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AIR FORCES

COL GEN AVN S. GOLUBEV ON SUMMER FLIGHT TRAINING

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) pp 1-3

[Article by Col Gen Avn S. Golubev, Hero of the Soviet Union and Honored USSR Military Pilot: "A School of Combat Skill"]

[Text] An important date, the 60th anniversary of the formation of the USSR, is drawing near. The nation's workers and the men of the Army and Navy are preparing to celebrate this glorious jubilee by weighty achievements in carrying out the historic decisions of the 26th CPSU Congress.

The aviators are improving their combat skills with a great patriotic upsurge. In the socialist competition which has developed in the Armed Forces under the motto: "A Secure Defense for the Peaceful Labor of the Soviet People!" the command and the political bodies, the party and Komsomol organizations of the aviation units and subunits are directing the increased activity of the personnel at mastering the assigned equipment and weapons. They are steadily introducing into training and indoctrinational practices the advanced experience of the best pilots, navigators, engineers, technicians and aviation rear specialists, the true masters of their job. This is one of the reserves for further raising combat readiness.

The summer is a period of intensive flying. During this time the flight personnel works on the most difficult types of combat training, they master the effective procedures and methods for attacking air and ground targets and they learn the art of winning under any tactical and weather conditions. Moreover, the summer is a period for conducting diverse tactical flight exercises and maneuvers. These are rightly considered to be a real school for courage and skill and a most important means for increasing the air, fire and operational-tactical skills of the men. In a situation as close as possible to real combat and in the course of carrying out diverse missions, the ability of the commanders, the staff officers and political workers is tested in controlling the combat actions of the air subunits in close cooperation with the ground troops and naval forces, in ensuring the ongoing work of all elements in the complicated military organism during the dynamics of modern combat. In turn, the flight and engineer-technical personnel acquire skills in operating under conditions which can be set by the combat situation with a sharp shortage of time. Exercises are also schooling in continuous, purposeful party political work which raises the mood of the aviators to unconditionally carry out the set tasks.

It is precisely in the exercises that the practically tested forms of party influence on the personnel are honed and new, more efficient ones are sought out which conform to the actual frontline reality.

The significance of the tactical flight, combined-arms exercises and maneuvers involving aviation is truly enormous for the combat training of the aviators. Only in them under peacetime conditions is it possible to gain a notion of the scope and dynamics of modern combat, to acquire the skills of precise and decisive actions, to profoundly realize the underlying principle of combat and political training, that is, to teach the troops what is required in warfare.

For the Soviet military guarding the peaceful, creative labor of our people, this principle in troop training at present has assumed even greater significance. The present-day international situation has become sharply more acute. The U.S. imperialist circles and their partners in the NATO bloc are increasing international tension and are endeavoring to bring the world to the brink of a nuclear catastrophe. Due to their fault the arms race has assumed an unprecedented scope. The U.S. military concerns have begun manufacturing neutron and chemical weapons as well as their delivery systems.

The developing situation has necessitated the maintaining of the combat readiness of the Soviet Armed Forces on the highest level. "This," commented the General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet, Comrade L. I. Brezhnev, at the 17th USSR Trade Union Congress, "is a pressing necessity of today's world and it, of course, requires the diverting of much resources to the detriment of our peacetime construction plans. But, as I have repeatedly said, we are not spending and will not spend for these purposes a single ruble more than is absolutely essential for ensuring the security of our people, their friends and allies."

The words of the leader of our party and state clearly define the direction for the combat training of the troops. It is essential to maximally intensify the training process, to strictly account for the precious time, to carefully plan and organize the exercises and flights, to thoroughly study the experience of the Great Patriotic War and that of the tactical flight and combined-arms exercises, to more boldly introduce advanced methods into practice and with the existing opportunities achieve maximum effectiveness and quality of combat skills. All that is new, advanced and meeting the needs of today should become known to every aviator.

Practice indicates that good results in the tactical flying exercises [LTU] can be achieved only by their exceptionally well-thought-out organization. As is known, squadron-level LTU are carried out in the concluding stage of preparing the flight personnel for carrying out a certain mission. As a rule, the young flight personnel participates for the first time in such a measure. What will the exercise give the young combat flier for his further professional growth? Everything will depend upon the LTU organizers.

In order that an exercise be instructive and bring maximum benefit and satisfaction to all its participants, it is prepared for ahead of time. This is an interesting, creative matter which requires from the commanders, the political

workers and staff officers a firm knowledge of the organizational bases, a high level of training for the personnel in flying and moral-psychological terms and a good knowledge of the capabilities of one's equipment and, of course, modern tactics. The commander who organizes the LTU should have a completely clear notion of its end result which will become a step for the further ascent of subordinates toward the heights of military skill.

In working out the overall concept for the LTU, experienced commanders pay basic attention to creating a situation which would be marked by newness and arouse in the men an interest and desire to show creativity and boldness in carrying out one or another task. Such a posing of the question is completely correct. Certainly an exercise tests not only the ability of the fliers to hit the target with the first round, missile or bomb (they learn this in the process of mastering the combat employment problem, starting from simple exercises with a gradual increasing of their complexity), but also the ability to precisely assess the existing situation, to act with initiative and energy in a difficult situation, to carry out the search and orientation intelligently and to take effective, nonroutine decisions. All the listed is nothing more than the elements of tactics and tactics is the most important weapon of a pilot. Thus, in an exercise along with the young aviators, the commanders training them are also tested. Ordinarily the plan for conducting the LTU of a squadron is worked out by the staff on the basis of the decisions of the unit commander. It reflects the subject of the exercise, the training goals and questions which must be worked through, the overall situation and the particular one for the start of the LTU, as well as instructions on safety measures and the squadron's combat mission. The plan also covers the questions related to cooperation between the tactical-level groups, the methods of supervision and control from the command post as well as many other questions relating to the direct training of the personnel. The plan for conducting the LTU is supplemented by a schedule plan for combat sorties and diagrams for carrying out assignments.

In preparing for an exercise in the flights and two-plane elements, the sectors of responsibility are allocated among the pilots in searching out and attacking the target, the tactical procedures, the methods of employing the weapons, the radiotraffic procedures, the take-off sequence, the combat formations in the various stages of the flight and the landing approach are worked out; safety measures are provided for starting from the starting up and ending with the shutting down of the engines on the ground. In other words, each pilot should firmly know the requirements of the documents which define the procedure for preparing for and carrying out the LTU, in particular those which concern his duties and tasks. In preparing for the flights, the commanders must remember that undertrained or unprepared pilots or crew members cannot be involved in carrying out even the simplest assignments. It is all the more unacceptable to make up crews, two-plane elements and groups which have not worked together. The underestimation of this or the neglecting of such an essential question of flight skills has led to severe and at times irreparable consequences.

In setting the mission for the squadron, a regimental commander describes the actions of the ground troops and defines the position of the front line by the start of the exercise, the basing of the cooperating subunits and units of fighter and fighter-bomber aviation, the air defenses of the ground troops, the

composition of the "enemy" forces, the enemy radar zone of visibility and the capability of air defenses. But all of this without disclosing its [the regiment's] combat missions, position and actions. In other words, the commander gives a specific instruction for which the personnel should be prepared. Thus, the overall plan within the confines of a certain subject provides the squadron commander with a right to independently carry out the task and to show initiative in organizing the attack and in determining the composition of the composition of the forces to be assigned and the method of implementing it. Undoubtedly the task will be carried out the more successfully the sounder the operation plan. If the commander is able to predict the course of events and scientifically calculate the actions of the sides, this will provide an opportunity to promptly take a decision to continue combat, to alter or halt it.

For example, in a recently conducted LTU, the subordinates of Col V. Zhavoronkov demonstrated high firing and tactical skill. In preparing for the squadron LTU, the regimental commander independently developed the ideas found in the document guides determining the procedure for conducting an exercise with field firing, he detailed certain of their provisions, he strengthened the procedural focus and thereby demonstrated high tactical intelligence. In knowing well the training level of the men in the squadron under the command of the first-class pilot Maj V. Shcherbin, he created a complicated and instructive situation. It demanded that the squadron commander and pilots demonstrate all that they had achieved in the course of the winter training period. The squadron's flight personnel had to support the combat operations of other branches of aviation as well as cover the ground subunits against air attack. Both parts of the task were unavoidably linked with the carrying out of air combat. Maj Shcherbin correctly calculated the resources of his subunit and skillfully organized the escorting of the bombers and patrolling in the air. With the complicating of the situation by various inputs, the squadron commander ensured precise cooperation of the leaders of the two-plane elements and flights with the combat control officers and promptly carried out the adopted decisions. The subunit commander himself skillfully conducted air combat and in the crucial stage shot down a radio-controlled target with a direct hit. In the course of the LTU, the pilots acted intelligently and decisively in tactical terms and the commander's plan was completely carried out.

The experience of the exercises indicates that there are many ways and methods for bringing the situation closer to the conditions of real combat. For example, in mastering the procedures and methods for attacking ground targets, the tactical and firing ranges can be employed. Of course, most popular among the crews are exercises involving real bombing, missile launching or cannon firing. However, the principle of succession in instruction presupposes the initial working of standard exercises at a stationary range with camera firing and bombing and then with live ammunition. Having gained firm skills in piloting and operating the sight and weapons, the crews on a tactical range work through the methods of crossing air defenses, fighter and missile avoidance maneuvers, the methods of locating the target and the procedures for attacking it singly and in groups. In order that each flight brings benefit to the combat fliers, the commanders should effectively plan the assignments for the pilots considering their skill level, they should more frequently change the target set-up and alter the direction and altitude of approaching the target. Real air defense weapons should be set up on the routes and a representative

should be sent out to them. Undoubtedly the commanders of the air units must organize good professional contacts with the command of the ground troops. Our overall combat skill merely gains from this.

The situation is more complicated with the firing ranges since the combat firing courses over them, as a rule, are fixed. Nevertheless, the advanced units have found a way out of the situation. Prior to flights using live ammunition, the commanders carefully work out the tactical situation on the maps showing the front line, the air defense weapons and "enemy" radar zones, the basing of its fighter aviation and many other questions, and on the ranges, to the degree that the safety measures permit this, work out several different combat courses. Considering these data, a decision is taken in accord with which the personnel works out the routes and draws up a model of the assignment.

An important element in the exercises is the training of the pilots and crews for the take-off as well as the actions after landing at the airfield under the conditions of its "contamination" with chemical toxins or radioactive substances. It must be said that it is rather difficult and cumbersome to work in a gas mask and individual protective gear. But this is an urgent necessity. As was said by the great Russian military leader A. V. Suvorov: Difficult in exercises, easy in the field. For this reason each aviator should learn to work precisely and faultlessly under the worst conditions in order to quickly prepare the aviation equipment for a second flight in a real combat situation.

In preparing for the tactical flight exercises and drills, it is very important to have a high determination of the personnel to carry out the assignments and a sense of responsibility on the part of each aviator for the results of his labor. We must not close our eyes to such phenomena as oversimplification and weaknesses in combat training. In the men these create an incorrect notion of the scope, dynamics and power of modern combat, they reduce interest in training and provide a distorted understanding of skill per se. One cannot help but consider the factor that an exercise conducted according to an oversimplified version leads to an unjustified wasting of material resources. For this reason, increased exactingness on the preparation of the commanders and staffs and all the personnel to carry out the tasks under complex conditions and considering the increased capability of the weapons is assuming evermore important significance. In line with this it is the duty of the commanders and political workers, the staff officers and party organizations to constantly develop in all the aviators a rejection of oversimplification and routine, negligence and a lack of principle, to increase the personal responsibility of each man for the quality of his work and to provide a principled, party evaluation of the mistakes and shortcomings in combat training activities.

The more complicated the situation is in an exercise, the more effective indoctrination of the personnel should be and the stronger the moral-psychological tempering of the pilots. Thus, in the preparations for the "Zapad-81" [West-81] Exercises, in the squadron commanded by the military sniper pilot, Lt Col A. Avdeyev, a party meeting was conducted in which the communists shared their ideas on how to better support the flights and prepare the equipment and personnel. Then talks were held in the subunit and experience exchanged between the veteran aviators and the youth.

It must be said that this experience was very helpful. In one of the episodes, the squadron commander was given the mission to attack an "enemy" strongpoint in the course of the aviation softening-up for the attack. Lt Col Avdeyev had several tested variations. He chose one of them as the main one and took a decision to attack the basic target with four planes and assigned two planes to neutralize the covering weapons.

After take-off the flight took up its battle formation and headed toward the target. The carrying out of the mission was complicated by the low cloudiness and haze with limited visibility. Moreover, the "enemy" employed strong jamming. Having crossed the air defenses, the group arrived at the object of the attack precisely on time and from different directions. At this moment intense artillery shelling had just ended. The targets were covered with a solid wall of dust and smoke. Here is where the experience of the squadron commander came into play, as well as his ability to correctly choose the direction and variation for the attack! A powerful bomb strike was made against the target. The pilots gained an apt lesson in how to prepare for and carry out a combat assignment.

One of the main tasks carried out in the course of exercises is a constant search for the most effective methods to employ the combat capabilities of the modern equipment and weapons and to constantly improve tactics. It is essential to effectively search out the ways to achieve surprise, to develop the art of cooperation and to constantly improve control of the units and subunits. Firm, flexible and continuous control makes it possible to have maximum use of the combat might of aviation weapons, it strengthens the confidence of subordinates in their commander and in the correctness of his decision and ensures steadfastness and continuity under any, even the most complex conditions.

It is often heard and said that the "commanders should" and the "subordinates are obliged" and explanations are given that precisely they "should" and are "obliged" in one or another combat training situation. Ultimately, everything comes down to the unswerving execution by each aviator of his functional duties and the provisions of the documents regulating flying. Certainly these consider the experience of previous exercises and on the basis of a profound analysis correct conclusions have been drawn which must be employed in daily training. If the commander fully carries out all the functions assigned to him, these documents help him in creatively analyzing the training process and in seeking out ways to improve it.

In organizing and in the course of the LTU, such a leader actively influences the development of events and is capable of predicting the end result and adopting correct decisions under the extreme conditions of modern combat. In teaching his subordinates the actions in a LTU, he instructs himself. For precisely this reason the LTU are becoming a real school in combat skill. An intelligent, ideologically mature commander would never permit the simplifying of the situation. Confident of his subordinates, he makes a maximum effort so that they work at full strength and with creative energy. But in peacetime training days, no one needs a victory achieved by any price. For this reason, here lower results are quite possible. But if this should happen, it means there are shortcomings and measures must be taken to eliminate them.

In using every hour of the exercises and each minute of flight with maximum effectiveness, the pilots and navigators, the aviation specialists spare no effort to achieve new heights in military skill. A spirit of competitiveness in the socialist competition and healthy rivalry can aid this as nothing else. The powerful aviation weapons are in strong, able hands. The modern missile-carrying aircraft are controlled by men who are completely dedicated to the cause of communism, by loyal sons of the Soviet motherland capable of coming to its defense at any minute.

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## AIR FORCES

### BOMBERS: IMPORTANCE OF PRECISION NAVIGATION DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) pp 4-5

[Article by Guards Lt Col Ye. Antonov, military sniper navigator: "Accuracy from Take-Off to Landing"]

[Text] Take-off. A heading to the range. The bomber crew was to attack a ground target and then in another area detect and photograph an "enemy" installation. The crew's commander, Guards Maj N. Vist and the navigator, Guards Maj A. Punin, had already carried out similar missions. But this day they were shouldering a special responsibility as the squadron was being inspected by a commission, the members of which were already at the range.

The route lay across markerless terrain. However, Punin confidently made the required calculations. When a third of the distance had been covered, he received an input by radio: The navigation and sight equipment had developed a problem. He reported this to the commander.

What should they do? Return to the airfield? In a combat situation this would have meant an aborting of the combat assignment. But bombing with large errors did not offer anything good. Maj Vist realized that a poor result would influence the morale of the crew and the squadron's personnel as well as the overall grade for the subunit's combat training. A decision had to be made.

"Navigator," he turned to Punin, "we will bomb using the optical sight."

"Roger, commander."

Cloudiness appeared along the route. The ground markers were constantly hidden behind dense caps of clouds. The strong atmospheric interference disrupted the arrow of the radiocompass which indicated the direction variably even to powerful radios. But the bomber reached the area of the range without error. The commander reported his position to the air traffic controller and was granted permission to bomb. The crew visually detected the target and hit it on the nose. The aviators also successfully carried out the second part of the mission. Under difficult conditions they demonstrated excellent professional skill, high moral-combat and psychological qualities, decisiveness and initiative.

Among the chief factors which determined the precise carrying out of the set mission one must mention the excellent navigational training of Guards Majs Vist and Punin. They employed the time assigned for preliminary preparations with maximum efficiency. The navigator skillfully drew up the map and along with the commander provided for possible unplanned changes in the route and variations for skirting the thick cumulus clouds. The aviators planned their actions for special conditions and considered the experience of other crews. Vist and Punin showed great activity during the training and playing through the flight. For this reason the excellent results were quite natural.

Our aviation navigators school is rich in glorious traditions such as great accuracy in calculations and preciseness in everything from drawing up the flight documents on the ground to keeping the flight log in the air, vigilant observation of the situation and its careful analysis. A majority of the pilots and navigators in our unit maintain and add to these traditions.

The command pays unflinching attention to further improving the professional skills of the flight personnel and its navigator training as this determines the quality of navigation and combat employment. In the process of preparing for the flights it is very important to correctly set the route and maneuver in the area of combat training actions, to draw up the maps and select the radar navigation support equipment as well as carefully monitor the crew's readiness in navigation terms.

As a rule, the best trained navigators and pilots are concerned with choosing the complex long routes as they determine the effectiveness of carrying out the flight mission and the safety of air navigation. In selecting the route, it is essential to consider many various elements. For example, the operating condition and schedule of the nondirectional and broadcasting radios, the local radionavigation system, the presence of characteristic ground markers and other factors which contribute to increasing the accuracy and safety of navigation. This helps to carefully mark the turning points on the route, for example, so that the most crucial stages are in the zone of radio beacons. In a word, the selection, preparation and calculation of the route are a complicated question requiring patience, profound knowledge, experience and skills.

However, with a shortage of time, the crews must often independently change the route. This happens in skirting thunder or in landing at the alternate airfield. In such instances the actions of the aviators are closely followed from the ground using radar and when necessary advice is given.

But in reconnaissance flights in a search area the crew members themselves take the decision to alter course. Certainly, the "enemy" can not merely employ camouflage equipment but can also change its position. It is virtually impossible to precisely predetermine the route in the area of carrying out the set mission.

The crew of Guards Lt Col N. Panteleyev in a designated quadrant was to detect and photograph a target. When the aircraft approached the search area, the target's radar equipment was turned off and the crew was unable to determine the direction to the "enemy." The situation was complex but quickly grasping

the tactical situation, the commander and navigator ably executed a maneuver to search for the target. When the "enemy" realized that it would inevitably be detected and turned on its radar to organize a repelling of the bomber's attack, it was already too late.

Undoubtedly, a route in the air can be calculated by a crew which has a good knowledge of the equipment and possesses high professional skill and navigation abilities. Thus, before the flight the navigator Guards Maj Pan'kin scrupulously plotted all the necessary elements of the tactical situation on the map in the target area. In the situation which developed in the air, the map helped the crew in quickly taking the correct decision.

Unfortunately, one also encounters instances of a negligent drawing up of flight documents. In relying on their experience and memory, certain aviators do not plot all the radar defense equipment on the map or make all the necessary calculations. It also happens that the crew commanders and navigators prepare the documents separately and as a result the markers for locating the target are different for each. It is not excluded that differences can arise in the air.

Certainly, such is rarely encountered. Ordinarily such shortcomings are detected in monitoring the readiness and are promptly eliminated. But at times, the flaws in preparing the officers for flights are discovered only in the process of carrying out an assignment.

...The aircraft was approaching the search area. The new long route and the difficult weather conditions caused increased tension in the crew. The navigator closely watched the radar screen. The expected blip should appear momentarily.

"Navigator, what is the matter?" asked the commander without concealing his irritation. "Do you see the target?"

"Not yet," replied the officer.

At one moment it seemed to him that he had spotted the target. But the aircraft was moving away from it. Without going into the details of the further development of events, I would point out that the mission was carried out. Nevertheless, the case was carefully analyzed and given a strict evaluation. The analysis of that flight indicated that the aviators had prepared poorly, particularly in navigation terms. In particular, the navigator had poorly studied the navigation and radar situation in the target area and had not put on the map all the necessary markers which would help him detect the "enemy" without error and on time. Nor did the flight navigation plan conform to the existing requirements. It should contain a precise procedure for operating the navigation equipment. This is the guarantee for navigational reliability, particularly under instrument flying conditions.

A very responsible attitude must be shown to the drawing up of flight documents and the integrated use of navigation equipment must be constantly remembered. On each leg of the route the flight and navigation plans should contain entries

reflecting the methods for determining the aircraft's position by various equipment and variations for monitoring the calculations made. In a word, conscientiously prepared documents are good support for the pilots and navigators in carrying out any flight assignments.

During commander training, the personnel not only rereads the necessary instructions, manuals and theoretical materials, but also without fail studies on a trainer and participates in playing through flight variations. It is difficult to overestimate this type of combat training. Certainly the playing through is an excellent rehearsal for the forthcoming assignment. The squadron navigator, Guards Maj A. Punin, organizes such exercises well. Here is how one such play-through was carried out.

In the preliminary training classroom, the aviators by crews positioned themselves behind tables with maps, tables and calculating instruments. That day, they were to work through an exercise involving the search for and reconnoitering of "enemy" ground forces. Initially the leader explained the nature of the forthcoming assignment and then began to give the officers previously prepared questions.

"Calculate the necessary fuel reserve if the flight to the search area and back is carried out and an altitude and speed ensuring maximum flight range while the search is carried out at an altitude of...and a speed of...," he asked one of his subordinates.

While the navigator was making the calculations, Punin proposed that his commander describe what he should pay particular attention to during the preflight inspection of the aircraft.

"In the maintenance log I would examine the entries on the work done on the radionavigation equipment as well as the entries confirming the elimination of shortcomings detected in the previous flight shift and I would ascertain the actual fuel supply."

Guards Maj Punin prepared carefully for the exercise, he thought it out to the last detail and closely tied the theoretical questions to practical ones. For this purpose he worked out a number of inputs and also provided time to analyze the errors committed by the aviators in previous flights.

The inputs followed one after another. The crews played through various methods of maneuvering in the search area and made calculations. At the end of the play-through, the leader asked:

"In approaching the airfield due to a deterioration of the weather conditions, you have received the command from the traffic controller to go to the alternate airfield. What would your actions be?"

"I would ascertain the fuel supply, calculate the course to the alternate airfield, the flight time and arrival at it, I would prepare the radar data of the landing airfield for putting them into the aircraft systems."

"Fine. Now, describe the landing approach at the alternate airfield."

The answer was concise.

The flight play-through was carried out in a creative situation. The pilots and navigators worked out all its stages in detail, they selected the best methods for monitoring the route and for eliminating possible malfunctions and they repeated actions for special cases. This helped to further increase the professional skill of the aviators and to raise their certainty in successfully carrying out the set missions.

Undoubtedly, the effectiveness of a play-through depends completely upon the competence of the leaders, their range of view, tactical abilities and pedagogical and organizational abilities. Incidentally, so does the checking of readiness.

The checking of a crew's readiness for a flight in navigation terms is the last but very important stage in the preparation of the flight personnel. Its aim is to establish the actual preparedness of the crew to fly along the route and for actions in the area of executing the mission as well as to determine the measures to eliminate shortcomings. An intelligently and skillfully conducted check makes it possible to erect a strong barrier against mistakes which can arise in the air. The link between the check on readiness and the quality of carrying out the flight exercises is obvious.

Modern combat is marked by dynamicness and by abrupt changes in the situation. In order to emerge from it the victor, the pilot and navigator should think quickly and accurately and show high skills, decisiveness and initiative. Such qualities are shaped in the process of daily training on the ground and are honed in the air.

Experience indicates that if a crew has gone on a flight unprepared, to a significant degree this is the consequence of formal inspection. Hence the inspector has not been concerned ahead of time for ascertaining how well the navigator has thought through his actions in the air under the specific weather conditions as well as other factors determining the successful carrying out of the combat training task.

A check on readiness is a many-staged process. Initially it is carried out in the crews and detachments and then the squadron command becomes involved in it. However, it may also happen that even the commander and navigator of a detachment do not possess sufficient time for profoundly checking on each aviator's preparations for the flight. The squadron commander and navigator are even more limited in time. For this reason, of enormous significance is the correctly chosen method of checking.

Definite experience in conducting a check has been gained in the squadron headed by Guards Maj N. Vist. Here they most carefully inspect those officers who are to carry out the most complicated tasks of the flight shift as well as those who are beginning to work on new exercises. The crews which are to fly as part of a group conduct a crosscheck. Particular attention is given to the

preparation of the group leader. Such a check on readiness is a dependable shield against errors.

Combat training is in full swing. The pilots and navigators steadily improve their professional skills and endeavor to carry out their duties with high quality in accord with the requirements of the documents regulating flying. This is the guarantee for ensuring high combat readiness.

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AIR FORCES

FIGHTER COMMANDER INTERVIEWED ON SUMMER TRAINING GOALS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) pp 6-7

[Unattributed interview with Lt Col V. Rassokhin: "With the First Missile..."]

[Text] The second training period has commenced in the Air Forces units and subunits. This is being carried out under the situation of the struggle to properly greet the 60th anniversary of the formation of the USSR under the motto "Secure Defense for the Peaceful Labor of the Soviet People!" The personnel have been seized by a high patriotic upsurge and are endeavoring to utilize each hour of intense flight training to further improve air, gunnery, tactical and technical skills, to improve combat readiness and strengthen military discipline. Our correspondent met with the commander of the outstanding fighter aviation regiment, Military Pilot 1st Class Lt Col V. Rassokhin and asked him to answer a number of questions.

[Question] Viktor Vasil'yevich [Rassokhin]! Your regiment has initiated the socialist competition in the district. Please tell us how the aviators fulfilled the obligations during the first training period.

[Answer] It seems just recently that we adopted the appeal to the Air Forces personnel of our Red Banner military district. In this document I particularly recall the lines: "In carrying out the historic decisions of the 26th CPSU Congress, the men of the regiment with a feeling of great responsibility are standing the combat watch to defend the southern air frontiers of our beloved motherland. In profoundly realizing the complexity and contradictoriness of the present international situation, each of us in our daily military service is unstintingly forging his military skill, steadily increasing his ideological tempering and forming in himself the qualities of a political fighter." From the results of the competition of the last training year, the regiment won the leading place among the aviation collectives in the district and attained the honorary title of outstanding.

But what has been achieved is not the limit. And it cannot be when it is a question of the struggle for high combat readiness and defending the present

and future of the motherland. Having thoroughly analyzed our possibilities, our aviators in the competition which has developed afresh at the beginning of the training year to properly celebrate the 60th anniversary of the USSR planned to raise combat readiness and air skills to a new level and to strengthen organization, discipline and proper order. In defining our tasks, we were guided by the decisions of the party congress, by the decree of the November (1981) Plenum of the CPSU Central Committee and by the demands of the USSR minister of defense and the commander-in-chief of the Air Forces for the new training year.

Of course, to adopt high obligations is merely just the start. Great political and organizational work was required from the commanders, the political workers, the party and Komsomol aktiv, as well as daily control over the course of combat training and the effective introduction of advanced experience and the achievements of the best pilots, engineers, technicians and aviation specialists. It is scarcely possible to get by without creativity, initiative and experiments and these are the unique call signs of our times. At present, entrepreneurship, independence and the overcoming of routine and inertia of thought are assuming particular significance. Under initiative from below we adjusted the technical calculations to supply the aircraft with weapons. Upon the proposal of ground specialists, special groups were organized. As a result it was possible to significantly shorten the time required to ready the aircraft for a sortie. And this was a concrete contribution by the regiment's aviators to carrying out the obligations. And hence the results for the first training period. In the regiment 53 percent are outstanding men in training and 78 percent are specialists 1st and 2d class.

For me, as the commander, I am greatly pleased by the fact that among the military aviators, 70 percent are communists and 30 percent are Komsomol members, while among the IAS [aviation engineer service] specialists, 60 percent are communists and over 30 percent are Komsomol members. It is pleasant to note that the Komsomol members have done a good deal to carry out the complex tasks during the previous training period and properly celebrated the 19th Komsomol Congress.

At present, we have two outstanding squadrons and seven outstanding flights while 50 percent of the crews are outstanding. The best indicators are in the squadron under the command of Military Pilot 1st Class, Maj Antipov. The plan for accrued flying time and the types of combat training has been carried out.

[Question] How do you achieve effectiveness in each flight shift and high quality in the exercises being worked out by the crews? What factors help in organizing the flights without any violations of the flight service laws?

[Answer] Let me begin with the organization of the flight day. Here we again check the planning table and hear the reports from the chiefs of the services on the readiness of the equipment and support facilities for the flights. Then we carefully instruct the officers in the flight control group.

It is a far from simple matter to ensure the safe outcome of flights with their great intensity and traffic in the air space. Exceptional coolness and precision are needed in the actions of not only the leadership group, but also the

flight crews. There must be the ability in just instants to correctly assess the existing situation and take the solely correct decision. Certainly in its structure flight control is a complex and many-sided process. Not every person is capable of successfully handling this, particularly in critical situations. For this reason, we endeavor that the officers who hold the microphone in the flight command post during the process of the flight shift have a good knowledge of the documents regulating flight activities, that they scrupulously carry out their requirements and most importantly not lose themselves in an emergency situation and not complicate the actions of a crew in the air.

In one of the flight shifts, my deputy, Lt Col Kachanov was controlling the flights. A professional-like atmosphere and proper order were maintained at the SKP [flight command post] as it should. Kachanov was controlling the crews clearly and confidently, giving terse commands. He constantly knew where each pilot was and how much time the flight had lasted. Suddenly it was necessary to help the Military Pilot 1st Class Capt Rakhimyanov on whose aircraft trouble had arisen in the operation of the electrical equipment. The pilot promptly spotted this and reported immediately to the SKP. The leadership group worked efficiently. Capt Rakhimyanov also acted correctly in the tense moment. In precisely carrying out the commands of the flight controller, he reached his airfield and landed safely. We thoroughly analyzed this case with the flight personnel.

But I must also say frankly and in a party-like manner that we still have not succeeded in escaping all potential accidents. The reasons come down primarily to violating the requirements of the guiding documents on organizing and controlling the flights. In truth such instances are few but they should not be.

[Question] The problem of preparing a pilot for enterprising and decisive combat actions is a complex and diverse one. What work is carried out in the regiment to indoctrinate courageous and able air fighters?

[Answer] The problem is certainly not an easy one. Its difficulty is that it requires from the commanders profound knowledge, tenacity, pedagogical skill, flexibility and purposefulness. We feel that the correct path to further increasing air, firing and tactical skills lies in the effective use of each training hour both in preparing for the flights and in the course of the flight shifts. Broad opportunities for this are to be found in modern trainers. Much can be done also by the procedural council if it delves deeply into the training of the aviators, if it promptly spots shortcomings, discloses their causes in a principled manner and improves educational methods.

Our regiment's procedural council has organized a number of timely and useful measures. Upon its initiative there was an exchange of experience between the squadron officers during the period of breaking in on a new type of aircraft for us. Here they brought up the particular features of retraining the flight personnel. The commander of the leading squadron, communist Antipov described his experience. Here the aviators were among the first to successfully complete the theoretical training and then began bombing and firing at ground targets, demonstrating high results in carrying out difficult assignments.

The flight commanders play a special role in indoctrinating able and enterprising military pilots, in developing their activist position in life and shaping strong moral and combat qualities. Precisely they are the first mentors of the pilots and they best know the character and individual qualities of their subordinates, their strong and weak points.

The pedagogical art of the commanders is often discussed by us in conferences, seminars, assemblies, party and Komsomol meetings. Often, in reflecting on the effectiveness of flight labor, one reaches the conclusion that air, firing and the tactical skills of flight crews are higher where the commanders, political workers, the party and Komsomol organizations constantly consider the requirements of modern times and actively pick up on advanced experience. Such a situation is characteristic of the squadrons commanded by Majs Antipov and Grafov. Here they have a good knowledge of the capabilities of each aviator, they effectively organize the training process, they improve educational methods and better utilize the trainer equipment and training facilities. They listen closely to the opinions, requests and proposals of each specialist. All of this increases the combat mood and unifies the collective. The men work with inspiration, being profoundly aware of their high responsibility for further increasing combat readiness.

In our view, not all the reserves for increasing efficiency and effectiveness of the competition have been exhausted. This was roundly brought up by the communists at a party meeting when they discussed their tasks for the summer period. It was pointed out in particular that certain exercises are not conducted on a sufficiently high organizational and procedural level. They are prepared for the case of shifting the flights. Moreover, the competition for the tasks and standards at times does not produce the desired effect. The communists also disclosed the reasons for these shortcomings. We have focused attention on eliminating the oversights in the summer training period.

[Question] Could you tell us about the contribution by the personnel of the IAS to raising the regiment's combat readiness?

[Answer] In the obligations adopted by the IAS specialists, there are such points as constantly raising the level of servicing the aviation complexes; maintaining the missile-carrying aircraft in constant readiness to take off.

During the last training period, the IAS personnel headed by Engr-Maj Saykov did a great deal to maintain the aviation equipment in constant combat readiness. The men work with great enthusiasm and energy. This can be seen from the following facts. At present, we have 52 percent outstanding service groups and 65 percent of the aircraft have the emblem "Outstanding Aircraft" on their fuselages.

How many interesting initiatives, original finds helping to maintain a high coefficient of combat readiness of the aircraft fleet have been proposed by the IAS specialists! Thus, at one time at a meeting of the subunit personnel, the idea was voiced of improving the network schedules for readying the equipment and weapons. This was supported by the appropriate chiefs and the matter was carried out. The aviators continued to search for new opportunities to improve the quality and shorten the time for readying the aircraft. In the

squadrons the specialists improved the carts for storing the interchangeable aviation weapons equipment. Now upon the "Assemble" signal, the men spend 5-7 minutes less than before. Upon the initiative of our engineers, card files have been worked out. This has made it possible for the IAS personnel to act more rationally.

The regiment's rationalizers have carried out a number of original ideas. They have worked out and introduced scores of rationalization proposals and have done good work on improving the training facilities and intensifying the training process. Now the regiment's commander has an opportunity to control the subunits from his desk. Most importantly, he can monitor more effectively how his orders are being carried out. The regiment's innovators are largely responsible for equipping this unique "command post."

[Question] Already a good deal of time has passed since the promulgation of the Decree of the CPSU Central Committee "On the 60th Anniversary of the Formation of the USSR." What has been done in the regiment to study it and how has it influenced the ideological life of your collective?

[Answer] The decree is of great political and mobilizing significance. It profoundly and thoroughly discloses the class essence, the scientific principles, the democracy and humanism of the Leninist nationality policy of the CPSU. Moreover, the world historical significance of the formation and successful development of the Soviet multinational state has been clearly shown. This document provides an impressive picture of achievements by all the fraternal republics, of the great victories of socialism put into the service of mankind and the constant struggle by our party, the Soviet state and all the people for communism and peace.

The decree of the party Central Committee has become a powerful ideological charge for the entire party organization and all the personnel. Its provisions and rich ideological content are close to and comprehensible for each aviator in our multinational regiment and they evoke a desire to work even better in the jubilee year, to constantly increase vigilance, to steadily master the complex military equipment and to hit the air and ground targets with the first missile and bomb. In his speech at the 17th USSR Trade Union Congress, the General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet, Comrade L. I. Brezhnev, spoke about the militaristic course and aggressive policy of the NATO bloc headed by the United States. This obliges us to constantly increase vigilance and combat readiness. The Decree of the CPSU Central Committee "On the 60th Anniversary of the Formation of the USSR" is being studied by the aviators in the system of Marxist-Leninist training and political exercises and in the party education system. The unit has worked out a range of measures, primarily a lecture series. In the plan for the ideological-indoctrinational and political work are evening meetings with workers from the local enterprises, the participants of the Civil and Great Patriotic wars, prominent scientists and the creative intelligentsia. There are plans to organize conferences, competitions, Lenin readings and a film festival. Great organizational and political work is required from the regiment's leadership, from the political workers, the party and Komsomol aktiv. We would like to point to the effective activities of the communists Shalin, Lugovkin, Kachanov, Pupkov and Tkachev.

With each day bringing us closer to the jubilee of the USSR, the arsenal of ideological means in the regiment is being employed evermore intensely and effectively.

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## AIR FORCES

### FIGHTERS: TACTICS, METHODS OF AERIAL COMBAT DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) pp 16-17

[Article by Candidate of Military Sciences, Docent, Engr-Col S. Bytko: "Before Air Combat"]

[Text] 1. In the Horizontal Plane

For achieving success in air combat it is very important to be able to represent the spatial picture of the engagement, to determine the nature of maneuvering as a whole and, in knowing the reciprocal position of the aircraft in the air, to reproduce the trajectory of their movement. This makes it possible to correctly predict the development of events and bring one's fighter to the most advantageous point for opening fire. In other words, the pilot should be able mentally to model air combat having first mastered the skills of graphic modeling the essence of which was previously described (AVIATSIYA I KOSMONAVTIKA, Nos 3, 4, 6, 1980).

For determining the limits of the areas for conducting air combat, let us turn to the nomogram published in the first issue of the journal in 1981. Let us agree that maneuvering air combat is initiated with a maximum visual range equal to 4-6 km. The radii of the figures executed by the pilots here will be 2-3 km. For constructing the limits of the area for conducting air combat, let us use Fig. 1.

On the abscissa axis in the lefthand upper quadrant, let us plot off the amount of the maximum radius equal, according to the example, to 2.0 km (point a). From this point, we will draw the straight line a-b which intersects the curves corresponding to the velocities of the range of interest to us. In the designated example we have chosen a speed of 1,200 km per hour (point b). From here we will draw a horizontal straight line b-c up to the intersection with the vertical c-d of the upper righthand quadrant. In the intersection point of the straight lines we will find  $n_y = 6$  from which it is possible to turn with a set radius of 2,000 m at a speed of 1,200 km per hour. From the value of the acceleration or g-load in the lefthand lower quadrant for the permissible angle of attack, let us find point e from which we draw a horizontal straight line e-n to the intersection with the extension of the vertical c-d in the lower righthand quadrant (point n). This will also be the value of the maximum height of the maneuvering area with the set radius.

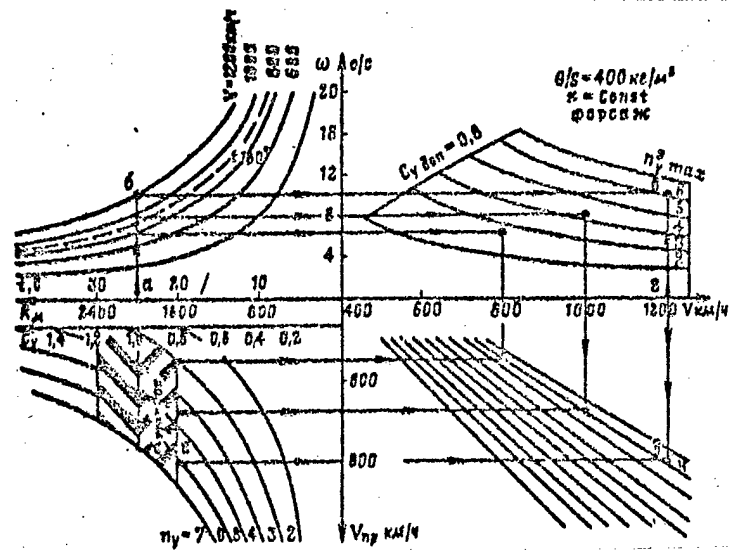


Fig. 1. Nomogram for determining boundaries of areas for conducting air combat

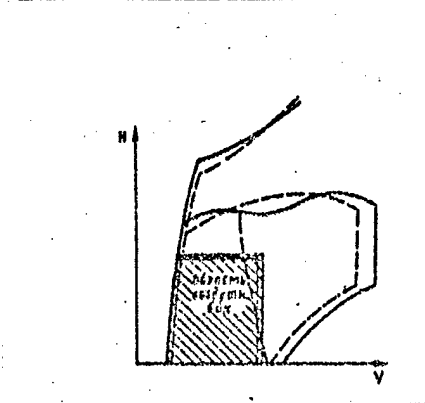


Fig. 2. Areas for conducting maneuvering air combat

Analogously, we can find the remaining points for the upper limit of the area for conducting air combat (Fig. 2). The maximum speed (the righthand boundary of the area) is determined at the point of intersection by the horizontal straight line b-c with  $n_{y \max}^e$  for the given aircraft.

Since the second aircraft has parameters of  $G/S$  and  $\alpha_{\text{sup}}$  which differ from the designated, the boundaries of the maneuvering area in air combat for it will not coincide with the constructed ones. These must be determined separately and plotted on the graph. With the aid of the nomogram it is also possible to find the boundary separating the areas of steady and accelerated turns for altitude.

Let us attempt to model air combat having viewed the maneuvering of the aircraft in a horizontal plane and then in space.

The main thing in maneuvering in air combat in a horizontal plane is to achieve superiority in the angular velocity of the turn. Here the attacker endeavors to achieve surplus speed which is one of the conditions for achieving quickness and surprise of attack. In order to judge the angular approach of the aircraft with surplus speed, let us employ a nomogram (Fig. 3). In the upper righthand and middle quadrants are shown the dependences known from the previous nomograms for angular velocity and turning radius upon flight speed and g-load; in the upper lefthand quadrant are the dependences of turning time upon the amount of longitudinal g-load and surplus speed; in the lower righthand one is the

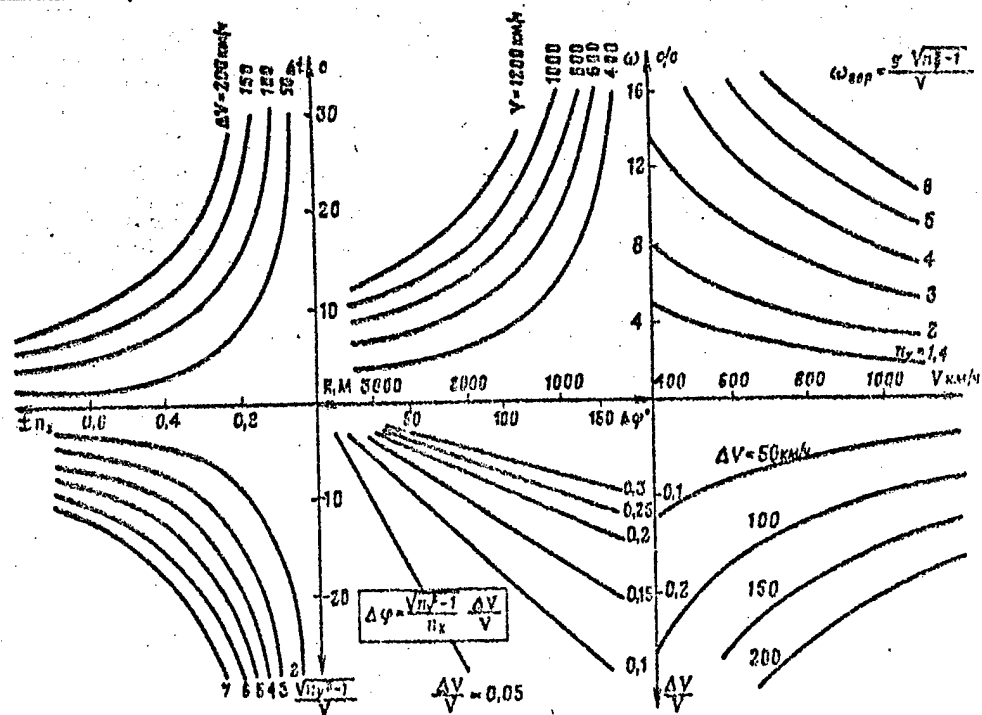


Fig. 3. Nomogram for estimating parameters for the angular displacement of aircraft in the horizontal plane

dependence of the relative surplus speed  $\Delta V/V_{cp}$  upon flight speed and its absolute excess  $\Delta V$ . The lower lefthand quadrant shows the dependence of the auxiliary parameter  $\frac{\sqrt{n_y^2 - 1}}{n_x}$ , which after multiplying by the constant  $\Delta V/V$  pro-

vides the turn angle  $\Delta\phi$ . This can be determined on the abscissa axis of the middle quadrant using straight lines. For example, in slowing from a speed of 1,000 km per hour to 900 km per hour with a  $g$ -load of  $n_y = 5$ , that is,  $\Delta V = 100$  km per hour,  $\Delta V/V = 0.11$ . From the technical description of the aircraft, let us find the longitudinal  $g$ -load  $n_x$  for the set  $H$ ,  $V_{cp}$  and  $n_y$ . Let us assume that it equals  $-0.3$ . Hence, the turn time in braking, when  $\Delta V = 100$  km per hour, is 10 seconds (the upper lefthand quadrant). The auxiliary parameter  $\frac{\sqrt{n_y^2 - 1}}{n_x} = 13$ , while the turn angle  $\Delta\phi = 80^\circ$ . Over this same time, an aircraft making a turn with a constant speed of 1,000 km per hour with the same  $g$ -load will turn by an angle  $\Delta\phi = 10.2^\circ \times 10 = 102^\circ$ .

Let us note that in using the nomogram, we assume a constancy of the longitudinal  $g$ -load  $n_x$ , and for this reason the velocity range  $\Delta V$  must be chosen in such a manner that it be as small as possible and averaging would not lead to large errors. For assessing the capabilities of the compared aircraft for the angular turn speed we can line up on one graph the boundaries for the maneuvering areas in a horizontal plane.

For an example in the diagram (the back outside cover [not reproduced here]) gives the boundaries for two hypothetical fighters. As we can see, for the pilot of aircraft A, the best speeds are from  $V_{\min}$  to 1,000 km per hour where aircraft A surpasses fighter B for  $V_{\min \text{ sup}} (\alpha_{\text{sup}})$  and g-load of a steady maximum sustained turn. The superiority for  $\alpha_{\text{sup}}$  makes it possible for the first aircraft to execute an extended steady turn at point a with  $\omega = 10.5^\circ/\text{s}$ , and for the second only with  $\omega = 8.5^\circ/\text{s}$ , that is, the advantage of aircraft A is  $\Delta\omega = 2^\circ/\text{s}$ . If the pilot of aircraft B executes a  $360^\circ$ -turn in  $\Delta t = 360^\circ/8.5^\circ/\text{s} = 42 \text{ s}$ , then over this same time aircraft A will turn by an angle  $\Delta\phi = 10.5 \times 42 = 440^\circ$ , that is, the advantage for the first fighter in the turning angle is  $\Delta\phi = 84^\circ$  per turn, or  $\Delta\phi = 84/360 = 0.23$ . This advantage actually remains up to speeds of 800-850 km per hour and is determined by the superiority in the maximum thrust g-load  $\Delta n_y = 0.5$ . For the pilot of aircraft B, the advantageous speeds are over 1,000 km per hour at which superiority in the angular velocity of a maximum steady turn reaches  $1.5^\circ/\text{s}$  ( $V = 1,300 \text{ km per hour}$ ).

However, the question arises: What maneuvering should there be so that the pilot of fighter B could be in the advantageous speed range exceeding 1,000 km per hour? As is seen from the drawing, for this he must maneuver with maximum (or less) g-loads corresponding to the speeds of flight (points c, d, e) and avoid accelerated turns.

We would point out that in knowing the turning radii and change in speed, angles, longitudinal and lateral misalignment, using the designated nomograms we can graphically reproduce the trajectories for the motion of both aircraft, determine their reciprocal position and establish the nature of maneuvering in conducting combat in the horizontal plane.

The distinguishing feature of such combat is at an accelerating of a turn leads to a loss of speed and the coming out of the aircraft in large angles of attack. As a result, the opportunities for maneuvering are sharply reduced and this comes down mainly to constantly avoiding dangerous angles of attack and increasing speed. The time for gaining the required speed and creating opportunities for actively continuing air combat can reach 10 s and more and for this reason basically combat in turns for aircraft with close performance is viewed as defensive ending with a long passive maneuver which substantially restricts the opportunity for active, attacking actions (to be continued).

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## AIR FORCES

### FIGHTERS: DISCUSSION OF VALUE OF PAIRS OF AIRCRAFT CONTINUES

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) p 28

[Article by Candidate of Technical Sciences, Col Yu. Vetrov: "A Two-Plane Element--The First Tactical Subunit"]

[Text] As is known, tactics depends upon the development level of military equipment. The appearance of fighters with qualitatively new combat capability naturally presupposes the need to work out methods of actions and tactical procedures which ensure their maximum use for successfully carrying out the set tasks by the pilots. This is expressed in the composition of the groups, the configuration of the battle formations in the various stages of the flight and in the maneuvers and methods of attack in air combat. Obviously for this reason the article "A Pair or Alone?" must be viewed as an attempt to utilize collective flight experience for seeking out ways to increase the effectiveness of modern fighters by an optimum group composition in carrying out the basic combat tasks.

On the basis of analyzing the merits of a pair of fighters from the period of the Great Patriotic War and the shortcomings of a pair of modern fighters, the article's author has voiced doubt as the advisability of a pair of aircraft and proposes that the combat assignments be carried out by individual aircraft. The very question of "A Pair or Alone?" incorporated in the title carries a hint of either or. Such an approach to solving the problem, we feel, is not completely valid. Let us try to prove this.

The opposition of a pair of aircraft to an individual fighter is caused, in our opinion, by the fact that the author is considering two different concepts as identical, that is, a fire unit and a tactical unit. But these are far from the same thing. During the years of the Great Patriotic War and in the postwar period, a pair of fighters armed with machine gun and cannon weapons was primarily a fire unit. This was explained not by the fact that the effectiveness of the weapons carried by a single fighter was insufficient (with able use, the scale of fire provided the destruction of several targets; let us recall the example of Sr Lt A. Gorovets who in one engagement shot down nine enemy bombers), but rather by the fact that a single fighter was unprotected from attacks from the rear quarter, since the pilot was unable simultaneously to attack the target, to scan to the rear and repel enemy attacks. The attacker was often

himself under attack even before he could open fire and the control posts were unable to help him. For precisely this reason, a three-plane flight was unviable. This had been created as a primary tactical subunit and not a fire one. In such a flight one of the fire units was unprotected and one of the wingmen was unable to successfully perform his functions. In providing fire cooperation, a pair could simultaneously attack the enemy and repel attacks by enemy fighters and for this reason it also became a fire unit.

Battle formations of different-composition groups were also organized only from pairs or flights. A flight of two pairs became the primary tactical subunit. Incidentally, in the air forces of the armies of a majority of foreign countries a pair is called an element. This emphasizes its basic significance in the organizing of fighter battle formations.

A modern fighter aircraft differs from its combat predecessors not only in higher performance, advanced equipment and long-range weapons. It represents an element of the aviation complex which includes the aircraft, the scanning and sighting system, the guided missiles and the command post. The pilot can promptly receive the necessary information on the air enemy while the fire potential of the aircraft ensures the destruction of several targets. Since a modern individual fighter with the aid of a command post is capable under any conditions, day or night, of destroying a target, it must be viewed as a fire unit which becomes the basic one for creating the tactical subunits (groups).

A pair of modern fighters has acquired a qualitatively new property as the possibility has appeared of tactical cooperation between the pilots, that is, they not only cover and support each other with fire, but also perform various types of maneuvers which ensure the realization of the aim of air combat. Here a temporary loss of visual or instrument contact between the pilots has become acceptable. The pair has become the primary tactical subunit.

The wider capabilities of an individual fighter, particularly in being controlled from a command post, makes it possible, depending upon the conditions and the tasks to be carried out, to make up tactical subunits (groups) from a varying number of combat units and not always an even number. For example, in destroying small groups of aircraft, it is possible to successfully use three airplanes in using the operational plan of a group of six consisting of three pairs. In clouds and at night individual crews, pairs, threes and so forth can be successfully employed if their onboard sights make it possible to observe the aircraft flying in front.

Thus, the question of "A Pair or Alone?" we feel has been wrongly posed. It would be more correct to formulate it thusly: "A Pair or An Individual Fighter Is the Fire Unit?"

As experience shows, a modern fighter is a fire unit. But the composition and battle formation of a tactical subunit are determined by the commander in accord with the set mission, the number of forces involved and the conditions of actions. However, as a consequence of the diversity of missions, combat conditions and the difficulty of obtaining sufficiently accurate data on the air enemy, particularly about the composition of groups, the fighters most probably

would operate in pairs. For example, in anticipating close air combat during the day and under visual flight conditions, with limited information functions for the command post and in carrying out particularly crucial missions as part of the air defense system, it would be advisable to operate in pairs and groups consisting of them. This also determines the importance of training fighter pilots as part of pairs and other tactical subunits under various conditions. Here basic attention should be given to mastering tactical cooperation so that each pilot in a two-plane element could successfully perform the functions of both the wingman and the leader and when necessary also operate individually, using all the available information.

The effective actions of fighter groups of varying composition is also largely influenced by moral-psychological factors such as a feeling of fellowship and mutual support in word and example in air combat.

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## AIR FORCES

### PREFLIGHT TRAINING: USE OF SIMULATORS DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) p 29

[Article by physician-pilot, Candidate of Medical Sciences, Lt Col Med Serv E. Kozlovskiy and Capt Med Serv L. Drach: "Into the Air by a Trainer"]

[Text] An analysis of flight accidents and near misses indicates that one of the reasons is insufficient pilot training and their psychological lack of preparation for actions under difficult flight conditions.

In the process of elaborating the combat training program, due to various circumstances, long breaks arise in performing certain exercises. This leads to a disruption of flying skills. Moreover, in an actual flight it is impossible to fully recreate emergency situations and work out the corresponding actions and for this reason the need arises of modeling extreme conditions using ground training equipment.

The basic way for increasing the psychological and professional training for such flight conditions is the effective use of flight simulators.

In recent years much attention has been given to simulator training for flight personnel. However, a negative or indifferent attitude on the part of the aviators to the simulators is still encountered. Why does this happen? Practice and the research conducted indicate that the basic reasons for the poor effective use of simulators lie in the insufficient organization and incorrect training methods, the incomplete use of objective monitoring devices and, in certain instances, a formal attitude toward the training of the aviators on the part of the commanders.

Pilots who were being retrained as ship captains arrived in the simulator classroom for carrying out research. After describing the aim of the experiment, they were asked: "What is your attitude toward simulator training?" The replies came down approximately to the following. The feel of the controls in the simulator did not correspond to the actual aircraft one and changes in instrument readings were late and for this reason it was impossible to master a landing. When good simulators appear then they can be used. Until then actual flight provides much more.

We did not try to repudiate this opinion.

The training got underway. The "flights" under simple, standard conditions were performed well by the pilots, but in introducing failures of the flight indicator, the engine or the PVD [air pressure gauge] the quality of the landing approach was low while nervous emotional tension was increased. In introducing failures of the glide and compass systems, that is, with the necessity of executing a maneuver and making the landing approach using the automatic radio compass and range finder, a majority of the pilots did not handle the problem. It is noteworthy that after five or six training sessions for these exercises the quality of piloting even under the more complicated conditions was completely satisfactory.

A questionnaire and talks with the crew members indicated that due to systematic training sessions the interest in simulator training had constantly risen and the attitude toward the simulator had substantially changed.

In the psychophysiology of flight activities, specialists have conditionally isolated several important components which determine the quality of professional skills and abilities. These are: motor (motor skills), sensory (the processes of perceiving instrument and visual information, the allocation and shifting of attention), emotional (behavior and physiological reactions) and intellectual (the ability to work out and promptly take the correct decision under various flight situations). In training sessions each of these is improved. As a result the amplitude and duration of control motions are reduced and their coordination is improved. The volume of attention is increased as is the number of monitored instruments and flight parameters. The quality of monitoring is improved and depending upon flight conditions and the situation, attention is redistributed more rapidly. Nervous-emotional stress is reduced and incoming information is processed more rapidly and accurately.

The distinguishing features of motor skills are, in the first place, the presence of automated components in them ensuring the transfer of the leading, component skills of control from one type of aircraft to another, and, secondly, their flexibility and plasticity. This contributes to rapidly mastering the particular features of the controlled object. Even after three or four flights under simple conditions usually no substantial changes are noted in the structure of motor skills. Subsequently, the quality of piloting is improved basically due to improvements in the processes of allocating and switching attention and the processing of flight information. This is particularly noticeable with the complicating of the situation in the air.

The skills of allocating and shifting attention, in comparison with motor skills, are lost more rapidly and require greater time for forming and improving. As for the intellectual, creative skills, their further development continues during all flight activities.

Since the simulators do not reproduce the feel of the controls accurately, permanent motor piloting skills should not always be learned on them as harmful skills can appear, particularly in officer candidates. For this reason it is desirable to avoid the extended sustaining of simple, steady flight modes and rather such inputs should be given which help to develop and improve the more

complex skills. This is achieved by introducing failures, by changing flight conditions and by additional tasks.

It is essential to bear in mind that, regardless of the further improvement, simulators will never be a carbon copy of an aircraft. For this reason, the basic task in training aviators on simulators is, in actively employing various training procedures and methods, to make maximum use of their positive aspects and minimize the impact of negative moments on the structure of the skills being developed. Well thought-out training procedures ensure high effectiveness in training pilots of any skill level.

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## AIR FORCES

### ROLE, FUNCTION OF CHIEF OF MAINTENANCE UNITS DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) pp 34-35

[Article by Lt Col Ye. Aparin: "Who Instructs the Chiefs of the TECH?"]

[Text] Returning from a meeting with the squadron commander where they discussed the preparations for carrying out a difficult exercise on the range, the flight TECH [maintenance unit] chief, Sr Lt Tech Serv A. Andreyev, reflected on what measures could be undertaken to ensure success. He shared his thoughts with the flight leader and proposed holding a technical training session with the aviators.

When the pilots in the aircraft cockpit were working on the procedure for executing the firing, Officer Andreyev, considering that the aircraft would take off with a full combat load, proposed that the crew commanders train in checking the pressure in the wheel shock absorbers. Initially the flight TECH chief demonstrated how this should be done, explaining the physical essence of the process. Then the aviators repeated the procedures and polished up on their skills. All of this came in useful later on.

The leading flight TECH chief, Sr Lt Tech Serv A. Andreyev, is constantly concerned with the high quality servicing of the aviation equipment and with increasing the professional skill of not only himself but also his subordinates. The officer's successful activities are based upon profound knowledge and strong ideological tempering. He constantly studies the materials of the 26th Party Congress and the decisions of the November (1981) Plenum of the CPSU Central Committee and masters the principles of military pedagogics and psychology. All of this provides great help in the training and indoctrinating of the aviators. Andreyev has a long-range plan for the studying of aviation equipment by the men and he makes certain that this is carried out without fail.

The TECH chief works in close contact with the flight commander. Together they have worked out a plan for training sessions with the flight personnel and they determine how to conduct these more effectively and beneficially. Preference is given to those questions the study of which helps in successfully carrying out the next exercises in the air and particularly for combat employment. In showing reasonable initiative and professionalism, Sr Lt Tech Serv Andreyev has made a weighty contribution to training and indoctrinating the flight's

personnel, to maintaining high combat readiness of the aircraft fleet and to effectively implementing the combat training missions which the aviators carry out under the conditions of a mountain desert terrain.

The other officers of the subunit's IAS [aviation engineer service] also perform their duties energetically and creatively. Primarily responsible for this are the commander, the political worker, the squadron deputy commander for the IAS and the party organization. In understanding well the role of the flight TECH chief in the high quality carrying out of the tasks confronting the aviators and his place in the collective, the squadron leadership has done a great deal to train and indoctrinate this category of specialist. Here the experience of the best officers is generalized and disseminated, skilled exercises and training sessions are held for them and they are invited to the assemblies which are regularly organized in the regiment. Hence the result: the officers work at the airfield and aircraft parking areas in a good mood, they effectively organize the work during the period of intense flight shifts and do not make mistakes or violations of the operating rules for the complex equipment on the ground or in the air.

The correct approach by Officer Andreyev and the other flight TECH chiefs to the planning of work is one of the important reserves for raising their professional skills. They firmly remember the words of the General Secretary of the CPSU Central Committee, Comrade L. I. Brezhnev, said from the rostrum of the 26th CPSU Congress: "The solution to the problems which confront us and the use of the opportunities which we possess largely depend upon the level of national economic leadership and the level of planning...."

This demand applies fully to the planning of work for the flight TECH chiefs. This should be well thought out and differentiated and should take into account the individual qualities and professional skill level of each officer. The TECH chief is not only a specialist but primarily the leader and indoctrinator of subordinates. Good results are achieved where systematic and purposeful work is conducted with this category of servicemen.

The deputy squadron commander for the IAS, Maj Tech Serv V. Ivanov, devotes a great deal of attention to the flight TECH chiefs. He carefully trains and indoctrinates the officer leaders of the subunit's IAS. In the forefront for communist Ivanov is the indoctrinating of the flight TECH chiefs in a feeling of high personal responsibility for the assigned job and the maintaining in the troop collective of an atmosphere of professionalism and strict exactingness for the quality of performing each operation and fulfilling each point of the socialist obligations assumed by the aviators in honor of the 60th anniversary of the formation of the USSR.

Once in the course of a flight shift, the fighter bomber prepared for the sortie by Sr Lt Tech Serv A. Sarekhov was returned from the inspection post. The officer V. Ivanov on that very day held a thorough discussion with his subordinates. He commented not only on the aircraft equipment but also rebuked the flight TECH chief Officer M. Tabukhov who had lessened control over the actions of subordinates in the process of the preliminary preparations. As a result of his laxness a potential cause of an accident was overlooked. The

deputy squadron commander for the IAS demanded that the appropriate exercises be held in all the flights. The lesson was beneficial to many specialists.

The communist V. Ivanov is strict with the flight IAS leaders so that they improve their skill, broaden their technical viewpoint as well as train and indoctrinate their subordinates. He demands that they scrupulously perform their duties and skillfully teaches them to plan work in the flight, to rationally use the specialists in conducting the preliminary, preflight and post-flight preparations of the aviation equipment and in effectively organizing the work of the IAS specialists in the fleet maintenance days. He devotes a great deal of attention to the observance of technical discipline as well as to instructing the TECH chiefs in the ability to skillfully conduct a technical analysis with subordinates. He painstakingly teaches them the art of engineer analysis of the condition of the aircraft, the rational use of equipment monitoring data in the forecasting, in compiling the aircraft inspection plan and in the rules for filling out the technical documents. In a word, everything which permits the officers in a short period of time to become able flight TECH chiefs who, when necessary, would be capable of independently organizing the squadron's work to ready the aviation equipment for flights and assume responsibility for this important question.

The flight TECH chief, as is known, is responsible for the constant combat readiness and correct working order of the aircraft assigned to him, for the quality of their operation and for the instruction and indoctrination of the personnel. He should set an example of the high quality execution of any technical operation on the aircraft or helicopter, he should be able to quickly detect a malfunction and promptly eliminate it as well as constantly monitor how well the flight's aircraft are operated.

However, far from all the flight TECH chiefs possess these qualities. Some of them do not always act as the supporters of high technical skills and production discipline and are not true organizers of the instruction and indoctrination of the aviation specialists. Not every IAS officer is capable of working skillfully and painstakingly with the men or of conducting an exercise or training session with the flight personnel on the proper educational level. Certain lack professionalism and initiative and the ability to clearly plan their tasks for the flight shift or maintenance day. Some of the flight TECH chiefs work without proper enthusiasm and verve, they do not use every opportunity to improve their skills and have a poor knowledge of the requirements of the guiding documents on the operation of modern aviation complexes. As a rule, this happens in those collectives where a clear, thoroughly worked out system of work with the flight TECH chiefs is lacking. Here at times you will not find this work reflected in the commander training plans or the party political work plans. Such shortcomings, for example, were noted in the unit where the IAS is headed by Officer V. Moseychuk. The lack of an organizing principle here has led to a situation where each chief indoctrinates and trains his subordinates in his own way.

Obviously, the planning of their instruction is required as is also the case for the flight leaders. Certainly the quality of operating the difficult aviation equipment, the fulfilling of the socialist obligations and the indoctrinating of the IAS specialists in efficiency, scrupulousness in observing the

documents regulating the rules for servicing the aircraft and helicopter systems depend upon the activeness and efficiency of the flight TECH chiefs.

The flight TECH chiefs who, as a rule, have great practical experience and high class skills comprise a dependable reserve for promotion to the position of deputy squadron commanders for the IAS as well as for recruiting candidates to be sent for instruction to the higher Air Forces military schools. In this regard the question arises of who should personally instruct the TECH chiefs and enrich them with advanced experience? Of course, this is primarily the IAS leaders. They should plan a many-sided process of instructing and indoctrinating this category of officers, they should delve deeply into it, constantly supervise them and teach them the art of indoctrinating and training subordinates and organizing work on the aviation equipment. We feel that these questions should be also taken up in the individual plans of the flight TECH chiefs, the deputy squadron commanders for the IAS, the IAS leaders of the units as well as in the plans of the procedural councils and party organization. This must be done considering an individual approach to each officer.

It is essential in every possible way to support the desire of the leading flight TECH chiefs to constantly broaden their professional knowledge and to gain experience in organizing indoctrinational work with subordinates. For this we must obviously create the appropriate conditions for them to deepen their knowledge and improve their skills while the achievements of the best must be generalized and introduced in the other subunits.

The first training period has ended. It has shown that the role of the TECH chiefs in maintaining the aviation flight in constant combat readiness has noticeably risen. This has been due to the further rise in the demands placed upon the IAS specialists to ensure a high coefficient of aircraft performance. It is essential to systematically raise the authority of the TECH chiefs, to regularly arm them with educational skills and to steadily develop their skills as organizers and indoctrinators. This will help to successfully carry out the great and complex tasks confronting the aviators during the summer training period and to fulfill the socialist obligations to properly celebrate the glorious jubilee of the 60th anniversary of the formation of the USSR.

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## AIR FORCES

### OVERALL DEVELOPMENT OF SOVIET AVIATION EXAMINED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 82 (signed to press 6 May 82) pp 36-39

[Article by Engr-Col Gen M. Mishuk, Hero of Socialist Labor, Lenin Prize winner, Doctor of Technical Sciences and Professor: "Progress in Aviation"]

[Text] The Soviet people and the men of the Army and Navy are preparing to properly celebrate the 60th anniversary of the formation of the USSR, the world's first united multinational state of workers and peasants. This state represents to the entire world a friendly family of equal republics which are jointly building communism. "The Soviet Union," as was emphasized in the Decree of the CPSU Central Committee "On the 60th Anniversary of the Formation of the USSR," "is a powerful industrial state with highly mechanized agriculture, advanced science and culture.

"The economy of each republic holds an important place in the social division of labor and makes an ever-weightier contribution to the national wealth of the country."

The voluntary unification of the Soviet republics into a single state ensured the remarkable prerequisites for all-round economic, sociopolitical and spiritual development for our nation's peoples. Over a short period of time changes of unprecedented scope and depth were carried out in all spheres of life of Soviet society. This created a strong and dependable foundation for improving the defense capability of the nation and strengthening the combat might of our Armed Forces. They embody the enormous successes of the socialist economy, science and technology as well as the historic achievements of the cultural revolution. The growing process of the drawing together of all the nations and nationalities has become one of the sources of the high morale of the troops and the monolithic solidarity of the personnel around the Leninist party.

Over the years of Soviet power, our nation has been turned into a great air power. Outstanding aviation designers, military leaders, engineers, scientists, pilots and navigators and the aviation industry workers have made a worthy contribution to the creation and development of the Soviet Air Forces.

After the victory of Great October, effective measures were immediately taken to save aviation equipment which remained after World War I. This included

around 300 worn out aircraft of various designs, including 13 "Muromets." Several small shop-plants involved in the assembly and repair of aircraft were put under state control.

Even in those years the Communist Party, the Soviet government and V. I. Lenin personally devoted great attention to the development of Soviet aviation. They saw in it an effective means for strengthening the nation's defense capability and for raising the combat might of the Soviet Armed Forces.

Materials, production equipment and electric power were needed for building new aircraft. Skilled specialists were also required. The workers, engineers, designers and scientists worked unstintingly. With an enormous scarcity of raw materials and fuel, they were able to provide the air force of the young Soviet republic with 669 aircraft and 265 motors. As a result, 1,974 aircraft and 1,740 motors were put back in service at the aviation plants, at stationary shops and on special trains specially equipped for these purposes.

After the severe wartime hardships, the nation began to rebuild the devastated national economy and lay the foundations of the future socialist economy. This was one of the most difficult periods in the formation of Soviet aviation. The Soviet people had to overcome unbelievable material and technical difficulties, mobilize all their spiritual and physical forces and allocate much financial assets.

In assessing the state of our aviation in those years, M. V. Frunze emphasized: "The air force will play a particularly important role in the coming clashes. This we do not have as yet for those few hundred devices cannot scarcely be considered an air force...."

In August 1922, the plenum of the VKP(b) [All-Russian Communist Party (Bolshevik)] Central Committee, in reviewing the question of the development of military aviation, allocated 35 million gold rubles for this purpose. These were used to build the first Soviet aircraft.

In keeping with socialist development and the strengthening of the state's defense capability, the creation of powerful aviation became a concern of all the people. During those difficult times, the party's slogans urged: "Working People, Build the Air Force!", "Proletarians, To the Aircraft!" and "Produce a Motor!"

These were years of the rapid development of the Soviet air force. Talented aviation designers sought out the ways for building new aircraft and were deeply concerned with solving the problem of developing all-metal aircraft and introducing new materials into production. During these same years, designer thought was shaped on the basis of the profound scientific research carried out by the Central Aerohydrodynamics Institute [TsAGI] founded upon the instructions of V. I. Lenin.

The successful implementation of Lenin's program for industrializing the nation made it possible to create the necessary material bases of the aviation industry and to equip the Air Forces with modern combat aircraft.

The middle of the 1930's was marked by the creation of such turning-point aircraft as the I-16 of N. Polikarpov, the DB-3 of S. Il'yushin as well as the Soviet engines of A. Shvetsov, A. Mikulin, V. Klimov and V. Dobrynin. Even by the start of the Third Five-Year Plan, our aviation industry had been turned into a major independent sector capable of producing fighters, bombers and heavy aircraft in ever-increasing numbers. In 1930-1932, the USSR produced as an average some 860 aircraft a year, while in 1938 their output had risen to 5,469.

The party Central Committee and the Soviet government undertook energetic measures to further improve aviation. A special program was worked out and a decision adopted to build new aviation plants. A large group of designers received the assignment of designing and developing new aircraft and aviation engines. Moreover, an entire range of measures was planned to further strengthen the physical plant of aviation and reorganize the activities of the aviation industry.

In the 1930's, Soviet aircraft construction began to widely use distant-reading magnetic compasses, the first automatic pilots and navigators, a gyro-magnetic compass, a solar heading indicator and zonal and directional beacons began to be installed on the air routes.

In the autumn of 1939, the Politburo of the party Central Committee reviewed the question "of reconstructing the existing aviation plants and building new ones." The adopted decree recommended that nine new plants be built and nine old ones reconstructed in 1940-1941. Soon thereafter seven plants from other sectors of socialist industry were turned over to the aviation industry.

In January 1941, the Politburo at a session specially discussed the work of the aviation industry. A decision was adopted to update and strengthen the People's Commissariat of the Aviation Industry, to reconstruct the TsAGI and create a flight testing institute and new design collectives. The measures of the Communist Party and the Soviet government to further qualitatively improve aviation equipment earmarked for the Air Forces involved all the basic types of combat aircraft.

The design bureaus headed by A. Tupolev, V. Petlyakov, V. Yermolayev and V. Myasishchev worked unstintingly on carrying out this responsible task. They developed the Tu-2, Pe-2, Yer-2 and others. All the aircraft designed in these collectives were all-metal cantilever monoplanes with two powerful liquid-cooled engines, retractable wheels and twin-fin tails. Their maximum speed exceeded 500 km per hour.

The prototypes of the bombers designed by A. Tupolev and V. Yermolayev in speed significantly surpassed the best foreign serially-manufactured aircraft and carried a significant payload; they had great range and powerful defensive weapons.

Major changes in the technical equipping of the Air Forces were to be carried out during the years of the Third Five-Year Plan. By this time, our aviation industry had changed beyond recognition. This can be seen from the increased output of combat aircraft and their improved quality. Moreover, work was

undertaken widely on designing new types of aircraft. Great attention was given to the development of high-speed, highly maneuverable fighters.

In November 1937, the designer N. Polikarpov was instructed to prepare and submit to the Soviet government a report on the ways for developing the fighter designs for the next 2-3 years. Polikarpov pointed out that the flying weight of fighters with an increase in speed would rise unrestrictedly and this happened not merely due to the increased engine weight. Increased engine power required a larger fuel supply on the aircraft in order to maintain the achieved flight duration. Let us compare the following figures: while in 1920 fuel weight in a fighter was around 6 percent of the flying weight, in 1930, it had reached 7-8 percent, and 5 years later, 13-14 percent.

The conclusion arises that with increased speed of an aircraft its weight also would rise. This worsened horizontal maneuver and reduced the vertical speed of a fighter, and for this reason the aviation designers constantly sought ways for solving the arising problems. It is no accident that in those years scientific and technical work was carried out in various directions.

As a result, experimental aircraft of several types were built. On the basis of the data obtained in testing the new aviation equipment, the Soviet government adopted a decision for serial production of more advanced fighters. The design collectives headed by S. Lavochkin, A. Mikoyan and A. Yakovlev were involved in carrying out this responsible assignment. Due to the unstinting labor of the scientists, designers and aircraft builders, in a short period of time all work was completed on designing new fighters with powerful liquid-cooled engines. These were high-speed monoplanes with very high performance and this made it possible for our aviators during the years of the Great Patriotic War to shift air combat into the vertical plane. On this question the prominent Soviet pilot, thrice Hero of the Soviet Union A. Pokryshkin has said: "The increased speed and better performance of the aircraft opened up new, broad opportunities to maneuver."

All the new Soviet fighters designed in 1938-1940 were designed for mass production. Along with this the quality of the aviation equipment being delivered to the Air Forces was improved. During the same years, the legendary ground attack plane, the Il-2, designed in the design bureau of S. Il'yushin appeared. Soon the units and formations of the Air Forces began to receive high-speed fighters such as the Yak-1, MiG-3 and LaGG-3, the Pe-2 divebombers, the Il-2 ground attack planes and the Pe-8 heavy bombers.

This was an enormous success of Soviet aviation building. The party Central Committee and the Soviet government highly valued these accomplishments. In September 1940, the Higher Certification Commission of the Committee for Higher School Affairs under the Council of People's Commissars, without defense of dissertations, awarded the scientific degree of doctor of technical sciences to the well-known Soviet aviation designers A. Arkhangel'skiy, N. Polikarpov, S. Il'yushin, P. Sukhoy and A. Yakovlev.

For successfully carrying out the assignments of the party Central Committee and the government to develop new types of aircraft, in March 1941, N. Polikarpov, A. Yakovlev, A. Mikoyan, M. Gurevich, S. Lavochkin, V. Gorbunov,

M. Gudkov and V. Petlyakov became State Prize winners. Many scientists, engineers, pilots, technicians and workers received USSR orders and medals.

However, we were not able to rearm Soviet aviation with the new aircraft. There was too little time for this. As a result, a number of measures relating to the technical equipping of the Air Forces with new military equipment had not been completed by the time the Nazis attacked our motherland.

In 1940, the socialist industry had produced 64 Yak-1 fighters; 20 MiG-3 fighters; 2 Pe-2 divebombers, and in the first half of 1941, our Air Forces received from the aircraft builders 1,946 Yak-1, MiG-3 and LaGG-3 fighters; 458 Pe-2 bombers and 249 Il-2 ground attack planes. As a total the Air Forces had around 2,740 new aircraft.

The years of the Great Patriotic War fully disclosed the remarkable combat capabilities of the aviation equipment, including high maneuverability, great speed and flight range. In using these, the crews were able to attack the enemy deep in its rear, to destroy various targets, to correct the fire of ground artillery and so forth.

The Il-2 ground attack plane developed by S. Il'yushin is a remarkable example of uniqueness, originality and boldness in Soviet design thought. It holds a special place in Soviet aviation building. Its combat effectiveness was exceptional and the accuracy of the devastating ground attacks was high. To this one must add the enormous invulnerability, the ability to make sorties in any weather and to attack targets from tree-top flight and by diving. It is no accident that the Il-2 became the most mass aircraft in the previous war. The attempt by German designers to develop a similar ground attack plane did not lead anywhere and the legendary Il-2 for a long time remained the only aircraft of its sort and a vivid proof of the high development level in Soviet aviation equipment.

Even during the first months of the Great Patriotic War, upon the initiative of V. Bolkhovitinov, work was started on designing a jet interceptor fighter with the liquid-fuel jet engine designed by L. Dushin. In the process of developing this unusual aircraft, the designers found a number of bold and progressive solutions. On 15 May 1942, the test pilot G. Bakhchivandzhi made his historic flight on the Bi-1. This was our nation's first jet take-off which inscribed a vivid page in the glorious chronicle of Soviet aviation and opened up a new stage in the development of aircraft.

As a result of the great organizational and mass political work of the party Central Committee as well as the local party and soviet bodies, by the middle of 1943 the Soviet Air Forces in terms of the number of aircraft already exceeded Nazi aviation by 2-fold. Their average monthly production had risen from 2,100 in 1942 to 2,900 in 1943. As a total in 1943, the Soviet aviation industry produced around 35,000 aircraft and 40,000 aviation engines.

As we can see, under the difficult wartime conditions, our Air Forces were constantly equipped with new aircraft and the courageous Soviet pilots clearly showed their high moral-combat qualities in the struggle against the strong

and perfidious enemy. Thus, in 1944, the German plants produced 27,600 fighters, ground attack planes and daylight bombers while our aviation industry in the same year supplied the front with 33,200 aircraft of the designated types. The successes of the Soviet rear made it possible to significantly strengthen the Air Forces.

As a result, over a short period of time Soviet aviation was fully rearmed. This made it possible to eliminate the technical superiority of the Nazis in the aviation area and to bring the organizational structure of the Air Forces' formations and units into accord with the demands of waging a war against a strong, technically well-equipped enemy.

During the difficult war years the design bureaus of S. Lavochkin and A. Yakovlev developed unsurpassed fighters. Thus, the La-5 and La-7 in terms of the rate of climb and combat power excelled over aircraft of the same type in foreign nations and surpassed them in terms of a number of flight and combat characteristics. During that period aircraft designed by A. Yakovlev comprised a large portion of the fighter aviation. Their speed and range rose, vertical maneuverability was increased and the armament strengthened. For example, the Yak-3 fighter surpassed the Nazi aircraft in terms of all types of air maneuvers at altitudes up to 6,000 m. This aircraft achieved the highest speed for the Soviet piston-driven aircraft, some 745 km per hour.

During the years of the Great Patriotic War the Pe-2 was the basic tactical Air Force bomber. It penetrated into the strongest air defense zones and made devastating bombing strikes against enemy equipment and personnel. In terms of speed it surpassed the Nazi He-111 bombers by more than 100 km per hour and the Ju-88 by 75 km per hour. Such high speed of the aircraft made it possible for the pilot to operate successfully against various targets.

During the war years the Soviet aircraft builders began series production of the Tu-2 with two ASh-82 engines. In terms of its flight performance this was the best bomber of the Great Patriotic War. It remained in service for many years. The Tu-2 had a great bomb load carried on an internal bomb rack and powerful defensive weapons. It was simple to pilot, it could fly on one engine and possessed great survivability in combat. The long-range aviation made powerful attacks against the enemy. It employed the Il-4, Yer-2 and Pe-8 night bombers.

The experience of the last war confirmed that Soviet aviation thought was developing along the correct lines. Our basic fighters, ground attack planes and bombers in terms of their combat performance possessed advantages over the analogous-purpose Nazi aircraft. This was explained by the fact that our aviation had a higher level of aerodynamics and better weight ratio, powerful aviation machine guns (automatic cannons with a caliber of 20, 37 and 45 mm) and aviation rocket weapons. The Il-2 ground attack plane was of a completely new, original type.

The victory of the USSR over Hitler Germany confirmed the correctness of Lenin's nationality policy in state and military development. The fraternal union of peoples based upon an unbreakable communality of class interests and ideals and Marxist-Leninist ideology had convincingly demonstrated its viability. This

victory summed up the historical development of our Armed Forces including the Air Forces. Only by thoroughly analyzing and studying this result is it possible to understand how the Soviet Air Forces were able to achieve air supremacy and then deal a devastating defeat to the Nazi Luftwaffe and to find the correct ways for further developing Soviet aviation.

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## AIR FORCES

### SUPPORT SERVICES: PROBLEM OF INTRODUCING INNOVATIONS DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No. 6, Jun 82 (signed to press 6 May 82) pp 40-41

[Article by Lt Col A. Guk: "But They Forgot to Introduce It"]

[Text] The pace of the flights picked up. One after another the crews left on their assignments to intercept the "enemy," to reconnoiter ground targets and work on piloting techniques. Sometimes one or two aircraft remained at the technical position but at times there were so many of them that there were scarcely enough nozzles to fill the gas tanks.

The pump of the centralized fueling system was working under a great strain. In filling the fuel tank of even one fighter it delivered to the line as much fuel as would be needed for the entire squadron. The pressure in the hoses at certain moments was too high, while the surplus fuel flowed into the tank through the safety valve. The powerful electric engines at times operated without a load, consuming a large amount of electric power in their transitional modes.

The chief of a chair at one of the higher military aviation schools, Engr Col A. Kuz'menko, studied the fuel delivery control system for the aircraft and concluded that it could be improved. The development proposed by the officer was simple and did not require any special reworking. In addition he provided a pressure signal which controlled the magnetic starter of the electric motor. The use of this device provided a good deal of savings. First of all, the consumption of electric power was reduced, normal conditions were created for the operation of the electric motor and pump, and instances were excluded of hose breaking and the leaking of fuel because of surplus pressure.

Seemingly the innovation would be correctly assessed. However, more than a year has passed since the rationalizer made the proposal, while at the airfield as before the electric engines continue operating at a high speed clearly delivering surplus fuel to the system.

Unfortunately, this history is not an isolated one. At times, it is a much easier thing to work out a rationalization proposal than it is to introduce it. Certainly the rationalizer is a dependable assistant of the commander or engineer in maintaining the combat readiness of the subunit and in organizing the savings of materiel.

...At one time specialists from a TECh [maintenance unit] drove out to a field airfield. The special vehicles, the airfield starters, were started up in the squadrons to support the flights while the TECh was left without electric power. But the aviators found a way out of the difficult situation and did not stop carrying out repairs. WO ["praporshchik"] A. Drannikov proposed using a field power plant buffered with the storage battery cart. The commander approved the useful initiative of the innovator and commended him.

This inspired the warrant officer. Sometime later he began to electrify the aircraft parking area. The group chief and the TECh chief provided him with the necessary materials and assigned mechanics to help. The subunit's Komsomol members assumed all the labor intensive work.

The work of the rationalizer became a cause for the entire collective. And he has gained in strength. He has introduced several other valuable proposals, in skillfully utilizing experience provided at the USSR VDNKh [Exhibit of National Economic Achievements] and the technical literature. In particular, he has been able to electrify the TECh production area and equip an autonomous system for starting the aircraft engines. But this is not the case everywhere. Sometimes, having examined and highly praised one or another proposal, the members of a unit's invention commission consider their mission accomplished. In precisely the same manner individual chiefs assume that it is enough to merely approve the decision adopted by the commission. But this does not stop here. Certainly there is the regulation that after the approval of any document, including the protocol of an invention commission, by a commander, it assumes the strength of an order. It is the task of the engineers, other leaders and chiefs to help the innovator to more quickly and better introduce the valuable proposal and seeing to it that it brings specific benefit. Unfortunately, this is not always so.

Once at a district rationalization exhibit, five devices were demonstrated for checking the aircraft barometric instruments. The same in purpose, they had different shapes, volume and weight. One was made in the form of a box which could be hardly lifted by two men. Nearby lay a light, convenient unit which could be controlled by one air specialist. Undoubtedly, the unit was much more convenient and better but the rationalizers learned about it only at the exhibit.

In talking with the active rationalizer of the flight training department at the ChVVAUL [Chelyabinsk Higher Air Force Pilot School], Engr-Capt A. Tumanov, I asked:

"Aren't the innovators concerned with searching for what has long been introduced at other aviation schools?"

The officer replied: "Who knows? We have a need and so we invent. What neighbors are doing, frankly speaking, I have no idea."

I told the officer how one squadron found a way out. There the specialists made a panel which increased the reliability of testing an aircraft system. The engineers concluded that such a panel would be needed in other subunits,

too. In a photographic lab they duplicated the drawings, diagrams and descriptions. Equal benefit was gained from the contest reviews conducted on the garrison level for the best rationalization proposal, the exhibits of work by army innovators and the monthly seminars for innovators at the officers club. The aviators have made up permanent stands for innovations of technical creativity. This has become an unique school for skill and a center for the exchanging of experience among the specialists.

This garrison also has other forms for propagandizing technical creativity. These help to avoid unproductive labor expenditures by the rationalizers and increase the effectiveness of their work. We feel that such forms are a substantial support in increasing combat readiness, in ensuring the reliability of aviation equipment and in the high-quality execution of obligations.

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