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Intelligence Information Special Report

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COUNTRY USSR

DATE 29 May 1975

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SUBJECT

MILITARY THOUGHT (USSR): Fighter Aviation in the Front Air Defense System

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Fighter Aviation in the Front Air Defense System

by

Colonel General of Aviation I. Pstygo

Of all the tasks performed by front fighter aviation, the cover of front troops and installations is the most important and responsible. The special features of using fighters in accomplishing this task will be determined, on the one hand, by the nature of enemy air operations, and on the other, by the role and place of fighters in the overall front air defense system.

If we proceed from the fact that troops and installations located in a tactical zone are destroyed primarily by enemy ground forces means, the principal efforts of his tactical aviation will be directed mainly at destroying installations in the operational depth. In this case, about 25 to 30 percent of his aviation forces may be used in strikes against second-echelon troops and installations at a depth of 40 to 150 kilometers, and up to 60 to 70 percent of them may be used against installations at a depth of more than 150 kilometers. In the tactical zone, only five to ten percent of the tactical aviation forces will be expended to destroy ground air defense means and control posts.

The great numerical strength of the tactical and carrier aviation of the probable enemy, and their ability to carry out surprise and powerful strikes against front troops and installations (especially under the conditions of nuclear war), bring the task of defeating the opposing aviation grouping to the forefront. Strategic and front rocket troops, as well as long-range and front bomber and fighter-bomber aviation, undoubtedly will be assigned to accomplish this task. However, we should not rule out the fact that by the time our strikes are delivered, a large part of enemy tactical and carrier aviation will already be airborne. In that case, the main burden of combatting it will fall on field air defense, which, to a considerable extent, will predetermine the success of all subsequent ground forces actions.

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Combined-arms and tank large units currently have a rather considerable number of ground air defense means available. But this, as

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research has shown, is still not enough for resolving the problems of the air defense of troops as a whole.

The problem is that the field air defense system is made up of a large number of elements which organically belong to ground forces subunits, units and large units. This unavoidably results in a dispersal of air defense means whereby the greatest number of surface-to-air missile and antiaircraft artillery systems are located in the large units of the first echelon of armies, that is, in the tactical zone, thereby creating a comparatively narrow air defense barrier with a uniform "field" of ground antiaircraft means. But the installations located in the operational depth are protected, as a rule, by a small number of air defense means subordinate to an army and front. Thus, in order to reach these targets, the air enemy will have only to overcome the air defense countermeasures of the first echelon of troops (that is to penetrate only some 30 to 40 kilometers into our territory, which corresponds to two minutes of flight), having used in the process the most advantageous form of movement, primarily low-altitude flight.

At the same time, the majority of the radar sights of our antiaircraft and artillery systems have about a 100-meter lower limit of operation against the flight altitude of a target (and over rugged terrain, higher than 100 meters); thus, the probability of destroying air targets at lower limit altitudes is 0.1 to 0.2. Organizing countermeasures against the air enemy at altitudes lower than these requires surface-to-air missile and antiaircraft artillery systems whose sights (homing heads) would operate in the infrared or optical spectrum. But these systems cannot, of course, have much range (not beyond two to three kilometers), therefore they have to be used as a mass air defense means.

If, in due course, we will have succeeded in saturating the entire territory of a front with the required number of such systems (calculated to create a continuous kill zone at extremely low altitudes), the enemy will seek other ways of overcoming our air defense. He may attempt to "punch through" a corridor, having destroyed or neutralized the mass air defense means on the required axis. It also is no less probable that the enemy will overcome air defense at high altitudes. To come to the point, this tendency already has been noted in actual US air combat operations in Vietnam, where tactical aircraft sometimes fly toward their designated targets at high altitudes, since low-altitude flights (especially at supersonic speeds) hamper target location and reduce the accuracy of air strikes.

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At present, field air defense can oppose enemy air attacks at high altitudes only with medium-range systems, the proportion of which (in number of target channels) in the grouping of front air defense forces does not exceed ten to twenty percent.

With this correlation of the means of destruction, for an unobstructed penetration to targets at high altitudes it is sufficient for the enemy to destroy a relatively small number of these systems, or neutralize them by jamming.

Especially difficult conditions may arise for field air defense in a massive enemy air raid in a narrow sector (in the combat actions zone of one of the armies of the first echelon of the front). In that case, up to 60 to 70 percent of the entire front grouping of air defense forces and means will in no way be able to participate in repelling the attack. Enemy tactical aircraft, finding themselves face-to-face with field air defense and skilfully maneuvering by axes and altitudes, will be able to overcome its countermeasures with a minimum diversion of their own forces to operate against ground air defense means.

This brings us to the conclusion that air defense, if not supported by highly maneuverable (by axes) and universal (in terms of altitude) means, which fighter aviation is by nature, will not be able to reliably cover front troops and installations against enemy air strikes (just as fighter aviation, for a great number of reasons, cannot by itself carry out this task without front air defense troops).

Meanwhile, this seemingly indisputable thesis is not recognized by all generals and officers. Thus the work, "Problems of Developing the Air Defense of Ground Forces and Ways of Solving Them", published a few years ago, indicated that with the introduction of surface-to-air missile systems into the armament of ground forces air defense troops, fighter aviation is losing its significance as an effective air defense means and in the near future will become unnecessary. Fighter aviation has been represented in the statements of several authors as a secondary means, suitable only for disorganizing enemy aviation combat formations to ensure favorable conditions for the activities of ground air defense means.

It seems to us that such assertions can be made only as a result of an insufficiently thorough appraisal of the combat capabilities of fighter aviation and an overestimation of the capabilities of surface-to-air missiles and antiaircraft artillery in the air defense of a front. To corroborate this we will take the article "Some Results of Research with

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the Help of the URAL-2 Computer of the Combat Capabilities of Groupings of Surface-to-Air Missile Units".* It contains computer data on the combat capabilities of a grouping of air defense troops in the zone of a combined-arms (tank) army, according to which the mathematical expectation of the number of destroyed enemy aircraft was 127 out of 136 participating in the attack. Such high effectiveness of an air defense grouping could be obtained, we are deeply convinced, only by means of an artificially created air situation. The enemy air attack was organized in such a way that the surface-to-air missile systems would be in the most advantageous circumstances for displaying their combat capabilities; not one target (in the accepted attack pattern) flew at an altitude of less than 500 meters. Contrary to known data on the structure of an air attack by the probable enemy, 65 percent of the targets flew at altitudes higher than one kilometer. The attack was planned for two waves of 20 to 35 minutes duration, each with a ten minute interval between them. With a total number of 65 targets, this allowed (given the grouping of air defense forces created) firing repeatedly at each target.

The conditions which were assumed for the functioning of the grouping of air defense forces and for controlling their combat operations were ideal: the calculations for warning, target designation, and determination of flight parameters of targets had no errors introduced into them. But all this obviously does not correspond to practical experience. To be convinced of this, it is sufficient to analyze the results of a number of joint exercises of air defense troops and front aviation conducted in 1966 and 1967, during which the field air defense radar system made flagrant errors in target designation and in tracking air targets.

As can be seen, idealizing the conditions for the combat use of groupings of air defense troops and not taking into full account the experience of exercises, unwittingly leads to overestimating the effectiveness of ground air defense means, and can create for combined-arms commanders and air defense chiefs the dangerous illusion that they can reliably cover front troops and installations with ground air defense means alone.

We think that modern air defense of front troops and installations must be based on highly maneuverable, missile-carrying fighter aviation and surface-to-air missile and antiaircraft artillery systems. Only the skilful combination of their peculiar combat capabilities will permit creating a reliable, stable, economically feasible, and tactically flexible air defense.

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*Information Collection of Ground Forces Air Defense Troops, 1966. No. 15.

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What, in our view, must be the principles of organizing the use of these active air defense forces and means?

Organizing the combined combat use of fighter aviation and surface-to-air missile and antiaircraft artillery systems consists primarily of creating a single system for their actions, on the basis of an efficient operational structure of the grouping and rigid centralization of control.

Research and the experience of special exercises in combining fighter aviation with field air defense testify that structuring front air defense forces and means into three echelons best satisfies the requirements we have indicated.* The first echelon is intended basically for the destruction of low-flying enemy tactical aircraft breaking through to targets in the operational-tactical and operational depths. This task is carried out by surface-to-air missile and antiaircraft artillery subunits and units of tank (motorized rifle) divisions which are in armed contact with the enemy, and also by fighters from the status of airborne alert over their troops. The second echelon serves for the destruction of enemy aircraft at high altitudes and in the stratosphere. It is made up of surface-to-air missile units of army subordination, and fighters in the high altitude zone of airborne alert. The third echelon is intended for the destruction of individual aircraft and small enemy aviation groups breaking through to targets in the front rear area. It is composed of fighters operating from airfield (and, in some cases, also airborne) alert status, as well as surface-to-air missile and antiaircraft artillery units and subunits directly covering important installations in the rear area of the front.

This operational structure of front air defense forces and means creates a firm basis for organizing the combined combat operations of fighter aviation and ground forces air defense troops according to a common concept. It also ensures continuous air defense combat readiness to repel air attacks; the continuity of strikes against the combat formations of the air enemy throughout his attacks in the entire depth of the operational disposition of front troops; the destruction of enemy aircraft before their breakout to the operational targets; and the massing of the forces of air defense means depending on the intensity of the attack, the axes, and the altitudes of the air enemy operations.

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*Collection of Articles of the Journal "Military Thought", 1968, No. 3 (85).

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In developing the concept of combined fighter aviation and field air defense combat operations, we should take into consideration the comparatively even distribution of surface-to-air missile and antiaircraft artillery positions in the front (especially in the first echelon of the operational disposition), as well as the circumstance that most of them are constantly ready to open fire. This creates the conditions for an economical expenditure of fighter aviation forces during periods of echeloned actions of the air enemy, when individual targets and small groups of aircraft may be destroyed by ground air defense means, while fighters on alert in the zones, with their limited forces, will be used only against concentrated targets which, because of their composition, cannot be completely destroyed by the fire of ground air defense means. The main forces of fighter aviation at this time are at the airfields in readiness for immediate take-off. Only after a high probability of the transition by enemy aviation to massive operations has been determined from intelligence data or the nature of the developing situation, or in instances of suddenly increasing density of attack, will fighters have to take off from the airfields immediately to augment the forces on dangerous axes, since field air defense in these conditions will not yet have been able to repel the attack alone.

In essence, the observations made here express the basic principle of the combined use of field air defense and fighter aviation, which may be stated thus: ground air defense means can ensure continuous and reliable cover of troops on a wide front only as long as the density of the attack by the air enemy in a certain sector of the front does not reach any critical magnitude, which fully exhausts the combat capabilities of the field air defense means in fire performance. A further increase in the density of an attack requires committing to action fighter aviation which can concentrate the necessary forces on dangerous axes and altitudes in a short time. In other sectors of the front, cover must be afforded as usual by field air defense means with limited fighter participation.

In all cases the main forces of fighter aviation must be used massively and only in those situations when ground air defense means cannot repel an air attack independently.

The above principle of the combined use of field air defense means and fighter aviation permits solving the problem of actually coordinating them during an operation. The status of the combat operations zones of surface-to-air missile units and of the lines of fighter interception of air targets through various combat operation methods, should be c[illegible] specific initial data in this respect.

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Fighters destroying the jammers and disorganizing the enemy tactical aviation combat formations over his territory, coordinate with surface-to-air missile and antiaircraft artillery units by zones. But this most simple coordination method is complicated by the fact that fighters proceeding to areas of independent search and returning to their own territory, must fly over the combat operations zones of our own air defense means. Therefore measures must be taken to secure them against possible fire by our missiles and antiaircraft artillery.

To prevent our aircraft being fired at by ground air defense means, a number of authors propose that aircraft fly over the combat operations zones of surface-to-air missile and antiaircraft artillery units only in specially designated corridors. But this sort of recommendation, it seems to us, does not fully take the possible adverse consequences into account. To be convinced of this we have only to examine the nature of fighter-bomber maneuvers to overcome enemy air defense countermeasures (Sketch 1). This maneuvering begins while still over our territory, 30 to 40 kilometers from the front line, and continues throughout their flight over the combat operations zones of the first-echelon air defense units (in the zone of one or two motorized rifle divisions), and then continues over the positions of the enemy air defense means. The question is, where in that case must the corridor be and what are its dimensions? If such a corridor is contemplated anyway (let us say in the zone of one of the divisions), it first of all will result in great losses to our aviation, the antimissile maneuver of which will be fettered by the limits of the corridor. Secondly, the enemy, having observed the designated corridors, will be able to use them for his aircraft to penetrate our territory with impunity.

A radical departure from this is to mount identification equipment on all surface-to-air missile and antiaircraft artillery systems, without exception. The requirement for such equipment becomes even more acute when coordinating fighter aviation and surface-to-air missile units (antiaircraft artillery) in one zone, when their efforts are spread out among the targets or concentrated on one grouped target. And this method of coordination, as experience shows, is the main one under front conditions. This is explained by the fact that the fighter airborne alert zones in the first and second echelons of the operational disposition of air defense means are located over the positions of the surface-to-air missile battalions, where the standing patrol fighters are located beyond the range limits of the Hawk surface-to-air missiles (at low altitudes in the first echelon) and the Nike-Hercules surface-to-air missiles (at high altitudes in the second echelon).

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Considering that our fighters will have a certain disruptive influence on the actions of our surface-to-air missile units, it would be desirable to move the fighter alert zones beyond the rear boundaries of the combat operations zones of the surface-to-air missile units. However, in this case the depth necessary for developing an air battle is not provided. The problem is that the lines of interception of the designated positions of fighter airborne alert zones are located approximately over the front line. Fighters carry out only the first attack on these lines of interception. If they are not successful in the first attack on an individual target or in intercepting a group of enemy aircraft, the air battle shifts into the depth of our own territory. If we assume that in the actions of a pair of fighters against a group of four or five aircraft the duration of the battle after the first attack is two to three minutes, then when the target flies at low altitudes and subsonic speeds (900 to 1000 kilometers per hour), the air battle is concluded at a depth of 40 to 50 kilometers; but when the target flies at high altitudes and supersonic speeds (1400 to 1600 kilometers per hour), it is concluded at a depth of 60 to 80 kilometers. Thus, it is not desirable to shift the fighter alert zones beyond the rear boundary of the combat operations zones of the surface-to-air missile units; this will move the lines of interception of enemy aircraft beyond the installations being protected and will weaken our system of air defense.

A proposal also has been made regarding using all front fighter aviation on the approaches to the combat operations zones of the surface-to-air missile units. But this also is undesirable. On the one hand, the disruptive influence of the fighters on our surface-to-air missile units increases, since they are in the spotting and target designation zones of the latter; on the other hand, their actions will be less effective, especially against low-flying targets, when they are forced to carry out independent search. Finally, being located over enemy territory, fighters will sustain losses from the fire of enemy ground air defense means.

The observations stated lead to the simple conclusion that designating fighter alert zones over the siting areas of the surface-to-air missile units best meets the requirement for the timely interception of enemy aircraft and for destroying them with the greatest effectiveness.

Thus, in the logic of things, fighter aviation and field air defense of the front are forced to operate in one air space, which is impossible without organizing a suitable system for controlling their combined combat operations. Such a system must ensure a rigid centralization of control of

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all air defense forces and means.

Under the conditions of a complex and rapidly changing air situation, centralization of control requires the constant personal contact of the commanders of the coordinating fighter aviation large units and units and ground forces air defense troops. However, the presently existing separate systems of controlling ground forces air defense troops and front fighter aviation do not meet these requirements.

The problem is that surface-to-air missile and antiaircraft artillery units and their control posts are deployed, as a rule, at a depth of up to 30 kilometers from the front line, and the regimental base airfields of the fighter aviation divisions and their command posts are located at a depth of 100 to 150 kilometers. Such a deployment of command posts provides the optimum conditions for instrument guidance of fighters to air targets at high altitudes and in the stratosphere. However, this completely rules out the possibility of guiding fighters to low-flying targets from alert status in the zones situated over the siting areas of the forward surface-to-air missile units, and does not ensure coordination with them.

The circumstances cited above require further development of the system of fighter control posts to provide the possibility of colocating them with the field air defense command posts.

The experience of research exercises conducted jointly by air forces large units and ground forces air defense troops showed that, besides command posts for divisions and regiments, it is desirable for fighter aviation divisions to have (in each large unit) a forward command post (fighter aviation division forward command post), colocated with the tank (combined-arms) army air defense command post, and no less than three guidance posts (fighter aviation division guidance posts) which it is desirable to colocate with the command posts of the surface-to-air missile units.

Colocating the command posts of fighter aviation and the air defense troops in principle permits the coordinating commanders to use air defense forces and means efficiently on the basis of their mutually agreed conclusions derived from an appraisal of the information they have received regarding the air situation and the combat readiness status of subordinate forces and means.

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In regard to the existing command posts of fighter aviation divisions and regiments, their tasks and the functional responsibilities of their

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crews are practically unchanged. They ensure the maintenance of the desired degree of combat readiness by the units and the timely flight of the subunits (crews) to their assigned alert zones, and they participate directly in guiding their fighters, especially in repelling massive air attacks.

The overall questions of organizing the combined combat operations of fighter aviation and front ground air defense means, and of controlling them, are resolved on the level of the air army commander (deputy army commander for air defense) and the chief of the front air defense troops. They determine the composition, the operational disposition and the principal methods of coordinating the forces and means of fighter aviation and ground air defense troops subordinate to the front, which are assigned to protect each army depending on the combat tasks they are given. As a rule, a tank (combined-arms) army operating on the main axis will be covered by one fighter aviation division. On other axes a fighter aviation division usually will operate in the zones of two armies.

During the research exercises the following procedure was worked out for controlling the combined combat operations of a fighter aviation division and the air defense troops of a tank (combined-arms) army operating on the main axis.

At the colocated army air defense command post - fighter aviation division forward command post, the chief of the army air defense troops and the commander of the fighter aviation division were positioned at one electronic-optical plotting board and together analyzed the air situation information plotted on the board, as well as the reports of subordinate commanders on the status and combat readiness of the means. In the process of repelling the attacks, they coordinated the distribution of the efforts of the units of fighter aviation and army air defense troops, allocated them combat tasks, and determined coordination methods.

At the colocated surface-to-air missile brigade command post - fighter aviation division guidance post the commander of the surface-to-air missile brigade and the chief of the fighter aviation division guidance post, on the basis of their allocated tasks, decided the specific target allocation, and determined the detail of forces and the coordination methods for each group of targets assigned to them. In the simultaneous actions of the fighters and surface-to-air missile battalions the commander of the surface-to-air missile brigade and the chief of the guidance post coordinated the priority for surface-to-air missile launches and fighter attacks. In all cases the chief of the fighter aviation division guidance

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post informed the commander of the surface-to-air missile brigade regarding the condition and activities of his fighters, which is particularly important when the existing centralized system of warning does not contain data on friendly aircraft. The exercise uncovered a whole series of cases in which the chief of the fighter aviation division guidance post prevented the commander of the surface-to-air missile brigade from allocating tasks to fire on friendly fighters.

Fighters and surface-to-air missile battalions were controlled in a similar way from the colocated surface-to-air missile regiment command posts - fighter aviation division guidance posts when repelling enemy air attacks at low altitudes. The special feature of the operation of this colocated control post is its complete independence in making decisions to destroy low-flying air targets, information on which could not be received in a timely manner at the army air defense command post - fighter aviation division forward command post. In this case the control post of the senior chief allocated only the general task to repel low-flying enemy aircraft and took steps to maintain the fighter forces detail in low altitude alert zones. The crew of the fighter aviation division guidance post also controlled the crews in the airborne alert zones, ensuring they maintained the desired combat formation.

The exercises again confirmed the soundness of the idea of creating forward command posts in fighter aviation divisions and the desirability of colocating them with corresponding air defense troops command posts. It should be noted that fighter aviation division forward command posts are necessary not only for maintaining coordination with air defense troops, but primarily for controlling fighter combat operations directly over the battlefield, irrespective of whether the troops are covered by their own surface-to-air missile means or whether these means fell behind the troops in the dynamics of the engagement, were found to be without ammunition, or were neutralized by enemy fire. The forward command posts are necessary also when fulfilling other tasks confronting fighters, including supporting the combat actions of other arms of aviation and battling enemy airlifts.

Speaking of colocating the fighter aviation division forward control posts and the air defense troops command posts, it should be pointed out that when the existing elements of equipment for fighter aviation command posts and field air defense troops command posts were developed, the necessity of combining them was not taken into account. Therefore, attempts to colocate these elements engender great technical difficulties, and the absence of developed communications and control systems hampers the normal work of the combat crews and technical personnel.

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We have to recognize that it has become necessary to clarify and revise the tactical-technical requirements of future systems for controlling the active air defense means, taking the considerations stated above into account.

However, to reliably cover front troops against enemy air strikes it is not enough just to join the control systems of fighter aviation and ground forces air defense troops. It is necessary to work out and persistently put into practice a single military-technical policy for further improving all active front air defense means, i.e., fighters and surface-to-air missile (antiaircraft artillery) systems. We are now confronted with the task of organizing systematic training of units of fighter aviation and ground forces air defense troops to conduct combined combat operations to cover front troops.

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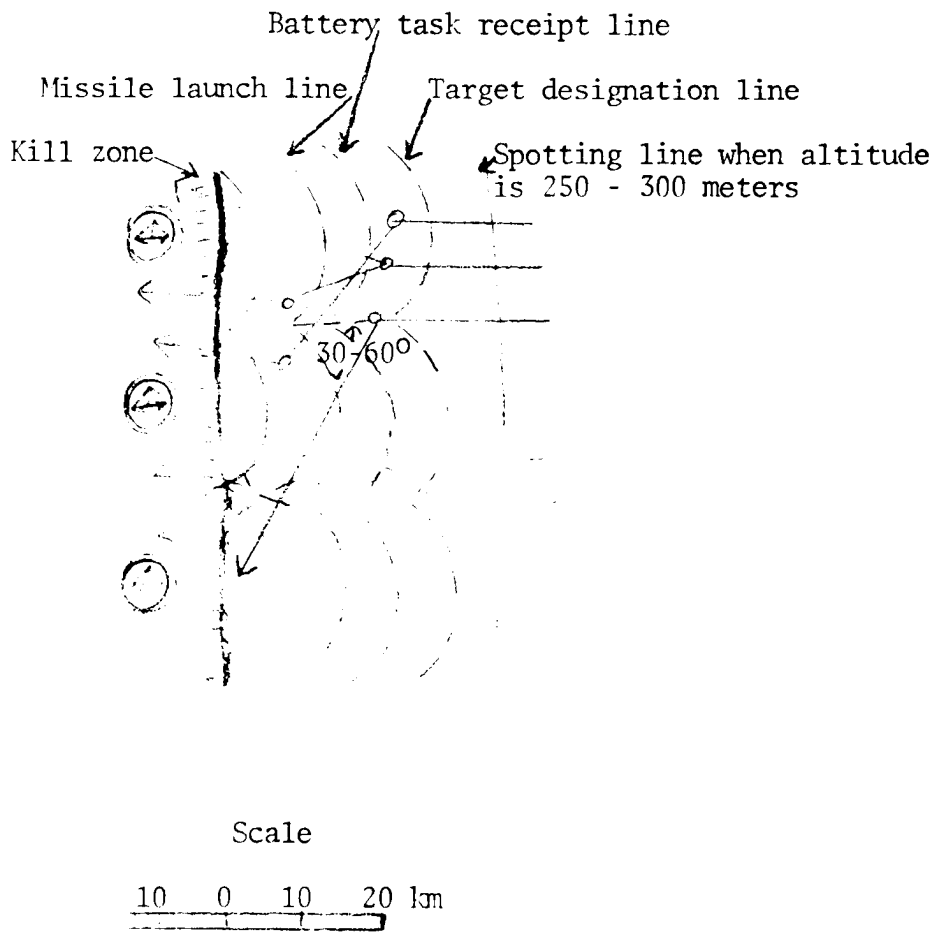

Sketch 1. Typical fighter-bomber maneuvers used to overcome Hawk surface-to-air missile system countermeasures.

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