?

[Pankin] Unquestionably the central problem at present for the Air Force Military Council is that of maintaining large strategic formations, combined units, and units in a high degree of combat readiness. It is no secret that the unilateral force reduction by 500,000 men, the withdrawal of forces from Mongolia, Czechoslovakia, and Hungary, as well as the political and economic processes which are taking place in this country have created feelings of uncertainty and depression on the part of some officers and warrant officers. A few commanders have begun displaying elements of complacency and have reduced demandingness toward their subordinates. This has been fostered to a significant degree, and continues to be fostered at the present time, by unthinking and superficial articles on the military.

Withdrawal of troops within a limited period of time places difficult and complex items on the agenda. Connected with the redeployment of units to Soviet soil is the drawing up of new combat training plans and schedules, revision of views on combat employment, and adjustment of organization of coordination of air components within Air Force large strategic formations and with other branches of service within the organizational framework of military districts. It is necessary to build new training facilities, taking into account basing of forces and altered missions. And this, you will agree, is by no means a simple task at the present time.

Social issues are particularly acute for the Air Force. Adequacy of provision of medical facilities is only at 77 percent in many garrisons, while the corresponding figure for retail trade facilities is 71 percent, and 44 percent for kindergartens. We are taking measures to normalize the situation. The housing program calls for completing for occupancy 13,000 housing units in 1990, and 75,000 units in the period 1991-1995. In the 13th Five-Year Plan we are planning to build 34 medical and 69 preschool facilities, 9 schools, 42 bathhouses and laundry facilities, 28 sewage treatment plants, 108 boiler facilities, 61 barracks buildings, 65 mess halls, 37 stores, and to lay 1,260 kilometers of utilities lines. It is planned to allocate 60-70 million rubles each year for these purposes and, by the end of the next five-year plan, to boost to 90-95 percent the provision of social, cultural, and consumer services facilities.

[AVIATSIYA I KOSMONAVTIKA] Could you tell us briefly about your career in the Air Force and about yourself? What moments in your life do you remember the most, and what moments brought you the greatest satisfaction?

[Pankin] I flew for more than 30 years, and I became type-rated on 21 different combat aircraft. I went through every career stage, from rank-and-file pilot to commander of a large strategic formation. I commanded a regiment, a division, and an air army for more than 10 years. I have served as chief of the Air Force Main Staff since 1985. The geography of my duty stations is quite extensive; I have served in practically all this country's outlying regions.

Being a pilot and flying modern combat aircraft always brought me a sense of fulfillment. I consider the years during which I commanded a regiment and a division to be particularly memorable ones. That was the busiest, most stressful and dynamic period in my life. But it was precisely during that period that I felt the greatest satisfaction from my military service.

The job of chief of the Air Force Main Staff is interesting in its own way. In addition to verification and organizational functions, the main items today are matters pertaining to Air Force organizational development taking into account its future development prospects, equipping units with new aircraft, strategic employment of the Air Force, as well as many other things which determine both the present and future of our military aviation.

I have a tough work schedule, running from 0700 to 2200-2300 hours. When crisis situations arise, such as following the earthquake in Armenia or during the difficulties in relations between Armenia and Azerbaijan, I spend the night in my office. But in general it is a quite simple matter: I have been serving the homeland my entire life. And that makes me happy.

Standardized Airstrike Mission Assignment Terminology Suggested

90SV0053B Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) pp 4-5

[Article, published under the heading "Combat Training: Debates, Suggestions," by Col Ye. Stanishevskiy, candidate of military sciences: "It Can Also Be Done Differently...."]

[Text] **While in agreement on many points with the author of the article "A New Approach Is Needed" (AVIATSIYA I KOSMONAVTIKA, No 1, 1990), Col Ye. Stanishevskiy, candidate of military sciences, expresses his own view on classification of the combat missions of frontal aviation.**

* * *

Many air commanders have gotten used to the fact that ground-attack, fighter-bomber, and frontal bomber aviation units and combined units, while striking the same

targets, perform combat missions which are different in name, as defined by standards-prescribing documents. Formulated in this way, by target attribute, they lack the requisite logical linkage with the content of the operational-level missions of higher headquarters, and without rephrasing are unacceptable for practical purposes. There arises the urgent need for their systematization or classification according to a common indicator or attribute.

In my opinion the author of the article "A New Approach Is Needed" was right in suggesting the use of common missions for different combat arms, branches and components. Other approaches are also possible, however. For example, if one were to select as a common attribute the principal tasking designation of the above-enumerated military aviation components—porazheniye obyektov [(1) effective engagement of targets; (2) destruction of targets]—then they have one and the same combat mission, differing primarily in depth of operations.

Defining porazheniye obyektov primarily as weapons delivery [ognevykh udarov—"fire strikes"], one can easily designate a first group of combat missions for combined units and units—"fire missions" [ognevyye zadachi]. Creating conditions for their successful accomplishment, commanders are compelled to form groups or elements of various mission tasking. Certain elements are tasked with directly striking the enemy, while others are tasked with supporting the strike elements.

Let us examine this in greater detail.

As of the present time there have been specified approximately 80 types of targets against which units and combined units of frontal aviation components can be employed. We must determine how the term porazheniye should be defined and how combat missions should be formulated in a practical manner.

As we know, personnel, military equipment, and various structures are defined as targets. The majority of these consist of two or all three specified component elements and are characterized by location, mobility, distance, dimensions, degree of protection, vulnerability, concealment and camouflage, and other parameters. In current documents the degree of destruction of targets is determined solely proceeding from their composition. Utilizing such a criterion, one can unambiguously formulate combat missions.

The following missions are designated for effectively engaging a single individual target (military equipment): "destroy," "disable," "neutralize." For group or multiple targets, including personnel and various military equipment, the missions are similar: "destroy," "neutralize," "disrupt." It makes sense to equate the nature of damage inflicted on structures (military, military-industrial, power generation, etc) to degrees of damage to military equipment, replacing the term "destroy" [unichtozhit] with "demolish" [razrushit], which is more applicable to fixed-site or permanent installations. A runway, bridge, dam, or nuclear power generating plant, for example, cannot be destroyed, but they can be demolished, disabled, and damaged. In this case a combat mission to strike structures could employ the following: "demolish" [razrushit], "disable" [vyvesti iz stroya], "damage" [povredit].

In connection with this, assignment of combat missions requires of commanders knowledge of the combat capabilities of combined units, units, and subunits. Mission formulation should reflect the degree of destruction or damage whereby a target ceases functioning, fully or in part, for a certain period of time, such as 7 days, 24 hours, or 1 hour. The nature of damage inflicted depends on the type of target, assigned force, weapons employed, level of proficiency of flight personnel, as well as many other factors, but not on the commander's subjective wishes or importance of targets. Such an approach will make it possible to eliminate the currently-existing differences in interpreting missions. For example, nuclear missile weapons unichtozhayutsya [are destroyed], while all other targets porazhayutsya [are effectively engaged] (with degree of damage unknown). The specificity of mission assignment also determines the desired result of combat actions.

If a strike objective contains a large number of nonuniform targets, and it is impossible precisely to determine the anticipated damage to be inflicted by the forces assigned to the strike, or if a strike is being delivered for the purpose of psychological effect on the enemy, one should apparently use the term "nanesti udar" [strike, deliver a strike]. During the Great Patriotic War this form of assignment of combat missions was frequently employed, and it should be revived. In this case it can be formulated as follows: "Deliver a strike on an administrative center, ship convoy, reserves, railyard," etc.

The second group of missions (supporting the actions of strike elements) includes: reconnaissance (follow-up reconnaissance), flights for purposes of decoying or demonstration (diversionary), searching for and marking (illuminating) targets, escort, leading to target, laying smoke screens, laser illumination of ground targets, and others, including missions which may arise in the course of combat operations. Their formulation does not present any particular difficulties. For example: "Flight such-and-such shall perform follow-up reconnaissance and marking (illumination)...." Such missions are most typical for subunits, but substantial forces may also be employed to perform such missions, depending on the developing situation. In Vietnam, for example, an approximately equal number of strike and supporting aircraft took part in each U.S. airstrike.

With such a classification it is no longer necessary to divide missions into primary and secondary, and therefore mission formulation is simplified. It is more difficult to do this with several missions of different types for

a unit, and particularly a combined unit. In this case consolidation according to some attribute is possible, in particular in time or place of action.

Thus it makes sense to formulate two combat missions for frontal bomber, ground-attack, and fighter-bomber aviation combined units and units: the first mission: strike primary targets at... depth (depending on air component); the second: support various strike elements of one's own and other air components. Proceeding from the tasking designation of air units and combined units, they correspond to the entire spectrum of operational-level missions, encompass all aspects of combat operations, are easily formulated, showing what results are to be achieved, and are unambiguously interpreted by commanders, staffs, and executing personnel.

Helicopter Pilots Use Unorthodox Flight Technique in Afghanistan

90SV0053C Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) pp 6-7

[Article, published under the heading "Into the Military Pilot's Arsenal," by Military Pilot 1st Class Maj V. Sharnauska: "Beyond the Allowable"]

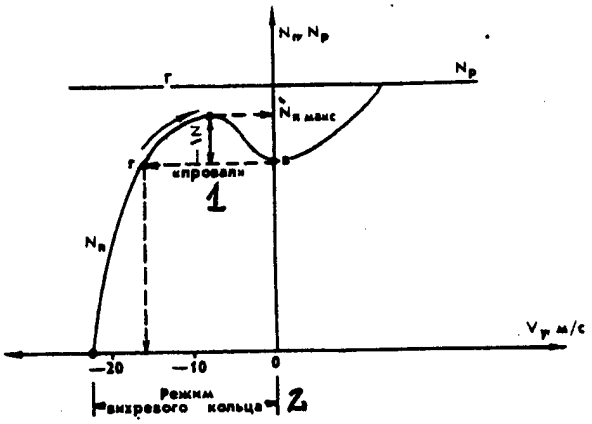
[Text] **In order to increase the combat effectiveness and survivability of helicopters, some army aviation pilots successfully utilized in Afghanistan the vortex ring effect (RVK), which is prohibited by regulations.**

* * *

The main reason for using RVK is to be able to descend rapidly within a limited space with engines at close to available power. Therefore one can easily shift to climb at any time even without moving the collective-pitch stick.

A normal steep spiraling descent takes up a great deal of airspace and requires that the engines be throttled back considerably. In view of slow engine response, considerable altitude and time is required to bring a helicopter back into level flight, as a result of which the tactical advantage is lost and there is a danger of colliding with obstacles.

In the difficult environment of Afghanistan, a number of important combat missions were successfully accomplished only thanks to using RVK. It was successfully employed in landing at airfields when the enemy was firing portable SAM missiles, as well as for landing in mountain gorges, when making 180-degree turns in a narrow space between mountains, when attacking without setting up a run on the target, with a subsequent 180-degree turn in order to avoid coming under antiaircraft fire, etc. Theory of RVK is described in detail in the instructional literature, as well as in an article entitled "In Vortex Ring Effect" (see AVIATSIYA I KOSMONAVTIKA, No 6, 1981). Its principal characteristics for standard atmosphere conditions are shown in figures 1 and 2. Let us review the specific peculiarities of helicopter behavior upon entry into and departure from RVK effect.

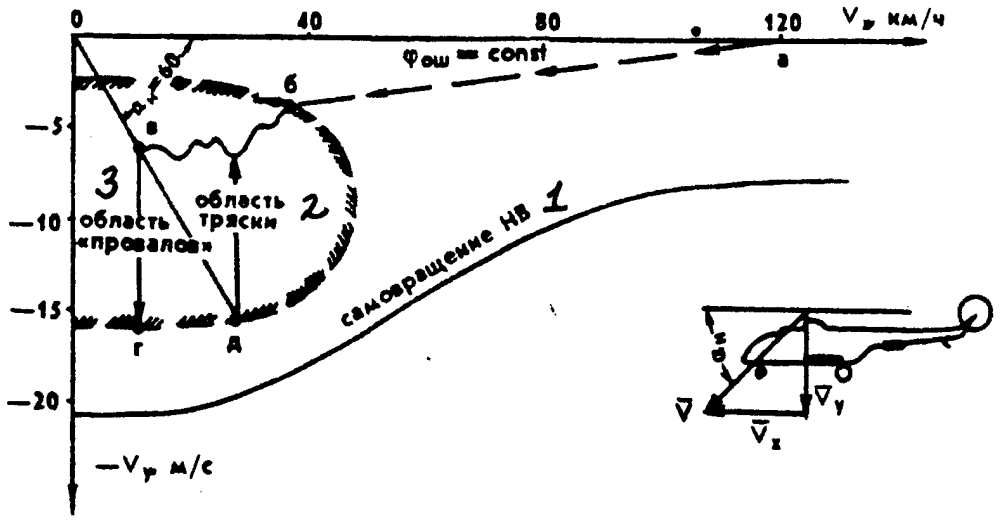


Key:
1. "Drop"
2. Vortex ring effect

If translational velocity is smoothly reduced from level flight with fixed position of collective-pitch stick (phi_{osh}=const), the helicopter begins to descend. As deceleration proceeds, the rate of descent increases due to increasing insufficiency of power. The rotor disc angle of attack ($alpha_H$) increases at the same time. Within a range of speeds in segment bB the same kind of buffeting occurs as on final approach descent.

When $alpha_H$ reaches approximately 60°, the helicopter becomes unbalanced on the roll, pitch, and yaw axes; this is accompanied by rapid increase in rate of descent ("dropout" segment Br). The process of descent in the RVK effect area, bounded by $alpha_H$=60-90°, stabilizes after reaching a sustained rate of descent (point r). Translational velocity (segment rn) must be increased to get out of this region. Upon crossing a boundary corresponding to $alpha_H$ approximately equal to 60°, rate of descent rapidly decreases to the initial value (segment Bb). In addition, exit from the RVK effect area can be accomplished by deflecting the control stick to the right or left, and when there is considerable altitude available, by transitioning into autorotation.

Figure 2 shows the relationship between required (N_n) and available (N_p) main rotor output on the one hand and sustained rate of descent (V_y) on the other. It is apparent that "dropout" with a fixed main rotor collective pitch position is caused by insufficient rotor output (-DeltaN). If available power is less than required power, vertical deceleration and transition to the initial point (point B) are impossible, which in many instances was typical of conditions in Afghanistan. With an increase in ambient air temperature, altitude (height above base



Key:
1. Rotor autorotation
2. Stall buffeting region
3. "Dropout" region

field), and flying weight, power deficiency (-DeltaN) would increase due to increase in vortex ring effect intensity (the lower boundary of the RVK effect region would expand to a descent rate of 20 m/s and more), while available power reserve would decrease. In these conditions "dropouts" would become more intensive, and vertical deceleration capability would diminish.

Afghanistan's mountain-and-desert terrain was the reason for a number of specific features in the conduct of operations by army aviation. The considerable elevation of airfields and landing sites (as much as 2500 meters above sea level and higher), the highly rugged mountain terrain, high required flight altitudes (above portable surface-to-air missile capabilities), and high air temperatures during the day limited capabilities of utilization of army aviation, affected maximum takeoff weight, and made it necessary to carry a reduced fuel load as well as a reduced ordnance payload.

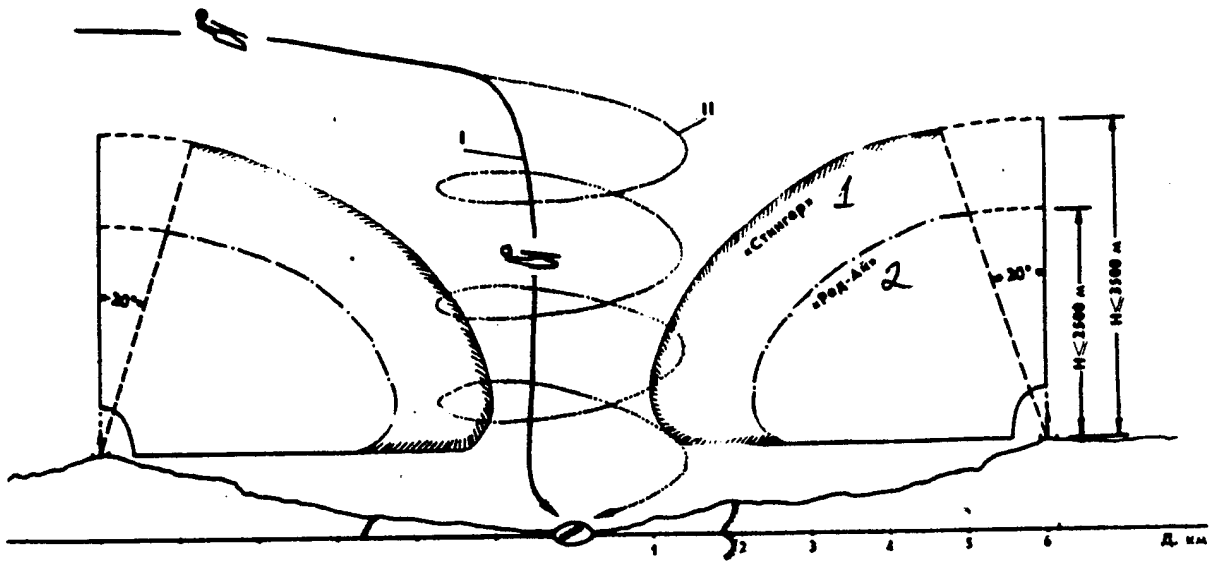
As time passed, there were more frequent instances of helicopters receiving fire in the vicinity of airfields while taking off, and particularly while landing. Due to the small size of zones around airstrips defended by security troops, sometimes rebels succeeded, under cover of darkness, in penetrating very close to the landing strips. In order to ensure safety, aircrews were forced to employ a rapid, steep descent directly above the airfield, in the RVK effect region, with subsequent exit from RVK effect and landing (see Figure 3, flight path I). In contrast to the standard descending spiral (see Figure 3, flight path II), this approach descent maneuver significantly diminished the probability that a helicopter would be hit by antiaircraft fire from mujahideen located close to airfields.

Approach to the field would be flown at a safe altitude, beyond the range of Stinger missiles. A point of reference would be placed in the airfield defended area, such as a middle compass locator, at an angle of 0-30° from the vertical. Above this point pilots would dissipate forward airspeed to a value less than V_{min} (airspeed indicator needle on zero). Following a brief period of buffeting, the helicopter would enter the vortex ring effect region with a rate of descent of up to 20 m/s. Even in the most adverse conditions, this would ensure minimum time within reach of SAM missiles.

Exit from RVK effect would be accomplished by building up forward speed by smoothly increasing collective pitch. Transitioning away from vertical airflow in the rotor system, the helicopter would sharply reduce rate of descent, and the final phase of the landing approach would be normal.

Frequently RVK effect would also be utilized during the performance of combat missions in high-elevation mountain areas with a large number of narrow passes and ridges. Ammunition, food and water resupply, as well as extraction of wounded also made it necessary to land in mountain gorges. In these conditions a spiraling approach at high forward speeds proved extremely difficult, and in some cases impossible. For this reason it was possible to fly a landing approach within limited airspace only with a steep descent.

When flying in narrow gorges, sometimes obstacles would appear in a helicopter's path which could not be flown around or over. Pilots would also use RVK effect in such situations. The pilot would pull the control stick back, reducing forward speed to a minimum, and would then reduce engine power, causing the helicopter to descend. As the helicopter descended, the pilot would turn the aircraft 180 degrees (reverse course), after which



Key:
1. Stinger
2. Redeye

he would restore power. Using this maneuver would increase flight safety when flying combat missions in unfamiliar high-elevation mountain terrain.

Thus utilization of RVK effect in the extreme conditions of combat is not only possible but in many cases absolutely essential. The answer to the question of whether pilots should be taught to utilize vortex ring effect is quite obvious to the pilot in the field. But the Air Force Combat Training Directorate continues to maintain silence. With this approach to things, we shall be unable to proceed with mastering more effective tactics.

Reader Criticizes Deficiencies in Flight Safety Efforts

90SV0053D Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) p 8

[Letter to the editors by Capt O. Belukov, with editorial commentary: "Letter From a Reader"]

[Text] Dear Editor: I am writing this letter in response to an article by Lt Gen Avn Ye. Rusanov entitled "Priorities of Flight Safety" (AVIATSIYA I KOSMONAVTIKA, No 1, 1990). In my opinion this is nothing more than one more "set of discussionary remarks," beyond which things will not progress in the matter of organizing flight safety. I shall endeavor to explain why.

I have been a flight data recording equipment servicing and flight data processing group chief since 1984. I came into "objective monitoring" with a strong desire to do a good job. I had always felt that this should be in actual fact a Flight Safety Service (SBP) subunit and not merely a name. I have come to the conclusion, however, that a great deal (if not everything) is done in our unit just to go through the motions, merely as lip service, that the work we do produces no results, and that nothing is really being done to ensure flight safety. Neither flight personnel nor the engineers have any interest whatsoever in thoroughly investigating any situation. But if a flight performance monitoring specialist treads on the toes of ranking personnel, he will be made to pay; they will find a way.

I, for example, was reassigned to a regiment using old equipment (SARPP-12, after using Tester and Luch-74 equipment), and had virtually nothing to do for an entire year. But after my name was mentioned in an article entitled "Distortion" (in the 5 May 1988 issue of KRASNAYA ZVEZDA) I was subjected to a great many adverse comments about "honesty and integrity." On one occasion I was forbidden to keep a notebook of comments on flight personnel performance and on aircraft equipment malfunctions or, God forbid, to show such a notebook to inspector personnel.

I frequently hear the following kinds of statements: "Mind your own business. You are not a pilot (engineer) and have no business making comments." I could cite a great many such examples. Even Lieutenant General Rusanov, who visited our regiment last summer and who looked in on our group, failed to ask: "How is your work going? Any problems? Do you have any suggestions on improving organization of the flight safety service?" In my opinion these are fundamental questions which

should be asked in a flight performance monitoring group by the chief of the Flight Safety Service. This did not happen, however. At the present time I see no sense in our work. It goes like this: you see something, you report it, you hear excuses from both sides, and then you just sit there and clam up. Of what benefit is such a job?

I made this digression just as another example of how things are in actual fact at the present time.

I shall now take the liberty of making several suggestions on organization of the flight safety service. Perhaps something can be used.

I fully agree that an effective flight safety service is needed at the regimental level. One must carefully think through the question, however, of to whom it should be subordinate. In any case it should not be under the regimental commander or regimental engineer, for otherwise one cannot avoid attempts to cover up things, the all-out pursuit of plan target fulfillment, and persecution of honest, upright individuals for criticism. As I see it, this should be an autonomous organization.

I have grave questions about whether a pilot from the same regiment should be appointed to the position of flight safety service chief. We know from experience that one pilot will always protect another, and this will only do detriment to the cause.

It is essential to select officers for the flight safety service in a purposeful manner. What is needed are honest, knowledgeable specialist personnel with integrity, not just chance appointees. Flight safety service officers should definitely receive specialized training on training simulators, and should thoroughly study aircraft equipment, aerodynamics, and aviation psychology. Only after this can one really monitor, check and verify (at the present time we have only the name "obyektivnyy kontrol" ["objective monitoring"; performance monitoring, e.g. "black box" tapes]).

The table of organization structure of the performance monitoring group could be revised. Job duties pertaining to transferring data and delivering cassettes could be assigned to air squadron (maintenance team) specialist personnel. They are not high-ranking personnel, but the number of primary-rank enlisted personnel and warrant officers in the group would be reduced. But processing and analysis of data would be performed by qualified specialists (who would not be diverted to secondary matters).

In my opinion it is essential to improve the quality of the onboard flight data recording devices. Processing equipment is currently being improved, but the primary parameters recording sensors are at a primitive level.

A fixed-installation version of the ground equipment for flight data processing should be manufactured. Why spend money on vehicles? Right now many units are taking out the equipment and installing it at a fixed location. I, for example, have six vehicles with Luch-71 units in good working condition; but only one truck is operating; the rest have been brutally cannibalized in the separate airfield technical support battalion's motor pool. We are not the only ones in this situation. After all, they make fixed-location Luch-74 units, so what is the problem?

Brief training courses should be held on a regular basis for flight safety service specialist personnel on specific types of aircraft. These would provide an opportunity to obtain detailed consultation and to exchange experience and know-how.

I can state one conclusion from the above: it is high time to take a close look at the flight safety service. Pilots should not be intimidated by the threat of unavoidable punishment for mistakes; they should be helped to avoid such mistakes in the future. Aircraft operation should be monitored not on a sporadic basis but continuously, with thorough analysis, providing capability to predict probable malfunctions.

As I wind up this letter, I think to myself: "What will be changed?" I have said these things time and again, but nothing has changed. All that remains is the hope (it is the only thing which keeps me from submitting a formal request for discharge for not performing a needed job) that someday the talking will come to an end, and we shall commence doing a necessary and useful job.

Respectfully yours, Capt O. Belukov

* * *

Commentary by Col Gen Avn Ye. Rusanov, chief of the Military Aviation Flight Safety Service of the USSR Ministry of Defense

In his letter Capt O. Belukov brings up questions pertaining to serious deficiencies in utilization of flight data recorder tapes for the purpose of making operation of the aviation system more accident-free, as well as the role and place of flight safety agencies within this system.

The cited facts indicate that officers at various levels, in the effort to accomplish the flight training plan, frequently do not endeavor to reach an objective evaluation of aircraft operational reliability and the quality of aircrew performance aloft. This is an incorrect and dangerous path to follow. The author is correct in stating that a "barrier" to this should and can be placed by flight safety agencies, which possess a certain amount of independence. In addition, however, every supervisory officer concerned with increasing combat readiness is obligated to seek to accomplish this. Only a smoothly-functioning joint effort, aimed at preventing accidents, can produce a substantial result.

This letter once again shows us that even in the fifth year of perestroyka, new innovations are having a hard time getting adopted. I am talking about first and foremost the Air Mishap Prevention Plan, drawn up through the joint efforts of specialists from many organizations and establishments, which takes a new look at approaches to

problems of ensuring flight safety. It follows from this document that the problem of preventing in-flight emergencies and air accidents should be resolved at the early stages of development: comprehensively, at all levels, and in each structural component of the continuously-functioning aviation system. Accomplishment of this task is guaranteed by prompt, timely, and full determination of hazard factors, elaboration, rapid and high-quality implementation of validated measures to eliminate such factors, comprehensive evaluation of the effectiveness of work performed, and well-organized, detailed briefing of air units.

Assimilation of the new approaches and adoption of the recommendations of the Plan constitute one of the main tasks formulated by the USSR Minister of Defense at an enlarged conference devoted to the problems of reducing the number of accidents in military aviation. All of us must be willing to work hard, to perform a job which requires conscientiousness and the willingness and readiness of each and every specialist to carry out his job duties conscientiously and with integrity. There are no trivial items in aviation, and we cannot permit compromise to the detriment of safety.

Suggestions for Improving Soviet Air Safety Efforts

90SV0053E Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) pp 10-12

[Article, published under the heading "Flight Safety: Experience, Analysis, Problems," by Maj Gen Avn (Res) A. Bystrov: "Plan for Preventing Air Mishaps: Theory and Practice"; part one of two-part article]

[Text] **The Plan for Prevention of Air Mishaps, which is now being implemented, is without question an important event for Air Force personnel. Approaches to the problem of flight safety have been formulated for the first time in a systematic, integrated manner. Let us hope that this document will give an additional push to the profound restructuring processes in the Air Force which are directed toward reducing the number of accidents.**

* * *

Facts indicate that over the course of several decades the number of air mishaps in military aviation under the USSR Ministry of Defense has remained basically unchanged. An analysis of the causes of past accidents indicates that the problem of flight safety cannot be solved by issuing limiting or restricting regulations, and certainly not by sporadically suspending flight operations.

For a long time it was also believed that it was enough to make aircraft reliable, and then accident-free operations would be guaranteed. The development of events in aviation in many countries proceeded in such a direction. This resulted in the development of aircraft with multiple redundancy of systems and equipment. And although reliability of aircraft has increased as a whole, aircraft are continuing to go down with approximately the same frequency. For example, taking into account errors and shortcomings of ground maintenance personnel, the percentage share of non-fatal mishaps and fatal accidents involving the human factor is approximately 70 percent of the total number of accidents, as a worldwide figure. Study of the causes of air accidents has shown that aircraft prove to be more reliable than the human operator. It has also been established that the level of flight safety is greatly affected by the environment, which forms the risk factors which as an aggregate can link up into a specific chain of events and lead to a tragic outcome.

Examining the "man-machine-environment" scheme, scientists and practical workers have reached the following conclusion. At the present stage of aviation development and in the future, man is and will continue to be the principal element in efforts to achieve flight safety. Man will constitute this factor, with all his needs and aspirations, social conditions and conditions of daily life, emotional and mental state, and the psychological atmosphere in the group. The Air Accident Prevention Plan contains many points which reveal the aviator's role in lowering the accident rate.

A thesis has been formulated on the basis of this plan: there is no fatal inevitability of air accidents. The causes of the majority of air mishaps stem from the activities of human operators, both those who design and build aircraft and those who operate and maintain them. Consequently man can and must prevent accidents. But first certain conditions must be created. Statement of the question of the legal protection of all persons connected with flight operations and flight operations support, as well eradicating from practical combat training activities hasty conclusions about pilot error and pilot culpability for an air mishap or a near-mishap incident, merits approval.

And, finally, the Plan comes right out and states that punishment for an error or mistake cannot constitute the principal means of preventing the repetition of a mistake, since it does not eliminate the causes but merely creates the illusion that measures have been taken, causes people psychological injury, and drives the "ailment" deep inside. Distortions in the campaign for a high level of flight safety, when the desire to find and punish the guilty parties predominates, create a tense atmosphere in the collective. An adverse psychological climate within units, grounded on insincerity and phoniness of interrelationships, does not help improve reliability of flight operations.

Fundamental is the assertion that an air mishap is a consequence, as a rule, of the occurrence and coincidence of several dangerous factors and that an endeavor to explain it away as being caused by the effect of a single

cause indicates an attempt to end the investigation once again merely by proclaiming the guilty party. Of interest in connection with this is an approach adopted abroad. Accident investigators analyze not what was incorrectly done by human operators but what is flawed or incorrect in the management system and what made it possible for the accident to happen.

In my opinion it is a good thing that "Managing and Controlling the Process of Preventing Air Mishaps" is made a separate section. I believe it is correct to claim that management of implementation of the Plan is the prerogative of military aviation command authorities and that the corresponding commanding officer bears responsibility for organizing efforts to prevent air mishaps. The thesis that the role played by aviation system principal authorities is particularly important in accomplishing the tasks of preventing air mishaps serves as a strong warning to those commanders who are accustomed to rule by administrative fiat and to coercive methods of command and control. The higher the structural level of the aviation system, the greater are the opportunities, the more profound the influence, and the more effective adopted measures will be. The guilty party should be held to administrative liability for erroneous actions and ill-conceived instructions, regardless of the position he may hold.

Formulation of the question of establishing flight safety agencies in the units is very interesting. I believe we should not delay the forming of these agencies, for two reasons. First of all, they are very needed. This was done in other countries more than 20 years ago. Secondly, cuts are presently being made in the USSR Armed Forces, and for this reason there is the danger of losing the opportunity to obtain the requisite number of personnel to staff flight safety agencies. Of course in order to prevent the idea from becoming discredited, it is necessary clearly to define the role and place, and to draw up programs of procedures and methods of assessing the performance effectiveness of flight safety service specialist personnel at all levels of the aviation system.

One cannot help but note that a very cool attitude toward the Flight Safety Service people has formed in line units. This is apparently because from the very outset they adopted a dictatorial and coercive method of operation, and there was a clearly-marked endeavor to stand above the aviation system, not to work in it and with it. For this reason there was increasing evidence of a corporate introversion on the part of the Flight Safety Service, a separation from science and line unit personnel. The state of affairs is not appreciably changing at the present time.

"Instruction - techniques - coercion" has always been and continues to be the approach to the problem of flight safety. We should note that in other countries this approach was abandoned 20 years ago. Also attesting to the inadequate substance of efforts to prevent air mishaps is the fact that to date there have been no major scholarly studies presenting ways to resolve the problems of flight safety management, and there have been few specific methodologies pertaining to the various practical work areas.

Since the Flight Safety Service does not have its own unrestricted-audience periodical, we lack in this country debate and discussion on various concepts and approaches to flight safety management. Obviously a special monthly illustrated journal could perform not only the role of organizer of discussion of this problem but could also perform the function of coordinator of the activities of scientific research institutes and academic departments of flight safety, as well as other services and directorates, seeking to ensure that work aimed at preventing air mishaps is organized not on a narrow practical basis but is grounded on scientifically validated methodology.

In short, there has long since been a need to publish a monthly scientific and practical journal titled PROBLEMS OF MILITARY AVIATION FLIGHT SAFETY or something of the sort. Restricted-audience serial reports with analysis of air mishaps and near-mishap incidents focus the readers on events which have already occurred, and are of no value as regards theoretical and practical issues. In addition, it would be very useful to have a textbook, such as one entitled "Military Aviation Flight Safety Management Techniques."

There are national flight safety programs in many countries. The need for such programs arose after views on problems of flight safety management changed. In the past air accident prevention efforts had been grounded on the principle "flight safety above all," while today the principle is "safe flying above all." In the past the objective of such efforts was successfully to superimpose a safety program on the operations of air units and aviation enterprises, while today artificially introduced programs are rejected, and only safe flight operations are acknowledged.

Today flight safety programs in countries with well-developed aviation are incorporated and implemented at the stage of aircraft design and development, construction, and testing. They are also implemented when forming new organizational structures and methods of operation, maintenance, and combat employment of aircraft, and at the stages of curriculum development in the personnel training process. Should we perhaps also within the next two years, on the basis of the Plan, taking into account world achievements in theory and practice of flight safety, draw up a Government Air Accident Prevention Program?

In my opinion this would make it possible to formulate a long-term strategy in the area of flight safety and would enable us correctly to choose tactics. Of course in the meantime we must provide for particular air mishap prevention programs and put them into operation in the process of flight activities.

It is repeatedly emphasized in the Plan that flight safety agency personnel should be specially trained. It seems to

me, however, that the proposed way to resolve this matter cannot be acknowledged as correct, since training courses will not resolve the problem of professionalism on the part of the flight safety people. Judging by all indications, what we need is a special instruction and training system for flight safety personnel. Other countries devote serious attention to this matter.

D. Peterson (USA) states in his book entitled "Techniques of Safety Management": "In recent years we have achieved enormous success on the road toward professionalism. We have defined our field of endeavor and our professional duties, and now we are recognized as certified safety specialists and registered specialist engineers in the field of safety. A graduate program has been established in the safety field, with graduate degrees. Many people in our country have a master's degree or doctorate in this field."

In connection with this I suggest that we consider introducing new areas of specialization and organize systematic safety management training for flight and engineer personnel at the Air Force Academy imeni Yu. A. Gagarin and the Air Force Engineering Academy imeni professor N. Ye. Zhukovskiy. Specialists in this field should have sufficient experience in aircraft operation and maintenance, an excellent mathematics background, and thorough knowledge of probability theory, information science, programming, and ergonomics.

The Air Accident Prevention Plan drawn up by our Flight Safety Service also contains other shortcomings, I feel. For example, the section entitled "Information for the Purpose of Preventing Air Accidents" is patently permeated with the spirit of the system of rule by administrative fiat. The Plan does acknowledge the possibility of introducing reports on deficiencies, conditions, situations and events which, in the opinion of participants or witnesses, present a potential threat to flight safety. But the only thing actually discussed in this section is a system of submitting reports "to one's superiors."

And yet experience abroad has shown that even with the most sophisticated automated control systems, reports, all kinds of memoranda, checks and inspections do not result in achieving completeness, promptness, timeliness, and objectivity of information on air accidents, near-mishap incidents and, particularly, risk factors. In other countries, in addition to reports "to one's superiors," there is in operation a system of voluntary anonymous reporting. The peculiarities of human psychology are felicitously utilized in this system.

In the United States, for example, a special flight safety system was established under NASA in 1975. A distinctive feature of this system is the fact that it gathers and analyzes reports from pilots and other aviation specialist personnel (air traffic controllers, engineers, technicians, etc) on errors or mistakes they have made when making and implementing decisions, reports which are submitted anonymously. A report reflects the most acute problems of operation or maintenance of a specific type of aircraft. Thanks to anonymity and exemption from punishment, the persons who submit the reports endeavor to state not only what occurs but also what they feel, why such a thing happens, and what action (in their opinion) must be taken by them or others to prevent air mishaps and near-mishap situations in the future. This system makes it possible to obtain the most diversified and extensive information, which is unavailable from any other source. But the main thing is that report analysis provides the opportunity to determine the true causes of deficiencies and to draft appropriate recommendations on correcting deficiencies in flight operations.

In an article entitled "Asleep at the Wheel" (NAUKA I ZHIZN', No 9, 1989), the author notes that at all U.S. airports there are boxes into which pilots can slip unsigned reports about near misses and other accident-threatening minor incidents. This helps improve organization of flight operations as well as aviation activities in general. Pilots are frank, because they do not fear punishment or blame directed at themselves and their colleagues. Approximately 95,000 such "confessions" have been submitted since the system was introduced.

A similar system is being adopted in Civil Aviation in this country. Voluntary reports are sent to the State Scientific Research Institute for Civil Aviation. Evidently the USSR Ministry of Defense also needs a center for collection and processing of information from military aviation specialist personnel.

It would be a good idea more precisely to formulate in the Plan the role and place of flight safety agencies in the structural subdivisions of the aviation system. At one point it is stated that flight safety agencies shall become organic components of this system, while elsewhere it is stated that better results are achieved when these agencies are independent of the aviation administrative structure. Evidently a mistake has been made in defining the place and role of flight safety agencies. I feel that of interest in connection with this is the opinion of the world's leading scientists in the field of safety management, an opinion which is backed up by practical experience.

Some assert that a safety specialist "is and should be a regular employee of the enterprise. Placing the safety service within the organization reflects the fact that the roots which cause an accident are to be found in all departments, at all levels, and in all functions. For this reason the safety service should oversee or at least influence every section chief, every function, every supervisor. A safety specialist does not bear responsibility for the safety record or results. Responsibility for performance includes actions which help management achieve safety goals. A safety specialist does not have authority over management. He has considerable influence, but that is not authority. How much influence or power a safety specialist will have depends on degree of

organization and on the individual working at the enterprise level. He achieves results using one of two methods: giving recommendations to those who issue orders, or he utilizes his exceptional position to conduct accident investigation and draws up proposals regardless of the position taken by enterprise management. The power of the safety specialist lies in the fact that he is an expert in his field, has the manager's attention and, in addition, exerts some influence on the manager's decisions and subsequently on this individual's future. For all practical purposes safety specialists work under the influence of management, but not on the orders of management."

I personally have my doubts about the correctness of interpretation in the Plan of the term "danger factor," where it is defined as any condition or phenomenon which can lead to an air accident. Theory of safety management distinguishes two types of accident causes: immediate cause, and root cause. Dangerous actions, conditions, and circumstances are symptons, the direct or immediate causes of an accident. Root causes include those factors elimination of which ensures constant results. That is, they are those weak points which not only have caused just one investigated accident but which could cause other accidents and management problems in the future.

On the basis of the above one can state that danger factors also include root causes of a potential or already-occurred accident. For example, an airplane in flight is always in conditions which could lead to a crash. We are dealing here with the direct cause of an air accident. But an airplane does not crash because all systems are operating reliably. If an engine fails, for example, an air mishap will occur. Consequently, in order to avoid mishaps it is necessary to fly (not remain on the ground), but to fly aboard reliable aircraft, with reliable crews, with reliable flight operations ground support.

In my opinion air accident prevention efforts should be directed toward predicting and preventing root causes. If an air accident occurs, the aim of the investigation is to pinpoint the causes and to correct them, in order to prevent the future occurrence of such an accident. The confusion in terminology has led to the appearance of a great many terms: the cause of an air near-mishap incident or in-flight emergency [PLP], the main cause for a PLP, contributing cause of a PLP, and the direct or immediate cause of a PLP. Such casuistry prevents Flight Safety Service specialist personnel from quickly and unequivocally pinpointing the principal and secondary elements in the causes of an air accident or near-mishap incident. As a consequence, the root causes of an air accident or near-mishap incident are frequently not thoroughly examined, and therefore preventive efforts are only of a partial nature.

An example of this is the term "failure of undetermined cause" (OPNU). Apparently in air accident prevention work it would be advisable to move away from technocracy. The fact is that we must treat with respect international safety management terminology and practices. It would be advisable to replace the term "danger factors" with the generally-accepted term "risk factors." It more precisely reflects the state of affairs and makes the content of the term more specific.

We cannot agree with applying the term "system" to the scheme "man-machine-environment." As we know, a system is an aggregate of subdivisions, mechanisms, parts and components as a whole, intended to perform a task. The presence of an "environment" component in the above-mentioned scheme presupposes the constant presence of a large number of conditions and risk factors which prevent the scheme from operating in a self-regulating mode, that is, stable operation. For this reason the sum of the concepts "man-airplane-environment" cannot be called an aviation system. It is, after all, only a scheme.

It would be more preferable to call the document proper a USSR Ministry of Defense Aviation Flight Safety Management Plan and to develop within the document a number of areas of aviation engineering, rear services, and electronic flight safety support. Then it will be all-encompassing and useful for all aviation specialist personnel.

One final comment. One cannot consider correct the use of the term "service" as applied to a USSR Ministry of Defense aviation flight safety agency, for it contains specialist personnel of different areas of practical activity (services). In addition, use of this term makes it impossible to reflect the scale of the work being done by our country's military aviation flight safety agency. It would apparently be more correct to call it USSR Ministry of Defense Aviation Integrated Flight Safety Directorate. This organization should also contain representatives of various specialization areas (services) from all military aviation elements and components. **(To be concluded)**

Soviet Combat Aircraft Design and Development Procedures Critiqued

90SV0053F Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) pp 18-20

[Article, published under the heading "Comments by a Test Pilot," by A. Akimenkov: "What Is Keeping Our Aircraft From Being Better"]

[Text] **These comments are a result of analysis of my many years as a test pilot. They are the result not only of intellectual analysis but of deeply-felt experience. I realize that there are those in whom my frank comments will arouse indignation, outright disagreement, and distrust of the facts, but there is documentary confirmation of every word. I am prepared to bear responsibility at any level for what I have stated here. I am also willing to engage in**

discussion, at any level, of the question of what is keeping our aircraft from being better.

* * *

No human activity tolerates indifference, and this applies to military aviation in particular. In this field of endeavor mental inertia and laziness bring deadly risk. Some people fly, while others are responsible for the outcome of a flight, but everybody is involved in risk. This is why the slightest success or failure is perceived in a very personal way. It is of course more pleasant to receive laurels. But they are becoming increasingly less common. The crisis of society and the economy which has seized this country has hit hardest at those industries which are at the cutting edge of scientific and technological events, and military aircraft engineering was among the first to suffer. Ultimately the people of aviation found themselves under assault: their hopes, their futures, and even their lives. Hence the subject of these remarks.

The crisis is systemic in nature; its emergence and development are dependent not only on the rank-and-file executing individuals but also on the highest authorities. Whatever the destructive force may be, however, it can and must be confronted. A great many things are in short supply in this country at the present time: quality electronics, custom-engineered materials, modern production lines, as well as specialist personnel capable of operating them. Nevertheless....

Memory serves well: when back in the 1940's aircraft production faced an impasse due to a shortage of aluminum, hot-pressed resin plywood was conceived, a material which won victories in the air over its "aluminum" adversary. One might retort that the times and technology are different today. But the people are also different, as are technological capabilities. I could cite dozens of alternatives to existing engineering solutions which have never been implemented, in spite of great persistence by their authors. The times are not to blame, nor even is the selfishness of the manufacturer. What is guilty is the obsolete organization of things—a cancer on our country.

The development of a new aircraft begins with the forming of a combat aircraft conceptual design. Three agencies prepare directive documents for an experimental design project: the appropriate CPSU Central Committee administrative department, the Council of Ministers Military Industry Commission, and the lead executing organization. Of course with this arrangement the latter organization possesses all the ammunition for imposing both its own point of view on the problem and for championing primarily its own interests. In this situation the CPSU Central Committee administrative apparat, and in many respects the Military Industry Commission as well, lack the structures to develop alternative proposals and serve for only one purpose: to share or, more precisely, to assume responsibility for the adopted decision to develop a new piece of military hardware. The decision essentially is dictated by the lead executing organization, that is, the supplier.

Of course they technically consult with the military representatives, as the contracting party and user of the future equipment. But the military possess some legal power only at the preliminary specifications (TTZ) phase; the fact is that the preliminary specifications constitute a secondary document, which is adjusted to that which has already been worked out by the Ministry of Aviation Industry people. We should note that the Ministry of Aviation Industry endeavors (or does it just pretend to try?) to overcome the technocratic nature of its project workups. Special establishments have been created for this purpose, which study the tactics of employment of combat fixed-wing and rotary-wing aircraft. But would it not be better for pies to be baked by a pastry cook and boots to be stitched by a shoemaker? And the main thing is that each would be specifically responsible for his mistakes.

Up to the present time, however, things have been such that as a rule the final decision has been made by the time the preliminary specifications are written up, and the conceptual design of the future aircraft has already been worked up..., taking into account the requirements of its mass production and the requirements of modern combat only as a last priority. There is a paradox here as well. In order to convince the government of the need to develop a new model, reference is made to Western innovations. With this the developer firmly ties himself to the results of that technology which is very frequently lacking in this country. Knowingly making overstated promises, he is forced to twist and scheme. Pressure begins to be brought to bear on those who draw up the preliminary specifications. Not only have the preliminary specifications been already substantially cut back (in order to save money) by government decree, they are also stripped of everything industry cannot handle, but treatment and interpretations are imposed which guarantee total freedom of maneuver, primarily to get out of one's own promises. Taking advantage of the absence of competition, the developer dictates his own will. He virtually writes his own preliminary specifications. And in order that everything run smoothly, a no less sophisticated system of encouraging tractability has been devised to assist this sophisticated system of applying pressure. Cash bonuses, awards, a guarantee of a "dust-free" job upon leaving the military.... There are a great many devices.

This happens because there is a lack of an effective legal status for those who take part in drawing up preliminary specifications, as well as the commissions involved in preliminary engineering design, preliminary drawings and models of future combat aircraft. Nevertheless the meetings of these commissions turn into fierce battles to defend the interests of the Ministry of Defense, interests which almost always fully coincide with state interests. The fact is that these commissions contain several individuals who, for the sake of duty, risk their own welfare.

Sometimes the confrontation is long and stubborn. At the present time, however, there are more than enough ways and means of resolving these conflicts in favor of

the group interests of the military-industrial complex. Up to the present time the Ministry of Defense lacks reliable tools to defend its own (state) interests. Money for the development and manufacture of military equipment is allocated to the defense industry directly from the state budget, bypassing the client and end user, whose only recourse is to pound his chest at the next commission meeting, asserting: "I don't want it and I won't accept it...." But in the final analysis they must take what they are given. What other recourse is there? They might give them nothing at all, but they have to have something with which to defend the homeland!

Working design documents are drawn up as a result of the commissions' activities; the building of an aircraft experimental prototype commences on the basis of these documents. But it also sometimes happens that the commissions function entirely separately, while the process of building the aircraft proceeds entirely on its own. For example, commission members are firmly convinced that the design submitted by the developer has been rejected and will never be revived from the ashes. And then suddenly a completed aircraft is rolled out of a factory hangar for developmental flight testing.

Of course the commission members, who had been kept ignorant, experience powerful negative emotions and even attempt to do something to support the prestige of decisions signed by representatives of a great many establishments. It soon becomes clear, however, that the majority of those who had endorsed the project have their own selfish interest from participation in joint projects with industry. The few indignant individuals become social outcasts, while the commencement of flight testing of a new aircraft lacking adequate prospects of military application becomes a fait accompli. Even worse is the fact that commission members are frequently well aware of the "under-the-counter" building of a prototype model, but they continue to play their part as if nothing were happening.

All the players in this game rapturously juggle before one another references to higher interests (of the state and of line units). And they contain a grain of truth: as a new aircraft development project progresses, the cost of correcting mistakes increases in an almost geometric progression.

Development flight testing continues. The military swears that it will never, under any circumstances, accept the aircraft for government acceptance testing (GI). And... it gets involved in joint activities, thus sharing responsibility for them. Nor is it a disaster if the aircraft falls outside the area of probable utilization on the basis of its performance characteristics demonstrated during the developmental flight testing. The Ministry of Defense's military-scientific establishments, heeding the request of industry, will immediately think up a new area of utilization for the aircraft. Nor is it a matter of importance that it could never happen. The main thing is that payment is made for this fiction. The following principle is in operation here: the one with the money calls the tune. The developer has the money.

In short, when it comes time for government acceptance testing, there already exist a great many arguments in favor of commencing this procedure. One's conscience is salved by the fact that at this stage, government acceptance testing, all the power is in the hands of the military, and they will be extremely severe and unyielding. Authority is one thing, but aircraft submitted for government acceptance testing continue to be serviced and maintained by industry, that is, it is very difficult if not impossible to evaluate designed-in efficiency of servicing and maintenance. That is item one. Secondly, processing of the flight test data is also done by the builder. The processing is performed and equipment serviced by people who have their own ax to grind.

And the team of military personnel which evaluates an aircraft is being tested just as much as the equipment is being tested. And there is the factor of human weakness. Nevertheless government acceptance testing is considered to be an objective evaluation.

And if blandishments fail, once again formulations of preliminary specifications materialize. Naturally five to seven years after they were originally formulated, they are obsolete by an order of magnitude. In addition, under the pretext of making them up-to-date, some of the fundamentally-important formulations are truncated to such an extent that nothing is left. Thus when things come to the point of holding to account, there is nothing to which to hold: everything turns out to be fully in conformity with the "emasculated document." Although it is obvious to many that the aircraft is not only a poor "warrior" but is not even capable of doing a decent job flying in conditions of line unit operations.

The fact is that the need to evaluate an aircraft's functionality within the system of employment of the Armed Forces and the enemy's response actions (to demonstrate capability to fight) does not fall within the preliminary specifications or government acceptance testing program. Nor is there any provision regarding the need to evaluate the "pilot - aircraft - environment" and "collective - aircraft equipment - environment" systems. The scientific research establishments of the Ministry of Defense which conduct government acceptance testing have virtually no other recourse than to accept the assistance of industry in bringing combat equipment into conformity with the most general and abstract criteria which are placed under the oversight of the CPSU Central Committee and Council of Ministers Military Industry Commission. We come full circle....

Thus the government acceptance testing certificate is signed, "success" is confirmed, and bonuses and awards are distributed. what then? After this the aircraft goes into mass production. Here new mutual relations begin. Development costs have been written off, and the aircraft is no longer of much interest to the designer. If you

military want to correct or change anything, pay additionally for it. The designers likes upgrades. Very frequently the development organization is quite willing to foist off upgrade improvements as a new aircraft. This is advantageous, since they pay more! Incidentally, the designer has no particular material interest in handing over the aircraft for mass production. The main thing is to receive money for the design and development, and what happens later is not the developer's problem.

The manufacturing plant deals with regular-production aircraft. The factory has its own design engineers. They are quite capable, and have proven this time and again. But just try to change anything for the better: the senior chief designer will immediately intervene, which has happened many times. All changes require his permission, and of course this requires additional large monetary payments.

Relations between the manufacturer and the end user are carried out via flight testing of aircraft coming off the production line and the delivered aircraft acceptance checkout flight test; in other words, by the client, who is bound by general responsibility for selection of the aircraft's preliminary conceptual design and the pace of its progression through commissions and testing.

Unfortunately it sometimes happens that production-run flight testing begins when production of a given model modification is ending. As a result nobody really knows exactly what the line units are flying, since almost all aircraft differ from one another. Consequently every flight is like walking a tightrope. Everything should be tested out. Is this really possible with such a state of affairs?

There are no fewer problems with military delivery and formal acceptance. At the present time nothing impels the people involved to defend the interests of the Ministry of Defense other than conscience and sense of duty. But in our country these concepts—forgive my candor—have been badly deformed. In all else the military procurement goods acceptance procedure is totally dependent on factory management. You can hardly call it acceptance procedure, for even the Air Force contract-letting directorates are in a state of servitude to the industrial ministries.

Another point in relations is military field testing. The purpose is to adjust the Ministry of Defense's military technical policy and to validate a reply to the question: "Is this equipment needed or not needed by the troops?" But since field troops lack experience in equipment evaluation (this is a very complex production process), this evaluation lacks adequate professional formulation. In addition, during such testing representatives of the Ministry of Aviation Industry are in the field with the troops night and day, so to speak, which cannot be said for representatives of the Ministry of Defense's scientific research institutes. As presently constituted, such tests serve more for the purpose of indignant line-unit pilots letting off steam than to improve anything in the equipment.

An attempt to gain an overall understanding of the above shows a clear collision of forces. It does not lie in anybody's personal evil intentions. There are plenty of self-interested individuals, but they are the effect rather than the cause. In my opinion the reason here lies in the fact that formal-logical patterns and mechanisms are not in operation in combat aviation, although such patterns are incorporated into the organizational foundations of these activities and are reflected in points of doctrine and regulations. What is needed is a keen, dynamic organization of things, capable of immediately perceiving the dialectical essence of decisions which are reached. The interests of all involved in the process of developing combat-capable aircraft should be respected. Many of these interests, condemned yesterday, have today been legitimated as normal human motivations. What is needed, however, is a mechanism of so-called "vertical" motivation of these interests, which would ensure their beneficial influence on the end objective of "production of combat capability" of aircraft—on victory in combat if combat occurs.

I feel that in order to achieve this "vertical" motivation, the directorates must take into account actually existing motivations and examine possibilities. In connection with this one could only welcome the establishment of an Air Force sociological service. Unfortunately at present things are not moving beyond declaration of a need for such a service. The situation is entirely explainable: there is a shortage of specialists. There are only about 1,500 nationwide. Nevertheless one sees as a solution integration even of those few specialist personnel who can be enlisted in this work, if only in the main work area. I am of the profound conviction that only the state expert review team can serve as this key work area.

It seems to me that "vertical" motivation should create the sociopsychological background for removing obstructions in the sequence of operations: conceptual design, engineering design, construction, testing, refinement and finishing touches, operational service. Each of these runs from one year to five-seven years. Add to this the time between operations required to build up starting momentum! If we add everything together, we come up with an unthinkable amount of time, which places in doubt the entire defense industry policy.

The process of "producing combat capability" of air units must be run in parallel, making it both integral and permanent: from the initial idea to combat aircraft operational readiness. Such a response to the buildup of military power by the countries of the NATO bloc will paralyze the arms race, since our lag or fallbehind zones will be minimal and will skim the political advantage right off of military technical innovations. This is particularly important in connection with the fact that war between economic systems does not require the use of weapons. For the political game of giving precedence to

new types of weapons as the basis for such a war, it suffices to fear these weapons. A transition to nuclear-missile parity, toward which the world is moving, will make such a game extremely dangerous and destructive to the economy. But the military aircraft industry is the most suited for it, due to the immense costs and the great variety of development and growth prospects.

Reexamination of the organization of things within the context of an integral process of "producing combat capability" of aircraft logically leads us to the problem of feedback. Any self-developing system must have it. In the West different variations of product quality service function as feedback. Scientific and technological advance as well as the future of every country which has partaken of such advance is linked to the performance effectiveness of these entities. In combat aviation such a service is embodied in the idea of state expert examination and determination, an instrument of which are the flight testing teams assigned at the Ministry of Defense to conduct military-scientific project oversight and testing of every new combat aircraft. It differs from gospriyemka [state goods procurement acceptance procedure] in the fact that its functions extend to the entire process of development of new aircraft. We have experience in this area. It now remains to extend this know-how to the entire production process: from the initial idea to an aircraft's operational service in line units.

In specific terms this could be as follows. Let us say, for example, that a regiment has received a mark of unsatisfactory at a training exercise. Instead of coercive organizational measures, which make little sense, the members of a state expert examination and determination team are called in, who evaluate the state of the "collective - aircraft equipment - environment" system and determine the actual causes of the adverse performance. They then present recommendations. They must be paid for their work. Hence the idea of team economic accountability. If the regiment is to blame, the Air Force Combat Training Directorate would pay for the recommendations. The designer or manufacturer would pay in the case of aircraft equipment failure or malfunction. If the cause is poor-quality performance of testing or inadequate testing and overstated evaluation of an aircraft, the team itself would pay a penalty. Government arbitration exists for the purpose of settling such claims. Incidentally, presentation of claims for compensation of damages, just as a system of fines and penalties, can effectively influence the figures pertaining to accident rate and equipment failure rate in aviation. But sensible state expert examination and determination is needed. Without it the idea makes no sense.

In my opinion a state examination and determination team should be of integrated makeup. The most concentrated expression of combined makeup is contained in an integrated evaluation of aircraft, which can be an aircraft's "combat potential." For practical purposes this is an item's use value or, in other words, "combat value." Consequently, via a relatively simple mechanism of conversion, an integrated evaluation can be expressed directly in rubles, as a procurement or purchase price. It will also constitute the "market" price of combat aircraft if the market of military aircraft sales is modeled in the conversion mechanism.

Knowing this current price and the model used in forming it, the evaluation and determination team will always be able to determine the percentage share of each element of "producing combat capability" in an aircraft. A new model will emerge, which will constitute a matrix of domestic market management between these elements or components.

If one computes the aggregate probability of combat mission accomplishment by some of our aircraft, taking into account the aircraft's inherent reliability, employed weapons and instrumentation systems, radio-link anti-jam protection, targeting and aiming effectiveness, coefficient of tracking to target, functional value of pilot, mission combat support, and other parameters, one can obtain figures which will place in question the very advisability of using this aircraft, not to mention purchasing it. If one were to array with various aircraft all air combat support assets or ground facilities and indicate the values of their relative participation in overall mission success, the graph of these indicators will also be in sharp contradiction to the costs of their manufacture and upgrading.

This might suggest an additional name for the state expert examination and determination team—"skvoznaya" [integral process] team. It should assume the role of end result feedback to every element related to end result, and would track each component in all its changes and transformations.

Would the team structure not be too unwieldy? It would not. There is no need for the team to contain a specialist of every designation. It would enlist specialists only for the performance of a specific job. At other times they would be working in various production organizational structures, as is dictated by the principle of economic accountability. Naturally the team should bear financial liability for the effectiveness of its findings, and vice versa. In other words the financial welfare of the state expert examination and determination team should directly depend only on the team itself and on nothing else.

I have presented in a general description what I see as a tool for accomplishing restructuring of military aircraft engineering. The main element which is lacking today is opportunities and capabilities to implement sensible ideas. In addition, the process of formulating and implementing ideas should be extremely reasoned and dialectical. If this is the case, our combat aircraft will truly be the world's finest.

Su-25 Frogfoot Ground-Attack Aircraft Described, Critiqued

90SV0053G Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) pp 21-23

[Article, published under the heading "Readers Request," by Col V. Bezborodov: "Is the 'Rook' a Reliable Aircraft?"]

[Text] **It is the official practice in Soviet combat aviation not to give aircraft proper names or nicknames. Perhaps we should. It is not surprising that airmen nevertheless christen their favorite aircraft with names which accurately reflect the aircraft's essence and substance, although it is not known who originally came up with the name. The Su-25 [NATO designation: Frogfoot] began to be called "Grach" [Rook—Corvus frugilegus, Old World bird related to crow] in Afghanistan. This aircraft was acknowledged and appreciated by airmen and ground troops alike. Many people remember how, at the most difficult moments of battle, this seemingly small but formidable ground-attack aircraft came to the rescue. It was constantly streaking low over the heads of attacking or defending troops. The rook escorts the plowman in the field in this manner. This magazine's readers ask how the Su-25 ground-attack aircraft came to be, who was involved in its development, and ask us to tell something about it.**

* * *

The experience of combat operations in local conflicts in the postwar years demonstrated the increased role of close air support of ground troops. The helicopters which performed this role were unable to handle the full extent of the mission. The fighters and fighter-bombers which were enlisted to this mission were unable to operate effectively and efficiently at low altitudes, as a consequence of the fact that they had insufficient time to spot the target, aim and fire, due to their high speed. Delivery of airstrikes from medium and high altitudes were not particularly accurate.

Experts came back to the view that a small, subsonic, simple, reliable, and highly-agile aircraft with good cockpit visibility was needed for the ground-attack mission. It should carry formidable offensive armament, a sophisticated targeting and navigation system, armor protection at vital points in order to increase survivability above the battlefield, should operate at a high sortie rate, and should be able to operate both from paved runways as well as dirt or grass airstrips.

Proceeding from these requirements, the Su-25 aircraft was developed at the Experimental Design Bureau imeni P. O. Sukhoy, which is currently headed by Lenin Prize recipient Senior Chief Designer M. Simonov. Chief Designer V. Babak and Senior Designer Yu. Ivashchechkin directly supervised the ground-attack aircraft development project. The Su-25 made its maiden flight in February 1975. It was flown by Special Design Bureau test pilot V. Ilyushin.

This aircraft is of a single-seat all-metal monoplane design. Its wing, with a moderately-swept leading edge and incorporating high-lift devices, is placed high on the fuselage. According to the appraisal of test pilots and line-unit pilots, this aircraft is reliable and fairly easy to fly.

Experience obtained in developing and upgrading the Su-17 fighter-bomber was utilized in working out the armament system. The Su-25 can fight day and night within target visual range, using a gunsight-type aiming system, a laser illumination and ranging unit, and control signal forming circuitry. Required information is obtained from the navigational systems package, which includes a heading and pitch attitude indicator, a local radio navigation system, a Doppler groundspeed and drift angle measuring unit, a low-altitude radar altimeter, as well as alpha [angle-of-attack] and yaw sensors.

There are 10 underwing weapon pylons divided equally between the left and right wing. The two outboard pylons carry air-to-air missiles, used against threat aircraft. The remaining pylons can carry the following: aircraft bombs ranging from 100 to 500 kg; expendable cluster bomb dispensers; incendiary drop canisters and drop tanks to carry additional fuel (800 liters each); pods dispensing small bombs, antitank and antipersonnel mines; 57, 80, 240, and 250 mm rockets; laser-guided air-to-surface missiles; downward-swiveling 23 mm and fixed 30 mm guns. In addition, this ground-attack aircraft carries a twin-barrel 30 mm gun mounted in the nose.

The Su-25 can carry a weapons payload with a single type of ordnance, a mixed-configuration loadout, without drop tanks, as well as with two or four drop tanks. Maximum combat payload is 4,000 kg of bombs, or 8 rocket pods, or 4 laser-guided missiles. With multiple-shackle mounts on the underwing pylons, 4 bombs of 50 or 100 kg each can be mounted at each station with the exception of the outboard station, that is, a total of 32 bombs.

Su-25 subunits took part in combat operations in Afghanistan from 1980 on. They flew close air support missions, including strikes on small targets located in rugged, remote mountain areas. The aircraft's special aerodynamic configuration, in combination with a high thrust-to-weight ratio, gave it excellent takeoff and landing performance and excellent agility, which enabled it to fly attack passes in restricted space, such as in mountain gorges.

The client and the designers sought to produce an aircraft capable of remaining over the battlefield for an extended time. In Afghanistan Su-25 pilots would fly from 6 to 8 or more target passes during a single sortie in order to accomplish the mission. But if you want to obtain more time for combat actions, expect the enemy to be putting fire on you for a considerably longer time. This means that, in addition to providing speed, agility, and formidable armament, measures must be taken to increase the aircraft's survivability.

In designing the Su-25, specialists approached this problem in an integral manner, which made it possible to build in protection for the crew, for vitally important

components and systems, as well as the airframe, without greatly increasing aircraft weight. The all-welded cockpit, of titanium armor, protects the pilot against heavy-caliber bullets, missile fragments, 20 and 23 mm shell fragments from the most probable directions of fire. The armor can withstand up to 50 hits without cracking or spalling of armor plate and welds.

The fuel tanks are filled with polyurethane foam, which ensures full protection against fire and explosion. In addition, the polyurethane foam substantially increases structural resistance to hydraulic impact, as well as to the high-explosive effect of shells from aircraft and antiaircraft guns. Actively removing heat from a combustion point, these porous materials greatly reduce the probability of fuel ignition and fire.

Pilots were also frequently saved by the reliable powerplant. It consists of two R-95Sh jet engines, developed under the direction of Senior Chief Designer A. Ryzhov. The engines, separated from one another by the fuselage, continue operating even when substantially damaged by missile or shell fragments. If one engine fails, the Su-25 has enough thrust remaining to complete the mission and return to its field.

The aircraft features two independent hydraulic systems, which operate both off the port and starboard engine. The pitch control system, gear extension system, communications and power supply feature double redundancy in order to increase reliability. All this has reflected in past performance. In Afghanistan these ground-attack aircraft experienced one loss for every 80 to 90 instances of sustaining combat damage, as compared with 15-20 for other aircraft. On the average these aircraft logged 2800 hours for every aircraft lost. In spite of the fact that this was the first specialized aircraft designed and developed by Soviet aircraft engineers since the war, in many indices it is the equal of the modern A-10 ground-attack aircraft (U.S.).

One can state that a fine combat aircraft was created at the Experimental Design Bureau imeni P. O. Sukhoy. It is not surprising that an entire family of aircraft is based on it: the Su-25UB combat trainer, the Su-28 trainer, and the Su-25UTG trainer, designed for naval aviators to learn carrier-based flying. Flying this aircraft, on 1 November 1989 test pilots I. Votintsev and A. Krutov made the first landing on the aircraft carrier "Tbilisi."

Nevertheless something is keeping the pilots and ground maintenance personnel, for whom this aircraft was developed, from being entirely happy and totally proud of this airplane. Unfortunately the Su-25 has also experienced one problem which characterizes our aircraft industry, involving so-called "trivial matters." Many pilots, in particular Hero of the Soviet Union Capt N. Goncharenko, Lt Cols S. Kosakov, and V. Martynov, and Aviation Engineering Service officer Lt Col V. Samodurov, while noting many of this ground-attack aircraft's fine points, have enumerated a long list of complaints and suggestions.

In their opinion more powerful and diversified armament is needed, including weapons to use against enemy radar sites, as well as a sophisticated integrated targeting and navigation system, providing capability to deliver ordnance in adverse weather, day or night. Effective countermeasures against surface-to-air missiles are needed. There have also been many adverse comments about the aircraft's avionics.

And why not make the engines have better fuel economy, thus increasing the aircraft's combat radius and time over the battlefield? This could also be helped by having aerodynamically cleaner surfaces and points where structural elements join. This would result in considerably reduced drag, and of course would result in improved fuel economy.

The cockpit is not very comfortable, and the "Rook" could have better stability when rolling on uneven ground in a crosswind.

Is it not possible to reduce pilot fatigue during flight? Of course it is. But this would require an automatic pilot....

Everybody is aware of these shortcomings, and certain authorities have authorized either operation of the aircraft with these shortcomings, or upgrade modification, which requires a great deal of money, manpower, and time. And it would seem that all of them are right. Everything is in conformity either with the original or corrected preliminary specifications or joint decisions. The only losers are the users: the pilots, engineers, and technicians, the ones for whom the Ministry of Defense purchases combat aircraft. Perhaps the time has come to adopt a rule about which so much is said but which cannot seem to be implemented: "The customer is always right." I am convinced that if more heed is paid to the voice of the customer, everybody will benefit.

Ground-Attack Aircraft's Principal Specifications and Performance Characteristics

Standard takeoff weight, kg	14,600
Maximum takeoff weight, kg	17,600
Weight at which aircraft can operate from dirt strips, kg	17,000 (with 4,000 kg combat payload)
Maximum airspeed at low level, km/h	970
Rate of climb at sea level, m/s	72
Minimum radius of constant-rate 360° banked turn with 1,500 kg combat payload at altitude of 1,500 m, m:	
at speed of 460 km/h	570
at speed of 555 km/h	680
Engine thrust, kg	2 x 4,100
Length of ground roll on takeoff with maximum combat payload, m	930
Landing speed, km/h	220
Ground roll on landing, m	600

Brief Description of Lift

90SV0053H Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) p 33

[Article, published under the heading "Practical Aviation Training," by Instructor Pilot 1st Class Col N. Litvinchuk, candidate of technical sciences: "Where Is Lift Directed?"]

[Text] **"Practical Aviation Training" is a new topical heading under which the editors will be publishing materials dealing with "gaps" in theory of flight and practical flying. We welcome all those who wish to take part in discussion of these topics. Send in your comments and views on items on which you have been unable to find explanatory materials in the instructional literature. We would also like to receive brief accounts of interesting, at times improbable occurrences in your flying experience. Original suggestions and the best answers to presented problems will be published in this magazine.**

This section will be handled by Military Instructor Pilot 1st Class Col N. Litvinchuk, candidate of technical sciences.

* * *

The reason for the generation of lift by an aircraft wing can be explained in several ways. In recent years, for the sake of simplicity, this phenomenon has been explained only in terms of the law of constant airflow and Bernoulli's principle.

The former states that in a steady-state flow, the mass of air passing across any wing cross section per unit of time is a constant quantity. For low velocities, where one can ignore compressibility of air (with constant density rho), the following statement is correct: velocity (V) is inversely proportional to the square of the flow section (f). Velocity decreases with increase in area, and vice versa: $V_1f_1=V_2f_2$.

According to Bernoulli's principle, for an incompressible gas the sum of the static (P) and dynamic (rho $V^2/2$) pressures in each section of the stream (flow) is a constant value:

$$P_1+\frac{\rho V_1^2}{2}=P_2+\frac{\rho V_2^2}{2}.$$

With an increase in airstream velocity, static pressure decreases (negative pressure increases), while pressure increases with a decrease in airstream velocity.

On the basis of this it is demonstrated that with a positive angle of attack, above the wing, where the airstream becomes greatly deformed, local velocity increases, while pressure decreases—a peak of negative pressure occurs. Airstreams under the wing undergo almost no changes, however, and therefore pressure in these airstreams changes insignificantly. In this case lift will be directed upward (see Figure 1).

Figure 1. Current Explanation of the Reason for the Generation of Lift.

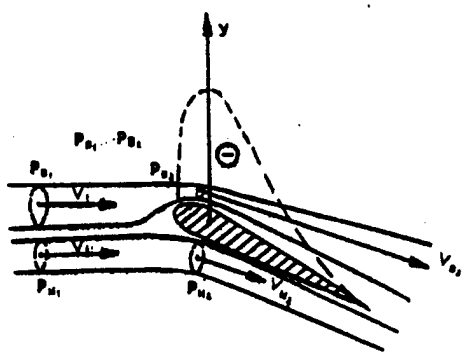
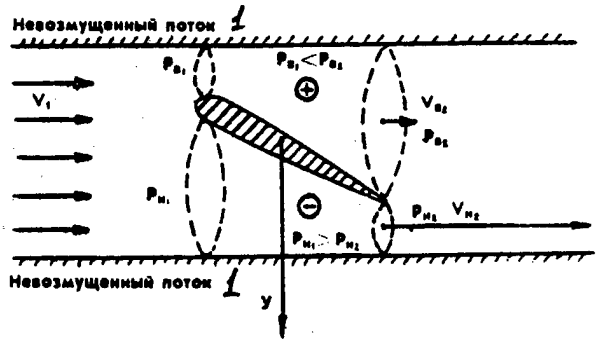


Figure 2. Explanation of the Cause of Reverse Direction of Lift.



Key:
1. Undisturbed flow

If we carefully examine Figure 2, using the same reasoning, we readily arrive at the conclusion that pressure should increase on the upper part of the wing with a positive angle of attack, while pressure should decrease on the lower part. In this case lift will be directed downward.

What is the reason for this paradox?

Political Turmoil at Irkutsk Service School

90SV0053I Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 90 (signed to press 5 Jun 90) pp 34-36

[Article, published under the heading "Party Affairs: Lessons of Perestroyka," by Lt Col A. Fominykh: "In a Political 'Tailspin'"]

[Text] **Lt Col S. Budko found himself in a political "tailspin" from which he was unable to recover....**

The story I want to relate has made the rounds in the Transbaikal Military District. Even party members variously appraised the events attending this story. I therefore feel that it is particularly important to publicize this story. We must learn how to to derive lessons from perestroyka as well.

* * *

The present situation in this country is quite unique. You look around, and see all over the place supporters of the planned reforms. All of us are for glasnost and democracy and are even making certain efforts to ensure that there is more of both. As it turns out, however, glasnost can be used in the old fashion, and democratic elections can be transformed into a resonator of the sociopolitical situation, which God knows even without this is not distinguished by any kind of stability. After many years of praying before icons bearing moustached and heavy-browed countenances, today one can dare spit at them with gusto. This is the simplest thing to do. But earnest praying, and at a later date furious spitting signify essentially one and the same thing: you are the same as before—you were a slave in your worship and admiration, and you have remained a slave in your rebellion.

Little by little some of us are turning into freeloaders of freedom, opportunists in the name of liberty. One frequently chooses from what is possible not that which you, I and he need, but rather that which promises the greatest political success or success of prestige and sensation. That would be all right, but here is the problem: by changing principles based on considerations of the political situation, man loses his very foundation. One finds that there is an outer shell, but there is no inner ideological and spiritual content. To be a member only of a biological species: is this not a bit too little for man?

...The people of Irkutsk learned about Lt Col S. Budko, candidate of philosophical sciences, an instructor in the department of Marxism-Leninism at the Irkutsk Higher Military Aviation Engineering School imeni 50th Anniversary of All-Union Komsomol, from the local papers, radio and television. His vigorous campaign effort to be elected USSR people's deputy last spring and to be elected RSFSR people's deputy in this year's elections have made him widely known to the public and have even brought him certain popularity within political and public organizations in that oblast and in military units.

I had become acquainted with him at a much earlier date. I had once attended a lecture he was giving on scientific communism. I remember that impassioned speech, in which he presented to the cadets the CPSU's idea about the need for perestroyka and improvement of socialism in our country. It was a lively, persuasive, memorable lecture, which won the audience over by its frankness, logical nature of presentation, and chain of reasoning. As an inspecting officer, I gave high marks to Lt Col Budko's preparedness, recommended that other instructors also use his classroom presentation method, talked about him with propagandists and political workers at the line-unit level, and noted in the newspaper NA BOYEVOM POSTU the importance of and need for his ideological work on the opening day of the military aviator party conference. I did all this with sincerity, since I saw him at that time as my comrade in arms as regards that critically important work facing political workers.

Metamorphoses in the convictions and conduct of Sergey Aleksandrovich began virtually from the moment he announced his candidacy for USSR people's deputy in the runoff election for one of the national-territorial districts in Irkutsk Oblast. At that time he had an unpleasant conversation with the school's political section chief, who decided not to support his candidacy. Presumptuous ambitions took over in Sergey Aleksandrovich, clouding a realistic perception of realities. Unfortunately a situation emerged which is typical today: he who shouts loudest about pluralism himself becomes intolerant toward any other point of view. And that is the way things went....

Lieutenant Colonel Budko has decided that his time has come. Since the political section chief is being discharged into the reserves, Budko has decided to take his place. To accomplish his aim, he is appealing to the cadets... to elect him to this position. Hand-lettered posters and campaign slogans calling upon cadets to support Budko are popping up at prominent locations at the school. Nor is this at all surprising. Everything is quite explainable: in a military collective, which operates according to its own specific laws, which in part restrict the young men's freedom of conduct, it is not a very difficult task to incite anarchy. In addition, young people tend to be naive and trusting. This ploy did not, however, help Budko become political section chief.

The meeting to nominate the instructor as a candidate for deputy was a stormy one, and he received majority support. The district electoral board, however, noted one significant detail to which the Law on Elections applies. More than half of the school's personnel was not represented at the meeting. The nomination was adjudged illegal. Although the fact in question was obvious, Budko interpreted this move as machinations by the political section as well as the entire command-bureaucratic system, and viewed himself as a victim of suppression of democracy.

Losing control over events, the candidate for deputy found himself in a political "tailspin," as it were. His response to the decision by the district electoral board (which, incidentally, is completely independent of the school administration) became unpredictable. This instructor's lectures and seminar classes now took on the appearance of election-campaign rallies: there was talk about the need to replace the school administration and virtually to seize power. Thus commenced a dangerous pseudoideological game between an experienced instructor and young, impetuous individuals, who do not always realize the wiles of intellect. In order to inflame

passions to an even greater extent, Budko declared that the school's command element was allegedly concealing an order from Moscow which permitted cadets to attend lectures according to their own wishes and to leave campus in civilian clothes whenever they wanted. Things kept getting worse. Budko voiced across-the-board accusations of inability to run the military, the party, and the country, as well as foul insults against all "higher-ups." In talking to the cadets, this officer began advising them to leave school.

All this of course could not help but affect the moral-ethical atmosphere at the school. During periods of stormy, irresponsible intercommunication between Sergey Aleksandrovich and the cadets, there occurred an increase in the number of gross disciplinary infractions, instances of absence without leave, and student performance declined. Ultimately the curriculum officers appealed to the command element to protect the cadets against this instructor's inflammatory influence. In response to this, Budko stepped up his activities, visiting barracks and dormitories after classes. Let's think about it: are we going to allow extremism, even political extremism, in the military community, where there are weapons close at hand? And what would Budko say to parents if, for example, cadets on guard duty got into a political argument and somebody used an assault rifle as a final argument? It would not be Budko feeling the pain of loss! This also applies to answering for what has happened! Yes, arrogant ambition and a passion for populism are blind and reckless....

Sergey Aleksandrovich likes to talk about persecution on the part of the school authorities. But it was not only the school's administrators who appraised his activities. The members of the State Examining Board, for example, noted in their report that this philosopher has exerted a negative influence on the consciousness of his students. I emphasize that a departure from the curriculum was noted by the State Examining Board, the members of which included scholars from various schools and academies throughout the country, and precisely in those groups in which Budko conducted classes.

The school's academic council did not meet until the fall, after the summer leaves and vacation, to return to the board's conclusion in order to grade this instructor's performance. There had been quite a delay (more than 3 months), which served even more to fire up Sergey Aleksandrovich's presumptuous ambitions, since the council removed him from provisional performance of senior instructor duties.

Budko also made good use of this action in his campaign. He proceeded to wave like a flag the fact that he had been "removed from his position for stating the truth." Aircraft maintenance depot employees and scientific research institute personnel took the bait, and the majority voted for this officer "who had fallen into disfavor." Budko was certified as a qualifying candidate. He was up against 11 other candidates in the same electoral district. Now was the time to put some more beef into his campaign platform. There is a demagogic technique to accomplish this: make a greater effort to exploit the fact of the difficulties being experienced by society, and go right ahead and make more promises.... Sergey Aleksandrovich proved to be not shy at all in this regard. He promised enlisted personnel pay of up to 800 rubles, while he promised officers up to 2,500! He also promised other attributes of a paradise on earth. A bit later we heard about Budko's endeavor to free the "slave labor of the common soldiers" from the "personal whim" of officers (who, incidentally, spend night and day at the airfields and ranges), while he promised to free the school's cadets from the curriculum officers, who were usurpers of authority. The scholar's quintessential position rang out in an Irkutsk TV broadcast, which aroused legitimate indignation on the part of his fellow officers.

Unofficial unpleasantnesses, so to speak, began at this moment for the candidate for deputy, since the Assembly of officers took up the matter. The meeting was unusual: it was attended, with the permission of the assembly council, by representatives of local unofficial organizations and the mass media. Nor were there any objections to the presence of Budko's wife.

The discussion was rather stormy, with excessive display of emotions and sharp words on both sides. The defenders of the candidate for deputy, on behalf of the "Civil Initiatives Club," defended him boldly and passionately, in spite of the insults which Budko had directed toward his fellow soldiers during the TV program. Nevertheless the assembled officers expressed distrust of him as an instructor, and resolved to petition that he no longer work with the cadets. This produced quite an uproar, which was exactly what Sergey Aleksandrovich and his supporters wanted. After all, they could call all this a dastardly attack on an elected representative of the public!

At this same time the school's political section received from the CPSU Central Committee a letter which had been written by Budko, in which he asked to be protected and defended against attacks by the school's bureaucrats in connection with his candidacy for the Russian Parliament. This is truly the height of hypocrisy: to turn for help to a body which you are smearing with mud at the same time! In his letter he cast accusations at everybody, including the new political section chief, who pursuant to his duty had guarded Budko's civil rights during the election campaign. How do you like that!

A group of officers and I thoroughly investigated the charges contained in this letter. We made a thorough investigation, but we were unable to confirm the correctness of the charges in the letter to the Central Committee. At a meeting of department party members, Budko was exposed as being guilty of unconscionable lying and deliberate deception. This was followed by an

appraisal of his personal qualities as an individual who had degenerated from a party member to an anticommunist.

All the months of election campaign get-togethers between Budko and constituents were marked by growing publicity for his speeches and statements. But things reached a culmination point perhaps on 25 February, at a city mass political meeting, at which Sergey Aleksandrovich accused the 2nd Congress of USSR People's Deputies of an in camera compromise agreement with the partocracy that the present government was unable to function, and he demanded the resignation of the Central Committee together with the Politburo. Thus he proceeded from the problems of the Russian Federation to all-union problems. It is true indeed that appetite comes with the eating....

After the mass meeting we met with him once again, in order to determine his position as a Communist. Thus it happened that Lt Gen Avn G. Benov, Military Council member and chief of the Air Force Political Directorate, the Air Force's political section chief in the Transbaikal Military District, also a military council member, and the author of this article were unable to ignore such a statement made by this party member. In an interview which ran about three hours, Budko informed us that he considered the CPSU to be obsolete and that the social democrats should seize leadership within the party. He replied in explicit terms to the question of whether he considered himself a Communist: "No. I am a social democrat. And I shall do everything I can to split with the Communists."

This was followed by an accusation that all of us were to blame for the repressions of the 1930's and that the CPSU was leading the country toward civil war.... Incidentally, Budko joined the party in 1968, while he was stationed in Czechoslovakia during his compulsory military service. In connection with this I have a question: "Just when was he sincere—then, in 1968, or now?"

Soon the party members of the department of Marxism-Leninism decided to ask Sergey Aleksandrovich to attend a meeting, feeling that they should hear him out. But he refused outright, declaring that, in the first place, he was extremely busy with preparations for the elections and, secondly, that it would make no difference, since there was nobody in the department or in other party bodies, including the Central Committee and Politburo, who would be capable of understanding him. In his opinion they lacked the proper level of thinking. At that point we reminded this philosopher that a fundamental question was at issue, and the party organization was not entirely in favor of the fact that he might enter the parliament of the RSFSR with a party card. "Should we perhaps part company right now?" the party bureau secretary commented.

Lieutenant Colonel Budko failed to appear at the party meeting, just as he failed to appear at a party commission meeting. They spent quite some time trying to locate him, but to no avail. So they went ahead and expelled him from the CPSU. The elections were also a fiasco for Sergey Aleksandrovich. The voters showed preference for V. Khayryuzov, an An-26 aircraft commander.

...This story gives us plenty of food for thought. As I see it, it shows us particularly that one should not fail to note a person's true multidimensionality; this is frankly dangerous for the country, for society, and for each of us. If we acknowledge that the socialist ideal is an integral feature of a contemporary vision of the world and its future, we must endeavor to fill it with human content in a practical manner. Otherwise extremism, political populism, and God knows what else will arise endlessly in these ideological recesses.

We have learned to see the human goals of development, evaluating first of all production, job-related, and other indices. Such a view of man contains a great deal of vitality. And yet there is an aspect to the problem of human measurement which is more difficult for understanding and reaching general agreement: human measurement of the possibilities of society to evolve and to change. Any society can be that which the people who form it constitute.

If we truly want to restructure our lives, in considering today and tomorrow, we must turn to actual, not imaginary or invented features of the social countenance of our fellow citizens, their psychology, the political reference points of their activity, and to those accelerating and inhibiting elements which each of us carries within ourselves. It is high time to overcome the accustomed dogmas of human psychology. The main difficulty for political agencies and political workers lies in the fact that today one needs a special intellectual boldness. We cannot divert our gaze from the mirror in which we political workers are today reflected as not as attractive, principled, fair and just, etc, as we would like. And we must constantly be prepared for the fact that there will be revealed among us many who are incapable of restructuring themselves, who lay the blame on the mirror. Political workers are faced with a very substantial task. Some will not be able to handle it. But there is no other option. Since our society has proceeded along the path of reforms, both the reforms proper and their result will inevitably bear the seal of that "human material" which carried out these reforms.

Air Force Cosmonaut Detachment

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[Listing, published under the heading "Readers Request": "Air Force Cosmonaut Detachment"; concluding part of three-part listing; parts one and two, see AVIATSIYA I KOSMONAVTIKA, May-June 1990]

[Text]

No	Rank, Last Name, First Name, Patronymic	Date and Year of Birth	Left Cosmonaut Corps	Service
1	2	3	4	5
Sixth Group Recruited (August 1976)				
1.	Sr Lt Vladimir Vladimirovich Vasyutin	8 Mar 1952	25 Feb 1986	Pilot-Cosmonaut USSR. Serves at Air Force Academy imeni Yu. A. Gagarin. Colonel
2.	Capt Aleksandr Aleksandrovich Volkov	27 May 1948		Pilot-Cosmonaut USSR. Cosmonaut detachment deputy commander for political affairs. Colonel
3.	Capt Leonid Georgiyevich Ivanov	25 Jun 1950	21 Oct 1980	Killed in airplane crash on 21 Oct 1980
4.	Capt Leonid Konstantinovich Kadenyuk	28 Jan 1950	22 Mar 1983	Serves in Air Force. Colonel
5.	Nikolay Tikhonovich Moskaleno	1 Jan 1949	30 Jun 1986	Serves in Air Force. Lt Col
6.	Capt Sergey Filippovich Protchenko	3 Jan 1947	28 Apr 1979	Served at Cosmonaut Training Center imeni Yu. A. Gagarin [CTC]. Lt Col (Res)
7.	Capt Yevgeniy Vladimirovich Saley	1 Jan 1950	1 Oct 1987	Serves in Air Force. Lt Col
8.	Sr Lt Anatoliy Yakovlenich Solovyev	16 Jan 1948		Pilot-Cosmonaut USSR. Colonel
9.	Capt Vladimir Georgiyevich Titov	1 Jan 1947		Pilot-Cosmonaut USSR. Directorate deputy chief, Cosmonaut Training Center imeni Yu. A. Gegarin. Colonel
Seventh Group Recruited (May 1978)				
1.	Capt Aleksandr Stepanovich Viktorenko	29 Mar 1947		Pilot-Cosmonaut USSR. Cosmonaut group commander, Cosmonaut Training Center imeni Yu. A. Gagarin. Colonel
2.	Capt Nikolay Sergeyevich Grekov	15 Feb 1950	30 Dec 1986	Mission controller at CTC. Lt Col
Eighth Group Recruited (1987-1988)				
1.	Capt Yuriy Ivanovich Malenchenko	22 Dec 1961		Cosmonaut-Test Pilot, cosmonaut detachment, CTC
2.	Capt Vladimir Nikolayevich Dezhugov	30 Jul 1962		Cosmonaut-Test Pilot, cosmonaut detachment, CTC
3.	Capt Yuriy Pavlovich Gidzenko	26 Mar 1962		Cosmonaut-Test Pilot, cosmonaut detachment, CTC
4.	Lt Col Valeriy Grigoryevich Kazun	5 Mar 1953		Cosmonaut-Test Pilot, cosmonaut detachment, CTC
5.	Lt Col Vasiliy Vasilyevich Tsibliyev	2 Dec 1954		Cosmonaut-Test Pilot, cosmonaut detachment, CTC
6.	Col Viktor Mikhaylovich Afanasyev	31 Dec 1948		Cosmonaut-Test Pilot, cosmonaut detachment, CTC
7.	Lt Col Gennadiy Tikhonovich Manakov	1 Jun 1950		Cosmonaut-Test Pilot, cosmonaut detachment, CTC
8.	Lt Col Anatoliy Pavlovich Artsebarskiy	9 Sep 1956		Cosmonaut-Test Pilot, cosmonaut detachment, CTC

* * *

There are presently 29 persons in the Air Force cosmonaut detachment: 28 men and one woman—Col V. Tereshkova.

Articles Not Translated

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