National Défense
Defence nationale

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Insert - Air Defence Artillery (V2.4)

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PART 8 - ARM INSERT

TAM 804 - AIR DEFENCE ARTILLERY

804.01 - AD ARTY ROLE, TACTICAL FUNCTIONS, PRINCIPLES OF EMPLOYMENT & DEPLOYMENT

1. **AD role**. To prevent the en from interfering from the air with our grd ops.

2. **Tactical Functions:**

TACTICAL FUNCTION	MEANING	REMARKS
Early wng	Detection/tracking/ ident of en ac	Part of the airspace con system. Ac safety is a paramount consideration
Protection	Area – volume of airspace under which friendly tps can move and fight while defended from en air recce and atk	ADATS is best suited for this task.
	Point – protection of an installation not exceeding 500 m diameter (reserve demolition, HQ, etc)	Javelin or gun/Skyguard is best suited for this task
	Rte – protection along a rte, axes, or series of rtes	Any AD wpn can do this task
	Unit – def of a specific unit or sub-unit	ADATS is best suited for this task
Attrition	Inflicting max attrition on an en ac overflying an area, along likely air avenues of approach.	Diverts AD from specific protection tasks
Airspace coord	Promotes the safe, efficient and flexible use of airspace. Integrates air, AD, aviation, unmanned aerial vehicles (UAVs)	Centralized coord through Airspace Coordination Centres (ASCC) at all levels

3. **Principles of Employment:**

PRINCIPLES OF EMPLOYMENT	COMMENTS
Mass	The concentration of sufficient resources to adequately defend an asset
Mix	Achieved through employment of a combination of wpns. Capability of one offsets the limitations of another.
Mobility	AD units should have the appropriate mobility to maintain protection of its specified task.
Integration	AD plan must be synchronized with all other cbt and cbt sp plans as well as the other components of the AD system.

4. **Principles of Deployment:**

PRINCIPLES OF DEPLOYMENT	COMMENTS
Def in depth	Site systems so that en ac are engaged from max effective rge until they depart the area. Density should increase as the en ac approaches the tgt.
All round def	Ac atk from all directions. AD should provide protection over 6400 mils.
Mutual sp	Systems are sited to cover the non-engagement zones of other systems and to minimize the effects of saturation atks.
Early engagement	Ac should be engaged prior to Line of Weapon Release (LWR).
Weighted coverage	AD systems should be sited to provide max fire along air avenues of approach identified and confirmed during battle procedure.

804.02 - COMD AND CON OF AD/TACTICAL TASKS.

1. **Comd.** Comd in AD language means the full auth and responsibility that a comd has to issue orders for the allocation of tasks, deployment, movement and log sp. Comd does not include fire con or airspace con orders. Control is conducted through CPs at various levels. It includes management (current ops) and planning (future ops) as well as the allocation of tgts to AD wpn systems, airspace con orders, states of readiness and the con of AD fire. There is only one controlling auth which is normally the Airspace Con Auth (ACA) (i.e. the Air Component Comd of a joint force).
2. Comd relationships are defined in USOP 106.
3. **Chain of Comd.** Due to the size of deployed forces in the CF, units and formations have integrated, well established affiliations. AD assets aval from

higher levels are allocated through the use of sp relationships. AD arty assets can be allocated in two possible scenarios:

a. AD arty allocated to other countries:
   (1) allocation of AD assets outside of national formations will use NATO terms:
      (a) OPCOM (Operational Command); or
      (b) OPCON (Operational Control);

b. AD arty allocated to national independent ops:
   (1) Used in the case of independent ops such as airmobile or airborne ops where the deployed force does not possess integral AD arty and will be required to operate independently for significant periods of time.
   (2) Used also when comd, most likely due to distance, cannot be carried out properly, such as an AD element supporting a covering force. The force will use the std Land force comd relationship.

4. **Tactical Tasks Matrix**. Tactical tasks are used because AD arty is normally commanded centrally. They are used to be able to influence the application of firepower without regrouping sub-units. The following tactical tasks will be used:

	DS (Direct support)	**R (Reinforcing)**	**GSR (General Support Reinforcing)**	**GS (General Support)**
Auth for AD priorities	Direct supported unit comd	Reinforced AD comd	Higher AD comd	Higher AD comd
Auth for AD wpns loc	AD comd with direct supported comd	AD comd in conjunction with the reinforced AD comd	AD comd selects in conjunction with the Area of Ops (AO) comd and the reinforced AD comd	AD comd selects in conjunction with AO comd
Coord for AD wpn loc	Direct supported comd	Reinforced AD comd coord	AO comd and reinforced AD comd	AO comd
Estb ln with	Direct supported comd	Reinforced AD comd coord	Reinforced AD comd coord	No inherent reqr
Estb comms with	Direct supported comd	Reinforced AD comd coord	Reinforced AD comd coord	No inherent reqr

NOTES:

1. The provision of an ASCC to the supported comd is implied in a DS task
2. Admin relationships must be determined with the AO comd during planning if required.
3. Tactical tasks are not used higher than Div. Comd relationship is then used for AD arty and FD arty.

804.03 - CHARACTERISTICS OF NATO AD EQPT

EQUIPMENT		**AMMO READY TO FIRE**	**CREW**	**RGE** (km)		**MAX SPEED (kph)**		**FUEL CAP** (l)	**EFF RGE (km)**		**RDR RGE** (km)
				Rd	**X-country**	**Rd**	**X-country**		**Min**	**Max**	
Roland		4	3	483	300	66	48	662		8	12
Rapier (FSC)		8	5	483	300	80	61	662	.9	6.8	
HVM (Starstreak)	SP	8	3						1	5.5	
	LML	3	3						1	5.5	
Gepard		560	9	550		65				4	.3-16
Patriot		4	6						3	70	150
Avenger		4	3	700		140	40	205	2	5	
ADATS		8	6	520	350	56	24	360	4	8	25
Javelin	SL	1	4						2	5.5	
	LML	3	4						2	5.5	
35 mm GDF-005		560	5						.350	4	
Skyguard FCU			5								25
TPS-70			4								456
M113			3	483	300	66	48	662			
HLVW				700		80	50	400			
LSVW			3	400		135	40	205			

NOTES:

1. SP = self-propelled
2. LML = lightweight multiple launcher
3. SL = shoulder launcher

804.04 - AIR DEF WPN SYSTEMS
JAVELIN S-15

Wpn system	**JAVELIN S-15**
Role	To provide point protection of specific grd tgts against the very low-level air threat
Wpn rge (km)	Max: Fighter Ground Attack (FGA) 4.5 km, heli 5.5 km Min: 350 m
Max effective height (m)	1000 m
Guidance system	Semi auto comd to line of sight (SACLOS) through the means of a line of sight beam rider (LOSBR) with initial gathering phase.
Multi tgt capability	Nil
Grd tgt capability	Nil
Propulsion system	2 stage solid propellant motor
Ammo	Rate of fire: LML 3 msls ready to fire, SL 1 msl ready to fire Warhead/fuze type: blast frag with impact/graze/proximity fuze Basic load: 10 msls per det
Surv system	Type: visual Active or passive: passive
Max speed	Mach 1.4
Coverage	Bearing: 6400 mils Elevation (max firing) SL: -176 mils to +800 mils LML: -176 mils to +500 mils
Drop limits	Unpacked canister: 25 cm Canister in full standard pack (FSP): 75 cm Aiming unit: 0 cm
Air portability	Hel and un-pressurized ac up to 10000 feet ASL
Climatic operating Rges	Temp: -30^{o} to $+60^{o}$ c Pressure: altitudes up to 1500 m ASL Wind: in crosswinds up to 46 km/h Humidity: up to $+40^{o}$c at 95%
Veh	Tracked or wheeled
Det size	4
Modes of deployment	LML or SL

Wpn system	JAVELIN S-15
Method of tgt ident	Visual ident dependent on wpn con status and national rules of engagement criteria
C4 systems	Type: cbt net rad

ADATS

Wpn system	ADATS
Role	Provide Low Level Air Defence (LLAD) protection of mobile tps and static installations during day, night and conditions of low visibility
Wpn rge(km)	Max: 8 km+ Min: 375 m
Max effective height (m)	5000 m
Guidance system	Cooled $C0^2$ laser beam rider
Tgt capability	Grd or air
Propulsion system	Single stage solid propellant motor
Ammo	Fuze type: proximity or impact Weight 67.3 kg in canister Basic load: 12 msl (8 loaded, 4 in limber veh)
Surv system	Type: radar or electro-optical Rge 25 km Active or passive: either
Radar type	I band pulse doppler: 25 km max rge, 17 km normal rge
IFF	L band mode 4/SIF capability
Fuel consumption	Veh: 85 litres/100 km PPU: 30 litres/hr
Flexibility	Can operate autonomously or with up to 6 ADATS, 1 master and 5 slaves in C3 configuration
Deployment limitations	Max 106 mils pitch and roll to be able to fire
Airspace con	Display zones and corridors on PPI
Fuel capacity	360 litres
Carrier veh	M113
Det size	6 (crew of 3)
Method of tgt ident	IFF or visual
C4 systems	Type: tgt data link Capabilities: tgt info can be passed between ADATS on data link via digital rad/landline

Wpn system	ADATS
Laser rge finder	Type: Nd/YAG

35-MM GDF-005

Wpn system	GDF-005
Role	The role of the GDF-005 is to protect grd areas i.e. ,airfields, bridges and industrial installations, against air atk from both msl and ac
Description	The twin 35 mm gun is an all weather mobile unit that is towed by a heavy logistic vehicle wheeled (HLVW)
Wpn rge	4000 m
Modes of engagement	Remote con by the FCU Local con by the gunner
Ammo capacity	280 rounds allows for 8 to 10 tactical engagements before reloading is required
Ammo types	Drill, break up, target practice tracer (TPT), high explosive-incendiary (HEI), advanced hit efficiency and destruction (AHEAD), automatic lead angle compensation
Rate of fire	1100 rounds per minute
Laser rge finder	300-5000 m
C3 systems	By means of rad and wire link
Weight	8200 kg
Method of tgt ident	Visual if gun operated locally and through IFF if operated from the Skyguard
Maximum side slope	The gun can be deployed on a max side slope of 7 degrees
Fuel consumption	Standby 1.5 litres/hr Op 5.5 litres/hr
Redeployment time	7 minutes
Deployment time	15 minutes
Det size	5

SKYGUARD FIRE CON UNIT

Wpn system	**SKYGUARD MK II**
Role	The FCU is part of, and provides fire con for the twin 35 mm guns within a LLAD system. It is designed to protect grd vital points i.e., Airfields, bridges and industrial installations ,against air atk (msls and ac)
Description	One FCU is capable of controlling two GDF 005 in the remote mode. The FCU is designed as a mobile all weather unit that is towed by a HLVW.
Det	6 (crew of 3)
Radar rge	25 km
Laser rge finder	10 km class 3b
Switch on time	6 minutes
Deployment	30 minutes
Distance measuring device (DMD)	Rge up to 1500 m
Optical sight (OS) chair	Extends the surv capability of the FCU
Radar	Pulse doppler radar, track while scan (TWS) up to 20 tgts X band search radar, 1 to 25 km X band tracking radar, 0.3 to 25 km Ka band tracking radar, 0.3 to 20 km IFF Frequency Agility (20 frequency) Electronic Protective Measure (EPM)
Towed speed	15-80 km/hr
Weight	Skyguard: 6800 kg Power Supply Unit (PSU): 660 kg
Fuel consumption	Standby: 1.8 litres/hr Op: 8.7 litres/hr
Redeployment	10 minutes
Fordability	600 mm

804.05 - AIR DEF WPN SITE SELECTION

SER	WPN	SITE CHARACTERISTIC
(a)	(b)	(c)
1	JAVELIN S-15	a. **Obsn.** Early engagement will permit destruction of the hostile ac prior to LWR. Ideally the wpn site should offer all round obsn to a rge of approximately 7 kms. b. **Communications.** Early engagement depends not only on obsn but on early wng via rad/digital-data link (ADATS). The wpn site must offer a positive communications environment. c. **Air approaches.** Javelin should be sited to cover the principal low-level air approaches, which can be predicted with reasonable certainty after a terrain study. d. **Distance from point to be protected.** Javelin should be sited close to the point to be protected to reduce the possible crossing angle of an air atk from any direction. As a rule, 500 m should be the maximum separation. e. **Protection.** Det should be deployed within the perimeter of friendly forces to afford protection from grd atk. f. **Camouflage.** Wpn site must offer or be capable of good camouflage/concealment to avoid detection from air or grd observers. g. **Elevation limitation.** The wpn site must be allowed to fire from -176 mils to +800 mils in elevation. This usually precludes firing from trenches. h. **Backblast.** Has a backblast and debris danger zone for unprotected pers of 40 m. In addition, for operator protection there should be no obstructions within 10 m to the rear. i. **Accessibility.** The wpn site must be accessible for resupply purposes. j. **Man-portability**. The wpn and its ammo are man-portable. k. **Veh.** Vehs are not required for firing the wpn and should be removed from the wpn site to decrease chances of detection. The veh is essentially a communication platform and

SER	WPN	SITE CHARACTERISTIC
		transport facility.
2	ADATS	a. **Siting requirement.** Firm level platform (106 mils pitch and roll). b. **Obstruction.** There must be no obstruction to the turret. c. **Visual unmask rge.** Min of 10 km thru 2100 mils – optimum of 10 km+ thru 6400 mils. d. **Radar unmask rge.** Min of 14 km in primary arc – optimum of 25 km thru 6400 mils. e. **External Targeting Device (ETD) loc.** With good visibility of primary arc and dead zones. f. **Engagement prior to LWR.** With respect to a vital point (VP) [3-5 km depl] or area def. g. **Mutual sp.** All around def and def in depth (area 3-5 km between det). h. **Given loc.** Within 200 m of site indicated by recce officer. i. **Concealment.** Passive AD measures – forward/reverse slope, treeline. j. **Protection.** Out of direct line of fire from grd forces. k. **Communications.** Between master/slave and CP. l. **Master ADATS battle posn.** Good visibility and radar unmask throughout 6400 mils. m. **PPU safety.** 6 m for debris and away from primary arc to mask source and prevent interference with optical sensors. n. **Laser safety.** Nominal Ocular Hazard Distance (NOHD); guidance beam – 52 m, laser rgefinder – 9.3 km (laser safety gogggles, implement no fires zones). o. **Radar safety.** 30 m for stationary emitting radar. p. **Launch area back blast.** 100 m. q. **Alternate sites.** 1000 m and coverage of same visual priority arcs (VPAs).

SER	WPN	SITE CHARACTERISTIC
		r. **Limber veh/ammo.** 100-150 m from ADATS and outside VPA. s. **Admin area.** 100-150 m from the ADATS and 50 m from the limber veh and outside the VPA. t. **Resupply guidance.** On position or withdraw under cover.
3	Gun/SKYGUARD	a. **Area.** The gun/Skyguard section require an area of at least 250 m x 250 m to be deployed. b. **Radar unmask rge.** The Skyguard must be able to "see" to its maximum (25 km). c. **Vehs loc.** Should be camouflaged, concealed and located 200 m from the wpn site. d. **Local def.** Each indiv FCU or gun loc should be defendable. e. **Accessibility.** Concealed track plan for entrance and exit including resupply veh. f. **Distance from point to be protected.** At least 1000 m. g. **OS chair loc.** Should be outside of the arcs but must be visually see in primary arcs and should also visually see in secondary arcs. h. **Obsn.** To choose a section site, you must consider visually seeing for a distance of 7 km and visually seeing for minimum arcs of 2100 mils. i. **Communications.** Should be tested if emisssion control (EMCON) measures permits. j. **Platform.** It is important that the guns and Skyguard platforms are solid and flat to withstand the weight of the primary call signs. k. **Concealment.** From air and grd obsn. l. **Alternate position.** Preferably two if time permits during recce ensuring to maintain the same arcs at a distance not to exceed 1000m.

804.06 - STAFF PLANNING TABLES

1. **Consumption data:**

VEH TYPE	**FUEL TYPE**	**AVG DAILY (1) CONSUMP-TION** (litres/day)	**CONSUMP-TION** (litres/km)	**FUEL CAPACITY** (litres)
ADATS	D	1043 (2)	1.43	359
M557	D	54	0.83	359
M548	D	50	0.78	377
M113	D	53	0.83	360
HLVW	D	53	0.81	400
MLVW	D	23	0.35	177
LSVW	D	33	0.51	205
ILTIS	G	8	0.12	65
SKYGUARD Generator	D	208.8		22
GDF-005 generator	D	132		22

NOTES:

1. Based on daily travel of 65 kms/day
2. Includes PPU fuel consumption (960 litres/day)

2. **Veh lift data:**

Veh	**ADATS** (msl)	**JAVELIN** (msl)	**BULK (Diesel)** (litres/veh)	**BULK (Gas)** (litres/veh)	**JERRYCAN (Diesel)** (litres/veh)	**JERRYCAN (Gas)** (litres/veh)
ADATS	8				40	
M548	10					
HLVW	40	240	6600 (pod)	6600 (pod)	4080	4080
MLVW		60			2180	2180
LSVW sev		8				

804.07 - AD LO DUTIES/LN AIDE MÉMOIRE

1. The AD LO acts on behalf of his unit and other AD units grouped with his unit or the formation with which he is placed. He advises on all AD matters affecting the formation including activities in flanking areas and especially on the capabilities of his own and other AD units. He must ensure that the Div ALO, CAS, aviation and arty intelligence know:

a. the loc of the AD Arty; and

b. the wpn con status (WCS) in force.

2. LO's will normally be deployed during passage of line ops, with flanking formations, to sector ops centres or wherever the reqr is determined in the estimate. They will normally deploy for early wng and co-ord. They will always be deployed during rad silence. He may have to impose a new WCS to safeguard friendly ac. As these restrictions greatly reduce the effectiveness of AD, they must only be applied to the minimum of wpns and for the shortest possible time. WCS should allow AD to operate permissively, especially at night. He must pass and obtain information both from the supported formation and the air component to his unit as outlined in para 3. He must obtain permission and instructions for any road move required by the AD units he is representing. He may have to obtain clearance for areas in which to deploy the RHQ/BHQ, workshop and echelon.

3. **AD ln aide-mémoire:**

BEFORE DEPARTING FOR LN	ON ARRIVAL AT THE LN LOC	INFO FOR THE UNIT	RECOMMENDATIONS
The AD rep should ensure that he has the fol info: a. comd and admin relationship; b. AD tactical task; c. duration of task; d. loc, time and who to report to at the specified unit; e. WCS; f. AD wng state; g. air threat and hostile act criteria; h. AD coverage aval from all AD units in the area; i. all AD CP loc; j. NBCD status; k. passwords; l. rad freq and codes.	The AD rep should req the fol from the sp unit: a. deployment plan; b. obstacle plan; c. anti-tank plan; d. STA plan; e. AAAD plan; f. DF tgts; g. deception plan; h. hide/harbour loc; i. light policy; j. track plan; k. CEOI, passwords, frequencies, recognition signals; l. USOPs; m. expected grd threat; n. unit pri int reqrs and other int reqrs; o. unit op O/overlays; p. unit AD priorities; q. points which comd wants covered by AD rep in daily O gp/brief; r. contact for log & maint sp; s. casevac, PW, BLP, along with postal and chapel loc.	The AD rep should also pass the fol info to the sp unit: a. comd relationship; b. AD tactical msn; c. duration of task; d. WCS for AD and AAAD; e. AD wng state; f. air threat and hostile act criteria; g. early wng procedures within the formation; h. coverage aval from all AD units in the area; i. maint/admin reqrs of the AD assets as applicable; j. strength and composition of the AD assets; k. current depl of the AD assets and if applicable future posns and rtes.	The AD rep should make recommendations on the fol: a. AD; b. tasks and groupings of AD assets; c. siting of AD assets; d. coord of AAAD; e. improvements to passive AD measures.

4. **Eqpt**. The LO requires the following eqpt and crew:
   a. A rad on his comd net with sufficient cable to remote up to 800 m.
   b. Sufficient pers for continuous manning. A minimum of two is normally required to be on duty at any one time.
   c. USOPs.
   d. A copy of all current op orders as issued by his unit, including CEOIs.
   e. 1:1,000,000 and 1:50,000 map coverage of the force area.
   f. Map for producing deployment traces.
   g. Staff tables for planning road moves and deployment by airlift.
   h. An info board showing:
      (1) the eqpt state for firing units and vehs;
      (2) the msl state;
      (3) the AD ARTY limits; and
      (4) AD ARTY task numbers.

5. **A Future Task Table**. The comd is likely to require recce to be carried out for a number of tasks to cover contingencies. For each task allocated the table must show:
   a. loc of task;
   b. what is to be defended;
   c. the comd's priorities for AD;
   d. redeployment plan;
   e. time to be effective; and
   f. the AD ARTY task numbers.

804.08 - AD BATTLE PROCEDURE

1. Steps of battle procedure are as per TAM 101.

804.09 - AD ESTIMATE OF THE SITUATION

FACTORS	**FACTS**	**DEDUCTIONS**
(a)	(b)	(c)
MSN ANALYSIS	1. Comd's intent and concept of ops with AD priorities (2 up, 1 up, arty comd) 2. Assigned tasks 3. Implied tasks 4. Limitations on the aim	1. Aim: to destroy/protect/deny from air atk (Who, what, when, where, why and for how long)

FACTORS	FACTS	DEDUCTIONS
(a)	(b)	(c)
EN GRD OPS	1. Strength and composition 2. Loc 3. Immed and subsequent objs 4. Rtes to objs 5. NBC 6. Morale 7. Eqpt 8. Break down en grd forces relating it to the grd	1. Inherent air sp with en formations 2. Approaches to expect air sp 3. States of readiness 4. WCS/AD policy 5. NBC measures 6. Likely tgts and probable wpns used to engage tgts 7. Ac loiter times based on rge 8. Stand-off wpn rges 9. AD priorities
EN AIR OPS (AIR INTELLIGENCE PREPARATION OF THE BATTLEFIELD)	1. No and types of en ac, wpn match, LWR. Relate each phase of the air battle to the battlefield (when are we going to see it and how will it affect us) and (how does it relate to what the grd forces are doing) 2. Wpns used 3. Atk parameters/tac 4. Recce 5. ECM eqpt/tac 6. Stand off rges 7. En suppression of en AD (SEAD) priorities 8. All weather capability 9. Ac markings/configuration	1. Air sp phases 2. Amount of ac expected by phase 3. LWR 4. Deployment consideration 5. Ac engagement consideration 6. EPM methods (passive/active) 7. Early wng/obsn reqr 8. Integration of friendly units into AD plan (arty tactical grouping, MFC, FAC, AA, tanks) 9. AAAD, active or passive AD policy considerations 10. Cam/concealment and met considerations 11. 24/7 op considerations for manning and eqpt 12. AD priorities
FRIENDLY FORCES	1. Dispositions 2. Type of op 3. AD aval 4. Flank/rear AD coverage 5. Friendly air sp	1. Types of AD to be considered: active, passive or combo 2. Manoeuvre reqr 3. Assist aval from other units – comms

FACTORS	FACTS	DEDUCTIONS
(a)	(b)	(c)
	6. Air Control Order (ACO) measures 7. Morale 8. NBC 9. Early wng (Super Giraffe (SUGI), grd based radar, etc) 10. Identify formation disposition by phase	4. Early wng and coverage by other AD units 5. Coord or airspace with all users 6. Ln required with sp arms 7. Effects on pers strength 8. NBC employment considerations 9. Engr sp aval 10. Ability of units to provide cbt sup 11. AD priorities
MET	1. Visibility 2. Weather 3. Temp	1. Effects on obsn, acquisition, coverage, grd and movement, plt proficiency and tac 2. In with other AD units 3. Early wng procedures
ADMIN	1. RSR 2. ASR 3. Repair and recovery 4. Casevac 5. PW	1. Engagement constraints by wpn type 2. RSR/ASR calculations 3. Centralized/decentralized resupply 4. Priority of eqpt maint and repair and recovery 5. Casevac required for tps 6. Sp from sp arm
ASSESSMENT OF TASKS	1. Tps to task matrix 2. AD priority matrix (note 1)	1. Go back to map and see what tasks can be grouped together
TIME AND SPACE	1. Time line from time now to time to be ready (TTBR) (shade night time on line)	1. Time aval for each activity 2. Degree of recce required 3. Priority of rtes for recce and deployment 4. Prep of alt position 5. Time required for resupply
COURSES OF ACTION (COAs)	1. En Courses Advantages/Disadvantages 2. Friendly Courses Advantages/Dis-advantages	Most likely/most dangerous en Recommendation of friendly COA

FACTORS	FACTS	DEDUCTIONS
(a)	(b)	(c)
THE PLAN		**AD op orders** 1. SITUATION: a. En forces: b. Friendly forces: c. Atts and dets: 2. MISSION: 3. EXECUTION: a. Gen outline b. Gping and task(s) c. Coord instrs: (1) WCS (free/tight/hold) (2) Alert state (white/yellow/red) (3) Order of march/EMCON states (4) Airspace con measures (5) Time for RV and O Gp (6) Recce Gp move at (7) Dets cease fire (8) Dets TTBR (9) Dets no move before (10)Pri of tasks. 4. SVC SP: 5. COMD AND SIGS:

NOTES: AD PRIORITIES

1. As a general rule there is never enough AD wpns and sensors aval to protect all forces and assets. Therefore, a comd must analyze the fol prior to establishing AD priorities:
   a. the msn;
   b. the threat;
   c. sp comd's intent; and
   d. concept of ops.
2. Comd will base the priorities on the fol factors:
   a. criticality;
   b. vulnerability; and
   c. recoverability.
3. During the estimate procedure (en and friendly factors) elements that are vital to the en to destroy and for our forces to protect are identified.

4. Based on the analysis of the grd and en, it is possible to determine what AD protection is required for each task including attrition. This staff check is done in the assessment of task portion of the estimate.

5. It is more than likely that there will not be enough AD to do all the tasks you have to do; you must therefore estb AD priorities. You find what are the AD priorities based on the comd's intent and concept of ops. Based on the priorities, you match resources to tasks.

CRITICALITY

6. Defined as the degree to which an asset or force is essential to msn accomplishment.

7. The determination of the criticality of an asset or force is made by assessing, the impact on the conduct of the op that would result from damage to the asset or force.

8. The degree of criticality is based on whether:

   a. damage to the asset or force prevents the execution of the plan;

   b. damage to the asset or force interferes with the execution of the plan; and

   c. damage of the asset or force causes only limited interference with the execution of the plan.

VULNERABILITY

9. Vulnerability is the degree to which an asset or force is susceptible to surv an atk or to damage if atk.

10. Consideration should be given to:

   a. the asset's or force's hardness;

   b. ability to disperse or displace to another position;

   c. its ability to cam and conceal (passive measures); and

   d. its capability to provide for its own AD (maybe AAAD).

RECUPERABILITY

11. Degree to which an asset or force can recover from inflicted damage in terms of time, eqpt and aval manpower to continue its msn.

12. The comd must consider:

   a. time and aval to replace soldiers and eqpt or entire units; and

   b. can a different element perform the same function?

AD PRI MATRIX

13. Table format is used:

   a. 1 is the highest value given to an elm;

   b. X (representing the total number of elm) is the lowest value given to an elm;

   c. never used the same value twice for the same criteria;

   d. once the a value has been assigned to each criteria for one element/activity, the values are added together; and

   e. the lower the total value, the higher priority it will be and vice-versa.

14. Once completed, you must review the AD pri matrix and verify that it makes sense. It is only a tool; you are the one making the decision on which pri you will recommend.

Ph: _____

ELMS/ ACTIVITY	VULNER-ABILITY	CRITICALITY	RECUPER-ABILITY	TOTAL	PRI #
Res	5	4	1	10	4
Fwd bg	4	5	6	15	5
Bde HQ	3	2	4	9	3
BSA	6	6	5	17	6
Rear bg	7	7	7	21	7
Arty	1	1	2	4	1

AD pri matrix (example)

804.10 - OPERATIONAL PLANNING PROCEDURE

STEPS	FORMATION COMD	FORMATION STAFF	AD ARTY PLANNER	AD TP
(a)	(b)	(c)	(d)	(e)
STEP 1 Receipt of task	Receive wng O Attends senior comd O gp	Initial wng O Staff planning process initiated	Initial wng O Staff planning process Quick map recce	Receive wng O
Msn analysis	Analyze tasks Define aim	Analyze tasks IPB process (G2) Ident key issues (arms/service advisors)	Analyze task Define aim IPB process with G2 Ident key AD arty issues	
STEP 2 Estimate & planning guidance	Comd estimate Planning guidance	Receive planning guidance Issue wng O Planning drives & timetable	Receive planning guidance Issue wng O Time analysis	Receive wng O Concur-rent plan-ning with battalion if no change to grouping

STEPS	FORMATION COMD	FORMATION STAFF	AD ARTY PLANNER	AD TP
(a)	(b)	(c)	(d)	(e)
STEP 3 Prelim-inary staff checks	Ident COA for further development Issue additional guidance	IPB process Ident possible en COA Ident tentative friendly COA Staff coord info brief	IPB process Develop en air COA with G2 Friendly COA development Staff coord	Concurrent planning Conduct recce
Final staff checks		Refine en & friendly COA Comparison of COAs Wargaming Recom-mendation of best COA	Develop AD arty COA for each friendly COA Assess-ment of tasks Analysis of priorities Recom-mend best AD arty COA	
STEP 4 Decision briefing	Comd decision Articulate intent and concept of op	Decision briefing to comd Issue wng O	Be prepared to answer questions from comd and discuss critical issues that could impact on plan - issue wng o on selected COA	Concurrent planning Regroup-ing
STEP 5 Prepar-ation and issuance of op O	Op O Backbriefs	Prepare op O Integrates input into op O Rehearsal Issue op O	AD arty paragraph to arty annex AD arty op O Rehears-al Brief AD arty portion	Receive op O Concurrent planning Recce Prepare and issue tp op O

STEPS	FORMATION COMD	FORMATION STAFF	AD ARTY PLANNER	AD TP
(a)	(b)	(c)	(d)	(e)
			of supported formation op O	
STEP 6 Execution of plan	Comd and con	Monitor situation Comd and con Refine plan as necessary Planning for subsequent op	Monitor situation Comd and con Supervise depl Assess coverage Advise the comd Planning for subsequent op	Assesses and adjust coverage as necessary Comd and con Planning for subsequent ops Supervise depl

804.11 - AIR THREAT

1. **Air Threat Characteristics.** The en air threat may be multi-faceted and may include the fol:

a. Constant use of electronic recce or ESM during peace and war. The goal of ESM is to gain intelligence that may be used to design effective ECM to degrade the performance of en AD and other electronic systems.

b. Use of UAVs and Cruise Missiles (CMs) for intelligence gathering, or in sp of cbt ops. In the latter role, UAVs may operate as jammers, decoys, or wpn carriers.

c. Use of long-rge anti-radiation msl (ARM) and air-to-surface msl (ASM).

d. Employment of various EW techniques in an attempt to degrade the effectiveness of AD. These would include both active ECM (jamming) and passive measures (flares or chaff).

e. Increased use of precision guided munitions (PGM) delivered at stand off rges against hardened, well-defended, or immobile tgts such as bridges, bunkers or airfields.

f. Carefully planned atk carried out by very low-flying ac against tps, eqpt and installations during all weather conditions using a wide rge of modern wpns.

g. The battlefield usage of hels to atk point objects, to suppress AD, to carry out AB assault, for recce, and for transporting tps and material.

h. Surprise atk against manoeuvre tps by ac on armed recce msns which may deliver a wide variety of wpns via low-level atk (lay down, pull-up or cbt-turn dive deliveries). These atks may often be accompanied by attempts to suppress AD (SEAD) using fighter-bombers, atk hels or long-rge arty and grd atk.

2. **Air threat categories.** For purposes of low-level AD planning, the en air threat may be divided into the fol categories:

a. **Fighter-bombers.** Fighter-bombers are used to atk all types of military tgts such as airfields, bridges, buildings, C2 facilities, vehs, wpn systems, and pers. The basic fighting unit is two ac, although formations of four ac are normal. Much larger formations (24 ac or more) may be employed to atk large, fixed tgts such as airfields. Fighter-bombers normally use high approach/atk speeds (up to 300 m/s) combined with very low-level atk profiles (30 m+) AGL to compound the AD problem. A coordinated, multi-directional atk may also be used. Fighter-bombers may employ a wide rge of conventional wpns, including bombs, rockets and cannon, along with a variety of sophisticated ammo such as ARM, PGM and ASM. Conventional armed wpns, along with chem and nuc ones, may be delivered by fighter-bombers.

b. **Recce ac.** Recce ac provides the en with a major source of cbt intelligence. Modern, high performance, fighter type ac equipped with cameras, special radars and/or electro-optical (EO) sensors are capable of gathering valuable data from recce msns flown at all altitudes. Detected tgts may be reported directly by voice or via real-time data-link transmsn to other air or grd-based receiving stations, such as AWACS. Often using the same high-speed and low-level approach tac as fighter-bombers, recce ac are very vulnerable to AD in the tgt area where they normally fly higher to permit on-board sensors to gather data.

c. **Atk Hels (AH).** AHs may be used for a wide rge of battlefield tasks. They can be expected to fly at very low altitudes, often at treetop height or lower using terrain masking technique to keep exposure times to an absolute min. AHs carry a wide rge of conventional wpns including rockets, cannons, bombs, anti-tank guided msl (ATGM) and ARM. They may also deliver certain types of chem wpns. AHs will often be able to operate in weather conditions that preclude the effective use of fixed wing ac.

d. **Transport ac.** Transport ac are used for carrying pers and materials into the combat zone (CZ). They are very vulnerable to AD due to their large size, slow speed and lack of manoeuvrability.

e. **UAVs and Cruise Msls (CM).** UAV and CMs may be used for a wide variety of msns including recce, EW tasks and wpns delivery (conventional, chem or nuc). Large numbers of UAVs may also be employed to saturate and confuse AD to divert fire from attacking fighter – bombers or CMs. Both UAV and CMs may be very

difficult to detect because of their small radar and visual cross-sections.

3. **Air Threat Tac**. Tac employed by the en will vary widely depending on the tgt to be attacked, the terrain surrounding it, the tgt area weather, the wpns aval to the attacker and the tgt area def. However, there are only two major categories of tgts from the attacker's perspective: Fixed tgts such as airfields, etc., and Battlefield tgts that may be highly mobile and therefore very difficult to atk with large numbers of fixed wing ac.

a. **Fixed Tgt Factors:**

(1) **Tgt.** The en will have highly accurate tgt info such as the specific loc of fixed AD, ac dispersion, maint facilities, POL storage areas, etc. The variety of tgts permits an optimum wpns selection. In addition, TA will be greatly facilitated, permitting high-speed (250-300 m/s), very low-level approaches, wpn deliveries and escapes (30-50 m AGL). The en will normally conduct a saturation atk that will include jamming ac. This type of atk could take up to an hr to complete.

(2) **Terrain.** The terrain surrounding airfields will normally permit the attacker to choose optimal approach/atk directions. En ac will be able to enter and exit the tgt area at high speeds and very low altitude thereby delaying detection by AD.

(3) **Weather.** Good weather permits very low atk profiles to be flown while visibility below 5-8 km will force atk ac slightly higher (75-100 m AGL).

(4) **Wpns.** The en will match wpns to tgts. The diverse array of tgts on an airfield will permit the selection of widely varying wpn load which may be delivered using a variety of atk profiles (lay down, pull-up or cbt-turn dive). Ac exposure times may be limited to 30-40 secs; therefore it is critical that prime consideration be given to placing all AD systems where they have a wide field of view.

b. **Battlefield Tgt Factors:**

(1) **Tgt.** The majority of deployed field type tgts pose a difficult tgt for high-speed fighter-bombers. Tgts that are dispersed and camouflaged are difficult to detect, and unlike large fixed tgts, they are not normally subject to planned precision atk. Little or no accurate tgt info may be aval to attacking plt. There may be no aerial photo of the tgt or those that are aval may be improperly oriented. Inaccurate tgt winds and elevations, irregular tgt arrays, or the movement of tgts subsequent to the latest info received by en air, will work against accurate, well-executed wpn deliveries.

(2) **Terrain.** Natural or man-made obstacles may prevent or inhibit a plt from using the most survivable or effective atk

direction. Terrain may tend to channel fighter-bombers into flying higher or employing higher atk dive angles.

(3) **Weather.** Since tgt data may be incomplete, marginal weather and decreased visibility will impact on fixed wing atk ops more than in the case of a fixed tgt.

4. **Typical Fighter-bomber Atk Profiles**. The specific atk profile employed by fixed-wing grd atk ac will be determined by a combination of many variables. However, there are only four major types of deliveries (or variations thereof) that will be employed:

a. **Offset Pull-up Atk.** The offset pull-up atk may be either planned or directed by a FAC. It consists of a run-in at very low-level (30-50 m AGL) at speeds up to 300 m/s from an initial point (IP) some 10-25+ km from the tgt. Natural terrain features are used to delay detection as long as possible in order to achieve surprise. At a pre-planned point, normally 3-10 km offset from the tgt, the ac pulls-up very rapidly to attain atk height and acquire both the tgt and the aim point. The ac then executes a hard turn to its atk heading, normally turning 45-50 degrees left or right of its run in track. Wpns will be released from 0.5-5 km from the tgt.

b. **Cbt-turn Dive Atk.** The cbt-turn dive atk may also be a planned or FAC-directed delivery. The geometry of the atk is very similar to the offset pull-up atk. However, attacking ac will simply execute a level turn-in towards the tgt or carry out a curving pull-up manoeuvre just high enough (100-500 m AGL) to acquire the tgt. Wpns may then be released from a level delivery or shallow dive angle at rges of 0.5-5 km from the tgt.

c. **Lay Down Delivery.** Using the lay down, the ac flies directly to the tgt from the initial point (IP), and wpns are released from a distance of 300-1000 m from the tgt at an altitude of 30-75 m AGL. Ac speed throughout the run-in, delivery, and escape will be up to 300 m/s.

d. **Toss or Loft Bombing.** Toss or loft bombing is a method of delivering bombs without overflying the tgt. It must be carefully planned and consists of a very low approach from the IP to a pull-up point. Normally the wpn(s) will be released as the ac approaches a climb angle of 30-45 degrees above the horizon. The bombs then complete a ballistic arc until impact in the tgt area. This delivery, though relatively inaccurate, allows the ac to remain outside the rge of most AD systems that are co-located with the tgt (approximately 6-10 km).

e. **Combination Atk.** When attacking a large, fixed type tgt, the en can be expected to employ a combination of lay down, cbt – turn dive and pull up atk in order to achieve optimum wpn parameters and confuse and degrade the AD. Such a multi-profile atk may also be executed from several quadrants almost simultaneously; for example, a mass atk carried out by 24 ac against an airfield could

be completed easily within a two minute timeframe. However, it is impossible for such large-scale, highlycoordinated atk to be executed against battlefield or mobile tgts. Here, the max number of fighter-type ac in one atk or timeframe (3-5 minutes) will be from four to eight. Normally, they will be forced to atk from only one or two directions. In this instance, combined hel/fighter-bomber atk may be expected.

NOTE: Although a combination of atk profiles may be expected, attacking plt will require minimum altitude of 20 m+ agl and a minimum of 2.5 seconds of stable striking time prior to wpn release.

5. **Examples of en ac atk profiles:**

WPN TYPE	TYPICAL TGTS	PREFERRED DELIVERY	DIVE ANGLE (degrees)	HEIGHT OF WEAPON RELEASE (m)	SPEED OF AC (m/sec)	LWR (m)
Bombs (low drag)	Tps in open soft skin vehs Log installations	Low angle dive	10+	300 – 500+	200 – 300	900 – 2300
Bombs (braked)	Tps in open soft skin vehs Log installations	Level – low angle dive	0 –15	40+	250 – 300	500 – 1100
Bombs (toss)	Tps in open soft skin vehs Log installations	Stand-off toss	Climb 30 – 60	300+	200 – 300	3000 – 8000
Cluster bombs	Tanks APC SAM launchers SAM FC radar Pers Soft-skin vehs Runways	Level – low angle dive	0 – 10	20 – 300	250 – 300	350 – 1000
Guided bombs	Hard tgts	Stand – off low angle	5 – 15	300 – 1500	200 – 300	10 000+
ASM (fighter or hel)	Tanks APC Hard tgts	Stand – off low angle	5 – 15	300 – 1500	50 – 300	5000+
Napalm	Tps in open soft skin vehs Log installations	Level – low angle dive	0 - 10	15 – 200	250 – 300	300 – 1000
Rockets (fighters)	Delay fuze, VT fuze Bridges Tps Buildings Soft skin vehs Runways Roads	Level – low angle dive	3 – 15	150 – 500	250 – 300	500 – 5000+
Rockets (hel)	Delay fuze, VT fuze Bridges Tps Buildings Soft skin vehs Runways Roads	Level – low angle dive	0 –10	30 – 200	50 – 80	300 – 3000+
Cannon (fighters)	Tps Soft skin vehs Log installation Tanks and APC Radars	Low angle dive	3 – 15	150 – 500	250 – 300	300 – 2000

WPN TYPE	TYPICAL TGTS	PREFERRED DELIVERY	DIVE ANGLE (degrees)	HEIGHT OF WEAPON RELEASE (m)	SPEED OF AC (m/sec)	LWR (m)
Cannon (hel)	Tps Soft skin vehs Log installation Tanks and APC Radars	Level – low angle dive	0 – 10	25 – 200	30 – 80	200 – 2000
Chem (bombs/ spray)		Level – low angle dive	0 – 10	30 – 500	200 – 275	Depends on wind

6. Aircraft data:

a. **fixed wing:**

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	Alpha Jet	Grd atk / trainer	Two turbofans	1000	410	30 mm Cannon 27 mm Cannon Rocket Launcher AIM-9 Sidewinder Bombs Cluster Bombs
2	F-15 Eagle	Fighter	Two turbofan	Mach 2.3	1100	Laser guided bombs GP bombs Cluster bomb units 20 mm cannon
3	F-16 Fighting Falcon	Fighter	Single turbofan	Mach 2.02	550-885	AGM-65 Maverick Laser-guided bombs GP bombs Cluster bomb units 20 mm cannon
4	F-111	Fighter/bomber	Two turbofan	Mach 2.2	2000	Laser-guided bombs GP bombs Cluster bomb units
5	Fencer-C Su-24	Interdiction	Two turbojets	Mach 2.18	1795	1 6-barrel 30 mm cannon 8 hardpoints for up to 11,000 kg Swing wing

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
6	Fencer D/ESu-24	Interdiction/recce	Two turbojets	Mach 2.18	1795	23 mm Gatling gun As-9 Kerry As-10 Karen As-11 Kilter As-12 Kegler As-13 Kingpost As-14 Kedge 57 370 mm rockets AA-8 Aphid
7	Fishbed-H Mig-21	Tactical recce	One turbojet	Mach 2.1	700	1 23 mm gun Infra red sensors ECM devices 4 AAMs or rkt pods
8	Fishbed-J/M Mig-21	Fighter/ interceptor	One turbojet	Mach 2.1	700	1 twin GSH 23 mm 4 AAMs or 4 rkt pods
9	Fitter-A Su-7	Grd atk/ interdiction	One turbojet	Mach 2	650	2 AAMs 2 ASMs 6 rkt pods 4 bombs 2 30 mm gun NR 30 Obsolescent
10	Fitter-C/D Su-17	Grd atk	One turbojet	Mach 2	650	4 AAMs, or 2 ASMs, or 6 rkt pods, or 8 bombs, or 4 23 mm gun pods 2 30 mm gun Swing wing
11	Fitter-H/K Su-17	Interdiction	One turbojet	Mach 2	650	30 mm NR 30 guns AA-2 Atoll AS-9 Kyle 23 mm gun pods Bombs RKt pods
12	Flanker-A Su-27	Air superiority	Two turbojets	Mach 2.37	650	6 AAMs 12 500 kg bombs Swing wing

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
13	Flogger-C Mig-23	Twin seat trainer	One turbojet	Mach 2.5	1100	1 twin GSH 23 mm 2 AAMs 4 bombs 2 23 mm gun pods Swing wing
14	Flogger-B/G Mig-23	Interceptor	One turbojet	Mach 2.5	1100	1 twin GSH 23 mm 6 AAMs Swing wing
15	Flogger-D/J Mig-27	Grd atk	One turbojet	Mach 1.6	1100	1 6-barrel 23 mm Gatling gun 4 ASMs 2 AAMs 8 bombs 4 rkt pods Swing wing
16	Foxbat-A/E Mig 25	Interceptor	Two turbojets	Mach 2.8	1400	4 long rge AAMs or 6 AAMs
17	Foxbat-B/D Mig 25	Recce	Two turbojets	Mach 3.1	1400	SLAR Radar jammer ELINT, EW Cameras IR devices
18	Foxhound Mig-31	Interceptor	Two turbojets	Mach 2.37	1900	8 AAMs gunpack
19	Frogfoot-A Su-25	Grd atk	Two turbojets	870	550	1 30 mm gun 4,500 kg payload on 10 hardpoints Swing wing
20	Fulcrum Mig-29	Fighter/FGA	Two turbojets	Mach 2.37	650	1 6-barrel 30 mm Gatling gun 6 AAMs 4 500 kg bombs

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
21	AV-8B Harrier	Grd atk	One turbofan	Mach 0.85	640	Laser-guided bombs AGM-65 Maverick GP bombs Cluster bomb units Napalm 2,75 in rockets 5,00 in rockets LUU-2 flares 25 mm cannon AGM-122 Sidearm ARM
22	F/A-18 Hornet	Multi-role Fighter	Two turbofan	Mach 1.8	750-1150	Laser-guided bombs AGM-65 Maverick AGM-62 Walleye AGM-84 SLAM AGM-88 HARM GP bombs Cluster bomb units Aerial mines LUU-2 flares 2.75 in rockets 5.00 in rockets Napalm/FAE 20 mm cannon
23	Jaguar	Fighter/Strike/ trainer	Two turbofan	Mach 1.6	725-1140	30 mm cannon AAMs Air-to-surface rockets Laser-guided bombs Free-fall bombs
24	Mirage III	Fighter/Bomber	Single turbojet	Mach 2.2	290-600	30 mm cannon AAMs AIM-9 Sidewinder Bombs Rockets

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
25	F-4 Phantom	Fighter/Atk/Recce	Twin turbojet	Mach 2.17	840	20 mm cannon AGM-88 HARM AGM-65 Maverick AIM-7 Sparrow AIM-9 Sidewinder
26	A-10 Thunderbolt	Grd Atk	Two turbofan	697	460-740	Laser-guided bombs AGM-65 Maverick GP bombs Cluster bomb units Aerial mines 2.75 in rockets LUU-1/-2 Flares LUU-5/-6 Flares 30 mm cannon
27	Tornado	Multi-role	Two turbofans	Mach 2.1	550-1200	27 mm cannon Nuc bombs ALARM ARM AIM-9 Sidewinder HARM Maverick Paveway II Laser-guided bombs ASMs Rockets

b. **Recce aircrafts:**

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	Badger Tu-16	Bomber, recce, EW	Twin jet	566 knots	135 nm	
2	Brewer Yak-28	Tactical recce	Two turbojets	Mach 1.5	900	Twin 30 mm gun ECM eqpt Camera, chaff Day/night recce Capability Brewer-D-Recce Brewer-E-ECM

c. **Transport aircrafts:**

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	Candid Il-76	Tpt	Four turbofan	850	2,500	120 Tps or 40,000 kg or 3 BMD Mainstay – AWACS variant
2	Cock An-22	Tpt	Four turboprop	740	5000	5 BMD 80,000 kg
3	Colt An-2	Tpt	One prop	258	450	12 tps or 6 paras 1,500 kg
4	Condor An-124	Tpt	Four turbofan	850	2,250	88 tps on upper deck and 150,000 kg on lower deck
5	Cub An-12	Tpt	Four turboprop	777	(with max payload) 1200	Tail turret Twin 23 mm NR guns Max payload 20,000 kg 90 tps or 60 paras or 2 BMD Cub-A-ELINT Cub-C/D-ECM
6	Curl An-26	Tpt	Two turboprop 1 x aux turbojet	540	550	38-40 tps 5,500 kg
7	C-5 Galaxy	Strategic tpt	Four turbofan	919	6000	
8	C-130 Hercules	Assault tpt	Four turboprops	602	5387	AC 130 variant only carries: 1 105 Howitzer 2 40 mm Bofors 2 20 mm Vulcan
9	Transall	Tactical tpt	Two turboprops	513	7336	

d. **Helicopters:**

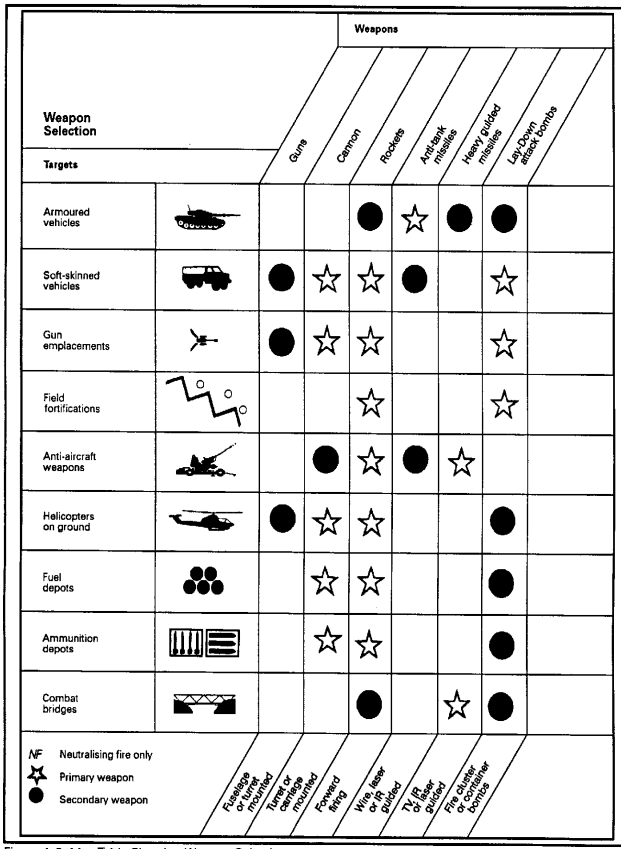
SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	Alouette III	Gen purpose hel	One turboshaft	230	600	7.62 MG 20 mm GIAT M621 AS-11 AS-12 MK44 Torpedo
2	AH-64 Apache	Atk hel	Two turboshafts	309	612	M230 30-mm chain gun Hellfire 2.75 in rockets
3	UH-60 Blackhawk	Gen purpose/tpt	Two turboshafts	296	600	7.62 mm MG Hellfire Rocket launcher pods

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
						Mine dispenser MK46 or 50 Barracuda
4	BO 105	Gen purpose hel	Two turboshafts	270	575	HOT msls HOT II msls TOW msls Stinger
5	AH-1T Huey Cobra	Atk hel	One turboshaft	291	200-240	Super Cobra has two turboshafts
6	SA-341 Gazelle	Aslt/Gen purpose hel	One turboshaft	310	360	2 7.62 mm MG or 1 20 mm GIAT M621 cannon AT-3 Sagger SA-7 Grail AS-12 HOT msls Mistral
7	Griffon	Gen purpose hel		259	745	7.62 mm MG Rocket packs
8	Halo-A Mi-26	Hy tpt	Two engines 1*8 blade rotor	295	300	20,000 kg or 2 BMD 90 tps
9	Haze Mi-14	ASW, SAR and mine counter-measures	Twin turbine	124 kts	612 nm	Torpedo Bombs Depth charges
10	Havoc Mi-28	Gunship	Two engines 1*5 blade rotor	300	240	1 23 mm gun 2 AAMs 14 ATGMs
11	Hermit Mi-34	Lt utility		210	170	4 AT-3 Sagger or 4 rkt pods 8 tps
12	Hind-A Mi-24	Gunship	Two engines 1*5 blade rotor	320	160	1 12.7 mm HG 4 Swatter ATGMs 4 rkt pods or 4 small bombs 8 tps plus full ordnance
13	Hind-D Mi-24	Gunship	Two engines 1*5 blade rotor	320	160	1 four-barrel 12.7 mm Gatling gun 4 Swatter ATGMs 4 rkt pods or 4 small bombs 8 tps plus full ordnance
13	Hind-E/F Mi-24	Gunship	Two engines 1*5 blade rotor	320	160	1 four-barrel 12.7 mm twin-barrel 30 mm (Hind F)

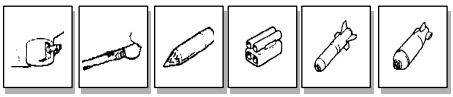
SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
						4 AT-6 Spiral 4 rkt pods
14	Hip-C Mi-8	Gen purpose hel	Two engines 1*5 blade rotor	250	200+	6 12.7 mm internal MG 4 rkt pods or 4 250 kg bombs or 2 500 kg bombs 24 tps or 2,400 kg Hip – B/G – airborne comm variant Hip – J/K – ECM variant
15	Hip-E Mi-8	Cbt asslt hel	Two engines 1*5 blade rotor	250	200+	1 12.7 mm HG 4 Swatter ATGMs 4 250 kg bombs or 2 500 kg bombs 6 rkt pods 24 tps or 2,400 kg
16	Hip-H Mi-17	Gen purpose hel	Two engines 1*5 blade rotor	250	450 +	4 rkt pods or 4 250 kg bombs or 2 500 kg bombs 24 tps
17	Hokum Ka-50	Gunship/anti-hel	Two engines 2*3 contra-rotating blades	350()	250	1 30 mm gun AA-9 Rockets AA-11 AS-10 AS-16 Igla ASM UPK-23-250 gun pod GUV-8700 MG pod
18	Hook Mi-6	Hy tpt	Two engines 1*5 blade rotor	300	300	Fitted with 1 12.7 mm MG 65 tps or 6,000 kg
19	Hoplite Mi-2	Lt utility	Two engines 1*3 blade rotor	210	170	4 AT-3 Sagger or 4 rkt pods 8 tps
20	Hound Mi-4	Lt tpt	One engine 1*4 blade rotor	210	250	Fitted with1 12.7 mm HG 4 rkt pods 12-16 tps or 1,250 kg
21	UH-1 Iroquois	Utility hel	Single turboshaft	185	399	7.62 mm MG Rocket packs
22	OH-58 Kiowa	Gen purpose	One turboshaft	222	481	12.7 mm MG pods Stinger Hellfire 2.75 in rocket launcher

SER	AC	ROLE	ENGINES	MAX SPEED (kph)	CBT RADIUS (km)	REMARKS AND ARMAMENT
(a)	(b)	(c)	(d)	(e)	(f)	(g)
23	SA-330 Puma	Tpt hel	Two turboshafts	294	570	2 23 mm guns Rocket pods ZT-3 Swift ZT-35
24	CH-53 Stallion	Hy tpt	Three turboshafts	315	414	

7. **Wpn selection for tgt type:**



8. **Data on wpns carried by rotary wing ac.**



Helicopter Attack Data		Guns 7.5-13 mm	Cannons 20-40 mm	Rockets 50-100 mm	Anti-tank Guided Missiles	Heavy Guided Missiles	Lay Down Attack Bombs
Speed: (m/sec)	Approach Attack	30-70 15-80	30-70 15-80	30-70 20-80	30-70 0-60	30-70 0-60	30-70 40-80
Altitude (m/AGL)	Approach Attack	10-300 5-60	10-300 5-60	10-300 10-60	10-300 10-60	10-300 10-500	10-300 20-100
Weapon Delivery Angle		5-15/45	5-15/45	5-15	3-15	5-20	0-5
Viability Angle Above Obstacles (mils)		5-20	5-20	5-20	5-20	10-40	10-25
Exposure Time	Detection Acquisition of Target Roll-in Time (sec)	4-6	4-6	5-7	4-10	8-12	4-8
	Stabilization and Aiming Time (sec)	4-8	4-8	6-10	6-10	6-12	4-8
	Firing or AGM—Tracking Time (sec)	2-3	1-2	0,5-2	(1) Wire guided 2 000 m : 9 4 000 m : 16 (2) Laser/IR : 2	Television and infrared 2-3 Laser Guidance 3 000 m : 10 8 000 m : 32	0-1
Weapon Release Range (m)		200-1 000 For Turret –1 500 (NF)	300-2 000 –3 000 (Cal 30 mm) -1 500 (NF) mm	300-1 000 2 000-3 000 (NF)	400-4 000 –6 000 (3rd Gen)	3 000-8 000	150-500
Firing Positions:	Forward Laterally	* *	* *	* *	*	*	* (seldom used)
Legend NF = Neutralization or Suppression Fire (Max. Release Range)		Chin turret or fuselage mounted, manually controlled	Chin turret	Pods	(1) 2nd Gen Wire guided (2) 3rd Gen Laser, infrared Guidance	Television and Infrared guidance "Fire and Forget"	Fire, Container, Cluster, Braked or General Purpose Bombs (delay fuze)

804.12 - AIRSPACE CON

1. All airspace con measures will be promulgated and detailed in the airspace con plan (ACP) for the specific op or theatre of ops.

TERM	DEFINITION
(a)	(b)
Air rte	In tactical usage, a rte established to facilitate movement of op sp traffic and non-op air traffic through friendly air defs
Airspace con	A service provided in the cbt zone to increase op effectiveness, by promoting the safe, efficient, and flexible use of airspace. Airspace con is provided in order to permit greater flexibility of ops, while auth to approve, disapprove, or deny cbt ops is vested only in the op comd. In this context the word service means the action of serving, helping or benefiting all those who are concerned with the use of airspace.
Airspace con auth (ACA)	That subordinate comd, designated by the op comd, to assume overall responsibility for the op of the airspace con system (ACS) in the airspace con area.
Airspace con area	Airspace which is laterally defined by the boundaries of the area of ops. The airspace con area may be subdivided into airspace con sub-areas
Airspace con boundary	The lateral limits of an airspace con area, airspace con sub-area, high density airspace control zone (HIDACZ) or airspace restriction
Airspace con sub-area	A sub-division of the airspace con area, designated by the ACA
Airspace con system	An arrgement of those organizations, pers, policies, procedures and facilities required to perform airspace con functions
Airspace in the cbt zone	That airspace required by cbt forces for the conduct of ops where the potential exists for interference and competition between friendly cbt forces
Airspace restrictions	Special restrictive measures applied to segments of airspace of defined dimensions
Airspeed con	A defined speed band within which ac may fly, normally as a supplement to other forms of ident and/or airspace con
Base def zone (BDZ)	An air def zone established around an airbase and limited to the engagement envelope of the SAM/short rge air def wpns system defending that base. The size of BDZ and procedures relating to their op of the grd-

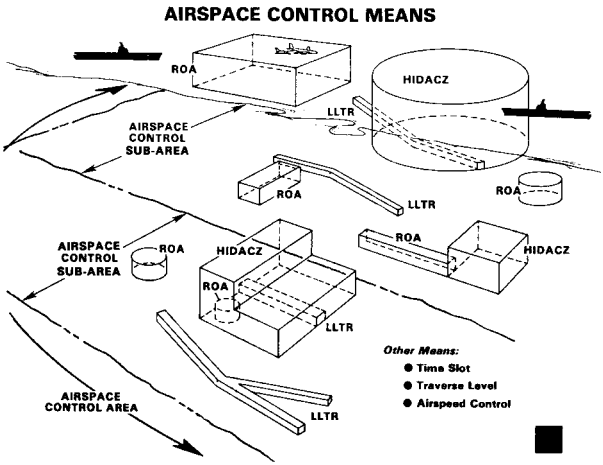
TERM	DEFINITION
(a)	(b)
	based AD wpn systems will be contained in sops. At 10º angle from the end of the runways, it will be wpns tight and wpns free elsewhere, broken into four sectors.
Coord level	The height above grd level defined for deconfliction of fast and slow moving air traffic, and which may be used for advisory purposes
High density airspace con zone	A block of airspace which defines dimensions, designated by the ACA, in which there is a concentrated empl of numerous and varied wpns/airspace users. Therefore, in add to being an ACS system organizational measure, a HIDACZ is also a control measure. The size of the HIDACZ depends on the tactical sit and should be kept to the min possible. Friendly air activity is limited to the ac that has a specific function to perform within the bdry of the HIDACZ. All other ac must avoid the entering the HIDACZ. They are often estb within the bdry of the corps or div area but in theory could be estb across bdry. Within an approved HIDACZ, the auth to con the airspace is delegated to the comd of the formation requiring the estb of the HIDACZ. The con auth will determine the procedural means of con within the HIDACZ, subj to limitations imposed by the ACA
Low level transit rte (LLTR)	A temporary corridor of defined dimensions passing in either direction through the areas of organic low-level air defs of surface forces, in a HIDACZ, or restricted ops area
Positive con	A method of airspace con which relies on positive ident, tracking and direction of ac within an airspace, conducted with electronic means by an agency having the auth and responsibility therein
Procedural con	A method of airspace con which relies on a combination previously agreed and promulgated orders and procedures
Restricted ops area (ROA)	Airspace of defined dimensions, designated by the ACA, in response to specific op situations/reqrs within which the op of one or more airspace users is restricted. Examples of ROAs include, aerial refuelling orbits, concentrated interdiction areas, airdrop and SAR areas
Special corridor	A corridor established to accommodate the special

TERM	DEFINITION
(a)	(b)
	routing reqrs of larger formations or special msns
Time slot	A period of time during which certain airspace activities within airspace of defined dimensions are restrained to permit one or more users greater freedom of ops. At the end of this period, the restraint is automatically cancelled
Transit corridor	A corridor established to rte op cbt traffic and military op sp traffic through friendly air defs
Traverse level	That vertical displacement above a low-level air def (LLAD) system, expressed both as a height (AGL) and altitude above mean sea level (AMSL) at which ac can traverse the area
Wpns free zone (WFZ)	A volume of airspace around a critical asset that merits special protection by AD arty. It is established to permit maximum engagement of hostile ac. All friendly ac must avoid WFZ unless prior approval has been obtained from the designated controlling auth. Reqrs for the creation, or implementation of WFZ can originate at any level, in response to grd ops, and will staffed through acs channels to ACA for approval.

WPN CON STATUS

WPNS FREE	Wpn systems may engage all ac not positively identified as friendly
WPNS TIGHT	Wpn systems may only engage those ac which are positively identified as hostile or which commit a hostile act
WPNS HOLD	Wpn systems may only fire in self def, or in response to a formal order, or if friendly tps/installations being defended are seen to be under direct air atk

NOTE: WCS are used within the rule of engagement (ROE) of the particular op. WCS may be caveated fixed wing or hel as appropriate.



804.13 - ELEC WARFARE (IFF AND EMCON)

1. **IFF**:

   a. Mode 1: This mode is used for gen ident friend or foe.

   b. Mode 2: This mode is intended for detailed ident of a specific ac.

   c. Mode 3: This mode is to be used to specify the functional class of an ac and has a direct air traffic control (ATC) application. In fact, it is the same as the mode used in civ secondary search radar (SSR) for ATC.

NOTE: In addition to those three modes of op, the ac can use iff to indicate a distress condition. By operating a special emergency switch in the ac, the transponder can be set to radiate automatically.

   d. Mode 4: Mode 4 is a cryptographic secur coded signal sent by the interrogator in the wpn system and a coded answer is returned from the transponder in the ac.

2. **EMCON**. It is very important that all electronic emissions be carefully controlled. AD pers must also be aware of the electronic emissions their eqpt radiates. For example, care must be taken to try to shield IR-emitting signatures produced by engine and PPU exhausts. Similarly, good EMCON procedures will help to minimize voice, data, radar, and laser emsns, which may be subject to intercept by an alert en. At the same time, commanders and AD tps must remember that AD systems were designed to fight and survive in the severest of EW environments. They must take care not to do the en's job by handicapping friendly AD systems with EMCON procedures that are restrictive. Perfect EMCON will result in immed availability of AD dets when required without having them give off any unwanted visual, rad, radar,

or EO signature. EMCON States are provided in USOP 203.03.The following actions are directed for AD elms:

a. EMCON 1. **Silence imposed**. No eqpt testing which requires emission required. Rad transmission and radar emission not permitted. Visual acquisition and optical tracking permitted (dependant upon noise and heat source restrictions).

b. EMCON 2. **As per EMCON 1**. Rad transmsn and radar emission may be broken for specific engagements but must be reimposed immedly afterwards. After first engagement one radar per tp may be authorized to emit.

c. EMCON 3. **Silence lifted.** Eqpt testing permitted. Rad transmsn and radar emission permitted. Restrictions on radar emsns may be detailed.

804.14 - ORDERS AND REPORTS FORMATS

1. Related NATO approved AD msg formats are aval in APP 9, part 4, sect 7 and part 5. The most currently used are provided below. Format for indiv msgs are to be conformed to APP 9 std NATO formats.

804.15 - AD STAFF BRIEFING

1. En air sits including approaches.
2. AD deployment including coverage.
3. Important events during period covered.
4. Unit strength, C&S, gun and AFV states.
5. Msl and ammo states.
6. The following sources are aval to the officer for briefing purposes:
   a. ops logs;
   b. reports and returns;
   c. overlays.
7. Always start briefings with “this briefing covers the period from _____ to _____.”

804.16 - AIRATKWARN

1. Format as per USOP 705.01.

804.17 - WEAPONS CONTROL STATUS

1. Format as per USOP 704.14.

804.18 - EMISSION CONTROL

1. As per FSOP 204.08 – EMCON.
2. Initiating auth.
3. EMCON state.
4. Effective period.
5. Effective area.

804.19 - SIGHTING REPORT

1. A sighting report is a priority tactical msg and will be sent to higher CP immed:
    a. C/S;
    b. number & type of ac; and
    c. estimated grid and direction of travel.

804.20 - ENGAGEREP

1. Format as per APP 9, part 4, sect 7.
2. Engagement reports are cumulative and are passed to higher CP when time is aval:
    a. C/S;
    b. date/time of engagement;
    c. type of tgt;
    d. results;
    e. loc of engagement;
    f. type of msl used;
    g. number of msls used; and
    h. misc.

804.21 - CRASHED AC REPORT

1. Crashed ac report is passed to higher CP when a crash is observed or detected:
    a. type of ac;
    b. time of crash or discovery;
    c. loc (encode if nec);
    d. nationality and ident number;
    e. number of pers on board;
    f. number KIA, WIA, or PW;
    g. condition of ac;
    h. condition of cargo; and
    i. misc.

804.22 - AIRSPACE CONTROL ORDER

1. Format as per APP 9, part 5.
2. Example:

SECURITY CLASSIFICATION (when completed**)**

1. Fm: (reporting unit/formation HQ)
2. To: (appropriate formation HQ)
3. ACO no: (three figures)
4. Valid from _____ to _____
    a. (air rtes);
    b. (transit corridors);
    c. (traverse levels);
    d. (LLTRs);

e. (special corridors);
f. (HIDACZ);
g. (WFZ);
h. (BDZ);
i. (ROZ);
j. (remarks); and
k. (amendments).

804.23 - TGT TRACKING REPORT

1. Posn.
2. Mov (speed, bearing).
3. Ident.
4. Tracking no.
5. Size of raid.

804.24 - ADREP

1. Format as per APP 9, part 4, sect 7.
2. Unit/sub-unit.
3. Report eff pd.
4. Hostile air activity:
   a. number and type ac;
   b. activity (bomb, atk, recce); and
   c. results of activity.
5. Number and type of ac destroyed.
6. This report is used to summarize the bty activities over a period of 12 to 24 hrs.

804.25 - DET ORDERS

1. Tp task and loc.
2. Tp RV.
3. Time to mov.
4. Rte.
5. TTBR.
6. Det loc, battle posn.
7. Arcs: primary; and
   secondary.
8. Msl frequency.
9. Misc.