TRANSLATION

HERALD OF THE AIR FLEET

STAT

7

1959

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EXPLANATORY NOTE

This publication is a translation of Herald of the Air Fleet, (Vestnik Vozdushnogo Flota) a monthly journal of the Soviet Air Force published by the Military Publishing House, Ministry of Defense, USSR.

Every effort has been made to provide as accurate a translation as practicable. Soviet propaganda has not been deleted, as it is felt that such deletion could reduce the value of the translation to some portion of the intelligence community. Political and technical phraseology of the original text has been adhered to in order to avoid possible distortion of information.

AEROSPACE TECHNICAL INTELLIGENCE TRANSLATION

(TITLE UNCLASSIFIED)

HERALD OF THE AIR FLEET

(Vestnik Vozdushnogo Flota)

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AEROSPACE TECHNICAL INTELLIGENCE CENTER
WRIGHT-PATTERSON AIR FORCE BASE
OHIO

STAT

FROM THE EDITOR'S MAIL

OUTSTANDING GUNNERY AGAINST AERIAL AND GROUND TARGETS

Continuing to grow in the Soviet Army is the creative enthusiasm called forth by the historic decisions of the Twenty-First Congress of the CPSU. This enthusiasm is felt literally in all forms of the activity of the personnel. The pilots and all the men of the Air Force are striving to achieve new successes in all forms of combat training.

Gunnery training of fighter pilots always has occupied and continues to occupy a leading place in the education of the flying personnel. The more perfect their gunnery skill, the higher is the combat readiness of our units and the stronger is the Air Force, vigilantly guarding the safety of its socialist state.

Teaching the pilots accurate firing at aerial and ground targets, the air commanders are constantly taking into consideration all the new things that the development of military equipment carries with it.

The principal characteristic of present-day aerial combat is its rapidity, which is due to great flight speeds. It requires of the pilot the ability to make proper use of the armament of the aircraft to destroy the enemy on the first attack. If the pilot does not hit the target on the first attack, a repetition of it requires time during which the target may get away to a considerable distance. In action against ground objectives under conditions of strong counteraction by the enemy, a fighter pilot must also be able to hit the target straight-in, on the first attack, the success of which depends greatly on a surprise approach to the objective attacked.

A fighter pilot acquires a high degree of gunnery skill during the process of daily combat training in carrying out exercises in combat application and at tactical flight lessons. Only in the air, in a situation approximating that of battle, can he learn to make proper tactical use of all the power of the armament on his aircraft.

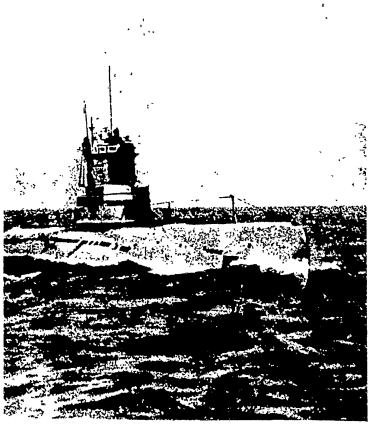
At the basis of teaching aerial gunnery, as in every other form of combat training, lies outstanding piloting technique. The better the pilot handles the aircraft, the more quickly and easily will he master the techniques and methods of using the sight and the weapons. Therefore, it is the duty of all commanders, especially in teaching young pilots, to concern themselves with perfecting their piloting technique in various weather and aerial situations and at any flight altitude, right up to the combat ceiling.

There can be no thought that a pilot who has inadequately mastered the technique of piloting is able to hit aerial targets accurately with the aid of the optical or radar sight. However, there still are cases when a pilot who has mastered poorly the technique of piloting is allowed to practice the elements of aerial combat. He encounters a number of the special features of utilizing the maneuvering capabilities of the aircraft and, not having firm skills, as a rule he tries to simplify the conditions of

The element commanded by officer Ye. G. Ivanov is the leading one in the unit. Here the pilots, as a rule, carry out all missions outstandingly. Here, having received the command, the element quickly rose into the air and flew out to intercept an aerial target. Their course lies over the sea. Their seamen friends are watching the flight of the aircraft from a submarine.

In the photo: the element of Ye. G. Ivanov in flight.

Photo by K. G. KULICHENKO.



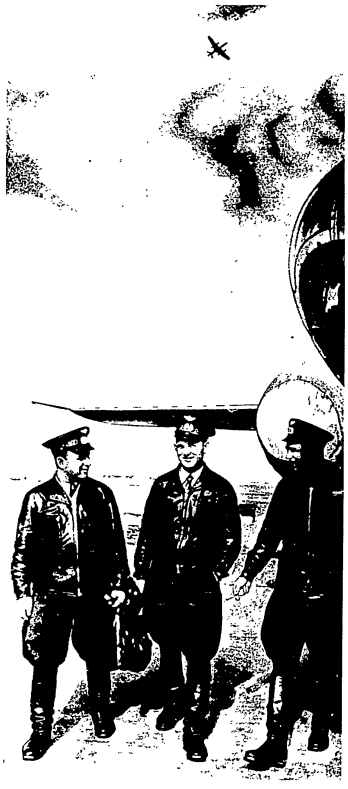
combat, and to avoid complex maneuvering. Of course, such a pilot will be unable to display creativeness, to make use of the new and more desirable tactical techniques of hitting a target.

There also are other cases when individual pilots who have mastered well the technique of piloting an aircraft day and night under normal and adverse weather conditions are poorly prepared for making intercepts and conducting aerial combat, do not know their weapons well enough, and are unable to handle them properly in combat. Thus, for example, one of the units is among the first in respect to average logged flight time per pilot. At the same time

In the air squadron commanded by Communist Capt. V. K. Shengeliya, the results of socialist competition have been summed up. Many pilots, navigators, technicians, and air mechanics achieved high indexes in combat and political training. First place in the competition was won by the element of Communist Capt. Divayev. Comrade U. Ya. Divayev and element navigator Communist Senior Lt. G. M. Il'ichev set an example for their subordinates in daily training.

In the photo (left to right): Squadron commander Capt. V. K. Shengeliya, Capt. U. Ya. Divayev, and military navigator Senior Lt. G. M. Il'ichev after flights.

Photo by G. M. OMEL'CHUK.



it lags far behind the others in respect to practicing the elements of combat application.

How then did they spend the relatively large amount of flight time? It is quite obvious that in this unit they concerned themselves with mastering the technique of piloting and almost forgot about the most important thing - combat application.

For daily improvement in individual combat training, the pilot must study the principles of single and group aerial combat with specific fighters and bombers. He must know the strong and weak points of the aircraft, their performance characteristics, armament, vulnerable points, firing sec-

tors, and the most convenient directions of attack and, on the basis of this, apply tactical combat moves and make skillful use of the weapons on his aircraft.

In order to master the art of gunnery, the pilot must know well the armament of his plane, the sight, and the procedure for using it in attack. Lack of ability to use the sight for determining range in attacks on aerial and ground targets frequently leads to abort of the mission, and sometimes creates causes of flight accidents.

Thus, only after having learned the elements of piloting technique, after thorough study of the armament of his aircraft, its sight equipment, and the rules of operation on the ground and in the air, and after appropriate ground training, can a pilot be permitted to practice aerial gunnery.

In order that the pilots become true masters of aerial combat and sniper fire, it is necessary to set up their training in a methodologically proper manner, not disturbing its sequence, and not permitting any elements of simplification or indulgence whatsoever.

One of the most important places in the training of a pilot in conducting aerial combat is occupied by photogunnery. Correct interpretation of the photo film and a methodologically competent analysis of the "gunnery" make it possible to make an objective evaluation of the actions of the trainee in conducting "fire", to reveal his mistakes, and thereby to avoid sending out untrained pilots to fire combat weapons. In this, principal attention should be devoted to practicing skills in photogunnery against real targets. In order to perform this task successfully, it is necessary to organize properly the interaction between units of different branches of the Air Force. Experience shows that pilots who have practiced attacks only on fighters conduct photogunnery from ranges that exceed the computed ranges in their first flights for attacking bombers. With the bomber maneuvering vigorously, some fighters stay in the zone of its defensive fire for a long time. There is no need to prove that this reduces the effectiveness of their attacks.

Having mastered photogunnery, the pilot undertakes firing of combat weapons at aerial tow targets and ground targets. In this, he must open fire and cease firing on time, at a certain range, remembering flight safety and taking into account the sluggishness of his own aircraft and the possibility of getting into the backwash of the target aircraft. He also takes into consideration the magnitude of the aircraft's mushing in pulling out of the dive in firing at ground targets. In withdrawing from the attack at altitudes close to the ceiling, the maneuver must be smooth and must be made with the necessary bank, otherwise a substantial loss of altitude can occur, which will create additional difficulties for a subsequent attack.

In teaching pilots operations against ground targets, special attention is devoted to developing skills in selection of the targets, to coming out on the targets with consideration of radio and radar camouflage, and to the suppression and destruction of the most important of them on the first attack under conditions of strong counteraction by the enemy.

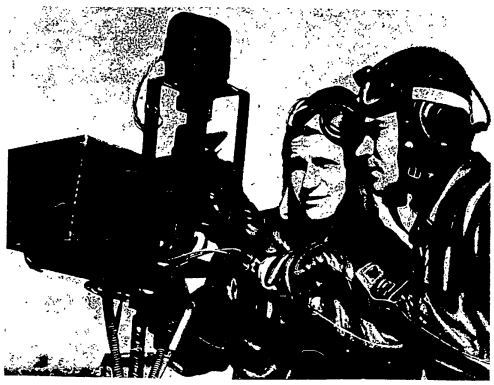
Substantial success has been achieved in those units where tactical and gunnery training of the fighter pilots is placed at the basis of the training, where the commanders of all grades are themselves masters of aerial combat and sniper fire and take a creative approach to improving the combat skill of the flight personnel. Unfortunately, not yet all air commanders understand the great responsibility that lies on them in teaching the flight personnel aerial combat and gunnery, and some of them commit mistakes and oversights that reduce considerably the training of the pilots.

What are these mistakes and to what degree do they affect the training of a pilot?

It is known that outstanding mastery of the technique of piloting an aircraft is a sort of key to the heights of flying skill in any form of combat training. A pilot who knows to perfection the art of advanced piloting and aerobatics will master more quickly and easily the elements of combat application of an aircraft. This truth must not be forgotten. However, we still have some subunits in which individual pilots do not fly in the aerobatics practice zone for long periods and fly with drop tanks in practicing the technique of piloting. There are cases when individual pilots have not been checked in the execution of advanced piloting for a long time. Such a situation, of course, cannot be considered normal. Naturally, it reflects negatively on the training of the pilots.

In the race for quantitative fulfillment of the plan of aerial battles, photogunnery at aerial targets, and firing with combat weapons, they sometimes plan and conduct flights that violate the methodology of pilot training.

Let us take for example a flight of a pair of fighters that was made in one of the air units. The pilots were supposed to intercept an aerial target, wage aerial combat between single fighters, and conduct photogunnery at an aircraft in approximation of firing at an aerial tow target. Yet a flight for an intercept is unthinkable without aerial combat, and the latter is unthinkable without photogunnery. Furthermore, combat between single fighters is waged without drop tanks and should be practiced separately. It may be asked: Why were all these exercises combined in a single flight of 50 minutes duration?



Young fighter pilots (left to right): Lt. V. G. Toporkov and Lt. A. Ye. Kiselev at the airfield training on a gunnery trainer.

Photo by V. A. ZHELEZNIKOV.

Or take another example when four firing exercises at ground targets with combat weapons that were planned for a pilot for a definite period are carried out on two flying days in one week. Can it be said here that the commander is teaching his subordinates in a methodologically proper manner and is training them systematically? Of course not.

Another vital shortcoming in the training of flight personnel in aerial combat and gunnery is the fact that in several subunits the ground training is unpurposeful and non-specific. Tactical moves are analyzed, as a rule, in general form, i.e., enemy attacks by single planes, pairs, and elements are not considered.

Good results in gunnery training have been achieved by the fighter pilots of the unit commanded by officer A. G. Ryazantsev. What is it that helps them perfect their gunnery skill? First of all, ground training lessons are conducted on a high level here. The place for processing and interpretation of photo films is excellently equipped. Every element commander and pilot knows how to interpret the photographs and analyze his mistakes. The majority of the officers follow new achievements and the development of aviation equipment with a lively interest and work painstakingly to increase the combat readiness of the unit. In addition, they have a good training base here, the training apparatus is always in good condition, there is an adequate supply of diagrams and placards, and the methodological training of the commanders is outstandingly organized. The commanders of the subunits carefully think through the plan of forthcoming flights and strive to see that every flight gives the pilot something new and improves his combat skill. The assignments are not simplified, but the pilots are not given tasks beyond their ability, tasks that they are not prepared to fulfill. The commanders approach each subordinate on a strictly individual basis, taking into consideration his peculiarities and capabilities and the level of his training.

The Party organization of the unit devotes considerable attention to problems in the gunnery training of the flight personnel. It is constantly interested in the improvement of the pilots and gives assistance to those lagging behind, generalizing the experience of the leaders and making it the property of all the flight personnel. At their meetings, the Communists reveal shortcomings in the work and help the commander to improve the combat skill of the pilots. For this purpose various forms of Party-political work are used: individual and group talks, the wall press, radio, etc.

Skills in aerial combat, photogunnery, and firing of combat weapons are perfected in tactical flight exercises. In these exercises the pilots are learning to act on the basis of the specific tactical situation that has developed, day and night, under normal and adverse weather conditions, and at all altitudes up to the combat ceiling. This task is not carried out in a stereotyped fashion, but a search is made for new tactical methods of hitting the enemy, for such ways of waging battle as will correspond to present-day flight speeds and the combat characteristics of fighter weapons.

The interests of the safety of our Motherland require a constant and high degree of readiness on the part of all fighter pilots. Continual improvement of the gunnery skill of the flight personnel, generalization of advanced experience, and its dissemination among the units - these are the most important tasks of commanders, political workers, and Party and Komsomol organizations.

Our Party has taken a firm stand for continual and rapid technical progress in all branches of the national economy. The Central Committee of the Communist Party of the Soviet Union is taking effective steps to expand the automation of production. All this inspires the Soviet fighting men to new successes.

MILITARY DISCIPLINE AND WAYS OF STRENGTHENING IT

Col. M. R. ROMANOV

Firm military discipline is the basis of the combat capability of an army. This is confirmed by the entire history of war. Especially high demands on discipline and organization are made by war under present-day conditions.

The basic question in determining the ways of strengthening military discipline consists in determining correctly the place of conviction and compulsion in this work.

The Communist Party has categorically rejected the bourgeois way of strengthening discipline in an army, which relies on the method of compulsion and deception of the servicemen, since it contradicts the very nature and historical purpose of the Soviet Army - an army of workers and peasants. From the very first day of the building of the Soviet Armed Forces, our Party has tied in the strengthening of military discipline with intensification of Party influence, with the work of Communists in the political education of the mass of soldiers. In a resolution of the Eighth Party Congress on the military question, it was stated frankly: "Rapid numerical growth of Communist cells is an important guarantee of the fact that the Army will be increasingly more impregnated with the ideas and discipline of Communism."

"Discipline among Soviet troops," said M. V. Frunze, "should be maintained by the consciousness of the leading portion of the mass of Red Army men, its Communist cells, its political instructors, and the entire command personnel, by their tenacity and devotion to the revolution."

That is how our Party has solved the basic problem of discipline in the Soviet Armed Forces. True, in the work of some military chiefs there have been deviations from Party decisions on matters of strengthening Soviet military discipline, but by its active interference the Party has always restored Party and Leninist principles of building an army and has severely condemned those who deviated from Party decisions, who distorted and violated them. Vivid evidence of this is the decisions of the October Plenum of the Central Committee of the CPSU (1957).

We have put the method of conviction in first place in the work of strengthening discipline. What is implied in this case is not so much a method as a certain technique of operation as a broad system of measures by the CPSU and the Soviet Government in the political education of the personnel, in inculcating all servicemen with Marxist-Leninist ideology, in explaining to them the decisions of the Party and the Soviet Government, the domestic and foreign policy of the USSR, in educating every serviceman in a spirit of Soviet patriotism and proletarian internationalism.

The program of the Communist education of the Soviet people as defined by the decisions of the Twenty-First Congress is also the program of educating the personnel of the Soviet Armed Forces.

The entire process of education and indoctrination, all our propaganda and agitation, are called upon to inculcate the servicemen with Marxist-Leninist ideology, with a conviction in the justness and correctness of the policy of the Communist Party and the Soviet Government, with a deep understanding of the patriotic and international duty of Soviet fighting men. The ideological level and effectiveness of the ideological work among the troops are determined to a great degree by the participation in this work of the supervisory command and political workers, who, as a rule, have considerable experience in life and a political outlook.

It is important that every serviceman understand profoundly the need for the strictest observance of military discipline and be always ready to carry out to the end his military duty. For this, of course, it is necessary first of all that he understand well the requirements of discipline, the need for observing them in order to win victory over the enemies of the Motherland, and that he understand them not as a superficial observer, not as a schoolboy, but as a fighting man who is convinced of the need for acting in conformity with the requirements of discipline.

That is why we speak of forming the convictions of every Soviet fighting man, of the need for hardening them in active and conscious work in strengthening the Army, in performing the tasks of combat and political training, in everyday military service. Herein lies the main task of the indoctrinational work of commanders and Party and Komsomol organizations.

The Party and Komsomol organizations discuss the most important problems in the life of the troops and subject to criticism the shortcomings in combat and political training, in Party-political work, and in the work of strengthening discipline. In the struggle to carry out the decisions of the Party and the orders of commanders, the Communists, Komsomol members, and all Soviet fighting men are educated and hardened.

The strength of the influence of Party and Komsomol organizations on the state of the discipline of all servicemen depends to a decisive degree on the personal example of Communists and Komsomol members in observing the requirements of Soviet military discipline. It is known that Communists and Komsomol members comprise the majority of the officers and soldiers of the Soviet Armed Forces. This fact determines the inexhaustible possibilities of further activization of the work of Party and Komsomol organizations and also the significance of the example of Communists and Komsomol members in carrying out the tasks of combat training. The following is an example. In the Guards bomber regiment where the deputy commander for political affairs is officer P. A. Yeremenko, 95% of the Communists are Outstanding Men. And we have many such regiments.

The Soviet Army is inseparable from its people. The unity of the Army and the people is the source of the might of the Soviet Armed Forces. That is why the October Plenum of the CC of the CPSU pointed out in its decisions the need for comprehensive expansion of the ties of all military units and commands with local civil Party, Soviet, trade-union, and Komsomol organizations, with the collectives of factories and plants, kolkhozes and sovkhozes. The growing and strengthening ties of the fighting men of the Army and Navy with the working people of city and village plays a major role in the formation and development of the political convictions of Soviet fighting men, helps them to understand more completely the importance of the heroic labor of the people and their personal responsibility for the defense of the Motherland and the peaceful labor of the Soviet people. Intercourse with the working

people helps our fighting men to see more tangibly and specifically the greatness of and the need for selfless performance of one's military duty and execution of the requirements of military discipline.

Under present-day conditions the Air Force is armed with complex combat equipment and weapons and the most diverse instruments. In connection with this, the duties of the personnel have also become more complex, and the demands on the technical competence and discipline of every aviation specialist have grown.

Preparation of an aircraft for any flight is now carried out by many officers, sergeants, and soldiers. It is enough for any one of them to permit negligence or inattention toward even a seemingly very insignificant detail in servicing for flight and a cause of a flight accident is created.

Military Pilot First Class, officer Ye. V. Sukhorukov tells about the following incident. Having prepared himself for a training flight, pilot N. K. Stulin rose into the air at the assigned time, penetrated the cloud cover, and put the plane on the assigned course with a climb. But after a while he noticed that the radio compass was functioning erratically. The flight was being made under adverse weather conditions, and to continue it with a radio compass that was functioning with inadequate accuracy was dangerous. Having requested permission from the flight controller, Stulin returned to the airfield. A postflight inspection showed that the radio compass was in working order but its tuning was inaccurate. Thus, a seeming "trifle" that was not taken into account in preparation for the flight became the reason for not completing the training mission and could have become the cause of a serious flight accident.

The primary role in strengthening discipline always belongs to the commander. The commander is responsible for the combat readiness, discipline, and political and moral state of his element (detachment, squadron, unit). In his work he relies on the Party organization and directs its activity to successful fulfillment of combat tasks and plans of combat and political training, to strengthening military discipline.

A commander's personal participation in the indoctrination of subordinates and in Party-political work gives him the opportunity of approaching every man closer and in a better manner, of learning what must be done for his education and combat training, of knowing the mood of the men, and of always foreseeing the possibility of violation of military discipline.

Internal order and regulation procedure on the whole in any military unit depend on the men - the commanders, political workers, staff officers, on all the functionaries of the regiment, right down to the rank-and-file soldier. Consequently, it depends on the conscious and conscientious execution of service duties by all the servicemen as defined by the Internal Service Regulations and other regulations and manuals. All the servicemen must be indoctrinated in the spirit of a conscious attitude toward the execution of their service duties. But, as shown by experience, the development of consciousness alone is not yet enough. In the subunits there will be found occasional loafers, sluggards, disorganized men, and weak-willed people, even among the officers. Therefore, the development of consciousness of their military duty among the servicemen must be supported by strict exactingness on the part of all commanders and chiefs toward all servicemen.

Even in respect to conscientious men, constant exactingness and strictness on the part of the commanders and chiefs is required, because without this there cannot

"I see the target," reported Military Pilot First Class officer A. F. Topil'skiy to the command post. Soon he attacked the aerial "enemy" and "destroyed" it at the very first attack. When the film was interpreted after the flight, it was found that the attack executed by pilot Topil'skiy merited an outstanding evaluation. Such are the majority of the evaluations of this pilot. For several years Communist Topil'skiy has been an Outstanding Man in training.

In the photo: Military Pilot First Class officer A. F. Topil'skiy.

Photo by V. I. KOLESNIKOV.

be strict regulation military procedure. Only under circumstances of strict exactingness and regulation procedure will the fighting man know his service duties outstandingly and acquire the necessary skills and habits. That is why subordinates always respect a strict but considerate and just commander. Regulation procedure and strict exactingness on the part of commanders and chiefs ensure the necessary training and consolidation of the skills and habits of military discipline acquired by the men.

Exactingness means a certain administrative pressure. The commander without any persuasion requires unquestioning execution of his orders by every serviceman and efficient performance of his service duties. If these requirements are not met, he imposes disciplinary penalties defined by the regulations. Such administrative pressure in establishing military discipline is absolutely necessary, and one cannot get along without it.

"Experience shows," M. V. Frunze pointed out, "that not all of our military men know how to approach problems of discipline correctly; there can often be observed among us an attitude toward military bearing, formation discipline, and external order that they are harmful, unrevolutionary, and unnecessary. This is utter nonsense. Conscious internal discipline must without fail be manifested also in external order. We must strive for this order... The Leninist approach lies not in neglecting the necessary external elements of discipline but in not making these external elements the basis of discipline."

Administrative pressure and exactingness on the part of commanders and

chiefs are recognized by our Party as legal and mandatory operating techniques, but on the one indispensable condition that at the basis of Soviet military discipline lie conscious execution of their military duty by the men and political maturity of the personnel. Exactingness on the part of commanders which is not supported by explanations to the servicemen of the policy of the Party, the tasks of the Soviet Armed Forces, and the work of the Party and Komsomol organizations would become administration by mere injunction. And administration by injunction contradicts the very nature of the Soviet order, of the Soviet Armed Forces, which base all their activity on a highly developed political consciousness of the mass of servicemen. The strength of Soviet commanders and the success of their activity are determined by the support of the broad masses of soldiers, sergeants, and officers, and administration by mere injunction disturbs this unity and can only bring harm to our Army.

What then should the exactingness of commanders and chiefs be like?

The exactingness of commanders and chiefs should be strict and an everyday matter. The disciplinary regulations declare that not a single violation of military discipline should pass unnoticed without some action by a senior chief as defined by the regulations. The strictness of commanders' exactingness in the Soviet Armed Forces and the possibility of putting it into effect are determined by the fact that the mass of servicemen themselves understand the need for it in order to increase the combat might and combat readiness of the units and subunits.

The exactingness of a Soviet commander is incompatible with rudeness, with injuring the personal dignity of subordinates. The regulations of the Soviet Armed Forces and Soviet laws require the commander to observe military tact and courtesy in his relationships with all subordinates.

The law "On Criminal Responsibility for Military Offenses" provides criminal penalties (deprivation of liberty for 3 to 6 months) for contumely or assault of a chief by a subordinate or a senior by a junior, and equally so of a subordinate by a chief or a junior by a senior in the performance of military duties by any one of them.

This article of the law protects the chief and gives him the opportunity of confidently demanding of his subordinates conscientious performance of service duties. At the same time it also warns the chief of the inadmissability of arbitrariness, of the necessity to act in strict conformity with the requirements of Soviet laws and military regulations. A commander is not an autocratic lord and master of his subordinates, but a representative of the Soviet state, a person in whom the Party and the Soviet authorities have placed great faith, entrusting to him the command of a subunit, unit, or command. He is given all the rights that are necessary in the interests of the successful performance of service duties by every commander. These are considerable rights.

All the servicemen of a unit or subunit are obligated by the military oath and the regulations to obey their commander implicitly, to execute his orders and instructions precisely. The regulations define precisely the subordination of servicemen, the rights and duties of each, the disciplinary rights of commanders and chiefs in respect to subordinates, the disciplinary rights of seniors in respect to juniors.

The commander and the chief are required to make use of the authority and rights granted them by the regulations, including disciplinary rights. If the commander makes strict demands on his subordinates, if he punishes the subordinates justly in conformity with his disciplinary rights, he has on his side the support of Soviet law, the support of higher-ranking commanders, political organs, and

Party and Komsomol organizations, the support of all service personnel.

The exactingness of commanders and chiefs should be strict but just, promoting successful accomplishment of the tasks of rearing disciplined fighting men. A commander in the Soviet Armed Forces is not only a chief but also the mentor of his subordinates, their military and political leader. The authority of the commander and the strength of his influence on his subordinates depends in large measure on how thoroughly and competently he carries out the tasks of education and disciplinary practice.

An air commander, like every commander in the Soviet Army, has the opportunity of carefully analyzing every offense of a subordinate, to give full consideration to the man's past service as well, to find out all the motives and circumstances that directly or indirectly drove the man to violating the requirements of discipline. However, not a few mistakes are still made in the disciplinary practice of our commanders. Which of them are the most typical?

The requirement of the Disciplinary Regulations that not a single offense by subordinates should be left without action is often considered as a duty to exact a strict penalty for every offense. Such an interpretation cannot be considered correct. A commander has many means of action against a subordinate. For example, a disciplined man who conscientiously performs his duties sometimes commits a violation of discipline unexpectedly even for himself, one that does not lead to serious consequences. The commander has convinced himself that the man sincerely regrets his mistake. Is it necessary to impose a penalty on him? No, this is not at all mandatory, nor do the regulations require it. Provided in the regulations is the possibility of simply talking to the subordinate in a number of cases. The regulations give the commander himself the right to decide how it is best for him to act for the purpose of educating the soldier.

Some commanders are carried away with extreme measures of disciplinary punishment - arrests with confinement in the guardhouse. Such comrades make a great mistake and violate the Leninist principles of working to strengthen discipline. Extreme measures of disciplinary punishment should be in the nature of exceptions, punishment for serious offenses. Abuse of extreme measures of punishment is erroneous because it leads to improper education of the men, reduces and dulls the effectiveness of all other forms of punishment, and the very fact of the arrest itself is transformed from an exceptional phenomenon to a common everyday phenomenon and, consequently, its educational significance is reduced.

Displaying strict exactingness toward subordinates and punishing the negligent, the Soviet commander and chief is at the same time required to commend his subordinates for exemplary execution of the requirements of military discipline, for diligence in performing service duties.

The great majority of officers understand correctly the educational significance of commendation. But in the use of commendations some commanders commit essential errors.

There are among us servicemen who have 20-30 or more commendations. This cannot be condemned without reason, but there is much here to think about. If the commander is too generous with praise, if he notes nearly every step of a subordinate, the value and educational influence of the commendations are thereby reduced. The experience of the leading commanders shows that not always is there need for expressing praise. In a number of cases it is enough to mention the name of the one who has distinguished himself before the formation, to remark positively on the work of an officer or a soldier so that he will understand that the commander is vigilantly watching the work of everyone, that he approves the conduct and the work of his subordinates. Skillful use of the various forms of commendation increases their educational significance.

Strict, everyday, reasonable exactingness should become an integral quality of every Soviet commander and chief. Only on this condition is true regulation procedure possible.

The task of all commanders, political organs, and Party organizations consists in instilling in every officer a sense of responsibility for combat and political training, in teaching them to concern themselves every day with strengthening discipline and organization and at the same time in having a considerate attitude toward the needs and requirements of their subordinates.

With the aim of maintaining discipline in our Armed Forces, Soviet laws and military regulations provide for disciplinary and criminal responsibility of the servicemen for military offenses.

The fundamental, the basic difference between the use of measures of compulsion under socialism and their use under capitalism consists in that in a socialist society such measures are resorted to in the interests of all the working people, all the people, and not in the interests of a small group of capitalist magnates, as is always the case in a bourgeois society. The distinction lies also in that the entire Soviet people, our working class, the peasantry, the intelligentsia, and the personnel of the Armed Forces are convinced of the need for using measures of compulsion against the violators of Soviet laws and labor and military discipline in the interests of the whole society.

In his report at the Eighth Congress of Soviets in 1920, Lenin said that the proletariat has the right to use methods of compulsion, that our victory in the Civil War was assured by the fact that the peasantry recognized the need for the iron leadership of the proletariat. "And it is only because we were able to convince the peasantry of this, it is only because of that," said Lenin, "that our policy of compulsion, based on this strong and unconditional conviction, had such a gigantic success."

The organs of Soviet authority apply measures of compulsion and bring the guilty parties to disciplinary and criminal account for military offenses that the law recognizes as "offenses against the established procedure of performance of service duties committed by servicemen and also by reservists when they are going through refresher training." Among such military offenses are, for example, insubordination, refusal to carry out orders, resistance to a chief or compelling him to violate his service duties, threatening a chief, absence without leave, leaving the unit or post without leave, desertion, etc.

With all this, Soviet laws severely limit the use of measures of compulsion and provide for strict responsibility of officials, court organs, military tribunals, and prosecutors for unfounded and illegal use of measures of compulsion, for abuse of authority, and for exceeding it. Arbitrariness and illegality are prosecuted severly by the organs of Soviet authority. The Communist Party and the Soviet Government are vigilantly watching the observance of socialist legality and are continuing their work of further improving Soviet laws in the interests of the working people. Attesting to this convincingly are the decisions of the second session of the fifth meeting of the

Supreme Soviet of the USSR, held in December 1958, and the materials and decisions of the Twenty-First Congress of the CPSU.

Compulsion has never been the principal method in the activity of the Soviet state. With the triumph of socialism, the sphere of compulsion has been reduced even further. Its edge is turned only toward the agents of imperialist states, against thieves, swindlers, parasites, malicious hooligans, murderers, and other antisocial elements.

Unfortunately, we still encounter occasional incidents where little concern is given to the fate of subordinates and where the primary aim is to bring them to criminal account as violators of military discipline instead of conducting educational work. Such a practice contradicts the Leninist principles of strengthening discipline among Soviet troops.

* * *

Working out the principles of building a Soviet Army, carrying out the practical tasks of strengthening our Army, Air Force, and Navy, guiding their combat operations against the enemies of the socialist Fatherland, the Communist Party of the Soviet Union and its leader and organizer, Vladimir Il'ich Lenin, have developed principles and methods of strengthening discipline in the Army that are fundamentally new and different from the principles and methods of strengthening discipline in bourgeois armies.

The decisive superiority of Soviet military discipline consists in that it is based on the servicemen's profound consciousness of their military duty and a conviction of the correctness of the policy of the CPSU and the Soviet Government.

The work of the Party in strengthening one-man authority further, in improving Party-political work, in the ideological and political hardening of the officer cadres, and in developing in them the qualities of leaders of the Leninist type provides our commanders with the necessary conditions for successful execution of the tasks posed and develops in them the personal qualities necessary for strengthening further the military discipline in the units and commands of the Soviet troops.

The majestic program of extensive building of Communism in our country outlined by the Twenty-First Congress of the Communist Party of the Soviet Union has been received with enthusiasm by the Soviet people, by the fighting men of the Army and Navy. It confronts the Army cadres with responsible tasks in ensuring the safety of the peaceful labor of their people and in Communist indoctrination of the personnel of the troops.

We have all the conditions necessary so that the tasks of Communist indoctrination of the Soviet fighting men will be successfully carried out in every unit and every command, so that there will be strong military discipline there and a high combat readiness. And this is the principal objective of our life and work.

THE POLITICAL SECTION GENERALIZES THE WORK EXPERIENCE OF AN ELEMENT COMMANDER

Recently the political section of our command decided to generalize the experience of the teaching and methodological work of an element commander.

They chose Capt. V. V. Lyutikov. This choice was not accidental. Not so very long ago this element commander had a second-class rating, while none of his subordinates had any class rating at all. In a short time, Lyutikov himself had risen to the level of first class and acquired good instructional experience; pilots I. Sh. Batalov and G. M. Kurdyukov are ready to take the exam for a second class rating. The element became Outstanding.

How did Capt. Lyutikov succeed in resolving the task of training rated pilots more quickly than the other element commanders? How did he manage to make his element Outstanding? These are the questions that the political section of the command tried to answer, analyzing the work experience of officer Lyutikov.

The analysis of the activity of this leading element commander showed that of considerable importance in achieving success in Lyutikov's good training is an instructor. Lyutikov sees and notes the slightest mistakes made by the pilots and then knows how to take the necessary steps to eradicate the mistake thus revealed.

Once, in raising the nose wheel at takeoff, pilot Kurdyukov made abrupt movements of the control stick. On the ground, in the plane, and in a trainer, Capt. Lyutikov showed him several times how the nose wheel should be raised properly and what rate of movement of the controls is necessary in raising it. To eradicate a mistake, to feel it, is not a matter of a single day. In addition to practical example, it is necessary to substantiate it theoretically with a model of the plane in hand, to convince the pilot that he is making a mistake. By convincing examples, by putting questions associated with the theory of flight, the element commander compels the pilots to think and to correct their mistakes.

When there is need, Lyutikov shows by personal example how it is necessary to pilot a plane or to conduct aerial combat.

Once Lyutikov's "enemy" in an aerial battle was this same Kurdyukov. Each tried to gain an advantageous position. For some time, neither the one nor the other was able to do this. Then Capt. Lyutikov decided to use a little cunning. He put his plane into a tight turn, knowing that the "enemy" would inevitably start to pursue him. And so it happened. And as is known, the strongest in a tight turn is that pilot who is able to reduce the radius of the turn to a minimum. That is precisely how Capt. Lyutikov piloted the plane. The distance between the planes was rapidly reduced. Another second passed - two, and Kurdyukov was attacked before he realized what was happening.

Important in the practice of Lyutikov's educational work is a strict combination of the method of conviction with a high commander's exactingness. He devotes considerable attention to checking the state of combat readiness of the aviation equipment, to checking the work of the aircraft specialists.

Maj. YU. A. BOYKO.

PARTY-POLITICAL WORK IN PREVENTING FLIGHT ACCIDENTS

Lt. Col. I. I. DOKTOROVICH

The soldier aviators in the unit where the air commander is A. D. Kurov and the political worker V. F. Khar'kov, while carrying out the directives of the Twenty-First Congress of the CPSU concerning the strengthening of the defensive might of our Motherland, are daily perfecting their combat skills.

Their successes are the result of the persistent and concerted activity on the part of the commanders, political workers, the indoctrination and training of the servicemen - a result of the joint efforts of the entire collective.

There is a great deal of attention devoted in the subunits to the political education of the personnel, to the inculcation of love and devotion toward the Communist Party and the Socialist Motherland, to increasing conscientiousness and ideological training, as well as to instilling a feeling of personal responsibility for the performance of their military duties. These problems are being systematically discussed at Party and Komsomol meetings and sessions of the Bureau; they occupy the center of attention of all commanders and political workers.

Thanks to the persistent training and educational work of the Communists many of the insufficiently experienced pilots were able to acquire, within a short period of time, the necessary skills and joined the ranks of foremost men. Take, for example, pilot G. A. Karapetyan. He experienced many frustrations before mastering jet fighter planes. At one time, he had trouble with discipline and there were also gaps in his knowledge of the equipment. Once, because of this, he was grounded. However, Communist pilots first class M. I. Orlov, A. F. Novikov, and others helped him correct his faults. Communist Pilot First Class A. I. Tyurin especially worked a lot with him. An environment conducive to study was created for Comrade Karapetyan. But at the same time a strict observance of military discipline was demanded of him.

Karapetyan attentively listened to the advice of his senior comrades, and attempted to do everything as they did - without deviations from the documents regulating flight work. The past year was most productive for the pilot. Karapetyan mastered daytime flights under adverse weather conditions as well as night flights under normal weather conditions and became one of the top trainees.

An outstanding degree of training and discipline enabled this pilot to pass a difficult trial during one of the flights. While flying in the zone at high altitude his engine stopped. However, the pilot was not taken aback and acted precisely according to instructions. Self-discipline, initiative, and know-how enabled him to start the engine in the air and safely complete the flight.

Among the pilots and the entire personnel of the unit, a well-earned reputation has been gained by Communist officers V. V. Frolov, V. V. Romanov, and many others. They often give talks to the soldiers on the most varied problems of life and existence. This is being done not only during ground training in the classrooms and during the preliminary training, but also on the airfields during servicing of the aviation equipment for flights, as well as during the flights themselves.

For instance, young pilot Lt. V. M. Plotnikov, experienced great difficulties - especially during the landing computation and landing. Once, he made the landing computation under excellent weather conditions with a short and, as a result of this, landed short of the VVP [runway]. The Party and Komsomol organizations took note of this incident. The element commander on several occasions spoke with the pilot and checked his preparedness for flight. As a result of this, it turned out that some elements of flight training were acquired with difficulty by Plotnikov and that he needed practical help. The element commander, having in detail analyzed the mistakes made by Plotnikov flew with him on several check pattern flights.

Proper individual methodological work with the pilot made it possible, within a comparatively short period of time, to overcome the existing shortcomings. Plotnikov learned to perform the landing computation and landing with ratings of no lower than "good", and he recently learned to fly in the daytime under adverse weather conditions with an increased minimum.

It is known that a long record of work with high showings in combat training without flight accidents can cause some soldiers to become conceited. Therefore all of the commanders and Communists by their conscientious attitude toward work must, by personal example, inculcate in the pilots and technicians, as well as other aviation specialists, integrity and truthfulness, and instill in them love for their unit.

Some time ago, the following incident took place in the unit. One of the mechanics, while performing regulation inspection work, dropped a bolt into the combustion chamber of an engine. Aware that this could have bad consequences, the mechanic went to his superior and frankly told him everything. The bolt was taken out of the combustion chamber. For the carelessness he displayed, the mechanic — a Komsomol member - was criticized at the Komsomol meeting, while his frank confession was praised. In talks with the personnel it was once more pointed out that a soldier must be honest and frank.

Here is yet another example. It was observed that pilot Senior Lt. G. P. Ivanov was careless in his work and once, neglecting the servicing for the scheduled flights, maintained a careless attitude toward conducting training sessions in the aircraft. The commander and the Party organization immediately undertook vigorous measures. The secretary of the Party organization in the squadron and the unit commander talked to Ivanov on this matter. This problem was thoroughly analyzed at a meeting of the unit Party Bureau. The members of the Bureau censored Ivanov's behavior, pointed out the fallacy of his views and to what they could lead to in the future, and demanded that he change his attitude toward flight training. This incident alerted the Party organization and it intensified individual educational work among the Communists and all the personnel of the unit.

Pilot Ivanov took notice of the censures by his senior comrades and members of the Bureau and in due manner revised his views, increasing exactingness toward himself. At the present time he is successfully perfecting his combat skills and has

started flying in the daytime under adverse weather conditions with a weather minimum.

One of the decisive f actors in the prevention of flight accidents is mastery on the part of the aviators of the equipment entrusted to them. This is being achieved by studying it systematically and unceasingly perfecting combat skills . This is why the Party and Komsomol organizations of the regiment show great concern for the technical training of the personnel.

What is the subject matter of technical lessons? It is compiled with a view toward the tasks being resolved in the unit; this helps pilots and technicians carry out their flights without flight accidents. If the unit has to carry out a flight, the subject matter is of one type; if it is preparation for training, it is of another. For example, the whole regiment had to make a long-range flight. In connection with this, a training session was organized with the pilots and technicians. With the flight personnel topics such as "Operation of the Aircraft and the Engine for Maximum Range Flights", "Computation of the Distance and Time of Flight" and others were covered, while the technical personnel received instruction in such matters as "Concerning Servicing of Fuel Tanks for Long-Range Flights", "Study of the Fuel System of an Aircraft", etc. This helped in many respects in high-quality performance of the flights.

Technical training is often conducted at the airfield. There the instructor accompanies his presentation with demonstrations on the aircraft. This increases the impact of the training. Thus, for instance, Engineer V. D. Chelnokov, conducted training session with the pilots on the subject of "Engine Troubles Which are the Fault of the Flight Personnel" directly at the aircraft. The instruction was stimulating and the students mastered the material well. No less interesting was the session on control and maintenance of the landing elements. Engineers A. S. Basilaya and N. R. Silenko also conducted the lessons directly at the airfield.

Sometimes, seminars on certain topics are arranged. The pilots and technicians take an active part in discussing the problems and share their experience in servicing and operating aviation equipment.

The command of the regiment decided to practice such training sessions more extensively in all groups.

The Party organization requires of every Communist - engineer and technician - that he daily educate his subordinates, expand their political and specialized knowledge, and strive for exemplary performance of his service duties.

Among the aviation specialists, a good reputation is enjoyed by such experienced officer - educators as Communists V. D. Chelnokov, V. V. Frolov, and other comrades. At the assignment of the Party organization and through their own initiative, they work individually with literally every specialist, painstakingly inculcating technical knowledge and practical skills in working on aviation equipment.

For example, continuing his tour of service, P. N. Golovatskiy joined the regiment as aircraft technician. At first he displayed carelessness and expressed his dissatisfaction with the transfer. On the instructions of the Party Bureau, its members had a talk with him. Many times the engineer of the squadron had a heart-to-heart talk with the officer . A serious warning was given him at the Party Bureau and meeting. All this had a positive influence and Golovatskiy began to work considerably better.

It was necessary to work a lot with yet another officer - aircraft technician G. I. Rusanov. At one time he was undisciplined and this was reflected in the quality of servicing equipment. Individual talks with senior comrades and the activists had a

powerful influence on Rusanov. At present he works without censure, services aircraft for flights in an irreproachable manner, and is an Outstanding Man in combat and political training.

The commanders, engineers, political workers and Party organizations observe with especial care the ways in which the aviation equipment is serviced for flights on the eve of a flying day and on the flying day, since in many respects the carrying out of the plan tables depends on this.

Usually, on days like this, work is going full blast at the airport and each specialist strives to service his aircraft as well as possible. The engineers check the sequence of aircraft servicing and personally check the actions of the technicians. At the same time, on instruction from the Party and Komsomol Bureau, propaganda of the work experience of the best technicians and junior aviation specialists is conducted and help is rendered those soldiers who might be in need of it.

The engineers of the regiment and squadrons know precisely the time required for servicing an aircraft for a repeat sortie. If a route flight is planned, one period of time is necessary; for target practice, another; for flights in the zone, yet another, and so on. Taking this into consideration, some of the Communists at one of the meetings introduced a proposal to make every minute count, and to consolidate the flying day.

Having accepted this proposal of the Communists, the command and the Party Bureau undertook to implement it. Now, the engineers think through in advance and discuss with the flight controller the plan of aircraft servicing and then, on the day of flights, service them in shorter intervals for repeat sorties. The time planned for servicing the aviation equipment is adhered to, and thus a rhythmic sequence of flights is achieved.

For instance, on one of the flying days, the regiment had to fly for gunnery practice. Taking into consideration the peculiarity of these flights, work on the combat equipment was organized in such a fashion that during loading of weapons for the repeat sortie, the whole plane was serviced as well.

Previously, after landing, the aircraft was placed in a safe location where the armorers checked the weapons and then reloaded them for the repeat sortie. However, a certain period of time was necessary for this, after which the aircraft was towed to the takeoff area. There it was inspected and reserviced with fuel, air, and oil. For this purpose almost twice as much time was required. Thus the repeat sortie of the plane was dragged out. Now, during the inspection and reloading of the weapons in a safe location, the rest of the aircraft servicing is also performed at the same time. As the result, only half as much time is expended.

When the flying day is more consolidated, within the takeoff period a greater number of flights are carried out (and thereby the time logged is increased). This is possible because all the personnel clearly understand the tasks, knows the nature of the flights in advance, and organize well the servicing of the combat equipment for repeat sorties. A superior quality of work is also facilitated by skilful radiofication of the takeoff area. Now the pilots, during the entire time of flights, can hear how their comrades are performing the flight missions and can analyze their mistakes on the spot. The technicians are able to follow the functioning of the equipment and the location of their aircraft. The radiofication is of especially great help during night flights.

Also practiced with us are flight critiques, with the engineering and technical

personnel taking part. In essence, these are practical training sessions where the aircraft technicians and other specialists learn not only about shortcomings but also about the work of the advanced aviation specialists who skillfully service the equipment and apparatus for flights. At these critiques, questions are raised dealing with the mutual assistance of crews, measures of flight safety, etc.

Many a time during these critiques G.A. Tret'yakov was cited as an example for others, His aircraft is always combat ready and has the greatest amount of logged time. Officer Tret'yakov is a competent, accurate, and efficient officer. The experience of his work in servicing aircraft for flight has been generalized and publicized in special bulletins. Recently, Outstanding Man and Komsomol member Tret'yakov was awarded a merit certificate by the Central C mittee of the Komsomol of the Republic.

On several occasions during such critiques, they told about the style of work of aviation equipment engineer V.V. Frolov who has a zealous attitude toward his work. While striving for better showings in the work of the junior aviation specialists, he introduced supplementary evaluation for the quality of work carried out on the aircraft and this has a most positive effect in raising the sense of responsibility among specialists for the work performed.

At meetings and sessions of the Bureau, the Party and Komsomol organizations systematically discuss the exemplary behavior of Communists and Komsomol members in matters of maintaining flight and military discipline, in enhancing the sense of responsibility during servicing and maintenance of combat equipment.

A significant place in the work of the commanders and of the Party organization is devoted not only to the elimination of conditions conducive to flight accidents, but also to the analysis of the reasons for these conditions as well. They began to note, take into consideration, and more thoroughly evaluate each minor infraction.

For instance, in the past, slight overshooting or undershooting of the runway often remained unnoticed by the commander. Now, landing short of the runway is considered in the regiment to be a serious violation. And if the pilot permits even a small negligence, it still will be taken into consideration, its causes will be established, and then measures undertaken to prevent any repetition of the same.

In the regiment, Capt. V.G. Korobov is known as an outstanding pilot possessed of much experience in flight work. One night, he flew as an instructor with pilot V.I. Chuprunov who previously had no record of mistakes. Suddenly, at low speed, they landed short of the runway. It turned out that Korobov displayed negligence in flight, depending on Chuprunov, and the computation for landing was made incorrectly. Having established the exact cause of the violation the command analyzed it in detail with the flight personnel, and at the Party meeting they had a serious talk with Communist Korobov. One must say that Korobov understood his mistake and, through practical effort, corrected it. At the present time he is an Outstanding Man in combat and political training.

Aside from the measures indicated, the Party Bureau of the unit conducted a conference with the Party aktiv and a talk with the Communists concerning the raising of the sense of personal responsibility of Party members and candidates for the performance of any assignment.

In the regiment, after each flight all violations in flight work are thoroughly analyzed. This, as a rule, is done during the summary of the results of the flying day. Before the critique, all of the causes of a given mistake or violation are

pointed out. The flight controller and the commander do not limit themselves to general remarks but rather talk to the pilot in detail and find out how he prepared for the flight, what the difficulties were that he experienced, what type of help he needs, and how he evaluates his mistake. The Party and Komsomol organization, using the material of the critique, organize help for those who have fallen behind and undertake measures designed to eliminate the shortcomings.

During one of the route flights pilot Ye.Ye. Kormishin was flying in a pair while performing aerial photography. On the last leg of the route, due to uncoordinated actions, the leader lost his wingman. Kormishin's fault was obvious. However, in the course of a more thorough examination of the incident, it turned out that the wingman did not carry out the directions of the element commander given on the eve of flights, which dealt with the actions to be taken when losing the leader. Both pilots were grounded. During the summary of the flying day the violations in methodology of flying in pair were analyzed. In order to avoid similar incidents, a detailed study of the actions of the leader and wingman during reconnaissance flights was worked out with the flight personnel of the squadron, including commands and their execution, the sequence of maneuvers in the group, and the actions of the pilot when losing his leader or wingman.

Several of the Communists on instructions from the Bureau and the secretary conducted, in connection with this incident, a series of discussions with the pilots. Thus for instance, Communist A.N. Barskov, on the basis of his work experience, told about the actions of the leader during aerial reconnaissance, while Party member Korobov discussed with the pilots the peculiarities of orientation in flight.

An important part in creating conditions for accident-free flight work belongs to the preliminary and preflight preparation. Therefore the commander, his deputy for political affairs, and secretaries of the Party and Komsomol Bureaus work very intensively these days in order not to miss, or leave without action or attention, any problems.

First of all, they are taking an active part in bringing to the attention of every airman the problems of the forthcoming flying day; through the aktivs of the Komsomol and the Party organization they exert influence upon the entire course of preliminary flight training and the carrying out of the flights themselves; they strive for precision of work on the part of every soldier, and undertake measures designed to eliminate the shortcomings uncovered.

One day the regimental commander had planned flights with target area photography. The photography was to be conducted against a tactical background, i.e., the objectives, both the basic and the alternate ones, were covered by "enemy" fighter aircraft.

Taking into consideration the fact that young pilots, not possessed of sufficient skills in conducting aerial photography and who were in need of special care, were scheduled for these flights, a great deal of attention was devoted to them. Immediately after the mission had been assigned, the deputy for political affairs assembled all the secretaries of Party organizations in the squadrons and instructed them about rendering the necessary help to young pilots in preparation for carrying out the flight mission.

Element commander A.I. Tyurin talked with the young flight personnel of his element regarding the distribution of aerial sectors of observation by the crew when flying in a pair and in an element and also rendered great practical help in preparation

for flights as well as in other problems.

By thoroughly scrutinizing the preparation of aviators for flights, the commander, his deputy for political affairs, and the Party aktiv could clearly see how the work was organized in each subunit and rendered help wherever it was necessary — at the same time citing the best soldiers as examples.

On the eve of flights and on the flying day, the deputy commander for political affairs and the chief of staff, together with the surgeon, inspected the quality of food preparation and the organization of rest for the flight personnel, as well as the observance of the preflight regime on their part.

The secretary of the Party Bureau, Ya.A. Semenov, talked in detail with young squadron engineer, Communist A.K. Belogortsev and learned how the equipment was serviced for flights. Since Belogortsev is a young engineer and does not have sufficient practical experience in problems of organization, the conversation dealt with the question of increasing exactingness toward the technical personnel and mutual assistance between the crews during the servicing of aircraft for repeat sorties.

Directly on the airfield was the secretary of the Komsomol Bureau of the regiment. Together with the engineers from the squadrons and the Party and Komsomol aktivs, he interpreted to the aviation specialists the missions, the forthcoming workload for every aircraft, and organized practical assistance. The preparation of the equipment was explained in combat memos.

The Party and Komsomol Bureau of the unit, on the eve and on the day of preliminary preparation for these flights, organized the publication of a leaflet devoted to the Outstanding Element commanded by officer I.I. Panov and prepared posters, in which they treated the problems of timely and high-quality preparation of the photographic equipment for the first and repeat sorties. They emphasized circumspection by the flying personnel while aloft and performing aerial photography and the peculiarities of conducting aerial reconnaissance during flight depending on the objective. In these memos there was unceasingly reflected the course of execution of the missions by the pilots, servicing of the aircraft for repeat sorties, as well as the operation and maintenance of combat equipment. At the same time mention was made of the best pilots, technicians, and junior aviation specialists.

For the flying day the deputy commander for political affairs, together with the secretaries of the Party and Komsomol bureaus, thought everything out to the last detail as to who should do what. Assignments were given to the members of the Party Bureau, as well as to the aktiv.

As it was planned, the secretary of the Komsomol Bureau, L.I. Ovsyannikov, on the day of flight arrived at the airfield together with the engineering and technical personnel and, with them, took part in supporting the timely servicing of the aircraft at the takeoff area.

After all the personnel had arrived at the airfield, interviewing of the pilots was organized as to the ways in which every one rested and if there were any complaints. Pilot Chuprunov was grounded by the doctor because he had a temperature and symptoms of the grippe.

Serious attention during preflight preparation was devoted to the training of the flight personnel in the cockpits of the aircraft. As on previous flying days, the training was conducted in accordance with the plans of element commanders. The pilots prepared for the flights with great interest and once more studied the rules of operation and maintenance of the apparatus. The best element in the organization of training was that of A.N. Barskov.

During flights the commanders and the political apparatus organized individual talks with the pilots and technicians as well as an exchange of experiences in carrying out flight assignments, at the same time noting the outstanding aviators in the servicing and competent maintenance of aviation equipment.

An interesting exchange of experience occurred during the break in flights between the pilots of the elements commanded by V.I. Kleyman and A.I. Tyurin. They shared their experience in area photography and circumspection in the air while flying in an element. Following this, Kleyman discussed briefly with his pilots why the wingmen failed to spot a fighter plane in good time during the photographing.

A lively response among the pilots was evoked by the talk by Communist M.I. Orlov. On this day he flew to intercept a group in the area where they were photographing and, after every flight, shared his impressions and pointed out the best airmen as well as the shortcomings of other airmen

The Secretary of the Komsomol Bureau of the unit, Ovsyannikov, worked a great deal that day. He talked with the pilots, technicians, and junior specialists and gave some of them practical advice. He talked in detail with Komsomol member V.I. Soltanov. This was due to the fact that the operating time of the engine on the aircraft he was servicing was running out; this meant that it was necessary to inspect and service the aircraft for repeat sorties more carefully.

The flying day was successfully finished. The plan table was fully carried out without any deviations. A great role here, as was pointed out by the commander during the summary, was played by thoroughly thought out and well organized Party and political work.

By assigning great importance to socialist competition as well as the generalization and propaganda of advanced experience, and the enormous role played by them in the campaign for flight accident prevention, the commanders, political workers, and leaders of Party and Komsomol organizations in the regiment devote a great deal of attention to the popularization of the best pilots, technicians, and other specialists, as well as to demonstrating their work methods. To this end, a variety of means are employed: meetings, conferences, flight critiques, visual agitation and so on.

Last year, for example, the experience of the work of the outstanding crews under V.I. Kleyman, Yu.M. Zobnin, and others, was generalized and brought to the attention of other airmen. Recently, a bulletin was published which is devoted to the Outstanding Element of I.I. Panov. There it is pointed out how the combat team was able to achieve high showings in training and discipline. The best pilots and technicians, in accordance with the instructions of the Bureau, shared their experience of work in specific problems of combat training and helped less experienced aviators. For instance, Communist Kleyman repeatedly told the pilots about flights under adverse weather conditions in daytime and at night, about actions when the ARK-5 [automatic radio compass] fails, as well as about the control of servicing and operating radio-technical and piloting and navigational equipment on the ground prior to flights.

Quite often exchange of experiences and practical help rendered by the foremost men to the less experienced ones is organized at the airfield during breaks between flights and in the course of servicing the combat equipment. Such work is of

great use, since as a rule the instruction by the Outstanding Man is in such cases accompanied by demonstration directly on the aircraft.

Eight years of accident-free flight work, successes in combat and political training — these are undisputably enormous achievements, and they were possible because the commanders of the subunits and units rely competently in their work on the Party and Komsomol organizations and properly make use of their organizing and mobilizing power in the solution of these problems. Comradely and cooperative work by the commander and his deputy for political affairs enables one to overcome any difficulties.

The Party and Komsomol organizations of the unit and subunits systematically and persistently strive to see that all the Communists and Komsomol members take a leading part in training and discipline and serve in all things as an example for non-Party members. One must say that the results of this work are not bad — two-thirds of the Communists and Komcomol members are Outstanding Men.

The Communists and Komsomol members constantly come forth as initiators of many good deeds and in this receive wholehearted support among non-Party members, because they show an example of impeccable service to the Motherland — not with words, but deeds.

However, in the subunits there are still shortcomings, violations of discipline, and unsolved problems. Some pilots, technicians, and other specialists, because of negligence and lack of discipline, permit themselves individual deviations from the existing order. There are cases when, due to the fault of responsible individuals, not all of the needs of the soldiers receive timely attention.

The command, the political apparatus, and the Party organization, by utilizing the great political upsurge among the personnel caused by the historic decisions of the Twenty-First Congress of the CPSU, direct the entire Party and political work toward the elimination of existing shortcomings, and toward the achievement of new successes in the combat training of soldiers. There is no doubt that the comradely team will cope successfully with this task.

INITIATIVE AND PERSONAL RESPONSIBILITY

WHAT DO YOU THINK OF THIS?

1. How To Instill These Qualities In Pilots?

Maj. Gen. of the Air Force P. I. KOKAREV,
Military Pilot First Class

In his article "Initiative and Personal Responsibility" (VVF[Herald of the Air Fleet] No. 6), Col. Ye. V. Sukhorukov broached a very exciting subject. The author comes to the indisputable conclusion that without initiative there is not and cannot be an active aerial fighting man. At the same time, any flight places on the pilot a great responsibility. But sometimes pilots forget about this. Recently the following incident occurred here. On a plane piloted by officer K. T. Shal'nov, the engine stalled during an aerobatic maneuver. The pilot started it without reporting this to the flight controller, and he said nothing to anyone after returning to the airfield. When officer G. K. Kumbutayev took off in the same plane, everything was repeated all over again. Kumbutayev started the engine and continued the flight. The engine stalled twice more. He started it again. And only after returning to the airfield did Kumbutayev tell the engineer about all this.

Technically, both flights seemingly ended safely. But that which had occurred in the air was fraught with great trouble. And the senior commander was right when, after investigating everything in detail, he characterized this as a serious cause of a flight accident.

The pilots did not have the proper sense of responsibility for carrying out a flight mission. How else explain the fact that Shal'nov did not report the stalling of the engine to the flight controller? And why did he hide this fact from the engineer? Apparently, not knowing the equipment well enough, Shal'nov could not himself understand what had occurred, and he did not want to show his technical incompetence. And Kumbutayev flew out after Shal'nov. Fortunately, he is an experienced pilot and knew how to start the engine. But he acted incorrectly when he reported nothing to the flight controller.

This incident attests not only to a lack of proper responsibility among some pilots for the job entrusted to them but also to poor educational work with them. If this work had been conducted systematically, neither of the pilots would have acted contrary to the requirements of flight safety rules.

Our Soviet pilot --called upon to guard the peaceful creative labor of the Soviet people -- is a man of high moral and combat qualities. Devotion to the Motherland and the Party and faithfulness to the ideas of Communism are pro-

foundly combined in him with a sense of personal responsibility for the job entrusted to him. This is even more perceptible now, when our Soviet Motherland has entered the period of extensive building of Communism, when every Soviet man lives with but one thought: how to carry out best and most quickly the assignments of the seven-year plan adopted by the Twenty-First Congress of the CPSU. The military pilots are also proposing their own goals in perfecting combat training and the combat application of aircraft. With a sense of high responsibility, they are fulfilling the obligations they have taken and are thereby strengthening even further the defensive capacity of our Motherland.

However, in a large group there are occasional individuals in whom the sense of personal responsibility is not sufficiently developed. They are being educated, they are brought to disciplinary account if suggestions do not help and if even after this they still commit offenses that lead to flight accidents; then the state organs are compelled to prosecute them.

After all, it is no happenstance that in the laws on state and military offenses adopted by the Supreme Soviet of the USSR facts associated with violations of the rules of flight are assessed very severely and severe penalties are provided for those guilty of flight accidents.

In all training work it is necessary to strive to see that the pilot never forgets his responsibility for the outcome of a flight. After all, in the air he is acting independently. Even if a group of planes is flying, its success or failure depends on the actions of individual pilots and navigators.

If the flight personnel are well educated and trained, everything will go as the commander planned; if not, there will arise causes leading to loss of orientation and other flight accidents. That is why commanders devote so much attention to the training of pilots and navigators, especially to their independent work and also to checking readiness for flight.

After the completion of preliminary preparation, for example, the majority of the commanders check to see whether the flight personnel have mastered the content of the flight assignment, the technique of performing all the elements of the flight, the methods of eliminating possible mistakes, the procedure for carrying out the flight by crews (groups) flying together.

In addition, the flight personnel are required to have a firm knowledge of all the data on communications, ZOS [ground aids to navigation] facilities and mutual recognition signals, the nature of the area of the forthcoming flights, and the regime established for it. The pilots and the navigators must also acquaint themselves with the weather forecast for the flying day and must learn well the special features of operation of the aircraft and engines, armament, radio and radar equipment, and aircraft equipment in all stages of the flight, as well as data on alternate airfields and actions in special cases.

The duties contain nothing new. However, if a pilot neglects something, a difficult situation may develop in the flight.

For example, once, simply because he had not trained well enough in the cockpit before night flights, officer V. V. Ivanov turned off the navigational lights in the air instead of the AP-5 autopilot heater and went in for a landing. By this he violated safety rules and made controlling of the flights more difficult. Another pilot for the same reason violated the established sequence in retracting the landing gear, exhausted the air, and almost landed with the

landing gear retracted. Only the attentiveness and exactingness of the flight controller prevented serious damage to the aircraft.

Only those pilots who know the equipment and the requirements of instructional documents outstandingly are well prepared even for cases of the most unforeseen emergencies. For example, when V. V. Poskryakov flew out at evening twilight to intercept an aerial target, suddenly the engine rpm dropped sharply at a high altitude. The pilot assessed the situation. The rpm dropped in horizontal flight with the throttle in unchanged position. Knowing well what must be done in such cases, he moved the throttle to idling position and turned on the isolating valve. The engine rpm were restored, and the pilot landed the plane at his home airfield.

Chief of the command post, officer N. A. Bantserov has successfully carried out a large number of operations in vectoring fighters to aerial targets. This result has been achieved due to a profound knowledge of radio engineering vectoring facilities and experience.
In the photo: Officer N. A. Bantserov giving commands to a pilot in the air.
Photo by V. I. KOLESNIKOV

It seems to us that hidden behind the fact that Poskryakov dealt properly with the piloting of an aircraft in an emergency situation while Ivanov himself created such a situation is not only the one's knowledge of the equipment and high flying skill and the other's inadequate training, but also different levels of training and educational work on the part of commanders and political workers.

Not all commanders have mastered methodological skills fully; not all of them know how to combine training and indoctrination of subordinates.

Not long ago I had occasion to study reports of air commanders on causes of flight accidents. For the most part, a true evaluation of the actions of pilots was given in the reports. There is no doubt that the educational value of such analyses is exceptionally great. But there were also commanders who made serious mistakes in the evaluation of facts and thereby brought harm primarily to the entire educational aspect of the matter. Thus, in a flight at night under adverse weather conditions in a UTI MiG-15 plane, pilot V. Ya. Nenakhov and instructor V. I. Pimenov made a landing at excessive speed on three wheels and overshot by 50-70 m. In addition, they used the brakes too late and ineffectively, and the plane rolled beyond the runway.

But in regard to this, the commander drew the following conclusion: carelessness and negligence on the part of pilot Nenakhov and excessive trust on the part of instructor Pimenov. It seems to me, however, that the instructor is to blame here. He should have corrected the pilot's errors in time. Such an unobjective analysis of errors leads to conceit and complacency among some and to unmerited mortification among others, and of course, it does not promote indoctrination of a high sense of responsibility for a flight.

A good rule existing in aviation -- before sending a pilot out to fly, check his knowledge -- is sometimes violated. And it is violated not because of carelessness but only because, for example, the commander of a unit or even of a squadron simply does not have time to do this for every crew.

Checking is done by asking spot questions. Some of the pilots are thus passed by, and their knowledge is not checked. And even those who answered the commander's questions are in fact checked only in some one particular field. The pilot knows that he may be asked or may not be asked. If he is not asked once or twice, he begins to prepare less well for the flight.

Analyzing these shortcomings of the preflight checking of crews, G. N. Pakilev, one of the air commanders, displayed genuine creative initiative: he decided to abandon the system of group checking and to change in the main to individual checking. Group checking was retained only in respect to those questions that are associated with interaction between crews and subunits and also, if necessary, to direct the attention of every one to serious mistakes committed previously.

The air commander personally checks the preparation for flight of each subunit commander and his crew. Brought into this are the instructor officers of various specialties: the navigator, the communications chief, the engineer, the meteorologist, and others. The commanders of the subunits check how ready for the flight the crews of their deputies are(also with the participation of officers of various specialties) and then together with them they conduct an interrogation of all the other pilots and navigators.

If the element commanders are well prepared, then after being checked they are also brought into the preflight checking.

This system has been followed by Pakilev for the second year now and has given good results. Here they are operating without accidents; here ever fewer causes of flight mishaps are noted. And this is understandable.

Individual checking raises considerably the sense of responsibility among the pilots for the preparation for flight and instills confidence in their own abilities and in the equipment. By the responses of the pilots, they prepare for the flights better and more comprehensively, and most important, going out on a flight they are confident that they will carry it out successfully. After all, everything that was not clear was explained during the process of individual checking.

Inculcation of initiative and a sense of personal responsibility among the pilots has promoted to a great degree socialist competition which has spread even wider among the units following the Twenty-First Congress of the CPSU. Recently a group of pilots and navigators who had taken individual obligations upon themselves suggested to the personnel of other subunits that their example be followed. They are calling upon all pilots and navigators to prepare for each flight mission with complete responsibility and to carry them out only for ratings of "good" and "outstanding", to know the aviation equipment thoroughly, and to operate it competently both on the ground and in the air.

Supporting in every way the initiative of the leading pilots and navagators, the command and the Party organizations are watching carefully to see that the pledges made do not remain on paper and that the results achieved in socialist competition quickly become known to all the personnel. For this, we strive to see that the results of the work done are summed up more frequently, and — in an element — every day. Let the men know who is in the forefront and who is lagging behind. This ignites a spirit of competition and compels the laggards to work more zealously so as to make up what has been lost.

The Communists are in the vanguard of those competing; they follow attentively the work of those pilots and navigators who systematically have high indexes in pilot and navigator training, they compare the successes of both, they analyze advanced experience profoundly and bring it to the attention of all the rest of the flight personnel.

By the joint efforts of commanders, political workers, and Party and Komsomol organizations, new successes in combat and political training are being achieved.

LET US CONTINUE THE DISCUSSION ON THE SPECIAL FEATURES OF PRESENT-DAY AERIAL COMBAT

8. KNOW HOW TO UTILIZE THE ADVANTAGES OF YOUR PLANE

Guards Maj. B.I. POLYAKOV,
Military Pilot First Class

Having read in the magazine a number of articles on the special features of present-day aerial combat, I decided to share my thoughts about how, knowing these special features, a pilot takes them into account so as to realize fully his aircraft's advantages in equipment and armament over the enemy. After all, the success of a battle depends in large measure on the ability to use the most effective maneuver and tactical move.

Indisputably, the principal features of present-day aerial combat are determined by the greater flight speed of the aircraft. Therefore, first of all, it is necessary to know how to utilize speed.

Let us assume that a fighter has an advantage in speed as compared to the target. How then should he act in order to intercept the target? It is necessary first of all to decide how to set up the flight route to the assigned line — whether to climb to maximum altitude first and then fly to the point of encounter with the enemy with an excess of altitude, or to travel at the same altitude as the enemy plane. But perhaps it is best to go with a gradual climb? The decision here depends on many factors. But about one thing there is no doubt: in every specific case the pilot will have to act on the basis of the prevailing situation.

Let us take the following example. Military Pilot First Class officer F. G. Afanas'yev flew out to intercept an aerial "enemy". He came out on a parallel course with the target, with an advantage in speed but a lower altitude. How could he best realize his advantage? Does it compensate to some degree for the insufficient flight altitude?

At first glance it seems that the relationship of altitude and speed in jet aircraft has not changed in comparison with piston-engine planes. However, this is not entirely true. True, during flight, especially during aerial combat, altitude and speed are in the same relationship. In order to gain altitude, the pilot accelerates the plane and puts it into a climb angle. But as the flight altitude increases, speed inevitably declines, thus being converted into altitude. We find the same thing in accelerating a plane by descending, when the loss of altitude leads to an increase in speed.

However, flight in modern aircraft has its own peculiarities. The pilot will be able to utilize the greater speeds of the aircraft with greatest advantage for himself if he takes them into account, if he knows the relationship of changing from one type of energy to another, i.e., how much a change in flight speed in modern aircraft can compensate for insufficient altitude. It is known that a body tossed upwards achieves maximum altitude at the moment when the vertical speed of its movement becomes zero. The altitude will be the greater the greater is the speed at which the plane flew before climbing. What practical conclusion can be drawn from what has been said?

The greater the angle of climb, the more rapidly will the plane gain the required altitude. But the greater the pitch angles during pitching, the more difficult it is for the pilot to bring the plane out into horizontal flight. A delay in starting to come out of pitching may lead to a loss of speed below that permissible; the plane will become unmanageable and will heel over on one wing.

Let us return to our example. The "enemy" started to climb. F. G. Afanas'yev increased speed to the maximum, and then put the plane into a climb with a zoom. The target was intercepted at the assigned line.

This example shows that for modern aircraft it is more important to have superiority in speed than in altitude. While formerly for aircraft such superiority brought a certain gain, now for supersonic craft it gives a very great advantage.

It is necessary to make the reservation that the difference in flight speeds of modern aircraft can hardly be great. In addition, at each altitude the range of speeds is limited by the controllability and strength of the plane, by aerodynamic heating, etc. The limitations enumerated do not permit the pilot to attain maximum speed under any flight conditions whenever he desires. The same thing can be said about minimum speed, which is limited by the danger of heeling over on one wing, by a deficiency of thrust, and by a number of other reasons.

While with piston-engine aircraft maximum speeds declined with a climb to maximum altitude, with modern aircraft the situation changes. With a climb to high altitude, speed increases and, consequently, maximum flight speed also increases. There develops the possibility of increasing flight altitude substantially through a reduction in speed. This is still another peculiarity affecting the nature of present-day aerial combat.

Thus, knowing the specifics of flight in modern aircraft and utilizing them skillfully for one's own interests, it is always possible to find the proper decision in any situation.

In the example we have been discussing, F. G. Afanas'yev knew how to make proper use of his advantage in speed. If he had immediately begun to climb over

his own airfield to the altitude at which the enemy was flying and had then flown on to make the interception, time would have been lost and his advantage in speed would have been reduced to nothing.

Modern high-speed aircraft are equipped with automatic wing and stabilizer facilities that have improved their maneuvering qualities considerably. That is why we cannot agree with the conclusions of S. A. Savosin in regard to the impossibility of getting on the tail of the "enemy" plane after an attack on frontal courses. In our view, of decisive importance here are the combat skill and the physical condition of the pilot, his ability to endure the G-loads that develop in the maneuver. We have more than once become convinced in practice that a physically well-trained pilot who knows how to pilot a plane skillfully can come out in the rear hemisphere of the target and use his weapons to destroy it.

True, here also it is necessary to take into consideration the fact that, with present-day speeds, at the moment the attacking fighter begins a 180° turn the interval between him and the target should be no less than 1000-1500 m. Such a maneuver has been used more than once and successfully in aerial training combat by Military Pilot First Class L. N. Ivanov.

However, it must not be forgotten that with the increase in flight speeds this interval may increase and may attain magnitudes at which the fighter pilot will no longer see the target.

Now, when substantial changes have occurred in aviation, when a tendency for operations by fighters in a pair or singly is becoming stronger, every pilot is required to know the capabilities of his aircraft and to know how to make proper use of them. Under present-day conditions, every pilot should be ready to make the proper decision independently and to realize most effectively the advantages of his aircraft.

With the increase in flight speeds, the conditions of sighting and conducting aerial gunnery have changed. Systems of radio and radar jamming are being used ever nore extensively; the tendency for automation of many processes is becoming ever stronger. This means that the pilot is required to have a higher level of general and special training, the ability to evaluate a situation quickly and correctly, to make full use of the equipment on his aircraft.

Now, the factor of time must be considered as never before. Less and less time remains for the pilot to make a decision; he has to operate within extremely short periods of time. The slightest omission or inaccuracy may lead to irreparable mistakes. Instructive in this respect is an intercept flight by Senior Lt. L. V. Vermin.

His fighter was vectored to a target hidden behind clouds, after which Vermin began setting up the maneuver for the attack. First he took up the distance and then the interval, and he was all ready to begin the attack when the target suddenly changed course sharply and disappeared into the clouds by descending. Vermin's plane, having greater speed, flew past; the pilot lost the "enemy" and was forced to return to his home airfield without having completed the mission. His mistake was that he did not makeuse of his advantage, dragged out the attack, giving the "enemy" the opportunity to evade the strike in time. An inability to utilize properly the advantages of his plane and the situation that had developed and underestimation of the factor of time and the importance of the first attack lead pilot Vermin to sorry results.

Absolutely right is Lt. Col. D. F. Goldyrev, who writes in his article ("Herald of the Air Fleet", No. 4, 1959): "To hit the aerial target in the first attack -- this requirement flows out of the peculiarities of present-day aerial combat. That is why it must be considered without fail in training fighter pilots."

So, the first attack decides the success of the battle. They talked about its role in the last war also. But at that time the most important thing was to achieve surprise, which decided the outcome of the battle in large measure.

What justifies the greater role of the first attack now? Can we say that it is only surprise? Unfortunately, no. Modern spotting and vectoring facilities make it possible to discover the fighter in good time, and it becomes increasingly more difficult for him to attack by surprise.

The necessity for destroying the enemy aircraft in the first attack is now dictated primarily by the tremendous flight speeds and the factor of time, of which we spoke above. Under present-day conditions it would be a mistake to hope for a repeat attack if the first is unsuccessful. There will not, as a rule, be time for a second attack.

Every pilot must remember this peculiarity of present-day aerial combat so as to make full use of the combat characteristics of his aircraft in a minimum of time.

A knowledge of the advantages of one's own aircraft -- this is only one aspect of the matter. It is possible to know what they consist of and at the same time not know how to make use of them. Only competent and timely use of this advantage brings good results. We can present a battle episode as an example. This happened during the war in Korea to a pilot of the Korean People's Republic. His plan e had a more powerful engine than the enemy aircraft.

Therefore, when he was attacked by surprise by a pair of hostile fighters, the Korean pilot did not lose his head and evaded the strike by climbing. It is characteristic that he did not fly the plane at maximum speed but in such a way that the enemy did not get any closer to him but also did not fall behind a great distance. The attackers were so aborbed in pursuing him that they did not consider the capabilities of their own planes. At a high altitude both fighters lost speed and went into a spin, which the Korean pilot immediately took advantage of. Both enemy craft were shot down one after the other. Thus, skillful use of the advantages of his aircraft helped this pilot to destroy a numerically superior enemy.

It is known that at subsonic speeds the following method of interception was used extensively. The fighter was vectored to a predicted point, and then he made a turn in the horizontal plane to come out in the rear hemisphere of the target and attacked it on a pursuit course.

Let us examine how such a method will look at present-day speeds, when the time and radius of the turn have increased greatly. Inasmuch as the interval and the lead distance have increased greatly, the accuracy of vectoring the fighter to the rear hemisphere has been reduced. Errors in range result in that the target must be attacked by pursuit, during which time with present-day flight speeds the attack line comes much closer to the objective being protected.

How then to reduce the lead distance and thus intercept the target farther away? A vertical maneuver can be used. Such a decision simplifies the vectoring

and assures an intercept even when the target is spotted at a short distance from the fighter. It is easier to achieve surprise in coming out on the target, and better conditions are created for attacking the target and conducting fire.

Let us explain this by an example. Military Pilot First Class Capt. N. S. Nikolayenko flew out to intercept an aerial target at twilight. The command post did not take into consideration the positions of the aircraft relative to the daylight side of the horizon and vectored the fighter to the target from the side less advantageous for attack. The pilot was confronted with the question of what to do: whether to approach for the attack from that side or to execute a maneuver and gain a more advantageous position. Captain Nikolayenko quickly evaluated the situation and the combat capabilities of his own aircraft and, obtaining permission, by a vigorous maneuver gained the initial position for an attack from the other direction. The target was maneuvering in the meantime. Choosing a suitable moment, the pilot attacked the "enemy" from the direction most advantageous for him and hit it.

The change in the nature of present-day aerial combat and its special features inevitably leads to the appearance of new methods of combat operations and tactical moves. Only by knowing these special features can a pilot act confidently in the aerial situation that has developed and make skillful use of the combat capabilities of his aircraft to achieve victory.

That is why a discussion of the special features of present-day aerial combat is of great benefit. Many of the articles are discussed with the flight personnel and, undoubtedly, help us in our practical work.

BOMBERS COME OUT ON THE TARGET AT NIGHT

(At Flight-Tactical Exercises)

Lt. Col. F. A. VAZHIN

The bombers were taxiing out to take off. One of them had already begun its ground run and, lifting off over the tops of the towering firs, disappeared into the darkened sky. With equal time intervals other aircraft took off after it. The senior navigator of the unit, Lt. Col. A. I. Borman, attentively watched the takeoff, following each aircraft with his eyes right up to the time it became a barely visible dot and disappeared.

The crews had to travel an extensive route, come out on the target, and release the bombs at a precisely appointed time. To carry out such a mission is possible only if the bombers succeed in maintaining precisely their places in the combat formation. Officer Borman realized that this was not easy - particularly on a dark night when it is difficult to discern the aircraft flying ahead and behind. Closure between the aircraft can disrupt the plan of the strike as well as flight safety. The difficulty lay in the fact that the crew had not simply to fly along a straight path, but had to carry out fighter and AA evasion maneuvers as well.

The officer recalled the preceding flights. At that time not all the bombers managed to maintain their positions. A disruption of the combat formation, even by a single crew, results in the disorganization of the entire formation. This is why all these things worried the senior navigator of the unit at this moment.

Lieutenant Col. Borman was an experienced first-class navigator. He flew many thousands of kilometers in jet bombers. It is common knowledge that the navigator's profession requires precision of thought and action and orderliness in performance. For many years these qualities were developed in the officer; they were sharpened and polished. And whenever he was confronted by some problem, in solving it he did not stop with half measures. The navigator literally performed research work in order to clarify each detail.

This attitude came to officer Borman's assistance many times in flight. There were no surprises for him aloft. The navigator prepared ahead of time for each complication in a situation and took all measures in order to forestall the least shortcoming which adversely affected the carrying out of the mission. This he also demanded of his subordinates.

Lieutenant Col. Borman was trying to do everything in order to ensure an efficient organization of the flight in this instance as well. He carefully thought over the problem, he discussed them with the more experienced commanders and navigators,

Officer A. N. Zav'yalov is one of the foremost political workers in unit X. The airmen respect officer Zav'yalov not only as an understanding comrade and a confirmed Communist, but as a good pilot - a master of aerial intercepts.

Comrade Zav'yalov flew bombers for a long time and was an instructor. It took him very little time to re-train and now he flies a fighter aircraft.

In the photo: Lt. Col. A. N. Zav'yalov before going on a night mission.

Photo by G. M. OMEL'CHUK

and conferred with the officers who excel at maintaining their position in the combat formation and also with those who committed errors on previous occasions.

The senior navigator reaffirmed his conviction of how important it is in organizing a flight to define and explain to each crew the method of maintaing its position. Here the most important thing is that this method satisfy the tactical plan, the flight conditions, and the prevailing situation. Much depends on the selection of check points on the flight route by which the crews check on the way they maintain their combat formation. If there is a paucity of such check points or if they are poorly visible, then the flight personnel has greater difficulty in operating.

After evaluating the flight route the senior navigator established the fact that it would be necessary to fly over a terrain where there were very few light check points. This meant that it would be necessary to select radar check points; but on individual legs of the flight route they were also scarce. For this reason it was decided to mark off predetermined points for the purpose of checking. By determining these in accordance with the bearing of a broadcasting radio station the crews would be able to use them as control check points.

The navigator devoted special attention to planning the flight route, determining the order of takeoff, coming out on the flight route, passing control check points, and coming out on the target.

What should be the method the crews use in maintaining their position in the combat formation?

Only a creative approach in this matter could result in a correct decision.

After all, it is necessary to find a method which satisfies best of all the nature of the mission, the specific flight conditions, and the level of training of the flight personnel. In the present situation such a method involved maintaining one's position according to the time of the leader's passing the control check points. True, this method required firm skills on the part of each crew in maintaining its position in the combat formation, the ability to re-establish its position whenever it is disrupted for some reason, repelling fighter attacks, carrying out an AA evasion maneuver, etc.

In order to develop these skills in the flight personnel the commanders and navigators of the subunits had to put in a lot of work. For example, this is how Military Navigator First Class Capt. A. V. Shashkov acted.

The crew of a bomber aircraft, the navigator of which was Senior Lt. S. F. Guzenkov, for a long time could not perfect the target approach in the given time and allowed deviations from the flight route. Squadron navigator Capt. Shashkov first of all explained the cause of the errors. It seemed that the crew navigator had not yet developed a sound system for distributing his attention in flight. The result of this was that he sometimes was not able to carry out in good time what was required of him. After discussing this with Guzenkov and then checking his actions on a trainer, the captain learned what the navigator's failings were.

Then he decided first to rehearse the flight on the ground in order to analyze fully the actions of the crew aloft and, in particular, the actions of the navigator. Here particular attention was devoted to maintaining position in the combat formation and precise target approach. When it became clear that Guzenkov fully understood the sequence of actions and the order of attention distribution, the squadron navigator went up with him.

Before flight a table was drawn up for dissipating excess time by the 60°-turnaway method. Senior Lt. Guzenkov not only familiarized himself with this table but took part himself in computing it and in checking every figure.

The bomber aircraft took off so as to have excess time aloft. Having determined this excess (it amounted to 2 min.), the navigator decided to dissipate it on the last leg of the flight route, making use here of the table. First, on a command from Guzenkov, the aircraft turned left from the course 60°. Then it traveled for a predetermined time and, turning 120° to the right, came out on the planned course. The crew navigator did all this himself while Capt. Shashkov followed all his actions and sometimes gave directions. The result was that the excess time was dissipated and the crew came out precisely on the target.

After they landed, the squadron navigator analyzed in detail with Guzenkov the entire flight, pointed out inaccuracies in his actions, and advised him how to avoid these.

This is how they worked in the squadron with each crew, striving to see that pilots and navigators develop firm habits in maintaining position in combat formation and in precise target approach.

In assigning problems to the crews, the unit commander informed them of the time intervals to be maintained between the aircraft and how they were to be stacked. Here he took into account the flight conditions, the crews' level of training, the technical facilities used for checking, as well as fighter and AA counteraction expected from the "enemy".

In the course of flight preparation the following were determined: order of takeoff, interception of flight route, passing the control check points, and the execution of fighter and AA evasion maneuvers. The time of passing the control check points - computed on the basis of the known wind - was given to the lead crew, while all the other crews computed it on the basis of their position in the combat formation. In order to attain accuracy in coming out on the target, on the route a segment was marked off on which the crews could dissipate excess time. All these elements were painstakingly worked out by the pilots and navigators in the course of preliminary flight preparation.

And now, when the bombers were aloft, Lt. Col. Borman again tried to visualize in detail the whole flight: again and again he checked himself to see if everything had been done to insure an organized flight and to see that the crews maintain the selected combat formation and come out precisely on the target.

After seeing off the last plane in the group, A. I. Borman dropped in at the SKP [flight-line command post]. Over the loudspeaker came reports from the crew commanders. On the basis of these he gathered that the bombers had intercepted the flight route and had taken up the selected combat formation. Each crew independently checked the track for heading and range. It is precisely here that superior skills on the part of the crews and sound flight discipline are required. Without seeing each other and as if joined by invisible threads, they flew along in a uniform combat formation.

The commander of the lead crew, Capt. A. I. Bodyakin (navigator A. V. Shashkov) informed all the crews in trail the time of passing the control check points; on the basis of this they maintained their time intervals.

Communist officer A. A. Zhdanovich is a topnotch man in combat training, a good methodologist, and an educator of young pilots. As deputy squadron commander he holds classes with the pilots, developing in them skill in intercepting aerial targets.

In the photo: Military Pilot First Class officer A. A. Zhdanovich.

Photo by V. I. KOLESNIKOV

The third in "stream" was the crew whose navigator was Senior Lt. S. F. Guzenkov. Hearing the time the leader passed a control check point, Guzenkov added to it twice the magnitude of the time interval and thereby got the time at which he was to pass the control check point. However, the navigator did not wait for this moment to definitize his position. Knowing beforehand the time-to-go and the flight speed, he quickly determined whether he was maintaining his position correctly. It was apparent that the crew was lagging a little. Guzenkov quickly made a check and requested the pilot to increase speed. The crew passed the control check point precisely at the estimated time, accurately maintaining their position in the planned combat formation.

Shortly afterwards there was heard a report from the group's commander. He made it necessary for all those at the SKP to be on the alert: his crew had come out on a scheduled control checkpoint 2 minutes ahead of time. Consequently all the bombers following him would do the same. Would they be able in the "stream" to carry out a manueuver to dissipate excess time or would they deliver their strike prematurely? Under present-day conditions when the situation changes so fast this could adversely affect the course of battle for the ground troops.

But the commander was certain that the leader would find a correct solution. After all, his navigator was Capt. Shashkov, a master of his profession.

The leader of the group decided to dissipate excess time on a previously selected leg. Having alerted all the crews of this, he initiated a turnaway at a determined point. All the other crews coming out at this point repeated his maneuver one after another. In this way excess time was dissipated.

But now the crews were approaching the region in which they were to meet the action of "enemy" AA defenses. It is common knowledge that the absence of visibility at night has no effect in the firing accuracy of AA artillery weapons. The initial firing data, the coordinates and the speed of the target are determined by radar gun director stations without visual reference to the target. It was necessary to execute an AA evasion maneuver. But this was hard to do, since the bombers following in "stream" had to maintain their time intervals. An increase in the number of turns and a change in the flight altitude could lead to disruption of the combat formation. But this was impermissible. This is why during preparation for flights the flight personnel practised so painstakingly the procedure for executing an AA evasion maneuver.

In order to preserve the combat formation "in the stream", it was decided even before preparing for the flight that the crews begin the AA evasion maneuver one after another. After analyzing the data on the AA defenses of the objective, they established the probable limits for initiating and terminating the maneuver and they indicated these on the map.

On approaching the point designated for initiating the maneuver, the group leader executed the maneuver. Following him, all the others did the same thing.

The maneuver was carried out in such a way that after its termination all the crews, without disrupting the combat formation, came out on the line of the planned course. This made it possible for them to come out accurately on the NBP (beginning of bomb run), and to quickly spot the target. At the SKP

they listened with pleasure as the commander of the lead crew reported: "On the bomb run".

Soon one after the other the reports were heard: "Bombs away... Bombs away..."

The duty ground controller recorded the time. Remarkable accuracy in target approach! These results were confirmed by the data received from the bombing range. The lead plane came out on the target with an accuracy of within 25 seconds and the other crews showed results almost as good.

The most important tactical element of the flight -- accuracy in the time of coming out on the target -- was executed with an "outstanding" evaluation. For accuracy in bombing the majority of the crews also received an "outstanding" evaluation. We must point out that a repeat target approach in the combat formation which the crews were using was out of the question. Therefore, they had to release their bombs on the run. All the crews coped successfully with this difficult problem, despite the fact that in the target area there were almost no check points.

The bombers came out on the return route. Now they were approaching the airfield. Searchlights cut through the night darkness. In their bluish light the aircraft flash by one after the other and touch down at the landing marker.

Another training mission has been accomplished. The combat skill of the crews has risen to a new level.

INSTRUCTIONAL SKILLS FOR ELEMENT COMMANDERS

Lt. Gen. of the Air Force M. G. MACHIN,
Hero of the Soviet Union

In the organization and conduct of flight training the leading role belongs to the instructor flight personnel, who train the pilots personally.

Therefore, methodological training directed toward giving the officer instructor personnel the necessary theoretical knowledge and practical skills occupies one of the leading places.

Experience shows that where sufficient attention is devoted to methodological work the tasks of combat training both on the ground and in the air are performed with higher indexes. And conversely, in those subunits where the instructor personnel are poorly prepared in the methodological respect, such shortcomings can be encountered as haste in practicing the exercises and all kinds of violations and simplifications that lead to flight mishaps or causes of them.

It is known that, in the main, element commanders are engaged in the teaching and indoctrination of pilots, especially young pilots. Therefore, all higher ranking commanders should help the element commanders to perfect their skill.

Unjustified is the opinion that methodological lessons should be conducted only with young element commanders. If this viewpoint is adhered to, one might as well give up methodological work with element commanders who have been serving in this capacity for a year or more. But is the squadron commander certain that all the officers in this category know how to teach subordinates? In one of the units there was the following case. The squadron commander did not pay due attention to the methodological training of officer V. V. Velichko, considering him to be an experienced and adequately trained element commander. Seemingly, the necessary grounds for this were present: he flew well, he was disciplined and efficient. But the squadron commander apparently forgot that, in addition to everything else, Velichko must also know how to pass on his knowledge and experience, how to teach the pilots from the instructor's seat. Yet it was just these qualities that he did not have. He was unable to notice the occasional slips of the trainee, to find the reasons for them, and to advise how the mistakes should be corrected. Of course, not having noticed this

THEY BECAME MILITARY PILOTS FIRST CLASS

The pilots of X unit are persistently perfecting their skill. Many of the officers here have become military pilots first class. Well known in the unit among them are the instructor pilots, the commanders of the leading subunits.

These leading officers are taking an active part in the work of Party and Komsomol organizations. Capt. G. G. Belyakov, for example, is a student at an evening university of Marxism-Leninism and conducts seminar lessons on the history of the CPSU.

There are many pilots here - - participants in battles for our beloved Motherland - - who have been singled out for high government awards. Such, in particular, are officers N. L. Korniyenko and V. D. Revin.

True to their military duty and their beloved Communist Party, these pilots add specific deeds to the glory achieved in battles for the Motherland.

In the photo (left to right): The leading airmen of the unit who have become military pilots first class: officers V. I. Zverev, S. I. Burko, G. G. Belyakov, N. L. Korniyenko, and V. D. Revin.

Photo by G. M. OMEL'CHUK.

shortcoming in the element commander in good time, the squadron commander neglected much in the training of the pilots.. From this it follows that higher ranking commanders, and squadron commanders in particular, must not relax methodological work with element commanders for any time at all, even if the latter are experienced pilots.

Training element commanders to fly as instructors is a fairly difficult task. There still are among us element commanders who do not fly as instructors and do not have the appropriate skills. Therefore, it is necessary to achieve a situation where all element commanders will be instructors in teaching the flight personnel various forms of flight training.

To teach young element commanders from the instructor's seat, our officer instructors bring in the most experienced methodologists, those who can pass on to them in a relatively short time their knowledge and instill firm instructional skills. Special attention is devoted to matters on which flight safety depends, to the formation of combat skills, to the ability to act in an adverse weather or tactical situation.

The most difficult thing for the instructor is to teach the pilots to maintain a certain assigned speed in flight in the pattern, to execute the third turn at a uniform distance from the runway, to complete the fourth turn, to plan and execute the landing procedure, and also to be observant during the entire flight, beginning with the moment the engine is started to taxiing in after the landing.

In teaching the element commanders, their attention is directed to group coordination in combat formations at high speeds and altitudes and also in waging aerial combat. After all, the level of training of the pilots and flight safety will depend on how well the instructor himself masters these elements.

Element commanders who are being taught instructor work should have a good personal flight training, profound knowledge and firm skills in the methodology of teaching and indoctrinating subordinates, and should be disciplined and exacting.

In the course of teaching instructors, the commanders strive to see that they are not only able to note in time, but also to rectify, the errors made in flight by the trainees. Non-observance of this rule leads to poor quality in the execution of flight missions, to flight mishaps and causes for them. For example, in making a flight to practice group coordination in combat formations at high speeds as an instructor with pilot V. M. Misyurin, officer A. F. Gubenko noted a number of errors made by the pilot that threatened the safety of the flight. Nevertheless, Gubenko did not bar the pilot from completing the mission but even gave him a high evaluation.

So that such cases do not occur, our officer instructors try to propagandize more extensively the experience of the leading element commanders and to teach the young men on the basis of this experience. An example of able teaching and indoctrination of his subordinates is being set by element commander officer Yu. V. Dmitriyev, who has good flight and instructional training himself.

What is characteristic in his experience? First of all there is his perspicacity and ability to approach the student pilots properly. Always staying with them on the ground and in the air, the element commander quickly discovers the strong and weak points of his subordinates. By personal example and demonstration, he helps them to eradicate shortcomings. Right on the flight line, in the intervals between flights, or after they are completed, Dmitriyev discusses with his subor-

A SOCIALIST OBLIGATION FULFILLED

Merited renown as the best navigator of the squadron is enjoyed by Communist I. A. Gelemeyev. He is considered a master of accurate navigation and precision bomb strikes. The Communists of the squadron have put great trust in him, having elected him secretary of their Party organization.

In response to the historic decisions of the Twenty-First Congress of the CPSU, Communist Gelemeyev took upon himself a new socialist obligation--to raise his class rating, to become a navigator first class.

And the day came when this high obligation was fulfilled with honor.

For the check flight under adverse weather conditions, the crew prepared with special care. The jet bomber breaks away from the concrete runway and disappears in the clouds. Actively using the electronic navigation facilities, the navigator brings the plane out on the line of the assigned track. Watching his actions attentively is the check navigator, Military Navigator First Class officer N. P. Nepomnyashchiy. The radioman reports to the ground that the IPM [point of departure] is passed.

The plane is on the bomb run. On the scope of the bombsight, the navigator looks for the distinct glow of the target and takes over control of the plane.

"I see the target," he reports to the pilot.

Ahead is the most critical stage of the flight -- the work on the bomb run. Captain Gelemeyev works efficiently with the bombing apparatus, and turns the plane toward the target with smooth movements. Noticing the target's departure from the lubber line, he starts doing lateral aiming [drift correction]. Practical experience with the sight has suggested to the navigator that the greatest accuracy of turns is achieved with the gyroscope uncaged and precisely at the moment of illumination of the reflecting angles of the antenna. In this case, the target is in the field of vision all during the turn, which gives maximum accuracy in laying it on the lubber line.

"The target is in the crosshairs. I am turning on the ground speed motor."

The slightest departure from the transverse line is parried by dual adjustment of the sighting and synchronization knobs, and then the position of the target in the crosshairs is again corrected.

"I am opening the hatch. The bomb is away," a confident voice is heard. The target was hit at precisely the assigned time. From the range it was reported: The result of the bombing is outstanding. The check navigator rated the combat skill of the navigator highly and warmly congratulated him on successfully passing the examination for first-class rating.

Lt. A. G. ARSEYENKO.

dinates the mistakes they made in flight and notices those who performed the exercises for grades of "good" and "outstanding". Such live work with the men gives good results.

In order that the element commanders be able to carry out the tasks set for them, it is very important to teach them systematically the methods of indoctrination of young flight personnel, and to generalize the positive experience of teaching, making it the property of all the element commanders. It is also necessary to teach the commanders to make proper use of all forms of teaching and indoctrination work. For this purpose, in addition to service conferences, meetings of element commanders, cadre flights, and individual work, it is desirable to hold periodic seminars with the element commanders on methods of teaching and indoctrinating the young flight personnel.

Fighter pilot, secretary of the Komsomol organization, Senior Lt. A. V. Tolochko outstandingly carries out missions in flight training, enjoys authority in the unit, and has citations for combat and political training.

In the photo: A. V. Tolochko before a flight.

Photo by D. S. PETRYAYEV

At the seminars, it is desirable that the unit commanders give addresses and the best element and air squadron commanders exchange experience in teaching and indoctrinating the pilots.

In the methodological lessons, it is desirable to direct the attention of the instructors to the need for a strictly individual approach to each man and for a profound study of his positive aspects and his shortcomings. It is necessary to strive to see that the pilots be disciplined and know precisely and observe the requirements of documents of conducting flights.

When commanders' flights are organized, of great importance is the detailed working out of the volume and content of the preparation of them. We still have occasional cases when the commanders' flights do not give the right results. The cause of this lies in poor preparation for the flights, as a consequence of which the commanders' flights do not differ at all from ordinary training flights. In preparing commanders' flights, it is necessary to take into consideration the fact that obsolete techniques and methods of conducting them and repetition of the very

same tasks reduce interest in such assignments sharply and fetter the initiative and creativeness of the trainees.

The practical and methodological skills of element commander instructors should be constantly checked by higher-ranking chiefs, which will make it possible to prevent mistakes in the teaching of flight personnel in good time, to discover shortcomings, and to eliminate them immediately.

THIS IS METHODOLOGY

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

How many different opinions can be heard about methodology! Many commanders try to find some hidden meaning in this word and even think that ignorance of this meaning impairs their activity and does not give them the opportunity to extend themselves to the full.

But the meaning of methodology, it seems to me, is clear as daylight: if the commander knows how to transmit his knowledge and experience to his subordinates, if he can teach them in a short time to do what they did not know how to do -- this is really methodological skill.

I am reminded of an incident in the front-line practice of teaching pilots. During a combat sortie the commander of the group, A. P. Zhukov, noticed that the wingmen were lagging in a turn. The lead men, however, continued the turn at the same speed and did not reduce the bank. The combat formation was extended to an impermissible degree. So that this would not be repeated the next time, Zhukov decided to rehearse the execution of turns on the ground.

Somewhat unusual for a front-line airfield was the picture of a "flying pedestrian" rehearsal of a flight.

"I am an Il-2 group," said Col. Zhukov. "You are the covering group. I am making a turn toward the target. Go ahead."

And about ten pairs and elements in a combat formation headed by Maj. F. P. Bayandin (whose pilots did not know how to execute a turn) started making turns around the airfield.

"Don't lag behind, don't lag behind!" demanded Anatoliy Pavlovich.. "It is necessary to sense what it means to be the outside wingman. In the air it will be harder."

And as a matter of fact, the outside wingman was running at full tilt, but he was still lagging behind, because the radius of the lead man's turn was small and the intervals in the group were large.

Lt. Col. Zhukov held methodological meetings several times in the intervals between combat work. And every meeting brought great benefit.

One of the pilots had trouble with tight turns. His time of execution for a very tight turn was as high as 35-40 seconds.

Zhukov made some remarks to him; the pilot blushed and started to justify him-

self, asserting that it is impossible to execute a tight turn in a shorter time.

At that time we had no training planes with dual controls, and in order to prove the opposite to the pilot, Zhukov gathered everybody together, repeated the theory of a tight turn, and then went up in a Yak-1 plane. Over the airfield at an altitude of 500-600 m, he made several tight turns with an average time of 18-19 seconds per turn.

Many instructive examples of able work by methodologist officers can also be given from the postwar period. Experienced instructors know well the final tasks of the process of teaching. They study not only the special literature but also follow the periodical military press. A good methodologist is always exacting toward subordinates and follows strictly the basic principles of teaching that have been worked out by a whole generation of notable Russian pilots.

Such an instructor among us is squadron commander Yu. I. Baranov. Once they asked us to organize ground training of pilots in sighting and in precise determination of the distances and intervals in an attack combat formation.

Some of the commanders in the squadron approached this in a formal manner. They conducted training sessions by elements at the aircraft parking area. Major Yu. I. Baranov did it differently. At the lessons he analyzed in detail the problems of circumspection and the rules of sighting, gave reasons for the intervals and distances in a combat formation of an element and a squadron. After that, the pilots in full flight regalia trained in the cockpits of the planes, which were arranged on the flying field at appropriate intervals and distances.

The pilots learned to sight at distances of 800-200m. The element commanders checked them.

In exercises, the flight personnel led by officer Baranov performed intercepts and photogunnery drills with a rating of "outstanding". The methodological skill of the commander had much to do with the fact that by the end of the training year the squadron became Outstanding.

What then does methodological skill consist of? What is the basis of it?

Following is an example of how the principle of going from the simple to the complex is applied in life.

At first the pilot masters flying under normal weather conditions in the daytime, and then the assignments are made increasingly more difficult. The pilot flies by instruments in an enclosed cockpit, under adverse weather conditions in the daytime and at night. Thus gradually he approaches flying at night in the clouds.

M. D. Reshetnikov, one of our leading commanders, organizes training properly. In a very short time, having completed the training of young pilots in the daytime under normal and adverse weather conditions, he changed over completely to teaching them under night conditions.

On dark nights the commander carries out the program of training in two-place aircraft, and he plans the first solo flights for twilight or clear nights. He always has with him a precise calculation of flying days and nights in relation to the phases of the moon.

Holding strictly to the principles of going from the simple to the complex in training, officer M. D. Reshetnikov has achieved considerable success in teaching young pilots the difficult types of flight training.

Very important in the system of teaching and indoctrination is the individual approach.

The pilots of X fighter air unit are working steadily and persistently. No small role in increasing their skill is played by lessons in the pilot trainer (TL-1).

In the photo: Flight controller, Komsomol member, Senior Lt. F. G. Chivikov (right in the photo) analyzes the actions of pilot Senior Lt. A. Omel'chenko in the trainer.

Photo by V. P. MALEVANCHENKO.

In any group there are men who learn well and men who lag behind. It is the task of the chief to study his subordinates, to give them tasks within their capabilities.

Unfortunately, this principle is sometimes violated. Striving to fulfill the training plan as quickly as possible, to equalize the pilots in some type of flight training, some commanders plan the same number of flights for all of them, not only for a day but also for a month and sometimes even for a year.

Because of a feeling of false shame, a pilot may not admit that it is difficult for him to execute some particular assignment or other. That is what happened to pilot Yu. A. Zhdanov.

The squadron commander was striving to complete as quickly as possible the training of the pilots in the daytime under adverse weather conditions. Despite the meteorologist's warning that deterioration of the weather to the minimum was expected, he sent all his pilots into the air.

For Senior Lt. Zhdanov, the approach for a landing under the existing conditions

The satirical newspaper "In the Backwash" enjoys great popularity in the X bomber unit. With expressive cartoons and cutting remarks, it fights against violators of flight discipline, against disorganization in training, and against causes of flight accidents.

In the photo: Military navigators first class, Communists Anatoliy Satrapinskiy and Pavel Zanuda are preparing to put out the scheduled issue of the newspaper "In the Backwash".

Photo by: N. N. YEMSHANOV.

proved beyond his capabilities. Two unsuccessful attempts to come in for a landing nearly ended in a flight accident. Not having firm skills in piloting by instruments on the ground, the pilot did not switch the ARK-5 [automatic radio compass] to the inner marker after passing the outer marker but looked for the landing strip visually. When he found it, he discovered that the approach was made incorrectly.

Zhdanov landed the plane only after the third approach and only with the active assistance of the flight controller. All the other pilots made their landings successfully.

After this incident, the squadron commander began to evaluate more strictly the individual capabilities and level of training of the pilots.

We also consider continuity in ground and flight training an important requirement.

On days of commanders' training, we carefully tie in all the subjects with the flights being conducted. For example, officer V. S. Os'kin prepared his subordinates for a tactical flight exercise quite properly. He gave the officers a number of lectures on flight tactics, on the possible variants of combat operations. The disposition of the aircraft and protection of the personnel against the use of facilities of mass destruction were rehearsed. The rest of the time the commander devoted directly to the preliminary preparation of the pilots.

All of our commanders attribute great importance to continuity and to reducing the time of teaching a new type of training. We think, for example, that the dual program, solo flights at night with the assignments made gradually more difficult, flights above the clouds, in the clouds, and at the established weather minimum should be conducted continuously and compressed within time limits.

A quite legitimate question arises. Why? Let us try to answer it. Experience shows that interruptions and extension of the training do not give the pilot the opportunity to feel the flight, lead to superfluous expenditure of facilities and time for repeating the program, to lack of confidence in one's powers, to dissatisfaction with the instructor.

To the squadrons of officers A. Ya. Sakhno and V. S. Zelepukin came pilots of the same level of training.

Sakhno organized the training process correctly. He planned flights under adverse weather conditions compressed within time limits; in the summer he made use of training planes with an "F-1" blind. As a result, the pilots did not have interruptions in piloting by instruments, and by the end of the year they received a second-class rating.

Officer Zelepukin extended the periods of training, flew longer under normal weather conditions, did not train the pilots in an enclosed cockpit enough, and permitted interruptions in the flying. In the winter in unfavorable months, it was necessary to halt the training. The pilots went over to flying at night only in the following year.

Thus, a commander who is more experienced in the methodological respect always achieves better success in combat training.

It is possible to train the pilots continuously and to carry out the task posed within short periods only under conditions of considerable specificity and vividness in the training. It is not necessary to set many tasks simultaneously. It is better to study less, but more thoroughly.

In the plans of half-hour training sessions in the cockpit of a plane, some element commanders include so many problems that the quality of the training is seriously impaired.

Officer V. A. Tyurin requires of the element commanders exceptional specificity in drawing up the plan of training sessions. In this subunit, training sessions are, as a rule, conducted on one subject only. For examples, there is "Tuning of the ARK-5 in Flight". Having thoroughly prepared for the flight in the cockpit of the plane, the pilot puts on glasses with covered lenses. The element commander gives problems; the pilot explains the arrangement of the control panel, turns on the compass, and tunes it to the assigned station. On subsequent days the subject of the training session is changed ("Starting the Engine in the Air", "Bringing the Plane Out of a Spin", and so on).

Vividness (clarity of perception) is, unfortunately, not always given due attention. There can still be found commanders who do not try to create a good training base. Such commanders forget that proper use of visual aids heightens the interest of the trainees in the lessons, facilitates understanding of the material, and promotes firmness in the mastery of it. There is no doubt that in the units that have a well-prepared training base the knowledge of the pilots is more profound, more complete, and more firm.

The crew of Communist pilot Ye. Sal'nikov is one of the best in the subunit. The crew commander himself sets an example in the performance of his tasks. He successfully carries out flight missions and is the squadron adjutant. Officer Sal'nikov is a versatile sportsman and has a second-class sports rating.

In the photo: The commander of an outstanding crew, officer Ye. Sal'nikov.
Photo by V. P. MALEVANCHENKO.

Ofcourse, only an experienced commander can make proper use of all these methodological principles. And if he has only recently become commander of a subunit or unit, this means that it is necessary to teach him to fly better than his subordinates, to inculcate methodological skills in him.

Just so do matters stand in the personal training of officer V. M. Skripchenko. He is always ahead of his subordinates. He was one of the first to make flights for the execution of a spin, a tight spiral, and aerobatics in the stratosphere. He became a military pilot first class in a short time. Every day he imparts his knowledge to the other commanders.

But a law for every commander is not only the ability to pilot a plane skillfully, but also the ability to teach properly, to show this or that element of the technique of piloting in the air. The following incident shows how important all this is.

In the early days of mastering the jet fighter, many pilots, understanding the theory of the spin incorrectly, were afraid of it and brought the plane out of this figure inefficiently.

Hero of the Soviet Union N. I. Beregovoy studied thoroughly the theory of the spin with the pilots and showed in the air how to put a combat plane into a spin and bring it out. After that, on a two-place combat trainer he trained several experienced pilots as instructors and together with them quickly overcame the difficulty that had thus unexepectedly developed.

Diverse are the forms and methods of teaching a pilot. The air commander must use them constantly, must not cling to stereotyped and copy-book truths, must continually enhance his own knowledge and skills, must creatively solve the difficult problems of indoctrinating and teaching his subordinates. Only on this condition is success possible in increasing the combat skill of the trainees.

MEETINGS OF ELEMENT COMMANDERS

Guards Maj. Gen. of the Air Force V. P. BABKOV,
Hero of the Soviet Union, Military Pilot First Class;
Lt. Col. N. K. KOCHANOV, Military Pilot First Class;
Engineer Lt. Col. K. A. GORODNICHENKO

Successful resolution of the tasks of flight training of a unit is possible with a constant improvement in the theoretical knowledge and methodological skills, as well as the combat skill of element commanders. However, not always is sufficient attention devoted to this category of air commanders. This, unfortunately, was true here. In order to fill this gap, we decided to conduct monthly methodological flight meetings of element commanders.

What did these meetings show? How were they organized and how did they proceed?

So as not to draw all the element commanders away from their direct work in the subunits at the same time, the meetings were held in three sessions. One element commander from each squadron was assigned to each one. A group of administrative officers headed by the deputy commander directed all the organizational work.

The meetings were given the tasks of increasing the theoretical knowledge and practical skills of the element commanders and of improving them as methodological organizers of flight training in the element and as instructor pilots.

The main objective of the program was to train the element commanders so that they would teach the flight personnel in a methodologically correct manner, acquire skills in the political and military indoctrination of their subordinates, and increase their theoretical knowledge in the basic disciplines of combat training (aerodynamics, aviation equipment, aerial gunnery training, and tactics).

In the lessons devoted to political and military indoctrination, it was intended to increase the organizational role of the element commander in carrying out the tasks of combat training, in maintaining strict regulation procedure in the element, and in conducting Party-political work in conformity with the requirements of the October Plenum of the Central Committee of the CPSU.

The program on tactics was to give the element commanders a uniform methodology in teaching pilots how to conduct aerial combat and aerial gunnery in combat formations of a pair and an element.

In the methodological training, it was planned to study at group lessons the basic guiding documents regulating flight work, the instructions on operation of aircraft and the technique of piloting them, the duties of the element commander on the eve of the day of preliminary preparation and on the day of conducting it. No less a place was also given to the methodology of conducting preflight preparation, the work of the element commander during flights and after their completion, and the methodology of teaching the flight personnel the tactical methods of carrying out various combat tasks. In addition, demonstration flights were planned. Their purpose was to show graphically the process of the element commander's work in the various stages of preparation for and conduct of flights.

The task set was that of developing among the element commanders uniform views on the methodology of teaching the flight personnel circumspection in group flight and in aerial combat, on waging aerial combat and conducting aerial gunnery, on flying by instruments and under adverse weather conditions in the daytime and at night, and also on the methodology of checking piloting technique and navigation.

All of the subject matter of the lessons on methodology was worked out in such a way as to prepare the trainees directly for carrying out the flight exercises planned at the meetings. During the flights that were planned for the daytime and at night under normal and adverse weather conditions, it was proposed to check the piloting technique of the element commanders and impart to them the skills of instructors.

For the first day, flights were planned with the participants at the meetings in the rear cockpit. They were supposed to pilot the plane, note their mistakes, and analyze them after the flights.

On the second and third day, the element commanders were also to fiy in the rear cockpit, with the instructor commanders in the front cockpit, and the instructor was to pilot the plane and introduce mistakes while the element commander was to note his "slips" and report on them after the flight .

At the flight critique, the trainee was supposed to analyze the execution of the flights, dissect the mistakes, and relate how it was necessary to act so as not to make them.

Just before the meetings, there was held a methodological conference of lecturers and instructor personnel, at which all problems on each subject planned were discussed. Five to seven days before the beginning of the lessons all the lecturers and instructors presented to headquarters summaries which were checked and approved by the commander.

And then the meetings began. The lessons were conducted by the deputy commanders, the chiefs of the landing systems, and the chiefs of the services, i. e., the best prepared officers who had considerable working experience.

Considerable attention at the meetings was devoted to the organization of the element commander's work in the political and military indoctrination of his subordinates. Serving as an example was the experience of the leading element commanders, officers V. S. Slonim, K. D. Barkhanskiy, and others who had achieved high indexes in combat and political training. In these elements, the commanders rely every day on the Party and Komsomol groups and organize socialist competition skillfully.

Problems of aerodynamics, aviation equipment, and tactics were discussed at lectures and group lessons. In the lessons on aerodynamics, practical examples

and problems were discussed as applied to the aircraft with which the air unit is equipped.

In the lecture on "Some Problems in the Practical Aerodynamics of Fighter Aircraft", the effects of a change in weight and flight altitude on the maneuvering qualities of the plane were considered in detail; simplified aerodynamic formulas that can be used in rough calculations of the flight characteristics of a plane were analyzed. The essence of the kinetic heating of the surface of the aircraft resulting from retardation of the flow (retardation temperature at the critical point) was explained. The theoretical principles were illustrated by solving problems applicable to the aircraft being operated.

Problems associated with the operation of the aviation equipment were studied at group lessons and also directly in the planes. Several practical lessons were devoted to deviation.

In the lessons on tactics, the main thing was an analysis of problems of escort, interception from an alert position in the air and at an airfield, blockading and relieving airfields, and suppression of enemy control facilities.

One of the lectures was devoted to the methodological sequence in teaching the elements of combat application and the tactical techniques of aerial combat and aerial gunnery, and also to the sequence in carrying out exercises in the course on practicing elements of combat application.

After the lessons on methodology, a "Memorandum For the Element Commander on the Preparation For and Conduct of Flights" was worked out. It was discussed with the trainees and was recommended to all element commanders.

The demonstration flights were conducted on the basis of one of the best squadrons. The squadron commander, officer I. G. Rogachev, and the element commanders led by him were acquainted with all the methodological material.

All the participants in the meetings were divided into three groups, each of which was assigned to one of the element commanders. Observing the actions of the squadron commander and the element commanders, the participants in the meetings wrote down all the shortcomings noted. These notes served as material for the methodological analysis.

They began to prepare for the demonstration flights on the eve of the day of preliminary preparation. The commander of the unit assigned a task to the instructor personnel. On the same day, the element commanders (of the training squadron), together with their squadron commander selected the exercise, made out assignments for each pilot (element commander trainee), and discussed the planned schedule. They prepared the necessary diagrams and literature, drew up plans of training sessions, and made the necessary calculations.

The planned schedule of the flights was drawn up in two variants -- one for normal and one for adverse weather conditions. For each pilot there were planned flights along a route and for interception at an altitude of 9-12 thousand m with a flying time of 2-2.5 hours.

Squadron commander Rogachev set the task for the flights. He set forth the content, the sequence, and the methodology of carrying out the most difficult elements of the assignment and dwelt on matters of circumspection and flight safety. Rogachev gave instructions as to what to study during the process of independent preparation and what the element commanders should practice with the pilots.

Officer S. Ye. Kovalev has proved to be an able mentor of the pilots in a bomber subunit. Many years of experience in instructor work and participation in many operations during the Great Patriotic War enable officer Kovalev to efficiently organize and conduct the combat training of young aviators and to inculcate in them the qualities necessary for masters of precision bomb strikes. Many of his pupils have become rated pilots. For irreproachable service, officer Kovalev has been awarded the Order of the Red Banner and two orders of the Red Star.

In the photo: Military Pilot First Class officer S. Ye. Kovalev.
Photo by V. I. KOLESNIKOV.

Then a group lesson was held with all the flight personnel on the special features of the operation of the VK-1F engine at high altitudes and in the stratosphere.

Four hours were allotted for independent preparation for the flights and for training sessions with the flight personnel on the TL-1 and STL-2 [trainers]. The element commanders directed these lessons. The preparation for the flights was checked by the squadron commander.

Six hours were spent for the preliminary preparation. After that, a methodological critique was held, at which the participants in the meetings spoke. In conclusion, the director of the critique pointed out the positive aspects and shortcomings of the preparation.

ADVICE TO THE ELEMENT COMMANDER

The Check Flight

Such flights are made both for the purpose of checking a pilot's piloting technique and for checking the practical work in the air of each member of the crew of a multi-place aircraft.

In the final analysis, a check flight gives the commander of an element or detachment an idea of whether this or that crew can carry out a combat training mission independently.

The forms of conducting check flights are very diverse. For example, it is not always necessary to make a special check flight for the pilot (especially of a bomber). To check his qualifications it is possible to fly as part of the crew when he is carrying out a scheduled flight mission. In such a flight, the checking commander of the detachment or element will get the most complete idea not only of the qualifications of the pilot but also of the coordination of the crew as a whole.

Some checking commanders do not take the controls in the air; others, on the contrary, abuse their right and do not let the controls out of their hands. Neither the one nor the other is correct.

Without touching the controls of the aircraft it is impossible to determine exactly the reason for the origin of mistakes. On the other hand, if the commander of the element or detachment holds the control stick or column all the time and interferes in the control of the plane, he will fetter the initiative of the pilot, who will begin to operate the controls without confidence, expecting help; or on the other hand, will hurry, afraid that the checker will get ahead of him.

Most correct are the actions of that checker who, without interfering in the pilot's flying, holds the controls at the most critical moments of the flight (takeoff, turns, landing) and in necessary cases, having forewarned the pilot by the SPU [aircraft interphone system], helps him or shows how this or that element of the flight is performed.

Some element commanders think that in a check flight the checker should merely observe and should not show the pilot anything. This is not right. In any flight, the element commander, if he is the instructor, is the teacher and closest mentor of the pilot. It must always be remembered that checking alone without showing does not give positive results in increasing the skill of those checked and does not permit determining their piloting qualities thoroughly. The commander of an element or detachment can give a correct reply to the question of the pilot's preparedness only after he has taken the necessary steps to teach the pilot the execution of those elements of flight that he had been performing poorly.

Maj. Gen. of the Air Force A. R. LEBEDINSKIY,
Military Pilot First Class.

* * *

During the demonstration flights, the participants in the meetings were given a full opportunity to become acquainted with the content of an element commander's work. The mistakes and shortcomings noted by the element commander during the flights were analyzed between flights.

The flights in the teaching squadron were held in an organized manner with the requirements of all documents regulating flight training being observed. The flight critique was made by the squadron commander on the following day. All the participants in the meetings were present at this critique. In addition, a three-hour methodological critique was also organized, where each participant gave a detailed analysis of the work of the element commanders in all stages of the preparation for and conduct of the demonstration flights.

Flights were made to fix the knowledge thus obtained. These flights were made only in UTI MiG-15 two-place aircraft.

On the first flying day, a check was made of piloting technique and also on how well the element commanders know how to determine the pilot's errors. Each participant in the meetings made two flights in the instructor's cockpit under normal weather conditions and two under adverse conditions. There were four flights in all; one in the practice zone and in the pattern, another for practicing prolonged piloting by instruments in an enclosed cockpit, a third in the clouds or above the clouds for executing a landing procedure and approach utilizing landing systems, and a fourth for practicing prolonged piloting and navigation in the clouds or above them.

On the eve of the day of preliminary preparation all the participants in the meetings were assigned to elements. Some of them performed the duties of an element commander in the preparation for and conduct of flights, and the rest played the role of rank-and-file pilots. The former were allotted two hours of study time in which they participated in drawing up the flight assignments and the planned schedule and also prepared for those problems on which they were supposed to conduct independent preparation with the flight personnel.

The preliminary preparation began with the setting of the task by the director of the meetings. Then he analyzed in detail the sequence, the methodology, and the technique of carrying out the exercise and the most difficult elements of it, and also matters of circumspection and safety measures.

After the group lessons on the methodology of teaching flying by instruments under adverse weather conditions, the element commanders undertook preparation for the forthcoming flights with their pilots.

The preparation for the flights was conducted in the form of group lessons. The element commanders studied with the pilots the methodological instructions on the planned exercise and specific articles from the regulatory documents. They recalled the norms for evaluation of the execution of the separate elements of the mission. Then the procedure for carrying out each flight from takeoff to landing and the most difficult elements (pilotage in the practice zone, flying by the system) were analyzed collectively. All the pilots participated in the discussion of the forthcoming mission. If one of them did not understand correctly some particular problem, the element commander gave an explanation on the basis of the directions obtained from the director of the meetings. Each pilot laid out the route and made the necessary calculations independently.

Training of the flight personnel on the TL-1 and in the cockpit of the aircraft was also directed by the element commanders. Training on the TL-1 was conducted immediately after the disposition of the task by elements, according to a schedule. On the day of preliminary preparation, every pilot was supposed to make a "flight" by the system.

During the training sessions the pilots put on parachutes and oxygen masks. They practiced operation of the control levers in the rear cockpit, movements of the controls in bringing the plane out of a spin, retuning of the ARK-5 [automatic radio compass] to the other radio stations, and using high-altitude and oxygen equipment. The element commander, standing on the access ladder, gave problems to the pilot who was sitting in the cockpit, and checked his actions.

The independent preparation and the training sessions were conducted on a high methodological level and in precise conformity with the articles that were defined at the lessons.

After a medical examination, an hour before the flights, preflight preparation began. The element commanders, together with the pilots, heard information on the actual state of the weather and the forecast for the flying day. They then definitized the mission, directing the special attention of the flight personnel on flight safety measures under adverse weather conditions.

Each pilot made two flights. After the execution of individual flights, the instructor commanders made no remarks to the trainees but listened to their reports on mistakes made. This made it possible to determine how well the trainees could note their own mistakes and analyze them.

A critique of the flights was held on the following day. The instructor personnel helped the pilots to understand competently the essence of the mistakes and to reason them out theoretically.

The subsequent days went by in a similar way. A Party group was organized at the meetings. It skillfully organized elucidation of the teaching process in the wall press and in bulletins published by an editorial board that was chosen at general assembly of the participants in the meetings. The Party group also conducted agitation and propaganda work.

At the end of the meetings, an exchange of the experience of the element commanders was organized. One of the best commanders, V. S. Slonim, gave an address. He noted that in the meetings the element commanders increased their theoretical knowledge, acquired experience in the methodology of teaching flight personnel, and mastered many problems in political and military indoctrination.

* * *

ADVICE TO THE ELEMENT COMMANDER

Dual Flight Into the Practice Zone

The distinguishing feature of such a flight consists in that here the element commander is an instructor, is able to carry out the planned exercise to perfection, is acquainted with the possible mistakes of the pilot, and knows how to correct them. The trainee, on the other hand, is encountering this exercise for perhaps the first time.

After the element commander shows the pilot the procedure for carrying out the exercise and has convinced himself that the pilot understood everything properly, he does not interfere frequently in the control of the aircraft. When deviations occur in the piloting of the aircraft within the limits of a satisfactory evaluation or temporary deviations that go beyond the norms of such an evaluation, the instructor points out to the pilot the mistake through the SPU [aircraft interphone system], and if the latter corrects the mistake he does not take over the controls.

In those cases when one of the elements of the flight is performed by the pilot with a constant deviation that falls below the limits of a satisfactory evaluation, the instructor is required to interfere in the control, to show personally how the plane should be piloted, and if necessary, to repeat this element of the flight jointly with the pilot . But he can permit the pilot to do this independently only after he has become convinced that the pilot has understood his mistake.

The element commander watches attentively to see that the trainee holds strictly to the requirements of instructions on the operation of the aircraft and the technique of piloting, and he inculcates in the pilot efficiency, executiveness, and other necessary qualities.

When going off with a pilot into the practice zone it is necessary to keep in mind that some pilots do not attribute importance to precise maintenance of the flight altitude at which the landing gear and flaps should be retracted. Because of this, serious mistakes may be made in piloting technique.

A special approach is required by a flight at maximum and minimum speeds and by a flight with one engine inoperative. Some young pilots do not always counter in time the turning moment from the operating engine, do not bank in horizontal flight in the direction of this engine, and do not take into account the radius of the turn in the process of approaching for a landing. The element commander should see all this and should prevent mistakes by the pilot in good time.

It is easy to judge the results of every dual flight by whether or not the pilot has acquired something new. Each such flight should raise his flying skill to a new level.

Col. A. I. KONYUKHOV,
Military Pilot First Class.

YOUNG PILOTS PREPARE FOR NIGHT MISSIONS

Col. P. P. VORONOV,
Lt. Col. B. I. PETROVSKIY

Experienced instructors are required to teach night flying to young pilots who had never before flown at this time of the day. In order to fulfill the plan of flight training successfully and on time, the commander of our unit set the task of training all the instructor personnel for teaching work. As a rule, the element commanders teach the pilots directly.

They are usually prepared for instructional activity at methodological meetings and on commanders' flights. Here they practice the methodology of teaching the flight personnel flying by instruments in the daytime and at night under normal and adverse weather conditions utilizing the landing systems. In order to teach the element commanders to organize the work properly, we set up special methodological lessons, and to inculcate in them uniform skills in teaching pilots we set up trainer sessions.

Of great assistance in training the cadres were five-day methodological meetings held before the beginning of the training year, in which the element commanders and navigators took part. They studied theoretical problems and practiced skills in organizing the planning and conduct of flights. At the meetings, shortcomings were revealed in the technique of piloting, especially in approaching for a landing by two 180° turns or straight in. Therefore, considerable attention was devoted to practicing a uniform methodology and to achieving uniformity in executing the individual elements of flight.

During intensive training flights, the planes on the landing course sometimes came too close to each other; despite substantial release intervals (3-4 minutes), the closing in on each other attained 40 seconds. Such a situation is very dangerous, and it came about because of a whole series of pilot errors.

The point is that in lifting off the ground at takeoff some pilots did not maintain a uniform flight regime along the trajectory and vertical speed in climbing to the first turn, nor the assigned bank in this turn. There were cases when in flying from the first to the second turns individual crews did not take into account the crosswind or did not execute the procedure turn precisely because the needle of the ARK-5 [automatic radio compass] oscillated under the effect of the mountainous relief of the terrain and inaccurate tuning of the aircraft radio compass. Even experienced pilots made mistakes. All this led to a decision to work out in the unit a uniform methodology for course exercises.

During the commanders' flights at the methodological meetings, there was established a uniform climb regime to the first turn and a bank of 15° in the first turn (it is set by the AGB-2[bomber gyrohorizon] and is absolutely necessary in the area of our airfield). Data obtained from a reconnaissance plane enable the unit commander to give a uniform time and course to the procedure turn in the instructions he gives before flight to crews flying by the system. As a result, it was possible to eliminate closure of the aircraft in the procedure turn.

The meetings of instructors and the commanders' flights showed that in teaching young pilots some commanders were sometimes too solicitous of them. For example, in dual flights by the system element commander G. V. Fedotov freed his pilots for working with the equipment in the cockpit, from tuning and switching over the radio compass, and he himself made radio contact with the flight controller and pointed out the place for the procedure turn and the time for extending the landing gear. It seemed that the pilots, performing the entire flight with promptings, did not pilot the plane too badly. When the commander began to check one of the pilots trained in this way -- V. V. Lepeshko -- it was found that he was not ready for solo flying. In order to eradicate such mistakes on the part of the instructors, the unit commander analyzes the flights in detail and checks the piloting technique of the element commanders from the instructor's cockpit.

Each element commander draws up a methodological elaboration of the exercises to be performed, which is discussed in the squadrons in the presence of the unit commander or his deputy and the navigator. This makes it possible to teach the pilots competently and to reason out the flight theoretically while still on the ground, to determine what they will do and at what stage.

Of great help in working out the exercises is the methodological classroom of the unit. In it there are examples of the methodology of performing all the exercises in the course of combat training planned for the year, a relief diagram of a flight by the system with a night takeoff and homing radio stations. This mockup shows the pilot graphically what he must do and on what segment, how the flight will proceed over mountainous terrain and in setting up the route for the approach and landing procedure.

In this same methodological classroom, for teaching the flight personnel there has been set up a table of the flight area and light check points, from which the young flight personnel study their location along the route and in the area of the airfield (the unit is based in an area where there are very few large light check points; they are all located only along a railroad running from west to east).

To develop firm practical skills in piloting a plane by instruments in an enclosed cockpit, in tuning the autopilot, and in using the ARK-5 for purposes of navigation, a special cockpit has been equipped in the unit.

Holding the cockpit in a horizontal position with the control column, after tuning the AP-5 [autopilot] the pilot makes an entire flight along the route by the autopilot. Then, together with the navigator, in an enclosed cockpit, and by instruments, he tunes the ARK-5 and maintains the flight regime, the course, the climb, and the descent.

In the methodological classroom there is a model of a gyrohorizon, working on batteries, and an electrical circuit on which the instructors train the pilots in determining the readings of the instrument.

Side by side with the methodological classroom there is a well-equipped classroom

for aerodynamics, aerial gunnery training, radio communications, and tactics, as well as a classroom for the aircraft, engine, and special equipment.

The convenient arrangement of the teaching base in the unit gives the commanders the opportunity, without losing extra time in going from one place to another, to conduct successfully the preliminary preparation and trainer sessions on the scheduled exercises of the course with the flight personnel.

After the instructor personnel from element commander up are prepared for instructional work and a good teaching base has been set up, we proceed with teaching the young flight personnel flying at night. First they become asquainted with the aircraft and ground equipment designed for night flying and with the appropriate chapters of the manuals on making flights. Instructions and a methodological textbook also help to explain the physiological and other peculiarities of night flying. The subjects of the lessons with the pilots are: "Bombing and Navigation at Night in Mountainous Terrain Without Check Points", "Working with the Equipment in the Cockpit of the Plane Under Night Conditions", etc.

The pilots and navigators who are undertaking night flying for the first time draw up outline plans of the exercises to be practiced. The elements of the technique of piloting in the pattern and in the practice zone are written out in detail in them, and a diagram is drawn of the night flight line, the light check points in the area of the flight, and also a diagram of the night equipment in the cockpit of the plane. These outline plans are checked by the commander of the unit and his deputies. During independent preparation for the flight, each crew commander conducts a rehearsal of the flight with his crew.

All this compels the flight personnel to prepare thoroughly for the flights and gives the element commanders an opportunity to perfect their methodological skills.

Firm skills in the use of the aircraft equipment are developed among the flight personnel mainly during night trainer sessions in the cockpit of the plane. They are held according to the element commander's plan in the aircraft in which it is planned that the pilot will carry out the flight mission (in flying uniform, with headset, parachute, and, if necessary, an oxygen mask).

Here, for example, is how officer N. A. Kiryushkin organizes cockpit trainer sessions. The pilot practices the rules of inspection and acceptance of aircraft, preparation of the cockpit for night flying and lighting equipment, and actions in special cases. During these lessons it is especially important to maintain an individual approach toward the pilots, to take into consideration the characteristic mistakes they have made in previous flights, and to investigate occasional incidents of violation of flight discipline. Thus, distributing his attention incorrectly in coming out on the landing course and in the descent, officer Yu. M. Mironov made grievous mistakes. After a detailed analysis of the causes giving rise to the aircraft's deviation from the axis of the runway, and after practicing the distribution of attention and working with the equipment on the landing course, Mironov eradicated these errors and now flies confidently.

In our unit all the pilots have successfully completed the program of teaching flying by instruments in an enclosed cockpit. This has made it possible to freely allow them to fly at night, although because of weather conditions not all of them could fulfill the norm of flying time in the clouds.

Before the teaching of night flying was begun, all the flight personnel were flown in a UShLI-2 aircraft for the purpose of acquainting them with the area of the flight (with

In the photo: Deputy commander of a foremost squadron, Military Pilot First Class, Communist N. S. Podvornyy (left) and Military Navigator First Class, Communist P. V. Babarykin preparing for a flight.
Photo by Yu. N. SKURATOV

the light check points in the area of the airfield and in the aerobatic zone) and with the night flight line.

The first familiarization flights at night in the practice zone and two or three landing approaches by making two 180° turns were made with the most experienced instructors and under difficult conditions (on a dark night). The pilots carried out the subsequent dual program with the element commanders.

However, it also happened that some pilots overestimated their capabilities. Thus, after the first dual flights on a moonlit night with an excellently visible horizon, officers V. D. Lukoyanov and A. F. Kurusenko declared in talks with their comrades that it is very easy to fly at night and if they were allowed they were ready right now to make a solo flight. But when these comrades went aloft on a dark night under conditions of an invisible horizon, it was found that there were many faults in their piloting technique. It was necessary to do appropriate work with them, to explain to them the erroneousness of their opinion.

We attribute very great importance to the element commanders' ability to analyze the mistakes noted. After all, many of our instructors did not yet have any experience in teaching night flying to young pilots. After the plane lifted off, some of the trainees

tried to gain altitude more rapidly and drew away from the ground at a large climb angle and at a low speed. They did this because of fear of colliding with obstacles(mountains). Sometimes in turns the pilots set too large a bank and searched for light check points (there are none in the area of the airfield), and because of this they were distracted from piloting by instruments. Noticing the increase in the bank, they would reduce it sharply and would become nervous if the horizon was not visible and there were no light check points.

The instructor and the senior commander analyzed all such faults, brought to light the reasons, and worked out methods for eradicating them. The mistake was discussed both with the pilot who made it and with all the flight personnel of the squadron and the unit.

For example, in retracting the landing gear during the climb, pilot I. P. Bulyga diverted his attention from piloting the aircraft by instruments. As a result, a large climb angle was created and there was a loss of speed. This mistake was corrected by instructor I. S. Rogachev. He showed the pilot the sequence of working with the equipment in the cockpit after takeoff and analyzed it in detail at the flight critique.

At the trainer sessions, all the instructors strove to see that in working with the equipment in the cockpits of the planes during flight the pilots did in no event divert their attention from piloting by instruments, even if the natural horizon could be plainly seen.

Maintaining the sequence in teaching, and permitting no interruptions in flying with the pilots who were going out at night for the first time, our unit achieved good results in combat training.

NAVIGATOR TRAINER SESSIONS WITH CADETS

To conduct trainer sessions in developing among the cadets firm practical skills and competent use of the RTS [radio engineering]facilities in flight, we bring in squadron navigators, teachers of the RTS and navigation series, element commanders, and the best trained instructor pilots. The trainer sessions are organized no less frequently than twice a week. The place for holding them is chosen in relation to the nature of the task to be performed and the level of training of the cadets: the RTS classroom, the methodological area, on a trainer, in a plane or near a plane, on the flight line, in the cockpit of a trainer or reserve plane, in the square -- in a trainer and outside of it.

Experience suggests that it is best to take some single problem in each lesson and develop it in detail. The maximum size of the group is determined by the content and nature of the subject. For example, lessons in tuning the ARK-5 [automatic radio compass] to the homing radio station and to the DPRM [outer homing beacon] and the BPRM [inner homing beacon] of the OSP [instrument landing] system, in tuning the ARK-5 to the homing radio station of the alternate airfield in a minimum of time, or in using the automatic radio direction finder to come out on one's own airfield, it is best to conduct with a group of 5 or 6 people. In the case of such subjects as making maps with lines of equal bearings, or determining the position of the plane with the aid of radio and radar facilities, the size of the group may be increased.

It is not desirable to conduct trainer sessions immediately with a whole squadron of cadets, since the director will not be able to ask questions of half the trainees in the time allotted; some of the cadets, left with nothing to do, will be diverted to something extraneous.

Tuning of the ARK-5 to the DPRM and BPRM of the airfield, and also retuning it to the homing radio station of an alternate airfield should for purposes of flight safety be developed precisely, efficiently and to the point of automatism.

It seems to us that it is methodologically correct to inculcate in the cadets immediately habits of the sequence of turning on the switches of those instruments and stations that are needed in flying by the system. In flights to the practice zone, for practicing group coordination, and in other flights (with the exception of flights in the pattern), the cadet is required to turn on and tune the ARK, the DGMK [distant-reading gyromagnetic compass], the SRO [aircraft radar equipment], the RSIU [radio receiver], and the gyrohorizon. In flights by the system, however, it is necessary to turn on, in addition, the marker radio receiver and the radio altimeter, and the ARK-5 receiver must be tuned to both the DPRM and the BPRM.

If these problems are not worked on immediately, then the cadets, who will soon become the pilots of line units, will be inaccurate.

We constantly direct the attention of the officers who are conducting the trainer sessions to the fact that the trainees should know how to check the tuning of the ARK-5 to the inner homing radio station.

Our pilots, navigators, and teachers strive to the end that the cadets memorize firmly the frequencies and call signs of the homing radio stations of alternate airfields, with the courses, distances, and flying time to them and the landing courses. This is best achieved by conducing joint trainer sessions in navigator training and communications. In such trainer sessions, the communications chief first gives two or three texts (each for two minutes). Then comes a check.

After that the communications chief gives two letters — the call letters of the homing radio station at one of the alternate airfields. The squadron navigator calls a cadet, who is supposed to give the frequency, location, landing course, MPU [magnetic course angle], distance, and flying time to the given airfield and name the call sign of the radio direction finder (if there is one there).

When the cadets acquire firm skills in the tuning of the ARK-5 on the trainer subsequent lessons are conducted in the cockpits of planes, and not only in MiG-15 bis aircraft but also in the cockpit of the UTI MiG-15, since here there are differences in the arrangement of the apparatus, the switches, and the panels.

The trainer can also be taken out on the flight line. However, this is expedient only at the beginning of the dual program, since after the cadets have mastered the trainer it is no longer needed on the flight line. Later on we conduct the lessons in a trainer aircraft. We usually use a reserve combat aircraft connected to the airfield current supply.

After the cadets have developed skills in using the RTS in flight in this aircraft, we interrogate them outside the aircraft. They tell by memory how the switches (AZS), light bulbs, pointers, instruments, etc. are arranged. Such interrogations train their visual memory well.

Conducting the trainer sessions in this sequence is, it seems to us, methodologically the most correct, since a gradual transition from the simple to the complex is maintained here, and this promotes the development of firm skills in utilizing radio engineering facilities in flight.

Lt. Col. I. N. CHIRIKOV

INSTRUCTOR PILOT V. L. KULAGIN

Instructor Viktor Ivanovich Kulagin has trained quite a few military pilots. He has graduated all of his pupils only in the first and second grades. At the basis of the work of this instructor pilot lies an individual approach to the trainees. Captain Kulagin devotes particular attention to the ground training of the cadets, to trainer sessions on apparatus and in the cockpit of the trainer aircraft. He strives to see that the future pilots perform all actions intelligently.

In the photo: Capt. V. I. Kulagin conducting lessons with cadets.

Photo by V.I. NELYUBIN.

PRACTICAL AERODYNAMICS FOR THE PILOT

4. CONTROLLING THE AIRCRAFT'S PITCH ANGLE

N. V. ADAMOVICH, Test Pilot First Class,
Candidate of Technical Sciences

Once while correcting the drift on landing, the pilot was slow in rounding out and pulled the control stick back a little more abruptly than usual. The aircraft seemingly did not "notice" the error but later smoothly went into a climb, nosed up, and started losing speed. The pilot reversed the control stick, attempting to forestall ballooning. The aircraft climbed for another two meters, hesitated, and then sharply "sank", at the same time banking and nosing down.

The impact against the ground could have been cushioned by quick operation of the control surfaces. But the pilot did not carry this out with sufficient vigor. As if deciding to act on its own, the aircraft hit its wheels against the runway, bounced a few times, and then settled into a fast ground run. The landing was poor. It could have resulted in damage to the aircraft.

One can say with confidence that there is not a single pilot who has not experienced at least once - with some "individual variations" - a similar landing.

Apparently there are some particular piloting difficulties which are common amongst all pilots. Where does their cause lie?

The control stick (column) and the pedals are sometimes called the "control surface levers". Such a name is inaccurate. When a pilot operates the stick and the pedals he is not thinking of the control surfaces but rather watches the aircraft's attitude, orienting himself by the angles of pitch, course, and bank. In the pilot's hands an aircraft acts as a system of "drive mechanisms" or "drives" which link the control levers in the cockpit with the angles of pitch, course, and bank. A delay in the operation of these "drives", i.e., a time lag between the movement of the stick and pedals and the change in the angles, is the main difficulty in piloting all present-day aircraft.

The delay especially complicates the control when an aircraft maneuver requires accuracy of execution: during landing, takeoff, making contact for in-air refueling, pilotage, flying close to the "ceiling", aerial gunnery, etc. In all these instances even an experienced pilot is often not able to "make" the aircraft perform precisely as he wills.

The cause of delay lies in the peculiarities of the "drives", the design of which is determined by the equations of the aircraft's dynamics. These equations are difficult not only for a regular pilot but also for an experienced engineer. At the same time, without a knowledge of the nature of the above-mentioned "drives" it is impossible to learn flying. Therefore every pilot in the course of training and afterwards becomes acquainted with them literally "by feel". This is not an easy problem if we take into account the fact that the quantitative characteristics of the "drives" depend to a great extent on the flight regime and on the aircraft design.

The difficulty with this problem explains in part why it is much more difficult to learn to fly an airplane than to drive any other vechicle.

To improve the technique of piloting every pilot should become acquainted with the principle of operation of the above-mentioned "drives". Let us examine the "drive" controlling the pitch angle, using an ordinary model.

The pitch angle ϑ, as we all know, is the name given to the angle between the longitudinal axis of the aircraft and the horizontal plane. By raising or lowering the nose of the aircraft, the pilot orients himself (through the cockpit canopy or by reference to the artificial horizon) precisely by this angle. By the way, in the technical literature there is frequent reference to the fact that by operating the control stick (column), the pilot orients himself not by the pitch angle but by the G-force, n_y. Actually the pilot's primary means of checking on the flight regime is vision. At best the G-forces which are felt only supplement slightly this checking. One may be convinced of this fact, for instance, when flying blind without a gyrohorizon. "Feeling G-forces" (even if it is supplemented by the readings of the accelerometer) by no means replaces the primary instrument for checking on the pitch angle - - the gyrohorizon. Consequently the primary aircraft characteristics which render control in the vertical plane convenient are determined by the "drive" controlling the pitch angle and not by the G-force.

The pitch angle equals the sum of the angle of attack α and the flight heading angle in the vertical plane Θ_v (Fig. 1), i.e.,

$$\vartheta = \alpha + \Theta_v.$$

Let us assume that the pilot has to change the aircraft from pitch angle

$$\vartheta_1 = \alpha + \Theta_{v_1}$$

to angle ϑ_2. How does the "drive" which links the stick (column) through the components α and Θ_v with the pitch angle function in this case?

Let us say the aircraft is in its initial regime traveling in a rectilinear path with a constant speed and pressure on the stick which is cut to zero by the trim tab.

If in this case the stick is moved quickly back or forward by a slight amount ΔX_v (cm), then the aircraft will rather quickly change its angle of attack by the magnitude $\Delta\alpha$ proportional to ΔX_v (see Fig. 1a). The greater the indicated flight speed, the quicker will this be accomplished. Then, due to its static stability, the aircraft will continue traveling at a new constant angle of attack $\alpha + \Delta\alpha$.

Let us suppose at first that the "increment" to the angle of attack—the angle $\Delta\alpha$ — follows without any time lag the movement of the stick ΔX_v. Then the first step of the "drive" which links the stick with the angle $\Delta\alpha$ may be depicted as a simple leverage (see Fig. 2a). Here the control stick, restored by spring f, is "rigidly" linked with the sighting piece "A". This latter is a conventional illustration of a part of the cockpit canopy (by the aid of which the pilot establishes visual reference

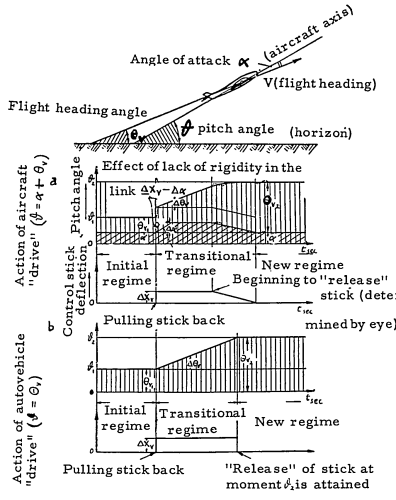


Fig. 1. Operating characteristics of an aircraft "drive".

to the horizon) or the "silhouette" of the artificial horizon. By applying pressure ΔP_v (kg) the pilot moves the stick by the magnitude ΔX_v and obtains, just as in a real aircraft, a deflection of the sighting piece to an additional angle of vision

$$\Delta\alpha = c_1 \Delta X_v = c_2 \Delta P_v,$$

where c_1 and c_2 are transmission ratios from the stick to the angle of attack; they are constant for a given indicated flight speed and Mach number.

Here so to speak, the operation of the first step of the "drive" under discussion which links the stick with the angle of attack terminates.

Later the appearance of $\Delta\alpha$ produces an excess (or a shortage) of lift by comparison with the weight of the aircraft. Due to this the flight trajectory begins to curve. Viewing the horizon, the pilot senses the beginning of this curve as though it were the engagement of the second step of the "drive" which links angle $\Delta\alpha$ with the flight-heading angle Θ_v.

However, this linkage is such that, at first, at the moment $\Delta\alpha$ appears, there emerges an angular rate of change in respect to time in the slope angle of the trajectory proportional to angle $\Delta\alpha$

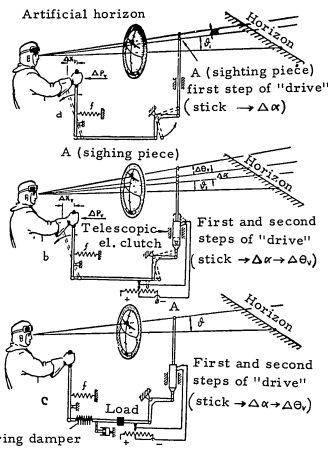


Fig 2. Model of a "drive" for controlling the pitch angle: a and b - simplified diagrams - linkage (stick → Δα) rigid; c- actual diagram - linkage (stick → Δα) elastic.

$$\Theta_v = c_3 \cdot \Delta\alpha,$$

where c_3 is the coefficient of proportionality which is constant for a given speed and altitude of flight.

After this, the angle Θ_v begins to increase gradually by the amount $\Delta\Theta_v$ (see Fig. 1a).

Many electrical, hydraulic, and other drives — as is known — which are used in technology have such a "high-speed" ratio. Figure 2 shows an electrical drive attached as a second step to our model of an aircraft "drive".

As can be seen in the figure, this drive consists of a telescopic electric clutch and its feed potentiometer. The clutch includes an inertia-free electric motor, the rotation of which makes it possible to alter the length of the rod carrying the sighting piece "A". The potentiometer slider is mounted on the rod which connects the stick with the sighting piece and for this reason it moves proportionally to $\Delta\alpha$.

The voltage fed though the slider to the motor terminals is proportional to the deflection of the slider. Since the rpm developed by the motor are in their turn proportional to the voltage, the sighting angle of point A, changed by the pilot by the amount $\Delta\alpha$, will begin to increase additionally relative to time in the same direction by a magnitude $\Delta\Theta_v$. Consequently, for each instant of the transitional regime, the pitch angle will be

$$\vartheta = \vartheta_1 + \Delta\alpha + \Delta\Theta_v.$$

The angle $\Delta\Theta_v$ will increase infinitely until the pilot "cuts" the excess angle of attack $\Delta\alpha$ (in Fig. 2b this angle is conventionally limited by the travel of a telescopic rod) by reversing the stick. In order to attain precisely the selected pitch angle ϑ_2, the pilot must determine by eye the beginning of the reverse motion of the stick, its nature, and tempo so that by the time the aircraft attains ϑ_2 the excess angle of attack will be reduced to zero and the increase in $\Delta\Theta_v$ will terminate. For the new regime thus obtained

$$\vartheta_2 = \alpha + \Theta_{v_1} + \Delta\Theta_v = \alpha + \Theta_{v_2}.$$

This is how an aircraft "drive", which links the stick with the pitch angle kinematically by means of two steps, operates. As we see, the angle of attack $\Delta\alpha$, the linkage of which with the stick represents the first step in the "drive", plays an intermediate and secondary role; it merely serves as a "means" for changing the flight-heading angle Θ_v. In order to change ϑ even by a considerable amount right up to executing a loop (when $\vartheta = 360^\circ$), it is sufficient by moving the stick only a little (several degrees) to increase the angle of attack and maintain it for some time. The excess in lift and in angular speed which thereby arises causes a time increase in the angle $\Delta\Theta_v$ (the second step in the "drive"). As the necessary value of ϑ is reached, the pilot gradually moves the stick into the initial position, "cuts" $\Delta\alpha$ to zero, Θ_v ceases to increase, and the aircraft again travels straight — but now with a new value $\vartheta = \vartheta_2$. The whole process of controlling the pitch angle consists of such reciprocating movements of the stick (column).

In actual flight a change in the pitch angle with constant engine thrust results finally in a smooth change in speed and altitude of flight. This does not disrupt our outline of the operation of the "drive" but has an effect on the values of its transmission ratios (Fig. 3). For the transmission ratios of the first step $c_1 \frac{cm}{deg.}$ and $c_2 \frac{kg}{deg.}$ there exist optimum values at which aircraft control is most convenient and the accuracy of control is maximal (in Fig. 3 this is taken as 100%). With deviations in c_1 and c_2 in any direction, convenience and accuracy of control are reduced. In one case this happens because of too abrupt a reaction of the aircraft to slight movements of the stick, and, conversely, in the other case because of too free motions of the stick and great forces on it. In the first case uncontrolled erratic flight of the aircraft in the pitch axis is possible, while in the second case control is fatiguing. Therefore the designer always takes pains to see that the values of c_1 and c_2 are as close to the optimum as possible.

It is customary to evaluate the transmission ratios c_1 and c_2 by using their dependent values: $\frac{\Delta P_v}{\Delta n_y}$ which is the exertion of forces on the stick per unit of G-force; and $\frac{\Delta X_v}{\Delta n_y}$ which is the amount of stick movement per unit of G-force.

In the upper graphs in Fig. 3 the broken lines show the course of transition to these values. As we see, the optimum values of c_1 and c_2 correspond to definite values — decreasing with an increase in speed — of $\frac{\Delta R_y}{\Delta n_y}$ and $\frac{\Delta \bar{x}_y}{\Delta n_y}$, at which any aircraft throughout the whole range of flight speeds will be most convenient and easy to control.

In the lower graph (Fig. 3) we see that the presence of a second step in the drive impairs convenience of control. The value of c_3 is determined by the tactical purpose of the aircraft and the flight regime.

It is interesting that the aircraft "drive" which we have examined (see Fig. 2b) is similar in principle to the steering "drive" of motor vehicles. The front wheels of an automobile function as the wing in an aircraft. When these are turned at an angle of attack in the direction of movement, a lateral force (i.e. "lift") results. Here there also appears an angular rate of turn proportional to the angle of attack of the wheels.

In an automobile, however, the wheels turn relative to the body while the wing of an aircraft is rigidly attached to the aircraft fuselage. Therefore the driver of an automobile does not see the angle of attack of the wheels and in making a turn reacts directly to the angular speed. A pilot, on the other hand, in controlling the pitch angle must always consider the fact that one of the components of this angle (the angle of attack $\Delta\alpha$) will be reduced to zero at the end of the turn.

Such a peculiarity of an aircraft "drive" naturally requires great attention and much training on the part of the pilot. It is possible to eliminate this inconvenience with the aid, for instance, of a wing which turns relative to the fuselage and which may be controlled by the stick in the cockpit. In such an aircraft the pitch angle will always be ϑ_v, regardless of α. Therefore, in the transition from ϑ_1 to ϑ_2, stick movement will be simplified (see Fig. 1b) and less attention will be required from the pilot.

Another distinguishing feature of an aircraft "drive" which also makes it inferior to an automobile "drive" is the actual lack of rigidity in the linkage between the stick and the wing's angle of attack.

That is why, strictly speaking, it is impossible to picture this linkage as a simple leverage (as in figures 2a and 2b). The ratio between the mass and the restoring aerodynamic moment in the aircraft is such that this linkage turns out to be quite elastic. The least external disturbance or careless movement of the stick produces flutter of the angle of attack relative to the stick. The higher the flight altitude, the slower the rate of attenuation of this flutter. The period T of this flutter depends on the indicated flight speed and the static stability; on the average, this amounts to 2-4 seconds for present-day aircraft.

In order to make our model agree with this peculiarity of the first step of the aircraft "drive", it is necessary to reduce the rigidity of the rod connecting the stick with the sighting piece "A" by installing a spring, load, and damper (see Fig. 2c).

The ratio between the rigidity of the spring, the mass of the load, and the power of the damper is selected in such a way that, with the stick locked, the natural oscillations of the sighting piece "A" (if it should be manually pushed, for example) will coincide in duration and attenuation with those of the aircraft. Then the model will reproduce precisely an aircraft "drive", while to the transmission ratios c_1, c_2, and c_3 which are characteristic of this "drive" will be added two more characteristics of the oscillation (dynamic) properties of the first step: the period of natural oscillations T and "relative damping" η.

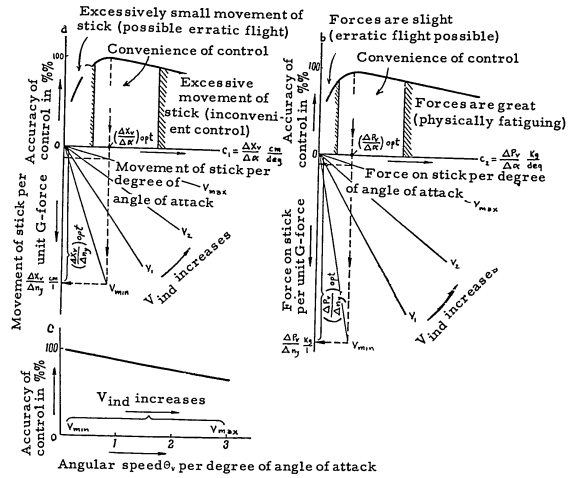


Fig. 3. Effect of transmission ratios of the "drive" on accuracy and convenience of pitch angle control.

The physical meaning of these magnitudes is simple. When $\eta = 0$ there is no damping and the oscillations of the angle of attack which appear when the stick is fixed are not attenuated (Fig. 4a). In this case the relationship between each ensuing amplitude and the preceding one $\frac{a_{n+1}}{a_n}$ is equal to unity. With the appearance and increase in damping, η increases and the oscillations are dissipated faster and faster (see Fig. 4b). As η approaches 1.0 (Fig. 4d) there are hardly any natural oscillations and when $\eta = 1$ (Fig. 4c) they cease.

By comparing the models in Fig. 2b and 2c, it is easy to see that the use of such a drive is the more difficult the more resilient the spring is and the more ineffective the damper. In controlling the angle ϑ_v through $\Delta\alpha$, it is necessary to take continuously into account the fact that the angle $\Delta\alpha$ can change unpredictably. The control stick should be moved very smoothly and carefully. Whenever oscillations $\Delta\alpha$ appear, they should be countered by additional and well-selected stick movements (broken-line curves in Fig. 1a).

This is precisely how one has to act when flying at high altitudes where "relative damping" η is very slight.

The driver of a motor vehicle can easily visualize these inconveniences of the aircraft drive if he imagines that the linkage between the steering wheel and the wheels is elastic and, at the same time, that the latter are of such great mass that they can rock relative to the fixed steering wheel with an inherent period T of the order of three seconds. Accurate control of such a motor vehicle — let us say in clearing an oncoming vehicle — would obviously require much attention and rapid and precise movements on the part of the driver.

That is how a pilot operates the stick (column) during landing, formation flying, and in other instances where precise control of the angle of attack is required. Figure 4e shows an example of this in a recording of such motions when a fighter pilot tracks a target through the conventional collimator sight. As we see, this is a continuous and extremely tense procedure by the pilot of aligning the cross-hairs with the target. And yet, if we compare the precision of aircraft control in this case with even the usual degree of accuracy of motor vehicle control, it turns out that in the case of the aircraft the degree of accuracy is much lower.

Now let us examine the quantitative difference of control convenience among the various present-day aircraft and also between the aircraft and motor vehicle "drives".

On the axes of the diagram (Fig. 5) the values of T and η are plotted, and curves of constant accuracies indicate how, depending on these aircraft characteristics, the accuracy and convenience of controlling angle ϑ varies.

Let us take a case when T equals zero, i.e., when the linkage between the stick and the angle of attack is rigid. This corresponds to the model in Fig. 2b whichcoincides with the motor vehicle "drive" in its dynamic properties. Corresponding to this "drive" in the diagram is the maximum accuracy which is taken as 100%.

In the diagram the deflection from the vertical axis to the right corresponds to the transition from the system in Fig. 2b to the aircraft system in 2c. Here in the first step of the "drive" there appear negative oscillation properties.

With relative damping η close to unity (extensive damping) and with a deflection to the right in the diagram, convenience of control smoothly decreases because of impairment in the way the aircraft "follows" the stick: the aircraft reacts with an angle of attack slower and slower even with rapid movements of the stick. If η is close to zero (slight damping), then with a deflection to the right in the diagram at first there is a very sharp decrease in convenience of control due to the appearance in the aircraft of a tendency towards "erratic flight" relative to the angle of attack. Then the qualities of the "drive" increase somewhat, after which they begin again to decrease smoothly as shown in the upper part of the diagram.

It has been established that in the region of "erratic flight" (see Fig. 5) the natural oscillations of the aircraft coincide in period with the most rapid motions of the stick which the pilot is able to make while actively controlling the pitch angle.

Therefore, with values of T less than in the region of erratic flight the pilot does not try to dissipate rapid natural oscillations of the aircraft which are small in amplitude; he averages them out by eye and uses the first step of the "drive" as a rigid one as shown in Fig. 2b. With values of T greater than in the region of

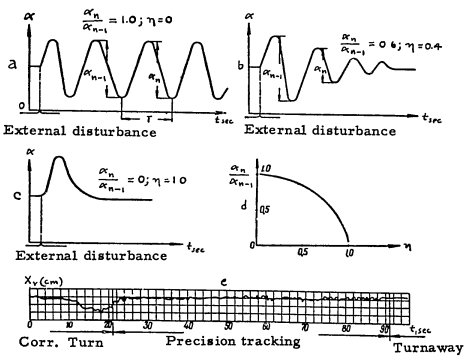


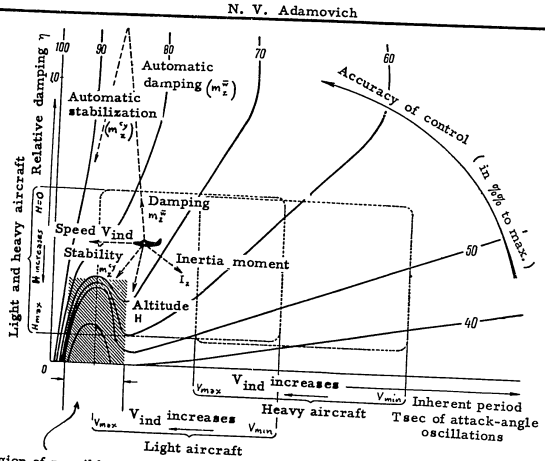
Fig. 4. Characteristics of the oscillation properties of the first step of the "drive" (a, d) and a recording of the stick movements during precision control (e).

"erratic flight" it is possible with rapid movements of the stick, to dissipate slow aircraft oscillations with reference to the angle of attack. In the region of erratic flight itself attempts to dissipate oscillations lead to a situation in which the stick gets "out of time"; there appears so-called "resonance" of the two oscillations which is felt as a tendency of the aircraft towards "erratic flight".

As an example in Fig. 5 are given the operating regions of the two aircraft: the lightest (fighter) and the heaviest. Other aircraft occupy an intermediate position in the diagram.

The point in the center of the diagram represents a fighter traveling at an average speed V_{ind} ("broad arrow" of the indicator) and at an altitude H. By reference to the broken-line curves passing through this point it can be seen in which direction it will move depending on the flight regime — speed, altitude, and Mach number, as well as the aircraft's inertia moment, its static stability, and damping.

With an increase in speed V_{ind} (with constant altitude) the period T is reduced



Region of possible "erratic flight" with ref. to pitch

Fig. 5. Effect of the oscillation properties of the first step of the "drive" on accuracy and convenience of pitch-angle control.

while damping η remains practically constant. The time lag between the angle of attack and the movement of the stick grows smaller here and convenience of control increases.

With an increase in altitude H (V_{ind} constant), on the other hand, the period T practically remains constant while damping η drops rapidly. The angle of attack shows a greater and greater tendency towards uncontrolled "rocking" (stick is stationary); this reduces convenience of control.

When the coefficient of static stability m_z^{cy} is increased (for instance with forward displacement of the aircraft's center of gravity), there is a displacement along a straight line in the diagram towards the origin.

If the coefficient of damping $m_z^{\bar{\omega}_z}$ is increased (for instance by installing automatic damping), then the displacement will shift upwards in the diagram similar to the effect of a drop in altitude H.

In all cases an increase in the inertia moment I_z is very dangerous (see diagram). It leads to impaired convenience of control.

Thus every aircraft, depending on its range of speeds and flight altitudes, occupies a definite region in the diagram in Fig. 5. If an aircraft's performance data are known

it is easy to find this region as well as the value of c_1, c_2 and c_3 in Fig. 3. Then even before flying an aircraft it is possible to gain a picture of its "character" and to determine beforehand the appropriate piloting technique.

The regions of possible "erratic flight" deserve special attention. Here we may find specifically some of the lighter aircraft flying at medium altitudes and at high Mach numbers (see Fig. 5). This requires increased attention so as not to cause "erratic flight" with respect to the pitch axis of the aircraft with inaccurate movements of the stick.

How is convenience of control affected by automatic stabilization and damping?

These devices, as we know, enable us to increase greatly the coefficient of stability m_z^{cy} and the coefficient of damping $m_z^{\bar{\omega}_z}$ by using additional deflection of the elevator. These automatic devices "take on", so to speak, part of the pilot's work spent in dissipating the natural oscillations of the first step of the "drive" and render this step more "rigid". The broken lines with arrows in Fig. 5 show that it is possible by using automatic devices to "boost" any present-day aircraft into the upper left-hand region of the diagram where convenience of control is the same as in a "rigid" motor vehicle "drive". In comparison with the poorest regions of the diagram this corresponds to an increase in accuracy of control by two to three times. With such improvement in the properties of the "drive" convenience in control is so enhanced that there is a radical change in the pilot's conception of the aircraft.

Such then are the properties of a pitch angle control "drive". A knowledge of these properties enables a pilot to master more quickly the technique of piloting and ensures correctness of actions in difficult flight cases.

HOW WE SERVICE AIRCRAFT OF VARIOUS TYPES

Engineer Senior Lt. V. A. GRECHIN

Will the technical personnel servicing aircraft of one type be able to switch over to servicing modified machines? This is not an incidental question. Aviation equipment is so complex at present that even preflight servicing, postflight inspection, periodic regulation inspection work, and repairs performed on one type of aircraft alone are fraught with difficulties.

How is one, then, to organize the work of the specialists when the unit is equipped with bombers and several types of fighters?

The whole difficulty lies in the fact that aircraft of different types have different systems and differ in equipment, its arrangement, etc. To find one's way around here and to learn the peculiarities of every aircraft is no easy task. When we received machines with which we had no previous dealings, we reinforced the service groups with young mechanics of the same year of induction. As new machines were introduced in other subunits trained mechanics were transfered there. As a result, in each subunit there were specialists who had mastered the equipment of the new machines.

In many respects we are aided by technical training which consists of lectures and seminars. The latter are conducted a week or two after the lecture. The instructor in the technical seminar compiles a plan in which the problems to be discussed are outlined. All the students are familiarized with this plan. For answers given during these seminars grades are recorded in a journal. By these grades one may judge the progress made by the students and take timely measures to speed up those who are falling behind.

As a rule, the mechanics coming to the unit have a good theoretical background. Therefore the basic emphasis in training is placed upon pratical demonstration and study of the equipment directly on the aircraft. Experience has shown that after four of five months all of the mechanics are able, regardless of the field of their training, to perform independently all types of inspections of the whole complex of aviation equipment. Thus, specialists A. V. Popruga, I. I. Matsulevichus, Ye. P. Lifanov, and V. M. Makis have outstanding knowledge and competently service not only the electrical equipment, but the instruments and oxygen equipment as well.

If in the past the aviation equipment specialists took part in technical training only during scheduled meetings, now things look different. Each of the aviation equipment specialists is given a list of topics which he must prepare in sequence by a given date. In this way the entire complex of the aviation equipment is encompassed. At the seminars every technician reports on his topic. The training sessions are in the nature of collective discussion. This makes possible a detailed analysis of all of the

problems of operation and maintenance.

We begin familiarization with aircraft of different types by comparing the systems and by studying the new and unfamiliar instruments and assemblies. In addition, their electrical diagrams are also supplied for these. In order to make the servicing of the aircraft easier and to find malfunctions and damaged areas more quickly, we first of all try to "tie in" the electrical diagrams of these assemblies with the overall electrical circuitry of the aircraft. This we did when we had to replace the DGMK [distant-reading gyro magnetic compass] with a GIK [gyro - induction compass].

By opening all the access and inspection hatches we try to discover everything that is new and unfamiliar; we study the location of the assemblies and ways of getting at them. This is done most conveniently during the fifty-hour regulation inspection work on the disassembled aircraft. During the performance of such work we try to get as many of the mechanics as possible to work on the equipment.

Differences in equipment and its location create a series of difficulties for the servicing personnel. Thus, for example, the correction switch of the GIK is located for various types of fighter aircraft in three different locations and positions. At the same time, it is well known that the work of an instrument depends on the position of the main axis of the gyroscope and the shock-absorbers. Therefore, when mounting it, we pay special attention to the position of the letter indexes and the shock-absorber springs.

Various types of fighter aircraft differ in the engine's regime control systems as well. This is especially true of the "maximum" and "afterburner" regimes. Thus, on aircraft equipped with push-button controls the regimes are checked differently on the ground. If, for instance, previously the "engine control instruments" toggle was not switched on on the new machines, it must definitely be switched on, since it controls the feed to the push-button controls. The PU [control] panel also works differently on these aircraft.

It is necessary to pay attention to yet another aspect of the functioning of the power plant. Sometimes it happens that the aircraft technician complains that the temperature in all the operating regimes of the engine remains 20° - 30° below normal. As a rule, the functioning of the thermocouples is suspected. Thermocouples and gauges are checked, groups of thermocouples and gauges are cross-checked- yet it is all in vain. Sometimes it even becomes necessary to open up joints.

We recommend first looking at the engine document. The fact is that sometimes one comes across engines which, during tests at the factory, show temperatures 20-30° below the normal for all regimes of engine performance. These are the so-called "cold" engines. Such indexes are considered normal for them.

We are striving to achieve a situation where every specialist will have to — at least in general terms - learn the performance of the engine. At present, without knowing well the power plant and its regimes, it would be simply impossible for him to carry out his work. After all, the whole burden of servicing the engine's automatic devices rests on the aviation equipment specialists.

The automatic devices of the flying tail require a great deal of attention. For purposes of studying them, all the mechanics from the subunits where there were previously no such machines came to us, so to say, in sequence for practice and took part in servicing and inspecting the new aircraft. The theoretical training was conducted for everybody simultaneously. In the course of this training primary emphasis was placed on operation and maintenance and, in particular, on the sequence of

Technician Lt. A. Kubitskiy devotes a great deal of attention to efficiency work. In the course of the past year he made six valuable suggestions, facilitating the performance of repair and regulation inspection work. Recently officer Kubitskiy completed the construction of an original device for checking the assemblies of the bombing and artillery armament directly on the aircraft. This device is portable and can be easily carried by armorers. It is fed from the electric power of the aircraft.

In the photograph: Officer A. Kubitskiy, with the device he has designed.

Photo by A. I. NELYUBIN

inspecting the durite units in the automatic system.

This system is connected to the overall static and dynamic systems. If these are not hermetic, irregularities in the control system may arise and, as a result of this, additional difficulties will face the pilot.

By being thoroughly familiar with the design and principles of operation of the apparatus, the pilot will be able to make a proper decision in complex situations. Let us assume that in flight certain defects of the flying tail's automatic system become noticeable. Pilots know that in landing the rod of the automatic device must be in the "major arm" position; this is controlled by the signal light on the instrument panel and by a special indicator. If the rod fails to move into the necessary position, it is shifted and thereby control of the aircraft is facilitated.

Furthermore, we take into consideration the fact that all the aneroid and diaphragm instruments are fed from these systems. An erroneous reading on any instrument aloft is a serious possible cause for a flight accident. Most often, their malfunction must be explained by a lack of air-tightness in the systems. For instance with the failure of the dynamic system only the speed indicator and the machmeter will fail. However, when the static system is not hermitic all of the aneroid and diaphragm

group instruments will not function. In order to make this convincing, we recommend that the pilot compare the readings of the altimeter and the UVPD [vacuum-pressure gauge]. They will be equal or almost equal, depending on the lack of airtightness. With an increase in engine rpm the readings of the speed indicator and of the machmeter decrease , and vice versa.

After the pilot has made sure that there is a leak in the static pressure system he should descend to an altitude of 1000-1500 m where the cockpit is wholly depressurized and the pressure equals the atmospheric. Here one may shut off the manifold pressure and, having contacted a ground radar station, ascertain the correctness of the altimeter readings. The readings of the speed indicator are checked by the rate of rotation of the turbine.

One must devote special attention to the training of flight personnel for the operation and maintenance of different types of fighter aircraft. Difference in equipment is an additional difficulty for the pilot. We act in the following way when studying the equipment of an aircraft. The engineering and technical personnel first analyze on their own the factors which must be taken into consideration by the pilot in operating the aircraft on the ground and in the air. Some problems require a detailed analysis. For the purpose of studying them and clarifying them fully, class sessions are organized. A great deal of attention is devoted to training flight personnel directly in the cockpit. Everyone of our pilots knows how to check the operation of the flying tail system on the ground. True, in the beginning there were complaints that on different aircraft the needle of the arm position indicator of the ARU [control surface automatic operation], when the instruments were checked, stopped on various markings in the right-hand section of the scale. However, such a phenomenon can be explained. The arm position indicator, in design, is similar to the voltmeter; hence the extent of the deviation of the needle depends on the magnitude of the charge contained in the aircraft batteries or from the ground power supply.

We periodically perform additional work on the aircraft, such as installation of new improved instruments and improve operational reliability of the equipment. As soon as we receive a new bulletin dealing with modifications we study it with all the technical personnel of the service. For the purpose of performing this work we enlist, along with the TECh [technical maintenance] groups, specialists from service groups as well. This gives to all of the technicians and mechanics the opportunity to study in greater detail all of the changes in layout or design which enables them in the future to operate and maintain the aircraft with greater competence. The basic burden during modification work in accordance with the bulletins rests, of course, with TECh. Taking this into consideration, the more trained and competent specialists were selected for the technical maintenance unit. It is here that outstanding masters in their work are created.

Our efficiency men had to devote a great deal of effort to facilitating the performance of many of the operations. They have built many devices which are successfully being used in day-to-day work. Thus, Technician Senior Lt. V. Z. Karabazhak and mechanics V. M. Soplinov and A. T. Gorelyshev have made a portable electrohydraulic device. It is a combination of the MPSh-1A d.c. electromechanism, with the second stage of the reductor removed, and a 435 VM hydraulic pump. The device receives its power supply from the ST-5 starter cart and is instantly actuated. It operates noiselessly and, what is more, minimizes the entry of air into the hydraulic system of the aircraft.

One should also mention the following point in the work of an engineer.

In cases of failure of an instrument or an assembly, the engineer must make an analysis and discern the cause. But sometimes this is simply impossible and here is why. Quite often the supply plant sends in a new instrument or assembly in exchange for a defective one. However, this often is time-consuming. For purposes of establishing the cause of failure and perhaps of preventing it in the future, we open and disassemble the instrument and assemblies which fail for the first time. This provides an opportunity of not only discovering a defect but also of studying the instrument itself in detail.

Very carefully we also watch the work of the AP-5-2m autopilot. One of the instrument technicians, competent in electronics and automation, is responsible in our unit for the servicing of the aviation equipment of the bombers. He is also responsible for servicing the instruments and equipment of the fighter squadron. Naturally, for this service group, the best trained officer is appointed chief.

Such is the work experience of our specialists. If one were to summarize briefly what is the most important point here, one would indicate the knowledge of equipment. To service an aircraft for flights, to check on the state of repair and workability of the entire complex of equipment, to check on the condition of most vulnerable spots - these are only possible when there is an outstanding knowledge of circuitry, location, construction, and operating principles of instruments and assemblies.

"An aggressive, well-practiced pair", they say in the subunit about two fighter-pilots who fly in the same pair, officers D. I. Il'chenko and A. P. Zinchenko. They are both Communists, Outstanding Men in training and successfully master the art of present-day aerial combat and sniper fire.

In the photograph: Communist officers D. I. Il'chenko (left) and A. P. Zinchenko.

Photo by V. I. KOLESNIKOV

THE AIR ELEMENT TECHNICIAN

Engineer Maj. A. I. UGAROV,
Engineer Lt. Col. P. A. GOLOVIN

Who knows how a man can seize a dream? For example, Viktor Mikhaylov dreamt of becoming an airman. When did this happen? Perhaps as a fifteen-year-old youngster for the first time he crossed the threshold of an engine-building plant. Or perhaps after a visit to a testing station. Here everything interested him, everything was mysterious and something unusual. Even the deafening roar of engines seemed to have a melody of its own.

And so it happened that when Mikhaylov joined the Army he was sent to a school for aircraft mechanics. The time spent in school passed quickly and then Viktor joined a combat regiment. Probably he will never forget the day when he was given his "own" aircraft, a Yak-3.

At the time the aircraft was handed over to Mikhaylov, Master Sergeant R. A. Voytsekhovskiy said, "Airmen loved to fly my 'little hawk'. They never found any defects or malfunctions in it. I always took care of them myself in good time".

The young mechanic did not answer but resolved not to disgrace the good reputation of the aircraft.

Mikhaylov lovingly took care of the plane, carefully serviced it for each mission, and — as they say — would not let a speck of dust settle on it. Several years passed by. For successful and exemplary service, Sgt. Mikhaylov won initial officer rank.

Soon after that they received new jet equipment which was completely different

from the type previously in use. The external appearance alone filled one with respect. Officer Mikhaylov began to carry out his duties with redoubled energy. The Communist reasoned thus: "Since I have been entrusted with an aircraft which pilots must fly in order to improve their skill, I must do everything so that the plane is always operational." The officer persistently studied the principles of jet engine operation, the theory of aircraft flight, and the regulations covering its maintenance. And so it became a practice for him to service the aircraft faster and better than the others.

Soon the command decided to appoint Mikhaylov instructor of practical studies in a trainee subunit. Now Viktor Nikolayevich had to teach others. All his knowledge, all his love for the equipment he passed on diligently to the young soldiers. At the same time he too, studied persistently. Attending evening classes he passed his examinations in an aviation technical school without attending classes.

After this Mikhaylov again joined a line unit -- but this time as technician of an air element.

Operation and maintainance work pleased him. But his new appointment made him think. And there was something to ponder. Earlier when Mikhaylov was an aircraft technician he was responsible for only one aircraft, its good operation and readiness. Now his round of duties increased immeasurably, he had additional work loads. He had to bear responsibility for both all the aircraft in the element and for the people who serviced them. Senior engineer officer P. F. Semin warned him, "The element technician is a special kind of instructor. And his work with people is most honorable and difficult. He must respect his subordinates, evaluate their work, trust them -- but must also be demanding. He must demand unquestioning, precise, and complete execution of orders. Besides, our people are young and inexperienced, they must be taught... so that there will be no cause for flight accidents. This is the main thing."

Of course we can imagine what it means to be an engineer who has to answer for everything. But only formalists reason this way. We all know what a wide round of responsibilities the engineer has and it is quite understandable that he is not able personally to check the servicing of every aircraft in the regiment or even in the squadron. Yes, but can one man check everything that is done by a large collective of aircraft specialists.

Success in the matter is decided in the final analysis by the training and organizational abilities of every technician, and every mechanic individually, by conscientiousness and a feeling of responsibility, by an ability to carry out quickly and correctly the whole assigned volume of work.

In teaching and training the subordinates, the engineer is helped by the Party organization. The role of the element technician is also important here.

All this made Mikhaylov think. He thought of how to organize his work, where to begin, and where to look for the most important things. Indeed, exactly here he will demonstrate whether he is justifying the trust put in him or not.

Viktor Nikolayevich began by considering his subordinates, by studying the character and disposition of those with whom he had to work. His first meeting put the element technician on guard. Many mechanics had just finished school and had a burning desire to serve in aviation; but they lacked practical skills. Observing their work and checking on how they carried out individual operations, Mikhaylov noted that the young men made many serious errors. Thus, on one occasion, in servicing an aircraft for a

repeat sortie, Sgt. A. I. Imametdinov, in refueling filled the tanks to overflowing. The kerosene got inside the fuselage and the aircraft had to be grounded.

The element technician tried to analyze the cause of such a mistake on the mechanic's part. It turned out that Imametdinov, before refueling, had previously simply removed the screen filter without considering the reason for its installation in the filler neck. Imametdinov was reprimanded. They explained that such a violation is contrary to the requirements of the instructions for technical operations, but they did not teach him how to do the refueling with a filter. Due to the mechanic's lack of skill, the fuel splashed, overflowed, and it was difficult to check on the fullness of the tank. Mikhaylov took the filler gun and showed the mechanic how to refuel the aircraft.

Another time the same Imametdinov was installing on an aircraft the fuel drop tanks. Soon after he reported that the work was finished. But when the airtightness and the fuel flow from the tank were checked, it turned out that the drop tank was not fully airtight. Air came out of the pressure nipple. This happened because Imametdinov failed to fit the nipple into the recess. It was necessary to take off the drop tank and to install it anew.

Other mechanics also made mistakes. It happened that Mikhaylov discovered oil leaks, bent piping, and incorrectly tightened nuts during the postflight inspection. If he were to neglect such oversights it could cause a flight accident. Much care burdened the element technician; he had to teach the young men to work competently and thoughtfully.

Technician Senior Lt. Mikhaylov patiently explained to and showed his subordinates how, in tightening, for example, the nipple joints it is necessary to hold the elbow or T-joint by a facet with one wrench and with another wrench to tighten the joint nut -- at the same time watching carefully to see that the tube does not turn. He also told them that when the tube turns the metal is deformed due to which cracks and breaks may appear in the course of further use.

Together with the mechanics, Mikhaylov inspected the aircraft, explaining in detail the requirements of the uniform periodic regulation inspections and showed them how and what to inspect and where any of the defects may appear. Nothing escaped his attention.

The element technician had to put in a lot of work before his hesitant subordinates, who often performed some of the jobs blindly, turned into mature specialists with a good command of maintenance regulations.

This was but one side of Mikhaylov's activities. It is no less important to keep under control the entire process of preflight servicing of element aircraft, to determine the sequence and the time necessary for carrying out various jobs and preventive measures as well.

Mikhaylov personally checked the condition of every aircraft, made notes in the technical documents on the results of checking, kept track of operational time of the assemblies and the engines; he consulted with the engineer about the best time to carry out any preventive measures.

In organizing the work of the subordinates on the flight line or in the parking area, the officer noticed that there were still many untapped reserves to be found here. After all, it is no secret that in individual cases working time is lost unnecessarily. At the flight line this occurs because of poor organization, and at the parking area because of inefficient allocation of specialists, untimely arrival of technical support facilities,

their idle time, endless searching for spare parts and expendable supplies. Many times Mikhaylov and his comrades pondered this problem and every time they came to the conclusion that all these shortcomings could be avoided by utilizing maximally every working hour.

They tried to revamp their work. The results quickly became apparent. The element aircraft logged many hours without a single failure in flight. Good preparation of materials for each flying day made it possible to increase the flying time for each aircraft.

What was the secret then?

It was all quite simple. Not a single system, not a single unit in an aircraft was left unchecked. For this purpose a plan for all the jobs was drawn up on the previous day with consideration being given to all the special features of the forthcoming day. Every operation was allotted a definite amount of time, servicing facilities were stationed in such a way as to preclude idle time for some specialists and, at the same time, to avoid unnecessary rush which tends only to lower the quality of servicing. The element engineer and technician checked the work of the specialists. Here they tried to see that the checking was not formal and that no one signed any documents for unchecked work.

Mikhaylov works in close cooperation with the engineer of the subunit, he keeps him current on all the happenings and reports to him on every malfunction. All the orders of the engineer are carried out strictly on time. Checking on the condition of the aircraft in the element, the engineer is always satisfied and often cites Mikhaylov as an example for the other element technicians.

In helping the specialists, service aircraft equipment, Viktor Nikolayevich does not attempt to perform himself those jobs which can be done and must be done successfully by others. But at the same time neither does he shun any kind of work. The officer reasons thus:

" It is much easier to do the job for someone else than to teach him to do it, and I must teach everyone what I know..."

The element's work is summed up at the end of each working day during brief technical analyses right on the aircraft. Here the element technician outlines the performance of each specialist, notes positive and negative features, and assigns an orientation problem for the following day.

Once Mikhaylov was checking the condition of the gas-turbine blades. Having readied and adjusted the TT-50 for work, the element technician began the inspection. Carefully, centimeter by centimeter, he examined the edges of the blades. Everything was going along fine. But what is this? Stop! Mikhaylov once again examined the suspicious-looking streak. "Yes, it is a crack along the blade." He had never heretofore had occasion to deal with this; only during class sessions in the course of technical studies did the engineer demonstrate a part with such a crack. He explained why such defects arise and where they may lead. The technician reported what had happened to the engineer, gathered all the specialists of his element, and said:

'Now each one of you will look through this instrument at the turbine blades. One of them has a crack. As soon as you find it, tell me. I will check to see whether you located the right blade."

This lesson was profitable. The specialists became acquainted with a rare but dangerous phenomenon. They learned its cause and the correct method of examining the

blades. Thanks to Mikhaylov's vigilance the engine on the aircraft was replaced in time and the safety of further flights was thereby guaranteed.

The element technician has established a very necessary and useful procedure: he personally checks on the quality of periodic regulation inspection work carried out on all the aircraft in the element. No matter how pressing the work is, he always takes time to go to TECH [technical maintenance unit] and be present when a fighter is being dismantled. According to the condition of the interior of the fuselage he reaches conclusions as to the quality of aircraft maintenance in the period between periodic regulation inspections. Not one engine test on a dismantled aircraft has taken place without his being present.

Meticulous checking on the quality of the periodic regulation inspection work -- this is what the NIAS [aircraft engineering service manual] demands. And Mikhaylov never departs from this rule. Thus, on one aircraft, after the TECH specialists had performed all their work, he discovered that the check valve in the drop tank pressure system had been installed incorrectly and was working in reverse. This, once again, gave graphic evidence of how important checking is.

The element technician inculcates in his subordinates the elements of superior technical competence. With specific examples he shows how important it is to be inwardly composed, collected, disciplined and accurate, how an efficiently prepared work station helps in the job, and how important it is to have all expendable materials and tools on hand.

Those men who now independently service combat jet aircraft remember with love and gratitude their mentor. Many of them were taught by experienced specialist and efficient methodologist, Viktor Nikolayevich Mikhaylov.

Life swiftly marches on. Everything around us changes, aircraft are refined, the design and equipment of aircraft become more sophisticated. This demands evermore knowledge, continual and painstaking study. And Mikhaylov studies, learns everything that is new, everything that emerges in aviation technology. He is happy in the realization of his dream come true -- he is in aviation. Even if he does not range the space beyond the clouds, still his work is important and honorable. Indeed the element technician is the engineer's right hand in the struggle for high-quality aircraft servicing, in the struggle for accident-free flying.

THE CREATIVITY OF INNOVATORS

Engineer Col. V.M. ZHDANOV,
Engineer Maj. K.S. SMIRNOV

The Twenty-First Congress of the CPSU set the tasks in the further technical development in all branches of the national economy. The carrying out of these tasks requires especially that the mass movement of efficiency men and inventors be expanded further.

Aviation specialists, engineers, and technicians quickly responded to this Party call. A great deal of inventiveness and creative thought is conspicuously present these days in the line units of the Air Force. A number of examples testify to the fact that the efficiency men are successfully resolving complex and urgent problems. In this respect, the achievements of the aircraft equipment specialists under the command of engineer S.I. Svechkov are indicative.

Not only individual officers but the whole collective are engaged here in efficiency work. Amongst the innovators we have V.T. Gritsay, P.P. Tokarev, and M.I. Volokhatov. All their work is directed towards forestalling failures in aircraft equipment, returning to operation equipment brought in for periodic regulation inspection work, improving the organization of the work of the specialists, as well as improving the quality of checking preflight aircraft servicing.

The officers strive to carry out preventive measures and to ensure reliable operation of aircraft equipment. We could talk about many suggestions and refinements, but could we possibly enumerate all of them? We will talk about the maintenance experience in the case of individual types of equipment only.

As an example, let us take the autopilot. It often happens that the work of the longitudinal-transverse stabilizers in the AP-5 and the AP-5-2 autopilots proves to be unstable in the periods between the overhauls.

An analysis of this has shown that, due to a slight lack of balance, the gyro axis drifts from the vertical position when correction of the longitudinal and transverse stabilizer is switched off (the coordinated turn knob set at zero). On the other hand, when the correction is switched on, this does not occur. During overhauls it was not necessary to switch off the correction and for this reason the drift of the vertical gyro had not been discovered.

But now the cause is clear. In order to improve the performance of the autopilots the efficiency men have made suggestions supplementing the overhaul. They make provisions for checking the drift of the vertical gyro in the longitudinal-transverse stabilizer with the correction switched off. They have worked out also a method of checking. For instance, a three-minute drift from the vertical should not exceed 1.2°. This time was chosen with consideration of the fact that a turn of 180° with a 15° bank or larger, executed by using the [turn] control, should comply with this norm. If the vertical gyro drifts from the vertical position by more than 1.2°, then such a longitudinal-transverse stabilizer is not considered balanced.

The balancing is checked not only during the periodic regulation inspection work but also during preflight servicing. Before checking the operation of the autopilot. when using the coordinated turn knob (with control surface actuators operating) the control on the pilot's panel is set at "zero" position and they check to see that the aircraft's control elements are not displaced. If this condition is observed for a period of three minutes, then the balancing of the gyro unit is considered satisfactory. If not, the longitudinal-transverse stabilizer is dismantled and checked on a PGV-53 [vertical gyro] tester. Thanks to the use of this method of testing vertical gyros, autopilot failure aloft due to disruption of balance in the PPS [longitudinal-transverse stabilizer] has sharply declined.

Efficiency men V. T. Gritsay and P. P. Tokarev have done much to cut down on the time necessary for servicing autopilots and to improve the quality of checking time. Specifically, they have suggested a device for regulating the transmission ratio and for checking the contacts of potentiometer sliders in all the components of the AP-5-2 autopilot.

Seemingly, the device presents nothing new. However, it is very helpful. Previously three specialists used to spend up to three hours on regulating the transmission ratio, while now - by using this device -- the whole operation is taken care of by one man in forty minutes.

Previously, in order to check the operation of the potentiometer of the control panel, it was usually dismounted or unplugged, and this operation required more than two hours. The device proposed by the efficiency men has made it possible to avoid removing from the aircraft not only the control panel but also the other components. At present, the checking of the autopilot potentiometers during periodic regulation inspections takes no more than 20-25 minutes.

A basic diagram of the panel of the device for regulating the transmission ratio is shown in Fig. 1. It is made up of a signal transmitter (UZP-47) and an indicator of aircraft control surface deflection angles (the repeater of a DIK-46 [remote-indicating] compass).

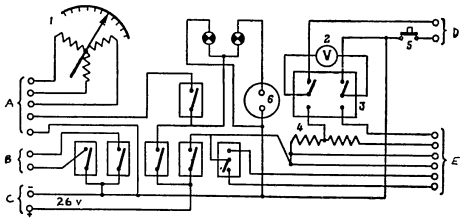


Fig. 1. Basic diagram of panel of installation for checking AP-5-2 autopilots: 1- Control surface angle of deflection indicator; 2- voltmeter; 3- 2PP-45 switch; 4- bridge resistance; 5- remote control button for pulse motor; 6- rosette for checking autopilot heating elements (A - to control surface deflection angle sensing unit; B - to PPS equivalent; C - power supply; D - to pulse motor; E - to actuator plug connection).

The UZP-47 transmitter is fastened to the control column at the point where the head joins the tube (not shown in the diagram). The slider, however, of the transmitter is linked with a rod to the rudder control pedals. If the pedals are immobile and are in the neutral position then the angle of deflection of the elevator is measured by the amount of displacement of the control column. When the control column is immobile and in the neutral position, the angle of deflection of the rudder is measured by the amount of travel of the pedals.

By connecting the rod from the UZP slider to the wheel of the control column at the bend of the right hand arm and by deflecting it, one can measure the deflection angle of the ailerons.

The tester is equipped with a PPS equivalent which makes it possible to unbalance the potentiometer circuit for longitudinal and transverse stabilization in accordance with a deflection of the vertical gyro axis by 10° in either direction from the neutral position.

All four PPS potentiometers are used in the equivalent. On each of them taps are made from the middle point at a distance corresponding to the deflection of the PPS axis by 10° from the vertical position. In regulating the transmission ratio, the equivalent is connected with the AP-5-2 circuit instead of the longitudinal-tranverse stabilizer. The lead-outs of the potentiometers are switched over with the aid of two relays.

Before all this work is performed the control surface deflection indicator is calibrated. For this purpose, using an inclinometer and a ruler the control surfaces and ailerons are deflected to the necessary angles and a table is drawn up on the readings of the DIK-46 repeater. On this table for each angle of control surface deflection there corresponds a definite reading of the instrument.

The attachment for checking the contacts of the potentiometer sliders in the autopilot components consist of an a.c. voltmeter with a copper oxide rectifier and a disc switch attached to the RSIU-3 pulse motor. It makes it possible to measure the voltage taken from the bridge circuit and the bias voltage in the control grid of the 6H8 tube of each cascade.

By the smoothness of motion of the voltmeter's pointer when the knobs on the panel are turned, when the aircraft's control elements are moved, or when there is precession in the PPS, it is possible to judge whether there is any contact between the slider and the winding of the potentiometer over the entire range of its travel. Whenever the contact is poor in any one segment, the pointer jumps.

The plug connection from the attachment (the disc switch) is connected to a seven-prong socket leading to the amplifier.

To the disc switch there are also connected two lead wires, the length of which is sufficient for connecting the voltmeter in the front and middle compartments. The disc switch is operated by the pulse motor.

When the button is depressed the voltmeter is successively cut into the diagonals of the bridge circuits and after that into the tube grids of each channel.

The sensitivity potentiometers are checked by successive rotation of the knobs ("balancing", "extent", "coordinated turn"), as well as by moving the control surface elements. The first three depressions of the button serve to check the potentiometers of the bridge circuits for the "bank", "course", and "altitude" channels, while the ensuing depressions serve to check the appropriate sensitivity potentiometers.

The installation makes it possible to regulate in the aircraft the middle position of the cam and the zero position of the potentiometer slider in the actuator feedback when the control surfaces are in the neutral position as well as the magnitude of the latter's deflection.

Truly the problems which our efficiency men are concerned with are unlimited. Let us take, for example, such an urgent problem as step-by-step check on the quality of periodic regulation work.

High-quality checking is always necessary, particularly in the case when mechanics have not as yet fully mastered combat equipment. In order to make sure that the most responsible operations are performed correctly, they have worked out in one of the units a plan for the various types of overhaul and the work of the specialists is checked against this plan. In addition to setting up a procedure for step-by-step checking, the plan specifies the problems assigned each specialist for the full working day and defines the required time.

Individual cases are known to aviation specialists when in checking aircraft equipment from malfunctioning airfield power sources, the airborne commutator apparatus has failed. Of special danger in this connection is the hook-up between the aircraft (one not equipped with an RPA-type box) and the mobile starter unit or the APA-7 [aircraft pre-heater] unit with the wrong voltage polarity. The fact is that, when the "battery" toggle switch is accidently turned on, a circuit is formed with two series-connected current supplies (aircraft and ground batteries) which are shorted.

In the unit where officer G. D. Lobiladze is in charge of the aircraft equipment specialists, an important place is devoted to checking on the condition of the starting facilities. In order to determine the correct polarity of the APA and the mobile starter units (ST-5), the efficiency men have built special testers (Fig. 2). Its design makes it possible to determine the presence of a cross-connection between the pole terminal and the fourth terminal in the plug rosette of the airfield power supply.

When carrying out periodic regulation work, it is very important to determine whether the parameters of the instruments and units being checked correspond to the technical specifications. But it sometimes happens that some of the irregularities manifest themselves in the periods between overhauls.

Why does this happen? After all, it seems that the mechanic who checks the instrument is an experienced specialist, that the task conforms with the technology, and the parameters of the instrument do not exceed the permissible allowances. Some group chiefs are apt to say that even though the readings of the instrument during checking are within the technical limits, one still cannot be absolutely sure that there will be no failures before the next scheduled overhaul. After all, this is not some simple mechanical part but rather an intricate instrument which defies penetration into its every component.

Such a notion is obviously erroneous. With a correct analysis of the results of checking aircraft equipment, in a great number of cases it is possible to foresee the possible failure of any instrument and to replace it in time.

It is known, for instance, that according to the technical specifications for the GU-1 gyroassembly of the DGMK-3 [distant-reading gyromagnetic] compass, the gyroscope drift in the azimuth should not exceed 3° in 5 minutes. This parameter allows us to judge indirectly the degree of unbalance in the gyro unit and the condition of its bearings. May we permit the gyro assembly to be used further if, let us say, the check indicates that over a five-minute period the gyro drifts 2.8°?

This question may appear strange at first. However if, in analyzing the previous measurements of this parameter, we discover that the drift of the gyro was at first constant and equal, let us say, to 2°, and that it then began to vary to 2.4° and later to 2.8°, we find that this instrument should be repaired even though technically it is still within the permissible limits.

If, on the other hand, it is permitted to be used longer, there is no guarantee that it will operate normally through the entire period between overhauls.

This example shows how important is systematic and comparative analysis of measuring the control parameters of instruments and components which are checked. For this reason records of the results of checking are best kept, not in common journals, but on individual cards for each instrument. Aside from the convenience of analysis, this type of record helps to improve the quality of checking on the condition of the equipment and to raise the level of personal responsibility on the equipment and to raise the level of personal responsibility of the part of the specialists who are performing the checking jobs.

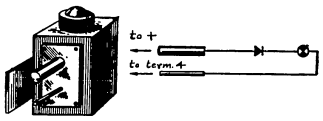


Fig. 2. External view of the tester and its electrical circuit.

The indicated method was adopted in one of the groups where the chief is officer A. A. Slizkoukhiy and it has justified itself completely. During the year there have been no cases of aircraft equipment failures for which the personnel of this group were responsible. In the final results of socialist competition, the group took first place and received the privilege of bearing the title of Outstanding.

The initiative of officers and their creative efficiency make for better utilization of equipment, reduce the number of failures, and economize on government resources. For instance, officer S. V. Podushko suggested substituting an ST-2-48B for the type ST-2 electric starter unit which is used for starting engines on trainer fighter aircraft. He showed that such a change not only improves the starting conditions but also reduces current loads; this has a beneficial effect on the operation and maintainance of ground -- and especially of aircraft -- electrical power sources. The possible number of starts provided for by aircraft batteries when an ST-2-48B is installed, is doubled. This suggestion will make it possible for industry to get away form the production of old-type starters.

We have dwelt on the work of only a few specialists who, efficiently, incisively, and satisfactorily, fulfilled their obligation and introduced foremost work methods.

The success of the work of the innovators depends to a great extent on supplying them in good time with the necessary materials and equipment and on the conditions under which they work. Indeed, we do not need amateurish work, but rather good, competently made and high quality installations, attachments, stands, etc. which may be used in servicing complex aviation equipment, which requires skillfull and precise handling.

In a number of examples we have shown the great effectiveness of intelligent suggestions which have been developed by innovators. However, there is not as yet daily concern for efficiency men and inventors in all the units. Here and there work is allowed to take its own course. Often the examinations of good suggestions is neglected for some time.

It seems to us that there is now a necessity to reexamine the present system of adopting the most complex and labor-consuming inventions and technical improvments. We cannot accept such a position when efficiency committees often occupy themselves with superficial reviewing instead of a profound and objective examination of a man's proposal.

The problem is this: to search out the most efficient methods of implementing and popularizing the suggestions of innovators, to make foremost work experience the property of all the specialists.

THE REPAIR OF PARTS MADE OF HEAT-RESISTANT MATERIALS

Engineer Lt. Col. V. A. GOROKHOV,
Engineer Capt. B. G. RYABENKO

The service life of a reaction engine is determined in the main by the magnitude of temperature stresses and resistance to heat of those materials which go into the manufacture of components of gas ducts (blades of the turbine and of the exhaust nozzle assembly, flame holders, turbine housing, etc.). After the engine's first service life, cracks are sometimes formed in these parts.

The parts are usually repaired by welding, but repair is made difficult by the fact that the majority of parts are made of heat-resistant steels or alloys possessing a high coefficient of linear expansion and low heat conductivity. As a result, the parts warp in welding and internal stresses are set up in the vicinity of the weld.

In addition to this, the surface of the heat-resistant alloys is covered by refractory chrome oxide and in order to obtain durable welds, a thorough preparation of the welding areas and the use of a flux are required. Finally, alloying components burn out to a large extent during welding, particularly chrome, which leads to a decrease in the heat resistance of the welded joints.

Until recently many repair shops have been using mostly acetylene welding. However, with this method the metal is heated comparatively slowly, which results in considerable warping of the material and granulation. As a result, the resistance to heat and fatigue of the welded joints decrease and this leads, in the final analysis, to the appearance of cracks in the weld and weld area.

We have an entirely different picture with electric arc welding. Here the metal is melted by the heat of an high-temperature arc, which results in a sharp increase in the concentration of heat and the zone of thermal action and the degree of deformation (warping) of parts are decreased. The long-term resistance and fatigue strength of welded joints obtained with electric arc welding are higher than they are with acetylene welding (Fig. 1). Productivity with electric arc welding is increased by 1.5-2 times.

Last year a team in one aircraft repair factory, changing over completely to this type of welding, achieved considerable economy and a sharp decrease in the percentage of rejects.

Gas flame brazing with heat-resistant solder also gives good results. Its advan-

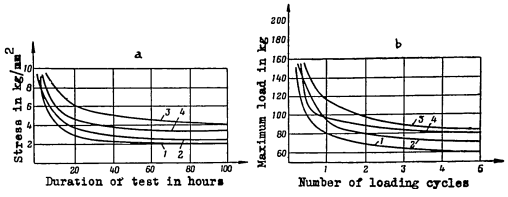


Fig. 1. Lasting heat resistance (a) and fatigue strength (b) of welded and brazed joints (number of loading cycles in millions): 1- acetylene welding; 2- electric arc welding; 3- brazing; 4- primary material.

tage lies in keeping the chemical composition of the material and its structure practically constant and is accompanied by only a small deterioration in mechanical properties. This method requires almost no equipment (a conventional welding torch is used). The method is highly productive, is distinguished by simplicity of the technological process, and makes it possible to obtain strong tight joints on parts having thin walls and parts of different wall thickness (up to 1:20).

The short-term resistance of brazed joints at temperatures of 20°, 600° and 800° as well as long-term heat resistance at 600° and 800° are not inferior to similar characteristics of primary material, while this resistance is 20-30% lower with welding (Fig. 1.). This is explained by the fact that the primary material is heated in brazing to lower temperatures than is the case with welding. Moreover, the brazing temperature of the majority of heat-resistant solders lies in the range of temperatures at which alloys are hardened to obtain large grain (1140-1200°) and, as is known, long-term heat resistance of many chrome-nickel alloys (for instance, EI-435) shows a marked increase after such hardening. At a temperature of 800° the fatigue strength of brazed and welded (eletric arc welding) joints is almost equal. At the same time, it is greater than that with acetylene welding. High fatigue strength of brazed joints is achieved through the form of the welds, which have smoother transitions to the primary material than do welded joints.

The smoothness of the form of brazed joints is attested to by the result of bench tests. Flame holders repaired by brazing were installed in an engine which prior to this underwent tests with holders which had not been subjected to repairs. The throttle characteristics measured before and after replacing the flame holders were within the

Brand of solder	Area of application
P-77	Brazing of parts manufactured of EI-435 and EI-602 alloys, working at temperatures of 500-800° in non-corrosive environments.
P-77-1	Same. When it is necessary to obtain welds with particularly smooth transition to the primary material or when brazing joints with extensive overlap (over 10 mm).
No. 22	Brazing of parts made of 1X18H9T steel, regardless of working conditions, as well as of parts made of EI-602 alloys working at temperatures of 500-800° in corrosive environments.
No. 27	Brazing of parts made of EI-602 working in conditions of high stresses and temperatures (up to 900°).

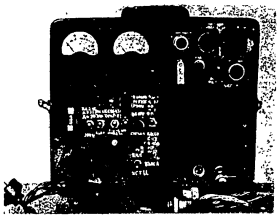
technical specifications. In this way, it was proved that with the brazing joints with an overlap weld, the engine's working parameters were practically unchanged, i. e. no separation of the gas flow resulted.

P-77, P-77-1, No. 22 and No. 27 solders are used to braze heat-resistant alloys. The range of their effective use, depending on the working conditions of the engine, are given in the table.

A PORTABLE CONTROL PANEL.

Efficiency men in our unit have manufactured a portable control panel to check electric parameters of various armament assemblies: bomb racks, electric valves, electric release mechanisms, camera guns, etc. In addition it is possible to check with the aid of this panel the proper operation of the signal circuits, the performance of contacts, electric motors, and 27v circuits. The assemblies are checked in the TECh [technical maintenance] groups as well as directly on the aircraft. To do this, it is sufficient to furnish a power source for the panel and to connect to it the assembly to be tested.

A rheostat circuit for regulating the voltage is used in the panel. Control instruments, a voltmeter, and an ammeter are mounted on the face side of the panel. For voltage measurements, check outlets are provided in the panel through which a voltmeter of any range of accuracy can be connected. The voltage in the panel is set



Overall View of Panel

according to a standard resistance, which insures great accuracy of measurement in checking the action of the operation of the drive.

All parts of the panel are assembled on a textolite board 4mm thick, mounted in a metal case. Fuses are provided in case of short circuiting in the equipment to be tested.

Guards Capt. of the Technical Services, S. A. Kemov.

* * *

The brazing is done with No. 200 flux which consists of 70% boric acid, 21% borax and 9% calcium fluoride. The part is heated with a normal oxyacetylene flame. For this purpose, a special multi-nozzle tip is used in the torch (Fig. 2).

The defects are removed by brazing on patches, with the damaged regions not always removed (depending on the character of the defect). Brazing of cracks without installing patches beforehand is impossible, since the cracks usually oxidize and catch dirt, and this has an adverse effect on the quality of the braze.

It is better to avoid butt-welds since these do not give equal strength between the braze and the primary material. To obtain the required strength, the material is joined with an overlap. The quality of the joint is visually inspected; a joint is considered satisfactory if it has a fillet in the region where the solder was applied as well as in the region where it ran out.

The reliability of repaired parts is increased also by the technological repair method. As is known from maintenance experience and experience in repairing engines of the VK-1 type, the greatest number of defects occur in the flame holder of the combustion chamber. This occurs because the holder material is subject to the action of a complex of different stresses, the foremost of which are the high temperature, variable thermal stresses, vibrational and repeated static loads. The temperature of the flame holder walls varies for instance between 400° and 950 °(Fig. 3), with possible increases up to 1150° for a short time.

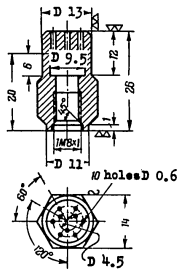


Fig. 2. Multi-nozzle tip for brazing.

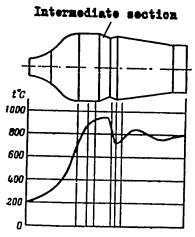


Fig. 3. Curve of temperature distribution along the axis of flame holder with the engine in operation.

The action of these loads, particularly of the variable thermal stresses, leads to fatigue damage of the material - above all in the region of maximum temperatures, i.e. in the first and intermediate sections.

Recently, a new defect has been observed in the intermediate section of many flame holders - the so-called burn-through of the material. This is diagnosed by a change in color (to brown), warping of the material, and appearance of thin cracks on the inner surface of the intermediate section.

In repairing flame holders with such defects, the damaged area of the intermediate section is usually removed and subsequently patches are welded on. The holders reconditioned in this way may be used only on engines with a 100-hour service life, since cracks can form again in the patch material after 100-120 hours of operation.

It is more advantageous to repair intermediate sections by butt welding of the inserts, which decreases the rigidity of the profile due to plasticity of welded seams. In this way the flame holders of two engines which have successfully completed long-term 300-hour bench tests have been repaired. In order to avoid appearance of cracks next to welded joints, these are filed flush and polished with an impregnated felt disc.

The greatest number of defects in flame holders is located in that section which faces the engine axis, i.e., where cooling conditions are poorer. With this in mind, engineers of one of the aircraft repair factories suggested that the bypass collar be relocated and in this way that the flame holder be rotated about its axis by 108° (Fig. 4). In this way, those regions of the flame holder which faced the engine axis and were subject to maximum thermal stresses are displaced to the region of more advantageous temperature conditions. The technology of modification of the holders is quite simple (Fig. 5).

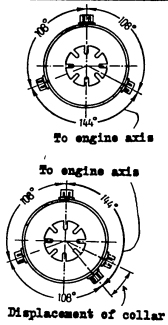


Fig. 4 Diagram of displacement of the bypass collar (a-position of flame holder prior to modification; b - after displacement of the collar).

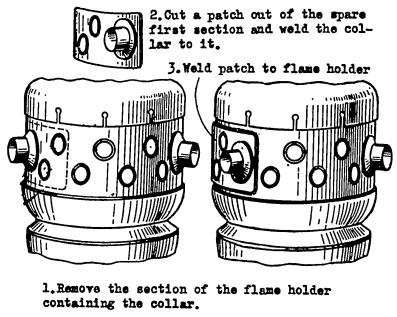


Fig. 5. Technology of repairing flame holders by relocating the bypass collar.

Also interesting is a different way of increasing the service life of the parts. The inner part of flame holders which have served a certain life span are coated with a heat-resistant enamel, brand EV-55. The enamelling process is not complicated and can be carried out in any repair factory. The flame holder undergoes sand-blasting prior to this. Then enamel is sprayed on it and the holder is dried at room temperature and fired in an oven at 1200°. As testing of such an engine showed, fewer cracks were formed on enamelled flame holders than on holders not subject to such treatment.

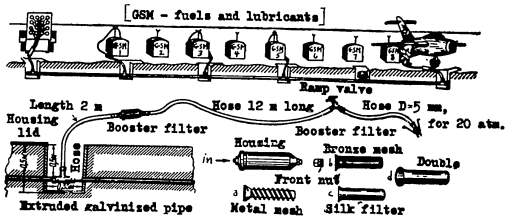
These are some of the ways of increasing the reliability and life span of parts manufactured of heat-resistant steels and alloys. These methods are not complicated and any aircraft repair factory can use them successfully without undue expenditures and can achieve in this way an improvement in the quality of their production.

* * *

A CENTRALLY-LOCATED AIR PRESSURE SYSTEM.

After a centrally-located air pressure system (see figure) proposed by officer M. G. Voronin was put into use in unit X, the time required to service aircraft for repeat sorties has been considerably cut down. Now this operation is carried out simultaneously with refueling. Here is how it works.

The fighter aircraft taxies to the service station after landing. Here the centrally-located air pressure system is is found. Bottles with compressed air are connected to it before the flights. Air hoses are kept in special housings. With such a method of servicing, work became much more convenient, and in addition, one man who was on duty at the battery of bottles was freed and the expenditure of compressed air has been reduced.



FROM THE EDITOR'S MAIL

ON COMPUTING TRUE SPEED DURING BOMBING

The crew carried out a bombing mission from a high altitude, at maximum speed, using the radio-technical system, and was given a satisfactory evaluation. It turned out that the navigator did not quite properly use the readings of the thin needle of the combined speed indicator (KUS-1200). He took the readings of the thin needle for the true speed of flight. Along with this, he made a considerable mistake on the bomb run which influenced the accuracy of range aiming during bombing.

It is known that the pressure of the outside air surrounding the plane is transmitted to the instrument through the pitot tube (PVD) which is mounted on a plane in a place where the flow of air is least distorted. However, at speeds in excess of 400 km/hr the airflow is distorted around the entire aircraft and even placing the PVD forward of the leading edge of the wing does not preclude distortion.

The error in the instrument readings arising from this is called an aerodynamic error. For the Il-28 aircraft the aerodynamic correction is taken as 7-10 km/hr and depends on the flight altitude and true speed.

Besides, in the case of the combined speed indicator - as it is true of any other instrument - there occur instrument and methodological errors.

The instrument errors are periodically determined and, for purposes of taking them into account, a graph is constructed. It is desirable to have in the aircraft a graph which combines the instrument and aerodynamic corrections.

The basic methodological error in using the KUS-1200 involves discrepancies between the standard temperature taken into account during the calibration of the instrument's scale and the actual temperature prevailing at the altitude of flight.

The temperature at the altitude of flight is determined by the navigator according to the outside air thermometer; yet one may not use this temperature for computing true flight speed, since the thermometer itself becomes heated by the flow of air and thus shows temperatures above the actual. Therefore it is necessary to add to the readings of the thermometer (with minus temperatures) a correction for the retarded flow which is indicated on a separate scale of the navigational rule (NL-10).

For example, if, during a flight with a true speed of 600 km/hr, the thermometer indicates a temperature of minus 30°, then the actual temperature is minus 40°, because the correction factor for the 600 km/hr speed is 10°.

By knowing the true speed and the altitude of flight as well as the actual temperature at a given altitude, it is possible to determine with the aid of the NL-10 the readings of the thin needle of the KUS-1200.

In order to speed up and facilitate estimating the readings of the thin needle for the assigned value of the true flight speed, one may recommend using in flight the table given below.

The V_{KUS} is computed in the following manner. From the table, for the selected V_{true}, one should - according to the temperature at the altitude which is indicat-

TABLE

for correcting V_{kus} for the difference in standard and actual temperatures at the altitude of retarded airflow

H of flight in m	V_{true}	Temperature at indicated altitude					
		0°	−10°	−20°	−30°	−40°	−50°
1	2	3	4	5	6	7	8
3000	500	503	512	523	535	547	560
	600	606	620	632	645	660	675
	700	712	728	742	759	775	784
4000	500	495	510	520	530	540	553
	600	600	610	624	638	650	668
	700	703	720	732	750	765	785
5000	500	490	500	510	521	533	546
	600	591	605	618	630	642	660
	700	695	706	721	738	753	772
	750	748	760	780	795	815	838
6000	600	585	597	609	621	635	650
	650	636	649	662	675	690	708
	700	685	700	713	728	744	763
	750	740	757	770	784	802	821
7000	600	576	589	600	612	627	641
	700	678	690	705	720	738	755
	750	730	742	758	774	790	810
8000	600	570	580	592	604	618	633
	650	620	631	644	659	672	690
	700	670	682	697	709	724	743
	750	720	732	749	763	780	800
H of flight in m	V_{true}	Temperature at indicated altitude					
		+20°	+10°	0°	−10°	−20°	−30°
500	600	603	614	625	639	650	664
	700	707	720	742	750	764	780

ed on the instrument - find the V_{KUS} and, taking into account, with the opposite sign, the instrument and aerodynamic corrections, assign to the pilot the speed in accordance with the thin needle of the KUS-1200.

By using this table, let us solve several examples which will show how the errors made in determining the true flight speed of the aircraft on the bomb run affect the accuracy of range aiming during bombing.

Let us assume that the crew must carry out a bombing mission, using practice bombs, with the optical bombsight from an altitude of 6000m and with true flight speed of 600 km/hr . After gaining the assigned altitude, the navigator took from the thermometer the reading of the outside air temperature (minus 30°) and, with the aid of the table, determined that the pilot should be assigned the speed according to the thin needle of the KUS-1200 equal to 621 km/hr (for purposes of simplifying the description we shall assume that the instrument and aerodynamic corrections are zero).

If the navigator fails to do this and the pilot maintains the 600 km/hr speed according to the thin needle, then the actual true flight speed will be 579 km/hr and the bomb will be deflected in range from the target by the magnitude of difference in lag. This will be 115 m.

Here is another example. A crew is assigned to carry out a bombing mission using practice bombs and employing a radio-technical system from an altitude of 9000 m with a true flight speed of 750 km/hr. On the bomb run, the pilot strictly held the thin needle in the 750 km/hr position, while at the same time the thermometer indicated minus 45°. Were the actions of the pilot correct? According to the table we determine that the navigator should have assigned - according to the thin needle - a speed of 780 km/hr. However, because the navigator did not do this, the actual true speed was not 750 km/hr for which the data was set into the sight, but 30 km/hr less.

For an altitude of 9000 m and a speed of 750 km/hr the lag is 4452 m while at the same altitude and with a speed of 720 km/hr it is 4205 m. By substracting the second lag from the first we will discover that the bomb will deviate from the target in range by a magnitude of 247 m (the characteristic time of bombfall is taken as 21.5 sec).

The above examples indicate that during bombing from an Il-28 aircraft, at any altitude inaccurate computation of the true flight speed of the aircraft on a bomb run will lead to significant range deviations of the bomb from the target. Therefore the navigator, by using either the table or the NL-10, must compute the speed which the pilot must maintain according to the thin needle of the KUS-1200 in order to improve the accuracy of bombing and increase the quality of crew bombing training.

Lt. Col. L. B. SLUTSKER

AIRCRAFT LANDING LIGHT BEAM ALIGNMENT

In the course of combat training, pilots quite often have to perform takeoff and landing on a strip not illuminated by runway floodlights. Under such conditions, it is necessary to align with especial thoroughness the beam of the aircraft landing lights.

An efficiency man in our subunit, officer B.I. Knyazhev, has suggested a method of aligning the landing lights which will insure illumination of the point of touchdown when the aircraft rounds out at a distance of 40-50 m.

Here is how this is done. The aircraft is placed on a level area (70 m in length) so that both its longitudinal and transverse axes are in the horizontal plane. The beam of the landing lights is aligned in such a manner that it focuses 50-60 m ahead and 2-4 to the side of the longitudinal axis of the aircraft. After this, the right landing light is rotated clock-wise, and the left counter -clockwise by 4°, which brings light spot of greatest intensity to a distance of 30-35 m.

As a result of this, there is no unilluminated cone ahead of the aircraft during taxiing, and during landing the light spot focuses at a distance of 40-50 m ahead.

Such a distribution of beams insures a high degree of precision in visual determination of the position of the aircraft at the time of roundout and facilitates the landing procedure.

Why then must the landing lights be turned 4°?

At the moment the main wheels of the aircraft touch the runway, the front wheel must be 200mm from the ground (see figure, segment BC). Moreover, in the course of lowering the "nose" of the aircraft there occurs a compression of the front strut by 200-250 mm (BD).

It follows then that:

$$\tan \alpha = \frac{DC}{AC} = \frac{450\,mm}{6677\,mm} = 0.0675,$$

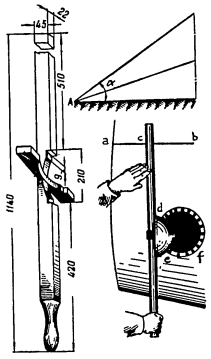
which corresponds to an angle of 4°. Here AC is the distance between the axis of the main wheels and the axis of the front wheel; α is the angle of rotation of the longitudinal axis of the aircraft after round-out; it is at the same time the angle of rotation of the landing lights.

For purposes of facilitating the alignment of the beam of the landing lights, the efficiency men of our group have suggested a special templet. The templet is placed against the extended landing light as indicated in the drawing. Along the seam of the skin of the middle cowling of the engine (ab) from the front edge to the left edge of the ruler a mark is made (point c) and the distance ac measured. The landing light must fit the indentation in the templet in such a way that the forward edge of the ruler will pass through point c. If the landing light is not aligned, then, when the templet is placed against it, it will not fit into the indentation. In that case we loosen the mounting screws and turn the landing light so that it is properly positioned. After this we make a mark on the landing light and the cowling by which we orient ourselves in the future.

Thus, essentially the method of aligning the landing lights with the templet consists in drawing a straight line through three points.

In the opinion of our pilots, such alignment fully insures the landing of the aircraft without using the runway flood lights.

[see figure on next page]



Engineer Lt. Col. I. G. NIKITIN

ADDITIONS ARE NECESSARY TO THE METEOROLOGICAL CODE

I think that the time has come when our country's aerological stations which sound the atmosphere should make computations of temperature variations from the standard atmosphere at altitudes of 10, 11, and 12 km. The data processed in the appropriate radio-meteorological centers must be broadcast over the radio along with other weather data obtained from vertical sounding. For this purpose we suggest introducing into the KN-04 code for transmitting the data of the vertical sounding of the atmosphere certain additions (Part VII). These additions may be as follows:

Part VII. 44444 $0n\Delta T\Delta T\Delta t$ $1n\Delta T\Delta T\Delta t$ $2n\Delta T\Delta T$ Δt,

where 44444 is an identification group which indicates that following it are the data about the variation of the temperature from the SA [standard atmosphere]; where 0, 1, 2 are the altitudes corresponding to 10, 11, and 12 km for which the data are being reported; where n is the sign of deviation which is coded: 1 - positive, 5 - negative; where $\Delta T\Delta T$ are the deviations of the temperature from the SA in whole degrees of Celsius; and where Δt is a tenth of a degree.

In our opinion it is useful to transmit over the radio facsimile telegraph a map of the deviations of temperature from the standard atmosphere at high altitudes. Because of this the quantity and precision of data will increase, since the computation for corresponding altitudes at aerological stations is taken from the processed radiosonde graph and is in itself a very simple operation. Besides, time will be decreased which is necessary for preparing the data for use in the operational work of the meteorological service.

Thus, for example, with the existing methodology the above data for the 03:00 hour period and the corresponding map are usually ready no sooner than at 10:00 - 11:00 hours and then not for all points. Therefore, for takeoff of an aircraft at 9 o'clock the information used is for 15:00 hours of the previous day, which decreases the quality of meteorological support of the flights.

Meanwhile, deviations in temperature from the SA for 03:00 hours for almost all of the points of sounding GAMTs [main air meteorological center] could transmit at 7 hours 40 min, which would make it possible to have the latest information regarding the distribution of temperatures at high altitudes by 8 o'clock.

We feel that the realization of our suggestion will increase efficiency in the work of the meteorological service and improve the quality of supporting high-altitude flights of present-day aircraft.

Engineer Capt. N. M. TELYSHEV.

REVIEW AND BIBLIOGRAPHY

ABOUT REGIMENTAL COMRADES

The first combat! I am writing about it many years afterwards when the acuteness of my impressions has been tempered by many subsequent battles and, even more so, by the passage of time. Yet almost every minute of this first mission is well remembered... "Finally," I sighed with relief, "today we shall meet with those who brought so much grief to us. We shall get even with the enemy. If only this moment would come sooner!"

This happened in the summer of 1941. Anatoliy Kozhevnikov, a former instructor at the Bataysk Flying School, then a junior lieutenant, was for the first time leaving on a combat mission. Since then, and till the end of the war, he made more than 300 sorties, conducted 69 aerial battles, and nearly a hundred times attacked enemy tanks, artillery, and infantry. Through the grim years of the war he went from Stalingrad to Berlin. There, in the skies over Berlin, Hero of The Soviet Union, Regimental Commander Maj. A. L. Kozhevnikov shot down his 27th Fascist plane.

About his first mission and many subsequent sorties, aerial battles, and men who fought beside him, Anatoliy Kozhevnikov now tells in his book Zapiski istrebitelya [Notes of a Fighter Pilot][1].

Immediately after the end of the war Anatoliy Kozhevnikov took up the pen. He began by assembling, recollecting, and writing down all that was interesting about his regimental comrades. Matters were such that the work on the book had to be interrupted several times. It was only several years afterwards that he returned to his notes. During this time, Kozhevnikov acquired new knowledge and had a different view of many things.

Now, when you read the "Notes of a Fighter Pilot", with the very first pages you can feel that they were written by a pilot and a commander...

War. Anatoliy Kozhevnikov, Nikolay Nesterenko, Mikhail Kruglov and other flight instructors have submitted requests for transfer to the front. And then they were in the Field Army.

The author does not exaggerate, nor does he color reality. Somewhat tersely, but with sufficient eloquence, he describes the aerial battles and heroic feats of the pilots, the victories and defeats. He describes what he saw all around him.

While reading the "Notes" one can vividly imagine the tense, heroic struggle of the Soviet soldiers, the complexity of the situation, and feel the bitterness of retreat.

1. Anatoliy Kozhevnikov, Zapiski istrebitelya [Notes of a Fighter Pilot], Military Publishing House of the Ministry of Defense of the USSR, Moscow 1959, 234 pp. Price 4 rubles 65 kopecks.

"Despite everything," Kozhevnikov writes, "we had faith... that we would return here once again... But if we do not return, others will - but they will be the Soviet soldiers, who will come as victors."

A great faith in victory over the enemy manifests itself in all of the deeds and actions of the characters in the book. The pilots of the regiment made eight to nine sorties a day, went into mortal combat with the enemy, who was numerically quite superior, fought valiantly, and caused the enemy to suffer great losses. And here is how the Soviet people worked in the rear areas meanwhile.

Vanya, the nephew of pilot Filatov, whom the author met in Moscow while en route to the location where the unit was being formed, was only fifteen years of age. Yet he took his father's place at the machine in the factory. Later his father perished at the front. With great enthusiasm, Vanya told Kozhevnikov how, during every shift, he assembled a number of sub-machine guns above the prescribed norm, of the Komsomol members in the factory, of how they worked at the machines three shifts straight.

Love and devotion toward their Socialist Motherland led the Soviet people to perform feats in the name of victory over the enemy.

From the pages of the book emerge the personalities of outstanding Soviet pilots, technicians, and mechanics who were reared by the Communist Party.

There vividly comes to mind Ivan Askirko, a quick, agile, and hot-tempered man who was always longing to be in action. During one of the battles near Yassy, Askirko's plane caught fire and he was captured.

"What is the mission your group is carrying out?" the German colonel asked him during the interrogation.

"Striking at the Fascists", the pilot answered without hesitation.

To all the questions about the number of the regiment and division, the pilot gave no answer. Then the Fascist ordered the prisoner's hands untied thinking that thereby he would predispose him toward the Germans. However, Askirko remained silent.

"Are you a Communist?"

"Yes, I am."

"Are you going to answer my questions?"

"No."

No threats nor torture could force the Soviet pilot to violate his oath. The very same night, having stunned a German sentry, Askirko made an unsuccessful attempt to escape. He was sent to a camp. En route, he jumped out of the window of the moving train, but again he met with failure. Again and again Askirko made attempts to escape. The Gestapo men cut off his hand. Yet he escaped for the fifth time, this time successfully. Askirko returned to his regiment and, until the end of the war, served as squadron adjutant.

Before the reader there also appear men like Orlovskiy - even-tempered and robust, determined and steadfast in battle; or the young and valiant pilot Dyrkin; or the industrious aircraft technician Vasil'yev; or the industrious and happy armorer Zakirov.

From the "Notes" one learns of many pilot-heroes. Each one of them has his own - and at the same time common - difficult and heroic lot intimately tied with the fate of our people. Their noble struggle for the freedom and independence of the Socialist Motherland wins and thrills the reader.

Convincingly the author tells about the power of the collective and of comradely

help. The reader will find in the book much that is useful and instructive.

When reading the "Notes" one is made keenly aware of the fact that the Soviet Army throughout the war was opposed by a strong and treacherous enemy. It was not easy to strike at an objective or knock down an enemy plane. Success was decided by the unparalleled heroism of Soviet pilots, their skill, and knowledge of tactics. These qualities of our fighting men manifest themselves in full measure in pictures of aerial battles, raids against enemy airfields, troop columns, etc.

With skillfully selected strokes, Kozhevnikov paints the pictures of his regimental comrades, the combat environment, and the life at the front.

Anatoliy Kozhevnikov has written an interesting book. There is no doubt that the aviation reader will receive it with great satisfaction.

Col. S. M. FEDOSEYEV

AVIATION ABROAD

THE TRAINING OF NAVIGATORS IN THE US STRATEGIC AIR FORCE

(According to information in the foreign press)

Navigators are trained for the US Strategic Air Force in four special schools which are part of the educational program for training Air Force flight personnel.

The majority of trainees starting a course at the navigator schools are commissioned officers who received their commissions in Air Force reserve officer schools. Trainees who have successfully completed the schools are designated air navigators and are assigned to the educational program for crew training.

The navigators selected to serve in strategic aviation are trained on a B-47 aircraft at McConnell AFB (Kansas). It was reported in the press that Air Force bases are being set up in the states of Arizona and California to train crews for the B-52 and B-58 bombers.

The theoretical principles of air navigation and the technical facilities for navigation, bombing, and aerial photography are studied in special schools for basic training.

The schools for crew training emphasize to a great extent combat training.

Team-work among crew members is practiced carefully in solving various navigational problems, in reconnaissance, in bombing, and in firing rocket missiles of the "air-to-ground" type. During the time that he spends in the school, the young navigator becomes a professional.

The Curtiss-Wright ground trainer is used extensively for crew training and the navigators are trained on it in navigation under adverse conditions.

Celestial orientation is practiced on a D-2 trainer which is spherical in design and which reproduces artificially 31 constellations of the Northern Hemisphere. Thirty men can train simultaneously on this trainer.

In 1954 an Air Force Academy was founded in the USA in the vicinity of Colorado Springs (Colorado) for training navigator specialists. Specially privileged young men between the ages of 18 and 22 years of age are accepted in the Academy on recommendation of cabinet members, senators, and important military leaders.

After four years of training in the Academy the students receive the rating of an air navigator, the highest type of training in the liberal arts (mathematics, physics, chemistry, philosophy, international relations, and literature), as well as excellent physical training. Every year the Academy graduates 250 men, most of whom enter the strategic aviation service as navigators for bomber and reconnaissance aircraft.

"The need for organizing an Air Force Academy," writes A. Brophy in his book,

"was determined back in 1948".[1] The now President of the US, General of the Army Dwight Eisenhower - who at that time was the president of Columbia University - personally took part in organizing the Academy.

The "necessity" of organizing such an academy is explained by the aggressive policy of the ruling circles of the USA which are attempting to ensure for American imperialism world domination by the use of military force.

For implementing this aggressive policy, in 1945 when, on 6 August for the first time in the world, an atomic bomb was dropped on Hiroshima from an American B-29 aircraft, there was born in the USA the idea of creating a strategic Air Force. This idea was realized. In 1946, after the reorganization of the continental Air Force at Bolling AFB (D.C.), there was created a Strategic Air Command (abbreviated SAC), which at the present time includes up to 40% of all the aircraft in the USAF.

In 1948 Gen. Curtiss LeMay was appointed commander of SAC. At that time he stated: "We must create a powerful strategic Air Force and for this purpose we need talented Air Force cadres. We need as many gifted young men as possible and for this purpose we must somehow attract them."

The training of navigators in line units of US strategic aviation is carried out within aircraft crews. Promotions, monetary rewards, extra vacation time, merit certificates, trophy prizes - i.e., a whole system of incentives and encouragements has been worked out as applied to the crew as a whole, depending on its successes. If it for some reason loses its leading place it also loses its privileges. Individual promotions in the service also depend on how the crew qualifies.

The crews of the Strategic Air Command of the USA are divided, according to their level of training, into "select", "lead" and "combat-ready" crews. The best trained and coordinated crews, after passing tests for definite standards of air navigation and bombing, receive the "select" rating. Every 3-4 months they are given tests at which time the crew must measure up to this rating. Otherwise it is demoted from "select" to "lead".

In the training of navigators for US strategic aviation there is a number of special features. The first of these is intensive training in flights for maximum range with in-air refueling.

Therefore the navigator of SAC aircraft must know "world geography" and be able to navigate an aircraft over any region of the globe.

In his book "SAC: The Strategic Air Command" R. Hubler tells of a flight made around the world in 1957 by three B-52 crews. "The flight had two aims: the first was to create a definite impression on the world of the B-52 and to demonstrate the global capabilities of strategic aviation; the second was to drop an imaginary bomb on an imaginary target, the location of which is still a secret but which was somewhere in the region of the Malay Archipelago."[2]

Taking advantage of its connections through various aggressive military alliances, US strategic aviation flies over most of the world. In recent years the military leaders in the USA have been trying ever harder to win Arctic regions which

1. A. Brophy. "Voyenno-vozdushnyye sily SShA" ["The Air Force", New York, 1956]. Translated from the English. Military Publishing House of the Defense Ministry of the USSR, Moscow, 1957.

2. Richard Hubler, "Strategicheskoye aviatsionnoye komandovaniye" [SAC: The Strategic Air Command], Duell, Sloan and Pearce (USA), 1958.

closely adjoin the northern borders of the USSR. In order to study the special features of air navigation in the Arctic a great number of flights are carried out from airfields located in Canada, Greenland and Alaska.

The second peculiarity of navigator training in US strategic aviation involves teaching the navigators the methods and tactics of bombing actual targets which are similar in "topography" to targets in the USSR and in countries of the Socialist camp.

"Almost every large US city," R. Hubler's book states "serves at some time as a target for bomber training missions of strategic aviation... New York is an easy target for a bombing attack since there are many bodies of water on its territory; on the other hand, Denver in the state of Colorado, or Birmingham in Alabama, is difficult to hit under adverse weather conditions because of hazy outlines. Such interior areas are difficult to identify and hit without good landmarks. And yet it is necessary to use them for training purposes, since they characterize targets located in Russia. It is necessary to use these cities for training under the most adverse weather conditions, since - according to information - the most important Soviet targets are 60% obscured by cloud covers most of the twenty-four-hour period. Only 20% of the bombing missions made by strategic aviation is carried out by using visual reference; the rest are accomplished by radar..."

In the opinion of US military specialists, training in bombing methods and tactics over actual targets is much more effective than training over bombing ranges.

The results of bombing missions against actual targets are checked with the aid of a radar installation set up in the target area which makes it possible to determine constantly the aircraft's coordinates from an initial range of from 100 to 160 km. Special auxiliary installations in conjunction with the radar installation determine the ground speed and the drift angle of the aircraft from its changing coordinates. Twenty seconds prior to "bomb release" the bomber sends a radio signal. It actuates the mechanism of the computer which records the aircraft's track on tracing paper placed over a map. After the "bomb release" which is recorded by a pulse from the electric bomb release mechanism, the point of its "impact" is fixed on the tracing paper. The location of this point is calculated by a computer from the automatically measured ground speed and drift angle, as well as by the bomb's time of fall and the trail for the practical bombing altitude and airspeed set into the computer.

The bomb deflection from the point of "impact" relative to the target is the bombing error. The continuous change in the aircraft's coordinates on the bomb run makes it possible to trace automatically (with the aid of the appropriate apparatus) the aircraft's track. The nature of this line makes it possible to see the bomber maneuvers in the course of sighting and this enables one to analyze the performance of the crew and to discover the causes of errors.

The third peculiarity is the training of navigators for strategic reconnaissance planes which comprise approximately 12% of all combat planes in the Strategic Air Command of the USA.

A navigator in a strategic reconnaissance plane must be able to determine accurately the coordinates of objectives and characteristic check points on the flight route to these objectives under various conditions.

For strategic reconnaissance, use is made of obsolete B-47, B-52, and B-58 bombers which, in place of bombing equipment, carry special reconnaissance

apparatus for determining the coordinates of the objectives, for photographing terrain, for spotting electronic AA defense facilities, etc. Since 1952 there has been held an annual six-day competition in aerial reconnaissance in the US Air Force. Every navigator taking part in such a competition must perform an exercise in celestial navigation and in photography with the aid of an airborne radar station and illuminating bombs. On the basis of reconnaissance results a graphic report is drawn up on the objective and its surrounding area. In readying the materials, besides the navigator and photointerpretation specialists, topographers, artists, and model-builders are brought in. These men systematize the collected material on an objective, supplement the maps, and compile "top secret navigational material".

In hatching their aggressive plans the military leaders of the USA are striving now even in peacetime to reconnoiter important objectives in the USSR and countries of the socialist camp and to obtain photographs and radarscope films of them. With this aim in view American aircraft have frequently violated the airspace of the USSR, China, and European socialist countries. Harry Ransom writes frankly about this in his book "Central Intelligence and National Security" published in the USA in 1958.

Richard Hubler speaks with especial frankness and unconcealed cynicism about preparations for war against the USSR. "Strategic aviation," he writes, "has more than 2.5 million sources of information, beginning with German photos of Russian cities taken during WW II and ending with our own data collected by the intelligence and information service. If all this material were combined we would obtain immediately a map of targets earmarked for destruction by US strategic aviation."

In March of this year the Strategic Air Command of the USA will be thirteen years old and during all these years the military leaders of the USA have been readying strategic aviation as the primary striking force in war against the Soviet Union and countries of the socialist camp.

The United Press International Agency reported (February 1959) that the Strategic Air Command of the USA was "reorganizing" its chain of air bases scattered throughout the world, "developing a new deployment program so as to save minutes in the attempt to get its bombers into the air as soon as possible..."

From information in the American press and statements made by responsible military leaders, it is quite clear that, continuing the obviously bankrupt "from-a-position-of-strength" policy, the ruling circles in the USA intend now to continue in the path of preparing for atomic war. Therefore the men in our Air Force must constantly bear in mind the intrigues of the warmongers and strengthen unceasingly the combat readiness of their units and subunits.

Maj. Gen. of the Air Force, V. I. SOKOLOV

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BRIEFLY ON MISCELLANEOUS SUBJECTS

The Most Exact Time

Before every flight pilots and navigators check the clock. Every hour signals of the exact time are transmitted by the Moscow radio. Time is now determined with the help of the so-called quartz clock. This clock, however, is not an absolute standard and therefore more precise regulation by astronomical data is required. But how can the accuracy of the display of standard time for control be improved?

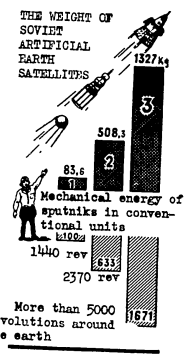
Soviet scientists have developed an original new device - a molecular generator. It is based on the property of ammonia molecules to radiate the energy of electro-magnetic oscillations when these molecules are excited in a special resonator cavity. These very molecules of ammonia which produce oscillations in the molecular generator serve as a pendulum in the master clock.

Calculations have shown that such a standard has an accuracy of not less than ten to the ninth power (0.000 000 001).

If this clock were to operate for 100 years without interruption its deviation from the absolutely exact time would not exceed a few seconds.

Aircraft in a Package

In 1935 a group of Moscow aircraft designers, for the first in the world, built an inflatable single-place glider which successfully passed flight tests. It could be folded into a compact package. The achievements of contemporary science and technology make it possible to construct inflatable aircraft of rubberized cloth. Its weight is many times less than the weight of an aircraft built of conventional materials and designed for the same wing loading.



Why the Sky is Blue

The blue vault of the heavens is the thick layer of air illuminated by sunrays. We know from physics that the white solar light comprises rays of all colors - blue, red, yellow, and green. When these rays encounter the finest particles (molecules) of the air, they are reflected by these particles in different directions (they are dispersed). And since the blue rays are dispersed more strongly than the red ones, the dispersed light acquires a blue coloring.

Do You Know?

That one ton of plastics does duty for about three tons of non-ferrous metals.

* * *

That a parachutist, who has jumped out of the basket of a balloon, during the first two seconds of free fall feels practically no air resistance. Consequently, his weight is equal to zero. The resistance of the ambient air gradually increases and in the twelfth second the parachutist's weight becomes normal.

* * *

That an aircraft, which at the pole weighs 10,000 kg, when orbiting the earth at a speed of 1000 km/hr in the direction from west to east "loses" over the equator 100 kg because of centrifugal forces.

MEETINGS WITH THE EDITORS

A Discussion of Flight Safety

The meeting was attended by representatives of aviation units, sections of the Air Force Combat Training Administration, instructors and teachers in various departments of Air Force academies, and members of scientific research institutes of the Air Force.

Many of the participants in the conference were familiar to others because of their active work in the magazine. For example, Maj. Gen. of the Air Force A. I. Khalutin recently published his article "Teaching Cadets to Overcome Difficulties". Major Gen. of the Air Force V. I. Sokolov is known as the author of many articles devoted to the navigational service. Guards Col. A. D. Yakovlev is familiar to the readers as the commander of an air regiment, deservingly considered one of the best in the Air Force. In the twelfth issue of last year a detailed account was given of the instructional experience of his work.

Now these men assembled in the editorial office. The conference immediately took on a businesslike atmosphere. The men spoke specifically about each article: this one was good, that one was weak and had such and such faults. The following articles were found to be good: Ye. V. Sukhorukov's "This Must not be Neglected", L. V. Vorob'yev's "If the Pilot Made a Mistake", N. Ya. Kondrat'yev's "Orientation is Lost. Why Did This Happen", A. I. Aleksandrov's "Double Checking is Necessary", I. I. Khnykov's "The Pilot First Class", as well as many others.

The articles by N. F. Zhuravel' "If the Gyrohorizon Fails in Flight" and by I. M. Stamm and I. V. Tarasov "Training Masters of Precision Bombing" were criticized for individual faults. The first was criticized for lack of clarity in exposition, and the second for superficial evaluation of the work done by the men.

However, the participants in the conference did not limit themselves to the evaluation of the work performed by the editorial staff. Their interesting discussion touched on many of the topics connected with direct participation by officer-instructors in the active campaign for flight safety.

A series of interesting points were raised by Military Pilot First Class, unit commander Col. P. Ya. Silin. He expressed his views concerning the generalization of experience in accident-free flying and gave useful advice on how best to describe the work of flight controllers.

No less interesting was the statement of Hero of the Soviet Union Col. I. A. Danil'chenko, who stressed the necessity of studying in detail the experience in units with average indices.

Officers and generals spoke one after another. Each had his own comments and suggestions. In addition to unit commanders, inspector pilots, and instructors, the engineers also took part in the work of the conference.

The engineer of an aviation regiment, V. Ya. Fishelev, who spoke at the conference, devoted a great part of his statement to experience in popularizing the magazine among the personnel.

The meeting with the aktiv of authors contributing to the magazine transpired in a businesslike atmosphere and was of great benefit to the editorial staff.