TRANSLATION

HERALD OF THE AIR FLEET

9

1959

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AIR TECHNICAL INTELLIGENCE TRANSLATION

(TITLE UNCLASSIFIED)

HERALD OF THE AIR FLEET
(Vestnik Vozdushnogo Flota)

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AVIATION ABROAD

THE YOUNG PILOT

Almost every year the air regiments accept into their ranks new pilot replacements. Young men who have completed school come to the units. They come to begin the difficult but absorbing road to aviation, to guard vigilantly the peaceful labor of the Soviet people, who are carrying out the majestic program of the septennium outlined by the Twenty-First Congress of the CPSU.

A young pilot! What enormous meaning and what profound content is hidden behind these seemingly ordinary words. Here is youthful fervor and an already beginning maturity. Here there still are youthful dreams about swift flights and flying skill itself, growing and strengthening. Here are thoughts of the heroic and the heroism of flying days itself. Everything stirs and fascinates the young officer. He is full of desire to fly and to become just as fearless and skillful an aerial fighting man as his elder comrades.

Spreading before the young officer -- a recent cadet at a flying school -- are broad perspectives. First of all to rise to the level of the rest of the flight personnel in the unit, to become a rated pilot and, finally, to obtain the first-class -- the highest rating, i. e., to master the most difficult flights -- at night under adverse weather conditions; to learn to fire accurately at aerial and ground targets, to become a master of aerial combat and sniper fire. To dare, to search constantly for new methods of fighting an aerial enemy, to learn to fly higher, farther, and faster than anyone.

It is with just such thoughts and aspirations that fighter pilot V. G. Koshelev began his service in the X air regiment. After a brief interruption in flying that developed in connection with his transfer from school to the regiment, Koshelev quickly became integrated. In a short time he was taught flying in the daytime under normal weather conditions in a pair at all altitudes up to the plane's combat ceiling; then in the daytime in the clouds and at night under normal weather conditions; the last stage of the training was at night under adverse conditions. Koshelev took upon himself the socialist obligation to prepare himself to the level of first class and to master persistently the art of intercepting aerial targets in the clouds and at night.

Soon the command nominated Koshelev for participation in aerial gunnery contests. The young pilot justified the confidence placed in him and won first prize in the Air Force.

Thus from success to success went one of the young pilots. And how many such examples can be cited from the life of other air units! At one of the subunits, several young pilots arrived at the same time. They set to work enthusiastically. In respect to the program of flight training, they considerably outdistanced their compeers in a neighboring regiment. They all went through the evening Party school. They participate actively and enthusiastically in sports contests and in the amateur activity of the regiment. Both in training and in relaxation they are the initiators of many useful undertakings. Since the very first days of their stay in the line unit no one can cast aspersions on them, because these young officers attend with spirit to their great and responsible work.

What brought about the success of these young men? Of course, first of all are their high personal moral qualities, inculcated by the Komsomol and the Party, by the school, the plant, the kolkhoz, and the school where they began their independent life. The second condition of success is the constant concern of the command to integrate the young pilots as rapidly as possible. Analyzing the factors that helped him to become a first-class pilot in a short time, V. G. Koshelev speaks with love about his squadron commander, who watches very attentively that the principle of consistency be followed strictly in the training of the flight personnel and carefully checks the preparation of each pilot for flight.

"I am already in my second year in the regiment," writes Koshelev, "and I have never noticed that the squadron commander permitted even the slightest weakening in the control over preparation for flights. I can say even more: the more perfect become the skills of a pilot and the more difficult the assignment that he has to perform, the more the exactingness of the commander increases."

In the leading units, where great importance is attributed to the training of young pilots, this work is being conducted according to a strict plan and experienced methodologists are brought in to do the teaching. The pilots are nurtured on glorious combat traditions in a spirit of fidelity to the requirements of the military oath. Much attention is devoted to Party-political work directed toward instilling in the young men a high Communist consciousness and patriotism.

In the Air Force, everything necessary is being done in order to improve the training of cadets in flying schools, to give them more perfect skills in piloting and in the combat application of modern aircraft.

Thus, better trained pilots are coming into the line units now than a few years ago. Here excellent living conditions are created for them, and considerable resources are allocated for the organization of relaxation. The commanders, the political workers, and the Party and Komsomol organizations are displaying a maximum of initiative and persistence in working with the young flight personnel.

"It is necessary to give young people the opportunity to work more," announced N. S. Khrushchev at the June Plenum of the CC of the CPSU. This requirement pertains in equal degree to both the civilian and the military youth. It is being carried out by our commanders and political workers. If the training and indoctrination work of the leading units and subunits are analyzed attentively, much that is new and very instructive for the others can be noted there.

In one of the units the commander encountered certain difficulties in the training of young pilots. Interfering were airfield conditions that were not entirely favorable, the different level of training of the flight personnel, and several other things. However, because the commander understood well the importance of the task confronting him he found a way out of the situation. He gathered the young men into one group and sent them off to another airfield. He assigned the most experienced instructors to them, and in a short time he gave them a full flying load. The young pilots, who had just begun to master a jet plane new to them, returned to their own airfield at night, each in his own combat plane, and demonstrated a high art in night flying.

Officer N. T. Shkola has proved to be a good methodologist and mentor of young pilots. Practicing with the young pilots a new exercise -- flying at night under normal weather conditions -- he was able to organize the matter in such a way that the pilots mastered flying in an abbreviated period. Having no lengthy interruptions, they flew as often as necessary to consolidate their skills firmly. As a result, they did not require supplementary check flights.

In recent times, the air commanders and political workers have markedly improved indoctrination work among young pilots. Following the decisions of the Twenty-First Congress of the CPSU and the October Plenum of the CC of the Communist Party of the Soviet Union, at the basis of this work they put the achievements of our people, the success in fulfilling the seven-year plan for the development of the country's national economy, and the achievements in combat and political training in their own and neighboring units. On the basis of special local features, our supervisory officers use very diverse forms of indoctrination work.

Unfortunately, not in all the air units do they treat the training of youth with proper diligence. There still are occasional subunits where the words "young pilot" are uttered even with irony. And this is understandable. If a young pilot flies only on occasion, if difficult exercises are not planned for him for a long time, he will never attain the level of the other pilots and will be included for a long time in the ranks of the inexperienced. And morally he will feel not too good; while insofar as combat training is concerned, where will it come from if he can only watch how others fly?

Analysis of the work of integrating young pilots into the unit shows that not yet all commanders utilize all opportunities to the fullest degree. Thus, in one of the units, in connection with the fact that it was necessary to organize flying with three categories of flight personnel with different levels of training, the proper significance was not attached to integrating pilots in their first year of service. By the schedule one flying day and one night per week were allotted to them. Naturally, with such planning, interruptions in flying developed, and this in turn led to an increase in check flight time. While in order to fulfill the approved plan, the commanders planned a maximum load for the pilot on the flying day, even exceeding the established norms in some cases.

For some reason, occasional commanders still do not take into consideration the fact that better trained pilots are now coming to the units, and in drawing up the plan for their flight training they mechanically include in it all the exercises that they had included formerly. As a result, the necessary total flying time for carrying out the first task for pilots with different levels of training has changed practically not at all. There occurs a marking of time and a superfluous expenditure of state resources.

It is even worse when such marking time is transformed into artificial restraint of the young officers in their efforts to become first-class pilots as rapidly as possible. After all, it is no secret to anyone that we have young pilots who cannot raise their class rating for long periods of time.

It goes without saying that such an attitude toward the youth is beneath criticism. Obviously, he who retards the training of youth is forgetting one simple truth: young pilots are the future of our aviation. They will have to solve problems in the further development of the Soviet Air Fleet -- the conquest of space and time. And in order to successfully master flying at new and as yet unheard-of speeds and altitudes, young pilots must absorb all the experience of the older generations. The sooner this is done the better. Hence the periods of integrating the young men into the units must be made shorter, not longer; everything possible must be done so that yesterday's young pilot be today a full-fledged air fighter.

Analysis of the shortcomings in the training of young pilots permits making some demands on aviation schools also. In a recently conducted interrogation of the instructor personnel of some units who teach pilots in their first year of service, a desire was expressed that more attention be paid in the schools to the study of equipment, its operation, and the methodology of determining the condition of instruments and various assemblies. In studying aerodynamics and in the process of aerial gunnery and navigational training, it is desirable that the cadets solve practical problems that will be encountered in the process of combat training in the units.

Experience shows that in some aviation schools commander skills are too weakly instilled in the cadets, and the skills of independent preparation for flights are inadequately developed. In the program of flight training it is necessary that the last flights in practicing standard attacks be conducted at high speeds. The profile of gliding in for a landing should be brought closer to the profile worked out in the line units.

Inasmuch as in the training of young officers, including pilots also, there still are serious shortcomings, commanders, political workers, and Party and Komsomol organizations must intensify in every way their political and military indoctrination of young flight cadres, must improve the quality of all their ideological work.

Our commanders and political workers have sufficient experience in organizing the Marxist-Leninist education of officers. However, when it is a matter of indoctrinating young men, it must not be forgotten that they sometimes have too little knowledge and skills, particularly in organizing independnnt work. Therefore it is necessary to help each young pilot to improve constantly his political and professional knowledge.

At the basis of Marxist-Leninist education, it is necessary to place the heroic history of the CPSU, to nurture the pilots on the revolutionary traditions of the Party and the labor class. The study of Marxist-Leninist theory must be organically tied in with the experience of building Communism in our country, with the tasks of the Armed Forces, and the specific practical tasks of each unit and subunit, and it should be directed toward achieving ever new successes in combat training. It is necessary to help the young pilots to understand the essence and the requirements of the military oath and the military regulations, and on this basis to instill in them irreproachable performance and discipline.

Apparently, it is necessary to restore everywhere an excellent old tradition where the unit commander presents the newly arrived young pilots at a general assembly of the officers. The commander and his deputy for the political section must without fail acquaint the arrivals with the heroic history of the unit, tell them about the successes achieved by the unit in the postwar years, and show by specific examples the men who are leaders in socialist competition and outstanding men in combat and political training. Such talks are of very great indoctrinational importance, because they immediately introduce the young pilots into the combat family in which they will have to work and perfect their flying skill.

Entry into a unit is an important moment in the lives of young pilots. And right here it is extremely important that the officer fraternity, the entire community, help them to become established, to get on their feet, as they say.

In the process of training and indoctrination work, the commander and the political supervisor working with the young pilots will surely encounter difficulties. For one officer everything may not be just right with discipline, for another with training, for a third with his family. All of this may happen. The commander and the political worker must be able to come to the right decision, and for this they need to know their subordinates well.

Without a doubt, in training young pilots the commander must devote more attention than at any other time to flight safety, both from the viewpoint of the best organization of flights and from the position of impressing on the young men the importance of maintaining strict flight discipline and the need to act both on the ground and in the air in precise conformity with the requirements of instructions.

Special attention should be devoted to improving the technical competence of the young pilots. It is necessary to prevent the level of training of the flight cadres from lagging behind the growing complexity of equipment.

Air commanders are required to systematically manifest concern about improving the methodological training of young officers. Their first duty is to help the young commanders constantly in organizing their service activity, in acquiring the skills of indoctrinating and teaching their subordinates. It is necessary to put in order the working day of the young officers and to provide for them the necessary conditions for improving their military and political knowledge and for their cultural relaxation. Special attention must be devoted to the organization of constant and painstaking individual work -- the basic form of indoctrinating young aviators. Persistently inculcating in them high moral and combat qualities, instilling a love for the military profession, improving the material living conditions and cultural services, air commanders will thereby ensure the success of the matter.

In the work of the commander-teacher, strict consistency and planned development, as well as purposefulness, are necessary. All the measures put into effect by the commander should be reflected in his personal plan. Young officers treat strong-willed commanders with love and respect. They strive to imitate such a commander, to adopt the style of his work. The personal example of the commander, his authority, are a tremendous force that influences the formation of the character of young flight personnel.

In the achievement of new successes by the young men, generalization and dissemination of advanced experience are very important. Among our young pilots there are many outstanding men in combat and political training. It is necessary to impress on all the personnel that there can be no laggards beside an Outstanding Man.

A certain number of experienced pilots leave the Armed Forces every year because of health and years of service. To take their place come young men. The main thing is that they grasp completely and develop steadily the glorious traditions of the Soviet Air Force, temper themselves ideologically, and perfect their professional knowledge and skills.

PARTY-POLITICAL WORK AT TACTICAL FLIGHT EXERCISES

Lt. Col. K. G. ANTONOV

After the Twenty-First Congress of the CPSU, Party-political work in the units was considerably activated. The increasing political activity of all the personnel called forth by the historic decisions of the Congress, patriotic enthusiasm among the fighting men -- all this has a tremendous effect on improving all combat training.

Recently a task was placed before us -- to prepare for and conduct a tactical flight exercise.

The personnel of the subunits increased even more their exactingness toward themselves during the period of preparation for the exercise. The political workers and the Party and Komsomol aktivs took a very effective part in this preparatory work, mobilizing the personnel for outstanding performance of the tasks set, generalizing and disseminating advanced experience, actively helping the commanders to eradicate shortcomings quickly.

In order to mobilize the Communists and Komsomol members and to bring the purposes and tasks of the exercise to the attention of every serviceman, we held a conference of the Party and Komsomol aktivs, Party assemblies, and talks with the servicemen.

The supervisory personnel took an active part in explaining the tasks of the exercise to the personnel. The deputy commander addressed a Party assembly with a report "On the Tasks of Communists at Exercises".

The participation of the supervisory command personnel in explaining the tasks of the tactical flight exercise helped the pilots, technicians, and specialists to determine correctly their place in the work of the large collective. Addressing the assemblies were many pilots and technicians, who shared their experience of past years, noted shortcomings that had interfered with preparing the personnel and equipment well, and told how they were eradicated.

The commanders of the subunits held political information sessions and explained to their subordinates the tasks confronting them.

In the elements where the commanders are M. I. Zheltobryukhov and A. F. Lysukhin, the pilots gave their pledge to perform intercepts of aerial targets only with outstanding evaluations. Technicians Yu. S. Nepogodin and N. Ye. Buravtsev pledged themselves to service the planes for a repeat sortie within abbreviated periods and with high quality. Drivers, radiomen, and other specialists also under-

Maj. S. N. Chervyakov is a military pilot first class. He has trained scores of young pilots.

This officer commands a squadron, and he has done much to put his subunit among the leading ones. The effort of the commander, who knows how to rely on the help of the Communists, produced results: the squadron has become Outstanding.

In the photo: Officer S. N. Chervyakov.

Photo by V. I. KOLESNIKOV.

took socialist obligations. The deputies for the political section and the secretaries of the Party and Komsomol organizations took an active part in the preliminary preparation for the flights. Rated pilots N. I. Gerasimenko and A. Ya. Mel'nikov helped the young pilots to study the flight mission.

The extensive Party and Komsomol aktiv was brought into the work of preparing the flight and technical personnel for the exercises. Military Pilot First Class, Communist F. A. Morozkin held a talk with the flight personnel on the actions of pilots in special flight cases. The secretary of the Party organization of a subunit, pilot B. I. Skudin, talked with the pilots and technicians on the subject "The Tasks of the Personnel in Preparing For and Conducting a Tactical Flight Exercise". Subunit engineer A. I. Korniyenko told the technical personnel and the aircraft specialists about the peculiarities of preparing and servicing aviation equipment during a period of intensive flight work., On the example of the best technicians, V. P. Ogloblin and P. V. Migunov, he showed how it is possible to service a plane for a sortie in a short time and with high quality.

As part of the preparation for the exercises, the workers of the club recorded on a tape-recorder addresses by experienced pilots on the special features of intercepting targets at low altitudes and in the stratosphere and addresses by engineers and technicians on the duties of the technician and the junior aircraft specialist in the three-zone system of servicing flights. All of these addresses were broadcast through the radio center of the propaganda machine.

The officers of the political section conducted active organizational work. They helped the commanders and the political workers in preparing the exercise, explained the tasks, and organized Party information sessions on the measures undertaken and on the exchange of experience among the subunits.

The exercises began with a combat training alert. The political workers went to the airfield together with everyone else. First of all, they helped the commanders check whether all the servicemen were ready for combat training work, talked with the pilots, technicians, and specialists, and pointed out shortcomings, which they eradicated right there if possible. In addition, the deputy commander for the political section held a talk with the truck drivers on the safety rules of traffic on the airfield, made the rounds of the places where the airfield guard was posted, checked how well the flight-line crew knew its tasks. The secretaries of the Party and the Komsomol organizations, staying with the subunits, continued explaining to the men the task assigned and the tactical situation.

Political workers Mel'nikov and Gerasimenko participated in the first sorties for interception of aerial targets. Through agitators they immediately reported on the sorties of groups of planes to intercept targets. And after the data on the target were received, placards and diagrams were posted showing the characteristics of the target and depicting the peculiar features of the intercept. The last names of the pilots who flew out were entered on "flash" bulletins prepared in advance, so that after their landing the personnel could be informed of the execution of the task assigned.

The very fact that the political workers participated in the first intercept flights is of very great significance. In the first place, the personal example of a Party leader is a mobilizing factor of no little importance, lifting all the personnel to outstanding execution of the mission. In the second place, after returning from a responsible flight it is much easier for the political workers to conduct further Party-political work on a business-like level. They themselves sensed the special features of the combat training tasks assigned and experienced certain difficulties in carrying them out. Their personal observations helped to make the necessary corrections in the explanatory work conducted by the Communists. The talks held with the personnel became more specific. The problems of combat training found more vivid expression in the oral broadcasts and the wall press.

During the course of the exercises, more than 15 radio newscasts were broadcast, devoted to the advanced experience of the aviators; addresses by the best pilots were broadcast.

In connection with an increase in intercept sorties, the pilots were barely able to report on the execution of the mission and discuss the results of the "battle" with their comrades, when the command to get ready was given again. The engineers, technicians, and aircraft specialists strove to inspect the planes as thoroughly as possible and service them for a repeat sortie as quickly as possible. Under these conditions, the principal method was individual work with the men.

For example, as soon as the camera gun film was developed after the first sortie, the agitators told about its results to every pilot who participated in the exercises. Those who received outstanding evaluations -- Mel'nikov, Gerasimenko, and others -- gave talks by radio and shared their experience in intercepting high-altitude targets. Then a photographic display with the results of the "firing" at targets was put together and mounted on the club truck.

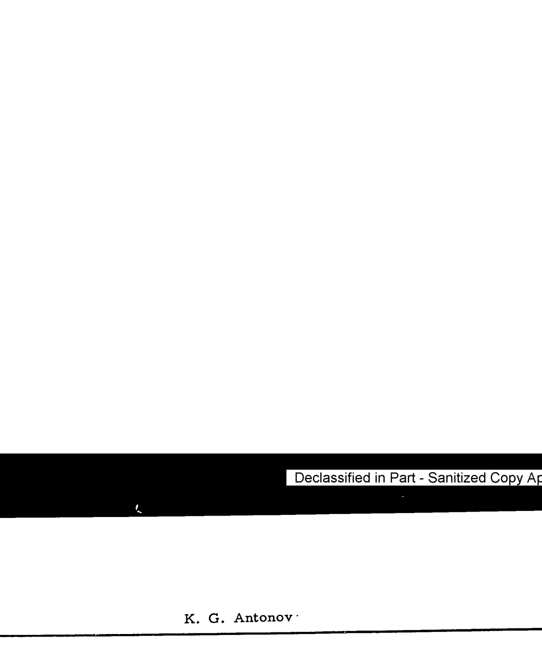
The agitators also told about a mistake made by pilot S. M. Gubin, who opened fire at the target at great range. The Party aktiv also reacted in time to the mistake of pilot V. S. Val'kov. He had not mastered precisely the procedure for emptying the tanks and, having an adequate reserve of fuel and being located within 25 minutes of flying time from his home airfield, he reported by radio that his fuel was exhausted. The flight controller ordered him to cease carrying out the mission and to land his plane at the maneuver airfield. Val'kov's mistake was thoroughly analyzed, and the procedure for emptying the fuel tanks on the plane and the methods of checking it were studied once again with each pilot. The subunit engineer made a radio address, explaining how the range and duration of the flight is calculated and noting the documents that regulate the actions of the pilot in checking the expenditure of fuel.

The agitators of the technical air units told all the personnel of the successful actions of the drivers of fuel trucks, tractors, and special purpose vehicles.

A combat leaflet was issued devoted to the resourcefulness and initiative of starter Pfc. N. I. Kitov, who noticed fuel leaking from a plane that had taxied out for takeoff. With flags he signalled the pilot that takeoff was prohibited, but the latter did not notice his signals and the plane began to gather speed. Continuing to run beside the plane, the starter snatched a loaded flare pistol from his holster and fired it ahead in the direction of takeoff. The pilot noticed the flare, stopped the takeoff, and, at the command of the flight controller, taxied to the parking area. The leak was eliminated, and the plane took off to carry out the mission. For initiative in performing his service duties, Kitov was cited by the commander.

At the end of the first day of flying, late in the evening, the Party and Komsomol aktiv got together. The deputy commander for the political unit summed up the results. The political section determined that political workers N. I. Gerasimenko and I. Kh. Novik organized Party-political work in the exercises better than anyone else.

Ordinarily, the experience of Party-political work accumulated during a day of exercises becomes the property of only a small group of Communists and political workers, since under the conditions of dispersed basing it is often very difficult to get together in large groups. This was taken into consideration at the exercises described here. So as to disseminate somehow all the new and good undertakings, we proceeded in the following manner. From the experience accumulated we selected what was most interesting and instructive that was not done among our neighbors. We transmitted this experience briefly and clearly by telephone to the other units. Thanks to such efficient action by the political workers, many pilots and technicians



The aircraft pool of Soviet aviation has been augmented by the gigantic new Tu-114 turboprop plane developed by the design bureau of Academician A. N. Tupolev. This plane has already shown its remarkable flying qualities in flights to Paris for the 23rd International Air Exposition and to New York.

"This is splendid!", "Amazing!", "Colossal!" -- such was the evaluation given it by foreign aviation specialists and visitors to the exposition.

In the flights, the crew of the plane under the command of A. Yakimov displayed a high flying skill. The Tu-114 traversed the course from Moscow to New York, a distance of over 8000 km, without landing in record time -- 11 hours and 6 minutes, and the return course in 9 hours and 48 minutes.

In the photo: Academician A. N. Tupolev among the members of the crew of the Tu-114.

knew about N. I. Kitov's resourcefulness and initiative on that very same day.

On the second day of the exercises an alert was sounded. Prepared in advance for action under conditions of atomic and chemical attack, the personnel displayed a high degree of organization in performing their service duties. By personal example, the Party aktiv mobilized the pilots, technicians, and other specialists for rapid and high-quality servicing of the materiel for the next flight and for doing away with the consequences of atomic and chemical attack.

Political workers S. V. Vasil'yev and M. I. Burochkin and the staff officers during this period intensified their control over observance of precautionary measures in motor transport traffic on the airfield. They personally checked the movements of motor vehicle columns to the dispersal points, helped platoon and squad commanders to evacuate the free personnel to covered positions, and took part in the degassing and decontamination of planes and motor vehicles. On the second day of the exercises, individual work was intensified even more. Combat leaflets continued to be issued even where there were 4-6 servicemen. For example, combat leaflets were issued at the points of dispersal of aircraft and motor vehicles, in the covered positions, and at degassing and decontamination points.

The exercises ended an hour before the advent of darkness. But the work on the airfield still continued.

And the political workers remained at the airfield for a long time yet. They told about the results of the exercises, about the work of the flight and technical personnel, and they listened attentively to remarks on the organization of Party-political work.

In the conquest of air space, Soviet pilots have achieved notable successes, establishing new world records in flight altitude and bringing fame to Soviet aviation throughout the entire world. On 13 July, in an RV [high-altitude jet] aircraft with two turbojet engines, Lt. Col. V. P. Smirnov attained in flight an altitude of 20,456 m, with a payload of one ton on the plane. A few days later, pilot Smirnov went up to an altitude of 20,200 m, but this time with a load of two tons. On 14 July, in a T-431 aircraft with one turbojet engine, engineer pilot Maj. V. S. Il'yushin went up to an altitude of 28,852 m.

In the photos: Communists Lt. Col. V. P. Smirnov [preceding page] and engineer pilot Maj. V. S. Il'yshin (above).

INITIATIVE AND PERSONAL RESPONSIBILITY

3. INITIATIVE -- SUPPORT IT; CONCEIT -- CONDEMN IT

Lt. Col. P. P. SADOVNICHENKO,
Military Pilot First Class

Col. Ye. V. Sukhorukov's article, "Initiative and Personal Responsibility", published in the sixth issue of the journal, I have read attentively. I agree with him fully in that where there is no initiative, progress ceases and the activity of the flight and technical personnel becomes limited. This gives rise to routine and indifference in the work.

Without initiative, without the creativeness of the mass of airmen, we could not have accumulated a wealth of experience and drawn up guiding documents on the basis of it. But even the very best manual cannot give ready-made decisions for all cases in life. In the flight experience of our units and subunits there is hidden so much that is unforeseen that scarcely anyone can be so bold as to assert that he has learned and knows everything and can now foresee everything.

My comrades and I have been serving in the Air Force for a long time. We fly much and we frequently direct flights; but before each flying day, before each flight, we invariably ask ourselves the questions: Has everything been done in the manner required by the guiding documents? Has everything been thought through to the end, to the smallest detail? It seems that everything has been weighed and provided for in advance, and yet once in a while a case will arise when it is necessary to display initiative, to make an immediate decision that is sometimes associated with risk.

For example, here is how the situation developed one time at night when I was directing flights. In the second half of the flight shift the humidity of the air began to increase rapidly. Knowing that in our area this is associated with the appearance of fog that envelops the airfield, I gave the crews the command to land immediately. Unfortunately, not all of them were in the area of the airfield and could touch down immediately. The crew of pilot A. P. Perfilov was making a route flight. Receiving my command, Perfilov came out on the homing radio station by the shortest route, but by that time the airfield was already covered by the fog. The alternate airfields were in the same predicament. A difficult situation developed.

Knowing Perfilov to be an outstanding pilot and having a complete idea of the capabilities of the landing system and the airfield equipment, I gave the command to turn on all the floodlights and the system to full capacity. Then I asked Perfilov whether he could see the airfield and how much fuel he had left. I received the reply: "Fuel 600, the floodlights are visible, I can land." I authorized the landing and ordered my assistant at the homing station to watch for the passage of the plane and to report the direction and altitude of the approach on time.

But what was still to be done in order to make certain of a safe landing? To improve the illumination of the runway and the designation of the flight line, I decided to make use of a flare pistol, especially at the moment of roundout and touchdown. All this brought the desired results. Perfilov landed the plane outstandingly in an even thicker fog.

I shall present yet another incident. In the daytime under adverse weather conditions, an element of fighters was making a route flight above the clouds. At the moment of its return, a fog spreading out from the sea unexpectedly covered the airfield. This happened so quickly that the third pilot managed with difficulty to land his craft to the right of the runway on the dirt (with the permission of the flight controller). The fourth plane, piloted by element commander N. Belash, passed over the flight line in a solid fog. The flight controller ordered the pilot to penetrate the clouds upward and come out on the DPRM [outer homing radio beacon].

ADVICE TO THE ELEMENT COMMANDER

BEFORE PRELIMINARY PREPARATION FOR A FLIGHT

One of the duties of an element commander is to conduct preliminary preparation with his pilots. This and other preflight duties compel him to prepare himself seriously and comprehensively for every new flying day.

First of all the element commander draws up the pilots' assignments for the forthcoming flights. Here, the sequence of carrying out the planned exercises is studied attentively and determined rigidly. When you do this, take into consideration the individual characteristics of your subordinates. After all, the sequence and especially the methodology of carrying out a flight may be different, depending on the personal qualities of the pilots.

The element commander must draw up in advance the plan of the flight from takeoff to landing. In this, it is necessary to picture very clearly the objective of the flight, the conditions of carrying out the exercises, the sequence and the technique of carrying it out, and safety measures. It is also necessary to make the necessary calculations.

Inasmuch as during the preliminary preparation it will be necessary to reply to questions that bother the pilots, it is necessary to comprehend theoretically the elements of the flight, the mistakes that may be made during the flight, and the ways of correcting them. For this, you will have great need for a knowledge of practical aerodynamics, which should always be high in a commander.

The next stage of the preparation is drawing up the plan of conducting trainer sessions and determining the exercises that are to be practiced. The element commander comes to an agreement with the squadron commander on matters of how, when, and on what the planned trainer sessions will be conducted: on the STL [aerial gunnery trainer], on the TL [pilot trainer], or in the cockpit of the plane, or perhaps here and there both. In this event, the time for conducting the trainer sessions on the apparatus is strictly determined.

The element commander selects the literature and the visual aids for conducting independent preparation for the flight (diagrams, models, methodological devices, and other aids), or assigns this work to one of the pilots.

In conclusion, the element commander devises and proposes in arbitrary form a plan for independent preparation and gives instructions to the element technician on preparing the materials for the flights and for conducting the trainer sessions.

Col. G. P. YEVSIKOV,
Military Pilot First Class.

During this time a report was received to the effect that the alternate airfield could not provide a landing, and there was not enough fuel to fly to the nearest neighboring airfield. Again a very difficult situation had developed. Both the flight controller and the pilot understood this very well. However, Belash did not lose his head. Having evaluated the situation, he requested permission to go to an area where the ground had recently been visible through breaks in the clouds.

Knowing this area and the capabilities of the pilot well, the flight controller gave this permission and suggested that he try to come out below the clouds if the conditions were favorable, select a spot, and land the plane. All this Belash executed brilliantly.

In both the first and the second case it was necessary, without a doubt, to take a risk, but this was justified by the fact that the flight controllers knew their subordinates well and had faith in their capabilities.

It seems to me that it is necessary to support in every way pilots who display initiative in a difficult situation and to popularize their deeds. This will be of great educational importance and will help other pilots to make the correct decision in a similar situation.

Generalization of the experience of flight controllers and flight personnel who are able to make the proper decision in a difficult situation and to act wisely and with initiative will make it possible to enrich our guiding documents in good time.

However, it is necessary to be very cautious in selecting such facts. Sometimes there are in them, like underwater rocks, hidden and undesirable features in the characters of individual pilots such as, for example, recklessness and conceit. And these must not be supported, but rather condemned.

At a subunit there appeared a new pilot. At first acquaintance he seemed capable and experienced; in conversations about flying he gave the impression of a fully mature, capable, wordly-wise airman. However, the very first check flights warned the element commander who was assigned to training him, and the latter announced frankly that the skills of the new pilot in piloting a fighter were very weak. After a flight in a two-place plane, I became convinced of the correctness of the element commander's conclusion. For training this pilot a special program was drawn up, in which we included the simplest elements of combat training. The main attention in it was devoted to practicing takeoff, initial approach, final approach, and landing.

We studied his logbook carefully. We found nothing inauspicious. There was a

The plane piloted by Senior Lt. Yerygin was returning from a flight mission at night. The airfield was already in sight. The pilot was putting the craft into the third turn. And suddenly the unforeseen happened.

"The right generator has gone out," reported the copilot, officer Osadchiy.

In the very next second, the situation in the air deteriorated sharply. A threat to the safety of the flight developed. Now everything depended on the endurance, the coolness, the resourcefulness, and the skillful actions of the crew.

But Yerygin did everything that was necessary. This first-class pilot knew very well how to act in special cases. This time he was able to make a precise final approach and land the plane on the runway. The craft was saved.

In this exceptionally difficult situation the crew commander, Communist Senior Lt. K. V. Yerygin and pilot V. A. Osadchiy acted competently and confidently. They were cited by the senior air chief.

In the photo: Pilot officers K. V. Yerygin (right) and V. A. Osadchiy.

Photo by V. I. KOLESNIKOV.

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lot of flying time and outstanding and good evaluations by the check pilots. It should be noted that the logbook was a new one; in it there were only two check flights (in the pattern and in the zone).

The pilot mastered the individual program with considerable delay, which retarded all the work of the squadron. He reacted sensitively to remarks, with dissatisfaction, expressing the opinion that he was "given no chance", that no confidence was put in him, and so on.

He gained sympathizers; especially zealous was officer Solodovnikov. Although I had warned him that the pilot was not ready for solo flight, Solodovnikov did not take my conclusions into consideration and, being flight controller, at the persistent request of the novice let him go on a solo flight. This was a clear violation, because Solodovnikov took a completely unjustifiable risk. Having taken off with considerable deviation, after the sixth approach and obviously overshooting, the pilot did not land the plane but hit the ground hard. However, even after such a "flight", if one may call it so, he continued to maintain that he saw everything and did everything properly, and it was only the disconnection of the radio cord jack that prevented him from executing the assignment outstandingly.

After that the pilot was checked by the unit commander, who suspended him from further training in a fighter of this type. But the latter continued to complain as before and to maintain that he was being given "no chance".

ADVICE TO THE ELEMENT COMMANDER

DEMONSTRATION IN FLIGHT

The element commander who is teaching a pilot must often resort to this life-tested method. Whether an exercise new to the pilot is being performed or whether lost skills in the technique of piloting are being restored -- in both the one case and the other the element commander first shows the pilot how to execute properly this or that element of flight.

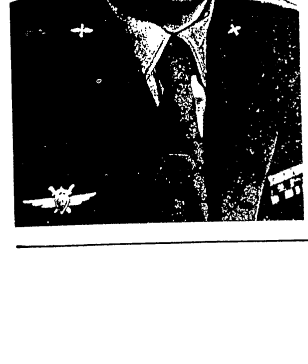
Like other methods of teaching, demonstration requires of the element commander instructor certain methodological skills. Would it be right, for example, if, having told the pilot that you will show him a combat turn, you execute it and that is all? Obviously, this will not achieve the purpose. Apparently it is necessary not only to show the pilot but also to explain why the given maneuver is performed just so and not some other way. And it is necessary to describe this, not just before executing the maneuver, but ahead of time, on the ground, in the preparation for the flight. Thus, demonstration in flight makes a whole series of fully defined methodological demands on both the teacher and the pupil.

Experienced methodologists point to such a requirement, for example, as the pilot's readiness to grasp the demonstration. To this end, during the preliminary and preflight preparation the element commander explains in detail to the pilot the procedure for carrying out the given element of flight and demonstrates it on aircraft models. In the flight, just before the demonstration the instructor makes certain that the trainee has performed all the necessary preliminary actions and that nothing will distract him. In general, an experienced element commander strives to create in the flight the most favorable situation, in which the maximum of the trainee's attention is concentrated on grasping the element of flight being demonstrated.

Together with the proper position of the plane, in some cases it is desirable to show also the deviations from the norm in one direction or another, explaining along the way the reasons giving rise to such deviations. And if the proper actions are repeated, the element commander strives to make them exactly uniform, because only under this condition will it be easier for the pilot to remember what is being demonstrated.

The main thing in demonstration is the ability of the instructor to execute the given element of flight precisely, without the slightest mistake. High quality in piloting technique on the part of the element commander calls forth in the pilot a desire to achieve the same degree of skill.

Col. I. I. TELKOV,
Military Pilot First Class.



Hanging in a prominent place in the clubhouse is a colorful leaflet "An Outstanding Pilot -- an Able Commander". It tells about Military Pilot First Class Capt. Petr Grigor'yevich Iovlev. The remarks written by his colleagues tell warmly of the selfless soldierly work of this Communist pilot, of the exactingness and methodological skill of this commander mentor.

Capt. Iovlev is a veteran of the Great Patriotic War. He made dozens of combat sorties. His courage, steadfastness, and skill were tempered in aerial battles. His combat experience helps officer Iovlev to perform difficult new tasks successfully.

In the photo: Outstanding Man in combat and political training, Military Pilot First Class P. G. Iovlev.

Photo by V. I. KOLESNIKOV.

To an unversed person it might appear at first glance that the pilot was in reality honestly eager to fly, displaying initiative and putting great responsibility on himself. In actuality, however, everything appeared entirely different.

This is the kind of "initiative" to which we object. It is necessary to support and develop initiative and responsibility that are based primarily on a high degree of awareness, honesty, devotion, outstanding knowledge of the equipment, a high degree of flying and combat skill, and a sound evaluation of one's capabilities. An individual approach to the training and an objective evaluation of the actions of subordinates in combination with specific and purposeful Party-political work in indoctrinating high moral and combat qualities in them are the most important conditions of successful mastery of combat skill and accident-free flying.

In his article Col. Sukhorukov touched casually on preliminary preparation. As a matter of fact, many of our commanders have come to the conclusion that the methods of conducting preliminary preparation do not correspond to modern equipment.

Wherein then is the root of the evil?

A major shortcoming of the existing method of preliminary preparation, in our opinion, consists in that all the work of conducting it is not done by those commanders who should do this, in the first place, and in the second place, an excessive amount of time is spent in studying the exercises, and by far not enough on trainer sessions.

Preliminary preparation is usually conducted by squadron commanders and higher ranking supervisory personnel. The element commander, however -- the principal mentor and teacher of the pilots -- is crowded to the background as before. And why not entrust the bulk of the work to him? After all, in the process of preliminary preparation the element commander is required to learn comprehensively the content and procedure of carrying out the forthcoming mission, to conduct purposeful trainer sessions with every pilot in his element, to determine how he has independently prepared for the flight, to check the necessary calculations, and to report to the squadron commander on the readiness of the element. The squadron (unit) commanders and the service chiefs are only required to check the readiness of the pilots by posing problems and to prepare the element commanders.

To what is it necessary to devote most of the time in the process of preliminary preparation? For example, if 4 hours are allotted for it, in our view it is desirable to allot no more than 1 hour for studying the exercises, no more than 1 hour and 30 minutes for independent preparation, and no less than an hour and a half for trainer sessions.

Why do we propose so much time for trainer sessions?

The thing is that at the present time the units are equipped with fighters of different types that have their own peculiarities both in piloting technique and in the disposition and arrangement of assemblies, instruments, and other equipment in the cockpit. Sometimes even in planes of the same series there are essential differences in the location of the equipment in the pilot's cockpit.

In the process of trainer sessions, control will also be perhaps the most effective. In order that the trainer sessions be purposeful, they must be prepared in advance, not only by the element commander but also by the service chiefs and the engineers of all profiles. All those who organize, support, and direct flying should participate in conducting trainer sessions.

A GIFT FROM THE SPONSORS

Ties of great friendship bind the men of X unit to the Pioneers of the city. Recently the Komsomol members of the unit conceived the idea of presenting a gift to the school children. They did not decide immediately what it should be. But everyone wanted the gift to be interesting and useful.

On a beautifully curved pedestal they set a large hemisphere, and on it they traced the boundaries of our Motherland.

Throughout the entire territory of the USSR, there are models of the new construction jobs of the septennium in the chemical industry and metallurgy, hydro and thermal power stations, new railroads, and many other things.

There appeared models of the first artificial satellite, of the second and the third, a model of a cosmic rocket, a plane...

You press a button, and varicolored lights of the new construction jobs go on, the model of the cosmic rocket begins to turn, sending out signals familiar to everyone.

Many of our Komsomol members took an active part in building the model.

In the photo: technician Lt. Mikhail Luk'yanenko at the working model "Construction Jobs of the Septennium".

Photo by N. N. YEMSHANOV.

ACT CREATIVELY IN AERIAL TRAINING BATTLES

(On the results of the discussion of the article on the special features of present-day aerial combat)

A fighter plane was rapidly closing in on an aerial target. Military Pilot First Class Maj. P. V. Novikov searched attentively for the "enemy" and spotted him at a considerable range. But the fighter interceptor had been vectored by the command post to such a position that he could not attack straight in and first had to execute a vigorous maneuver. The pilot put the plane into a turn, but he soon saw that the flight speed was declining rapidly and he was beginning to fall behind the target. In order not to lose the "enemy" from view (since in this case a repeat vectoring would have been necessary), Maj. Novikov began making a descending turn. The speed was restored but altitude was lost. It became necessary to pursue the target and attack it far from the assigned line.

Maj. Novikov told about this incident at a conference devoted to a discussion of the articles on the special features of present-day aerial combat published in the journal "Herald of the Air Fleet".

The pilots and air commanders who participated in the conference discussed the contents of the articles and cited the most interesting examples from their own experience.

As a matter of fact, why was the fighter unable to attack the plane at the assigned line?

The pilot executed the commands and maintained the assigned regime precisely. He spotted the target in good time, insofar as the conditions and the visibility permitted, and subsequently acted vigorously and piloted the plane skillfully; and yet the interception line shifted.

Analysis of this flight showed that the special features of aerial combat at present-day flight speeds were not taken into consideration in vectoring the fighter. If the target and the fighter plane were flying at speeds of, let us say, 600-700 km/hr, then under the conditions that developed the fighter pilot would have successfully executed a maneuver for coming out in a position suitable for attack. In this the target would not have been able to get far away and the mission would have been accomplished.

It is another matter at present-day flight speeds. It is much more difficult for the fighter to execute a vigorous maneuver; in order to gain a position advantageous for attack, he needs considerable air space. In turning with a small bank the pilot may get far away from the target and lose it, while with a large bank he will lose speed. Furthermore, the rapidity of the maneuver is regulated by the magnitudes of ultimate load. These special features were not taken into consideration in the vectoring.

And so, there is no doubt that qualitative changes in aviation equipment and armament have led to a change in the nature of present-day aerial combat. Pilots encounter these changes in conducting aerial training battles. And it is quite natural that he who does not know them and does not take them into consideration cannot hit aerial targets successfully, act creatively, apply the most effective tactical methods and rational combat procedures.

The editors of the journal published Col. S. A. Savosin's article "Special Features of Present-Day Aerial Combat" (No. 12, 1958) and began a discussion of it. In subsequent articles, pilots expressed their opinions on the problems touched upon.

Naturally, the opinions of the authors of the articles did not always coincide. But during the discussion some of the special features of present-day aerial combat were subjected to debate. Of course, these views cannot become some sort of dogma. With the development of aviation equipment and weapons they become more profound and change as experience is accumulated. However, a proper understanding of the special features of present-day aerial combat will help our pilots to conduct aerial training battles creatively, to search for new methods of action and tactical moves.

In the opinion of the majority of the authors of the articles and the pilots who spoke at the conference, these special features are due primarily to increased flight speeds and altitudes.

It is known that fighter planes are intended to hit aerial targets, whose flight speed has increased considerably. What has this led to? First of all, there has arisen a need to spot the targets at great ranges, and the development of radar technology has made it possible to do this within certain limits.

As stated by A. F. Petrov in his article "Find New Tactical Methods", the plan of battle has also changed.

The actions of fighters are now continuously controlled by command posts, which vector them to the target, help them to conduct the search and to gain an advantageous position for attack, and, in the case of failure, to attack again.

All of this has also caused changes in the concept of surprise and in the views on ways of achieving it. The majority of the authors agree that the importance of surprise in aerial combat has not declined. But in connection with the use of technical spotting facilities, it is more difficult to achieve concealed closure. However, it is possible to take the enemy unawares and to deceive him, for which it is necessary to make skillful use of various technical facilities in combination with diverse tactical methods. Furthermore, the sphere of activity for creative initiative on the part of the flight personnel and command posts has now expanded considerably.

As a matter of fact, quite limited facilities were used formerly to achieve surprise: the cloud cover, the sun, haze, etc. Added to them now are radio technical facilities and other technical equipment, which have moved to the foreground. Naturally, the demands on pilots have increased, but at the same time there has been an extension of their possibilities for creativemess with the aim of achieving surprise and, consequently, success in attack and in aerial combat as a whole.

In regard to problems associated with intensification of the role of technical facilities for supporting the search for the target and success in the attack, Col. A. A. Gubanov appeared in the third issue (for 1959) with an article "We Must Not Measure Everything by Speed Alone", in which he drew a conclusion on the need for including in the concept of "aerial combat" the process of vectoring and directing the actions of fighter pilots. If we agree with this, then another conclusion suggests itself to the effect that victory in present-day aerial combat is achieved by the joint and coordinated efforts of the pilots and the personnel who directly support their operations in the air. Consequently, development of coordination of the actions of vectoring officers, operators, and pilots is the most important requirement flowing out of the special features of present-day aerial combat.

In the article "The First Attack" (No. 4, 1959), Lt. Col. D. F. Goldyrev notes quite correctly that the role of the first attack grows with the increase in flight speeds. As is known, under present-day conditions vectoring is performed by means of ground radio technical facilities. Therefore, a repeat attack has become much more difficult and its effectiveness has declined. During the attack the aerial target, having great speed, traverses a considerable distance and approaches the objective of the strike. In addition, surprise is lost, and the "enemy" bomber may take steps to disrupt the attack.

That is why it is very important to teach fighters to hit aerial targets in the first attack. To this end it is necessary to act creatively, to search for new tactical methods that satisfy most completely the conditions of aerial combat using modern aviation equipment and weapons.

Improvement of aviation equipment and strike facilities, as the majority of the authors say, has also led to other changes. Formerly, at subsonic flight speeds, the fighter pilot waged battle, as a rule, in a group and his actions were directed by the commander who was in the combat formation. He saw all the pilots, observed their conduct, and, when necessary, gave instructions as to how to act, and finally directed by personal example.

It is another matter with present-day aerial combat. Combat now may spread out over a tremendous expanse of air, and during the course of it visual contact among the pilots of the group may be disrupted. Under these conditions can a pilot be passive and await commands? Indubitably, he cannot. He must know the order of the battle and must make decisions independently, must act with initiative, in the interests of carrying out the common task. This means that he must know the nature of present-day combat and its special features and must take them into consideration in his training.

The increase in speeds, without a doubt, will affect the nature of maneuvering by fighters in present-day combat. Col. Savosin expresses his opinion to the effect that maneuverability in combat is gradually declining, the lines of the planes' tracks are straightening out, and enormous space is required to execute maneuvers.

Many comrades agreed with this opinion. At the conference, for example, they spoke about the fact that maneuverability has not lost its significance in present-day combat. It is known that the main combat qualities of fighters that distinguish them from other types of planes were: speed, maneuverability, and fire power. Viewing it from this aspect, it can be said that the greatest advantage of modern fighters has remained with maneuverability. The flight speed of other types of planes is sometimes close to the speed of fighters. On a heavy plane, for example, more powerful armament can be installed than on a fighter.

Consequently, the principal quality of fighters is maneuverability - in combination, of course, with high speed and powerful armament.

Where then can this advantage be manifested? Indubitably, only in maneuvering aerial combat.

Nevertheless, combat at supersonic speeds is sometimes considered as separate attacks, i.e., maneuvering aerial combat is essentially rejected. From this comes the conclusion that there is no sense in teaching free aerial combat to fighters.

Is this correct?

If fighter planes are used as equipment and their principal advantage is maneuverability, then to reject maneuvering combat means to reject the need for the existence of fighter planes in general. The unsoundness of such an assertion is obvious. Of course, the increase in speeds leads to a reduction in the maneuverability of aerial combat. However, as officer V. D. Romanyuk correctly concludes in his article "This is What We Think" ("Herald of the Air Fleet", No. 6, 1959), aerial combat will remain maneuverable as long as pilots strive to come out to an advantageous position for attack while maintaining visual contact, as long as interaction among the pilots of a group, and fire cooperation in particular, will retain some significance in combat.

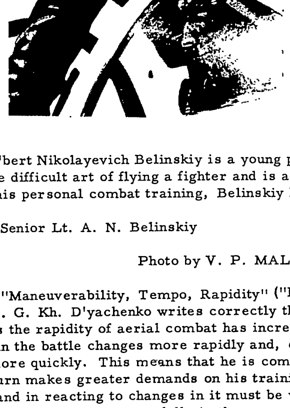
With the present-day level of development in aviation equipment and armament, the concept "initial position for attack", in the opinion of some of the pilots who spoke at the conference, loses its meaning, and the range for beginning the attack and for pulling out of it increases. The significance of visual and fire cooperation declines, and in connection with this the tendency for reduction in the maneuverability of aerial combat becomes ever more pronounced.

Perhaps waging free aerial training battles is not justified from the viewpoint of usefulness in improving combat skill? Let us see if this is so.

In order to triumph under present-day conditions, a pilot needs high moral and combat qualities and firm skills, which can be developed most successfully in free aerial combat. During the course of it, the fighter pilot develops boldness, decisiveness, quickness of reaction, persistence in achieving victory, and skills of waging battle. To reject aerial training battles means to deprive the pilots of this opportunity.

Furthermore, it is known that a guarantee of victory in battle is the pilot's ability to handle his plane and to make full use of its combat capabilities. Without a doubt, the pilot can learn this only in free aerial combat. Here he will, as they say, feel his plane and learn what it is capable of. At the same time, the pilot polishes his piloting technique and learns to handle the plane skillfully.

Thus, free aerial training combat is reflected most productively in developing the necessary combat qualities in fighter pilots. During the course of it, conditions are developed for creativeness and for searching for new and more effective tactical methods of operation (this is the conclusion that the participants at the conference came to).



Senior Lt. Al'bert Nikolayevich Belinskiy is a young pilot. But he is successfully mastering the difficult art of flying a fighter and is a leading airman of the unit. Perfecting his personal combat training, Belinskiy helps his comrades in every way.

In the photo: Senior Lt. A. N. Belinskiy

Photo by V. P. MALEVANCHENKO.

In his article "Maneuverability, Tempo, Rapidity" ("Herald of the Air Fleet", No. 5, 1959), Maj. G. Kh. D'yachenko writes correctly that in connection with the increase in speeds the rapidity of aerial combat has increased. And this means that the situation in the battle changes more rapidly and, consequently, the pilot must react to it more quickly. This means that he is compelled to act more intensively, which in turn makes greater demands on his training. Quickness in evaluating the situation and in reacting to changes in it must be very high. And these qualities can be developed most successfully in the course of aerial battles, in a difficult situation.

In connection with the change in the nature of aerial combat, many comrades quite correctly pose the problem of combat formations. Without a doubt, they must correspond to the level of development of equipment and to the nature of aerial combat. If both the one and the other have changed to some degree, this cannot but reflect on the arrangement of the planes in a group.

Consequently, an explanation of the special features of present-day aerial combat and comprehensive consideration of them will help to find the most effective combat formations. However, this does not mean that it is possible to devise some kinds of formations suitable for all occasions. At certain stages of the battle, under different conditions of the aerial situation, they will have their own peculiarities. At the same time, it is important to clarify the general tendencies in the development of combat formations in connection with the increase in flight speeds and improvements in the armament of fighters. This can be done by the common efforts of the flight personnel on the basis of experience in aerial training battles.

In the course of the discussion on Savosin's article, the idea was expressed about changes in the significance of individual factors affecting the course and outcome of aerial combat. Thus, for example, Military Pilot First Class Maj. B. I. Polyakov in the article "Know How to Utilize the Advantages of Your Plane" ("Herald of the Air Fleet", No. 7, 1959), analyzing the relationship of altitude and speed, came to the conclusion that for modern aircraft in battle an advantage in speed is more important than in altitude. Consequently, at supersonic flight speeds, the well-known tactical formula for aerial combat acquires a somewhat different appearance: speed -- altitude -- maneuver -- fire.

Knowing the special features of aerial combat, a pilot will undoubtedly make fuller use of the combat qualities of his plane for achieving victory. Fighter pilots of the X unit, participants in a conference of readers, talked about all this. Speaking at the conference were pilots Comrades A. L. Kozhevnikov, Ye. G. Pepelyayev, D. S. Nikolayev, V. F. Perepletchikov, L. M. Dymchenko, I. Kh. Mikhaylichenko, V. D. Gusakov, P. V. Novikov, A. T. Mikhalev, and others.

Thus, the discussion of Savosin's article in the journal has helped to present the special features of present-day aerial combat more clearly, and to explain the tendencies in the change in its nature. Consideration of them in teaching practice will, without a doubt, help air commanders to improve the combat skill of the flight personnel.

AERIAL RECONNAISSANCE UNDER ADVERSE WEATHER CONDITIONS

Col. N. V. SUVOROV

Air exercises were in progress. The ground and aerial situation was changing rapidly. In order to react in time to these changes and to make the proper decisions, the command required information on the "enemy". The reconnaissance crews provided it, despite adverse weather conditions. At the end of the day, an order was received in the reconnaissance subunit -- follow the advance of "enemy" reserves, which could be expected with the advent of darkness.

Taking off at twilight, the crews reported on the beginning of movement of the reserves. But the command was interested in the direction of their movement. By this time the weather had deteriorated; the reconnaissance area was covered by a low overcast.

Evaluating the situation, the commander entrusted this responsible mission to Maj. P. F. Chelombit'ko.

The major sized up the task, the special features of a reconnaissance flight in darkness under adverse weather conditions and the character of the terrain along the route and in the assigned area, analyzed the latest reconnaissance data, and determined the possible further direction of the movement of the reserves.

The preparation was completed, and then the plane was already in the air.

Crossing the "front line", the crew followed the proposed route below the clouds at an altitude of 1000 meters. But soon they began to encounter cloud masses at a lower altitude also. By time calculations, the navigator determined that the plane was approaching the reconnaissance area. The pilot decided to reduce altitude. Observing the rules of flight safety, he brought the plane out below the clouds and recognized the assigned area. By various signs, the crew detected that an "enemy" column was moving toward the "front line". Having completed its mission, the reconnaissance plane returned to the airfield.

This example shows that a reconnaissance crew can carry out a difficult task successfully even under adverse weather conditions, if it is well prepared and has organized the sortie efficiently and properly, and if the actions of the crew are constantly checked by the command post and it is informed of the weather situation in the flight area.

It is known that present-day combined-arms combat is waged continuously, irrespective of the time of year or day and the weather. Therefore aerial reconnaissance must also be incessant.

Under adverse weather conditions, various methods of reconnaissance are used. With a solid overcast, the crew may fly in the clouds or above them, coming out below them in the reconnaissance area.

If the plane is flying below the cloud base at low altitudes, periodically entering the clouds and coming out of them, then it is very difficult to spot it by means of radar facilities. Such a flight is not difficult, especially in the daytime; however, its range and duration are reduced. In addition, the possibilities of aerial reconnaissance are also reduced, since the base of the overcast is usually located at low altitudes. Therefore, such a method is applicable under certain conditions in reconnoitering the field of battle and the tactical and nearest operational depth of the enemy's defense.

As a rule, adverse weather conditions make aerial reconnaissance more difficult. At the same time, they make for a surprise appearance in the assigned area and help to reduce the probability of fighter attack.

However, in order to conduct aerial reconnaissance under such conditions, the members of the crew must have good flight and tactical training, must possess high moral and combat qualities -- boldness, decisiveness, creative initiative, and must be able to evaluate correctly the weather along the flight route and in the reconnaissance area and to foresee changes in it.

The success of a reconnaissance flight is determined by thorough and reasoned preparation. No matter how limited the time for preparation for the flight, the crew of a reconnaissance plane is required to study comprehensively the task assigned and the nature of the reconnaissance objective, to reason out the methods of finding it quickly, especially after coming out of the cloud cover, and to evaluate the weather situation on the flight route and in the area of the target.

Let us return to the actions of Maj. P. F. Chelombit'ko. In preparing for the flight, the pilot familiarized himself with the procedure of operating the ground radio technical facilities. Before taking off, he determined the higher (lower) elevation of the terrain in the reconnaissance area relative to his own airfield, devoting special attention to the characteristic check points by which it was possible to recognize the reconnaissance area quickly after coming out below the overcast.

The skills and knowledge needed by the crew members for reconnaissance under adverse weather conditions are acquired in the process of daily flying.

Teaching reconnaissance men to penetrate the clouds and trainer sessions can, in our view, consist of several stages. In the first stage, flights are conducted under normal weather conditions. The crews learn to come out precisely at the point of beginning cloud penetration by time calculation and to select the flight regime at the moment of descent and cloud penetration. The pilot (crew) is given the following task: to come out at a specified point at some altitude by time calculation. He also begins to descend and to come out conventionally below the overcast at minimum altitude and in the reconnaissance area. Then he finds the objective and, having completed the mission, "penetrates" the clouds upward to the assigned flight altitude. Here the pilot practices maintaining the assigned flight regime and accuracy in coming out in the reconnaissance area.

The next stage in the training may also proceed under normal weather conditions, but the pilot performs the flight in an enclosed cockpit.

Later on, it is best to practice methods of penetrating the overcast without the

aid of ground radio technical facilities in the area of one's own airfield. Then the flight controller, utilizing all facilities and methods available at the airfield, will be able to control the actions of the pilot.

In a radius of 50-60 km from the airfield or in a specially designated area, the crew is given an objective which it is required to find and reconnoiter, and also the minimum altitude of coming out below the clouds. After taking off, having come out above the clouds, the pilot flies the plane along the assigned route, and then by time calculations brings it out at the point of beginning the penetration of the overcast. This point is assigned to the pilot or is computed by him on the ground. In approaching it, the reconnaissance man requests of the flight controller permission for a maneuver and then, having established the flight regime for descent, penetrates the overcast. He continues the flight to the assigned area below the clouds.

In assigning the task to the crew, the commander points out the objective of the reconnaissance, the type and scale of the photography, the direction of approach, the procedure and regime of flight and of penetrating the overcast, and gives the minimum altitude for coming out below the clouds. In the process of preparation for the flight, in addition to studying the mission and the reconnaissance objective and performing the necessary calculations for photography, the crew determines the line of beginning cloud penetration in relation to the flight altitude, lays out the flight course from some radio navigation point (usually from the airfield DPRM [outer homing radio beacon]) or check point, and computes the flying time from it to the line of beginning cloud penetration, as well as the route of the return flight.

After takeoff, the reconnaissance plane penetrates the clouds upward, comes out above the clouds at the airfield DPRM or at a radar check point, and, flying for the calculated time, follows the route laid out to the line of cloud penetration downward in the assigned area. The controller on duty at the SKP [flight-line command post] checks the flight according to the data of radar station observations, gives corrections, and vectors the plane to the line of beginning cloud penetration downward.

Control by the controller on duty at the SKP is especially important in flights of single-place reconnaissance planes. Coming up to the proposed line, the pilot puts the plane into a descent in the assigned flight regime and penetrates the clouds. After coming out below the overcast, the crew reestablishes orientation and proceeds to the reconnaissance objective. Having completed the mission, it finds a characteristic check point, enters the clouds (above the clouds) on the calculated course, and continues the flight. If after having begun to penetrate the clouds downward and having attained the assigned altitude the reconnaissance plane does not come out below the clouds, it must discontinue cloud pentration downward, gain altitude, and continue the flight in accordance with instructions received before takeoff.

Pilots who have undergone education and trainer sessions in specially assigned areas and who have good flight training are authorized to come out below the clouds in other areas along the route also, on condition that all safety measures are observed. During the course of aerial reconnaissance in the daytime under adverse weather conditions, the crew of a multi-place reconnaissance plane can use various methods and tactical moves. The following is one of them.

At tactical flight exercises it was necessary to reconnoiter an important "enemy"

Senior Lt. A. I. Gruntenko and Lt. G. I. Lenyushkin have a reputation in the unit as masters of aerial combat. Not only do they carry out every flight mission outstandingly themselves, but they also successfully transmit their experience to young pilots.

In the photo: A. I. Gruntenko (right) and G. I. Lenyushkin definitizing the route of a forthcoming flight.

Photo by P. K. DYUZHIN.

objective far from the "front line". There was a multi-layer cloud cover along the route.

Capt. A. K. Andrianov's crew began to prepare for it in accordance with the mission assigned and with consideration of the rules regulating the procedure, and consequently, also the safety of the operation. Having evaluated the weather conditions, the members of the crew determined the possible altitude of the cloud base. After their readiness to carry out the mission was checked, the reconnaissance crew was permitted to take off.

It penetrated the clouds upward and continued the flight above the clouds. The navigator conducted orientation by dead reckoning and with the aid of the radar sight. Approaching the reconnaissance area, he reported to the crew commander: "We are approaching the assigned area; penetration of the overcast can be begun."

Having established the flight regime, the pilot began to penetrate the overcast downward. Below the clouds, having reestablished orientation and having discovered

that the reconnaissance objective was somewhat to one side of the track, the navigator gave the command for a turn. The plane flew over the objective at high speed. The crew transmitted the observation data by radio to the command post. Having photographed the objective, the reconnaissance plane disappeared above the clouds with a sharp turn and a climb.

Under adverse weather conditions, a reconnaissance crew operates alone, as a rule. It has to evaluate the situation independently and make decisions. It therefore achieves success only when it displays wise initiative and creativeness. Much depends on coordination, on how all the members of the crew help each other. In order to come out on the target unexpectedly, reconnaissance men make use of the cloud cover. That is why it is so important to evaluate correctly the weather situation in the area of the flight. To this end, weather reconnaissance is conducted before the beginning of the flight, additional reconnaissance of the weather is conducted periodically during the flight, and the actual weather at different altitudes is established. Special attention is devoted to reconnaissance in different directions, in order to determine where deterioration in the weather may come from.

Reconnaissance under adverse weather conditions is a different type of combat activity, which has its own peculiarities. Consideration of all the special features in the process of preparation of the reconnaissance crews will give them the opportunity of acting in a tactically competent manner of utilizing techniques and methods of operation that are the most effective and most unexpected for the enemy.

A COMMAND FROM THE GROUND

Col. V. A. KUZNETSOV,
Military Pilot First Class

Nowadays it is difficult to imagine how pilots could formerly take off on a flight without having communication with the ground. Yet there was such a time. The plane breaks away from the runway, and the pilot is entirely on his own. Nobody directs him, nobody prompts him how best to overcome difficulties. Of course, lack of communication with the ground prevented more effective utilization of the capabilities of aviation equipment, reflected negatively on flight safety, and in wartime made it very difficult to carry out combat missions.

The following episode is recalled with vexation. A group of German Ju-87 bombers crossed the front line, dropped bombs on the main line of resistance, and calmly (literally, calmly!) disappeared to the west. And above them an element of our fighters was patrolling. They made turns, flew in a straight line, maneuvered, but ... did not see the enemy. To prompt them, to give them some advice from the ground was impossible. Facilities for vectoring and control were far from perfect at that time. The pilots caught it from the infantry for such "blunders".

But all that is in the past. Look now.

... Heavy low clouds hang over the airfield. There is a drizzle. Formerly such weather would have been considered non-flying. But now a pair of fighters makes a swift run, lifts off the ground, and disappears in a minute in the murky shroud of clouds.

Exercises are going on. Pilot V. M. Panov is taking off for an intercept in a pair with officer A. N. Solomon.

"Course 220°, altitude...", P. A. Rubtsov, vectoring officer at the command post gives the order.

"Roger," replies the lead man.

The pilots attentively watch their instruments and maintain the climb regime precisely. They do not see each other, but the planes hurtle through the clouds on a parallel course.

The clouds are black -- a sign of great thickness and density; the planes ice over lightly.

Ask the pilot where he is or whether he will encounter the target soon, and he will not reply. After all, this is not the most important thing now. Penetrate the clouds! Assemble the pair! That is the immediate task.

These few tense minutes are trying. All the attention of the pilots is concentrated on the instruments. Altitude -- course; course -- gyrohorizon.

The altitude is six, eight, ten thousand... It is getting noticeably lighter! A few seconds more, and the cloud cover suddenly breaks up.

Below is a blinding, white, undulating sea of clouds; overhead it is blue and a bright sun that hinders observation.

The pair is above the clouds. A quick glance to the right -- the wingman is in position.

"I have penetrated the clouds upward. Altitude..."

The pair is assembled. The first part of the flight has been carried out successfully. But now it is necessary to execute the assigned mission. But how? After all, the pilots know nothing about the target. At this moment, commands come from the ground:

"Course 220°, altitude... The target is two 'Eagles', altitude... Course 30°, range 400."

The information from the ground is laconic and timely. The situation immediately becomes clear. And now, having received the necessary data, the pilot begins to analyze the situation himself: the encounter should occur no less than 200-250 km from the objective.

But here, as frequently happens, an unexpected difficulty arises.

"Course 180! The target has turned to the right!" Rubtsov's sharp voice is heard in the headset.

"Roger. Course 180." And the silvery fighters turn smoothly to the left.

Planov continues to analyze the situation.

"The range of interception is increasing, and the weather is unstable. We must be ready to land at the maneuver airfield."

From the CP comes a new command:

"20 more to the left! Turn on the afterburner, maximum 'acceleration'!"

And, as though having guessed the commander's thoughts, Panov takes in the concluding words of the command: "Be ready to land at X airfield..."

The commander on the ground is proud of his subordinates. There has not yet been a case that Rubtsov missed the target and Panov did not intercept it. And this is no happenstance. After all, the pilot executes every command in a considered manner, and the vectoring officer, before transmitting it to the plane, weighs all the "pros" and "cons". And now, too, it is a major risk to lead the fighters so far away. But the target is very important, the commander has confidence in Panov, and the training of the officers of the CP combat team does not give rise to any doubt of success.

A brief radio exchange occurs between the ground and the plane.

"Make ready to turn to the left!"

"Turn to the left to course 90, bank 20!"

"Roger. I do not see the target."

"The target is lower, to the left 2-3 km!"

"I see the target. Attacking."

The pilots attack the bomber and pick up the return course. But ahead lie new obstacles. From the CP they report:

"The alternate airfields are not receiving! Go to your own point! Descend from the line only at my command!"

The pilots understand that the weather at the "neighbors" has deteriorated conclusively. Anxiety creeps into their hearts. How is the weather at home? Will the fuel last? But Rubtsov's firm voice again instills confidence.

The pair penetrates the clouds downward and executes the landing safely.

Now let us give some thought as to how it was possible to carry out such a difficult mission. Of course, helping, first of all, was the perfect radio technical apparatus with which the airfield and the plane are equipped. It made it possible to "see" even through the clouds all that was occurring in the expanse of air, and to maintain close communication between the plane and the ground.

But is it only this that assured success? Indubitably, no.

Much depended on the people, on their technical and tactical competency. It is no accident that in organizing the vectoring under adverse weather conditions the commander addressed himself in his mind to the work of his subordinates. He knew that they would handle the task and he made decisions boldly, acted surely.

We are thinking of the tremendous importance of timely, clear, and precise commands from the ground not only in vectoring. Takeoff, landing, as well as all flights in the area of the airfield are regulated strictly by flight controllers who are located at the flight-line command post or at the KDP [control tower].

But does every flight controller give thought to the fact that the fate of the pilots is in his hands, especially in flying under adverse weather conditions or at night? Only he -- the flight controller (or the landing duty officer) -- can inform the pilot of the precise course in the clouds. Only he can warn him of a dangerous letdown. On him alone depends the safety of flights over the airfield. And all this is again achieved by means of clear and competent commands from the ground to the plane.

It is therefore necessary to be very scrupulous and exacting toward all of one's decisions. And before it is transmitted to the plane, everything must be thought over and weighed.

Every air commander has had occasion to be witness to how the proper actions of a flight controller have saved a pilot and a plane, how confident and clear commands from the ground have more than once prevented flight accidents. Following is a characteristic example.

The overcast dropped sharply throughout the entire area. The alternate airfields were closed. In the air were several planes. But visibility below the clouds remained good.

The flight controller informed the pilots and ordered that they pass the outer homing station 100 m lower than usual.

It was night, darkness. The runway lights were reflected on the low-hanging clouds in white, green, and red light. Landing floodlights flashed on occasionally. There were the planes landing one after another.

But here came pilot A. F. Biryukov in for a landing. The commander knew that this pilot reacts to commands with a delay; he needs more time than others to comprehend this or that order, to understand it, and to execute it.

Above the clouds Biryukov turned the plane to the homing station by the needle of the automatic compass and radioed:

"On the landing course!"

Above the clouds there was a moon; visibility was excellent. The horizon line

stood out distinctly. But then the plane entered the clouds. Around the cockpit it grew dark immediately. The altitude declined sharply. The pilot began to get worried: "Can I do it?" Around the cockpit was an impenetrable darkness.

The controller was also disturbed. But no one must notice this, especially the pilot.

The pilot radioed the SKP [flight-line command post]:

"At 'safe' altitude; I have not penetrated the clouds downward."

And he receives the reply:

"Descend to two hundred meters!" the voice of the controller was calm and quiet.

"Roger. I have passed the outer; I do not see the runway."

"Your altitude?"

"Three hundred."

The flight controller is indignant. He could see the lights of the plane moving over the flight line at the very base of the clouds.

"Biryukov again! He has learned that it is prohibited to descend below three hundred meters in the clouds and he doubts the propriety of my command. But perhaps he didn't hear it?"

From the plane comes a signal of alarm:

"Altitude one thousand. I am going through clouds. The red fuel light is flashing."

The flight controller analyzed the situation: "There is enough fuel left for 15-20 minutes. The pilot has gone off into the clouds again. He is obviously afraid to descend. What to do?"

Quiet set in on the airfield. The flight controller's assistants stopped their work; the flight-line crew and the floodlight men grew quiet. Everyone grasped the difficulty of the situation.

Only the flight controller could change the situation for the better. He ordered:

"Execute my commands unquestioningly! Turn to the outer in the clouds! Repeat the approach!"

The worried Biryukov carried out the order and came out again at the homing station on the landing course and again at an altitude of three hundred meters.

"I have passed the outer; I do not see the runway."

"Have you descended to two hundred?"

"No, I have three hundred meters."

A critical minute began. It was necessary to do something to compel the pilot to descend at least a few meters.

The commander looked attentively out the window and saw the lights of the plane. He was traveling at the very base of the clouds again and of course could see nothing. But he could not bring himself to descend -- below was the ground.

"I see you, descend!" ordered the commander. "Descend to two hundred meters!"

The plane came out smoothly below the clouds. But the pilot might enter the clouds again. The commander knew Biryukov. And he brought the decision adopted to a conclusion.

"Look to the left! Do you see the runway lights? Do not enter the clouds!"

The commander's voice became gentler, quieter.

"I see the lights, but I don't know in which direction to land."

"Listen to my commands! Turn left ninety! That's the boy! Go perpendicular to the landing course!"

"Roger."

"Make turns only at my command! Make the second one!"

"Complying."

The pilot made the third and fourth turns precisely at the controller's command and set down safely. There was practically no fuel left in the tanks.

What does this example attest to? It shows the same thing as the preceding one: a command from the ground is very important nowadays, and it must be executed punctually.

However, turn your attention to the actions of the flight controller. They were very well thought out and efficient. He confidently required the pilot to descend to 200 meters, since under the conditions that had developed only at this altitude was it possible to see the runway. But some kind of paralysis had seized the pilot and he was afraid to come out below the base of the clouds, although the lights of the plane could be seen clearly from the ground. Then the controller made use of another possibility. By the information that the plane could be seen from the ground, he instilled confidence in the pilot and thereby compelled him to come down to the indicated altitude. Then the pilot landed the plane by the flight controller's commands.

For the entire duration of a flight the pilot of a modern plane is reliably connected with the ground. From the command post he is vectored to aerial targets. Ground navigation facilities help him to hold to the assigned flight route and at a difficult moment bring him to his home airfield. Landing systems give him the opportunity of making a landing under weather minimum in the daytime and at night. The command from the ground has become the guiding principle for the pilot of any type plane.

That is why the most important task of all air commanders at the present time is instilling confidence and executiveness in the pilots. Confidence is necessary in order that the pilot or navigator takes a command as the only correct instruction without the slightest doubt, and executiveness is needed so that he executes this command quickly and efficiently.

Another no less important task is to instill a sense of responsibility in those who are entrusted with giving commands and constant improvement of their technical and tactical skill. The officers who give the commands need a high sense of responsibility. Under no conditions can they make bargains with their conscience. When the matter pertains to carrying out a critical task, when it is a matter of the life or death of a man, bargaining with one's conscience is just as dangerous as indifference or carelessness. A high degree of technical and tactical knowledge is extremely necessary for these officers because without it they will simply be unable to make the correct decisions in a rapidly changing aerial situation.

During the Great Patriotic War, fighter pilot I. Kh. Mikhaylichenko successfully waged many aerial battles. For courage and heroism displayed in battles with the Hitlerite invaders, he was awarded two gold Hero of the Soviet Union medals and several orders. In the postwar years, twice Hero of the Soviet Union Mikhaylichenko has mastered jet planes to perfection and has taught the art of aerial combat and sniper fire to many young pilots.

In the sketch: Military Pilot First Class, Twice Hero of the Soviet Union, Lt. Col. I. Kh. Mikhaylichenko.

THE RELIEF GROUND CONTROLLER

Guards Col. G. I. MAKHORIN,
Lt. Col. S. Ye. RUDAK

At every airfield one can encounter a relief landing controller who helps the flight controller perform a difficult and responsible job -- to ensure reliable landing of aircraft in the daytime and at night under normal and adverse weather conditions. The pilots know well their best landing controllers and have faith in them, and this serves as a worthy tribute to the officers who are responsible for the fate of the men. In our unit officers V. S. Sekirskiy and G. S. Mosin have proved to be able relief landing controllers.

They know that their main task is to ensure that the planes are brought out on the VPP [runway] accurately and safely. In order to perform this task outstandingly, officers Sekirskiy and Mosin prepare thoroughly for duty. They usually participate in the preliminary preparation for flights, where they familiarize themselves in detail with the nature of the forthcoming flights; they ascertain how the flight personnel have prepared themselves for landing by the system, they study the planned schedule, and they make the necessary excerpts from it. In addition, these officers acquaint themselves with the pilots who will be landing by the system for the first time.

In preparing for flights each one of our landing controllers carefully studies the guiding documents on making flights, the plan of cloud penetration and approach for landing at the given airfield, the relief of the terrain and the nature of its representation on the radar display units, the instructions on applying one landing system in conjunction with another, and familiarizes himself with the weather forecast for the flying day (night).

Right at the system he uses the operational documents and the reports of earlier shifts after a check of the system under current, and reports to the flight controller that the landing support facilities are ready for operation.

During the period of flying the relief controller is located at the mobile display units of the landing radar or, if these go out of commission, at the display units of the PRL [landing radar].

A plane has intercepted the landing course. Having established two-way communication with the crew that is approaching for a landing and having spotted and identi-

fied it on the scopes, the landing controller, if necessary, gives commands to change the flight regime in respect to course or glidepath, giving consideration to bringing the plane out smoothly on the course and letdown glidepath.

In directing a landing, G. S. Mosin, and the rest of our officers as well, strive to avoid superfluous commands and requests to the plane. They understand that this merely clutters up the air, distracts the pilot from piloting, and gives rise to nervousness and loss of confidence in him.

Both Mosin and Sekirskiy hold strictly to the following rule: they give the pilot commands only in the event the plane deviates from the course or letdown glidepath. When the pilot makes mistakes simultaneously in both course and glidepath, then they strive first to correct the worst and most dangerous mistake.

When the target blip appears below the letdown glidepath the pilot receives a command to discontinue further letdown. If the plane is deviating from the landing course by more than the limits established by the instructions, the landing is prohibited, as a rule, and the pilot makes a go-around. In all cases, the commands given to the plane are of utmost brevity, clarity, and intelligibility and are given always in a quiet voice. For example: 225, I am Oka, distance 15, turn right 10; or 225, distance 2, regime.

When clutter appears on the radar scope or there is sharp deterioration in the control of planes on the landing course (for any reason), the landing controller reports this to the flight controller and acts according to his instructions.

During the course of flights, Mosin and Sekirskiy do everything necessary in order to know the state of the weather at all times and how it might change in the area of the airfield. They never allow telephone conversations to distract them and categorically forbid anyone to enter or leave the PDP [mobile control-tower] truck in order to avoid clutter on the scopes (especially if static is observed).

At the conclusion of flying, every one of our landing controllers discusses the results of the flying with the personnel of the system's operating group and reports shortcomings to the flight controller.

At the critique, Mosin always makes his remarks to the pilots who have not completely mastered the procedure of using the system in landing, explains how it should be used, and thoroughly analyzes the most serious mistakes.

Such, in the main, is the work procedure of our best landing controllers. However, we also have some who sometimes do not carry out their functional duties and violate the requirements of the instructions on operating landing systems and other documents regulating flying. In such cases, flight safety is threatened.

Some landing controllers determine the position of a plane on the scopes "by eye" without laying out computed letdown glidepaths for the given type of plane, and do not record the most serious mistakes in the approach for landing. As a result, pilots who are inadequately prepared repeat mistakes and the program of combat training is carried out much more poorly.

It seems to us that for effective utilization of landing systems it is necessary to take into account the conditions of their location at airfields. The point is that the majority of our systems are situated at airfields that are bordered by terrain with complex relief, and this restricts the field of vision of the radars. In such a locality, in order to improve the visibility of the plane blips on the RLS [radar station] scopes, the maneuver for the landing approach must be set up on the basis of the specific zones of action of the radars. This principle must be taken into consideration every time in compiling the instructions for conducting flights at a given airfield and the other documents defining flight work.

In our unit, the zones of vision of the surveillance radar are given to all the flight personnel so that they will know firmly the areas and altitudes where a flight can or cannot be controlled.

How should sensible landing controllers with initiative be trained? Before beginning work at a new airfield a landing controller takes an examination. Under the direction of the instructor he lands 8-10 crews, half of them under adverse weather conditions and at night. In addition, he must know the equipment of landing systems, the location of the airfield radar facilities, the instructions on making flights at the given airfield, its area (relief) and holding zones, the plans of cloud penetration, the characteristic signs of the depiction of local objects on the display units, the results of a flight over the radars of the system, and the errors in their determination of range, azimuth, and altitude. Only by knowing all this well is it possible to direct a landing successfully.

At assemblies we have subjected to extensive discussion the question of uniform commands given by the landing controller to the pilot. In particular, various commands were suggested for correcting the position of a plane relative to the landing course.

Some thought that the corrective turn of a plane to the right or left in respect to the landing course should be given in degrees, others that it should be given in meters. After detailed discussion, the participants at the assemblies came to the uniform opinion that before the DPRM [outer homing radio beacon] is passed it should be indicated in degrees and, after passage, in meters. They also concluded that it is necessary to know well the linear dimensions of the course and glidepath scan on the display units of the landing radar.

In order that the landing controllers perfect their knowledge and skills and become outstanding specialists, trainer sessions are conducted with them systematically. During such trainer sessions they learn thoroughly where on the course and glidepath display units (of the landing radar) the corner reflectors, the outer and inner homing radio beacons, and the ground check points between the DPRM and the BPRM [inner homing radio beacon] are located; they study the nature of the representation of local objects. In addition, they memorize the letdown glidepaths of different types of planes and the safe angle of the plane's deviation from course in approaching for a landing, and they determine the brightness of the glow on the display units of the corner reflectors, the DPRM, the BPRM, and the localizers (for an approximate check of the sensitivity of the PRL [landing radar] receivers).

Constantly training themselves and training the crews of the RSP [electronic landing system] operating group in the use of the system for supporting landings under adverse weather conditions, every one of our landing controllers requires that the personnel know the equipment outstandingly and maintain it in constant readiness.

Thus we see how comprehensive must be the knowledge and the training of a relief landing controller in order that he meet the requirements of his job.

FLIGHT EVALUATION

Lt. Col. G. G. SEMENKO,
Military Pilot First Class

The flights for checking piloting technique were planned in two variants: if the weather conditions were normal, the check-out would be made in the practice zone; if they were adverse, a check-out would be made of the pilots' technique in piloting by instruments and in approaching for a straight-in landing using the landing system.

Among the pilots who were to be checked by the inspector were two officers with considerable work experience.

The weather turned out to be unstable: at times a seven-to-eight-point overcast developed, at times it was broken up. Having evaluated the situation, the commander made a decision to carry out the flights according to the first variant.

Having checked out the first pilot, who displayed outstanding quality in executing aerobatic maneuvers above the clouds and a high flying competency, the inspector flew out with the second. For the takeoff, the flight into the practice zone, and simple piloting maneuvers, the pilot received mainly excellent evaluations. In executing tight turns with the maximum possible bank, loops in an inclined plane, half-loops, rolls, and turns of the aircraft on ascending and descending verticals, he made deviations that did not permit evaluating these maneuvers higher than "satisfactory". For coming out at the airfield, approaching for the landing, and making the final approach and touchdown, the inspector gave outstanding marks.

However, the flight was evaluated "satisfactory", and the inspector suggested to the pilot's immediate superior that aerobatic maneuvers be practiced with him in the practice zone in a combat training aircraft. This surprised the pilot very much. After the flight an interesting conversation was held between the check pilot and the student that merits attention. The pilot thought that the evaluation of the flight should be made according to the principle of an arithmetic average of all the flight elements evaluated on the basis of the five-point system. And in actuality, after a simple arithmetic summation the general evaluation could have been higher than "good". However, the arithmetic method of evaluating flight training is beneath criticism.

Having been a witness to this conversation, I looked through the pilot's flight log. It developed that in previous checks he had also made similar mistakes. Des-

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pite this, his check flights had been evaluated by the commanders in general as "excellent" and "good", and his training flights for aerobatics in the practice zone only as "excellent". In our opinion, it is such fallacious practice that was the main reason for shortcomings in this pilot's piloting technique.

In the given case, the inspector acted absolutely correctly. If he had made the evaluation by the average of the points, then, just as before, behind it would be hidden individual shortcomings in the piloting technique and nothing would have been done to eliminate them.

Unfortunately, there still are occasional commanders who do not evaluate the flight of a pilot being checked quite correctly. Making a general evaluation according to the principle of the arithmetic average, these commanders do not see the principal evil: hidden behind the formal rating is not only a barely satisfactory but in some cases even a poor training of the pilots. It is not difficult to comprehend what this leads to.

But why do they not notice what is hidden behind an average evaluation of a flight? Apparently it is because they are not always guided by the fact that in flight training there are no elements of little importance, that a deficiency in the training of a pilot that appears very insignificant at first glance may lead to very serious consequences. That is why we fight so that all the elements of flight training without exception be constantly considered by the commanders.

It is known that the basis of successful training of the flight personnel for combat operations under various conditions is high quality in individual piloting technique in the daytime and at night in the pattern, in the practice zone, and by instruments. The acquisition of firm skills in piloting a plane by a pilot depends not only on the training commander's art in a combat training plane but also on his ability to determine the degree to which the trainee is mastering the elements of flight and to evaluate the flight objectively.

A commander develops his methodological evaluation skills both in flights in a combat training plane in teaching the pilot and in checking him. Those people are mistaken who believe that for the evaluation of a flight it is enough to know only the norms and, guided by them, to give a mark for each element performed by the pilot and then to make a general evaluation. The general evaluation should be made with consideration of the observations and the general opinion developed by the check pilot in regard to the pilot for the entire flight. Very important for the check pilot is the ability to take into consideration how quickly the trainee (the one being checked) determines deviations in piloting the plane and to what extent he corrects them in time, at what stages of the flight and to what extent he had to give assistance, resorting to prompting over the SPU [aircraft intercom system] or personal interference in the control.

Let us analyze, for example, a flight to teach a pilot the approach for a straight-in landing from above the clouds by the system at the established weather minimum. Let us assume that the takeoff, the penetration of the clouds upward, the entry to the homing radio station, and the setting up of the maneuver for the landing approach were performed by the pilot for grades of "good" and "excellent" according to the evaluation norms. In the turn onto the landing course the pilot made a mistake of 15° in direction. After extending the landing gear and the flaps and establishing the appropriate speed, he put the plane into the descent. In the process of descend-

ing, he corrected the error in direction on instructions from the commander. To an altitude of 1000 m he descended for an evaluation of "good"; from the altitude of 1000m he did not maintain the vertical speed, and for this element of the flight he received an evaluation of "satisfactory"; while from the altitude of 500 m to passage of the DPRM [outer homing radio beacon] he piloted the plane jointly with the check pilot. He executed the final approach and the landing for "excellent".

If this flight is evaluated as some commanders would evaluate it, the pilot could be given a good evaluation. But is this correct? Obviously, no. After all, the pilot made serious mistakes when piloting the plane himself, and he performed the main elements of the flight -- descent to the landing course and further piloting of the plane to the moment of passing the DPRM and visual spotting of the VPP [runway] -- jointly with the commander.

Such examples are encountered most frequently in the practice of checking, especially when the flight personnel are being taught under adverse weather conditions by inadequately experienced instructors. Although rarely, it still happens that an instructor with insufficient experience, checking how a pilot makes the landing approach at the established weather minimum, because of fear of not coming out on the runway, pilots the plane unnoticed by the pilot until the DPRM is passed and gives him a general evaluation of "good" or even "excellent". And yet on this basis the pilot is permitted to go on training flights in a combat plane. He is sent on such a flight without having firmly developed skills in the most difficult elements of flight -- that is what an improper flight evaluation sometimes leads to.

We would very much like to dwell on yet another such example. In piloting a plane by supporting instruments with the static line of the PVD [pitot tube] turned off or with the gyrohorizon switched off, a pilot commits deviations of short duration in speed, altitude, and course at different stages of the flight. True, these deviations do not go beyond the limits of "good" evaluations. But can a good mark be given for such a flight as a whole? I think not. And this is why. The commander should take into account not only the magnitude and duration of the deviations but also the facts as to how timely and correctly the pilot determines the failure of individual instruments, whether he shifts his attention to substitute instruments properly, and how confidently he pilots the plane by their readings.

In our opinion, some commanders do not evaluate with sufficient objectivity the results of checks of fighter pilots in navigation. They consider the principal rule to be maintenance of speed, altitude, time, and course of the flight that ensure accuracy in maintaining the assigned route. But the accuracy in coming out at the turning points (at the target) at the assigned time, which is an inseparable part of the general evaluation of navigation, is often not considered. This leads to carelessness on the part of the flight personnel in practicing a very important element -- aircraft navigation -- especially in flying a combat plane when ground check points are not visible by eye. Also bad is the fact that the crews of ground radar stations are not always brought into teaching pilots accurate entry on the target at the assigned time, while the diagrams of the way they fly the planes along a route are sometimes not even used in evaluating the flight.

That is how matters stand in regard to general evaluation of a training or check flight in a combat training plane.

How then to evaluate a flight in a combat plane? This question is also very crucial and it arises among a large number of commanders. For example, take a flight for piloting in the practice zone in the daytime or at night, as well as other flights under conditions when visual observation from the ground is impossible and there is no special apparatus that permits checking all elements of the flight. In this case, in the opinion of some commanders, grades should be given for the flight elements that can be observed visually (takeoff, approach for landing, accuracy of final approach, touchdown, etc.) in accordance with the norms of the five-point system, while the rest should be noted in general -- "performed exercise" or "did not perform".

But how to determine whether the pilot performed the exercise or not? In order to answer this question, it is suggested that all the shortcomings and deviations that he himself noticed in the process of carrying out the mission be first discussed with the pilot (from his report). We think that this alone is far from enough. In order to determine the quality of the exercises practiced in a combat plane, checking in a combat training plane should be resorted to periodically.

An evaluation of "did not perform" for some exercise or another must without fail be supplemented by an indication of the circumstances that were the cause of this. If the pilot did not carry out the mission because of lack of confidence or as the result of serious errors and inability to correct them, all the errors must be thoroughly analyzed with him on the ground, then a check flight must be made, and only after that can he be sent out again in a combat plane.

In evaluating aerial combat, firing of combat weapons at ground or aerial targets, as well as exercises in tactical flight training, the commander must take into consideration a whole series of elements that comprise a single whole in the given exercise. Thus, the quality of aerial combat is composed of evaluations of the tactics in waging it, the technique of maneuvering, and the results of photogunnery, with the tactics and the maneuvering in the course of the battle being evaluated directly by a commander participating in this battle. The commander also takes into consideration the precision and rapidity in executing commands which vector the plane to the aerial "enemy", the search, surprise and swiftness of closure with the "foe" from the moment he is spotted to gaining the initial position for attack, the correctness of the pilot's (group's) decisions and actions in gaining the initial position, maintenance of tactical and fire cooperation in the group of attacking fighters, the actions in pulling out of the attack and in repeating it, and also evasion of a strike, disengagement from the battle, and assembly.

In making a general evaluation of an aerial battle, the commander compares the results of the photogunnery of both sides and the elements enumerated above, and determines which side (pilot, group) had the advantage.

The general evaluation of an exercise in firing at ground targets and aerial tow targets is composed of evaluations of the results of the firing and the maneuvering. In evaluating the maneuvering of a pilot (group) during firing at ground targets, consideration is also given to how accurately he maintained the assigned speed and altitude of going into the dive, the established altitude for pulling out of the dive, the assigned combat formation of the group in approaches and attacks, whether the AA evasion maneuver and repeat attacks were properly executed, the time of assembling the group into a combat formation after the attacks,

The commander obtains the data for evaluation of the maneuver in firing at ground targets from the flight controller on the range for each pilot individually and

for the group as a whole. In giving a grade for maneuvering during firing at aerial tow targets, the commander also takes into consideration whether the pilot properly took up the initial position before the attack and whether he maintained the assigned range and target course angle at the moment of firing. The first data are taken from the report of the tow plane, the second are obtained from an analysis of the photo film.

If there are no remarks on the maneuvering, the grade for an exercise in firing combat weapons (photogunnery) at ground and aerial tow targets is given in conformity with the established norms. If, however, the pilot's maneuvering in attacking the target is not entirely satisfactory, the commander reduces his grade for the exercise, but he must without fail explain the reason for the reduction.

If the pilot has made mistakes that threatened flight safety, a grade of "unsatisfactory" must be given for an exercise in aerial combat, gunnery, and photogunnery at ground targets and aerial tow targets, irrespective of the results of the photogunnery or the firing of combat weapons.

And how to evaluate correctly an exercise in aerial combat or aerial gunnery performed by a pair, an element, or a squadron? If the guide used in this is the norms of group flight for combat employment, then individual pilots who have not even carried out the task set may receive "good" or even "excellent". It is quite clear that such a methodology, if one may call it that, of evaluating group exercises cannot serve as a stimulus for improving the combat skill of a pilot and brings enormous harm to the combat training of a subunit or unit.

In order to avoid this shortcoming, it seems to us, it is best to give each pilot participating in the flight two evaluations: in the numerator -- the evaluation received by the group; in the denominator -- an individual evaluation for firing from combat weapons at ground (aerial) targets or for photogunnery in aerial combat.

With such a methodology, the commander will always know the level of training of the pair, element, or squadron, and also of each pilot individually and, in accordance with this, will be able to take steps to improve the quality of training of the lagging pilots and groups.

In addition, in making a general evaluation of a flight for a single pilot or a group, especially in practicing combat employment, the commander must constantly take into consideration such important factors as manifestation of reasoned initiative and strict observance of flight discipline. The commander can judge this either by his own observations or by the conclusions of the flight controllers on the range, the commanders of the target plane crews, the tow plane crews, and the crews of command posts (PN) [vectoring post] who do the vectoring and exercise control over the execution of the mission.

We have examined only opinions about the evaluation of flights in certain forms of flight training as expressed by the commanders of leading units and subunits. These suggestions, without a doubt, do not exhaust by far all the methods of evaluating a flight and require extensive creativeness from the commanders.

Every air commander must remember that not a single omission in flight work brings such detriment as non-objective evaluation of a pilot for a flight. Only this can explain many flight accidents and causes of them that arise because flight personnel are inadequately trained.

And conversely, proper and objective evaluation excludes the possibility of un-

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trained pilots flying out in a combat plane and, consequently, improves the quality of combat training of the subunit and unit as a whole.

AN INSTRUMENT FOR CONTROLLING AIRCRAFT FLIGHTS UNDER ADVERSE WEATHER CONDITIONS

For controlling aircraft flights by the system and along a route, we make use of an instrument (Fig. 1) designed by officer Yu. F. Negonov.

This instrument makes it possible to control the flight of aircraft and helps to evaluate the precision with which the pilot maintains the flight regime and the computed data in cloud penetration. In addition, it gives the flight controller and the duty vectoring officer the opportunity to follow the movement of aircraft in space constantly. For this it is enough to cast a quick glance at the instrument, where the movement of silhouettes of the aircraft can be seen, and then at the RLS[radar station] control plotting board, after which the appropriate corrections are made.

This instrument serves also as a valuable visual aid in teaching pilots flying by the OSP [instrument landing] system. With the aid of a supplementary mechanism, it is possible to follow aircraft in the piloting zones.

A control panel is situated on the face of the instrument. The instrument is powered by a type 2PP-40 direct-current electric motor (1) of 18.5 volts (Fig. 2). The speed at the outlet shaft is 4100 rpm. On one end of the armature there is a fan to cool the motor; fitted on the other is a worm reduction gear (2). The speed at the outlet is 93.75 rpm. Fitted to the outlet shaft of the reducer is a single-cut worm (3), which transmits rotation through gear (4) to the shaft of the friction disk of the timer (5). The friction disk, 185 mm in diameter, makes 0.788 rpm. For better engagement, its working side is faced with leather.

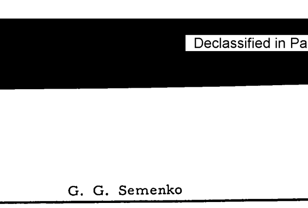


Fig. 1. Overall view of the control instrument: 1 -- V-belt; 2 -- silhouette of plane on a special mounting; 3 -- signal control case; 4 -- box for storing the aircraft silhouettes; 5 -- rheostat; 6 -- voltmeter; 7 -- current switch; 8 -- signal system switch; 9 -- pilotage zone switch and lights.

From this disk, motion is transmitted to a movable friction roller (6), 38 mm in diameter, which makes from 0.75 to 2.5 rpm. Fitted to the upper end of the friction roller is a cylindrical gear (7), the motion from which is transmitted to drive gear (8).

The working regime in respect to time (altitude) is set in by means of timer knob (9), which is connected to microscrew (10) through a shank. When the latter is rotated, motion is transmitted to a movable forked nut (11), on the fork of which is located a movable rubber friction roller.

The readings of the assigned regime are transmitted by means of a link mechanism (12) from the forked nut to a movable pointer with an index. The readings are taken off the time scale (13), which is set on the outside of the instrument case. Fitted to the upper end of the shaft of the drive gear is a drive roller (14). Its working diameter is 52 mm. This roller is given a range of rotation from 0.15 to 0.5 rpm, thus changing the speed of the V-belt system. The latter consists of one drive roller and five driven rollers (15), a V-belt with a flat belt (16) attached to it, a contact signalling system (17), and movable aircraft silhouettes (18) with terminal switches.

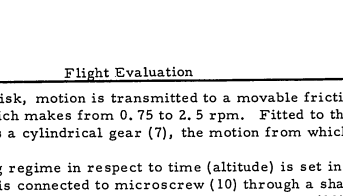


Fig. 2. Schematic diagram of the instrument.

The reciprocal position of the axes of the rollers of the V-belt system depends on the regime and profile of the flight in penetrating the overcast. All the magnitudes are maintained in scalar time proportions. The V-belt makes a complete turn in 10-70 minutes (depending on the time or echelon established). Its functional length is 1225 mm.

When a plane is flying at the assigned echelon and passes the DPRM [outer homing radio beacon], the signal system goes into operation.

At the SKP [flight-line command post], the control instrument is operated by the duty vectoring officer together with the flight controller. Depending on the echelon, the initial data, taken from the table, are set in on the instrument. When a plane takes off, a silhouette with its index number is placed on the V-belt band opposite the code "Takeoff". As the plane moves through space, its silhouette moves correspondingly on the instrument, on the condition that the pilot maintain the assigned regime. If, however, the regime is not maintained, the vectoring officer, utilizing the data from the RLS plotting board, makes corrections on the instrument or transmits them to the pilot through the flight controller. The reports of the pilot at certain stages of the flight are also used for control.

The instrument is mounted on a wooden panel. Its side walls are made of plywood. It is very simple in construction and can be built in the unit. The instrument works without any failure and has received universal recognition among us.

Guards Col. B. A. ABRAMOVICH.

WIND-DATA SERVICEABLE PERIODS

Engineer Col. K. K. GARIFULIN,
Candidate of Physico-Mathematical Sciences

The wind, just as other meteorological factors, has a substantial effect on the work of aviation. On the knowledge and proper consideration of its velocity and direction depends precision of bombing and accuracy of navigation. In many cases, the wind has a strong effect on flight safety, as for example, in a jet-stream zone or in landing aircraft. That is why data on the wind are among the most important elements of which pilots and navigators must be absolutely certain.

In practice, however, a certain time almost always elapses from the moment of determining the wind to the moment of utilization of the data on it. Depending on the methods of measurement and processing, as well as on the method of transmitting the data, the time gap may attain several hours. Thus, in the radar method of sounding the atmosphere above 10 km, the processed information on the wind may not be received until 1-2 hours after the measurement. In addition, it is necessary to take into consideration the intervals between observation times. If the observations are made 4 times a day, i.e., every 6 hours, the greatest duration of utilization of the data attains 7-8 hours; in sounding twice a day it is 13-14 hours. Of course, the wind does not remain constant during this time.

The characteristics of variability of the wind in time make it possible to evaluate what errors may arise in utilizing the wind when a certain interval of time has elapsed after measurement, or during what period it is possible to use the data on wind measured earlier with a permissible accuracy given in advance. This period is called the serviceable period of the data.

The processing and analysis of a large number of observations on the wind at high altitudes have given us the opportunity to study the variability of wind in time. This was based on quite accurate data from more frequent observations made with the aid of radar and the base method in our area over a period of several years.

Since wind is a vector magnitude, it is desirable to examine separately the variability of its direction, velocity modulus, and vector (Fig. 1).

In Fig. 1, α_0 and V_0 are the direction and velocity of the wind at the initial moment of time; α_t and V_t are the direction and velocity of the wind after a time interval t; $\Delta\alpha$, ΔV and $\Delta\vec{V}$ are respectively the changes in the direction, velocity modulus, and vector of the wind during time t.

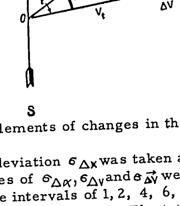


Fig. 1. Elements of changes in the wind vector.

The mean square deviation $\sigma_{\Delta x}$ was taken as the main characterization (measure) of diffusion. The values of $\sigma_{\Delta\alpha}$, $\sigma_{\Delta V}$ and $\sigma_{\Delta\vec{V}}$ were calculated to a level of 18 km for every kilometer at time intervals of 1, 2, 4, 6, 12, and 24 hours separately by seasons and eight graduations of velocity. The total number of cases for calculating $\sigma_{\Delta\alpha}$ and $\sigma_{\Delta\vec{V}}$ to an altitude of 10 km was 11,253, and for $\sigma_{\Delta V}$ it attained 16,027. For altitudes of 12-18 km this comprised 1320 and 4275 cases, respectively.

Analogous data to an altitude of 9-10 km were computed for a comparison of the results from materials of stations in other areas also.

A detailed analysis made it possible to draw the following basic conclusions.

The variability of a wind of given velocity (at the initial moment of time) is practically the same in all seasons of the year and at all altitudes in the troposphere, i.e., in the layer from 1 to 10 km. No marked dependence of it on the geographical position of the locality and synoptic conditions (the state of the weather) was observed.

In the lower stratosphere, i. e., in the layer of 12-18 km, the variability of wind velocity is practically no different from its changes in the troposphere, but wind direction is 1.5-2 times more stable. This difference increases as the velocity

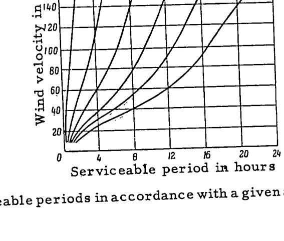


Fig. 2. Serviceable periods in accordance with a given accuracy of wind direction.

Table I
Serviceable Periods of Wind Sounding Data in Hours (Example)

Altitude in km	Wind		Permissible norms of variability		
	Direction in °	Velocity km/hr	$\sigma_{\Delta\alpha}=20°$	$\sigma_{\Delta v}=10$ Km/hr	$\sigma_{\Delta\vec{v}}=20$ Km/hr
1	2	3	4	5	6
2	182	15	1,0	5,8	8,0
4	225	29	2,8	5,0	6,7
6	241	75	8,0	2,8	3,8
8	252	100	9,5	2,0	3,0
10	257	148	12,0	1,2	2,0

of the air flow decreases.

The principal index of the structure of the wind at all altitudes is its velocity at the initial moment of time. The stronger the wind the more stable is its direction, but the pulsation of the velocity itself is greater. The characteristics of variability for different initial velocities may differ from each other by several times. Therefore, the serviceable periods determined by a time interval, at the expiration of which assigned or permissible values of change in the wind are attained, should be evaluated with consideration of the velocity of the initial wind.

In practice, it is more convenient to determine the serviceable periods by nomograph data (Figs. 2-4 are charts for the 1-10 km layer).

Various permissible values of the elements of wind variability are shown on each figure by several curves. Laid out on the vertical axis is velocity in km/hr; on the horizontal axis are the serviceable periods in hours. Knowing the velocity of the wind at the given altitude and the given norm of variability ($\sigma_{\Delta\alpha}$, $\sigma_{\Delta V}$ or $\sigma_{\Delta\vec{V}}$), it is possible to determine the serviceable periods of wind sounding data.

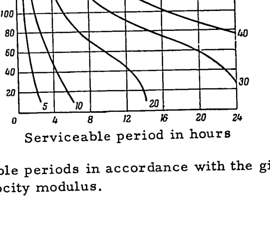


Fig. 3. Serviceable periods in accordance with the given accuracy of the wind velocity modulus.

Let us assume that the distribution of the wind at different altitudes (columns 1, 2, and 3 in Table 1) is obtained as the result of sounding. Let the permissible values of variability be: $\sigma_{\Delta\alpha}=20^{\circ}$; $\sigma_{\Delta V}=10$ km/hr; and $\sigma_{\Delta\vec{V}}=20$ km/hr.

Using the curves corresponding to these tolerances, we find for each altitude (in accordance with the wind velocity at that altitude) the unknown serviceable periods (columns 4, 5, and 6 in Table 1).

A difference in the serviceable periods of data on the wind at high altitudes appears more clearly the greater is the change in wind velocity with altitude. Only with a velocity that changes but little with altitude, which is found very rarely, is it possible to determine uniform serviceable periods for large layers or even for the sounding as a whole.

The graphs (Figs. 2 and 3) can also be used for an approximate evaluation of the serviceable periods of wind data in the lower stratosphere. Inasmuch as the variability of the velocity modulus of the wind in the 12-18 km layer is practically no different from its variability in the troposphere, the procedure of using the graph in Fig. 3 is the same.

In order to use the graph (see Fig. 2) for high altitudes, as a consequence of the greater stability of wind direction in the lower stratosphere, it is necessary first to multiply the permissible norm of variability $\sigma_{\Delta\alpha}$ by 2 at wind velocities of 15-30 km/hr or by 1.5 at velocities greater than 30 km/hr.

Let us assume that the wind, measured in flight at an altitude of 15 km, has a direction of 310° and a velocity of 25 km/hr. It is required to determine the segment of time during which this wind can be used with a permissible mean square change of 10° in wind direction. Since the velocity of the wind is less than 30 km/hr, we multiply 10° by 2. By the wind velocity of 25 km/hr and the permissible variability of $10 \cdot 2 = 20^{\circ}$, from the graph (Fig. 2) we find the unknown serviceable period to be 2 hours.

Or, the wind measured at the same altitude is: 170°, 60 km/hr. With no change in the required accuracy of its direction $\sigma_{\Delta\alpha}=10^{\circ}$, we obtain a serviceable period of 4 hours.

There arises the question: What is the reliability of the results obtained? By the theory of probability it is known that the assurance of the mean square deviation of a random value which is subject to the normal law of distribution is approximately 68%. This means that at the expiration of the serviceable periods found, the actual changes in the wind will not exceed on the average the given or permissible values of variability in 68 cases out of a 100.

By the graphs (Figs. 2-4), it is possible to determine the serviceable periods with a greater probability also, on the order of 95%. In this case, it is necessary to use the curves corresponding to half the value of the permissible change in the wind. For example, if 20° is used as the permissible change in wind direction with a probability of 95%, then the unknown serviceable period must be determined from the curve $\sigma_{\Delta\alpha}=10^{\circ}$.

The possibility of using such a method has been strictly validated mathematically in the course of investigation.

It should also be noted that the permissible norms of wind variability ($\sigma_{\Delta\alpha}$, $\sigma_{\Delta V}$ and $\sigma_{\Delta\vec{V}}$) should be established by the user, on the basis of the specific tasks and the

required accuracy of the data.

Fig. 4. Serviceable periods in accordance with the given accuracy of the wind velocity vector.

THIS IS VERY GOOD

THE COMMUNISTS OF X UNIT PROPOSE SETTING UP AN EVENING ENGINEERING-TECHNICAL UNIVERSITY FOR PILOTS

The competition for most rapid execution of the decisions of the June Plenum of the CC of the CPSU is growing with every day.

It is as though the people had grown wings! New obligations, new plans, a new surge of patriotism -- that is what is characteristic of these days.

Also going in the common formation of all the people are the pilots and navigators, the engineers and technicians of the Air Force. The decisions of the Twenty-First Congress of the Party and the recently concluded Plenum of the Central Committee of the CPSU call them to move forward even further. The grandiose achievements of the country of triumphant socialism are inspiring the fighting men to selfless performance of their duty to the Motherland, to further increasing the combat readiness of the units and subunits.

It is with just these thoughts that the Communists of the X fighter unit are now living. The decisions of the June Plenum of the CC of the CPSU have suggested much to them, have induced them to interpret their work in a new way. And that is why at a Party assembly at which these historic decisions of the Party were discussed the Communists talked ardently of those possibilities, the utilization of which would make it possible to raise the level of the combat training of the personnel.

Addressing the Communists, air commander Military Pilot First Class I. A. Kuznetsov remarked that the aircraft now used as equipment are fundamentally different from those that existed in the early postwar years. Also expanded considerably is the range of tasks that our airmen must now resolve. Furthermore, these tasks are unceasingly becoming more difficult. That is why every pilot, every engineer and technician, every member of the crew, whether he is on the ground or in the air, whether he is carrying out a combat mission or is preparing the equipment for flying, must know his weapons to perfection and must be able to use them technically competently in battle. Permeated with concern for raising the level of the engineering and technical knowledge of the pilots, as a pressing and imperative task, were the addresses of military pilots, Communists F. S. Ponomarev, A. I. Nezyayev, L. V. Kositskiy, V. N. Kaindin, officers G. F. Semikin and M. T. Nikanorov, and many others.

In the opinion of these comrades, the knowledge acquired during the course of training does not conform to the extensive range of tasks confronting the airmen. In this, consideration is not being given to such important factors as the continuous improvement of equipment and the appearance of new automatic electronic and other apparatus. After all, this makes it necessary to improve and augment continuously the knowledge of the men operating the equipment, to live not only in today but also to look to the near future and prepare for it.

These problems have become imminent; they disturb everyone. Here is Military Pilot First Class Maj. F. S. Ponomarev. He is an able commander, a good pilot who has successfully mastered the piloting of a modern fighter under normal and adverse weather conditions, in the daytime and at night. However, he is convinced that nowadays it is no longer enough for a pilot to know the construction and principles of operation of only some one type of apparatus, assembly, or engine, that he must have a more profound knowledge of the theoretical principles of aerodynamics, thermodynamics, physics, radio, electronics, the structure and strength of aircraft, theoretical mechanics, etc.

More extensive knowledge will help the flight personnel to achieve new successes in combat training and make it possible to find the proper decision under the difficult conditions of a flight. After all, pilots often encounter considerable difficulties in mastering high-speed aircraft with complex airborne equipment. However, these are difficulties of yesterday. Modern equipment requires more profound knowledge and greater volume in the general engineering and technical training of the pilots.

The pilots of the unit understand that a combination of work and study, raising the general educational and engineering training to the level of the Party's requirements, is their main task. In addition to daily combat training and concern over outstanding condition of the aircraft, they decided to improve their technical knowledge, to become comprehensively competent specialists.

Having discussed the decisions of the Plenum of the CC of the CPSU, the Communists of the unit accepted obligations to learn the principles of aviation sciences even more completely and profoundly, to improve the operation and maintenance of the equipment entrusted to them, and at the same time to extend their knowledge in the field of aerodynamics, aircraft and engine design, on the basis of studying theoretical disciplines.

How to carry out these tasks in practice?

<u>Striving to keep in step with the development of technology, the Communists of the unit suggested setting up an engineering-technical university, the aim of which would be to give the pilots firm military-technical knowledge, to study the theory and practice of aviation.</u>

It is difficult to say now what forms this training will take, but the proposition that creation of such a university will strengthen the combat might of the unit and will increase its combat readiness creates no doubts whatsoever.

The airmen propose to organize the studies on the pattern of evening schools, including in the program a whole series of disciplines that are not being studied in the plan of general technical training. For instruction in the university, it is proposed to bring in engineers of the unit and the command.

The Communists of the X fighter unit appeal to all the pilots of the air units of the VVS [Air Force] and the PVO [AA defense] with a suggestion that they discuss their undertaking. (<u>From the Editors.</u> In publishing this article, the editors support the initiative of the Communists of the X fighter unit and ask their readers to share their views on how best to organize training in engineering-technical universities for pilots.)

COMPLEX CONTROL AUTOMATION FOR FLIGHT VEHICLES

Maj. Gen. of the ITS [Engineering and Technical Service] V. A. Bodner, Professor, Doctor of Technical Sciences

Current successes in aircraft and rocket building are indissolubly associated with achievements of the scientific and technical thought of our age in the field of automation and telemechanics. At the present time it is difficult to imagine combat operations by aircraft without extensive use of very diverse facilities of automation, radio electronics, and computer technology.

Further development and improvement of flight vehicles (aircraft, helicopters, rockets, etc.) and improvement of their performance characteristics are also impossible without control automation. Automatic devices (autopilots, autonavigators, various kinds of regulators, and other automatic mechanisms) not only facilitate the work of the crew members but in a number of cases also promote an improvement in the performance of aircraft. As concerns the use of unmanned flight vehicles, it would be utterly unthinkable without systems of automatic control.

The need for automation of modern aircraft is due to a whole series of reasons. The continual increase in speeds and flight altitudes is associated with changes in the aerodynamic forms of the aircraft and requires acceleration of all the processes of control and a sharp reduction in the time for making a decision. This means that under these conditions appropriate instruments must come to the aid of the crew.

As a matter of fact, man, despite the high perfection of his sense organs, is capable of apprehending directly only a limited portion of the phenomena that occur in nature. Man's vision, for example , can distinguish only a small part of the spectrum, while his hearing is limited to a few octaves and does not perceive mechanical oscillations with a frequency of above 15-20 thousand periods, etc.

Man's sense organs are unable without auxiliary devices to perceive phenomena that occur at great speeds, or to give a quantitative evaluation of the processes observed and compare them to each other objectively. True, the pilot and other crew members are helped by instruments that register this or that phenomenon. In modern aircraft, however, the amount of information on flight regimes, on the work of power plants and other equipment has grown so much that the crew is not able to process all these data and make a decision in time.

To the aid of the crew come various automatic devices and entire systems. They not only show in figures the processes and phenomena measured but they also call forth appropriate changes in the positions of the control levers, in the magnitudes of electric current or voltage, in the level of pressure in pneumatic and hydraulic systems, or in the parameters of other physical magnitudes used to influence the control elements of flight vehicles.

While previously the accuracy of control of an aircraft was determined primarily by the individual qualities of the pilot, his knowledge, his capabilities, the state of his health, in automatic systems this is provided by appropriate mechanisms.

The need for extensive application of automation and computer technology facilities is due to both the tendency to reduce the number of crew members and to improvement in flight safety. The role of automation grows even more in carrying out tasks of navigation, bombing, gunnery, and vectoring to aerial and ground targets.

While in the not-too-distant past aircraft had only a few simple instruments, expenditures for the manufacture of which comprised an insignificant percentage of the cost of the airframe and engine, at the present time their proportion has grown so much that these expenditures have exceeded fifty percent of the total cost of the aircraft. The electric power required by the equipment exceeds 100 kw in some cases.

The dynamic properties of aircraft (stability, controllability, damping) are not always satisfactory. Attempts to improve them by changing the design lead to deterioration of aerodynamic forms. That is why there arises the task of improving the stability and controllability of aircraft by automatic facilities. Finding application here are automatic stability and damping devices, which may be built in the form of autonomous mechanisms or may be composite parts of a general control system (for example, autopilots).

Dampers and automatic stability devices are varieties of semi-automatic control systems. In such systems, participation of the operator (pilot) in transmitting information is provided for. Gathering the information, processing it, and working out the commands are done by a computer. The pilot merely transmits the commands received from the command instrument to the control elements. Of course, the control of the aircraft is considerably facilitated by this.

For controlling the reactions of an aircraft to command signals, semi-automatic systems provide for the use of panoramic instruments, on which the position of the aircraft is displayed

It is possible to conceive that the movement of every flight vehicle consists of angular travel and the motion of the center of the mass. When there is no need for the aircraft to fly accurately along an assigned trajectory in space, the control is limited to only the angular travel. This is due to the fact that a flight vehicle must occupy a fully determined position in space in respect to the vector of the speed of the center of the mass. An example of a system of automatic control of the angular travel of an aircraft is the autopilot.

Extension of the tasks confronting aviation has led to making systems of automatic control more complex. Thus, a turn in the horizontal plane is executed by means of automatic directional control devices, while for guiding the movement of the center of the mass along the assigned trajectory automatic altitude and lateral control devices are used. These automatic devices are usually component elements of the autopilot, which is due to the fact that the very same control surfaces and ailerons are used for controlling angular travel and the movement of the center of the mass.

In connection with the increase in flight speeds and altitudes and the decrease in the time the aircraft encounters the target, there has arisen a need to automate the vectoring of the aircraft both to ground and to aerial targets.

The fighter pilot of a modern aircraft, operating in the system of the automatic PVO [AA defense] center, receives the signal vectoring him to the target not in the form of a voice command by radiotelephone but by means of its direct delivery to the autopilot. The aircraft goes to meet the target without the participation of the pilot. When the distance has decreased so much that fire from the airborne artillery and rocket weapons becomes effective, the automatic device is actuated and the target is fired upon.

Further extension of the functions of the autopilot is associated with the need for automating homing to the area of the airfield, the approach for landing, the landing, and the takeoff. The latest designs are already equipped with appropriate automatic devices that direct the flight on the glidepath.

In group flights of aircraft it is necessary to maintain certain space or time intervals. This makes control more difficult, since there arises the need to measure the intervals and distances by means of automatic devices. Automatic control of time intervals and the time of arrival at an assigned point (for example, at the airfield) is exercised by means of changing flight speeds or maneuvering in course and altitude.

The flight of an aircraft, as is known, is accompanied by the influence on it of external forces and moments which result in G-loads. Inasmuch as the strength of the construction is limited, the acting G-forces must be limited also. Consequently, the systems of control must effectively counteract external disturbances (gust of wind), without at the same time permitting sharp movements of the control surfaces of the aircraft.

Modern autopilots for changing dangerous G-loads and banks include sensing elements, the signals from which are used for control.

In order that a combat mission be carried out under optimal conditions, the flight of the aircraft must be economical. This is possible only when the changes in the parameters of the regime take place according to a certain law with the aid of optimalizing systems of automatic control. Such systems are based on extensive use of computer technology.

The flight of an aircraft is not always made by the simplest trajectory (a straight line). Often there arises the need for maneuvering. Obviously, under these conditions the optimal trajectory of the movement of the center of the mass of the aircraft will be the one that assures the greatest effectiveness of the aircraft.

For flight by such a trajectory, the control systems are supplemented by a special programming device which gives the optimal flight trajectory. If necessary, the program can be changed. For this there are supplementary devices for collecting information on the situation and for feeding this information into the control system.

In the course of the flight, the dynamic characteristics of the aircraft (damping, stability) often change. Under different flight conditions, however, different control actions are necessary to parry the very same disturbances. Obviously, under these

conditions a uniform quality of the transition process can be obtained only when the parameters of the control system change in conformity with the situation.

Such systems of automatic control are called self-adjusting.

Self-adjusting autopilots have a number of advantages over conventional ones. They are lighter in weight and smaller in dimensions, and they have greater reliability and universality of application.

Until recently, only individual stages of the flight were automated (route flight, vectoring to a target, etc.). Such automation, called partial, has received considerable development in recent years. It has promoted improvement in the performance characteristics of aircraft. In a number of cases, use of flight vehicles is impossible without such automation.

However, partial automation, especially on supersonic aircraft, is not enough. Therefore, there arises the need of creating systems of complex automation of flight vehicles, i.e., a change from individual instruments and mechanisms to measuring systems, from isolated automatic regulators to complex systems of automatic control with central computers.

What do we mean by the term complex automation?

This means automation of all the consecutive functions performed by flight vehicles (preparation for flight, takeoff, route flight, maneuvering in the area of the target, employment of the weapons, return to the home airfield, approach for landing, landing, etc.) while providing optimal characteristics (accuracy of vectoring, weak reaction to disturbances, precision in executing commands, optimal trajectory, etc.). A mandatory requirement for complex automation is a minimum possible number of elements, i.e., adequate simplicity and reliability.

Included in the system of complex automation of the aircraft are piloting and navigational instruments that ensure obtaining comprehensive information on flight regimes, the attitude of the aircraft, the aerial situation, etc. The computing center of the system processes the information for carrying out the tasks of navigation, bombing, firing, etc.

The program mechanism gives the flight program, while the instruments of simplified control give information on its regimes.

The most important part of the system of complex automation is the navigational system, which serves for obtaining information on the various navigational elements. The navigational systems used on modern aircraft, principally radio and radar, do not have adequate noise protection, range of action, accuracy, or reliability. Autonomous navigational systems, including inertial systems, are free of these shortcomings. Inertial systems of navigation acquire especially valuable qualities when they are combined with Doppler systems. Obviously, in the future they will win a leading place.

Automation is boldly entering aviation. However, no matter how automatic the flights of flight vehicles, the basic functions in effective utilization of them as combat weapons remain with man. Although the foreign press remarks on the enormous possibilities of automating different processes by using high-speed electronic devices, such machines cannot replace man completely. Even the most perfect automatic device and mathematical computers solve logical tasks and perform automatic operations only by programs which were developed by man in designing and adjusting them.

In the process of automation, the number of people (for example, the crew of an aircraft) guiding the flight and handling the complex aircraft equipment is reduced, but the number of people servicing the various mechanisms, automatic devices, and systems on the ground is increased; greater demands are also made on their skills. The ratio between the operating personnel and the technical personnel changes.

One of the main tasks in developing systems of automatic control is increasing their reliability and, consequently, the safety and effectiveness of the flight. The principal ways of solving this problem are increasing the reliability of the individual elements of the system, supplying (duplication) of its critical parts, use of automatic safety devices and self-adjusting systems. If the systems of automatic control are reliable enough, use of them will permit not only improving the performance characteristics of flight vehicles but also increasing general flight safety.

The spheres of application of radio electronics in aviation, as with automation, are continually expanding. Thanks to the constant concern of the Communist Party and the Soviet Government, our aviation now commands the most improved means of communication, radar, radio navigation, and automatic control, developed by the hands of Soviet people on the basis of the latest achievements of science and technology.

ENGINE SURGE

Engineer Maj. V. V. LEBEDEV

The day was especially hot. The red column of the thermometer climbed above the mark that was usual for that time of the year. Towards noon it climbed even higher. The air was burning hot, as if it had been heated in gigantic ovens and blown onto the flying field, the parking areas, the taxiways...

The heat affected first of all engine starting. It became "sluggish" and "hotter". At other regimes the power plants worked stably on the ground. True, at maximum rpm one did not hear the harsh bubbling sound which usually came from the jet nozzle along with the exhaust gases. A noticeable decline in air consumption was in evidence.

Pilot E. N. Knyazev was ready to take off. Having tested the engines and taxied out to the flight line, he asked instructions from the CP. When he received the command to take off, the pilot moved the control levers to the detent and released the brake. The silvery bird, as though released from captivity, irresistibly darted ahead, gently lifted off the concrete runway, and began climbing.

The aircraft's speed was mounting rapidly. Knyazev began to throttle the engine. Suddenly a loud pop was heard. The aircraft shuddered with a violent jolt.

"Surge," decided the pilot. He looked at the instruments. Engine rpm had dropped, the gas temperature was creeping to the red line. Knyazev cut off the fuel supply to the engine and continued the flight.

Pilots have flown often and long in jet aircraft, have mastered them to perfection and surge has become a rare phenomenon by now. But why did it occur here?

The anticipated change in the adjustment of the automatic air by-pass vane control for supplying air from the compressor did not materialize. The engine functioned normally just as it did before takeoff. The vane closed and opened at the established rpm.

We started checking the engine surge limit with the by-pass vane closed. A device was attached for forced control. The aircraft technician started the engine, increased the rpm, and, when the vane closed, he began to smoothly throttle the engine by depressing the button. There was a pop. The button was quickly released and the control lever was moved to the "Stop" position. The effective surge rpm were somewhat above the norm.

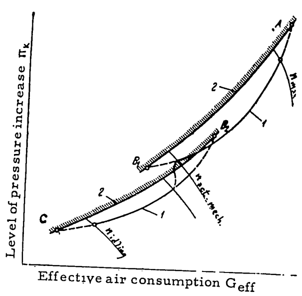


Fig. 1. Compressor characteristics: 1-- working characteristic ; 2-- surge limit; n_{max} -- measured maximum rpm; $n_{act. mech.}$ -- compressor mechanization actuation rpm; n_{idling} -- measured idling rpm.

In the flight described above pilot E. N. Knyazev acted correctly and confidently. His knowledge of the aircraft and of its special features helped him evaluate the situation and reach the necessary conclusion.

But why is it that the stable operation of the engine is disturbed in flight?

If we look at the characteristics of an air compressor (Fig. 1) it is not difficult to see that it may operate unstably in three regimes: in the region of maximum effective rpm (point A); at rpm close to actuation of compressor mechanization (points B_1 and B_2); in the zone of minimum effective rpm (point C).

As the effective rpm decrease and the temperature of the atmospheric air increases or the flight speed is increased, the effective consumption of air by the engine is reduced. As a result, the axial rate at the compressor input decreases while the airflow at the working compressor blades travels at great angles of attack. At times these latter reach critical values and, just as in the case of aircraft wings, there occurs a separation of flow (point B1, Fig. 1) which leads to pulsation of the airflow in the compressor.

Separation of flow usually starts at below cruising regimes at the first low pressure stages of the compressor. In contrast with this, the focal point of surge in the area of the maximum effective rpm occurs at the last high-pressure stages. Beginning to limit the air consumption through the engine they, so to speak, lock the compressor. In order to provide for normal operation at lower regimes, special devices have been designed into the compressor which insure engine stability over the entire working range of the rpm (by-pass of air from the compressor, turning of the guide apparatus vanes, arrangement of two-rotor compressors, etc.).

However, the effective rpm values for actuating the mechanization are not constant. With an increase in the temperature of the air entering the compressor, these values drop and approach those of effective surge rpm. Due to this, the engine's stability margin in the regime of compressor mechanization actuation decreases.

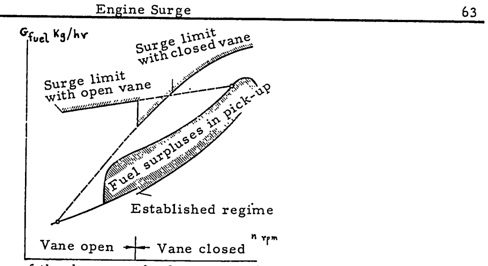


Fig. 2. Nature of the charge in absolute engine fuel consumption surpluses as a function of rpm.

Consequently, in this area surge is most possible at high atmospheric air temperatures and when flying near the ground at regimes close to compressor mechanization actuation rpm. In this case, it turns out that the effective engine rpm are minimal and close to a surge regime.

In the aircraft piloted by E. N. Knyazev, surge occurred precisely under such conditions. Here it was not only the effect of heat but also the acceleration of the aircraft near the ground that led to further overheating of decelerated airflow at the engine intake.

Why were there no instances of engine surge in the other aircraft that day?

Here is the reason. In this particular engine the surge limit had shifted in the direction of higher rpm. This fact had cut down the margin of stability additionally.

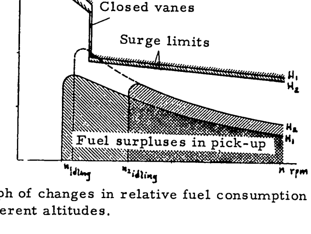


Fig. 3. Graph of changes in relative fuel consumption surpluses as a function of the rpm at different altitudes.

But the basic cause lay in the fact that the engine had for a long time been operated from a dirt airfield. The dust and sand pulled in by the compressor led to a deterioration of the blades. This led to a change in their profile, making their surfaces rough; the occurrence of separation in the boundary layer appeared at smaller angles of attack (at higher effective rpm).

Under identical climatic conditions engines have varying margins of surge resistance. This is due to a lack of uniformity in the degree of wear and expenditure of the operating life of parts in the gas-air system as well as the varied technology employed in the manufacture of the latter.

The margin of stable engine operation decreases whenever there are losses of air pressure at the input into the compressor and when there is significant non-uniformity in the field velocities before it. In other words, the margin depends on the design and the condition of the intake channel of the aircraft. These phenomena, in the final analysis, lead to the usual effect of engine throttling, the work characteristics of the compressor (Fig. 1) shifts in the direction of lower effective air supply, thus approaching the surge limit.

The downwash of flow in front of the air scoops results in significant non-uniformity in the velocity field. This occurs during sharp aircraft evolutions, particularly when skidding, but also with sharp gusts of wind such as, for example, when flying in very turbulent air.

The adjustments in the control system for the compressor mechanization of the engine changes with time. The natural wear on the sensing element which controls the vane reduces the actuation rpm and the margin of engine stability in this regime narrows. This is why, with the onset of hot weather, it becomes necessary to check periodically the actuation rpm of the compressor mechanization. Here one must not forget that the rpm depend on the tempo of the acceleration or throttling, since the actuation of the vane relative to the moment of signal output by the sensing element always has a certain lag.

Consequently, sudden engine throttling will result in the sensing element's putting out a command to open at the same rpm, but the vane will open at lower rpm. Due to this, the engine's margin of stability will also drop. Conversely, with sudden engine recovery the vane will close at increased rpm. Therefore, when checking the control system of compressor mechanization, we can in no way neglect the operational instructions.

WELL DONE, TECh SPECIALISTS!

(The soldiers in X unit seek out ways of eliminating manual labor)

A short distance from the airfield two buildings loom. One of them is the hangar and the other houses the TECh [technical maintenance] subunits. This shop has a fine reputation. People have earned it: officers, sergeants, and privates of the technical maintenance unit who are true masters of their profession, real experts, and innovators.

Every day passes in intensive work for the TECh groups. Periodic regulation inspections of aircraft and engines, electric and special equipment, radio equipment and armament are carried out quickly. At the same time new work methods are developed for eliminating manual labor.

Recently an aircraft was delivered to the TECh. It had to be put back in shape. This was achieved eight hours earlier than expected. Not a little creative initiative was displayed by aircraft and engine specialists of the group headed by Communist Military Technician First Class L. V. Yakovlev.

For example, earlier a good deal of time was spent on manually removing the access hatch covers of the fuselage. The efficiency specialists built a power screw driver. The device is simple but makes it possible to put in and take out screws five times faster. At the present time, the power screw driver is used in all our subunits.

Or here is another instance. In the course of periodic regulation inspection, it is most unhandy to pack grease into landing gear struts by using a grease cup. Our efficiency men have put in a lot of work during their off-duty hours to develop an improved method for carrying out this operation. At first there were failures, but persistence and perserverance led to success. The specialists built an hydraulic grease gun with which grease is packed automatically. It is very convenient to use and has reduced the packing time ten times.

One of the TECh officers suggested building an all-purpose cart for disassembling an aircraft. It can be used for fighters of all types.

A good deal of time used to be spent on extracting the bolt from the landing gear strut retractor. We had no special tool for this purpose and the bolt was hammered out manually: this often caused damage to parts. Making use of the device suggested by Technician Senior Lt. A. P. Teselkin, we now remove the bolt within five minutes without difficulty or damage to parts.

The specialists have also prepared a stand for testing the automatic course computer system.

A great deal of credit goes to the inventors and efficiency men of the aircraft weapons group for high-quality periodic regulation inspection work performed ahead of schedule.

Thus, for example, the disassembly and assembly of the cannon counter-recoil mechanism has been a problem of long standing. Until recently, two specialists spent an hour or more on these operations. Now, by using a pneumatic stand built in TECh, one man without any special effort can assemble or disassemble the counter-recoil mechanism in a shorter time.

Officer B. N. Kononov built an all-purpose device for checking the weapon and pyrotechnical facility assemblies with which the aircraft is equipped. This device makes it possible to check the assembly parameters both under laboratory conditions and directly in the aircraft. The dimensions of the device are 20 x 15 cm, and the weight is two kilograms. This makes it very convenient to transport and to use in the parking area.

At one time TECh had a great deal of difficulty in checking the pneumatic reloading of weapon systems. There were no tools for this purpose.

Communists B. N. Kononov and N. T. Maslov built a device for checking the pressure in the pneumatic reloading hoses of the weapons system. By using this device it is possible to check the pressure at any point in the hoses, to eliminate malfunctions, and thus to forestall weapon failures. This suggestion was approved by the efficiency and invention committee of the group.

We must note that the above-mentioned improvements do not in amy way entail any deviations from the technical requirements of periodic regulation inspections, but at the same time they prevent damage and increase production efficiency. All these factors contribute to the carrying out of tasks ahead of schedule.

Having joined in socialist competition , the specialists of the technical maintainance unit are exerting all their efforts in order to attain even better work indexes. More than fifty percent of the TECh personnel are Outstanding Men in training and rated specialists. Many have been awarded the "Outstanding Air Force Man" badge.

The officers, soldiers and sergeants of TECh are not resting on their laurels. Day by day they broaden their knowledge and their competence in servicing equipment, and they are gaining new successes. The Communist and Komsomol members set an example in work and study. The aviators know that the decisions of the June Plenum of the Central Committee of our Party have set before them new and greater tasks. They will exert all their efforts to carry out these tasks.

Lt. Col. I. I. GOSHKO

The margin of stable operation of the power plant sometimes narrows in the process of pick-up or during usual engine transition to higher rpm.

But why does this happen? The reason is that a transition is made to an acceleration regime by feeding additional fuel into the combustion chamber; this means a rise in the temperature of gases in front of the turbine. The working characteristics of the engine are shifted toward higher levels of pressure increase π_K and lower values of effective air consumption G_{eff} in the direction of the compressor's surge limit. This is especially evident if the engine's characteristics are shown as fuel consumption versus rpm (Fig. 2). By using these characteristics it is easy to determine the margin of engine stability by fuel consumption surpluses.

The magnitude of actual surpluses and, consequently, of the stability margins depends upon the adjustment of the fuel apparatus. In turn, permissible fuel surpluses which characterize engine pick-up and determined by the magnitude of stability margins, i. e., by the efficiency of the compressor.

The character of the change in the stability margins for various settings of the air by-pass vane may vary. When the vane is closed the surge limit is steeper (Fig. 2) and for certain rpm it intersects the working characteristic as well as the surge limit with an open vane. Thus, at below cruising regimes the engine's stability margin is greatest when the vane is closed. In other words, an open vane due to, for instance, a malfunction of the compressor control system at a regime approaching the maximal, can result in surge. The appearance of such a defect is determined by a rise of $30\text{-}50^{\circ}$ C (in comparison with the normal value) of the temperature of gases behind the turbine.

The margins of stability at acceleration regimes decrease with an increase in flight altitude. This is apparent from Fig. 3. The relative fuel surpluses which cause surge vary slightly with altitude for different positions of the vane. At the same time the actual relative surpluses which occur during pick-up tests increase. In connection with this the working characteristics at acceleration regimes approach the surge limit with an increase in flight altitude. Such a situation is observed in engines in which the fuel surpluses created by the apparatus during pick-up tests always remain constant.

"We have another Outstanding Element in our regiment", explained the commander at a meeting in which the results of socialist competition were summed up. "The commander of this element is Capt. Filippov."

The pilots know V. V. Filippov as a skilled educator of subordinates, as a master of aerial target interception. V. V. Filippov is a military pilot first class and has been awarded the orders of the Red Banner and the Red Star for his successes in combat training.

In the photo: Commander of an Outstanding Element V. V. Filippov.

Photo by V. I. KOLESNIKOV

If the pilot at high altitude suddenly takes the engine out of a regime lower than the rpm of high-altitude idling (Fig. 3, broken line), then at the moment the vane closes, surge may occur. Under such conditions, actual and surge fuel surpluses are commensurable.

How may we avoid surge when the engine is changed to a higher regime in cases when the minimal rpm are reduced. The most correct solution is decrease of flight altitude.

We have shown that stable engine operation in the process of operation and maintenance depends on many factors; on the temperature of the atmospheric air, on the speed and altitude of flight, on the character of the operation of the fuel apparatus and the system of controlling compressor turbulence. It is natural that the greatest likelihood of disturbance of the normal operation of the power plant is when several of these factors operate simultaneously. By taking the appropriate prophylactic measures

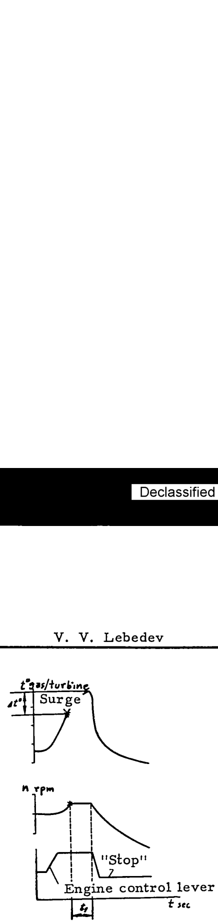


Fig. 4. Change in engine rpm and temperature of gases in front of the turbine on the basis of time during surge.

and by observing caution many of these may be eliminated, and by doing so flight safety may be increased.

How dangerous is surge for an engine?

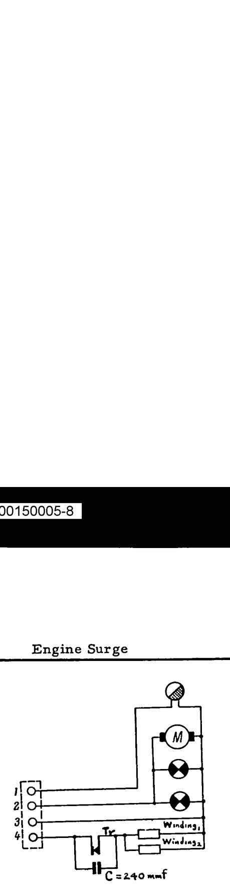
The occurrence of surge, as a rule, disturbs normal work processes in the engine. Deterioration in the work conditions of the combustion chamber at high altitudes and in the stratosphere -- as evidenced by reduced permissible limits in the composition of the fuel mixture -- leads to engine flameout. At low and medium altitudes, where the stability margins of the chamber are great, there arises an rpm "hot stall". During surge a delay in cutting the supply of fuel to the combustion chamber may cause engine failure due to overheating of the turbine during the rpm "hot stall" or breaks in the compressor blades due to vibration overloads.

Figure 4 shows that during the rpm stall (t_1 sec) the temperature of the gases in front of the turbine has increased by Δt^o. However, a further increase here may be stopped if the engine control lever is quickly moved into the "Stop" position. If, however, surge occurs, then the pilot cuts the fuel, flushes the engine at autorotation rpm, then he starts it again and continues the flight.

Thus for pilots who have a good knowledge of the equipment and rules for its operation, occurrences of surge do not create any special difficulties in flight.

SIMPLE BUT RELIABLE

Under conditions of low temperatures and increased air humidity, maintenance men frequently encounter cases of the fusing of contacts in the heating controllers for camera-gun heating elements. It is not always possible to avoid such a situation in good time between periodic regulation inspections, since the camera-gun must for this purpose be disassembled.



In order to avoid fusing of the contacts in the heating controllers and to protect their surfaces from damage, officer N. K. Martynov has suggested hooking into the electric heating circuit of the camera gun a condenser (C) of 240 mmf capacitance (see figure).

The operation of several such sets during one year modified according to officer Martynov's suggestion, yielded good results: it was possible to eliminate the occurrence of burning of contact surfaces in heating controllers.

Engineer Lt. Col. A. Ya. KOMAROV

BOMBER HYDRAULIC BRAKE SYSTEM MAINTENANCE

Engineer Capt. N. A. MEDVEDEV

The brake system of a plane, just as many other of its assemblies and systems, is subjected during flight and landing to the action of a sharp drop in temperature, shocks, vibrations, considerable forces, etc. Naturally, unfailing operation of it is possible only with thorough checking and timely elimination of all defects discovered. If you know well the arrangement of the system and the design peculiarities of this or that unit, and if in addition you take into consideration all the factors that may affect its operation, it is not difficult to achieve a situation where pilots returning from flights will say: "The equipment functioned well".

During the operation of the hydraulic brake system of bombers, the engineering and technical personnel of our unit have accumulated some experience, which now makes it possible for us to spot in time any particular abnormalities in the operation of the assemblies and to eliminate quickly all defects on the ground, without permitting them to appear in the air.

Let us relate in detail about specific cases from our experience.

Let us take, for example, leaks in the system. These develop not because some particular assemblies are improperly designed or not reliable enough in operation. A sharp change in ambient conditions affects them. These are the factors that the engineer must take into consideration.

As a rule, it is associated with a drop in the temperature of the outside air. With a sharp drop in temperature, leakage of the working fluid is possible even at junction points where the packing gaskets are in good condition. This happens because the elasticity of the rubber gaskets is impaired, their volume is reduced somewhat, and the proper packing is disturbed.

How to avoid and prevent leakage of the hydraulic mixture? Depending on the time available and also on the time of year (we have in mind the temperature of the outside air), we use one of the following methods.

If possible we tighten up the junction points or warm them up with warm air from an MP-44 motor heater. If this does not help, we replace the packing gaskets.

It is somewhat more difficult to eliminate leaks associated with bleeding of the working fluid from the high-pressure line to the low-pressure line. The presence of

leaks is determined by means of a manometer. However, it is not always possible to establish immediately which of the elements (assemblies) of the hydraulic system is the cause of this. Here a profound analysis and proper evaluation of the defect observed are necessary.

In connection with this, it seems, the following example will not be without interest. In officer G. M. Anisimov's aircraft logbook the ship commander made the following notation: "On the run after touchdown, the red light went on. The pressure in the main hydraulic brake system, which had fallen to 60 kg/cm^2, gradually recovered toward the end of the run..."

The technical personnel had to work hard before they were able to find the true cause of what had happened. At first it was decided to replace the sensing elements of the automatic brakes, the electromagnetic slide valve (Fig. 1), and finally the mechanical portion of the electric powered hydraulic pump. However, after a check taxiing of the plane it became clear that the specialists had chosen the wrong way. It became necessary to engage in a more thorough analysis of the deficiency. In questioning the ship's commander it was discovered that the automatic brakes worked normally (the blue light was flashing during braking), and the effectiveness of the braking was adequate. Thus, the work done proved to be entirely unnecessary. The cause of the bleeding of the working fluid was due to leaks in the brake valves and the auxiliary valve that closes the flaps of the cargo hatch.

This incident taught us much. It showed graphically that haste in conclusions and a formal superfical analysis only confuse the matter.

Here we should like to tell of another incident. Checking the air-tightness of the main hydraulic brake system on the ground, officer V. L. Shelud'ko discovered that the pressure by the manometer fell to 120 kg/cm^2 in a time considerably less than required by technical conditions. Evaluating the situation soberly, he first checked the air-tightness of the brake valves, resorting to separate braking from the ship commander's seat and the copilot's seat.

This operation is not a difficult one. If one of the brake valves is not hermetic, then the working fluid constantly leaks out of the hydraulic accumulator, which can be determined by ear by the unceasing noise in the valves or by the readings of the manometer. But the brake valves were hermetic. After checking the position of the bleeder valve, Shelud'ko decided to make sure that the safety valve was hermetic. For this, having created a pressure of 150 kg/cm^2 in the main hydraulic brake system, he disconnected the proper pipe. The safety valve proved to be non-hermetic: the working fluid leaked out through the open end. Quickly replacing the valve, the technician eliminated the deficiency, thus saving time to check other assemblies.

Sometimes a leak in the safety valve is caused by mechanical admixtures. For this reason we carefully check the quality of the working fluid charged, using special funnels with screens. In the event mechanical admixtures do get in, we press the "Pump" switch two or three times, the valve is actuated, and the air-tightness is, as a rule, restored.

There also are other reasons causing interruptions in the work of the hydraulic brake system. Because of shrinkage in the spring, the safety valve begins to operate at a pressure considerably below that specified in the technical specifications. This results in that the PDME-150 electrical unit does not switch off the electric hy-

Fig. 1. Schematic diagram of the hydraulic brake system of an aircraft: 1--tank of the hydraulic brake system; 2--hydraulic pump; 3--filter; 4--return valve; 5--hydraulic accumulator; 6--manometers; 7--PDME-150; 8--bleeder valve; 9--safety valve; 10--SPME-130; 11--two-way cover valve; 12--foot brake valve; 13--hand brake valve (emergency); 14--hydraulic switch; 15--electromagnetic slide valve; 16--turn-off valve; 17--shuttle valve; 18--pressure reducer.

draulic pump and the latter works until it is switched off completely as a consequence of the burning out of the fuse in the feeder circuit. The switching off of the power source, naturally, will lead to a drop of pressure in the system and failure of the main brakes.

Once on the plane where the senior technician is officer A. V. Bludov, the pressure of the working fluid in the brake system fell to zero during flight. Detailed analysis showed that this occurred because of a fault in the mechanical part of the electric hydraulic pump.

Such flaws did not appear afterwards. In order to prevent in time the electric hydraulic pump from going out of order during flight, we remind the flight personnel of the need for checking the readings of the working fluid pressure manometer in the main hydraulic brake system. If it is found, for example, that there is an abnormality in the work of the electric hydraulic pump (the pressure does not rise above 140-145 kg/cm^2 or the red light goes on), it is necessary to switch off the AZS [automatic circuits protector] of the hydraulic pump and switch it on again just before landing.

Some engineers think that the greater part of the deficiencies enumerated above that affect the air-tightness of the main hydraulic brake system appear not as a consequence of shortcomings in technical servicing but as a result of "prolonged operation". However, these comrades are deeply mistaken. Experience has shown that it is entirely possible to ensure unfailing operation of this or that assembly; only one condition is necessary: thorough preliminary and preflight servicing.

It is no less important to check the isolation of the main hydraulic brake system from the emergency system.

When the former is operating with the two-way cover valve closed, the pressure in the latter should not fall.

With low temperatures in the outside air, we check especially carefully the pressure in the main brake line with separate braking from the main and the emergency systems. The pressure is checked by manometers screwed into special connections in the brake lines. The need for such a check was prompted by an incident. On Yu. I. Volkov's plane the brakes were being checked. The wheels could not be braked from the emergency system, because the shuttle valve had frozen. The freezing was quickly eliminated by heating the valve with warm air from an MP-44 motor heater. However, the incident itself pointed up how important it is to avoid having moisture and other admixtures getting into the tank for the working fluid.

Instructive examples can also be given from our experience in operating the automatic brake systems. Thus for example, in one flight the blue light of the automatic device went on (Fig. 2). In checking on the ground it was found that a short circuit (a bare wire touching the ground) had developed in the electrical circuit of the inertial transmitter. Another time the light went on as a consequence of corrosion in the terminal switch. Elimination of such flaws, however, presents no difficulties.

We recommend to the flight personnel that they proceed in the following manner when the blue light of the automatic brake device goes on. If the light does not go out at the moment the wheels touch the runway, then the automatic brake device should be switched off, the brake chute extended, and braking effected from the main hydraulic brake system, depressing the pedals smoothly. If the automatic device stays on, the wheels will not be braked because in the process of braking (as soon as the pressure of the working fluid behind the brake valves reaches 8-9 kg/cm^2) the hydraulic switches (Figures 1 and 2) will be actuated, the electrical circuit of the automatic device will close, and the GA-49 electromagnetic slide valve will be actuated. Here the pressure reducers will make connection through it with the main drain line to the tank, and the working fluid will drain off.

Thus, the pilot judges the work of the automatic brake device during landing by the nature of the lighting of the blue light. If the blue light is flashing at the moment the wheels are being braked and released, the automatic device is functioning normally.

In order to make sure that the assemblies are in good order, we set the plane on the parking brake and insert manometers in the brake system, Then we switch on the automatic brake device, take each inertial transmitter off, and give its shaft a sharp turn.

If the automatic device is in proper order, the pressure in the brake system should fall and then come up again quickly. With this, the blue light will be flashing, and easily heard clicks will show that the electromagnetic slide valve has been actuated.

One of the abnormal phenomena is the formation of an air block in the hydraulic brake system. Because of this the effectiveness of the braking action is reduced in taxiing or in the run after touchdown.

Our specialists have learned to recognize this phenomenon quickly. They snap the emergency brake valves sharply. If there is an air block, some pair of wheels

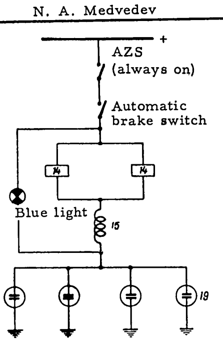


Fig. 2. Schematic electrical diagram of the automatic brake device.

will, as a rule, be cut off (braking will not occur), and a characteristic knock is heard in the places where the emergency brake valves are installed.

It is also possible to proceed another way. In special connections in the brake lines, manometers are screwed in to measure the pressure at the beginning of braking. If there is no air block, it should be no more than 1.5 kg/cm^2.

To get rid of air blocks in the hydraulic brake system we use a special ground hydraulic assembly, by means of which the working fluid is pumped through the drain line into the tank. Such a method gives good results and abbreviates the entire process considerably.

Sometimes in approaching for a landing the pilot is compelled to use the brake chute. However, the latter may not open if the equipment has been poorly serviced for flight. Such an outcome occurs when the pyrotechnic cartridges get damp, when the container flaps are deformed, when there is a break in the electrical circuit for exploding the cartridges, when the pusher is stuck, etc.

The specialists of our unit take all this strictly into consideration. During inspections, they check without fail the position of the pull rod that closes the container flaps. Before each flight, the senior technicians of the planes check the position of the lock of the brake chute release, and make an entry in the check list of the bomber's readiness for flight on the results of the inspection.

We have told of a number of incidents encountered in our experience. They all occurred at different times, at different stages in mastering the plane. Now, when the engineering and technical personnel have learned well the peculiarities of the operation of the hydraulic system, we are able not only to spot many of the faults but also to prevent them in time and thereby achieve unfailing operation of the equipment in the air.

AUTOMATIC DEVICES ON THE TU-104

Engineer Maj. YU. G. VLADIMIROV

A beautiful silvery Tu-104 flies over the boundless streches of the Soviet Fatherland. It is in the hands of an experienced crew. The in-flight duties of the crew are many and complex -- especially when the aircraft flies on a long-distance route. However, no matter what the altitude, speed, and the ambient temperature of the aircraft are, the crew experience no discomfort. The ship is equipped with various automatic devices and systems, commutation and signal apparatus which greatly assist the crew not only along the flight route but also during takeoff and landing of the aircraft.

We have grown so thoroughly accustomed to the assistance of these automatic devices that it is difficult to imagine how it would be possible to insure the carrying out of the entire complex of various operations connected with flight safety without these.

There are many automatic devices in the aircraft. Some of these begin functioning when the ship is still on the ground. Thus, when the engines are started before taxiing out to the flight line, scores of relays switch on or off the various assemblies and systems, each relay functioning at its proper time. And so, before the fliers' eyes appear various data on the nature of engine operation displayed on the control instruments. A few words now concerning these instruments. There are many of them: control, piloting and navigational, signal, etc. A person entering the cockpit of such a huge aircraft for the first time can hardly imagine how anyone can get his bearings amidst all this, However, the instruments are merely the terminal elements of a great number of automatic and semi-automatic devices which I would like to talk about a little.

In order to insure the work of the engines, fuel must be supplied without interruption. The aircraft holds almost a full railroad tankcar of fuel. If programmed delivery from these tanks is not provided for, then the trim of the aircraft may be disrupted. The crew keeps track of the fuel by watching the fuel gage installed in the aircraft. This not only measures the quantity of the fuel in the tanks but also provides for a definite sequence in which it is used up in flight. In principle, the operation of the fuel gage is based upon measuring the volume of a cylindrical condenser which constitutes one arm of a self-aligning bridge system (Fig. 1).

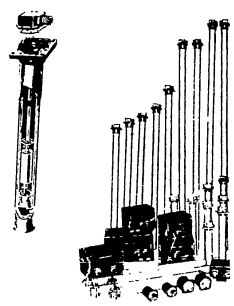


Fig. 1. Elements of the aircraft automatic fuel system (quantity transmitter in cross-section).

When the fuel in one of the tanks is expended, the float drops down and disrupts the balance of the bridge system. The signal thus generated turns on the tank pumps of the next group. And this continues during the whole flight. The pilot observes the fuel consumption by the engine on two other indicating instruments -- the fuel flow-meters. Their transmitters are installed in the main fuel line to the engines. Their design provides for vanes which, as the fuel flows through a special device, transmit the rotation to a magnet; this in turn transmits a pulse through an interrupter to a thyratron. The indicating instrument serves, so to speak, as an electrical pulse-meter.

On the whole, these systems are intricate, but their performance is reliable.

The fliers observe the operation of the automatic fuel system on other instruments as well. Thus, there are warning lights which closely check the proper operation of all the fuel pumps and assemblies. Should anything fail, it is possible to change over to manual control of the system.

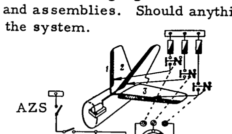


Fig. 2. Circuit diagram of the vertical and horizontal stabilizer deicing system.

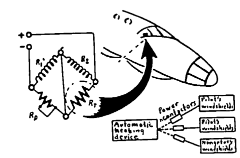


Fig. 3. The heating system for the cockpit windshields.

Numerous automatic devices in the aircraft require a great quantity of electrical power -- approximately 100 kw. Four powerful aircraft generators put out as much power as would be required for a large kolkhoz. The generators function in a common system.

In order to join the separate units of all the automatic devices, instruments, and assemblies, over 20 km of electrical wiring alone is required.

For parallel operation of the generators and for maintaining constant voltage in the network, automatic devices are used -- carbon-pile regulators, differential-undervoltage relays, and other auxiliary elements. There is no need to analyze in detail the intricate system of automatic voltage regulation. I would like merely to emphasize the fact that the operating conditions for the generators are very difficult. Approximately 1000 liters of air are forced through the aircraft generator housings per second for the purpose of cooling.

In the aircraft there are devices using electrical power for which alternating voltages of different magnitudes are required. For this purpose the equipment includes more than ten different single- and three-phase transformers, each of which has its own automatic system for regulating the frequency and voltage of the alternating current.

The great number of devices using electrical power (more than 300, not including signal and illuminating lights) necessitates an automatic circuit protection in case there is a short or the given current exceeds the nominal value.

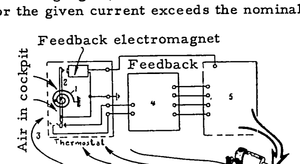


Fig. 4. Diagram of automatic air temperature regulation in the cockpit.

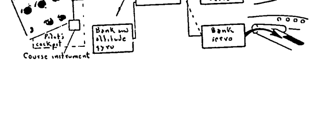


Fig. 5. Structural diagram of the autopilot

There are about 170 such automatic protection devices on the aircraft. In addition, about 100 time-delay and glass-covered fuses protect the circuits of individual power-consuming devices.

One of the power-consuming devices in the aircraft is the automatic deicing system.

During flights in cumulus clouds and under other adverse weather conditions certain parts of the aircraft, especially the vertical and horizontal stabilizers (Fig. 2) may be subject to icing; this weights down the airframe and impairs control. Here

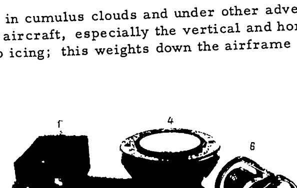


Fig. 6. The directional gyro: 1 - transformer; 2 - control panel; 3 - distributor box; 4 - navigator's instrument (data unit); 5 - pilots' instruments (repeaters); 6 - correction switch.

Fig. 7. Automatic navigational instrument.

too special devices come to the aid of the crew.

As we can see from Fig. 2, in the aircraft there is an automatic device - (the commutator) which switches on in sequence the contactors of the power circuit for the heating elements.

Tail assembly heating is divided into units. The vertical stabilizer has one unit, the horizontal stabilizer has two (outer and inner).

Each in turn, the contactors are switched on for a definite time interval (40 seconds), thus closing the heating circuit of the units. At first, power is fed to the outer units and subsequently to the vertical stabilizer and the inner units of the horizontal stabilizer.

The electric current passing through the units heats the outer surface of the leading edge of the vertical and horizontal stabilizers, thus removing ice from the surface. The operation of the deicing system is checked by reference to a white light which goes on the instrument panel of the copilot.

In order to prevent icing of the glass surfaces, automatic devices are installed to heat them. In its simplified version such an automatic device is similar to a bridge circuit, the two arms of which are connected to a polar relay; it is located together with the other elements in a special block.

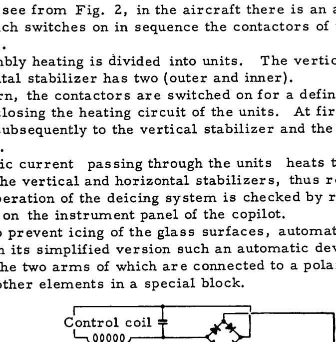


Fig. 8. Electric circuitry of the compass transformer.

One arm -- the resistor R_t (Fig. 3) - is a thermistor. It is separated from the common amplifier and mounted in the glass. Such a thermistor has the peculiarity of sharply reducing its resistance when there is an increase in temperature.

The heating element is a current-conducting film sandwiched between the outer and inner glass layers. Through this the electric current passes, heating the glass surface to a definite temperature and protecting it from icing over.

Frequently the aircraft flies at a high altitude. However, this has no physical effect on the crew. The pointers of the altimeter indicate 10,000 m but the pressure and temperature in the cockpit are almost normal. This also is due to automatic devices.

The Tu-104 aircraft is equipped with special air pressure regulators and ventilators which maintain in the pressurized cockpit a very definite pressure necessary for the proper functioning of the organism. But if a man were to find himself at this altitude without special equipment, he would live only a few seconds.

In the aircraft cockpit there are installed special automatic regulators which independently maintain the air temperature within the limits of from $+16^\circ$ to $+26^\circ$ C (depending on the ambient conditions and whether the aircraft is taking off or approaching the landing strip).

The principle of operation of the automatic temperature regulator is based on the curling and uncurling of a bimetallic helix. The latter is located in a thermostat which has free access to ambient air (Fig. 4).

When the air temperature in the cockpit changes (increases or decreases), the bimetallic helix (1) moves the armature (2), thus closing one of the stationary contacts (3). With this a signal passes to the block of electromagnetic relays (4) and the latter, in turn, connects the corresponding windings of the slave electromechanisms. The mechanisms open a shutter, thus increasing the supply of cold or hot air.

The hot air is drawn from the seventh stage of the jet engine compressor and then after passing through a special turbocooling device and pressure regulator, is fed to the cockpit.

The automatic device can be regulated manually whenever the crew chooses to do so, thus increasing or reducing the air temperature. To make its operation stable it is provided with feedback.

In flight the pilots watch the readings of a great number of piloting and navigational instruments as well as instruments controlling engine operation; the navigator checks the flight route and the radio man maintains contact with the ground and watches the functioning of the power supply system.

The process of piloting an aircraft at night or under adverse weather conditions when flying on instruments alone is most fatiguing and requires precise coordination of movements. It is here, too, that the crew is relieved by automatic devices (autopilots) which stabilize the aircraft's attitude. The idea of making use of such contrivances was born a long time ago. It was back in 1898 that K. E. Tsiolkovskiy worked out a system of automatic control. But then it was a crude device. In a modern aircraft a whole complex of automatic and gyroscopic devices is employed without which one cannot visualize a single flight -- particularly long-range flights.

A coordinated turn, a smooth letdown, a climb, a flight along an assigned route - all these are carried out by the automatic pilot.

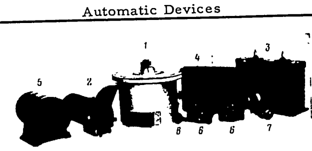


Fig. 9. The astrocompass: 1 - sun-sensing unit with photoelectric sighting head; 2 - coordinate setter; 3 - amplifier; 4 - distributor box; 5 - transformer; 6 - indicating instruments; 7 - 8 - sun search controls.

If we examine the structural diagram of a static autopilot, we see that it is composed of ten units (Fig. 5). This is a very convenient and reliable contrivance. Whenever any unit fails, the pilot, by pushing a button, can disconnect it and control the aircraft as usual. If the coordinated turn adjustment is disrupted, or the stabilization of any one channel, then, by using special levers on the control panel, it is possible to refine the adjustment of the autopilot in flight.

With the aim of providing for flight safety in case of fire, the aircraft is equipped with an automatic fire-detecting and extinguishing system. This includes bimetallic detectors located in the most likely spots for fires as well as bottles of fire-extinguishing fluid.

For starting the various actuating devices on the aircraft use is made not only of electrical but also of hydraulic and air pressure systems.

Control of the hydraulic system pressure and maintaining pressure in the air bottles are also automated. Thus a special automatic device controls and -- in case of necessity -- changes the pressure in the landing gear-extension and retraction system, in the automatic brakes, etc.

All this considerably reduces the work of the pilots.

No less complicated are the duties of the navigator. He controls the aircraft flight along the route, carries out celestial and radio orientation, etc.

The navigator has to make computations, work with the tables, compare and collate individual data. Many of these operations are performed by automatic and semiautomatic devices on the Tu-104 aircraft.

Let us take the conventional directional gyro (Fig. 6) as an example. It is difficult to find a navigator who does not use this reliable semiautomatic instrument.

The operating principle of the directional gyro is based on the property of a three-degrees-of-freedom gyro to maintain an unaltered position of its axis in space. On the Tu-104 aircraft there are about 15 gyroscopic devices based upon this principle. Another automatic instrument is a navigational indicator which continually shows the navigator the aircraft's position. It is made up of individual automatic components: the automatic course and rate units, a wind data unit, and a computer (Fig. 7). Each of these performs definite operations and assists the navigator.

The automatic rate unit, for instance, senses an aerodynamic pressure corresponding to the true airspeed of flight as well as the static pressure of the ambient medium. These parameters are transformed into definite voltages of direct current, amplified, and fed into the computer.

The computer algebraically sums the signals put out by the automatic course unit and the wind data unit and integrates the sum of the signals of a time basis. As a result, there appears on the instrument dial the coordinates of the aircraft's position.

Wide use is made in the navigational indicator of various magnetic amplifier circuits, tracing devices, etc.

Observing the readings of this or that instrument, we sometimes forget the fact that, before these terminal data are obtained, many automatic devices or elements of such devices have done their work.

Another unique automatic device is the DGMK-7 type distant-reading gyro-magnetic compass. This is made up of a whole complex of regulating devices. Thus, for example, in order to maintain a constant frequency of 400 cps, extremely necessary for supplying power to all the compass circuits, a special transformer is used. This contains a magnetic amplifier, selenium rectifiers, resonant circuits, etc. (Fig. 8).

How many automatic and servomechanism elements are included in the design of the astrocompass?

The astrocompass determines the actual course of the aircraft by sighting on the sun by means of photoelectric sighting pieces (Fig. 9).

A special automatic system preserves the horizontal position of the mechanism when the aircraft is tipped and directs the sighting system at the sun.

The latter system transmits through a special circuit the value of the actual course to instruments which are located in the working areas of the navigator and the pilots.

A few words more now on one other system. Often the aircraft approaches an airfield which is obscured by a solid ring of rain clouds. However, even under such conditions the craft makes a safe landing. Precision automatic instruments show whether the pilot has acted correctly or not, signal passage of the radio beacons, etc.

In the Tu-104 aircraft there is a special automatic instrument which helps the pilot navigate his plane around the landing airfield along definite orbits -- especially when the airfield itself cannot be seen. This guarantees flight safety for several aircraft in one region. At the same time the instrument automatically shows the distance to go to the landing airfield on the route, may indicate the distance to the point of touchdown, and performs a number of other air navigational problems.

When we penetrate the cloud cover and come in for a landing, one other automatic instrument aids the pilot -- the automatic radio course, glidepath, and marker apparatus. The pilot has an instrument with two needles -- horizontal and vertical.

The vertical needle serves as a course indicator in landing while the horizontal needle indicates the letdown path. When the aircraft is precisely on course the vertical course-indicator needle is strictly centered. When there is a deviation from the line of the landing course, the needle swings and shows the pilot in which direction the aircraft must be turned in order to bring it out on the line of the course. The horizontal needle tells if there is need for gentler or steeper letdown. The landing device is equipped with an automatic emergency warning system. When signals from the ground are lost or when the apparatus is malfunctioning, there appears a small white flag on the landing indicator dial in the emergency warning window. This alerts the pilot to the fact that the system cannot be used.

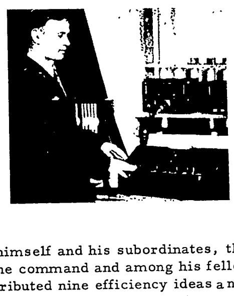
We have named only a few of the automatic devices installed in the Tu-104 aircraft. If we were to enumerate all the automatic operations on the aircraft, then we would see that, directly or indirectly, automatic devices are involved in all the operations. They regulate the engine rpm, maintain an optimum flight regime, signal the passage of ground homing stations, stabilize the aircraft's attitude, assist the crew members in carrying out a great number of difficult and tiring operations, and insure flight safety.

The automatic devices operate during the entire flight. Even when the aircraft touches down on the landing strip and during the ground run, the special automatic brakes reduce the length of the run, the wear and tear on the tires, and preclude the possibility of skidding.

Long-range flights under adverse weather conditions and at night are impossible without automatic devices and, in some cases, without whole intricate systems.

Communist Military Technician First Class V. K. Umnov heads the periodic regulation inspection work group for instruments and automatic electronic equipment.

An ability to utilize fully the checking and measuring apparatus during the checking of intricate aircraft equipment, a capacity for organizing precise accounting of all work performed by the specialists of the group have enabled Viktor Kirillovich to bring his subunit up to the ranks of the foremost.



Exacting towards himself and his subordinates, this officer enjoys a well-deserved reputation in the command and among his fellow workers.

V. K. Umnov contributed nine efficiency ideas and is the recipient of several citations; he actively participates in public service activities, is a group leader in a Marxist-Leninist training group, and never tires of explaining to the airmen the measures undertaken by the Party and the Government.

In the photo: Officer V. K. Umnov checks the automatic fuel system of an aircraft.

THE STUDENT

Engineer Senior Lt. M. F. REBROV

All kinds of people study at the Higher Technical School. They are different in appearance and character, in work experience and in age. Among them are offfcers who have trod the roads of war, and students who have acquired quite a bit of experience in operation and work in line units in the postwar years, and very young men who are still to learn the specifics of the work of an aircraft specialist -- an engineer.

The young men do not lag behind. They are in step with life, striving in every way to make use of the tremendous possibilities that the school commands, to learn from their older comrades. When the time comes they too will say a new word in the development of aviation science, will take their places in line units, repair establishments, and scientific research institutes. This is what the future engineers are being prepared for; in each one is instilled a valuable sense of the new.

Here is one of the students -- V. A. Chesnokov -- a young man with attentive, searching eyes, slender and trim. He gives his biography in a few words -- "After all, there is nothing special in it."

So far Chesnokov has not yet participated in great deeds, has not performed any outstanding feats. His only award, which he received before he was in the army, is a silver medal for successful completion of secondary school.

But it so happened that when the conversation in the political section of the school touched on students and they began to talk about the outlook of tomorrow's engineers, their desires, their interests, and their training, to my question as to who could serve as an example Chesnokov was named among others. An elderly, graying colonel said then:

"Write about Chesnokov," and, thinking awhile, he added with fatherly warmth in his voice, "He is a good lad, still young, but his step is firm..."

* * *

In Chesnokov's biography there really is nothing special. So far it is made up of simple words: school...Komsomol...Army.

His childhood went by somehow quickly and imperceptibly. Youth came. Still not forgotten are his worries about his examinations for the school certificate, hot youthful disputes about books read, about friendship and love, interplanetary journeys, and much, much else, and then the first steps into unknown, alluring distances. It is good if these steps are firm and true. After all, it is these that often determine the entire future.

Life! Vladimir Chesnokov, as incidentally, everyone who was born in our country, wanted to make of it something bright and meaningful, to do something great and significant.

Some time passed. Chesnokov took examinations for the Higher Air Technical School. He was accepted as a student. The first step into aviation was made...

Studies began. It was a new situation, new people who had gone through a school of work, multifarious new impressions. Each day opened up before the student the pages of new and unknown sciences.

Vladimir became utterly absorbed in his lessons. He listened eagerly to the lectures, striving to grasp the meaning of every word. He especially liked physics and higher mathematics. Figures and formulas attracted him with their stringency, clarity, and brevity. They tolerated no liberties. The slightest inaccuracy and everything goes for naught; begin again. The figures and formulas seemed to say: This is not it, think again. And Vladimir thought. He thought persistently, stubbornly. He thought until he found the right solution.

The days and weeks literally flew by on wings. There were more and more abstracts; notebooks accumulated with homework and with entries from practical work. It was not easy to get everything done. Much time was spent in studying lecture material and in doing difficult laboratory jobs. Drawing was especially hard. At first he sometimes redrew the sheets several times. At times he lost heart from the failures, but Vladimir got hold of himself and went to work with redoubled energy. He would sit until late in the reading room. When the day was not long enough he would gain time at the expense of sleep, but he always completed everything on time.

The first year went by imperceptibly. Then came the examination session. The instructors rated the student's knowledge highly. Reflected here were not only his outstanding capabilities but primarily his love of work and persistence.

He had learned long ago that study requires rhythm. One cannot neglect an assignment and then make up what has been neglected for several days. Even if in a hurry you do not merely leaf through the textbook but read it from cover to cover you will not know the material. And from the very first days Vladimir set himself the aim of learning outstandingly.

Many of his classmates also strove for the same thing. However, also encountered among the students were such whose motto was: "A gram of health is better than a ton of knowledge." Thus reasoned those who had got into the VUZ [higher educational institution] by chance. It was not a desire to acquire knowledge, not a striving to keep in step with life that brought them to the school. They need a diploma as a "piece of paper", with which one can cover oneself, hide behind the backs of others, find a warm place. They are convinced that to perform work exploits in training, to manifest a unique kind of heroism is possible only for the sake of glory; they do not suspect that the human soul has some special requirements.

Such people do not create the atmosphere in the school. For the majority of the students the password opening up the way to knowledge was persistence.

It was with this password that Vladimir Chesnokov and his comrades in training entered life.

V. A. Chesnokov

Vladimir was attracted by books. He loved Gor'kiy and Tolstoy, Aldrich and Remarque; he read with enthusiasm "The Battle on the Road", "The Brothers Yershovy", "The Fate of Man". Books were his first friends and good counselors. "After all, when you read a good new book," he says, "you feel that your inner world has become fuller, richer." For the sake of this Vladimir sacrificed sleep,. rest, his few free hours.

Practically all the time was spent in study. In addition to this, as secretary of the Komsomol organization he had to think about the success of others. At first it seemed that it was not so difficult to be a Komsomol leader: he conducted the meeting, wrote a copy of the proceedings, took in membership dues at the proper time. However, life showed that this was not the main thing. Intercourse with people, the ability to understand character, to reveal the individual capabilities of students like himself -- that is what is mandatory for a youth leader. And here he was helped by the Communists, the leaders of the class and the faculty. More than once he turned for advice to Col. I. N. Kuzin, engineer Maj. I. P. Solov'yev, his comrades in the class. Gradually the job was done.

One of the interesting undertakings of the Komsomol members was a visit to the city cultural university. The university interested many. There one could obtain knowledge in Marxist-Leninist esthetics, learn to understand music, study literature and art. And this is so necessary to the young Soviet engineer -- a bearer not only of technical but also of general culture.

His comrades in the class respect Chesnokov. They respect him for his modesty, for his calm disposition, for his readiness to help everyone, and also for his fairness and incorruptible attitude toward everything. He often studies together with his comrades. Such lessons are very useful. After all, it is not for nothing that they say that one head is good but two are better. Three of them usually get together: Mikhail Ventsel', Valeriy Mar'yash, and Vladimir. Sometimes other students also come. At the blackboard, with chalk in hand they solve all the difficult problems.

After the second semester many of the students, among them Chesnokov also, decided to take the examinations ahead of time. It is more difficult this way, but time does not wait. And ahead there are still so many heights to be taken.

* * *

After completing the second year, Chesnokov went to a line unit for military on-the-job training. Here he saw flying life as it really is -- unadorned, tense, and vibrant.

For one who is acquainted only superficially with aviation it is difficult to become oriented right away in the endless movement of men and machines, to understand who is doing what, to comprehend the words of speakers amidst the mighty roar of engines. At first glance everything around may seem to be terribly confused, complex, and incomprehensible.

But a short time passes, you get accustomed, and everything comes to be interpreted differently. That which had seemed to be senseless bustle in reality has a definite rhythm and sequence. Everything is done efficiently, quickly, without superfluous motion; those around you understand each other with half a word. And all of this seething activity is subordinated to one aim, one idea -- to support the flying day or night. It was here, at the airfield, that Chesnokov understood what it means to be a true engineer.

The engineers, and there were several of them in the unit, were supervising all the ground work. They not only gave instructions, but they also worked all the time. They worked, like everyong else, intensively and with concentration. When something unforeseen or special happened that required an immediate decision, they called on the engineers. When it was necessary to do something, to correct something, to eliminate something -- again to the engineer. The engineers were needed everywhere. They clambered into the most inaccessible places, and when necessary they did any kind of manual labor. Not a single one of them left the airfield as long as there was something unfinished before the forthcoming flights, as long as there were defective craft in the parking area.

How many problems confronted them during the flying day or on the eve of it! And all of them had to be solved, solved quickly, correctly, and most important, independently.

They constantly turned to the engineer for assistance, they asked him how to develop and make this or that improvement, they asked him all kinds of questions. And all this the engineer must answer -- that is what he studied for.

In the on-the-job training period, Chesnokov learned how great is the force of the unity of learning and experience, academic theory and creative practice. He comprehended with new force what a difficult but interesting road was traveled by those who had chosen this lively and absorbing profession. It became clear to him what an engineer must be -- an extensively erudite and cultured officer, exacting toward himself and his subordinates, creatively solving difficult practical problems.

Time went by, day after day, semester after semester. Each year studying became more interesting: there were more special subjects, more lessons associated with aviation technology -- the field in which Chesnokov had decided to work.

Aviation technology held much that was interesting. Vladimir avidly read books in this field of knowledge. When the department distributed class projects, he chose the design of a receiver. The work was absorbing, but it took up all his time. He wanted very much to do something new, to get away from the established standard.

"Will I succeed?" doubts arose. Vladimir spent many days and nights in research, read a mass of all kinds of books and brochures, consulted with his teachers, expressed his thoughts to his comrades, and as a result success came. The work received a high rating.

Vladimir Chesnokov took scores of examinations in various subjects. And scores of times the exacting examiners gave him a rating of "excellent". This was a natural result of the efforts that the student had put into his studies.

The Central Committee of the VLKSM [All-Union Leninist Young Communist League] of the republic awarded Chesnokov a Merit Certificate; by order of the Minister of Defense he was awarded the high title of Stalinist stipend holder. This was an award that Vladimir obtained not only for success in his studies but also for discipline, for exemplary performance of his military duty. Not long ago another serious event occurred in his life -- he was accepted as a member of the Communist Party.

When Chesnokov was asked to tell about his successes, Vladimir spoke not of himself but of his teachers, his comrades, the school. And this is, perhaps, correct. After all, it was the collective that helped him to find the true path by which he is going into aviation with a firm step.

OVER THE MONGOLIAN STEPPES

In the spring of 1939 the imperialist circles of Japan organized an armed provocation. They attacked our friend the Mongolian Peoples Republic, with whom the Soviet Union had a mutual assistance pact. In the plans of the Japanese aggressors, the MNR [Mongolian Peoples Republic] was considered the key to Soviet territory in Asia.

The attack of the Japanese invaders began on 28 May. In the battles that developed, the enemy suffered defeat. By dawn of 29 May, the Soviet-Mongolian troops, having shattered the invading Japanese, threw the invaders back behind the national boundary. But the Japanese command did not renounce its objectives. It tried several times to attack our troops from the air and, bringing up large forces in to the area, on 2 July it began a new offensive. Stubborn battles were fought for the first three days. The Japanese succeeded in driving a wedge to a depth of 15-20 km, forcing the Khalkhin Gol River, and capturing Mt. Bain Tsagan. On 5 July the Soviet and Mongolian units broke the enemy's resistance and he began to retreat. However, it was not possible to restore completely the situation on the national boundary. The Japanese held on to Mongolian territory east of Khalkhin Gol and continued to reinforce their troops in this area.

In order to restore the situation on the national boundary, the Soviet-Mongolian command decided to surround and destroy the Japanese invaders east of the Khalkhin Gol River.

The offensive of our troops began on 20 August 1939. At 0545 hundreds of our bombers made a powerful strike on the enemy defenses, on the nearest reserves, and on the enemy artillery positions. By 31 August, the territory of the MNR seized by the Japanese invaders was completely cleared of them.

In the first half of September the Japanese command made several attempts to violate the national boundary and the air space of the MNR but, receiving a proper rebuff, it was forced to halt combat operations.

Revealed in these battles was the unsurpassed courage of the Soviet fighting men and the outstanding quality of Soviet combat equipment.

Below we print an excerpt from the memoirs of a participant in the aerial battles over the steppes of Mongolia, A. V. Vorozheykin.

During the Great Patriotic War, A. V. Vorozheykin shot down 52 enemy planes and was twice awarded the title of Hero of the Soviet Union.

* * *

It was the longest day of the year -- 22 June. The sun at the zenith had heated the ground to the point where to the men sitting in the planes for more than three hours it seemed that it had begun to smoulder, and waves of smoke gleaming in the distance created the impression of a fire on the horizon that was slowly creeping toward the airfield.

The sitting position had become torture. It was hard to breathe from the heat. My head was filled with noise, and at times there could be heard the roar of battl e, although all around there was the usual quiet of a hot day.

Suddenly steps were heard somewhere nearby. This was technician Vasil'yev who had completed building a light frame and covering it with canvas and now came up to place an awning over the cockpit.

"Here's a sunshade for you; it won't be quite so hot," he said.

This simple device brought some coolness, but without movement my legs had gone to sleep entirely and, unbuckling the safety straps, I stretched them out so that they would not press so tight against the seat, got up, and began to stretch my swollen muscles.

Lying under the wing of the plane, Vasil'yev suggested that I get a drink of cool water that was kept in a pit dug especially for this. I drank with enjoyment and splashed my face.

As always with standby duty, the time passed slowly. I tried to fill it by reading, but it didn't work; my eyes just slid over the pages while my mind was full of reality and stubbornly would not apprehend Chekov's tales.

A distant roar of motors attracted my attention. "Apparently the Japanese have appeared again. They will go away; they won't accept battle," I thought, following with my glance a group of our fighters going toward the Khalkhin Gol.

The planes disappeared, and quiet set in again.

"Those, I guess, were from the neighboring regiment," sounded Vasil'yev's voice from beneath the wing.

"Maybe..." But I didn't finish: shots rang out one after another, and two little red balls soared over the command post -- immediate takeoff of the entire squadron.

I started the engine. I could see the neighboring squadron already taking off. And I thought: "This time, apparently, they decided to t rain us as a regiment. That's good." Then quietly, without hurrying, I glanced at the planes standing at

the ready, and advanced the throttle for takeoff. I did not feel that high excitement and nervousness that are the usual accompaniments of the first sorties against the enemy -- I had already gone through all that before. Training sorties toward the front line had gradually brought us up to combat reality, had taught us endurance and vigilance. Even in our movements there was something established that is an attribute of only men who have grown together with their job. We did everything just as efficiently and quickly as though it were an ordinary training flight. Of course, had we known what we would have to go through, there would probably not have been such complacency.

The squadron flew in a tight formation toward the Khalkhin Gol. Above us, at an altitude of 4000 meters, passed an element of Japanese fighters. The Japanese began to circle over our territory.

Thinking that perhaps there were other Japanese planes around somewhere, I looked around attentively. But I could see nothing suspicious anywhere; everywhere there was blue sky and very rare flecks of white clouds. Spread below was the bare steppe. "We have not yet reached the river." I determined our position and again began to scan the sky. On one side planes appeared. There was something unusual, unfamiliar in their flight. There were many planes, about 50-60, and they were all silvery white, not like our fighters at all. They flew with a provocative calm and confidently, as though they were complete masters over the Mongolian land and felt no danger. It became clear that these were Japanese I-96 fighters.

Here my heart first skipped a beat and then, as though gathering strength, it contracted and froze. The excitement of a novice, hate, the fervor of youth -- all this was intermingled. I flew toward that armada.

Suddenly something unexpected happened -- an avalanche of planes fell upon the enemy formation from somewhere above. The strike was so strong and so unexpected that it seemed to me that the enemy was scattered by some tremendous explosion and, leaving burning planes hanging, whirled around in a wild dance. What had happened? Stunned by the spectacle that presented itself, as though seeking an answer from the pilots in the formation, I glanced at them and noticed that other planes were hurrying to the rescue of the attacked Japanese. It was necessary to delay them, and I turned to meet the enemy.

A frontal attack!.... Do not turn away in any case! A desperate excitement seized me.

How much has been written about this frontal attack! How many legends have grown up around pilots who have displayed persistence and resourcefulness in it! What feelings are born at that moment! How much ability and will are necessary in order to come out of it victorious!

However hard I tried not to make a mistake, the enemy planes grew up in front of me so fast that I was unable to look into the sight and pressed the gun trigger -- everything flashed by. Having showered each other with poorly aimed fire, we separated for an instant so as to attack again without delay but from a better position. Still not believing that this frightful frontal attack had ended so simply even somehow involuntarily, I flew for a while with an intense expectation of collision: after all, neither I nor the enemy had turned aside, at least it seemed so to me. "And what about the rest?" I came to my senses and looked around.

Something incomprehensible was going on around: the air swarmed with planes and glistened with fire as though the whole sky were burning, while sparks and flame were being blown around by some wild wind, overwhelming everything, swirling, leaving nothing in peace.

Looking at this picture, I became confused and did not know what to do. All of my ideas about aerial combat had nothing in common with what I could see. There was no formation. You could not tell where our planes were and where the Japanese: everything was mixed up.

Remembering the instructions of veteran pilots: "If you break away from the formation in battle, formate immediately on the first friendly plane that comes along," I wanted to do just that but right in front of my face was a Japanese fighter looking like a bird of prey with large wings and legs not tucked up under. Forgetting all about danger, I went after him. Possibly I would have caught him, but something white suddenly flashed before me and, unable to jump away, I hit it with my wing. The plane jerked. "A parachutist. Perhaps one of ours?" But then I saw that a burning enemy fighter was falling right on top of me. Avoiding a collision with it, I turned aside and found myself beside another enemy plane flying on the same course as I. We flew together for a time, in a pair, and neither one tried to fall behind or turn away; each was thinking about how best to deceive his "neighbor" and destroy him.

Making out well the Japanese pilot's head wearing a helmet with earphones fitted into it, I gently reduced the throttle trying to fall behind and get on the tail of the Jap. But the latter guessed my guileless intention and calmly turned. Our glances met. Instead of the expected fright, hatred, or resoluteness on the enemy's small round face with a mustache, I saw a cool, condescending smile which made me feel not too good. "I'll ram my wing into his cockpit," I thought. Perhaps we both would have broken up from the blow and fallen to the ground if at that moment the Jap had not been cut through by a burst of machine-gun fire; his condescending smile immediately faded.

The I-16 that had destroyed the enemy skipped over his victim, not noticing another enemy plane behind him. Comprehending the danger threatening the pilot who had just squared accounts with the enemy so deftly, I hurried to the rescue. A shot... and a cloud of dust flew out of the enemy fighter just like from an old sack that is shaken out. Feeling slight blows from small fragments, I pulled up sharply and formated on the friendly plane, which was already rushing to attack an enemy element.

A brief engagement, and one more Japanese fighter went down, while the second turned over and climbed upward. Suddenly the I-16 that had just destroyed two enemy fighters began to smoke. But the pilot of the burning plane, apparently trying to put out the fire, tore off to one side. The fire, as though annoyed at the stubbornness of the man, broke outside. The pilot jumped out.

The battle was in full swing. The air was boiling with fire. One of our fighters formated on me. When I saw beneath the silvery cupola our parachutist hanging on to the shrouds, I felt better. Two Japanese I-96's tried to shoot down the helpless man descending by parachute. Somebody from our side immediately attacked them, and at that moment I froze with fright: the burning plane was falling directly on the parachutist. I could see nothing more: a burst of machine-gun fire lashed at me just like a whip. Remembering instructions that an I-96 should not be evaded by

making a turn, without hesitation I pushed the control stick as far away from me as it would go and tore down momentarily. The force of inertia was so great that I was pushed halfway out of the cockpit, the stick was torn out of my hand, and the plane dove straight for the ground. The pressure roared in my ears, penetrated into my nose, and grabbed at my throat, ready to tear away a part of the body and cast in out into space.

When I was able to pull the plane out of the dive almost right at the ground, some kind of wild joy seized me and I started upward, forgetting even to think about the extended safety straps because of which I had almost been thrown out of the cockpit.

As before the air was stormy with fire and metal; everywhere there were blunt-nosed I-16's; occasionally one would come across an I-15 spinning like a top. Among them there were many Japanese fighters, now somersaulting cautiously, now turning quickly. They were all distinguished from the Soviet planes by their whiteness, their fixed landing gear, and some kind of feline movements.

No matter how I tried to find the familiar parachutist, he could not be seen anywhere. Thinking that he had got down safely, I tore into the very thick of the battle. I fought with some kind of bitterness, and all my movements were jerky and headlong. More than once, catching up to an enemy, I had to aim and fire. Several times I evaded enemy attacks, formated on friendly planes, and flew around until I noticed that the sky was clearing up. Sensing a weakening of this hurricane, I seemingly stopped and, sighing with relief, looked around.

And then it became clear to us that the Japanese were withdrawing to their own territory; the battle was ending with pursuit. I immediately formated on an I-16 who was going after a solitary Jap bolting for the Khalkhin Gol. Reloading my guns, I prepared for attack. The one on whom I had formated caught up with the enemy at the very ground and tried to attack him straight in, but the Jap slipped out. For a second attack, my unknown friend in the I-16 went with the Jap on the same course and a little to one side. Seeing that no one was attacking him at the moment, the enemy continued flying in a straight line. "He will get away!" I began to worry, noticing the approaching gleaming thread of Khalkhin Gol water. "Why tarry?"

My new leader did not hurry with the repeat attack; as though warning the enemy fighter of his intentions, he dipped his wings and made a large bank toward him. The enemy, apparently comprehending that the turn toward him was being made for firing, turned sharply toward the attacker. I noticed that our fighter just made one bank toward the enemy and kept his plane in rectilinear flight. By this he deceived the Jap, who guessed his mistake and tried to slip out again, but it was too late. The I-16 froze for a moment...fire flashed out, and the enemy, as though staggering, plunged right into the river.

"There you are!" I thought admiringly, making a turn after my unknown pilot. "Only why did he not attack straight in?"

When I was returning home, the steppe no longer seemed so clean and fresh; it was strewn with brightly burning bonfires with spreading columns of smoke, silvery heaps and fragments from the downed planes that had ripped in to the ground. This is the outcome of an aerial engagment.

Satisfied with the safe return, not hurrying and even with a feeling of some solemnity I switched off the engine, unbuckled the safety straps, took off my gloves and, shoving them behind the cockpit canopy, climbed out of the plane. Feeling the ground under me, I took a deep breath. Excited by the preceding battle, I did not feel a trace of fatigue and I noticed with satisfaction that proud sparks of my first combat sortie glowed within me. My mind, filled with new thoughts and sharp impressions, did not yet comprehend the surrounding reality. Revelling in the quiet and the fresh smell of the air, the caressing sun, and the expanse of the steppe, I slowly straightened out my clothing, put myself in order and, glancing at Vasil'yev, said with profound meaning:

"Well, now we have received a true baptism..."

Vasil'yev stood there silently and gazed expectantly, and when I spoke, he reported sadly: "Some have not yet returned."

I heard nothing; my ears were stuffed up from the altitude, and even my own voice seemed to me distant and muffled. I held my nose and began to blow hard. My ears began to hiss, something broke through, and immediately there gushed in to them the familiar airfield sounds and Vasil'yev's words, somewhat enthusiastic, somewhat concerned: "Bullet holes!..."

I roused myself and began to examine the bullet holes in the plane with special attention and deference, even with some sort of tenderness and love, just as though this were a close comrade wounded. There were twelve of them.

"Ye-es... they really shot you up," said Vasil'yev.

I fell to thinking, forcing myself to evaluate the success of the battle. But this was beyond my powers. I felt it more than I saw it. I could not grasp the general picture of the battle and judged it only by my own actions and by what I saw near me. But even this gave me an opportunity to conjecture that the rest of the pilots were returning and to sense in the depth of my being a victory over the Japanese.

By the end of the day all the pilots of the squadron flew back to their home airfield. One man did not return -- the commander of the regiment, Maj. N. G. Glazykin. Having personally shot down two Japanese fighters, he jumped out in his parachute but perished from being hit by his own burning plane.

In the official report of the Kwangtung Army, it was said about this battle: "On 22 June at about 0400 hours, 105 Soviet planes illegally crossed the boundary near Gandjur and were met in the air by eighteen Japanese fighters. In the subsequent battle, 49 enemy planes were shot down, while 5 Japanese planes did not return to their base because of distance. Included among these was the plane piloted by Capt. Morimoto."

The Japs lied brazenly.

In reality it was as follows. Concentrating up to 250 planes (of which more than 150 were fighters of the latest type), the Japanese decided, as in May, to attack the Soviet air forces by surprise. And then 120 fighters crossed the Mongolian border. Ninety-five Soviet fighters went up to meet them in good time. As a result of the battle, one quarter of all the enemy planes remained on Mongolian land.

Thus did the Japanese begin an aerial fight for supremacy in the air, which lasted for an entire week with relative quiet on the ground.

* * *

On Sunday, 20 August, the pilots were awakened earlier than usual. The night was dark and cold. Fog was forming in the lowlands. It hung over the Khalkhin Gol like a curtain of smoke, and helped the Soviet infantry and tanks to approach right up to the enemy.

Dawn had not yet begun to appear, but all 600 of the Soviet planes were ready to rise into the air. In the quiet of the night, the squadrons lined up in formation on the airfields and listened in excited silence to their orders.

The seizure of Manchuria, the war in China, and finally the incursion into the MNR as the beginning of the plan of the Japanese militarists for the seizure of Siberia -- all this incited hatred and a natural desire to punish the enemy and establish peace in the Far East. This is why the airmen listened to the words of the order with such attention.

Then a meeting developed almost imperceptibly. The speeches were brief; they were something like a solemn oath that rang with deep internal conviction.

When they separated to go to their planes, dawn was already breaking. Never before had the Soviet-Mongolian troops waited for sunrise with such impatience as on this day.

Our reconnaissance fighter squadron, formed at the beginning of August, was given no tasks this day other than reconnaissance. But we already knew from experience that scarcely a single large aerial battle could get by without us, because our airfield stood near the front line. And you cannot but fly out after an enemy that you see. Besides that, having direct and reliable communication straight to the headquarters of the 1st Army Group (the headquarters of the operating troops), we were often used as a reserve. Therefore we were always ready to carry out any mission.

I in a pair with pilot Zhenya Shinkarenko were ordered to determine the changes that had occurred in the enemy's position during the night and to reconnoiter whether any reserves were approaching. But in order not to call forth any premature sortie by enemy fighters, we were not to appear over the area of combat operations before the first squadrons of our own air forces.

Receiving a report that our bombers had begun to take off, we got into our planes. It was quiet all around. The steppe gray with abundant dew and the cloudless, clean, as though washed, sky had never seemed so peaceful and majestic...

We took off. The future field of battle lay as though in the palm of a hand. Bridges bisected the river with thin lines in several places. On the shores of the Khalkhin Gol, bluish with the remains of the fog, a practiced eye could see without difficulty a web of entrenchments and communications trenches, but no troops with their equipment could be seen. The eastern shore, toward which the Japanese invaders had zealously been pushing for three months, was especially cut up and dug up; located there in a strip of 3-5 kilometers were the Soviet-Mongolian regiments that had crossed over in the last two nights. They were compressed like a spring and were ready to fall out at the first signal and go into motion.

Shinkarenko and I approached the front line a little to one side of the cannon squadron of Lt. Trubachenko. Flying beside us were small groups of our SB's [medium bombers]. They were being covered by fighters from Maj. G. P. Kravchenko's regiment. The Japanese did not guess that these were specially-assigned planes for suppressing the fire of their AA artillery and began firing, thereby showing their facilities immediately. The bombs raining down, the fire of ground-attack fighters, and artillery shells compelled the enemy AA guns to fall silent. But the black clouds of the bursts had not yet dispersed when more than a hundred and fifty Soviet bombers flew out of the southern blue of the sky. Fringed with fighters from the primary escort regiment of Maj. V. M. Zabaluyev, they flew in columns and involuntarily attracted attention by their amazing calmness. Above everyone were nine-plane groups of "Chaykas".

The Khalkhin Gol had never before seen such a mighty operation. Looking at them, the Soviet fighting men felt pride in their Motherland, in their people who had equipped their army so well.

The ground occupied by the enemy seethed and shuddered from the bombs. It seemed that out of its depths there broke out a gray-black lava and, spreading out drowned the Japanese fortifications and with them the men and equipment. Fires that broke out in places, like signal torches, made known the successful beginning of the defeat of the Japanese. Soon the artillery went into action.

The sudden strike was so devastating for the enemy that in the first hour and a half he was unable to send a single shell, a single bomb in reply. The Japanese command did not guess at all that it would be beaten to the offensive, which it had intended for 24 August.

...Aerial battles broke out. The Japs, recovering from the surprise blow, threw many fighters at the front, and their bomber force also went into action.

Having completed our mission, we landed at our home airfield and reported on the results of the reconnaissance. The pilots of the squadron were awaiting take-off in combat readiness.

Columns of nine Soviet SB's had passed over our airfield from the direction of the Khalkhin Gol for the second time this day. At a low altitude groups of our fighters were darting after a battle. Following them with our gaze, we wondered why our squadron was not being sent into the air for such a long time. The commander of the squadron, Nikolay Grinev, began to get worried and telephoned to headquarters. There they replied: "Don't worry! Wait!" And, laying the receiver down, he waited.

Finally -- immediate takeoff.

From the air the front line was noticeably far away; it was delineated by a solid strip of smoke and fire. The eastern shore of the Khalkhin Gol was all alive. Twelve divisions and brigades of infantry, cavalry, tanks, and armored cars with artillery and engineering units of the Soviet-Mongolian troops had crawled out of the ground and were moving on the Japanese. The entire panorama of the seventy-kilometer battle could be seen.

On Mt. Khamar Daba, from where the fighters were being vectored, a fifty-meter arrow showed the squadron the way to the enemy.

Off to one side a battle was already going on: the Japanese had attacked our fighters patrolling in the air. "They will have to fight alone. Can we do it? Can we get through to the bombers? Will we be tied up by battle just like the duty patrol?" -- thoughts flashed anxiously.

We were scarcely able to recognize the danger hanging over the ground troops, who were threatened with a bomb strike of major proportions, when the Japanese fighters came to cut off the squadron. A battle began. The rear planes were cut off. Grinev and I were able by a miracle to break out of the merry-go-round that had developed and go off to the bombers. But then -- out of nowhere -- from above, from the direction of the sun, about ten enemy fighters fell upon us. The enemy was catching up with us from behind and from the side. But as though noticing nothing,

Not long ago, Military Technician First Class, technician Senior Lt. Askol'd Yakovlevich Bragin was awarded a valuable gift for accident-free flying. Working as deputy squadron commander for the IAS [aviation engineering service], Communist Bragin indoctrinates his subordinates in a spirit of high conscientiousness and responsibility for the job entrusted them. The technical personnel of the squadron exert every effort to ensure that the plan of combat training would be fulfilled without flight accidents.

In the photo: officer A. Ya. Bragin (extreme left) analyzing flights with the aircraft specialists of the element where the technician is Vladimir Makarovich Stoyan.

Photo by V. P. MALEVANCHENKO.

Grinev continued to fly toward the bombers. But no, he saw and understood everything, and I could easily see that he was no longer looking behind but was trying to aim better. There was no doubt whatsoever: Grinev will perish but will not turn off the course. What a will in the man! Only will could support him under such a stress.

My glance slid off to one side of our airfields, and there, to my great joy, I saw several groups of our fighters hurrying to our aid. But this joy died immediately, like a spark: it was too late; before they could be attacked the Japs would be able to drop their bombs.

Seconds decided the success of the entire battle. From my seeming helplessness, I didn't feel quite myself. The Japanese fighters were pressing hard. It became clear: we could no longer fly together -- we would be shot up. The experience of a score of aerial battles suggested a solution to me -- without losing an instant, I rushed at the enemy fighters, counting on delaying them a few seconds and giving my commander an opportunity to attack the bombers.

A dog fight began. Finding a moment, I glanced around: where was Grinev? He had darted under the formation of bombers, and then -- an explosion, flames, bombs rained down... I guessed: one of the bombers had exploded from Grinev's shells. Having found the commander, I looked around intently.

The picture of the battle had changed drastically in a few seconds: our fighters that had come up had fringed the Japanese bombers, who, losing all formation, were hurrying to turn as rapidly as possible and to save themselves in flight. Lumbering, large, squeezed by the nimble I-16's, they were rushing about, deserted by their fighters, and, like tow targets, were being shot up by the Soviet pilots.

Shinkarenko came up close to me. Reveling for a few seconds in the relaxation of the battle, he and I flew side by side and, looking at each other, smiled affably. Only he who has himself lived through such never-to-be-forgotten minutes of excitement and joy can understand what sort of smiles these were.

* * *

On the night of 24 August the Japanese units were surrounded. The enemy would not surrender and, in the last few days of the month, was destroyed for the most part.

On 1 September, the Soviet-Mongolian troops changed over to normal guarding of the national boundary.

After that the Japanese, making two more unsuccessful attempts to intrude within the borders of the Mongolian Peoples Republic, discontinued ground fighting. But in the air it broke out with renewed force. On 15 September, about 400 fighters alone from both sides took part in a final aerial engagement.

Having achieved nothing and having suffered great losses (during the Khalkhin Gol operations 660 Japanese planes were destroyed), the Japanese were forced to sign an agreement halting all military action.

Maj. Gen. of the Air Force Reserve,
A. V. VOROZHEYKIN, Twice Hero of the
Soviet Union.

IN A FLIGHT FOR RECONNAISSANCE

It was 1915. A soldier walking with formation stride came up to a senior officer of the Gatchina Military Aviation School and, saluting, reported cockily that Pvt. Smirnov, a chauffeur-mechanic of the Ninth Motor Company, had arrived for flight training!

The officer raised his head in surprise: "What?" and he laughed. "To fly? This can't be."

This typical representative of the reactionary officer class considered that flying

Col. S. F. Smirnov, Ret.

was a matter for the chosen. In the air training institutions of Russia prior to WW I only officers were accepted, and preference was given to the nobility, members of the Tsarist Guard, persons having influence, etc. It was very difficult for a soldier to become a pilot.

Pvt. Sergey Smirnov was sent to an aviation-motor course, finished it that same year, and began working as an aviation engine mechanic in a branch of the Gatchina school -- at the Korpusnyy Airfield near Petrograd.

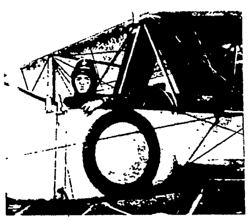
Later on, however, in order to replenish the losses of pilots at the front, the dominating classes were compelled to permit to flight training even those who, in their opinion, were born only "to crawl". A special group was organized of the most capable soldier-mechanics at the Gatchina school who expressed a desire to fly. The soldier cadets continued to service the planes of the officer cadets, as before, and learned flying in their spare time.

In 1917 Smirnov passed the examination for a military pilot and for the time being, before receiving orders to the front, stayed at the school as an instructor. It was here, at the Korpusnyy Airfield, that the February bourgeois-democratic revolution caught Smirnov. Together with the workers of the Putilov plant, he roamed the streets of the capital and took part in disarming the police and officers who were firing on the people. On 20 August, the representative of the Bolshevist faction in the Council of Worker and Soldier Deputies at Gatchina called up Smirnov:

"It's urgently necessary to clarify the situation and learn the disposition of the counterrevolutionary units. The officer pilots are not reliable. Can you reconnoiter the march of the counterrevolutionary troops of the 'wild division' on Gatchina and Tsarskoye Selo from the direction of Vyritsa?" Smirnov agreed immediately and went to the airfield right away.

On Smirnov's orders, the mechanics pulled out of the hangar a new, as yet untested, "Voisin" reconnaissance plane. Mechanic Aleksey Bokoy volunteered to fly as observer. The engine was already started when a group of officers headed by the chief of the school ran up to the plane: "Why are you flying?"

"They have learned of the reconnaissance! They want to prevent it!" thought



Pilot S. F. Smirnov in the cockpit of the "Voisin" plane in which he flew out for reconnaissance.

Smirnov, but he answered quietly:

"It is necessary to check the engine adjustment for tomorrow's training flight."

"If you take off," cried one of the officers in reply, "you will be hung on those birches there," and he pointed to the trees in the officers' compound.

Making no reply, Smirnov advanced the throttle, and the plane went out to take off.

It was about five o'clock in the evening. Having checked all the main highways leading to Gatchina and Tsarskoye Selo and having seen no cavalry. Smirnov decided to land the plane at the Tsarskoye Selo airfield and find out about the situation. The engine was not turned off after landing, so that they could take off immediately in case of a surprise encounter with the Cossacks.

No enemy appeared. The plane was met by the chairman of the Soldier's Committee of the Tsarskoye Selo Air Detachment. He had the task of sending out a plane with appeals to the mountaineers of the "wild division", but the officer pilots, pleading bad weather, refused to fly.

Twilight was already falling. Smirnov agreed to scatter the leaflets. Having come to an agreement that bonfires would be lit for him to land by, Smirnov took off.

The plane was over Vyritsa. Visible below were troop trains, horses, soldiers. At treetop level, the "Voisin" flew over the columns of the "wild division". The pilot and the mechanic tossed out packets of the appeals. The white sheets fell down, spinning.

The mission was completed; it was necessary to return. In complete darkness, the pilot flew his "Voisin" to the airfield.

Water flashed below the wings. Is it possible that these are the ponds of Tsarskoye Selo? No, they do not look like them, too much water. It became clear that he was lost. Smirnov turned the "Voisin" to the left away from the water. Below, under the very wing, lights broke out suddenly.

The plane touched the ground with its rear wheels and bounced. The pilot immediately turned off the motor. Bouncing up and down, the plane rolled along the ground and stopped.

Thus did a pilot from the ranks, now a retired Colonel, begin his service to the Revolution.

B. N. ORLOV.

Declassified in Part - Sanitized Copy Approved for Release @ 50-Yr 2014/06/18 : CIA-RDP81-01043R004400150005-8

AMONG OUR FRIENDS

THE COMBAT EXPLOITS OF CHINESE PILOTS

The great Chinese people under the wise leadership of the Communist Party are gaining ever new successes in building Socialism. Guarding the peaceful labor of the Chinese people, vigilantly stand the soldiers of the various arms -- including aviation. The workaday life of the Chinese pilots includes not only peaceful training but actual aerial battles with enemies of their Motherland.

The Chiang Kai-shekist clique instigated by the US imperialists are continually carrying on provocative operations on the borders of People's China. And the pilots of the NOA [People's Liberation Army] Air Force, standing continous guard over the airspace, must often interrupt their intense training and engage in combat with the brazen air pirates. In the course of the past year alone fighters in violent engagements with the enemy shot down seventeen and damaged twenty-five Chiang Kai-shekist aircraft.

Below we give an account of the training and the combat life of staunch comrades-in-arms, the glorious aviators of People's China.

* * *

THIS HAPPENED IN THE REGION OF EN-P'ING

Heavy black clouds covered the sky over the province of Kwangtung. The rain which had drizzled all evening long increased at night. The Chiang Kai-shekists decided to take advantage of the adverse weather for one of their routine provocations. Into the airspace over the KNR [Chinese People's Republic] was dispatched a four-motor bomber numbered 815....

Hardly had the aircraft risen over Taiwan when the radar posts of the People's Liberation Army spotted it.

"There's a target!" reported almost simultaneously several posts.

In the X fighter unit, which covered the coastal region of Kwangtung province, a combat alert was sounded. The pilots of the duty element, Li Ai-p'ing, Tsiang Che-lun, Hao Tai-hua and Chu Pao-cheng took their places in fighter interceptor cockpits.

Information on the enemy aircraft came in continuously. The Chiang Kai-shekist bomber was flying over the open sea in the direction of the island of Hainan. Then, having changed course several times, it violated the airspace over the KNR in the region of the Luichow Peninsula.

Tense work was in progress at the CP. Over the plotting board bent the deputy commander of the group Li Hsian-kang, the assistant chief of Staff Tu Tsing-t'ang, controllers Wang Tsin-chang and Lin Kwang-tsian, and other officers. They were evaluating the situation, making computations, and plotting the interception line.

The invader was maneuvering in direction and altitude. He was passing over Henghsien and Kweiping. Another turn. The bomber was over Wuchow.

"Number fifteen, start", the CP alerted.

Interceptor pilot Lt. Tsiang Che-lun was excited. And why not? They were entrusting him, a young pilot, with a responsible mission.

"Take off", came a new command. And instantly the aircraft shot down the concrete runway like an arrow and zoomed steeply into the air.

"Have penetrated the cloud cover," the pilot soon radioed.

Tonight the soldiers in the radar unit under the command of Wan Tian-shun were on vigilant guard. The crew of the radar station under Junior Lt. Wang Si-chang were working efficiently.

"Target number one -- course 135, altitude..." reported operators Huang Kwei-tao, and Pei Hua-min. And immediately the ground controller, Junior Lt. Tan Liu-kwang radioed the interceptor pilot:

"Left turn, 10°bank."

Plotters Tsiang Sin-tian and Tang Ho-kwang traced on the map in bold lines the invader's course and the position of their aircraft. With each second the fighter interceptor drew closer to the target. Seven, six, five kilometers remained until he reached the bomber.

"Attention! Four kilometers to target," the pilot was warned from the ground.

No matter how hard he scanned the darkness, Tsiang Che-lun could not discern the bright spots which were the enemy aircraft's engines. Suddenly on the sight's scope Tsiang Che-lun noticed a barely discernible blip. Gradually it became clearer and clearer. "There can be no doubt, this is the enemy", decided Tsiang Che-lun. The Chiang Kai-shekist aircraft was flying to the right and somewhat below the fighter interceptor.

"I see the target!" immediately reported Tsiang Che-lun.

"Attack!" followed the command from the ground.

Having reduced the rpm, Tsiang Che-lun made a smooth corrective turn. The bomber blip moved to the central marker of the sight. Tsiang Che-lun's nerves were taut. All his attention was now concentrated on the bluish scope of the radar sight. Coolly he awaited the moment of firing.

"Fire!" the pilot gave the command to himself.

The fighter shook a little. A short burst and streamers of tracer shells stretched between the aircraft and the darkness in which the enemy bomber was flying. Tsiang Che-lun carried out a maneuver. Boring through the darkness, he tried to spot the target -- but in vain. He could not even make out the instruments in the cockpit of his own plane. The dazzling flashes of the cannon bursts blinded him for a brief time. But then he regained clear vision. Tsiang-Che-lun maneuvered again, and suddenly -- Oh joy! -- for a split second he saw down below under his right wing a bright flame flash by which at once was lost far behind.

"I got him, I got him!" Tsiang Che-lun rejoiced and immediately he reported to the CP:

"The enemy aircraft is in flames!"

Tsiang Che-lun decided to attack the enemy once again to finish him off. Contacting the CP, he continued the pursuit of the enemy. Soon, in a break in the cloud cover down below to his left the pilot spotted the burning bomber. The Chiang Kai-shekist kept maneuvering, hoping thereby to shake off the plane and escape towards the sea.

Tsiang Che-lun knew that he had very little time, because the bomber could enter a cloudbank and then he would be difficult to find. A quick turn of the fighter, and the Chiang Kai-shekist was in the sight. Fire! And once again the tracer shells, drawing a bold track, caught up with the bomber at the very edge of a cloud bank. However, the very next moment it disappeared in the clouds.

During these seconds Tsiang Che-lun clearly remembered how three years ago fighter pilot Lu Min flying under adverse conditions at night successfully attacked and shot down a Chiang Kai-shekist bomber just like this one. "And this skunk is so persistent!" he thought with annoyance and immediately decided that he would in no case let the enemy get away. But now, a few seconds later, he smiled with joy; he saw the ChiangKai-shekist bomber tumble out of the clouds, dropping down rapidly, enveloped in flames. A powerful explosion shook the air -- and now burning fragments of the plane showered down the mountain sides in the region of En-p'ing.

The command evaluated highly the daring actions, so full of initiative, of the men of the Air Force. Fighter pilot Tsiang Che-lun, ground controller Tan Liu-kwang, and chief of the radar station Wang Si-chang were promoted to the next rank ahead of schedule. Also cited were many other men who helped achieve victory over the enemy.

CHOU CHUN-FU DOWNS TWO ENEMY AIRCRAFT IN ONE BATTLE

The brazen enemy air pirates were trying to penetrate deep into Chinese territory in groups. At the CP of a fighter unit of the People's Liberation Army an alert was sounded: Chiang Kai-shekist aircraft were approaching the coast from the sea.

"Numbers... Start". The command was given to fighters on duty.

The enemy aircraft were flying in the direction of the mouth of the Min River. The enemy plan was clear: the Chiang Kai-shekists were trying to break through to the port city of Fuchow.

"Take off!" came the command.

The group of fighters quickly assembled aloft, gained altitude, and took up the course to the line of interception.

"Switch on afterburners!" the command came from the ground.

The interceptors closed in rapidly on the enemy and soon in front and to the right at an altitude of 11,500 meters they spotted eight Chiang Kai-shekist jet fighters of the F-86 type.

"We will attack in a group," ordered Chao Tsiun-shan. "Pick your target."

Having made a right turn the fighters vigorously attacked the enemy.

The Chiang Kai-shekists, relying on their numerical superiority, did not decline battle. And now high in the sky over the mouth of the Min River an aerial carrousel was turning. The first cannon bursts were heard.

During the battle fighter pilot Chou Chun-fu noticed that two Chiang Kai-shekists were trying to attack the "silver swallow" of Chao Tsiun-shan from the rear hemisphere. "The commander's life is in danger!" flashed through the mind of Chou Chun-fu. Making a turn, Chou Chun-fu took up an advantageous position for attack. Now the Chiang Kai-shekist closest to the commander's aircraft was bracketed in the sight. Another minute, and an accurate burst of tracer shells riddled the enemy "Saber". Enveloped in flames, the enemy fighter plummeted into the sea not far from the island of Pingtan and exploded, throwing up a huge column of water. The second enemy fighter declining the attack, hurriedly withdrew.

The fishermen who were watching the aerial battle from their boats, rushed to the spot where the enemy plane had fallen. Floating on the surface they saw a rubber tube from the landing gear of the fighter with the inscription "Made in USA". This was all that was left of the Chiang Kai-shekist air pirate.

In the meantime the dogfight flared anew. At an altitude of more than 12,000 m four more fighters appeared. They attempted to strike from above by surprise. But this treacherous enemy plan was scuttled.

"Attention, they are attacking from above", Chou Chun-fu forewarned his comrades and at that moment, pointing his fighter across the enemy's path, he attacked one of their aircraft. The Chiang Kai-shekist fighter was hit! Losing altitude, it headed in the direction of Taiwan, trailing smoke.

The Chiang Kai-shekists were hurrying to withdraw from battle but the fighters of the People's Liberation Army were on their tails. And again success was with Chou Chun-fu. Now his fighter, with the number eight marking, was hot on the trail of the enemy. The latter made a desperate attempt to evade pursuit but he had no luck! The enemy "Saber" was firmly bracketed in the sight. A burst -- and one more enemy aircraft, exploding in the air, plummeted into the sea.

Thus in a single aerial battle at the approaches to Fuchow a fighter-interceptor of the People's Liberation Army, officer Chou Chun-fu, personally shot down two and damaged one Chiang Kai-shekist jet fighter.

VALOR

In the X fighter unit the routine training gunnery exercises at aerial targets were in progress on this day. Time and time again the tow plane with the sleeve target appeared and the fighters attacked it one after the other. Now they had completed the maneuver for a repeat attack. A short distance remained to the sleeve target; any moment the cannon bursts would follow. Suddenly the CP transmitted:

"Numbers... relinquish the target. Course 210. Accelerate the climb!"

From the data transmitted from the ground it became apparent to the pilots that they had to intercept a group of eight Chiang Kai-shekist F-86 jet fighters which were attempting to break through from the sea deep into the continental area of the country.

The fighters assumed a course heading toward the intercept line. Young pilot Han Yueh-yan's heart started pounding; this would be his first aerial battle.

The battle was fierce. High up in the sky twelve kilometers above the ground the "silver swallows" and the "Sabers" whirled in a mortal struggle. Continually cannon bursts resounded.

Outstanding in combat and political training, pilot Yeh Chun-sin (left in photo) shot down four enemy planes in aerial battles.

Surreptitiously one of the Chiang Kai-shekist vultures managed to slip close to Han Yueh-yan's fighter and to attack him. The aircraft was jolted. It was seriously damaged. At this moment Han Yueh-yan did not think of himself or of withdrawing from battle. He saw in front of him the Chiang Kai-shekist plane and, bracketing it in his sight, gave a long burst.

The crippled enemy aircraft, losing altitude, attempted to withdraw from battle. "I must finish off the enemy!" thought Han Yueh-yan but he did not succeed. The "silver swallow" suddenly became uncontrollable and, falling downward into the unknown, went into a spin. Han Yueh-yan was still able to notice that his battle comrade Chou Yu-tsai vigorously attacked and downed the Chiang Kai-shekist.

Meanwhile Han Yueh-yan was coolly trying to pull his plane, which was rapidly losing altitude, out of the spin. Ten, eight thousand meters to the ground -- but he still continued to fall. Han Yueh-yan exerted all his efforts but the fighter kept on spinning. "Should I eject? No, I must save the plane at all cost," thought the young pilot and finally at five thousand meters above the ground he managed to recover from the spin.

But his trials did not stop here. One of the Chiang Kai-shekist air pirates, having noticed that Han Yueh-yan's plane was out of control, decided to attack it without risking his neck. Only several hundred meters separated the Chiang Kai-shekist from Han Yueh-

yan's fighter. Another instant -- and a stream of fire riddled Han Yueh-yan's fighter.

There was a smell of burning. The cockpit filled with smoke. Once more it was difficult to control the aircraft. But do not yield before obstacles! Han Yueh-yan well recalled the words of that glorious Soviet pilot, Thrice Hero of the Soviet Union Aleksandr Pokryshkin; "Valor will give you everything you need."

"So long as my heart beats, so long as the aircraft's engine functions, I will carry on the engagement." This was Han Yueh-yan's firm resolve.

At this moment the pilot noticed the Chiang Kai-shekist, pulling out of the attack, sweep by under his wing. With great difficulty he made a turn and, even with a damaged aircraft, began to pursue the enemy. The range shortened. Han Yueh-yan took careful aim and gave the enemy a burst. And suddenly the hostile "Saber" was in flames! Blanketed in smoke, losing speed and altitude, the vulture escaped in the direction of the sea.

"Yes, this was some fight!" thought Han Yueh-yan to himself.

Having thwarted the raid by the Chiang Kai-shekist air pirates, the fighter interceptors returned to their airfield. Ahead appeared the familiar contours of inhabited points, rivers, and hills. And there was the airfield. Han Yueh-yan was approaching for a landing.

"Number seven, attention! Only one of your wheels has extended. Try to extend the other one." came the warning from the ground.

But no matter how hard Han Yueh-yan tried he could not extend the other wheel.

"Do I have permission to land the aircraft on one wheel?" he asked.

The commander thought carefully. Slowly one second stretched into another. And now in the headset was heard his calm and firm reply:

"Permission granted."

Han Yueh-yan skillfully landed his plane. How great was the surprise of all those at the airfield when the technicians, having carefully examined Han Yueh-yan's fighter, reported that the "silver swallow" had been hit more than forty times. And yet the aircraft was saved.

"Good boy, Han Yueh-yan!" said the commander, embracing our hero like a father, "we're proud of your exploit."

WE ARE CONTINUALLY IMPROVING OUR COMBAT READINESS

General of Division JAN FREY-BIELECKI

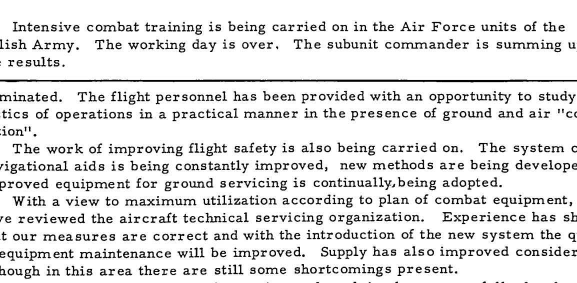
The road traveled by the Polish people during the last fifteen years proves convincingly that the success of our country is based on a common goal toward which the peoples of the Soviet Union and Poland are moving together. The traditions of this indestructible friendship and cooperation which was born during the war years are especially dear to our Air Force. Now too, under peacetime conditions, we are consolidating and developing these traditions more and more.

Speaking of our contribution to strengthening the power of the Air Force of the Polish Republic, we must first of all note that during the last few years the training system in our flying schools has been considerably improved. At the present time the majority of young men, after completing the aeroclub, enter the military Air Force flying schools. The future military pilot candidate, even before beginning his studies at the flying school, has already logged a certain number of hours of flying in gliders and small-engine aircraft. Due to this set-up, as well as to the improvement in training methods, the military Air Force schools graduate students with a military pilot third class training level. In this way it is possible to concentrate on tactical training and its further improvement in the line units. We are particularly careful about achieving systematic and uniform flights, striving to have every pilot establish a rhythmical logging of flying hours over a period of the entire year. This method has yielded considerable results already-- the level of combat training in our pilots has risen and flight safety has increased.

It is known that flying in present-day jet aircraft has an effect on the physical condition of the personnel. A training center has been established for reconditioning and improving the physical training of the flight personnel.

With a view toward a continuous improvement among the Air Force cadres of all the specialties, we have set up an educational center where officers extend their methodological knowledge and skills in guiding Air Force outfits and units.

It has been two years now that combat training has been carried out by the new method. This has produced good results. The special feature of this training consists in the fact that, having received the essential primary skills, a pilot practices them under conditions which approximate those of combat. In this way the break between combat training and flight tactical exercises which existed before, was



Intensive combat training is being carried on in the Air Force units of the Polish Army. The working day is over. The subunit commander is summing up the results.

eliminated. The flight personnel has been provided with an opportunity to study the tactics of operations in a practical manner in the presence of ground and air "counter-action".

The work of improving flight safety is also being carried on. The system of navigational aids is being constantly improved, new methods are being developed, improved equipment for ground servicing is continually, being adopted.

With a view to maximum utilization according to plan of combat equipment, we have reviewed the aircraft technical servicing organization. Experience has shown that our measures are correct and with the introduction of the new system the quality of equipment maintenance will be improved. Supply has also improved considerably, although in this area there are still some shortcomings present.

The scientific research and experimental work is also successfully developing. A great deal of attention is devoted to improving methods of supervision in strategical formation and group staffs.

With satisfaction we recall the past years. The work to which the Soviet comrades have contributed in no small way permits us to look boldly toward the future. At the present time we have at our disposal an up-to-date production base, well-trained scientific-technical and design cadres, a large number of experienced pilots, and engineering and technical specialists with an excellent background.

The cadres of command personnel at all levels have grown and have acquired experience.

The cooperation -- which has existed for many years and which is continually growing -- between Soviet and Polish aviation is an aid to our further improvement.

The United Polish Worker's Party and the government of the Republic continually take pains to see that the combat readiness of the Polish Army, and especially of its Air Force, increases. We spare no efforts in training our Air Force and the men of the PVO [anti-aircraft defense]. At any moment they are ready to rise in defense of the peaceful labor of our people.

We are convinced that in the future, as well as in the present, the mutual aid and friendship between the peoples of the countries in the Socialist Camp will develop and grow strong in the spirit of brotherhood and mutual trust.

FROM THE EDITOR'S MAIL

CLOSER TO THE TROOPS

Recently I read an article in the "Herald of the Air Fleet" by S. I. Mironov[1] on the connection between scientific work and the life of the troops. I would like to express some of my considerations on the subject.

Let us examine, for example, how the situation stands on strengthening relations between training future engineers and maintenance men and the life and practical combat training of the troops. It is very important that instructors in educational institutions visit line units and acquire a good knowledge of their needs. In each training institution there are instructors who are involved in present-day creative work with the engineering personnel of line units. Here are a few facts. Engineer Lt. Col. S. S. Troitskiy has worked out and introduced into one of the units a method and an instrument for evaluating the results of aerial gunnery. Senior instructor G. I. Kuranov has built an instrument for testing the operational soundness of one of the airborne systems under field conditions and, together with the engineers of the unit, has made tests. The instrument was positively evaluated and it has been suggested that it be adopted in the practical work of operation and maintenance. Similar examples occur in every training institution. But to speak the truth, not all instructors by far are busy with such work. We have scientists who know life in the units only from articles published in the periodical press and who have not visited the troops for years. Some, indeed, limit themselves to giving lectures in the units. As for on-the-job training of instructors with the troops, this does not always produce results. Often the on-the-job trainee becomes a staff lecturer. We have in mind cases when an instructor, besides giving lectures, "escorts" the unit engineer and "observes" the life in the unit without directly participating in work on the aircraft. He is able to spend literally a mere few days at the aircraft.

It is even worse when the instructor spends his on-the-job training time at a post corresponding to his military rank and not immediately on dealing with aircraft objectives. This is exactly the reason why he sometimes does not acquire experience in the operation and maintenance of new equipment; and such an important matter as on-the-job training, because of shortcomings in the organization, often becomes ineffective.

At the same time instructors especially need a thorough mastery of the experience of line units. And for this purpose a month's stay among the troops, especially as an observer, is clearly insufficient. Obviously it is expedient for the instructor personnel to spend longer-on-the-job periods in the units directly on subjects concerned with combat equipment.

On-the-job training for the engineer personnel of units at instructor duties in higher institutions of learning would also be very useful. Indeed, the great majority

1. S. I. Mironov, The Interests of the Cause Require This. "Herald of the Air Fleet", No. 5, 1959.

of engineers have a higher military engineering education. They are able to generalize scientifically experience in the operation and maintenance and combat employment of aircraft and to pass on this experience to future engineers. Of course, in order to choose engineers in the line units for such work an individual approach is necessary, since not all of them have the necessary qualifications and methodological experience for conducting classes. Such an "exchange" of service posts for a year (once every four or five years) would be very useful. The instructors would study the experience in the operation and maintenance and combat employment of aviation equipment throughout the whole year at exercises and under varied conditions of operation. On the other hand, the engineers of the line unit would have the opportunity of considering scientifically and of generalizing their accumulated experience, of supplementing their theoretical knowledge of gaining methodological experience in conducting classess with the personnel.

Successful development of military scientific work and an improvement in the quality of training engineers in the Air Force demand the solution of yet another problem which is, in our opinion, extremely important. We refer to a radical improvement in training in operation and maintenance for students. For some reason it has been habitual to consider that in military institutions of higher learning the faculties teaching operation and maintenance, combat employment, or the aviation engineering service must deal with this. As a result in a number of special faculties the study of any one subject becomes more and more theoretical. Thus, for example, the course dealing with the fundamentals of radio technology is not taught with reference to specific receivers and transmitters used in the Air Force. They study the dynamics of flight only in the classroom and from textbooks. At best two or three laboratory projects are carried out in wind tunnels.

As far as actual flying for the students goes for determining the basic characteristics of flight vehicles and the special features of their behavior at different flight regimes, this has long been excluded from training plans and programs supposedly for reasons of economy.

The tendency toward the "theoreticalization" of courses is also evident in the aviation engineering service faculties. This is evident from the increase in the number of the laboratory projects carried out in buildings and not on the airfield nor in specific aircraft.

The interests of the cause demand that all special courses taught by the various faculties be maximally approximated to actual operation and maintenance. The instructors in general science and general engineering faculties are obliged, by using examples, to reveal the essence of physical phenomena and laws observed during the operation and maintenance of specific types of aircraft. Hardly anyone will dispute the fact that all the instructors of special faculties must themselves be first of all maintenance men in the widest sense of the word. It is expedient that questions dealing with operation and maintenance be explained in courses offered by the faculties and that special faculties be assigned to direct the on-the-job training of students with the troops.

In the schools and academies of the Air Force all the operation and maintenance faculties must, in our opinion, be consolidated into one -- the aviation engineering service. Its objective will include teaching the students the basic organization of the IAS [aviation engineering service] and inculcating in them skills in organizing the work at the airfield, on the range, etc. This faculty would direct on-the-job training with the troops.

The introduction of practical work in flying and operation and maintenance would be of indisputable benefit to the students in all the faculties: They would learn how to determine the basic flight characteristics, the stability and controllability of flight vehicles and they would acquire skill in working with the radio and electrical instrumentation not only on the ground but in the air as well.

In the article by S. I. Mironov it was very correctly pointed out that some scientists work for years without appreciable results not only in practice but as regards theoretical development as well. This is often seen from the fact that organizations directing scientific research within the Air Force do not give timely directions as to which problems need immediate attention. It would be very useful to widen the channels of communication and scientific information exchange, especially in institutes and design bureaus.

It seems to us that certain problematic questions may be assigned for joint consideration (with joint responsibility) to the command and to the engineering personnel of establishments and to the professorial and instructor personnel of institutions of higher learning.

If the organizations which direct scientific experiments come to direct more specifically the military scientific work, then this will broaden the scope and quality of such work and allow them to concentrate the efforts of scientific forces on the solution of the most pressing problems.

Engineer Col. V. N. SAGINOV

SUMMING UP THE DISCUSSION

In connection with the publication in No. 10 of the magazine for 1958 of the article by A. I. Pushkin, N. P. Sukhochev, and B. S. Vinnik, "Let Us Revise Outmoded Views" and the responses to it (See Numbers 1, 2, and 6 for the current year), the Chief of the Air Force Cadre Administration has communicated the following to the editors.

The authors of the above-mentioned articles -- officers and generals -- touched upon an important question and drew the completely correct conclusion that the director of the aviation engineering service must have good organizational abilities, superior political and administrative qualities, as well as an engineering training of wide scope.

It is exactly this principle that lies at the basis of selecting cadres. Such a procedure does not preclude the possibility of appointing to the post of Chief of the IAS engineers of any specialty, so long as the political and administrative qualities meet the requirements set for the deputy commander for the aviation engineering service.

REVIEW AND BIBLIOGRAPHY

AGGRESSIVE AIMS AGAINST PEACE-LOVING NATIONS

In the United States of America there are still calls for an aggressive war. The war mongers preach a military policy founded on the doctrine of a preventive war, i. e., open aggression against peace-loving governments. In numerous newspaper and magazine articles and in thick books the various aspects of waging such a war are considered. The forces and means to be used in an attack are examined and the military might of the USA -- especially the weapons of mass destruction -- are praised.

Among such books we must include "The United States Air Force Report on the Ballistic Missile"[1]. This publication is entirely devoted to an examination of strategic means of aerial attack. All its sections were written by Air Force specialists of the USA, including a number of official personages. Paying homage to the strategic power of the USA, the authors immediately strive with all their might to show the necessity for increasing budgetary appropriations for ballistic missiles and space vehicles for waging war.

The book enables us to gain some idea of the views current in the USA on the military employment of strategic ballistic missiles and on related questions of technology and production.

The basis of the work is a series of articles published in the magazine, "Air University Quarterly Review" -- the principal US Air Force military science organ devoted to strategy, tactics, and technology - published by the Air University. The book opens with a preface by the Chief of Staff of the Air Force, Gen. Thomas D. White, entitled "Missiles and the Race Toward Space."

General White has often spoken out lately about winning cosmic space for military purposes. He has been demonstrating the necessity of the USA's supremacy in space, since this, in his opinion, means also supremacy in the air. In his preface Gen. White avers that manned aircraft, missiles, and space vehicles constitute parts of one unified system which mutually complement and support each other and that therefore they must be combined in an organized manner.

In the lead article, written by Maj. Gen. Bernard Schriever, the US Air Force ballistic missile program is outlined. Schriever states that this program provides for spending one billion dollars a year, or three million dollars a day. Eighteen thousand scientists and engineering-technical personnel in universities and in industry are employed in developing the program. Among these are nuclear physicists, astrophysicists, mathematicians, metallurgists, chemists, mechanical engineers, hydraulic engineers, and specialists in electronics and pneumatics. In addition, no less than 70,000 individuals in 22 branches of industry are working on the implementation of this program.

1. "The United States Air Force Report on the Ballistic Missile", New York, 1958, 338 pp. [Doubleday & Company] "Otchet Voyenno-vozdushnykh sil SShA o ballisticheskikh reaktivnykh snaryadakh."

The figures cited by Gen. Schriever are only for the Air Force ballistic missile program for the fiscal year 1957-58. During the 1959-60 fiscal year for the purchase of all kinds of missiles the US Air Force plans to spend $2,768,000,000 -- not including the enormous sums needed for scientific research and experimental design work.

Schriever tries to show that the USA must achieve supremacy in all fields of science and military technology which are connected with outer space. Although the military requirements in this respect are still not sufficiently outlined, nevertheless, according to Schriever, they "are no less demanding of our country's sustained and vigorous efforts if we are to equal and surpass Soviet concepts and capabilities in the conquest of space..."

The authors of the chapters of the book devoted to the experience gained by the US Air Force in developing missiles and to the prospects for their further development come to the conclusion that the limited controllability of rocket missiles must be compensated for by the greater flexibility of manned aircraft. They recommend that this point be taken into account in developing both, not allowing even a temporary interruption in their combat capabilities.

The chapter "Command and Control" was written by Maj. Gen. Charles McCorkle, the Assistant Chief of Staff of the US Air Force for Guided Missiles. He starts from the premise that ballistic missiles are an inseparable part of the long-range weapons of the Air Force. In his opinion, the necessary conditions for their effective employment involve: a unified and well worked out system of command; a time-coordinated plan of the combat employment of ballistic missiles along with all other weapons; the creation of a reliable and fast-acting system of communication and a system of material and technological support which fully answers the stiff present-day requirements.

The book also deals with the basic organizational principles of manning missile units.

A special chapter is devoted to questions of operational readiness of ballistic missiles. Major Roy Ferguson especially emphasizes the importance of having the personnel training correspond to the development of ballistic missiles. With this aim in mind, the US Air Force introduced the concept of "initial operational capability". Earlier the Air Research and Development Command was responsible for this; the responsibility has now been transferred to the Strategic Air Command. Ferguson considers it expedient to prepare the missile unit personnel directly at the industrial plants.

Lieutenant Col. Allen Stephens, the Chief of Staff of the 1st Ballistic Missile Division writes about the difficulties which arise in the training of the personnel in connection with the constant development and refinement of ballistic missiles. To back up his statement he refers to the organization of the 1st Ballistic Missile Division which was formed in July 1957 at Cooke AFB (now the Vandenberg AFB) in California. At the beginning of 1958 this division was placed under the immediate command of the SAC chief.

The chapter "Impact of the Ballistic Missile on Warfare" is of great interest; it was written by Col. A. Sheridan. The author, who worked on planning and evaluating intercontinental ballistic missiles, tried to systematize the views of the military scientific circles in the USA on this question.

On the basis of the US military doctrine, he asserts that, in order to deal a swift and decisive blov , the United States must have considerable combat-ready armed forces.

With the introduction of ballistic missiles, it will be necessary, in the opinion of the author, to introduce changes in operations and tactics.

Early planning and very detailed information on the target, as well as post-strike reconnaissance, become exceptionally important. In approaching the question of combat employment of missiles with a characteristically American "business-like" attitude, the author writes that it would be well to supply warheads with low explosive power, since the employment of expensive ballistic missiles for this purpose is economically justifiable only if the destruction of the enemy outweighs the expense.

In Sheridan's opinion, ballistic missiles will in the course of the next two decades become the basic weapon of strategic offensive operation and will replace the conventional manned bombers. The author assigns special significance to the employment of ballistic missiles during the initial period of a war. He explains this by the supposed psychological effect of an explosion of missiles in the deep enemy rear during the few minutes after the initiation of combat operations. Ballistic missiles may also turn out to be the only practically applicable weapon for the destruction of such targets that cannot be destroyed by manned bombers due to formidable antiaircraft defenses.

It is known that there is no threat to the USA. More than that, the Soviet Union has proposed a number of measures directed towards the relaxation of international tension and an end to the "cold war".

Sheridan, however, does not want to consider these facts and tries to show that the "new era" demands that American forces be in a state of instant readiness and relatively safe from enemy action. The brief character of all operations resulting from the introduction of the new weapon makes necessary timely and detailed planning prior to the beginning of military operations and combat readiness of unprecedented dimensions. He urges us to be ready for an instantaneous strike against the population centers of the enemy's country; this involves a full deployment of all forces both in the continental United States and at overseas strategic air bases.

Having thus laid a certain foundation for the notorious concept of "massive retaliation", the author moves on to a justification of a preventive strike, a justification which is exceptional for its hypocrisy. He begins with the statement that the armed forces of the USA supposedly "are not intended for aggression"; it is "doubtful" that the Congress will have to declare war. Therefore, writes the author, the decision for making use of a future ballistic weapon, no doubt, will "come from the President as Commander-in-Chief..."

There is no doubt that such statements are not the expression of the author's personal opinions, but rather reflect those ideas which hold sway now at the summit of the military bureaucracy in the USA and which find their expression in numerous bombastic expressions by American generals and admirals. Such a "strategic concept" practically allows the President of the USA to decide personally on the question of delivering an atomic missile strike. Here, of course, he will be guided by the "recommendations" of his military advisers who carry out the will and the intentions of the leaders of monopolistic capital's "financial empire".

The fundamental propositions connected with the possibilities of developing anti-missile defenses are set forth in the book. On the basis of theoretical premises. Col. Harvey Shelton comes to the conclusion that even if all the difficulties connected with the effective solution of the problems of anti-missile defense are actually overcome it will be possible within the territory of the USA to create only a certain number of defended "islands" of comparatively modest area. He also analyzes the question of the US President's right to order an attack with ballistic missiles. In such a case the time for readying the ballistic missiles for launch ("reaction time") after the order is received can be no more than 15 minutes. However, according to data in the American press the actual time of immediate preparation for launching large US ballistic missiles, even when this is done at a practice range (at Cape Canaveral) still requires no less than 2 hours.

In the end the author comes to the conclusion that the only real measures of defense against ballistic missiles are still passive operations, including the threat of delivering a retaliatory blow.

Maj. Gen. B. Funk, Director of the Ballistic Missile Office, Air Materiel Command, analyzes the influence of ballistic missile production on US industry. However, he presents almost no specific data on production and technology, trying merely to show the necessity for expanding existing production and thereby the necessity for an increase in budgetary appropriations - at the expense, naturally, of the taxpayer.

The author of the chapter "SAC and the Ballistic Missile" is the SAC chief Gen. Thomas Power. This chapter, like the chapter written by Sheridan, presents the views of those in authority in the Air Force on the basic questions of the combat employment of weapons for strategic aerial attack. Power emphasizes the fact that now missiles and manned bombers are combined in the common organizational structure of SAC.

A whole series of new, difficult problems arises with the present-day use of manned bombers and ballistic missiles. Therefore Power points out that, just as the transition from propeller-driven aircraft to jet aircraft was gradual, so the transition from bomber aviation to mixed bomber and missile forces must be carried out systematically, according to a carefully worked out plan.

Analyzing the problems of the combat employment of strategic weapons of aerial attack, Power advocates the delivery of a surprise attack; and, in order to forestall a retaliatory blow, he advocates increasing AA defenses. In his opinion a simultaneous strike may be delivered with missiles and with manned bombers. Here the former operate mainly against large-scale targets, while the latter operate against air units, ground equipment, and strategic aviation objectives. However, Power points out that it is very difficult to insure the arrival at targets of manned and unmanned weapons at the same time and also to achieve complete surprise. An attack by small forces makes detection difficult but cannot prevent a retaliatory blow. Thus, the greater the attacking forces, the less chances there will be for a sneak attack.

In order to prevent a retaliatory blow, according to Power, there must be constant improvement of AA defenses, especially against manned bombers. But in proportion as AA defenses become more and more complicated, to a greater degree will they all depend on electronics. The use of electronic jamming, antijamming , etc., constantly creates a "vicious circle" of confusion, an exit from which, as technology advances, will become more and more difficult.

General Power deals in detail with questions of reconnaissance, the highly developed organization of which will, in his opinion, have an exceptionally important meaning for the combat operations of SAC.

General Power dreams of developing a strategic reconnaissance earth satellite. He claims that the creation of such a satellite would attenuate one of the basic shortcomings inherent in pilotless weapons -- their inability to report that they have carried out an assigned mission. A strategic reconnaissance satellite will also be of help in determining the accurate location of targets, simplifying the guidance of missiles, and , possibly, jamming defense facilities. Moreover, it will be able to spot earlier the enemy's missiles.

The problems of ballistic missile combat readiness are most closely bound up with the location and construction of launching sites. In this respect, as Power indicates, it is very important to select correctly their location. One has to consider here the suitability of the soil for building hardened sites, as well as the climatic conditions, the occurrence of electric interference, etc. The engineering of launching site reinforcement, as the author asserts, is a matter of primary importance; strategically, it is more important than the reinforcement of bomber air bases.

In conclusion, repeating the myth of the aggressive intentions of the USSR, Gen. Power writes that, as the developement of ballistic missiles improves the "deterrent" posture of the United States, the rocketry successes in the Soviet Union enhance the "offensive posture of the Soviets". As a result of this, according to his words, there will continue to be that "precarious balance between aggressive intent and deterrence" which is the best we can expect under the existing conditions.

Basically such are the views, as set forth in the book, of the people who are making ready to employ ballistic missiles. The preparations which are being carried on in the USA toward a universal war under the guise of various deceitful doctrines and concepts, such as "mass retaliation", "balanced deterrence", etc., are altogether obvious on the basis of their pronouncements. Inspiring all these war mongers are those monopolistic circles which first of all are interested in continuing the unsurpassed armament race and in exacerbating international tension. The financial magnates - the masters of "financial empire", corporation owners who produce aircraft, missiles, and nuclear warheads and all the other types of arms, belong to these circles. Each of these manufacturers of death stands to lose his fabulous profits by the relaxation of international tension.

Given in the book as technical appendices are basic data on rocketry, methods of estimating possible damage, and ways of reducing it, and information on cartography connected with the employment of ballistic missiles. It must be noted that even though there is nothing new fundamentally in their contents, nevertheless it is of some interest because the material is given in such condensed and popularized form.

The appendices conclude with selections from the minutes of the various meetings of US Senate committees and sub-committees which investigated the status of development of Air Force ballistic missiles. Their work was carried on from December 1957 to January 1958 in connection with the launching of the Soviet earth satellite. The materials in this section, as in the whole book, are selected tendentiously with the purpose of proving that, even though the Air Force is bending all its efforts and its policy is correct, the US lag in the field of rocketry cannot be overcome without

increasing the budgetary appropriations, i.e., without a new squeeze on the tax-payer.

Naturally, such a feverish arms race and open preparations for war induce us, the airman, to be particularly vigilant.

Maj. Gen. of the Air Force B. L. TEPLINSKIY (Ret.)

AVIATION ABROAD

THE COMBAT EMPLOYMENT OF GUIDED ROCKET MISSILES

(From Data in the Foreign Press)

The ruling circles of the most powerful imperialist governments are trying to keep the world in a constant state of tension and on the brink of war. Assigning a leading role to implementing a policy of aggression through air forces, they are expending colossal sums for increasing their number and technical equipment. Here very great importance is attached to increasing the combat capabilities of fighter aviation, which is considered one of the means of increasing the striking power of the air forces in an aggressive war.

In the general arms race, along with increasing the speeds and altitudes of present-day fighters, serious attention is paid to arming them with guided missiles of the "air-to-air" class and with instruments for automatically guiding them during an attack against aerial targets at different times of the day and night and under adverse weather conditions.

A considerable number of foreign military specialists feel that a fighter must have guided weapons, since the reliability of hitting high-speed aerial targets with aircraft cannon is inadequate, while the time for combat after the enemy is spotted is very brief. In the pages of the foreign press are met more and more often statements to the effect that an attack by a single fighter is unsafe, while carrying out a simultaneous group attack -- especially at great speeds and altitudes -- is rather difficult. But a fighter, at a distance of several kilometers from the bomber, may use guided missiles and still be safe from the bomber's counteractions.

Thus, for instance, in the magazine "Flight" (July 1958), it is pointed out that the use of URS [guided rocket missiles] increases the firing range and reduces the degree of vulnerability of the attacker. Moreover, maneuvering is simplified and the missiles may be launched with considerably less precision of aiming.

As the magazine "Force Aerienne Française" asserts (March 1958), the arming of fighter aviation with guided missiles of the "air-to-air" type has a strong influence on the fighters' tactical operations in an aerial combat. It is assumed that the probable objectives of the fighters' operations will be single aerial targets (bombers, reconnaissance aircraft, winged missiles, finned rockets) and groups of three to four bombers.

The author of an article, "Is a Manned Fighter-Interceptor Needed in Addition to Rockets", G. Pellandini ("Force Aérienne Francaise", March 1958, No. 135), writes that the tradition is current of arming fighter aircraft with only one "air-to-air" rocket, since the probability of hitting a target is assumed to be 100%. Nevertheless, the author considers that it is more effective to arm the interceptor with a greater number of "air-to-air" rockets, even if the probability of hitting the target is smaller. It is enough to equip these rockets with the simplest system of self-guidance and with proximity fuzes; their cost is thereby reduced.

Such missiles may be fired both singly as well as in volleys and bursts; the number of rockets in a volley or burst is considered to depend on the probability of hitting the target. Such a weapons system, in the opinion of the author, provides the interceptor with the capability of attacking several targets and he is not left defenseless after one attack.

In considering the prospects in the development of fighter-interceptors, G. Pellandini feels that there is likely to be a gradual transition to a pilotless nonexpendable interceptor armed with rockets.

In the foreign press there is much talk of how the warhead of an "air-to-air" class rocket should be armed. And on this question the imperialists are true to form. Striving to increase the profits of military orders, the American atom mongers envisage arming the warhead of the guided missile with a nuclear charge.

At the present time in the armament of the US Air Force there is supposedly already an unguided rocket missile of the "air-to-air" class -- the MB-1 Genie -- with such a charge. This missile is designed for arming the F-102 "Delta Dagger" fighter, the F-101 "Voodoo", and the F-106 "Delta Dart" (Aeronautics, May 1958). The fire-control system automatically releases the missile and explodes its warhead. However, an attack carried out by firing such missiles is, obviously, difficult and dangerous, since it is pointed out that "the mother aircraft must, immediately after launching the missile, turn sharply away."

As is pointed out in the magazine "Flight" (July 1958), the launching error of "air-to-air" class missiles is compensated for by using an atomic warhead.

Among URS of the "air-to-air" class with a conventional warhead there are: in the USA, the "Falcon" I and II, the "Sparrow" I, II, and III, and the "Sidewinder"; and in England, the "Firestreak" and the "Fireflash" ("Flugwelt", April 1958).

It is pointed out in the magazine "Aeronautics" (May 1958) that these missiles enable a fighter to increase its range of fire by up to 3-12 km.

In the foreign press there is mention of the development of the "Eagle" "air-to-air" class missile with an effective range of 80-160 km. Such a missile ("Interavia Air Letter" bulletin, No. 4158, 29 Jan. 1959, and No. 4170, 14 Feb. 1959) is designed for arming mother aircraft. The performance data of these mother aircraft may be comparatively low (in particular, with subsonic speed); these are presumably compensated for by the high performance of the missiles.

For the purpose of automatizing the guidance of the interceptors to the target region, assuming the initial position for attack, aiming, the presentation of data for firing, and control of the "air-to-air" missiles, wide use is being made of computers. Consequently, the position of the interceptor in relation to the target both in the course of closure and at the time of attack depends on the capabilities of these devices and of the system used to control the flight of the rocket missiles.

The magazine "Flight" says that in the USA work is being done on creating a system for automatic interception on intersecting courses; this is designed for the F-86D and F-102 fighters.

Recently much attention has been given to the fire-control system - dubbed "Airpass" - in the British supersonic "Lightning P. 1B" fighter. This presumably allows the fighter pilot to hit a target without seeing it. Judging by the description, this is done as follows.

During the intercept, the ground-based radar gives the pilot a general direction to the target. Then the "Airpass" system takes over. Its radar beam covers a wide angle, both horizontally and vertically, "scanning" the airspace for several kilometers ahead.

After determining the location of the target, the radar tracks it while the computer works out the best approach course. After this, by using the sight, the pilot attacks. With good visibility, it is possible to aim visually. Whenever the fighter must alter his course in order to avoid colliding with the target, a special automatic warning device alerts him. The system's radar is located in a single container which is installed in the nose section.

The foreign press reports on a digital computer which makes it possible to obtain computations for target intercept, navigation, and flight control. Supposedly this device insures automatic navigation of the aircraft into the target area by commands from the ground. When the interceptor is close enough to the target, its radar locks onto it, and the computer switches over to use radar data to compute steering commands and display information. The computer also determines when the "air-to-air" missile control system should be switched on and when it should be fired. After the attack the computer automatically flies the interceptor back to the original or alternate base.*

There is also a report on an analog computer developed by the American "Westinghouse Electric" firm. Westinghouse claims that the computer yields information not only for attacking the target along a pursuit curve or on intersecting courses but also for controlling "air-to-air" guided missiles.

Thus the nature of the attack and the tactical techniques of fighters which employ "air-to-air" guided missiles will depend on the guidance system with which they are equipped.

In an article, "The Superiority of the 'Air-to Air' Missile" ("Flight", July 1958), D. Airey emphasizes the fact that fighters are able to attack from the rear hemisphere whenever their speed is greater than that of bombers. If, on the other hand, they do not have such superiority, then they attack head-on. In evaluating these two methods, the author points out that an attack from the rear hemisphere requires more time, but at the same time it may be repeated. In the case of a head-on attack this is completely out of the question. At the same time, the author dwells on the fact that such an attack, regardless of the objective, the time of day or night, or the weather conditions, can be carried out by single aircraft and essentially without involving the pilot actively in fire control.

Information on the promising aspects of this method of attack can be found, for example, in the magazine "Aircraft" (Feb. 1958). There we find a description of the weaponry of the improved version of the Swedish "Draken" fighter with a combat speed close to Mach 2. It is pointed out that this fighter, armed with "air-to air" guided missiles, will become part of the Swedish Air Force by the beginning of 1960. It is planned to install in the "Draken" new fire-control equipment which provides for interception on intersecting courses. This new system, in the opinion of the editors, will increase the fighter's combat effectiveness.

Especially promising in the employment of guided "air-to-air" missiles is the "snap-up" attack which makes it possible to destroy targets traveling at high altitudes. Essentially the method consists in the interceptor's traveling head-on in the direction of the aerial target. After spotting the target, the fighter closes in on it and, climbing for altitude, fires the guided missiles. The fighter can, immediately after this, withdraw from the battle. The missiles are guided to the target by the homing nose.

[*This is the "Digitair", described in "Aviation Week", 16 Dec. 1957, p. 105]

Companies manufacturing guided rocket missiles advertise them in every way. Thus, in the magazine "Flight" (Jan. 1959) it is pointed out that the launchings of the "Firestreak" guided missiles over the Mediterranean Sea against tow targets supposedly resulted in 80% of target hits.

According to the "United States Naval Institute Proceedings" (March 1959) such missiles are placed on the all-weather fighters of British naval aviation, the "Sea Vixens".

In order to test the effectiveness of guided missiles, the American aggressors handed certain types of these to the Chiang Kai-shek clique.

As the press reports, the Chiang Kai-shek aircraft of the F-86 type violated the airspace over China on 24 Sept. 1958. In the course of aerial battles, the American "Sidewinder" ("Rattlesnake") guided missiles were employed. According to the France Presse agency, these missiles are equipped with infrared homing heads which sense the heat radiated by an aircraft engine and which automatically deflect the control surfaces of the missile, thus guiding it to the target. A fighter equipped with "Sidewinder" missiles endeavors to take up an initial position for attack (or to attack straight-in) in the rear hemisphere, since in this way the maximum performance of the plane is used. The firing range from the rear hemisphere for the above-mentioned types of missiles does not exceed 5-6 km, according to available data. The most enlightened public opinion of all countries has condemned this case and has vigorously attacked the aggressors' use of foreign territories to test new types of weapons.

Thus, the foreign press asserts that "air-to-air" guided missiles -- an important weapon against an aerial foe -- are considerably enhancing the combat capabilities of fighter aviation. Their employment brings significant changes into the tactical operations of fighters.

The foreign press is advertising in every way possible the growing capabilities of guided rocket weaponry of the aircraft. At the same time, very often weapons which are still under development are described as being already employed.

Lt. Col. V. K. POLYAKOV,
Hero of the Soviet Union

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BRIEFLY ON MISCELLANEOUS SUBJECTS

A REGIMENT TAKES TO THE AIR ONCE MORE

This happened near Leningrad in the critical year of 1941. A regiment of fighters were covering our transport aircraft which were delivering supplies to the besieged city.

The fighters were successfully handling their assigned mission. But suddenly severe frosts set in and on the American aircraft which were used by the regiment the oil coolers failed.

What to do?

They tried soldering the honeycombs with ordinary solder which was used on domestic aircraft. It did not work. They tried using liquid glass to plug up the damaged spots. But it did not hold. Silver solder was needed. But such solder was not available in the shops or the depots.

One aircraft after another failed. Emergency measures had to be taken.

And then someone suggested: go to the people in the neighboring villages with a request to collect silver articles and money.

The aviators' request received a response. Enough silver was collected to repair the damaged aircraft. The regiment took to the air once more.

STAGGERING FIGURES

In one of the articles of the aviation press for 1921 it was reported that on the air lines "Moscow -- Khar'kov and Moscow -- Orel for the period from 1 May to 17 June and from 30 June to 10 October the following work was done:

Total flights made. 43
Passengers carried 60
Total weight of cargo transported
(Mail, passengers with luggage,
and other cargo) . . . . .400 poods.

Now, however, a single "Tu-114" airliner can transport on one flight 200-220 passengers and several tons of cargo and mail. With this cargo it makes the run from Moscow to Vladivostok in 10 hours.

A PLAN FOR THE "CONQUEST" OF THE MOON

A so-called seven-year plan has been developed in the United States of America. One might think that a seven-year plan is designed to increase labor productivity and liquidation of unemployment. But this is far from being the case.

The American monopolists are trying to be the first to reach . . . . the Moon. This seven-year plan provides for setting up a reconnaissance base on the Moon by 1965, and a missile base by 1968.

Military bases, the conquest of the universe -- such are the dreams of the imperialist predators.

HOW TO RELAX IN A ROCKET

The possibility of human flight into cosmic space has already been demonstrated by the research of Soviet and foreign scientists. However, one problem still remains unsolved. Scientists think that a feeling of timelessness and weightlessness may prevent space travelers from sleeping.

Some scientists have suggested that this problem may be solved by using electrical stimulation which, through soothing vibrations, will induce sleep in the stratonauts.

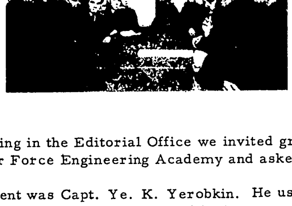
There are others who advocate self-hypnosis or else the use of a device which would induce drowsiness in space travelers when certain lights go on or certain bells ring.

Still others propose the creation of an artificial force of gravity by imparting to the space ship a rotation of 5-6 rpm.

Declassified in Part - Sanitized Copy Approved for Release @ 50-Yr 2014/06/18 : CIA-RDP81-01043R004400150005-8

MEETINGS WITH THE EDITORS

A NEW DETACHMENT OF ENGINEERS



At a regular meeting in the Editorial Office we invited graduates of the Professor N. Ye. Zhukovskiy Air Force Engineering Academy and asked them to tell of their plans for the future.

Among those present was Capt. Ye. K. Yerobkin. He used to be a navigator, but the engineering profession attracted him and he is successfully completing his course at the Engineering Academy. Senior Lt. O. N. Goncharov also came to the Academy from flying work and dreams of becoming a pilot engineer. Officers A. K. Mirolyubov, E. V. Bebing, A. V. Vybornov, N. M. Yashanov, and M. S. Sasin used to work, before taking up their studies, as technicians, but are now preparing to become engineers.

Major V. M. Anuchin, Capt. A. N. Kuznetsov, privates A. Ye. Averin, D. V. Ivanov, and others -- men of different age groups -- mastered various specialties during their years of training at the Academy; but one thing is common to all of them-the desire to be as useful as possible in that sphere of work where the Party will assign them.

Before the young engineers there open broad horizons, great opportunities and

perspectives. In the Air Force there are many places where their knowledge, their skill, and their experience are necessary. And there is no doubt whatsoever that Outstanding Men in training will in the future become foremost in labor, will be bold, will untiringly seek out what is new, and will apply in practice that vast knowledge which the Academy gave them.

Now when the Plenum of the Central Committee of our Party has set new and grandiose tasks in the field of the automation and mechanization of production and in the development and introduction of new technology, new and important problems face the aviators--including the engineering and technical personnel--problems which they are called upon to solve.

In the photo: A group of graduates of the Professor N. Ye. Zhukovskiy Air Force Engineering Academy in the Editorial Office of the Magazine.