**1. THE AIR THREAT**

***Learning objectives:***

*- analysis of GBAD forces passes through and requires the analysis of the adversary;*

*- identify and describe the various threats for SHORAD systems.*

**1. General principles**

The particularities of the air threats from the information and fire controlled areas by the platoon/group of anti-aircraft missiles/anti-aircraft artillery differ depending on the type of technique and the specificity of the air means mission.

The leader of the anti-aircraft defense subunit must know and understand the tactics, techniques and procedures/sequences used by the air enemy as an essential condition for combating/destroying him to the maximum possibilities of the technique provided.

The danger of an air attack on the Land Forces has become really difficult to counteract on the modern battlefield. Nowadays, the vertical component of the war has become an essential element of the operation, being just as important as its horizontal component.

The knowledge and interpretation of the technical-tactical characteristics of the air assets offers the subunits of anti-aircraft missiles/anti-aircraft artillery the possibility to establish the most efficient procedures for combating these means.

The main technical-tactical characteristics that any commander of the anti-aircraft missile/anti-aircraft artillery subunit must know are: speed; ceiling; distance; armament.

During the ***enemy's offensive operations***, their own forces are vulnerable to all types of airstrikes.

The research actions in the tactical space can be carried out with unmanned aerial vehicles, tactical research aircraft and specialized helicopters for locating the command points, the air defense means, the artillery, the logistics and the areas of concentration of forces.

After discovering these objectives, the enemy is expected to neutralize or destroy them with ground or anti-armor attack aircraft/helicopters, cruise missiles/air-to-ground, unmanned aerial vehicles and/or artillery fire.

The actions of fighter-bombers will take place more intensely at night, in low visibility conditions, in order to reduce their vulnerability, increase the probability of survival, will be preceded, and followed by research and reconnaissance missions.

Support/combat helicopters are the main threat, especially for anti-aircraft missile/ anti-aircraft artillery platoons operating in the areas of operations of units in direct contact with the enemy.

Fire support will be achieved with teams of 4 ÷ 8 helicopters, through the process of accompanying troops, especially in the main moments of the offensive: breaking the defense; exploiting success; introducing new forces/reserves into battle and repelling counterattacks.

During ***the offensive of their own forces***, the enemy in defense will try to regain the initiative with the fighting and support forces.

The enemy's aviation will perform, in support of the defense of the Land Forces, missions of:

a) Research;

b) Recognition;

c) Supervision;

d) Neutralization.

In addition to the actions of the air enemy, the neutralization of the platoon / anti-aircraft missile/anti-aircraft artillery group will also be achieved with the artillery hitting subsystem.

 The most important means that can act in the tactical field during the enemy defense operation are attack or special purpose helicopters.

***The main missions*** of ***combat helicopters*** in support of the defending forces are:

a) Counterattack - mobile anti-armor force;

b) Recognitions;

c) Counter mobility of the opponent.

The resource of helicopters that can act in support of the defender is much reduced compared to the support provided during the offensive operation - for example, in the band of a battalion in defense, they can act in support of 2 ÷ 3 helicopter platoons, each with 4 ÷ 6 ÷ 8 devices.

**2. Major threat categories**

As mentioned earlier, the analysis of GBAD forces passes through and requires the analysis of the adversary. Today we can categorize the threat for SHORAD systems into the following – major – categories:

* Theater Missiles;
* Unmanned Threat;
* Manned Threat;
* Rocket – Artillery – Mortars (RAM);
* Electronic Warfare.

2.1. Theater Missiles (TMs)

TMs constitute the primary threat to be countered by AD forces. Theater missiles are missiles with a range of 3,500 km or less. They may be a ballistic missile, a cruise missile (CM), or an air-to-surface missile (ASM) whose target is within a theater of operations. Theater missiles do not include short-range, nonnuclear, direct fire missiles, or wire-guided missiles.

*Air-to-surface missiles (ASMs)* are air-launched, precision-guided munitions designed to strike and harm ground targets. They are ideal against targets that are difficult to destroy with "dumb" bombs, such as bridges. They are similar to air-launched CMs, but are smaller, have shorter ranges. ASMs lack the wings and aerodynamic lifts associated with CM flights, and are launched by tactical fighter-bomber aircraft. The former Soviet Union and free world countries widely export ASMs, and they are operational in numerous air forces around the world.

Laser-guided systems, because of their short range (generally less than 10 km), place the attacking aircraft within the range of friendly air defense systems. Electro-optical or video-guided systems and ARMs offer the greatest standoff range and aircraft survivability factor. Some electronic-optical guided systems have ranges in excess of 100 km.

ASMs and CMs are becoming smarter and more versatile, reliable, accurate, and lethal. New capabilities may include a lock-on-after-launch capability or a loitering capability to attack enemy radar (for ARM variants) and may use dual mode seekers for increased reliability and combat capability (Table 1-1).

 Table 1-1 Characteristics of Air-to-Surface Missiles

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| --- |
| **Targets:**Armored vehiclesAir defense sites and radarsTheater ground targets |
| **Current Capabilities:**Range up to 100 kmSupersonic speed (Mach 3+)Extremely accurateGuided by electro-optical, laser, and anti-radiation homing |
| **Future Trends:**Improved accuracy and reliabilityLock-on-after-launch or loitering capabilityMultimode seekers and increased reliability |

*Cruise Missiles (CMs)* are unmanned, powered, self-guided air-breathing vehicles that sustain flight through aerodynamic lift and carry a warhead or other lethal payload. Modern CMs tend to be reliable, accurate, survivable, and lethal. They can be launched from the land, air, or sea. In flight, they are difficult to detect, can fly indirect routes (low or high) to avoid heavily defended areas, and can attack from any direction.

Today’s CMs are remarkably accurate; tomorrow’s will be smarter and more accurate. As a result, CMs will pose a far greater challenge. There are two primary missions and, thus, two types of CMs:

* Antiship cruise missiles (ASCMs);
* Land-attack cruise missiles (LACMs).

Significant operational characteristics of state-of-the-art CMs include low-level flight profiles as low as 20 to 50 meters above ground level (AGL). CMs travel at subsonic to supersonic speeds possessing high-to-pinpoint accuracy displaying small or low RCS, reduced infrared (IR) signatures. They have longer standoff ranges, all-aspect attack capability, and few “intent-to-launch” indicators, as well as several adaptable warhead options. These warhead options can include penetrating warheads for hard targets; antirunway, antiarmor, antipersonnel, and antimateriel submunitions; antiarmor smart submunitions; and chemical, biological, radiological, and nuclear (CBRN) warheads.

Emerging cruise missiles pose a serious threat because of their unique operational characteristics. New technologies used in airframe and warhead design and in propulsion and guidance systems increase their lethality. Stronger and lighter airframes made of composite materials give these missiles a lower RCS; by reduced observable flight characteristics and stealth technologies that are now available to further reduce the detection.

CMs are relatively small in physical size and are much smaller than manned aircraft. CMs are similar in many respects to manned FW aircraft and, as such, are often difficult to identify as either friendly or enemy, or to distinguish between manned or unmanned platforms.

CMs can fly at differing altitudes during the various phases of their mission, but are employed to fly very low altitudes (depending on terrain) during ingress to the target area or through defended airspace. CMs follow a preprogrammed flight path that often includes or can include deceptive routing or terrain masking, which makes it difficult to determine their flight history, point of origin, or to predict their intended target.

In the terminal phase, CMs may employ different attack modes to maximize their target zone penetration capability and potential to inflict lethal effects on their targets. Although, formidable threat cruise missiles have exploitable vulnerabilities as well. Presently, CMs cannot deviate from their preprogrammed flight if detected, attacked, or if they encounter adverse weather conditions. The net result of these stressing characteristics is a relatively low cost, easy-to-use, highly effective threat to friendly forces and assets throughout the theater.

The CM threat is projected to increase in both quantity and sophistication of technology since cruise missiles offer a practical, easy-to-use, inexpensive method of building a theater missile inventory; are more accurate in targeting specific high-value targets (HVTs) than TBMs; and do not endanger pilots or put sophisticated and costly FW aircraft at risk.

Anticipated technology enhancements may provide a capability for increased ranges, improved accuracy, increased use of countermeasures through signature reduction, improved synchronization of simultaneous attacks from multiple azimuths, the ability to fly at even lower altitudes, greater maneuverability, and greater lethality by employing chemical, biological, radiological, nuclear, and high yield explosives (CBRNE) adversely effecting friendly forces (Table 1-2).

Land Attack Cruise Missiles (LACMs) are missile attacks originated from air-, ground-, or sea-launched platforms with attack oriented to strike targets on land. Advancements in propulsion, guidance systems, electronics, and warhead design have resulted in the development of highly sophisticated LACMs. LACMs have traditionally been used to strike high-value stationary targets, but with the advent of smart submunitions, real-time video guidance, and sensor-to-shooter links, moving targets can also be attacked. LACMs are employed from long ranges and launched from various platforms.

 Table 1-2 Characteristics of Cruise Missiles

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| **Targets:**Assembly points, logistical facilities, stationary objectsC2 centers and sensor nodesArmored formations/systems |
| **Current Capabilities:**Small and pilotless, multiple configurations and variations, boost and turbo-fan drivenOn-board radar processing with terminal guidance systems3-D terrain contour matching (Tercom), plus GPS correlation for flight guidanceVery low (hugs the ground at high speeds) flying altitudeFlight ranges from 800 to 1,600 kmMultiple launch locations- submarines, destroyers or aircraftPayloads-high explosive bombs up to 1,000 pound (450 kg) with precision accuracy and target location |
| **Future Trends:**Composite material constructionStronger lighter airframesReduced radar cross section |

*Anti-Radiation Missiles (ASMs)* that employ anti-radiation homing systems are referred to as ARMs and represent the greatest threat to AMD, counter battery artillery, aviation, and intelligence radar. Most ARMs have ranges of over 100 km. An aircraft firing an ARM can launch from outside the lethal envelope of the air defense system and negate capture. These platforms have a variety of launch options and are usually “fire and forget” systems. Most ARMs are designed to destroy radar installations including air defense systems radar systems.

2.2. Unmanned Threat

Unmanned systems possess inherent lethal capabilities. CMs, ASMs, UASs, unmanned attack drones (UADs), UCAVs, and large caliber rockets (LCRs) are increasingly available on the world market. Investment in substantial numbers of these may have a higher payoff value than an equal value investment in manned systems.

Sophisticated and rudimentary versions of unmanned systems pose a danger to deployed friendly military forces. CM can deliver both conventional and WMD on deployed forces or geopolitical assets. Intelligence, surveillance, and reconnaissance (ISR) and UASs can detect friendly force operations and provide the basis for near-real-time targeting, leading to potential disruption of decisive operations. LCRs pose special hazards and challenges across the spectrum of operations and presents the changing threat that is facing AD forces.

*Unmanned Aircraft Systems (UASs)* include drones characterized by preprogrammed flight paths and patterns, and remotely-piloted vehicles controlled by ground-based operators. Many countries are expected to operate multiple types of UASs, which include UADs, electronic jamming, and tactical reconnaissance UASs. UADs are a non-recoverable UAS that is fitted with warheads that self-destruct on impact with the target. UASs have traditionally been used to perform reconnaissance missions.

Electro-optical, IR, and radar technologies have improved detection capabilities that continue to increase reconnaissance standoff distances. Other technological developments have expanded the UAS role to include target designation, EW, suppression of enemy air defenses (SEADs), and decoy and attack missions. UASs have reduced RCS and infrared signatures, making them more difficult to detect. UASs can cruise at subsonic speeds of 75 to 550 miles per hour and sustain flight using aerodynamic lift over most of their flight path. Flight altitudes vary depending on type of mission, weather, and terrain.

ISR and target UASs will generally operate between 1,500 and 4,000 meters AGL. Lower altitudes are most likely to be associated with attack UASs depending on guidance and control as well as operational tactics. Threat UAS platforms typically will detect targets at a range of 12 to 15 km and specifically identify and track at ranges of 8 to 10 km.

UASs have relatively low RCS, low speed, and low thermal and sonic signatures, thus making them difficult to detect, track, and engage. UASs serve as ISR platforms for target detection, identification, and location weapon targeting, target designation, and battle damage assessment (BDA). State-of-the-art sensors and data links provide real-time targeting for fire support systems, maneuver forces, and aircraft (Table 1-3).

 Table 1-3 Characteristics of Unmanned Aircraft Systems

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| **Targets:**Assembly areas, logistical areas, C2 centers (seeing) Troop movements (seeing) C2 centers and sensor nodes (jamming) Armored formations/systems (attacking) |
| **Current Capabilities:** Remotely (networked) or self piloted enduring performance Multi-missioned: RSTA, EW, attack, imagery Range to 1,900 km Loitering altitudes 300 meters to 17+ km Standoff/detection range from 25 km Payloads - daylight, TV, cameras, high-explosive warheads laser designators |
| **Future Trends:** Added missions — decoy, electronic combat, SEAD Standoff range in excess of 50 km Detection to 70 km; all-weather, day or night |

*Unmanned Combat Aerial Vehicles (UCAVs)* include recoverable systems that use UASs as delivery platforms for expendable ordnance. Some are actually remote-controlled bombs. UCAVs embrace concepts for air-to-air and air-to-surface munitions delivery. UCAVs can carry a warhead and employ precision guidance. Current attack UASs are antiarmor and anti-radar systems that loiter overhead waiting for a target to appear. Some UASs have also been identified as possible munitions delivery systems since they can carry expendable munitions and can be recovered, rearmed, and reused.

2.3. Manned Threat

The traditional air threat comprised of both FW and RW aircraft remains a viable threat to forces and equipment. FW aircraft will continue to evolve as expensive, but highly capable, multirole weapon systems. RW aircraft (helicopters) will also continue to pose a significant lethal hazard for ground forces with both improved night and standoff capabilities. While these manned threats are still formidable, the proliferation trend in the 21st Century is toward the unmanned threat.

*Fixed-wing aircraft* will continue to be a threat as numerous countries continue to buy new multirole aircraft (for example, SU-30 Flanker, Mirage 2000-9, Eurofighter Typhoon) or perform major system upgrades to existing inventories. While long-term force levels are expected to decline, the manned fixedwing threat remains a part of the battlefield environment.

Nations that have a manned fixed-wing force is capable of using those aircraft to strike surface targets. Only the most advanced nations can mount extensive, deep penetration attacks against targets protected by integrated air defense systems. However, even the most rudimentary air force has the ability to dash into the forward areas of the battle to strike targets, while minimizing exposure inside hostile airspace.

The increasing availability of standoff weapons, including the relatively short-range ASM, further increases the threat potential of manned aircraft. Although US military air power can be expected to quickly achieve at least local air superiority, the manned aircraft remains a threat to be countered.

Terrorist threats bring new dimensions to the method and purpose of air attacks. Use of an air vehicle as a terrorist weapon is a highly stressful homeland threat. Asymmetrical threats include use of commercial and private aircraft; hijacked airliners fall in this category (Table 1-4).

 Table 1-4 Characteristics of Fixed-Wing Aircraft

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| **Targets:**Enemy fixed-wing/rotary wing aircraftArmored and non-armored vehiclesAir defense sites and radarsTheater ground targets |
| **Current Capabilities:** Multi-role: attack, RSTA, EW, assault/transportCountermeasures, jamming and surveillanceSupersonic speed (Mach 3+)Extremely accurate attack with large guided payloads |
| **Future Trends:** Improved engine technology and reliabilityAdvanced airframe and coating technology |

*Rotary-Wing Aircraft*

Helicopters will continue to be a threat, especially to the maneuver force. This is confirmed by the steady introduction of improved systems with increased standoff ranges and payloads, as well as improvements in combat effectiveness and survivability in high threat areas. Helicopter munitions can include guns, rockets, and tactical air to surface missiles (TASMs)/anti-tank guided missile (ATGMs). Low-flying helicopters, taking advantage of terrain masking, will be difficult to detect.

Attack helicopters will continue to use the “run-in” attack profile that makes them somewhat more vulnerable to ADA systems during attack. Helicopters armed with sophisticated TASMs can fire from a hover at standoff ranges up to 10 km, thus avoiding short-range air defense systems as well as large caliber direct fire weapons. Growing numbers of exported western-built attack and armed helicopters contribute to the potential threat capabilities and increase the likelihood of encountering a threat capability to launch ATGM from a significantly longer standoff distance.

Although many threat countries operate Russian-built helicopters (especially in the Middle East), countries like North Korea operate older generation models, such as the US-built Hughes 500 series, modified to perform attack roles. Any helicopter can be modified to carry weapons and, hence, can perform in some form of an attack role.

Helicopters pose a distinct air threat to forces due to their maneuverability and weapons payload capacity. Ground-force commanders rely primarily on helicopters to fulfill direct air support requirements throughout the AO. Helicopters perform a variety of missions. Hovering and low-flying helicopters, taking full advantage of terrain masking, are difficult for ADA units to acquire and target. They have improved fire control and weapon capabilities enabling helicopters to search, acquire, and fire at ground targets from longer standoff ranges, thus increasing their survivability and effectiveness (Table 1-5).

Table 1-5 Characteristics of Rotary-Wing Aircraft

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| --- |
| **Targets:**Troops/armored vehiclesConvoysC2 centers |
| **Current Capabilities:**Multi-role: attack, RSTA, EW, assault/transportRange to 370 km; speed to 350 km/hrPayloads - guns, rockets, missiles, mines, laser systems, ECM |
| **Future Trends:** Modular upgrades to airframes Expanded night/adverse weather capability Improved fire control system/engagement capability -standoff at greater rangesImproved ASMsImproved IR countermeasures |

2.4. Rockets, Artillery, and Mortars

Though rockets and artillery are organic to field artillery units and mortars to infantry units, they are grouped together due to their similar characteristics and trends. They are expected to remain the most serious threat to personnel and to all but the most heavily protected vehicles and other equipment. Advances in munitions and delivery systems have increased their range and lethality. The advents of GPS-guided artillery delivered high-precision munitions (ADHPM) make the mounted and armored forces increasingly vulnerable to artillery indirect fire.

*Large Caliber Rockets (LCRs)* are unguided, surface-launched, indirect-fire rockets that can be fired from a single or multiple launch platform, and have a diameter of 200 mm or greater and a range of at least 40 km. Of the LCR, those with the larger diameters allow for a payload capacity with a destructive potential in line with TBMs. They also have greater payload space in which to carry more advanced submunitions. Single rocket launch systems, such as the free rocket over ground (FROG) and the multiple rocket launcher (MRL) systems (for example, the Russian Smerch) are considered LCR.

LCRs are widely proliferated, and production and sales are increasing. LCRs are expected to continue to be used as a preferred means of delivering long-range tactical fire support, particularly in a suppressive role. Most rocket rounds are not capable of accurate strikes against moving or point targets at maximum range.

LCRs are employed most effectively against large static targets. Their employment also complicates the air picture at tactical levels. The high volume of fire, mobility, rapid reload, and area attack capability of MRL-type LCRs make them ideal for striking assembly areas, air defense/fire support sites, and troops, as well as choke points and routes of advance. Developments in passive IR, millimeter wave, and other smart or precision guidance technologies for unitary and submunition payloads have improved capability. They are used to counter heavily armored vehicles, lightly armored infantry vehicles, command, control, communications, and computers (C2) nodes, and radar systems.

LCRs pose a significant threat to deployed US and multinational forces. While technically not missiles, LCR size, trajectory, warheads, and battlefield targets are similar to those of SRBM. Older LCR systems are exemplified by the Russian Luna M or FROG series. More recent multiple LCRs include the Chinese WS-1.

Highly mobile launchers, combined with the rocket’s short burn time and low RCS result in little or no warning for maneuvering forces. LCR short ranges discern detection and preclude engagement by most current missile defense systems. LCRs are widely proliferated, and their production and sales are increasing (Table 1-6).

 Table 1-6 Characteristics of Large Caliber Rockets

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| --- |
| **Targets:**Assembly areas Air defense/Field artillery locationsDefensive positionsTroops in the offenseChoke points/advance routes |
| **Current Capabilities:**High rates of fireHighly mobile (shoot and scoot)Low signature flight trajectoryArea denialWarheads – High explosive, chemical, bomblets, mines, all types ideal for massive ordinance delivery |
| **Future Trends:** Advanced antiarmor warheads |

Rockets can deliver high rates of fire and a variety of warheads, making them ideal weapon systems for fire support missions. The highly mobile launchers can rapidly move around the battlefield. This mobility, coupled with the rocket’s short burn time, gives maneuver forces little warning. Their short range and salvo fire capability preclude engagement by current missile defense systems.

*Artillery and mortars* are recognized as systems of systems – each is not effective if one of its components (for example, weapon, C2, reconnaissance, and munitions) is deficient. Thus, countries are upgrading and improving deficient components rather than replacing the entire systems.

Cannon artillery and mortars submit a lethal threat to unsuspecting ground forces and equipment when employed by enemy forces using multiple temporary or expedient substitute launch point systems. Cannon artillery and mortars possess high firepower and a variety of warheads. The advent of ADHPM represents a force multiplier, allowing smaller forces to rapidly and accurately attack larger mechanized forces.

2.5. Electronic Warfare (EW)

EW is military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy. EW can cause misinterpretation of the information received by electronic systems. The three major subdivisions within EW are: electronic attack, electronic protection, and electronic warfare support.

Adversaries can use EW as an essential component of warfare. EW can be used in conjunction with counterintelligence to protect their C2 while attacking Patriot locations. EW, used effectively by the enemy with maneuvers and fire support, can locate, identify, damage, and possibly destroy Patriot battalions and batteries.

**3. Procedures for action/attack**

The actions of the hunting-bombardment/ground attack aviation will be carried out within the air operations, concomitantly with ground-to-ground missile strikes, with the action of radio-electronic warfare, with the action of helicopters and unmanned aerial vehicles (to fight).

As a rule, the hunting-bombardment/ground attack aviation acts to neutralize/ destroy the reserves, realizing the air interdiction (AI).

The hunting-bombardment/ground attack aviation, destined to hit different categories of troops/targets, uses the attack procedures: dive; horizontal flight; pitch; laser-guided ammunition bombardment; bombardment of radio electronic-marked targets and anti-radiolocation missile attack.

Compared to hunting-bombardment/ground attack aviation, helicopters have the following ***advantages***:

a) The helicopters do not need aerodromes, being able to take off and land on any portion of flat ground located near the units and sub-units of the Land Forces;

b) The helicopters can be easily masked/hidden near buildings, under the crown of trees or using camouflage equipment;

c) Evolving at low and very low altitudes, they can be discovered with difficulty by terrestrial and aircraft radiolocation stations.

In addition, helicopters are able to quickly change their location/disposition/action and avoid enemy strikes.

Unmanned aerial vehicles (UAVs) - airplanes/helicopters/missiles - can perform almost the same range of missions as manned aerial vehicles and have the following ***advantages***:

a) They have small dimensions compared to the planes/helicopters with the same destination and therefore, the probability of discovery is lower - they can also be made in stealth technology;

b) Manufacturing costs are much lower compared to those for manned aerial vehicles;

c) They can perform various missions - multiple research, transport of ammunition to the target, execution of radio electronic warfare actions, simulation of air actions;

d) During the execution of missions they can be directed from their own combat device or based on a program recorded in the memory of the on-board processor;

e) During the operation, the human resource is not exposed to the enemy's attack because the direction and/or exploitation of the data are done from one's own device, from sheltered/masked points or from the planes, which are outside the anti-aircraft armament.

Airplanes, helicopters, cruise missiles/air-ground/winged, program-based or self-directed, are a major danger to the Land Forces.

Cruise missiles against land targets are safe, accurate, highly able and lethal. Cruise missiles may be launched from the ground, from the air or from sea-going vessels. In flight they are difficult to detect, they can fly along indirect routes – low or high – to avoid areas with a high concentration of anti-aircraft defences and attack from any direction.

The special technical-tactical characteristics of cruise missiles imply increased protection measures against them in anti-aircraft missile/anti-aircraft artillery sub-units.

Anti-aircraft missile/anti-aircraft artillery sub-units equipped with radar research means will establish appropriate airspace surveillance and cruise missile control measures as with low-reflectance air targets, of those who are caught or are flying at a low height.

In the event that the anti-aircraft missiles/anti-aircraft artillery sub-unit cannot ensure the discovery by means of radar of cruise missiles, measures will be taken to provide space observation research and warning of the possibility of cruise rocket attacks.

All anti-aircraft missile/anti-aircraft artillery sub-units shall organize and implement the above measures in such a way as to provide at least the time necessary to accommodate and protect personnel against cruise missile attacks.

Air-to-surface missiles (ASM) are launched from the air and can be precisely guided to attack ground-based lenses. They are ideal against targets such as bridges, which are hard to destroy with bombs.

Air-to-ground missiles are similar to air-launched cruise missiles, but are smaller, have a shorter reach, are missing wings, and do not fly around the terrain profile. They are launched from tactical bombardment-hunt aircraft.

Air-to-ground missiles pose a very serious threat due to their diversity and precision. Most air-ground missiles use radio or laser/electronic-optical control and guidance on electromagnetic radiation.

Anti-aircraft missile/anti-aircraft artillery sub-units with the means of radar research/guidance will operate under the conditions of enemy use of air-to-ground missiles as specified by the firing rules.