

Chapter 9: Air Defense Support

This page is a section of FM 7-100.1 Opposing Forces Operations.

The OPFOR system of air defense includes assets and actions at the strategic (national), operational, and tactical levels. The focus in this chapter is on air defense of maneuver forces at the operational level. However, operational-level air defense does not exist in isolation from the overall system of OPFOR air defense. For more information on tactical-level air defense, see FM 7-100.2.

All-Arms Air Defense

The main objective of air defense is to prevent enemy air action from interfering with mission accomplishment of the entire force. For the OPFOR, air defense is not just a particular organization or branch of service. It is a mission.

To do this, the OPFOR uses a combined arms and joint approach, involving not only air defense units, but also other forces such as

- Aviation.
- Special-purpose forces (SPF).
- Rockets and surface-to-surface missiles (SSMs).
- Artillery and mortars.
- Infantry.
- Engineers.
- Affiliated forces.

These forces are often used in combination or participate separately in attacking targets, which in effect achieves a combined result.

Against a sophisticated enemy, the OPFOR recognizes that it will have to adapt the operations and tactics employed by air defense units to improve their chances of success. It also views the creative and adaptive use of other arms to accomplish air defense objectives as part and parcel of the overall air defense effort. This practical application of the combined arms concept calls for the simultaneous employment of several arms, in some cases including air defense systems, to achieve an effect against the enemy air threat that will render greater results than the use of air defense assets and systems alone.

The extent to which the concept of all-arms air defense can be applied is limited only by the commander's and staff's knowledge of the enemy air threat, capabilities of their own systems, and their ability to apply that knowledge to come up with innovative solutions. The air defense-related activities of all arms are part of an overall campaign to defeat or at least degrade enemy air capabilities. The results may produce effects at the strategic, operational, or tactical levels.

Goals

Air defense forces and other arms work together to protect ground units and other potential targets from attacks by fixed-wing ground-attack aircraft, cruise missiles, and armed helicopters. They also try to deny aerial reconnaissance platforms, including unmanned aerial vehicles (UAVs). A secondary mission is to protect OPFOR air and airborne or heliborne missions over enemy-held territory. OPFOR air defense focuses on destroying or disrupting the activities of not only enemy aircraft, but also the command and control (C2) systems associated with enemy air operations.

Concepts

The OPFOR's concept of air defense is not purely defensive in nature. Destruction of enemy aircraft is not always linked to military objectives. The destruction of high-visibility or unique systems employed by enemy forces offers exponential value in terms of increasing the relative combat power of the OPFOR. However, it also has possibly decisive effects in the information and psychological arenas. Losses among these premier systems demonstrate the vulnerability of even a technologically superior enemy and may undermine enemy morale, degrade operational capability, and inhibit employment of other enemy weapon systems. High-visibility (flagship) systems that could be identified for destruction could include stealth aircraft, attack helicopters, or aerial reconnaissance and surveillance platforms. The OPFOR can also attack high-payoff targets such as high-technology communications nodes and other information systems that support enemy air operations.

The OPFOR emphasizes that air defense does not necessarily have to destroy aircraft to accomplish the mission, although that is obviously desirable. The mission is accomplished if air defense prevents enemy aircraft from conducting successful air activities. For example, air defense units can force enemy aircraft to break off their attacks or to expend their ordnance inaccurately without having to destroy the aircraft. In fact, the mere presence of active and effective air defense weapon systems can reduce the effectiveness of enemy air activities by forcing aircraft to avoid the systems or otherwise use less than optimum procedures. The OPFOR can also use air defense jammers, GPS jammers, and other electronic warfare (EW) methods to disrupt the enemy's air capability.

The role of air defense can be to create opportunity for fire and maneuver by clearing or minimizing the air threat in the airspace above friendly forces. This is especially important when the OPFOR lacks the air power or air superiority necessary to create opportunity with air attacks. The OPFOR can concentrate the fires of its air defense assets to create a window of opportunity for a limited-duration and limited-objective offensive action (such as a spoiling attack, counterattack, raid, or ambush). Likewise, air defense can enhance the ability to defend or transition from defense to offense. Air defense can also mass fires to protect the key reconnaissance and fire assets that perform reconnaissance fires.

Another important OPFOR concept is that air defense is an integral part of combined arms combat. The maneuver unit commander who disregards the enemy air threat or fails to properly plan for defending against it risks mission failure.

A closely related concept is that air defense weapons, radars, and associated equipment cannot be regarded as single pieces of equipment or even units engaged in combat actions but as parts of an integrated air defense system (IADS). Proper integration of these assets in mission planning and execution is the only way the commander can effectively deal with the enemy air threat.

Principles

In pursuit of these goals and concepts, the OPFOR follows several basic principles when conducting air defense: surprise, firepower, mobility, continuity, initiative, coordination, and security. Of these, the element of surprise is the most critical.

Surprise

Achieving surprise is fundamental to successful air defense. Surprise can be achieved by

- Positioning air defense systems in unexpected locations.
- Using other arms for air defense.
- Using camouflage, concealment, cover, and deception (C3D).

The OPFOR is aware of the potential physical destruction it can achieve by attacking an unsuspecting and unprepared enemy. It is also aware of the psychological effects of violent and

unexpected fires on aviation crews. These effects are often only temporary, but at critical moments they can reduce the effectiveness of aircrews preparing to attack.

The element of surprise is also increasingly important because of modern technological advances. The speed and evasiveness of modern aircraft reduce engagement times. Modern aircraft also have a great amount of firepower with which to suppress air defenses. These two factors make it necessary for units to achieve some degree of surprise. Of course, the air enemy also is trying to achieve surprise, and the OPFOR must consider how enemy aircraft might exploit the terrain in making a concealed approach.

The principle of surprise is also important in the wider context of denying the enemy's intelligence organization an accurate and comprehensive picture of the deployment of air defense weapons and radars. Otherwise, the enemy also can use air defense formations as a principal means of determining the organization for combat and organization of forces of supported maneuver units.

Firepower

The OPFOR force structure includes a wide variety of air defense weapons (both missiles and guns). This mix of capabilities gives ground force commanders outstanding firepower for air defense. It is important that air defense planning consider and employ all assets available, across all arms, to achieve maximum firepower.

Mobility

Air defense assets must have mobility comparable to the ground forces for which they provide cover. When planning air defense, the commander must always consider the mobility of air defense weapons and the time required for their deployment. The ground forces, for which air defenses provide cover, are quite mobile and frequently change formation as they deploy. The air enemy is mobile and can attack from many directions or altitudes. Therefore, the commander must use to the maximum the mobility and firepower of his assets, creating optimum groupings and fire plans.

Continuity

Air defense forces must provide continuous protection of critical organizations and assets. Only constantly-moving air defense units that have adequate logistics support can ensure comprehensive air coverage. They must provide air defense day or night in all weather conditions. Mobility contributes directly to continuity.

Initiative

The modern battlefield is a fluid and volatile environment. Air defense unit commanders must respond to constant changes in the situation with initiative and aggressive action. Units must continue to operate efficiently even when communications with other air defense units fail. For example, if the supported unit receives a modified mission, the air defense commander must reevaluate his own unit's deployment in light of the new requirements. He also must be aware of changes in the tactics that enemy air forces are employing.

Coordination

The OPFOR stresses coordination between air defense units and supported maneuver units, other air defense units, and units of other arms performing air defense functions. It views air defense as a single, integrated system composed of various parts. Air defense is an integral element of the air and ground battle.

All tactical-level air defense weapons must coordinate precisely with flanking units, with operational-level air defense units, and with aviation units. Failure to coordinate can result in gaps in the air defense umbrella, excessive ammunition expenditure, and casualties to friendly air forces. To achieve efficient coordination, the OPFOR stresses centralization of control, with operational-level headquarters playing a key role as a land-air interface.

Security

The OPFOR recognizes that enemy air assets can attack from any quarter. Therefore, it must provide security for units anywhere on the battlefield or in sanctuary areas against air attack from any direction. Air defense must function with unremitting reliability and overall security. This requires careful deployment, uninterrupted ammunition supply, and a comprehensive early-warning system. Commanders must factor security into air defense planning.

Command and Control

The OPFOR combines ground-based national-, operational-, and tactical- level air defense assets with fixed-wing aircraft forces to provide an integrated air defense umbrella for ground units. Consequently, effective control of the airspace becomes more complex. The OPFOR stresses the need for operations conducted with a single integrated plan under unified command and control.

Integrated Air Defense System

OPFOR air defense weapons and surveillance systems at all levels of command are part of an integrated air defense system (IADS) that presents a threat to any potential enemy. Air defense effectively supports the concept and requirements of combined arms combat. The best way to accomplish this is to integrate a large number and variety of weapons and associated equipment into a redundant air defense system.

The OPFOR's intent is to integrate air defense assets at all levels of command into a continuous, unbroken umbrella of air defense coverage. Integration can be vertical and/or horizontal. Vertical integration is between the strategic, operational, and tactical levels, while horizontal integration is within each of those levels.

The dispersed positions of OPFOR units, as well as enemy actions to suppress OPFOR air defense and C2 capabilities, may make it difficult to maintain vertical or horizontal integration. Enemy capabilities may present a situation where a vertically integrated system at the strategic or even operational level is neither possible nor desirable.

An integrated communications system is established to provide target information and early warning to air defense and ground maneuver units. If communications with other air defense units fail, however, commanders may have to use their own initiative and flexibility, in order to respond to frequent changes in the ground or air situation.

National Level

Against regional opponents, the OPFOR may be able to use an IADS that is centrally directed from the national level. Centralization of control gives the OPFOR flexibility in the employment of resources to meet the overall goal of air defense. The national-level air defense organization can play a major role in the control of air defense assets of operational-level commands.

Sector Level

Against a modern extraregional force, however, the OPFOR accepts that it may not be able to employ a nationally integrated air defense system to defend its entire airspace. In fact, a vertically integrated system centrally directed from the national level could be a liability from a

C2Â standpoint. Thus, the OPFOR is prepared to adapt its air defense operations to use IADS at sector levels. Within sectors, it may be able to challenge the most modern air forces, at least initially. It can prevent extraregional air forces from attaining air supremacy, for a time. Air defense sector boundaries do not necessarily parallel geographic boundaries or the boundaries of military areas of responsibility (AORs). It is quite possible that boundaries could coincide, if air defense assets are allocated to provide support for theater- or operational-level commands. In some cases, however, an air defense sector could cover a larger area that includes the AORs of one or more operational-level commands and could cover airspace not included in any of those AORs. It is possible that the OPFOR could divide a large geographic area into air defense sectors even when it does not establish multiple theater headquarters within that area.

Sector air defense can reduce the physical and electronic signature of defensive systems. To the extent possible, the OPFOR disperses high-value assets. Still, air defense assets may be close enough together to be hard-wired. Sector IADS enables the OPFOR to mass the effects of air defense assets from dispersed sites to protect the most critical targets. It also facilitates the use of passive air defense techniques including dispersal, deception, and camouflage.

In choosing to fight within sectors, the OPFOR accepts risk, in that air defense sectors present seams in the defenses and may be unable to provide mutual support. Within sectors, the OPFOR develops air defense ambushes along the most likely air avenues of approach.

Operational and Tactical Level

In most situations, an operational-strategic command (OSC) directs the employment of the air defense assets of at least its immediate tactical-level subordinatesâ divisions and division tactical groups (DTGs) or separate brigades or brigade tactical groups (BTGs). Brigades and BTGs that are part of a division or DTG provide coverage for their own units and vertically integrate with division or DTG coverage. When not part of a division or DTG, they vertically integrate with OSC-level coverage, which would be their next-higher level of command. There may be skip-echelon situations when the OSC will specify how divisional maneuver brigades employ their air defense batteries. Normally, however, the division or DTG will dictate that.

At the tactical level, the commander normally strives to achieve horizontal integration. His ability to integrate or be integrated vertically will depend on the air defense course of action taken at the next-higher level.

Centralization Versus Decentralization

Air defense control relationships are subject to conflicting pressures for centralization and decentralization. Factors favoring centralized control include the greater efficiency and effectiveness of centralized target detection systems and the increased ranges of modern surface-to-air missiles (SAMs). Centralized control is necessary, especially during defensive operations, to ensure that the coverage of air defense units is mutually supporting and comprehensive. Centralization of control gives the OPFOR flexibility in the employment of air defense resources to meet the overall goal of an operation. In most situations, therefore, an operational-level command directs the employment of the air defense assets of at least its immediate tactical-level subordinates.

Nevertheless, the complexity and fluidity of the modern battlefield require the possibility of some decentralization. Decentralized control provides flexibility and shorter response times for supporting fast-paced operations by ground maneuver units and the many contingencies that can arise in local situations. The OPFOR expects its air defense commanders, like their maneuver counterparts, to demonstrate aggressive action and originality, responding to changes in the tactical situation and operating effectively when cut off from communications with other air defense units. In general, the OPFOR imposes enough centralization to optimize efficiency while allowing sufficient decentralization for effectiveness.

Airspace Management

When the OPFOR Air Force is able to fly, airspace management is the most complex aspect of air defense operations. Commanders must divide the airspace among ground-based air defense systems and aviation.

Staff Responsibility

A single operational-level commander must control the full scope of combined arms and/or joint activity, including air defense within his AOR. It is the combined arms or joint commander who is ultimately responsible for the success or failure of air defense in his AOR. He approves the overall operation plan prepared by his staff. The operation plan includes the air defense plan and coordinating instructions.

The OSC is the lowest level of joint command with control of both Army and Air Force units. On the staff of an OSC, under the operations officer, the chief of airspace operations (CAO) is responsible for airspace management issues and procedures. The CAO maintains the airspace control net for controlling the command's airspace. OSC headquarters typically receive liaison teams from all constituent, dedicated, and supporting Air Force, army aviation, and air defense units associated with the command. All these units and their liaison teams are on the airspace control net.

Zones of Responsibility

The OPFOR establishes zones of responsibility in order to minimize mutual interference between its fighter aircraft and ground-based air defense weapons. Zones of responsibility could also be used to determine areas or altitudes to be covered by national-level Air Defense Forces, as opposed to operational- or tactical-level air defense assets. However, the use of such zones does not preclude engagement of high-priority targets by more than one type of weapon system if there is centralized control of all weapon systems involved.

The OPFOR may assign zones of responsibility in the vertical dimension. Thus, fighter aviation would engage enemy aircraft at certain altitudes, while ground-based air defense assets would be responsible for engagement at other altitudes. See example A in Figure 9-1.

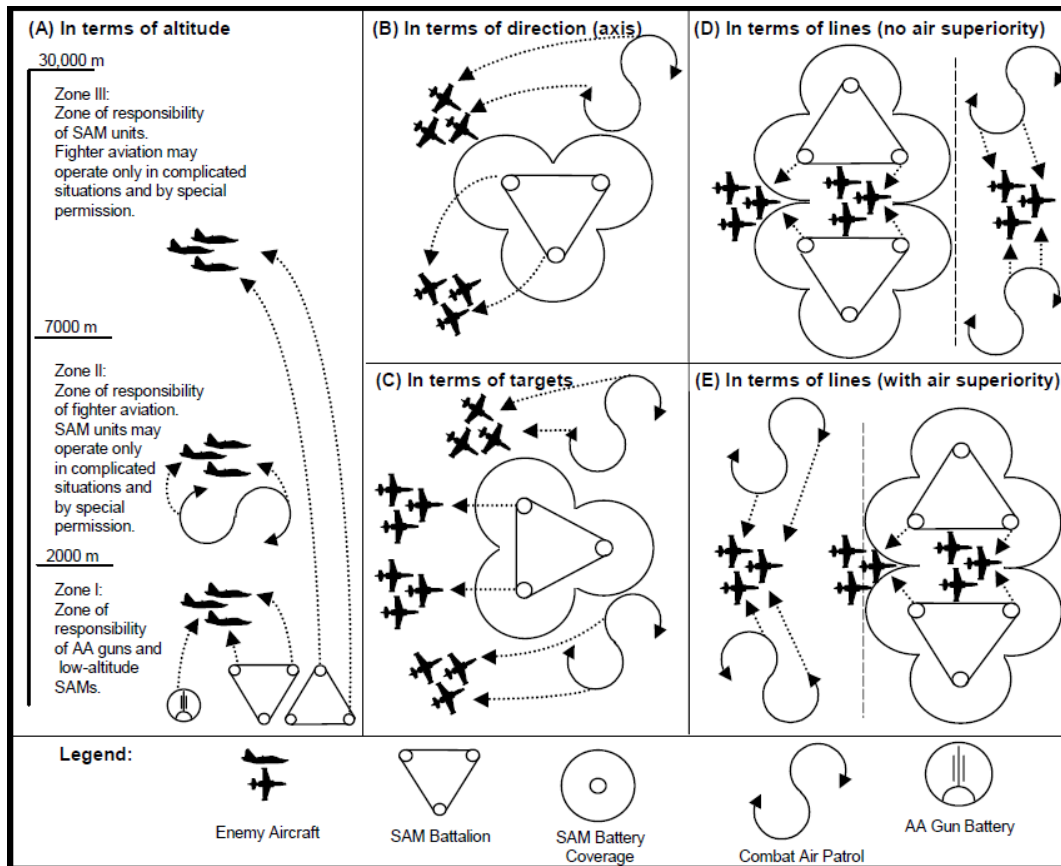


Figure 9-1. Coordination of Fighter Aviation and Ground-Based Air Defenses (Examples)

In the horizontal dimension, zones of responsibility may be in terms of the direction from which target aircraft are approaching (example B). The OPFOR may also choose to delineate responsibility according to the type of target (example C). For instance, fighter aircraft might engage manned aircraft, while ground-based air defense might be responsible for engaging enemy missiles or UAVs. Sometimes, specific targets are assigned to specific systems. However, the latter is likely only in a very low air threat environment.

Another way of dividing air defense responsibility is in terms of lines. Particularly when the OPFOR does not have air superiority, the first line(s) of air defense responsibility could be for ground-based air defense weapons to engage enemy aircraft. OPFOR fighter aviation would then operate in the relatively safe airspace behind those lines, where its fighters would engage only those aircraft that managed to get through the first line(s). See example D in Figure 9-1.

If the OPFOR does have air superiority, it might establish a boundary line parallel to and forward of the battle line. This boundary would be generally at the range limit of medium-range SAMs, possibly beyond the supported ground force unit's limit of responsibility. Ground-based air defense systems would engage aircraft out to this boundary. Fixed-wing aircraft would engage the enemy beyond this boundary. See example E in Figure 9-1. However, the OPFOR is unlikely to use this technique unless it possesses air superiority.

There will never be sufficient specialized air defense assets to protect all units and vital assets from air attack. Therefore, all units must be capable of using their organic weapons for self-defense against air attack. Self-defense is never denied. Thus, air defense units with short-range weapons always have the capability to defend themselves from immediate air threats, regardless of whether another aviation or ground-based air defense unit has responsibility for the airspace above them.

Air Defense Control Measures

9-45. The OPFOR uses various types of air defense weapons control status and procedural

controls to coordinate the use of airspace by aviation assets and ground-based air defense. Primarily, it employs a system of identification, friend or foe (IFF) between aircraft and air defense systems. When using non-IFF-capable systems, it may enact strict procedural controls in order to protect friendly aircraft from fratricide. The air defense coverage may be "switched off" to allow friendly aircraft to pass on a mission planned in advance and then "switched on" as they exit the area. For other missions, air defense coverage may allow aircraft to transit only on "safe corridors" based on air routes or other procedural methods. In general, however, the OPFOR would prefer to risk losing some aircraft through fratricide, rather than allowing gaps in its radar and air defense coverage that the enemy might exploit.

Command Posts and Communications

The CAO and his staff are part of the OSC staff at the main command post (CP). Also located there are Air Force, army aviation, and air defense liaison teams with whom he closely coordinates for airspace management. A deputy CAO and possibly an air defense officer from the liaison team may also be present at the forward CP to advise the OSC commander.

The basic rule for the establishment of communications between supported and supporting unit is that the higher command allocates landline, radio relay, and mobile communication means, while radio equipment is allocated by both higher and subordinate levels. This ensures proper coordination of communications. If communication is lost, the commanders and staffs of all units involved are responsible for the immediate restoration of communication. An air defense and NBC warning communications net is established to warn maneuver units, the staffs, and logistics units of incoming enemy aircraft. The warning is communicated through signal equipment that is specially allocated for this purpose.

Phases

The OPFOR plans to employ its air defense units and all-arms air defense in three phases. The phases are defined by where the enemy aircraft are and what they are doing:

- Phase I: Actions against enemy aircraft and control systems on the ground before they are employed.
- Phase II: Actions against enemy aircraft while in flight but before they enter the airspace over OPFOR ground maneuver forces.
- Phase III: Actions against enemy aircraft that have penetrated into that airspace.

While these phases may occur sequentially after the initiation of hostilities, they are not wholly distinct. They may overlap, and all three may occur simultaneously. The OPFOR roughly equates the three phases with where they will primarily occur on the ground and in the air. Thus, phases I, II, and III occur in the "basing area," "flight area," and "target area," respectively. The purpose of these phases and areas is to assist planners in rationalizing, planning, and organizing the overall air defense effort.

Phase I

The first phase includes all actions taken to destroy enemy aircraft and control systems before they are employed. It targets aircraft while they are still on the ground at airfields or in marshalling or staging areas. This "basing area" extends from enemy home territory, to allied basing and staging areas, to and including in-theater enemy support areas down to enemy division level.[1] It is the area in which aircraft are based, refueled, maintained, and resupplied. This area is the overall responsibility of the OPFOR theater commander. A large part of it could be given an OSC. Part of the area assigned could fall within the OSC's disruption zone, which can include enemy airfields and attack helicopter forward arming and refueling points (FARPs).

Planning

Planning for Phase I begins at the national level, when the General Staff is considering various contingency plans for possible strategic campaigns before the actual threat of war or extraregional intervention. This planning includes any OSCs that might be involved in a particular contingency.

Each contingency plan developed includes detailed analysis of the area involved, including the identification of key airfields, facilities, and lines of communication (LOCs) that could support enemy air operations. In those areas controlled by the OPFOR, preparations are made to support planned missions. These include the identification of complex terrain in the vicinity of identified targets, potential cache sites, and forces to perform missions.

Areas not in the direct control of the OPFOR, but anticipated to be included in the contingency, are also analyzed. In this case, in addition to all the factors mentioned above, planners would also examine potential means and routes of infiltration and potential sources of supply. They would also try to identify potential *â* affiliated forces that could assist in attacking key targets: insurgent groups, groups with ethnic ties to the OPFOR, groups that sympathize with the OPFOR for political reasons, individual sympathizers, terrorist groups, and even criminal organizations.

Based on this information, planners identify key targets and missions and task OPFOR units and/or affiliated forces to be prepared to perform them. This information is shared with the OSCs assigned to the particular contingency, and the planning effort is coordinated with them.

What is developed is an integrated plan consisting of a large number of tactical actions that support air defense objectives at all levels. This is the basic plan from which the OPFOR operates at the initiation of hostilities. It is modified and updated and new missions are assigned as the contingency situation develops.

Plans are developed which, taken as a whole, may constitute a battle or operation within the designated area. This is particularly true in the basing area, since most of the forces operating there will be small units. Their actions are timed to occur simultaneously or sequentially to achieve a result over time. For example, a series of actions against an airfield, set to occur within certain timeframes, can have the net effect of not only destroying aircraft and their support facilities but also degrading enemy air operations. An additional payoff is the possible diversion of enemy forces from other areas to secure the facility.

Participants

Attacks on airfields and related facilities feature coordinated operations by all available forces, and they are primarily not air defense units. Aviation, SSMs, artillery, or SPF can destroy air C2 facilities, aviation support facilities, and the enemy's aircraft while they are still on the ground. When the enemy is operating from bases in or near State territory, the destruction or degradation of these systems may be achieved through the use of raids and ambushes by regular ground forces, insurgents, or partisans.

Disruption Forces. Typical targets for attack by all forces in the disruption zone include enemy airfields and attack helicopter FARPs. The forces employed for such attacks consist almost exclusively of small units.

When the OPFOR is forced to withdraw from an area, this may become a basing area for the enemy. In such cases, the OPFOR may leave behind a multiple rocket launcher (MRL) in a hide position. In other cases, it can infiltrate a single-round rocket launcher or single mortars to occupy hide positions near the target. The hides are situated in complex terrain, highly camouflaged, and dispersed over a wide area. Once given the order to execute, the firing systems work on a predetermined firing schedule issued as part of an overall plan.

MRL system hides might contain only one system, which is loaded and ready to fire, with

previously determined firing data set on the weapon. Crews manning the systems bivouac away from the system to keep it cold. Crews have communication capability but are kept on radio silence. When monitoring and acknowledging one-time orders to execute, they do so away from the system. Once given the order to execute, the firing systems work on a predetermined firing schedule issued as part of an overall plan. Each MRL may be assigned the mission of firing once. Firing occurs in a predetermined sequence separated by time. The net effect of this tactic is to destroy or damage facilities and/or aircraft on the ground and degrade the operating capability of support personnel. Munitions loads can be mixed dependent on the desired effect. They can include scatterable mines, delayed-fuzed munitions, high-explosive (HE), and chemical.

This effort can be enhanced through the employment of single mortars and/or single-round rocket launchers. The weapon crews operating from preselected hides can move to firing positions where rounds are cached. Once laid in, the mortars can fire rounds in rapid succession at targets on the airfield and then move back to hides. Given range and terrain considerations, larger-caliber mortars (120-mm) can be used in conjunction with laser target designators to place rounds on point targets such as large aircraft, fuel storage and ammunition facilities, and hangars.

Small SPF teams equipped with explosives or man-portable antitank guided missiles (ATGMs) can target aircraft on the ground, or air traffic control or maintenance vehicles and facilities. SPF teams with shoulder-fired

SAMs can engage enemy aircraft taking off or landing at airfields. OPFOR SPF or affiliated insurgents or terrorists can conduct raids against enemy air bases and other installations, using terror tactics to destroy enemy systems and generate fear. The goal is to present the enemy with a nonlinear, simultaneous battlefield. Attacking such targets not only denies the enemy sanctuary, but also can weaken his national will to continue the conflict.

Infiltrated or stay-behind SPF and infantry can conduct on-call raids against airfields and ground support facilities. These raids can be timed in conjunction with other methods so that they assist in keeping the target under constant pressure. SPF or infantry can also conduct ambushes along LOCs to destroy certain types of vehicles or equipment related to air operations.

National- and Operational-Level Assets. Some of the means available to attack these targets may be national- and operational-level assets. Since the OPFOR may be unable to reach such targets with its own Air Force aircraft, it may use long-range artillery, rockets, or missiles to possibly deliver persistent chemical attacks or other weapons of mass destruction (WMD) to disrupt or degrade enemy activities in the basing area.

Affiliated Forces. In each contingency area, OPFOR planners try to identify insurgents, sympathizers, terrorist groups, and even criminal organizations that might participate in Phase I. Some of these affiliated forces can conduct raids or ambushes and any of them can employ terror tactics to disrupt enemy operations at bases. They can also intimidate host country civilian contractors to force them to sabotage the enemy operations they were hired to support.

Phase II

The second phase of air defense aims at destroying enemy aircraft while in flight and before they enter the airspace over OPFOR ground maneuver forces. The flight area overlaps the basing area and extends from enemy bases to the battle zones of OPFOR units. Thus, the OPFOR disruption zone(s) are included in this area, since one of the missions performed in this zone is to destroy aerial platforms before they get to the battle zone. The OPFOR often plans air defense ambushes in the flight area.

Planning

As with Phase I, planning for Phase II occurs primarily at the national and operational levels. This

planning includes any OSCs whose AORs fall in the *flight area*. Although tactical units in the disruption zone can carry out air defense-related actions, these actions are part of a larger plan.

Participants

In Phase II, OPFOR SPF teams can infiltrate man-portable, shoulder-fired SAMs close to airfields or along identified and potential flight routes in the flight area. These teams are best employed in pairs. One team can over-watch an airfield and transmit information on the departure of aircraft and their direction of flight to another team with SAMs. Alternatively, the SPF observers could pass this information as early warning to other air defense units.

After that, the Phase II mission is performed primarily by air defense forces at the strategic and operational levels. Interceptor aircraft and long- and medium-range SAMs conduct this phase of the air defense.

When the enemy aircraft enter an OPFOR disruption zone, shorter-range operational- and tactical-level air defense systems can engage them. Such systems often conduct air defense ambushes from positions within the disruption zone.

Phase III

The third phase entails the destruction of enemy aircraft that have penetrated into the airspace over OPFOR ground maneuver forces. Thus, the *target area* consists of the area where enemy aircraft have penetrated over the OPFOR disruption, battle, and support zones. The disruption zone is included here, since part of the air defense mission in it is to protect forces on the ground within that zone.

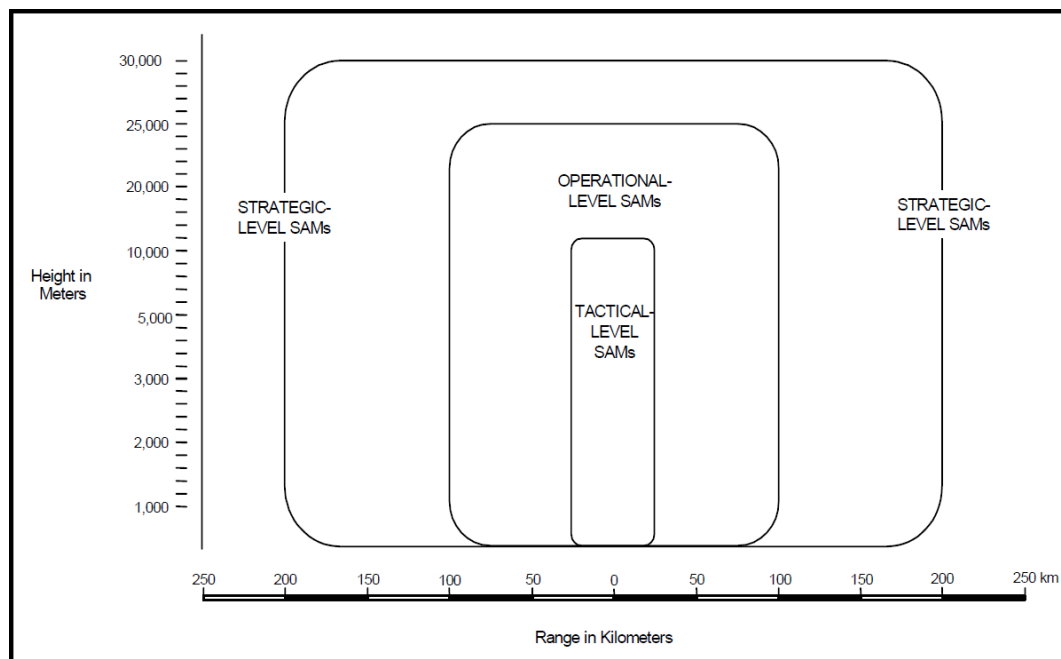


Figure 9-2. Air Defense Coverage (Example)

In Phase III, it is not always necessary to destroy the enemy aircraft. After all, the objective is to deny enemy aviation the ability to interfere with OPFOR ground maneuver units. The OPFOR can accomplish this either by destroying enemy aircraft or by forcing them to expend their munitions beyond effective range or by diverting the aircraft before they reach their targets.

Planning

Planning for Phase III extends down to the tactical level. However, tactical efforts are typically

part of a plan for integrated air defense at the operational and perhaps the national level.

Participants

In Phase III, the OPFOR may be able to employ its own tactical fighter aircraft, operating in the relatively safe airspace of the *target area*. These fighters and fighter-interceptors can engage enemy aircraft that have *leaked through* ground-based air defenses. However, the bulk of the air defense effort in Phase III falls upon short- to medium-range SAMs and antiaircraft (AA) guns of tactical air defense units, complemented by operational- and national- level air defense assets and other weapons of the ground maneuver units. In the *target area*, the OPFOR is particularly concerned about attack helicopters using standoff firing techniques. It is critical to identify likely firing positions for these helicopters through terrain analysis. These sites will be located primarily in the disruption zone. The planned combined use of antihelicopter mines, artillery, and remote sensors by OSCs and their constituent organizations can be an effective tactic against attack helicopters.

Once identified, potential sites for attack helicopter firing positions can be seeded with antihelicopter mines. These are directional fragmentation mines that function like a Claymore mine, but are larger. Once emplaced, the mines can be left unattended. Built-in sensors detect approaching helicopters and initiate the mine when a helicopter enters the lethal zone. Thus, the antihelicopter mine systems can autonomously detect and engage enemy helicopters. This technique can be used at some potential sites to economize other air defense assets for use at the most likely sites.

Another method is to emplace remote sensors to overwatch the sites, and have the sites registered as preplanned artillery targets. Once the sensors pick up the incoming helicopters, the information is relayed to artillery units that take the sites under fire using variable-time-fuzed munitions. This tactic can either destroy or damage the aircraft or cause the area to be unusable. In lieu of remote sensors, small teams of SPF or affiliated forces can be positioned to overwatch the most likely sites and relay information back to the guns.

Another crude but potentially effective method is to have engineers string cables across the helicopters' *avenues of ingress*. Engineers can also assist in the construction of deception positions to divert enemy air attack from actual forces or to lure the enemy into air defense ambushes.

Assets

In the OPFOR's *approach* to all-arms air defense, various services of the Armed Forces and various branches within the services participate in the mission of air defense. However, there are some forces that specialize in air defense.

Both the Air Force and the Army maintain air defense forces. In peacetime, all these air defense assets belong to the OPFOR's *administrative force structure*. Even in wartime, some of them *such as* the national-level Air Defense Forces *may* remain centrally controlled at the national or theater level. Other assets from the administrative force structure are initially allocated to OSCs. An OSC, in turn, may allocate some of its air defense assets to augment those of its tactical subordinates. Thus, it is hard to predict where national-, operational-, and tactical-level assets may actually appear in the wartime, fighting force structure.

Within the limits of its economic capabilities, the OPFOR has incorporated recent technological developments into its air defense weapons. It may invest in a few high-technology systems that provide it a technological niche that it can exploit against even the most modern enemy air forces. Deployment of advanced air defense systems, even in limited numbers, would affect all enemy air operations.

National-Level Assets

National-level air defense forces focus their efforts on destroying enemy aircraft, while protecting critical defensive positions and key political and economic sites. National-level assets include fighter-interceptor aircraft of the Air Force. Against a regional opponent, the OPFOR can use these aircraft to prevent enemy aircraft from entering or operating in OPFOR airspace. It can destroy enemy aircraft before they even take off by using air attacks and the long-range rockets and missiles of the Strategic Forces or direct action teams from its SPF Command.

The Air Force also includes Air Defense Forces with which the OPFOR can successfully defend its airspace against regional opponents. These national-level assets, along with operational-level air defenses, also provide the capability to challenge or deny air access into the region by outside forces, at least initially.

The State's national-level Air Defense Forces have medium- and long-range SAMs, some short-range AA guns, and early warning radar units. These forces reflect the State's force development philosophy. They combine obsolescent and state-of-the-art air defense firing units to support area coverage and point protection of high-value assets. The State is investing in point-protection technology that it believes can prove effective in defending against cruise missiles. This capability would include the ability to deploy and use GPS jammers.

Operational-Level Assets

The Army recognizes the importance of preventing or at least delaying enemy air superiority. Therefore, it maintains its own operational- and tactical-level air defense forces in addition to those subordinate to the Air Force. Army air defense includes mobile air defense units and large numbers of shoulder-fired SAMs. However, air defense involves use of all arms of the ground forces, not just the specialized air defense units.

The inventory of operational-level air defense weapons includes a variety of missiles, guns, and support equipment. The numbers and types of air defense assets vary with the size and composition of the OSC. An OSC may have some air defense assets that it reserves for coverage of its own operational support zone and for engaging enemy aircraft that get past tactical air defenses. It also has assets it can allocate to subordinates to augment tactical air defenses at critical points on the battlefield or to cover gaps in the air defense umbrella.

Surface-to-Air Missiles

Operational-level air defense systems include medium-range SAMs (and perhaps some long-range SAMs) for medium- to high-altitude area coverage. Some SAMs have the capability to engage ballistic or cruise missiles, as well as aircraft. Medium-range SAM units typically have some AA guns or shoulder-fired SAMs for self-protection.

Antiaircraft Guns

Operational-level commands may have some short-range AA guns for point protection. The AA guns found at the operational level are typically towed systems that lack the mobility of self-propelled SAM systems and cannot fire on the move. These AA gun units are capable of only a limited area coverage and are better suited for short-range, point protection of individual locations. Within their range capabilities, however, these AA guns are extremely lethal weapons.

Radars

OSCs normally have early warning units with a variety of air surveillance and target acquisition radars, plus some AA guns or shoulder-fired SAMs for self-protection. The majority of air defense

surveillance radars are at the operational level. (See the Air Surveillance section later in this chapter for more detail.)

Tactical-Level Assets

Aside from air defense assets that might be allocated down from the operational level, tactical maneuver units have a number of systems designed for air defense. They also have systems belonging to other arms that can contribute to the air defense mission.

Air Defense Systems

Tactical-level air defense includes short- and medium-range SAMs, short-range AA guns, and shoulder-fired SAMs. Tactical assets may also include some combination AA gun and missile systems, offering added flexibility. The OPFOR's tactical air defenses support the need to protect ground forces and the desire to seize any opportunity to shoot down high-visibility (flagship) enemy airframes.

The Army considers every soldier with a shoulder-fired SAM to be an air defense firing unit. These weapons are readily available at a relatively low cost. Therefore, the OPFOR is acquiring as many of them as possible, within economic constraints, and issuing them in large numbers to a wide variety of units. The small size and easy portability of these systems provides the opportunity for ambush of enemy airframes operating in any area near OPFOR units. The OPFOR could also employ them to set ambushes for enemy helicopters in an attempt to bring down what it perceives to be an enemy flagship system.

Radar-controlled self-propelled AA guns can fire on the move. Aside from short-range air defense, they also can be employed against all but the heaviest of enemy ground force systems, as well as against personnel, with devastating effects. Shoulder-fired SAMs can also find use against light vehicles when other, more likely systems are unavailable.

Other Arms

Throughout maneuver units, there are also a number of other systems that can be used in an air defense role. The heavy AA machineguns on tanks are specifically designed for air defense, although they can also be used against ground targets. Machineguns on APCs and automatic cannon on IFVs can engage both ground and air targets. Some ATGMs can be effective against low-flying rotary-wing aircraft. Field artillery and small arms can also be integral parts of the air defense scheme. A variety of relatively new systems, which significantly enhance air defense capabilities, have entered the OPFOR inventory. These include remote helicopter infrared (IR) sensing devices and passive acoustic acquisition systems. Antihelicopter mines are widely available and increase the OPFOR ability to deny firing positions and landing sites to enemy rotary-wing aircraft. Another example of OPFOR all-arms air defense is the use of artillery in conjunction with antihelicopter mines against attack helicopter firing positions.

The OPFOR continuously looks for new and adaptive ways of employing not only air defense systems but also systems not traditionally associated with air defense. It attempts to adapt these systems and develop new tactics that may help to fill the void when a more sophisticated enemy denies the OPFOR a specific capability.

Nonlethal Air Defense Assets

The OPFOR also uses nonlethal air defense-related systems, such as air defense jammers, radar corner reflectors, and GPS jammers. Such systems are potential combat multipliers, when employed in conjunction with SAM and AA gun systems, to defend high-value assets.

Air Defense Jammers

OSCs can have air defense jamming units. These units employ a variety of radar and communications jamming and target acquisition systems. Electronic intercept systems provide targeting information to the jammers.

Air defense jammers target the onboard emitters of enemy aircraft used for terrain-following, navigation, and radar-aided bombing, as well as airborne radar reconnaissance systems. The goal of jamming these systems is twofold. The primary goal is to force the attacking enemy aircraft to alter their flight profile, bringing them into the targeting umbrella of SAMs or AA guns. Jamming the terrain-following radars or radar altimeters employed by attacking aircraft does this by forcing low-flying aircraft to gain altitude. The secondary goal is to cause the aircraft to miss their target or abort the mission through the disruption of radar-aided bombing and target acquisition systems.

The OPFOR deploys air defense jamming assets, in conjunction with lethal systems, to defend what the OPFOR has identified as high-value assets. Examples of these include air bases, major logistics centers, critical LOCs and choke points, and higher-level military CPs.

Corner Reflectors

Radar corner reflectors provide a low-cost and effective addition to expensive air defense jammers. These passive systems can deceive enemy airborne surveillance and target acquisition radars by providing false or multiple targets. Corner reflectors can also mask or distort radar reference points.

GPS Jammers

The OPFOR also can employ low-cost GPS jammers to disrupt aircraft navigation and precision munitions targeting. GPS jammers are also effective against cruise missiles.

Passive Air Defense Measures

In addition to active air defense, the OPFOR practices a variety of passive air defense measures. Many of these measures involve use of C3D or maneuver and dispersal techniques. Sophisticated camouflage, deception, decoy, or mockup systems can degrade the effects of enemy systems. When conducting actions against a superior foe, the OPFOR must seek to operate on the margins of enemy technology and maneuver during periods of reduced exposure. These and other measures constitute passive air defense.

Camouflage, Concealment, Cover, and Deception

The OPFOR emphasizes the use of natural terrain and vegetation, camouflage netting and other artificial materials, smokescreens, and decoy equipment to provide C3D. Deception includes deception positions and decoys. The OPFOR can use quick-setup, high-fidelity decoys; derelict vehicles; radar emitter decoys; quick-hardening foams; and many other types of manufactured and field-expedient means. It also employs simple heat sources to confuse IR sensors and weapons seekers.

The dispersion measures discussed below should be employed with consideration of the protective and screening properties of natural and artificial screens, and would be combined with thermal camouflage and engineer preparation of positions. Natural screens consist of vegetation, terrain folds, populated areas, and local features or objects. Artificial screens include camouflage nets that would enhance natural screens, and radar-opaque screens using local features, radar nets, metallic nets, and corner reflectors. Concealment would be combined with the use of deception positions, using decoy equipment and activities. Like real positions, deception positions would be changed periodically. Dummy emitters and jammers would be used to attract enemy reconnaissance and targeting.

Maneuver and Dispersal

9-105. Maneuver and dispersal of air defense assets, both emitters and other types of equipment, is important for their survival both during movement and in combat formations. Sudden maneuver and periodic changes of position are simple and effective means to counter enemy reconnaissance and precision weapons; these measures are planned and implemented at the tactical level.

9-106. All, or only a portion of, an air defense unit may maneuver to alternate positions, depending on such factors as the degree of air threat, time of day, and meteorological conditions. The first parts of the unit to shift positions are those that have performed combat alert duty for an extended period, or that have been deployed in the position they currently occupy since before the onset of combat. The optimum configuration for shifting to alternate positions involves no more than one-third of the assets of a given unit shifting at one time, in order to maintain adequate air defense coverage.

9-107. The OPFOR uses certain rules of thumb for distances related to dispersion and distances of air defense units from supported units and from the battle line. The OPFOR recognizes that these distances vary with the situation and the threat. Of special concern is the enemy ATGM and precision weapon capability. If it is high, the OPFOR increases the spacing between SAM launchers and the distances of air defense systems from the battle line. Ideally, the degree of dispersal for units would be the same whether the enemy is employing conventional or precision weapons or even tactical nuclear weapons. A general rule for the degree of dispersion is that the enemy attack should not destroy two adjacent units simultaneously. A maximum of one-third of a unit should be vulnerable to a single precision weapon attack.

Other Survivability Measures

Other measures taken to improve the security and survivability of air defense systems include the following:

- Signals security. SAM and AA gun system radars, which move forward to cover the offensive or defensive action of a maneuver unit, remain silent until after the maneuver unit begins to execute its mission.
- Frequency spread. Each of the air defense systems operates within separate radar frequency bands. (No one jamming system could operate simultaneously against all bands.)
- Frequency diversity. Tracking and guidance radars change frequencies to overcome jamming.
- Multiple and interchangeable missile guidance systems. Some OPFOR systems work on pulsed radar; others work on continuous waves. Some radar tracking systems also possess optical tracking for continued operations in a high electronic countermeasures environment; others systems use IR homing.
- Mobility. All OPFOR tactical air defense systems and most operational-level systems are mobile. They can quickly change positions after firing or after enemy reconnaissance units detect them.

Reconnaissance

Reconnaissance related to air defense takes two basic forms. First, commanders conduct terrain reconnaissance to determine likely avenues of approach for enemy aircraft and optimum positions for air defense weapons. Then air surveillance seeks to detect approaching aircraft and provide early warning and target information.

Terrain Reconnaissance

The OPFOR places significant emphasis on identifying all potential attack routes for low-flying enemy aircraft of all types. Routes of approach suitable for armed helicopters and positions from

which these helicopters might employ ATGMs are of special concern. The OPFOR considers armed helicopters to be a serious threat to its ground maneuver units. The OPFOR trains commanders to look for areas masked by trees or folds in the terrain where enemy aircraft might use nap-of-the-earth (NOE) flight techniques to avoid radar detection.

Both the commander of the supported maneuver unit and the commander of the supporting air defense unit usually conduct terrain reconnaissance. A preliminary map reconnaissance can tentatively identify positions for deployment of air defense weapons in defensive areas, along movement routes, or in areas seized by advancing OPFOR units.

Air Surveillance

The principle objective of air surveillance is to provide the earliest possible warning of approaching enemy aircraft and to develop target information for planning and conducting air defense. Forearmed with this information, the OPFOR can ensure that it can mass the fires of dispersed air defense units to engage the intruders. Ground-based and airborne reconnaissance assets at the operational level play a major role in gathering, integrating, and disseminating information to tactical units. Continuous surveillance of surrounding airspace ensures current data on the enemy air situation.

The OPFOR uses electronic and electro-optical means and visual observation to conduct air surveillance. The air defense forces have a passive early warning system based on a combination of radar systems and observers that will serve them well in the early stages of combat operations against even the most modern opponents. In later stages, the OPFOR accepts that it will either lose many of its airborne and/or ground-based early warning systems or at least not be able to use them with optimum effectiveness. When technical early warning systems are not available, the OPFOR is prepared to continue air defense operations while relying primarily on observers for air surveillance.

Radars

Air defense radars fall into two general categories: surveillance and fire control. The category of surveillance radars includes early warning, target-acquisition, and height-finding radars. Some fire control radars also have limited target-acquisition capability.

National-, operational-, and tactical-level surveillance and target-acquisition radars detect and monitor targets. The radars then provide the necessary data for engagement. Radars work as part of the IADS rather than as separate units. Air defense planners at all levels integrate radars into an overall system of coverage.

Operational-level early warning units deploy their radars as close as possible to the supported ground force unitâthe battle line, in order to detect enemy aircraft at maximum radar range. National-level early warning units can establish a second line of radar posts behind the first line of operational-level systems, in order to give depth. The types and capabilities of the systems employed and whether the battlefield is linear or nonlinear will determine the distances between lines.

Both national- and operational-level air defense forces maintain reserves to expand coverage as the operation develops, to replace casualties, or to establish a new line of radar posts. When the OPFOR is preparing for offensive operations, operational-level early warning radars remain inactive as part of C3D, and the national-level reserve radars deploy forward.

In many cases, long-range surveillance radars in early warning units at the national and operational levels can gather target information long before the enemy aircraft come into the range of air defense firing units. These radar units pass preliminary target data to air defense commanders and their firing batteries. Commanders then select the weapon system that can best engage a given target. The early warning units also pass warning information to operational

and tactical maneuver units and air defense firing units.

SAM systems and AA guns may have their own radars in the firing positions or mounted on self-propelled systems. However, higher-level radars can gather the information without unnecessarily exposing the air defense firing units to detection and subsequent neutralization by enemy forces. This practice reduces the vulnerability of battery radars and radar-equipped gun carriages and missile launchers to jamming or to destruction by antiradiation missiles (ARMs) or other means.

The air surveillance radar network is difficult to avoid or defeat. Many air defense radars are highly mobile and can displace quickly. Fire control units turn on radars at the last minute to achieve surprise and to avoid exposing themselves to enemy electronic or physical attack. The more advanced radar systems have enhanced electronic protection from jamming and ARMs. The wide spread of operating frequencies makes jamming difficult. Operator training stresses electronic counter-countermeasure skills and the use of radio and electronic silence where possible. Units back up radar reconnaissance with visual observation. Maneuver units have a radio net devoted exclusively to the passage of air and NBC warnings. Radar provides an all-weather detection capability.

Visual Observation

Despite the presence of a technologically advanced early warning system, the OPFOR continues to stress the importance of visual observation. Air defense and maneuver units deploy air observers as a backup to radars and so air defense units may not need to use their radars. In later stages of combat against more modern opponents, the OPFOR may have to rely heavily on observers after losing much of its radar capability.

An effective system of visual observation may often provide the first warning of an enemy air attack, especially one conducted by low-flying aircraft or armed helicopters using NOE techniques. When operating close to enemy forces or in areas where enemy air attack is considered likely, all units post air observers. In the defense, air observation posts are set up at suitable locations, usually on terrain offering good visibility, near CPs, and/or close to air defense units in firing positions. During tactical movement and during both the defense and offense, observers are posted on each vehicle. Observers are changed frequently to reduce fatigue and maintain their effectiveness.

Whenever possible, the OPFOR tries to get SPF teams, human intelligence (HUMINT) agents, or sympathetic civilians to visually observe enemy airfields in or near the region. These observers report by radio or telephone the number and types of aircraft taking off and their direction of travel. Other observers stationed along probable approach routes can monitor and report the progress of the enemy aircraft en route to their targets. Thus, OPFOR air defense units may not need to use their radars to detect and track incoming aircraft.

Requirements

The information required by air defense units falls into two categories: information on enemy air actions and information that can complete the picture of the overall air situation. The first category is a joint responsibility of all reconnaissance forces, and the second is the specific responsibility of air defense reconnaissance units.

The first category includes data from which the OPFOR can determine probable enemy air actions. This information is critical for planning and organizing the air defense system. Such information could includeâ

- The composition and strength of enemy air power.
- The capabilities of enemy aircraft.
- The enemy's basic methods for operational and tactical employment of air power.

- The locations of enemy airfields, C2 & centers, resupply bases, and production facilities.
- Avenues of low-level flight.
- Locations of FARPs.
- Locations of ground stations for UAVs.

The second category includes data from which the OPFOR can develop a clear picture of the air situation as it unfolds. This information is necessary to determine the enemy's plans, air order of battle, and air attack objectives. The OPFOR can then assign targets to fire units or redeploy resources. Necessary data also include the positions, types, numbers, direction, speed, and altitude of aircraft in flight. Radio intercept provides some data, but most comes from air defense radars.

Missions and Employment

Whatever the nature of combat being conducted by maneuver forces—offensive or defensive, most actions of supporting air defense units are, as the term implies, inherently defensive. The essence of an air defense unit's combat mission is to provide area coverage and/or point protection. However, air defense missions can also have an offensive nature, with the purpose of destroying certain enemy air platforms or denying or disrupting their employment.

The OPFOR recognizes that it may be unable to defend its entire airspace adequately. Therefore, it must establish priorities to ensure denser coverage in certain areas or increased protection for key assets. Priorities include airfields, SSMs, artillery, maneuver units, headquarters and communications centers, and critical logistics units and LOCs. The priority assigned to a particular area, entity, or site may change during the course of operations, as the tactical, operational, or strategic situation changes.

National-Level

National-level Air Defense Forces use their own air defense weapons for various missions, depending on the situation. Some of these assets might cover the air defense weapons of subordinate commands. Others might fill gaps between operational-level commands. They usually are somewhere to the rear of operational-level air defense weapons in order to engage aircraft that penetrate forward air defenses. Some national assets might provide general air defense coverage of the State and nearby airspace. In any event, the intent is for Air Defense Forces to ensure continuous coverage in both detection and engagement capabilities.

Operational-Level

Operational-level commands (primarily OSCs) can use their air defense units in many ways. Some medium-range SAM units may augment tactical-level assets. Others provide cover for gaps between tactical units or provide general area coverage of the OSC's entire AOR. This area coverage gives depth to the defensive effort and overlaps with envelopes of tactical units. Where possible, this SAM coverage overlaps the envelopes of adjacent operational-level commands.

The medium-range SAM units engage enemy aircraft at some distance from tactical maneuver units and other high-value assets within the OSC's AOR. These SAMs and shorter-range AA guns also protect key targets such as operational-level CPs, tactical ballistic missiles (TBMs), long-range rockets and artillery, and reserves.

Tactical-Level

In the best-case situation, a division or DTG will have sufficient air defense assets to provide area coverage over its AOR, including the AORs of subordinate units. At brigade or BTG level, there is a significant element of point protection in support of subordinate units and brigade- or BTG-level

assets. This is due to the nature of the units defended and the relatively short range of air defense weapons at this level.

Tactical-level short- and medium-range SAMs provide area coverage for the entire tactical-level unit, overlapping with the envelopes of flanking units. Short-range AA guns and shoulder-fired SAMs can provide point protection.

Air Defense Umbrella

Air defense assets from national down through tactical level create an air defense umbrella. Radars can provide an unbroken detection envelope extending well into enemy territory and across the entire AOR. If OPFOR fighter-interceptors are able to operate farther out against enemy aircraft in the *OPFOR flight area*, national-level long- and medium-range SAMs might be the first to engage enemy aircraft that slip past fighters. When OPFOR fighters must operate in *OPFOR friendly* OPFOR airspace, the national-level SAMs probably would be the first air defense assets to engage the enemy aircraft. The next layer of defense is operational-level medium-range SAMs. The final layer in the battle zone would consist of tactical-level SAMs and AA guns. If enemy aircraft escape air defenses in the battle zone, they may still encounter operational- or national-level air defense systems protecting key assets in the support zone. This deployment scheme causes enemy aircraft to run into overlapping defensive systems as they approach and penetrate the airspace over OPFOR units.

There is no set pattern for the deployment of air defense assets. A basic and flexible guideline is that, depending on their functions and weapon capabilities, air defense units occupy positions at a distance from the battle line that ensures the accomplishment of their mission and provides relative safety from enemy fire. For area coverage, this generally means that weapons at the operational level and below deploy rearward from the supported unit's battle line at from one-third to one-half of their engagement range. However, the OPFOR recognizes that *rules of thumb* are just that, and the operational or tactical situation and common sense may dictate that these distances be modified. Actual deployment depends primarily on the supported unit's mission, terrain, and the ground and air situations at a given time and place in the operation. Sometimes, air defense systems can be much closer to the battle line, realizing that such placement increases their vulnerability to enemy direct fire systems. When necessary, tactical- or even operational-level air defense systems may deploy beyond the battle line, out into the disruption zone.

As OPFOR units maneuver, the air defense umbrella also moves when necessary, in order to prevent maneuver units from becoming exposed to enemy ground-attack aircraft and armed helicopters. In a fluid, fast-developing situation, textbook efficiency may not be possible. While the OPFOR strives to maintain continuous area coverage, temporary gaps might appear in the air defense umbrella, both in surveillance and in weapons coverage. Commanders must be flexible and prepared to use standard and nonstandard solutions to prevent gaps in air defense coverage from developing during combat. The objective is to deny enemy aviation the ability to interfere with ground maneuver units. Air defense forces can accomplish this either by destroying enemy aircraft, by forcing them expend their munitions beyond effective range, or by diverting the aircraft before reaching their targets.

Figure 9-2 illustrates the vertical and horizontal coverage typically provided by OPFOR air defense systems at the tactical, operational, and strategic (national) levels. The example altitudes and ranges are illustrative of a principle. The actual systems and their capabilities can vary. Although not shown in this example, all SAM systems have a minimum range and a minimum altitude. Of course, the range beyond the battle line or limit of responsibility of supported forces depends on the situation and where the air defense systems deploy within the supported unit's AOR.

Engagement Procedures

On a priority basis, the OPFOR engages aircraft posing the greatest threat. The preferred technique is to fire at an already engaged target rather than switching from target to target. This priority continues unless a later-acquired target seriously threatens air defense units.

The OPFOR prefers to engage a hostile aircraft prematurely and waste some ammunition rather than allowing the aircraft to expend its ordnance. The OPFOR fires on aircraft as long as they remain within range.

Air observers and weapon crews outside the attacked area maintain observation and readiness to fire. This precludes enemy success through simultaneous air attacks from several directions.

OFFENSE

Operations from the air have ceased to be auxiliary and have become a critical component of combined arms combat. Thus, air defense is a vital part of the combined arms operation. The OPFOR can successfully execute operational offensive actions only if it can negate enemy air power. Conversely, failure to provide effective air defense against enemy air power can result in operational and tactical failures. Therefore, the OPFOR has an extensive air defense system to protect attacking maneuver units. Air defense weapons can fully support dynamic offensive combat.

Deployment

In an offense, the exact location of air defense weapons depends on the following factors:

- The assessment of the air threat.
- The mission of the supported unit.
- The commander's chosen organization of forces.
- The tempo of operations.
- The terrain.
- Fields of fire and observation.

The shape of the air defense deployment can change as supported units maneuver. The most common methods follow:

- Where the air threat is low, the commander assigns the complete air defense unit lines of deployment to occupy in succession.
- When the air threat is continuous, air defense units may move forward in bounds into successive firing positions, maintaining continuous coverage of supported units.
- In a highly mobile, fragmented operation, the OPFOR might integrate air defense into combat formations and occupy temporary firing positions on less likely approaches or in gaps between the coverage of the main air defenses.

SAM units at the operational and tactical levels deploy where they can provide area coverage for as much as possible of the supported maneuver unit's AOR.

Disruption Zone

In many cases, dispersed ground ambushing forces and other key assets in the disruption zone will require point air defense protection. Regular infantry, SPF, and affiliated forces operating in the disruption zone should have air defense systems as mobile and survivable as the force they are protecting. This may require extensive use of man-portable, shoulder-fired SAMs. Some forces may rely strictly on C3D for protection from enemy air.

Some air defense forces may be deployed in the disruption zone, particularly in the form of air defense ambush teams. Their purpose can be to deny aerial attack and/or to prevent enemy reconnaissance platforms from targeting forces in the disruption zone or battle zone.

Area coverage is desirable for protecting the overall disruption force. When necessary, the

OPFOR will move divisional assets or even OSC assets (both normally located in the battle zone) well out into the disruption zone to assist in area coverage or to provide early warning for other air defense units.

Battle Zone

Most air defense forces would normally be within the battle zone. In order to provide continuous coverage for supported maneuver forces, air defense systems need to have the mobility to move with those forces. Their main role is to allow friendly ground forces the freedom to maneuver as the operational situation develops rapidly. Air defense units in a fixing force can help prevent enemy aviation from coming to the aid of the enemy formation targeted for attack by assault and exploitation forces. Air defense action or even an uncertain air defense environment can help create the window of opportunity for an attack.

Support Zone

Some air defense units may be deployed in the support zone to help keep this zone free of significant air action and thus permit the effective logistics and administrative support of forces. Generally, commanders can afford to defend the support zone with less mobile air defense assets than in the disruption and battle zones. Throughout the support zone, the OPFOR makes extensive use of passive air defense measures, including C3D, maneuver, and dispersal.

Movement

The OPFOR anticipates that its units may be subject to air attack during movement. Accordingly, units engaged in movement are protected by their constituent air defense assets and, in many cases, by additional air defense assets allocated by their parent unit. When a subordinate tactical unit is conducting tactical movement, an operational-level command may order its own air defense assets to provide cover for the moving unit. Due to their longer-range systems, operational-level air defense units may be able to provide this coverage from their original positions or with minimal repositioning. Alternatively, the operational command may direct that the subordinate unit conducting movement receive air defense coverage from another, adjacent tactical subordinate whose air defense assets are within range of the moving unit.

Air defense units relocate as necessary to provide continuous and effective protection to the supported unit. OPFOR commanders maintain effective protection by leaving at least one air defense battery in firing position to cover the movement. Air defense units constituent to or augmenting a maneuver unit usually move as a part of that unit if the air threat is high. If there is little or no air threat, these air defense assets may move separately to a new location.

Defense

Air defense units seek to provide coverage to all levels of the organization. They must integrate this coverage with the ground operation and ensure continuous air defense. Air defense must provide all-around security because air attack can come from any direction. The OPFOR must coordinate fires among all air defense units and supported maneuver units. This provides an integrated air defense. Under conditions when the OPFOR can employ integrated defense, it generally can also employ integrated air defense, integrated both vertically and horizontally. During transition and adaptive operations, however, decentralized conditions may affect the ability to integrate horizontally and thus provide mutual support. The same would apply to the commander's ability to achieve vertical integration between the tactical and operational levels.

Deployment

9-154. Deployments closely parallel those in the offense, but there are some differences. The

positioning of operational-level air defense assets depends on the overall organization of the battlefield for the defense. Operational-level SAM units might deploy to provide point protection for the main CP, SSM units, airfields, or other high-value assets. The SAMs might cover units in sanctuary areas or sanctuaries into which maneuver units may deploy. They might cover lines of commitment for an operational-level counterattack. The OPFOR sees the threats posed by air reconnaissance and airborne or heliborne assault as being greater in the defense and devotes greater effort to guarding against those threats.

Disruption Zone

Air defense in the disruption zone should provide area coverage to defend forces in the zone and provide point protection for key assets involved in conducting fires. Even the systems providing point protection must be highly mobile and capable of moving with units as they displace to hides or new firing positions or conduct survivability moves.

Forces operating in the disruption zone are typically separated from sanctuary areas in both time and space. This separation typically requires the OSC commander to place air defense units in the disruption zone to support the disruption mission. Such deployment allows the OPFOR to detect, track, and attack air platforms in the disruption zone and beyond. This can involve deployment of divisional or even OSC air defense assets (radars as well as weapon systems) well into the disruption zone. These forces occupy prepared and camouflaged positions to support other units in the disruption zone. As in the offense, they try to prevent enemy aerial reconnaissance platforms from targeting forces in the disruption zone or the battle zone. This is a key part of the OPFOR's aggressive and creative counterreconnaissance effort.

Battle Zone

In maneuver or area defense, air defense units provide protection for the battle positions of DTGs or BTGs of the main defense force. In a maneuver defense, they especially cover units maneuvering from line to line. Especially in an area defense, they help preserve key components of OPFOR combat power or assist units in the stubborn holding of tactically favorable defensive positions that the OPFOR would prefer to retain. A typical battle position incorporates air defense systems, in conjunction with extensive use of C3D. In any type of defense, air defense units conduct air defense ambushes to provide opportunities for other forces to conduct counterattacks or reconnaissance fires. An OSC in the defense usually employs a strong reserve positioned in an assembly area with good C3D measures and strong air defense protection. The reserve must have sufficient air defense coverage to allow it to maneuver from the assembly area in order to conduct a variety of contingency missions the OSC commander might give it as the operation develops.

Support Zone

The OPFOR usually deploys some air defense units in the support zone to protect key logistics units and administrative support elements. However, it also relies heavily on passive air defense measures, including C3D and dispersal.

Antilanding Defense

Air defense units have a significant role in defending ground forces against attacks by enemy airborne and air assault troops. When the OPFOR detects an enemy airborne operation, Air Force units (if available) attempt to intercept and destroy enemy transport aircraft. They try to do this while the enemy is at marshalling airfields or en route to drop zones.

Operational- and tactical-level SAM units engage transport aircraft entering their respective air defense zones of responsibility. Short-range air defense assets near the drop zones also engage transport aircraft. These air defense forces typically act in the form of either air defense

ambushes or roving air defense units. Self-propelled AA guns, vehicle-mounted machineguns, and small arms all fire on descending paratroops and equipment.

Sanctuary Areas

A sanctuary area may exist because of natural or manmade features. However, it only remains a sanctuary if the OPFOR can prevent the enemy from striking it with standoff weapons, including air power. Thus, OPFOR units in a sanctuary area use all available C3D techniques to reduce likelihood of detection or identification. They may also exploit political restrictions placed on the enemy force.

The air defense of the sanctuary area is integrated into the overall air defense scheme at the tactical, operational, and strategic (national) levels. The net result is the requirement for enemy aviation to pass through overlapping

coverage to attack the sanctuary area. Attacking enemy aircraft must first penetrate the strategic (national), operational, and tactical engagement envelopes. Then they must face the air defenses within the sanctuary itself.

Within the sanctuary area, the air defense unit commander and the supported maneuver commander work closely together to integrate their weapons into an effective air defense plan. The maneuver commander provides guidance for the placement of all air defense systems, while the air defense commander supervises the details of the placement of his weapons and ensures that they remain within mutually supporting distance. As a rule, one crew in each pair of air defense systems remains alert, except when they have received warning of an air attack. Any available shoulder-fired SAMs supplement the defense, and the supporting air defense commander may exercise some degree of control over the SAM gunners. Air defense units observe radio silence and light discipline and dig in, as time allows.

A 360-degree surveillance of the surrounding airspace increases the air defense engagement envelope to the maximum extent possible. Air observation posts and air defense firing positions are positioned to provide comprehensive observation and interlocking fires on the most likely approach routes for low-flying fixed- and rotary-wing aircraft. All other weapons, including vehicle-mounted machineguns and ATGMs, are further integrated. Even planning for the use and integration of massed small-arms fire is essential to an effective air defense.

Mountains and Water Obstacles

Air defense units operating in mountainous terrain have unique problems. The rugged terrain makes it difficult to maintain the integrity of maneuver and air defense units. This, in turn, makes maintaining comprehensive air surveillance and air defense fire support more difficult, resulting in a greater degree of decentralization than normal.

Air defense forces play a major role in water obstacle crossings. They protect crossing sites and forces from air attack by creating envelopes of protected airspace above and around crossing sites. Major problems in air defense of water obstacle crossings include

- Providing comprehensive radar and visual observation.
- Handling simultaneous threats on multiple approach axes.
- Maintaining continuous 360-degree fire coverage.
- Supplying ammunition to firing units on the far shore.

Air Defense Ambushes and Roving Units

The OPFOR recognizes the disproportionate effects that sudden, unexpected destruction of an aircraft or small group of aircraft can have on enemy tactics and morale. For example, the surprise destruction of one or two lead aircraft, on what the enemy perceived to be a clear avenue of approach, could cause an enemy air assault to be called off or seriously disrupted. Air

defense ambushes may set up at temporary firing positions to surprise and destroy enemy aircraft and disorganize enemy fixed-wing aircraft and rotary-wing operations. Ambushes and roving air defense units can cause the enemy to believe that significant air defense assets are located in areas where actually there are only a few weapons. This can reduce the effectiveness of enemy reconnaissance and the likelihood of enemy air attack in the area concerned.

Ambushes

Air defense ambushes usually comprise a single AA gun or SAM weapon, section, platoon, or battery with the mission of engaging enemy aircraft from a hidden or unexpected position. However, the OPFOR may also employ antihelicopter mines.

Placement

By their very nature, the placement of air defense ambushes is unpredictable. They might be placed on the most likely air avenues of approach or along secondary and tertiary avenues. They can be along flanks, forward, behind, and in gaps between maneuver units. Their purpose can possibly be to fill apparent gaps in air defense coverage or to defend key units or sites. Typical missions include defending maneuver units, CPs, reserves, artillery and missile units, other air defense units in firing positions, and water obstacle-crossing sites. Ambushes can be placed

- In valleys or defiles likely to be used as ingress or egress routes by infiltrating aircraft.
- On adjacent heights to shoot down into valleys or defiles.
- Just behind a crest to catch aircraft from behind as they clear a ridge.

Single-launcher shoulder-fired SAM ambushes may be set up on wooden platforms built in treetops to catch aircraft flying over a forest. In urban areas, AA guns could be set up within the top or middle floors of buildings to fire

laterally or even down on low-flying aircraft while remaining unseen from almost every angle. Often, air defense ambushes are placed in complex terrain that offers poor fields of observation but allows them to fire through windows.

Planning and Preparation

Air defense ambushes may be planned and executed on short notice with little preparation. In other cases, they may involve elaborate preparation and camouflage, and tracking enemy aircraft over several days to discern operational patterns and possible weaknesses, or optimum weather patterns for a specific ambush site.

Weather conditions may facilitate the use of an air defense ambush. For example, low cloud bases may force enemy aircraft down into the envelope of a particular weapon. Ambushing units may work in concert with smoke- or aerosol-dispensing units or ground-based jammers that jam a low-flying aircraft's terrain-following radar, forcing it up into the ambush weapon's optimum engagement envelope. The OPFOR may create a deception position using decoys or derelict weapons and vehicles, to draw the attention of enemy aircrews and cause them to enter the ambush zone of an air defense ambushing unit positioned nearby.

The unit or weapon assigned to an air defense ambush usually occupies a temporary firing position in hours of darkness or under the cover of poor visibility conditions. It may assume a hide position near the firing position

and establish local ground security and air observers. The unit or weapon is carefully camouflaged and keeps all its emitters off or in dummy mode until ordered to engage a target. While in this mode, it can receive automated surveillance and target tracking data from its parent air defense unit or be alerted by air observers posted nearby. All this can allow the ambushing unit to delay using its own radars and other emitters until the last possible moment, in order to achieve surprise.

Occasionally, AA guns may choose not to employ their radars, using strictly electro-optical sights. This tactic takes into account the capability of modern aircraft, including attack helicopters, to detect radar and IR systems.

More than one air defense ambush, involving more than one weapon type may be established along the same air avenue of approach. These may work independently or in concert depending on the situation. Target engagement decisions may be left up to the ambushing unit commander.

Execution and Redeployment

When an air target is detected, the ambushing weapon or unit prepares to engage. This may involve removal of some camouflage or a short movement from its hide position to its firing position. It then fires on the target until the target is destroyed or moves out of the firing zone. Then the ambushing unit or weapon immediately displaces to a new ambush site or returns to its parent unit.

Roving Units

Employment of roving units is similar to that of air defense ambushes. The primary difference is that, while an ambushing unit lies in wait in one position for approaching enemy aircraft, a roving unit moves to the most likely areas of enemy air attack and occupies a series of predesignated positions in the supported unit's AOR. The commander of the roving unit identifies these positions during his terrain reconnaissance and coordinates them with the air defense and maneuver unit commanders. The roving unit occupies these positions according to a prearranged schedule or on order of the air defense unit commander. Roving units terminate their missions and return to previously designated primary firing positions upon direction of the commander of the parent air defense unit.

Air Defense Against Unmanned Aerial Vehicles

The OPFOR recognizes the increasing importance of UAVs on the battlefield, to both its own forces and those of the enemy. They can perform high- and low-altitude missions, collect the full spectrum of intelligence, and immediately downlink the data to a ground station. They have the capability to loiter or to fly deep. They can collect against a predetermined target or look for targets of opportunity. Their construction can make them difficult or easy to detect. Since UAVs can support targeting for enemy long-range fires, their priority for destruction increases.

9-180. Typically the enemy conducts reconnaissance missions using UAVs operating in the "window" between low-flying helicopters and higher-altitude fixed-wing aircraft. This altitude window is between 300 and 4,000 m. The most common technique is to approach the target area at high altitude and, once at the target area, drop down to a lower altitude that optimizes the capabilities of the sensor package on board. Once the mission in the target area is complete, the UAV climbs to higher altitude and departs the mission area.

Targeted Subsystems

Countering UAVs should not be viewed as just a defense against the aerial vehicle, although that is important. Most UAV systems consist of three basic subsystems: the air vehicle, the ground station, and the launcher. (In some cases, the latter two may be one vehicle.) There are also a variety of communication data links between the ground station and the air vehicle. Some systems also include satellite links. The air defense commander must coordinate with other arms to ensure that UAVs are being attacked not just in the air, but that their related subsystems are also addressed. The successful destruction of a UAV ground station has a far greater impact than the destruction of a single air vehicle.

Thus, air defense against UAVs requires not only an IADS but also an integrated all-arms

approach. Air defense commanders and planners should view the three UAV subsystems as three separate targets that can be countered through a variety of means. These means are both active and passive.

Active Measures

A wide variety and large number of active measures are available to the OPFOR to counter UAVs. The effectiveness of air defense radars can vary dependent on the radar cross section (RCS) and altitude of the vehicle. Of course, this does not preclude the use of radar, since these factors are considerations in detecting any aircraft. The relatively small size of many UAVs obviously reduces their RCS.

A variety of sound-ranging systems are available that can provide early warning and azimuth of an approaching UAV. This in turn provides air defense weapons and maneuver unit weapons an opportunity to prepare for the vehicle's approach and to put up a large volume of fire, provided the UAV can subsequently be visually detected. The early warning provided by sound ranging increases the probability that visual observers will be able to spot the vehicle.

The location of UAV ground stations and launchers is typically a high priority for reconnaissance. The OPFOR will use all available means (from the civilian population to commercially available satellite imagery) to locate these key targets. Reconnaissance assets for locating these targets can be tied to artillery, MRLs, or aircraft that can quickly engage the targets once the information is received. SPF operating in the enemy rear can also be a valuable asset in locating launchers and ground stations. They can either take direct action to destroy the targets or relay location information to allow the OPFOR to employ other means against them.

The OPFOR can also use jamming techniques to counter UAV system data links. In some cases, data links cannot be jammed but they can be monitored. The effectiveness of these procedures varies according to the UAV system being attacked. High-power spot or barrage noise jammers can be effectively used to mask ground targets from side-looking airborne radars. Many satellite up- and downlinks employed are through the use of the commercial telecommunication infrastructure. This infrastructure and supporting satellites can be jammed or monitored to some degree.

Passive Measures

Since the mission the UAV is executing may not be apparent, actions should be taken to counter all possibilities. The integrated use of the passive air defense measures described earlier in this chapter can reduce the effectiveness of UAVs. The use of a variety of decoys provides a false picture of the mission area to the enemy and, to a large extent, can deny information or distort the information collected by the UAV.

Strategic Context

The OPFOR accepts that, while it has a full range of capabilities to deal with its neighbors, air defense against a technologically superior force is problematic. It believes that comprehensive planning and the creative use of all capabilities, including some normally not associated with air defense, can serve to mitigate many disadvantages.

Regional Operations

Within the context of regional operations, the OPFOR views its air defense system as fully capable of protecting ground forces and infrastructure from air attack by any of its neighbors. To accomplish this, it believes that its aircraft will be capable of conducting successful counterair operations, thus denying any major encroachment into its territory or significant attacks by fixed-wing aircraft against its military forces operating in enemy territory. The ability to use ground-

based systems to defeat any "leakers" and rotary-wing attacks serves to reinforce this belief. This confidence does not preclude the OPFOR from using a wide variety of other options, to include TBMs or SPF.

While desiring to attack its regional opponent with overwhelming force, the OPFOR plans for the possibility of extraregional intervention. In doing so, it may choose to husband certain assets that may not be essential to accomplishing its air defense objectives against its neighbor.

Transition Operations

The first OPFOR combat actions against extraregional forces may be against the enemy air threat. Past operations have shown that one of a major power's first steps in support of intervention is the deployment of aircraft to third countries within range of the battlespace. Deployment could also include movement of aircraft to the territory of the regional neighbor with which the State is already at war. Attacking sites within these countries, especially third countries or the extraregional enemy's homeland, is a decision made at the highest political levels. Once the State leadership has assessed this as a viable option, however, the OPFOR will use every means available to preclude deployment or, more realistically, limit access and delay deployment timelines.

Taking early action against the air threat is essential to forces transitioning to adaptive operations. It provides time for ground forces to reposition. It also allows the use of OPFOR fixed-wing aircraft against targets they can range. Waiting too long to employ fixed-wing aircraft could result in an effective loss of the capability.

Adaptive Operations

OPFOR air defense actions during transition and adaptive operations are based on the premise that it is essential to attack aircraft while they are on the ground. While defensive in nature, OPFOR air defense has an important offensive component to it. Therefore, it must use every means available to attack enemy air capability. TBMs provide the OPFOR with the means to continue to attack after the effective loss or degradation of its fixed-wing capability. The key to the use of TBMs is that they are systems that have been held in reserve during regional operations and positioned in hides. These hides are dispersed and not tied to any operational pattern of the ground forces. Armed with a mix of high-explosive and persistent chemical warheads, they can destroy aircraft and make airfields unusable for extended periods of time.

Augmenting early OPFOR air employment and the continuous use of TBMs is the employment of SPF, insurgents, and terrorist groups. These forces can be a means of providing depth to the battlefield. SPF prepositioned in anticipation of intervention can operate in third countries or within the theater. Typical SPF missions include air defense ambushes of aircraft along routes of ingress or egress from airfields. Shoulder-fired SAMs equipped with night-vision devices serve as the weapon of choice for these ambushes. In some cases, the ambushing forces could be instructed to fire only at certain types of aircraft. These may include Airborne Warning and Control System (AWACS), reconnaissance aircraft, and fuel tankers. SPF can also conduct raids to destroy maintenance facilities and fuel storage sites. Insurgent forces, advised by SPF, can conduct similar missions. They can ambush cargo trucks en route to airfields or aviation facilities. SPF or insurgents can intimidate local contractors and force them to contaminate fuel supplies or sabotage air traffic control facilities. Where plausible deniability is important, terrorists may be more suitable for conducting some of these operations.

Air defense by ground-based systems still plays a key role in both transition and adaptive operations. The OPFOR recognizes that strategically and operationally it cannot maintain a fully integrated air defense system over all areas all of the time. However, it does believe that, through niche technologies and creative means, it can achieve integration in some sectors while taking a degree of risk in others. Longer-range systems, normally positioned deep, can be moved forward

to cause enemy aircraft to operate from greater standoff distances. By investing in key technologies, the OPFOR has some capability to provide early warning and target information to firing units from remote locations. This protects the firing units from detection and significantly lowers their radar transmission times. There is heavier reliance on the use of passive systems. Air defense ambushes along likely routes of ingress serve as effective means of augmenting ground force protection. In key areas, these ambushes would be positioned forward and in depth.

The use of other arms is an effective means of augmenting air defense capability. An in-depth analysis of the battlespace is conducted to identify likely helicopter firing positions. These can be sowed with antihelicopter mines and remote sensors. The sensors serve to key artillery fires to attack these sites and render them unusable or prevent effective fires by attack helicopters.

References

1. [redacted] For U.S. forces other than aviators, this phase may present the greatest threat.