

Joint Air Defence

Joint Warfare Publication 3-63

JOINT WARFARE PUBLICATION 3-63

JOINT AIR DEFENCE

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As directed by the
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Director General
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PREFACE

SCOPE

1. **Purpose.** The purpose of JWP 3-63 '*Joint Air Defence*' is to convey understanding, and to inform and guide those most likely to be involved in the study, planning and conduct of Joint Air Defence (Jt AD) operations in UK joint and UK-led multinational deployed operations. As such, it should be of particular value to those appointed as an Air Defence Commander (ADC) and/or commanders of air defence forces at Component, formation and unit level, and their staffs. It will also be of value to planning staffs as well as joint and single-Service training establishments.

2. **Context.** This Second Edition of the publication avoids replication of established AD tactical doctrine and procedures used by a maritime force when operating in isolation from land-based AD authorities. However, in recognition of the essentially joint nature of air defence within the single littoral battlespace it draws upon the proven principles and procedures employed in providing air support to maritime operations¹ as well as Ground-based AD (GBAD) of land forces and applies them to the joint environment. It articulates the over-arching principles and mechanisms required to achieve co-ordinated and/or integrated AD and describes current air defence capabilities (including Theatre Missile Defence) and Command and Control (C2) arrangements for AD in all 3 components, providing guidance as to how they are integrated into the planning for, and conduct of deployed AD operations. Conduct of AD within the UK Air Policing Area falls under a different doctrinal context, however the majority of principles and procedures described in JWP 3-63 are applicable to home defence within UK airspace.

3. Given the most likely scenarios in which UK forces might be employed, the procedures employed by UK AD assets should be flexible enough to allow for the smooth integration of other AD assets into a UK-led coalition or, alternatively, the integration of UK AD assets into a coalition or combined force led by another nation. Similarly, such procedures should align with those already implemented in an existing AD system, such as NATO's fixed infrastructure (NATO Integrated Extended AD System - NATINEADS). Furthermore, the UK deployed AD posture must take account of Host Nation airspace requirements, depending on the nature of operations and the threat to friendly forces, to ensure that indigenous, civilian, neutral and non-combatant air traffic is not threatened.

¹ Hitherto termed Tactical Air Support to Maritime Operations (TASMO), such maritime air support is now considered within the established categories of air power in accordance with AJP-3.3.3 '*NATO Air-Maritime Co-ordination Handbook*'.

4. **Structure.** The document is laid out in 6 Chapters. Chapter 1 covers the fundamentals of joint AD within the context of Counter-air Operations, and describes the basic elements of a joint AD system. Chapter 2 provides more detail on these capabilities and how they are integrated into a joint AD system, with Theatre Missile Defence covered in the following chapter. Chapters 4 & 5 discuss the C2 structures and planning involved in AD operations, and in the final chapter guidance is provided on certain aspects of the conduct of AD in joint operations.

LINKAGES

5. This publication is closely aligned with JWP 3-00 '*Joint Operations*' and relates directly to AJP-3.3 '*NATO Joint Air and Space Operations Doctrine*' and its UK Supplement, IJWP 3-30 '*Joint Air Operations*'². It is consistent with and, where necessary, expands upon AJP-3.3.1 '*NATO Counter-Air Operations*' and AJP-3.3.3 the '*NATO Air-Maritime Co-ordination Handbook*', and draws upon other related single-Service tactical doctrine. It should be read in conjunction with JWP 3-63.1 '*Ground Based Air Defence*',³ and JDP 2/01 '*Real-time Exchange of Tactical Data*'.

² Due for publication in late 2003.

³ Being developed by the JDCC under the auspices of the Joint AD Development Group to provide Joint TTPs for GBAD operations. Due for publication in late 2003.

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Glossary of Abbreviations

JOINT WARFARE PUBLICATIONS

The successful prosecution of joint operations requires a clearly understood doctrine that is acceptable to all nations and Services concerned. It is UK policy that national doctrine should be consistent with NATO doctrine and, by implication, its terminology and procedures (other than those exceptional circumstances when the UK has elected not to ratify NATO doctrine). Notwithstanding, the requirement exists to develop national doctrine to address those areas not adequately covered, or at all, by NATO doctrine, and to influence the development of NATO doctrine. This is met by the development of a hierarchy of Joint Warfare Publications (JWPs).

Interim Joint Warfare Publications (IJWPs) are published as necessary to meet those occasions when a particular aspect of joint doctrine needs to be agreed, usually in a foreshortened timescale, either in association with a planned exercise or operation, or to enable another aspect of doctrinal work to be developed. This will often occur when a more comprehensive ‘parent’ publication is under development, but normally well in advance of its planned publication.

The Joint Doctrine Development Process and associated hierarchy of JWPs is explained in DCI JS 91/03.

RECORD OF AMENDMENTS

[illegible]

CHAPTER 1 – FUNDAMENTALS OF JOINT AIR DEFENCE

101. **Counter-Air Operations.** UK doctrine recognises that control of the air is fundamental to the success of joint operations. In that it allows freedom of action it is not an end in itself, but a necessary enabler to achieve joint campaign objectives. Unless the operation demands a defensive-only posture using Defensive Counter-Air (DCA) essentially for force protection, control of the air for an offensive force posture will require careful consideration of Offensive Counter-Air (OCA) and DCA effort, with OCA being pre-eminent. DCA is primarily executed as Air Defence (AD) operations, however in the maritime environment the term Anti-Air Warfare (AAW) is generally used.¹ Throughout this JWP, the term AD should be taken to encompass maritime AAW - although AAW is used on those occasions where consistency with extant maritime terminology is required.

102. AD is defined as '*all measures designed to nullify or reduce the effectiveness of hostile air action*'.² Throughout the Joint Operations Area (JOA) AD must be based upon agreed joint doctrine from which concepts of operations, detailed plans and compatible tactics, techniques and procedures can be derived. This will apply whether the force is required to operate within the area of influence of an existing fixed AD system, or where no such system exists.

103. **Joint Air Defence.** Within his campaign plan, the Joint Task Force Commander (JTFC) should be prepared to defend against all air threats which may span the spectrum from Theatre Missiles (TM), stand-off weapons targeted at land or maritime targets, to conventional manned bombers, ground or maritime attack fixed wing and rotary wing aircraft and Unmanned Aerial Vehicles (UAV). In addition he should plan to deny adversary air reconnaissance and fighter sweeps against targets of opportunity and recognise the potential for asymmetric attacks. Joint AD should therefore aim to integrate the AD capabilities of all components in order to protect and influence the battlespace in line with the JTFC's campaign plan.

104. **Extended Air Defence.** Defence against threats from advanced technology Weapons of Mass Destruction (WMD), and their means of delivery, has become increasingly important. To counter this threat, NATO has developed the concept of Extended Air Defence (EAD) which is based on the strategic objective of deterring aggression against NATO territory or deployed Allied forces.³ EAD operations are intended to counter the entire spectrum of emerging air threats, but are particularly

¹ US Navy adopts the term Air Warfare and (maritime) AD Commanders as a Composite Warfare Commander (CWC) functions.

² AAP-6.

³ Being developed under the umbrella of NATO's Integrated Extended Air Defence System (NATINEADS).

focused at achieving defence in depth against Theatre Ballistic Missiles (TBM) and Tactical Aerodynamic Missiles (TAM).⁴

SECTION I – THE OPERATIONAL CONTEXT

Operational Environment

105. Future deployed operations in which UK AD forces may participate are likely to be characterised by several features:

- a. Operations will be expeditionary in nature, certainly joint, and probably multinational and multi-agency.
- b. They may encompass conflict prevention, conflict and post conflict activities, and will be dominated by uncertainty and the threat of rapid escalation.
- c. The UK contingent of a multinational force, although ultimately responsible for its own protection, will normally contribute to the overall AD effort of coalition members or the Host Nation.
- d. Rather than the traditional distinction between ground, sea and air areas of operations, there will be a single battlespace embracing all 3 environments.⁵ That integrated battlespace may be non-linear, with several operations taking place simultaneously.

106. **Spectrum of Conflict.** Regardless of the area, type or intensity of operation, the same basic principles of AD employment will apply, whether in a joint, coalition or national operation, against a superior or inferior adversary. Furthermore, although the capabilities of a potential peer or niche adversary may differ significantly, both may attempt to incorporate emerging technical advances in the key areas of information exploitation, Command and Control (C2), penetration and precision. For example, a niche adversary may have a robust inventory of weapons, including non-stealthy manned aircraft, chemical munitions and TBMs, together with limited numbers of emerging systems such as cruise missile-type TAMs, UAVs, access to civil satellites for reconnaissance and communications, and the ability to conduct limited Information Operations (Info Ops). Putting these factors together means that, in future operations, UK forces could face the same potential threats, regardless of an enemy's overall military capability - only the intensity and scale of the threat will differ.

⁴ See Chapter 3.

⁵ The joint integrated battlespace can be considered as an amalgam of 6 dimensions: Land, Sea (including the underwater environment), Air (including the space environment), the Electro-magnetic spectrum, Cyberspace and Time.

Risk Assessment

107. Whilst all conflict has an element of attrition, UK doctrine espouses the ‘manoeuvrist approach’ which seeks to shatter the enemy’s will and cohesion rather than simply destroy his manpower and material.⁶ Implicit within that approach is the UK’s wish to keep casualties and damage (on both sides) to the minimum necessary to achieve the political aim. In particular, the UK cannot afford to fight a campaign of attrition and the institutional wish to minimise casualties is reinforced by a political requirement. Whilst absolute security against all air threats is likely to be impractical, and a degree of risk unavoidable, the level of that risk should be assessed and commanders apprised.

The Air Threat

108. UK forces could face a range of air threats that might include traditional fixed and rotary-wing aircraft, and, as the availability of new technology spreads to potential adversaries, more advanced capabilities. Some examples of likely threats and capabilities pertinent to AD are as follows:

- a. **Space Operations.** A space-based Intelligence, Surveillance and Reconnaissance (ISR) capability could present a significant potential threat to the security of a JTF throughout the battlespace and at all stages of a campaign by providing critical intelligence and situational awareness to an adversary. The capability is constantly being improved in terms of accuracy, coverage of the electromagnetic spectrum and speed of availability of the product – increasingly becoming real-time or near real-time, often available from commercial sources. ISR sensors can be hosted in a wide variety of space-based assets, including the possible use of non-military platforms.
- b. **Fixed and Rotary-Wing Aircraft.** Existing and future generations of fixed and rotary-wing aircraft will operate by day and night and in poor weather. They will have increased range and payload, an ISR capability, precision weapon delivery systems and improved survivability through the use of armour, defensive aids systems, stand-off weapon systems and low-observable technology.
- c. **Unmanned Air Vehicles.** UAVs are low cost can be employed in electronic warfare, decoy, surveillance, reconnaissance, targeting or intelligence gathering roles and range from the high altitude strategic-type to ever smaller tactical examples. Several types are now capable of acting as Unmanned Combat Air Vehicles (UCAV). UAVs or UCAVs could be

⁶ Refer to IJWP 3-30 ‘*Joint Air & Space Operations*’ (Chapter 5) for guidance on risk assessment and air attrition rates.

encountered throughout the battlespace and are likely to be deployed in number by an adversary.

d. **Stand-off Systems.** The use of stand-off systems such as Air-to-Surface Missiles (ASM), including Anti-Radiation Missiles used for Suppression of Enemy AD (SEAD), and Surface/Sub-surface-to-Surface missiles is increasing in recognition of the vulnerability and value of manned air vehicles. The range and accuracy of such systems continues to increase.

e. **Ballistic Missiles.** Improvements in their accuracy and range could turn TBMs from mainly a political weapon into a more effective military weapon, posing a significant threat to UK deployed forces or strategic mounting bases. However, principally with US assistance, TBM launch can be detected and the projected impact point determined with a high degree of accuracy.

f. **Tactical Aerodynamic Missiles.** Stealthy and non-stealthy Cruise Missiles (CMs), launched from air, land and sea platforms, with small electromagnetic signatures, are difficult to counter due to late detection and the ability of an adversary to concentrate them in time and place to overwhelm defences. Land-attack TAM technology has been dramatically demonstrated in operations and furthermore, their launch is significantly more difficult to detect than that of TBMs.

g. **Munitions and Sub-Munitions.** The precision and lethality of munitions and sub-munitions is progressively improving. The threat from loitering munitions is likely to increase.

h. **Electronic Warfare.** Our increasing reliance upon use of the full electromagnetic spectrum will be targeted. Attacks may include both destructive and non-destructive methods.

SECTION II – THE PRINCIPLES OF JOINT AIR DEFENCE

109. This Section sets out the principles of joint AD, which are applied to joint deployed operations, whether the Force is required to operate within the area of influence of an existing AD system,⁷ or where no such system exists. The principles of AD remain unchanged throughout the spectrum of conflict. However, as conflict escalates the emphasis shifts to different AD objectives from early warning and air policing, through selective engagement in accordance with strict Rules of Engagement (ROE), to inflicting maximum attrition whilst minimising losses or damage to own forces. The principles of joint AD are:

⁷ An example of an in-place infrastructure is the Integrated AD System (IADS) in the Malaysian peninsula, implemented under the Five Powers Defence Arrangement (FPDA). Where no such system exists, AD is most likely to be conducted as part of CJTF operations.

- a. **Denial of intelligence** to an opponent to mount an attack or to complicate his targeting and C2 process to the extent that his attacks are ineffective.
- b. **Obtaining warning** of adversary action by putting in place the means to compile and disseminate a Recognised Air Picture (RAP) that will present options for the AD Commander (ADC) to provide an appropriate response to hostile activity.
- c. **Defence in depth** in three dimensions through the integration of all AD systems. The ADC will need to identify co-ordination measures related to the defensive assets used to counter hostile attack systems. The number, and placement of defensive layers will depend upon the assets available, the C2 infrastructure, the warning time available, the threat orientation and the disposition of joint forces. The nature of the threat is a significant consideration in determining the placement of outer defensive layers, through establishment of 'kill lines' based on the expected launch range of enemy weapons.
- d. **Co-ordinated Air Defence activity** whereby subordinate sector and/or local AD/AAW elements established by the ADC can exchange the RAP and air battle management information, effect weapons co-ordination and airspace control and reduce mutual interference during operations. Co-ordinated AD activity will also provide mutual support.
- e. **Concentration of effort** by means of a co-ordinated AD design to gain maximum synergy out of joint AD assets and effectively counter the whole spectrum of the air threat.
- f. **Centralised Control – Decentralised Execution.** A single commander cannot personally direct the detailed execution of a complex AD battle, thus centralised control and decentralised execution is essential, accomplished by dynamic delegation of tactical functions to the lowest possible level. Control by veto, exercised by the relevant commander, who may apply a veto to an action initiated by a subordinate unit, is a cardinal aspect of this principle.

110. **Control of the Air.** Achieving a measure of control of the air is of vital importance to military operations and is one of air power's most important contributions to the successful execution of a joint campaign.⁸ For the side that does not control the air in modern conventional warfare, military operations on land, sea or in the air are extremely difficult to prosecute without significant risk of failure or large numbers of friendly casualties. There are 3 degrees of control of the air:

⁸ JWP 0-10 'United Kingdom Doctrine for Joint and Multinational Operations' and IJWP 3-30 'Joint Air Operations'.

- a. **Favourable Air Situation.** A favourable air situation is one in which the extent of air effort applied by the air forces of an adversary is insufficient to prejudice the success of friendly land, sea or air operations.
- b. **Air Superiority.** Air superiority is defined as that degree of dominance in the air battle of one force over another, which permits the conduct of operations by the former and its related land, sea and air forces at a given time and place without prohibitive interference by the opposing force.
- c. **Air Supremacy.** Air supremacy is defined as that degree of air superiority wherein the opposing force is incapable of effective interference.

Applying the Principles of Air Defence

111. **Denial of Intelligence.** Actions must be implemented to deny the adversary access to operational or tactical intelligence. This will be achieved by the joint Info Ops strategy or operation as well as the operational and tactical counter surveillance and counter targeting plan.

112. **Obtain Warning.** Warning of a potential attack is essential to allow for the timely implementation of defensive measures without maintaining forces at a debilitatingly high state of alert, and to initiate engagements at the earliest opportunity. Measures must be implemented to develop, compile and disseminate the required level of RAP to support the chosen posture by fusing operational and tactical-level data. The assets available and the geographical situation, balanced against the assessed threat, will usually allow a spread of options to counter attack. Application of military judgement will identify an optimum posture that will support an appropriate response to an adversary's activity and which must be reviewed as the situation develops. Sufficient warning must be achieved to enable air battle management to take place within the enemy's decision-making cycle.

113. **Defence in Depth.** Commensurate with the ability to achieve warning, overlapping layers of defensive weapon systems should be established to make contact with the adversary at a chosen time and place. The warning achieved will dictate the posture or state of readiness of weapon systems. Intelligence data passed independently of the RAP is also an essential element of early warning. Defence in depth is achieved by the integration of all available surveillance and weapon platforms including area and point defence weapon systems and AD fighter assets. Area weapon systems, land or sea-based, are medium or long-range weapons able to defend a wide area against targets transiting through it; point defence systems, which may be land or sea-based, are limited by range and are deployed to defend specific units or facilities. In disposing joint AD assets, such as GBAD systems, about the battlefield a degree of mutual support should also be provided within the layered defensive plan.

114. **Co-ordinated Air Defence Activity.** Within the C2 structure, and where possible within the existing AD organisation of a host nation or in-place AD infrastructure, subordinate commanders may be delegated various responsibilities by the ADC in specified AD Sectors or local AD areas. These sectors or local areas may be exclusively over land or sea, or they may encompass both; they may be supported by both ship-borne and land-based assets and levels of tactical control of AD assets may be delegated to the most appropriate authority within each one, as appropriate to a particular scenario. Procedures for the exchange of the RAP, air battle management (including AD operations),⁹ weapon system co-ordination and airspace control should be established¹⁰ throughout the JOA and applied within each designated Sector or area. Airspace control may be assisted by establishing areas of responsibility (such as Co-ordinated Air Defence Areas (CADAs)) and implemented by Positive and/or Procedural means. Weapon engagements may be managed by means of Zone or Area control methods. There is also a requirement to co-ordinate and/or control non-combatants in the JOA.

115. **Centralised Control – Decentralised Execution.** The principles of centralised control, with decentralised execution, implemented through direct control by veto imposed from a superior authority, ensure the maximum degree of freedom for diverse weapons systems, especially in a hostile, reactive environment when balanced against the need to minimise fratricide and weapons expenditure. These principles demand a comprehensive and reliable Command, Control, Communications, Computers and Intelligence (C4I) system with adequate redundancy.¹¹ Control responsibilities must be carefully defined and implemented at each level to support a smooth and controlled flow of directives, orders and information, and to allow all to benefit from the activities of other elements of the joint AD structure. The JTFC will have to define clearly the terms of reference for the ADC and the Airspace Control Authority (ACA) and the rules regarding delegation of authority to subordinate AD/AAW Commanders, TDL Co-ordinating Authority (TDLCA) and the Electronic Warfare Co-ordinator (EWC). For the ADC, centralised control is effectively limited to the planning function to develop and publish the AD Plan and oversee its implementation. Other than for assets assigned directly to the JFACC, e.g. AWACS, responsibility for execution lies with the Component Commanders who will have the majority of AD assets under their tactical command for the execution of current

⁹ Air battle management is defined as the control of all joint assets that operate in or influence the air environment during operations.

¹⁰ See Chapter 4, where the various methods of achieving co-ordination of AD activity are discussed. Procedures applied in subordinate AD areas must comply with those laid down for the JOA.

¹¹ A consideration for joint AD operations is that land forces combat net radio voice communications is VHF, whereas the vast majority of maritime and air tactical radio communications is UHF. This is also generally the case for data communications. Current plans centre on BOWMAN and FALCON providing up to SECRET UHF High Capacity Data Radio services (HCDR) for the land component, but bandwidth will be variable and depend upon location and tactical level (HCDR bandwidth will vary greatly depending on the tactical COMPLAN). Therefore, BOWMAN could provide real-time information exchange for AD operations, such as tactical data link information for the RAP, if adequate bandwidth capacity were allocated.

operations. In addition, management of real-time data exchange will be of critical concern to the JFACC for many aspects of air operations including the tactical data link input to the RAP. The data link network control responsibilities exercised by the Tactical Data Link Co-ordinating Authority (TDLCA) should be decided by the JTFC during the planning phase; in most scenarios this role is likely to be vested in the JFACC. However, regardless of whoever fulfils this function, the JFACC must ensure that jointly-agreed track recognition criteria, identification authority, track reporting and data link network control responsibilities for the total air environment are established throughout the JOA airspace. Unless exceptional circumstances as detailed by the JTFC require specific responsibilities to be split, ADC, ACA, TDLCA and EWC should normally be combined under the JFACC.¹²

Assessment of Risk

116. Gaining control of the air is not an end in itself, but is only useful if it is then exploited as a means to a greater end. That end will be to damage, destroy or otherwise affect an enemy's centres of gravity, whatever they may be, and to be able to conduct operations in defence of friendly centres of gravity. However, because control of the air is so critical to the total military effort, the air commander should avoid any distractions before it is achieved. There may be occasions when control of the air cannot be guaranteed throughout the area of operations or for the entire period of a joint campaign. Under these circumstances a risk analysis will need to be made by the JTFC before deciding to conduct operations. If surplus assets are available, they can be assigned to other operations simultaneously, but only after very careful deliberation.

SECTION III - ACTIVE AND PASSIVE AIR DEFENCE

117. Joint AD encompasses both active and passive defence measures, the balance of which will be dictated by the operating environment. Active and passive AD measures are also applicable to Theatre Missile Defence, which is discussed in more detail in Chapter 3.

118. **Active Air Defence.** Active AD operations include all direct defensive actions taken by AD weapons to nullify or reduce the air threat. To be effective, an active AD architecture must be capable of carrying out the following sequence of functions:

- a. Air battle management which allows interception, marking, covering and engagement of potential air and space targets.
- b. Airspace Control, both positive and/or procedural.

¹² These functions are carried out through: ADC - AD Operations Centre (ADOC); ACA – Joint Airspace Control Centre (JACC); TDLCA – TDL Planning & Co-ordination Cell (TDLPC) and EWC – EW Co-ordination Centre (EWCC).

- c. Information Operations measures conducted as part of the AD plan.
- d. Compilation and dissemination of a RAP which allows detection, tracking and identification of potential air and space targets.
- e. Evaluation by assessing the potential threat posed by such targets and whether or not they need to be intercepted or engaged (ROE dependent).
- f. Reporting the additional tactical information needed by agencies and units involved in the interception or engagement.
- g. Assigning weapons and/or aircraft and placing them under appropriate tactical control along with the use of Weapon Control Status and Orders.

119. **Passive Air Defence.** Passive AD consists of all other measures taken to minimise the effects of hostile air action. The requirement for passive AD recognises that active AD measures may not be entirely successful. Passive AD measures include:

- a. Information Operations measures conducted as part of the AD plan.
- b. Dispersal.
- c. Physical protection, including ground patrols.
- d. Recuperation measures, including the rapid repair of AD weapons and surveillance systems.
- e. Redundancy in systems, equipment and operating surfaces.
- f. Compilation and dissemination of a RAP to provide an alert, warning and all-clear system.
- g. Military deception techniques which include tactical deception, tone-down, concealment, decoys, dummy positions, camouflage and exploitation of the environment.
- h. Elements of Electronic Warfare which include: electronic deception and counter-targeting measures such as signature control, deceptive formations/routing and Electronic Protection Measures (EPM).

SECTION IV - OUTLINE OF A JOINT AIR DEFENCE SYSTEM

Elements of a Joint Air Defence System

120. **Surveillance and Identification.** The surveillance and identification assets of a joint AD system are responsible for providing continuous surveillance of the assigned airspace and any contiguous areas, identifying all airborne objects, and providing RAP information to the relevant control centres and AD units. All available sources for surveillance and identification, whether theatre assets or those active or passive sensors provided by maritime, land, air or space-based platforms should act as an integrated and interoperable system which provides the highest level of air situational awareness throughout the relevant area of operations.¹³ Identification may be achieved procedurally through airspace control measures, or actively by visual, electronic or Electro-Optic (EO) means, by Electronic Warfare Support Measures (ESM), by track behaviour, other means or most likely by a combination of these. Identification will be greatly assisted by electronic means, using co-operative systems such as Identification Friend or Foe (IFF) and Link 16 Precise Participant Location and Identification (PPLI) or non-co-operative systems such as Non-Co-operative Target Recognition (NCTR). If the identification and/or classification facility is separated from the weapon system, or unavailable to certain AD units, then the C2 architecture must include a dissemination and co-ordination facility for both that will function seamlessly in combat at all levels.¹⁴

121. **Airspace Control.** Airspace Control (ASC) applies to all aspects of air operations. It is a combination of airspace utilisation planning procedures, the resulting control structure and co-ordinating functions required to minimise risks and allow for efficient and flexible use of airspace by all maritime, land and air elements. The responsibilities of the ADC are therefore closely inter-related with those of the ACA and these functions should be discharged by the same individual. Where, for whatever reason, this does not occur, extremely close co-ordination is essential between the ADC and ACA.

122. **Weapon Systems Co-ordination.** Within the overall AD structure, different weapon systems are required to be deployed, as no single system can counter the whole air threat spectrum. Weapons may be placed under positive control or utilised autonomously within an area of responsibility under procedural control. Weapon restrictions composed of Weapons Control Status (WCS) and Weapons Control Orders (WCO) communicate the criteria an AD unit must use to engage a threat. Land-based and maritime long, medium and short-range AD weapon systems should be used to complement each other and thus offset weaknesses inherent in individual systems. AD

¹³ The UK is involved in a US-led programme to develop a Single Integrated Air Picture (SIAP).

¹⁴ Tactical data links inherently combine both these functions, and wider access to the RAP by joint AD units, in real-time, is seen as an increasingly important requirement.

fighters permit the rapid concentration and projection of AD firepower over long ranges and large areas as well as visual identification and shadowing capabilities. Maritime and land-based surface to air weapons can be maintained at high states of readiness for extended periods and are capable of short reaction times, rapid engagement and all-weather operations. It should also be remembered that weapons not primarily designed for AD may also have some AD utility. The surveillance and identification elements are inextricably linked with weapons systems co-ordination.

123. Air Battle Management and Command, Control, Communications, Computers and Intelligence. All of the above elements require integration through a comprehensive, secure, reliable and survivable C4I system, such that the required degree of air battle management can be exercised through exploitation of the RAP. The RAP element of the Common Operational Picture is essential to enable real-time or near-real-time¹⁵ dynamic control of AD operations, thereby achieving effective weapon employment whilst reducing the risk of fratricide. A fixed C4I architecture may be available within the JOA; in the absence of such an architecture it is likely that a deployable air C2 system will be needed.¹⁶

Employment and Command and Control of Air Defence Assets

124. There are various options for the employment¹⁷ of joint AD forces within the following postures:

- a. **Area Defence.** Area defence is the co-ordinated defence of a specific area by a variety of systems.
- b. **Point Defence.** A posture designed for the protection of a specific and usually small area such as vital installations, or an individual unit.

125. Command and Control and Co-ordination of Air Defence Assets. In most circumstances, joint AD operations will employ a mixture of area and point defence. This will exploit the relative strengths of friendly AD systems against an adversary's

¹⁵ Descriptions of 'real-time' and 'near real-time' in this context are given in JWP 6-00 (Annex 4J - Tactical Data Links), as follows: Real-time information is that seen in a platform's tactical data system from its own sensors, or relayed from other remote sensors over a TDL network or other real-time sensor network, which are capable of real-time information exchange. Near real-time information is that seen in a platform which is relayed from external sources over less capable TDLs. The data rate, grid accuracy and discrimination of track information passed over a real-time network provides the highest level of tactical SA which will permit continuous tracking or maintenance of a fire control solution to be achieved; it has a latency of no more than 1 second. These parameters are more limited in a near real-time network therefore the level of SA is marginally lower, and the latency of such track information is likely to exceed 10 seconds; however, continuous tracking and maintenance of a fire control solution is achievable on near real-time networks for the majority of land, maritime and air picture elements but not for high latency air targets, such as TBMs or TAMs, where a real-time information exchange capability is an absolute requirement.

¹⁶ NATO ACCS or the IUKADGE are examples of fixed architectures. The Theatre Air Command and Control System (TACCS) is the UK's deployable land-based Air C4I system. Maritime assets may also provide a deployable air C2 system. Deployable C2 elements should be interoperable with those utilised in a fixed infrastructure.

¹⁷ Self defence is the inherent right of all personnel and units to defend themselves from attack. As such, it is not considered here as a type of AD employment.

weaknesses, and provide defence-in-depth to allow the interception of aircraft and missiles as early as possible with multiple engagement opportunities. Defences should be organised to ensure that a potential opponent is detected and subsequently intercepted prior to weapons release point; this will ensure the maximum level of defence for friendly assets and maximum attrition of enemy assets. The optimum capabilities of different weapon systems vary in terms of detection and engagement altitudes and ranges. Integration and co-ordination to exploit the potential of each weapon system will provide mutual support, as well as the best available coverage, ensuring the minimum risk to friendly aircraft and the deconfliction of surface-to-air weapons and airborne fighters and sensors. Such integration and co-ordination requires a robust and effective C2 system, where unity of command and delegated control of AD assets through robust Tactical Battle Management Functions (TBMF) is achieved at the same level within components.¹⁸

Composition of a Joint Air Defence System

126. The composition of a joint AD System for a particular theatre should be considered in the context of the JTFC's campaign plan. The requirements are to support the JTFC's campaign objectives by providing AD protection for the conduct of operations within the JOA and the subsequent redeployment and recovery of forces. In determining the structure of the joint AD System the following factors should be considered:

- a. The threat.
- b. The size of the JOA.
- c. The assets available for surveillance of the JOA.
- d. The number, location, size and importance of assets to be protected within the JOA, and the level of protection to be achieved.
- e. Own weapons systems and C4I capabilities.
- f. Environmental conditions in the JOA.
- g. The existence of a fixed AD infrastructure, and its degree of integration with any relevant civilian Air Traffic Control System.

127. **Layered Air Defence.** In applying the above principles, the primary aim is to achieve success through layered AD. The outermost layer is usually provided by

¹⁸ In this context, TBMF equate to maritime Composite Warfare Commander (CWC) functions and duties. Army Artillery doctrine describes certain Tactical Tasks, some of which relate to GBAD, however there is no direct equivalent to TBMF/CWC in army doctrine, nor are the functions of Air Control, Data Link Management, Engagement or Identification Authority covered to the same extent. The approximate equivalence of the AD C2 elements within each component is discussed in Chapter 4, and TBMF/CWC comparisons are shown at Annexes 4A & 4B. In the longer-term, UK has proposed to NATO that a joint STANAG be developed in which joint duties and responsibilities are defined.

fighter aircraft, supplemented by Long-range Surface-to-Air missiles (LRSAM), where these are available. Inner layers are provided by a combination of shorter-range fighters and SAMs, with the innermost layer covered by Very Short-range AD weapons (VSHORAD). Greater detail on the primary AD weapons fielded by UK forces is given in Chapter 2, however Surface-to-Air Weapon (SAW) systems may be categorised as follows:

a. **Surface-to Air Missiles**

- (1) Long-Range SAM (LRSAM).
- (2) Medium-range SAM (MRSAM) (e.g. RN Seadart).
- (3) Short-range AD (SHORAD) (e.g. Rapier/RN Seawolf PDMS).
- (4) Very Short-range AD (VSHORAD) (e.g. HVM or other man-portable AD systems (MANPADS)).

b. **Guns**

- (1) RN Close-in Weapon Systems (CIWS) (e.g. Phalanx & Goalkeeper).
- (2) Anti-aircraft Artillery (AAA).
- (3) All-arms Air Defence.

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CHAPTER 2 – JOINT AIR DEFENCE CAPABILITIES

SECTION I – AIR SURVEILLANCE AND IDENTIFICATION

201. An Air Surveillance and Control System (ASACS) provides surveillance sensors for detection and tracking of contacts within its allocated airspace and/or dedicated control functions. An associated identification capability such as Identification Friend or Foe (IFF) or Link 16 Precise Participant Location and Identification (PPLI) should be integrated into the ASACS. The capabilities of traditional airspace sensors vary in terms of range, vertical coverage, target discrimination, the provision of height data and low-level detection capability. However, the increased availability of pulse doppler radar and electro-optic surveillance systems has greatly improved air surveillance, and modern air-to-ground surveillance sensors using Moving Target Indication (MTI) techniques also have the ability to track low-level and slow-moving aircraft over land. Such sensors operate within widely differing areas of the electromagnetic spectrum with operating parameters that have different susceptibilities to Electronic Warfare (EW). Similarly, Electronic Protection Measures (EPM) capabilities vary from system to system. Thus, a number of complementary systems are necessary to provide the spectrum of information and coverage required by a joint AD system for early warning, identification and control. That coverage should take account of all likely threats from high to low level, and from large to small signature and Radar Cross Section (RCS). Systems should be networked to enable mutually-supportive AD information to be gathered and disseminated under all operational conditions.¹ A Theatre Missile Defence (TMD) capability may also be part of the ASACS, however additional specialist TMD surveillance systems are likely to be required.

Surface-based Air Defence Surveillance Radars

202. Range, bearing and, in most cases height estimation is provided by radar out to a range determined by its function or line-of-sight limitations. For surface-based long-range AD radars, this range may be in excess of 200 miles against an aircraft at medium-to-high altitude. Long-range AD radars are all equipped with an IFF interrogation capability. Against small targets or at low level, detection ranges will be reduced. Virtually all radars are vulnerable to EW in some way and, if distinctive, are likely to reveal their identity or that of the host platform to an ESM system. Terrain masking and meteorological effects degrade the performance of all radars.

203. **Ship-borne Radars.** Most major combat vessels have an air surveillance radar with an associated IFF interrogation capability. Aircraft carriers and AD

¹ Track information is generally passed around network participants over real or near real-time tactical data links, supported by voice communications, however the Co-operative Engagement Capability (CEC) will provide a significantly improved real-time sensor networking facility.

destroyers have air surveillance radars with good height coverage and a range capability out to 200 miles or more; they also provide a reporting and aircraft control capability. All RN frigates have air surveillance radars giving some high-level coverage, but with more limited range capability. Whilst ship-borne radars are highly capable and inherently mobile in the maritime environment, the older variants are not optimised for littoral operations. Newer pulse doppler and MTI radars give better detection capability over land but still suffer from terrain masking.

204. **Land-based Radars.** Land-based static radars normally form the core of a fixed AD system's air surveillance capability. Transportable or mobile radars can be employed to supplement such static radars or provide a stand-alone, deployable capability where no such system exists. The provision of a Local Air Picture (LAP) by mobile ground-based radars can provide land-based elements with increased situational awareness about low-level threats such as Unmanned Aerial Vehicles (UAVs), attack helicopters or cruise missiles which may not be detected by other surveillance assets. Similarly, other land component battlefield surveillance assets may be in a position to provide local air picture information into the wider Recognised Air Picture (RAP).

Airborne Early Warning

205. Airborne Early Warning (AEW) is provided by airborne vehicles equipped with a search radar and the appropriate communications or tactical data link equipment for transferring information to the AD Command and Control (C2) system. AEW can overcome some of the line of sight and terrain masking detection limitations inherent in a surface-based sensor system and it will extend detection ranges and consequently increase the time available for reactions to be taken. The threat from low-level surprise attacks may also be significantly reduced, although AEW aircraft can still suffer from some terrain masking and the detection of objects with smaller radar signatures, such as helicopters or UAVs, can be problematic. AEW aircraft generally have a control capability in addition to their surveillance capability.

206. **Boeing E-3 Series.** Operating at altitude, the Boeing E-3 series² of Airborne Warning and Control System aircraft (AWACS) can detect and track surface contacts and most low-flying aircraft at longer ranges than equivalent surface-based sensors; that radar range is obviously greater against higher-flying aircraft. The UK E-3D aircraft is also fitted with an Electronic Warfare Support Measures (ESM) system. The aircraft's communications fit (both voice and datalink) and surveillance area coverage may allow it to support several units concurrently. However, it is vulnerable to attack and it should, therefore, be afforded appropriate protection if necessary. It needs to operate from well-found airbases but has a long range and can conduct Air-to-Air

² E-3A (NATO AWACS Force), E-3C (USAF), E-3D (RAF), E-3F (French AF). Some nations operate AWACS systems fitted in other commercial aircraft types.

Refuelling (AAR). Up to 4 x E-3 aircraft will be required to sustain an AEW orbit providing 24-hour continuous cover; this will vary dependant on distance between the operating base and the location of the orbit as well as diversion fuel requirements.

207. **Sea King ASaC Mk7.** The RN SKASaC Mk 7 operates from RN aircraft carriers, or from a deployed base, and its primary role is provision of AEW for a maritime force. Operating at low to medium levels, depending on the threat, the SKASaC Mk 7's pulse/pulse doppler radar provides it with a good medium and low-level detection capability and much improved performance in littoral areas. It has no air refuelling facilities but is fitted with a data link and has a control capability.

Weapon System Sensors

208. Many weapon systems are equipped with their own integral surveillance or fire control radars which can provide information of value to the joint AD system, particularly height data. These may vary from fighter air intercept radars and Radar Warning Receivers (RWR), Surface to Air Missile (SAM) search and fire control radars to the infra-red AD Alerting Device (ADAD) used by Very Short-range Air Defence (VSHORAD) weapon systems. Many weapon system sensors have an associated IFF capability. The utility of such information will vary between good quality track information with IFF/PPLI which can be fed into the RAP to a simple voice indication of potential hostile activity within a particular locale.

Electronic Warfare Support Measures

209. ESM can provide situational awareness and threat recognition. Location of emitters can be fixed by direction finding from multiple ESM sensors. Where detection by other surveillance methods has not been achieved, ESM can often gain a range advantage by providing the first indication of air activity, which can then be used to cue an appropriate response. In the absence of a secure identification system, ESM can provide key supplementary information to resolve track ambiguities from other surveillance methods, and unique parametric data can provide platform identity. Most maritime units have an ESM capability, as do certain land-based AD systems and airborne platforms. Particular care should be taken by the appropriate EW Co-ordination Cell (EWCC) or EW Co-ordinator (EWC) to ensure that tasking of EW assets is co-ordinated with other air operations, including AD, to avoid mutual interference with friendly ESM systems or 'swamping' of data link networks with ESM information.

Combat Identification

210. In practical military terms, there is currently no guaranteed method of identifying aircraft at the detection range of electronic sensors or even some weapon systems. Visual identification at closer range is very much dependent upon light

conditions, range, aircraft aspect and the skill of the observer. Track behaviour, point of origin, compliance with the Airspace Control Plan or broadcast instructions, ESM indications, Non-Co-operative Target Recognition (NCTR) tracking or other intelligence and visual identification means individually or collectively contribute to track recognition and identification. Current electronic Identification Friend or Foe (IFF) equipment comprises Mark X/XA with Mode 1/2/3 insecure capability, and the later Mk XII with the Mode 4 secure capability. A US-led operation may require multinational partners to have a Mode 4 IFF capability to a greater or lesser extent. Currently, not all UK air assets or GBAD elements are fitted with Mark X/XA equipment but the UK's Successor IFF (SIFF) programme³ should redress this shortfall. Units participating in a data link system will automatically give their basic identity and position (e.g. PPLI in Link 16) around the network, and may also be able to provide a greater level of identity through an IFF Mode 2 Selective Identification Feature (SIF) function.

Air Pictures

211. **Recognised Air Picture.** The RAP is an electronically produced display⁴ compiled from a variety of sources including primary and secondary radar and ESM. It covers a three-dimensional volume of interest in which all detected air contacts have been evaluated against specific threat parameters and recognition criteria, and then assigned an identification category and track number.⁵ There will be only one RAP for the Joint Operations Area (JOA), however the management task associated with its compilation will require a clearly understood structure. On occasions, the RAP may be provided by a number of different data link systems, which may require suitably equipped units to carry out a data transfer function between networks to ensure the widest dissemination of unambiguous track information. The quality of the sources feeding into the RAP and accessibility to its bearer system(s) will determine the efficacy and utility of the RAP to the various users. Modern tactical data links (TDL) or sensor network systems may permit dissemination of the RAP in real-time, however available bearer speed or capacity limitations of older data links may reduce it to a near-real-time picture. For a large AD Area with a great number of inputs to the RAP, the area should be sub-divided into smaller Track Production Areas (TPA) for ease of management, which will collectively feed the RAP.

³ SR(SLA) 924 will equip sea, land and air platforms with IFF Mk XII.

⁴ Although described as a 'display' the core element of the RAP is a common database of airborne objects updated in real-time or near-real-time with varying levels of access to some form of electronic digital 'display' by data link participants.

⁵ Specific recognition criteria may already be in force within an established AD Area, or be laid down by the JTFC/JFACC in a JOA; tactical identities are laid down in STANAG 1241. An identified air track should be allocated a track number verified by the Force Track Co-ordinator (Air); ideally this track number should remain associated with a particular contact throughout its reported period in the RAP.

212. **Local Air Pictures.** A LAP may take the form of a manually or electronically produced display compiled from a combination of local sources covering a limited three-dimensional volume of interest. Those sources could include local ATC radars, other short-range or weapon system radars or position reporting by other means. The LAP may be associated with the area of AD responsibility of a Local Air Defence Commander (LADC). Those contacts within the LAP which are of value to the RAP should be exported to the latter and vice versa.

213. **Recognised Air Picture Compilation Process.** When an airborne object is detected it will be assessed⁶ against a set of recognition criteria set down within the AD plan by the nominated Identification Authority. As a result of that assessment, an ID category label, and a unique track number, will be applied to the contact. There should be only one ID Authority for an AD Area (encompassing any associated TPA(s)); all or part of that authority may be delegated by a superior AD commander in accordance with the extant level of TBMF delegation and guidance provided in the ATO or OPTASK⁷ messages. An initial track ID category may be changed as the quality of information on it improves (any RAP participating unit should challenge a contact's ID category if it has contradictory or better information), or the Force Track Co-ordination (FTC) authority for the RAP may exercise power of veto if it has better information. This is an inherent process in the operation of TDLs, where such track information can be exchanged automatically under strictly controlled track quality, identity, correlation and filtering rules. Track data should be sufficiently detailed to permit the C2 system to evaluate the track, determine any threat, and either designate AD forces for the interception, shadowing, intervention or engagement of the track, or to advise units of the passage of friendly aircraft. Additional C2 information can be passed over some data links such as target allocation to weapon systems and engagement orders. The TDL network and its associated real-time management process provide an essential contribution to RAP compilation.

SECTION II – PRIMARY AIR DEFENCE WEAPONS

214. The advantage of detecting an adversary at long range will be reflected in greater attrition, given appropriate weapon systems, with avoidance of 'overkill' and the ability to reduce alert states. The weapons element of a joint AD system will normally comprise a balance of 2 complementary components, Surface-to-Air

⁶ An object should be *detected* as being of potential military significance (i.e. fast moving aircraft), *recognised* by its nature or behaviour (e.g. fighter ground attack) - and possibly by class and type (e.g. F-16) - and *identified* by its 'allegiance' (e.g. unknown, hostile, friendly, etc). A standard set of recognition criteria and identification levels must be established by the JTFC or other authorised commander with all components, and implemented throughout the JOA.

⁷ The Maritime Tactical Messaging System (MTMS) is made up of the Operations General (OPGEN) message and supporting Operational Tasking (OPTASK) messages; the OPTASK AAW is predominantly used and understood by maritime and air forces as a means of providing operational direction and tasking for AD/AAW operations. The OPTASK LINK provides operational direction for tactical data link operations, including ID and Force Track Co-ordination duties. Some information sets from these messages are also incorporated in the ATO.

Weapons (SAW) and fighter aircraft armed with Air-to-Air Missiles (AAM). All systems have limitations such as range, reaction time, identification capability, and flexibility of operation. Closer examination of individual systems shows that the disadvantages of one are often balanced by the advantages of another; therefore, effective active AD requires a mix of weapon systems which can be integrated and layered with sufficient overlap in coverage to allow flexibility of deployment and employment.

Fighter Aircraft

215. The performance of a fighter aircraft should be good enough to enable it to intercept or engage targets at all altitudes. However, the need to ensure that the AD fighters have good range, endurance and an adequate suite of weapons may conflict with the desire for high speed, climb rate and agility. In the absence of air refuelling, fighter aircraft have limited endurance, and they cannot be re-armed, re-crewed or maintained in the air. However, they are flexible across the spectrum of potential operations in that they have the capability to intercept, identify, and shadow aircraft prior to any subsequent intervention and/or engagement. Subject to the overall air surveillance capability, they can be used to defend large areas or be quickly concentrated to counter large raids.

216. **Fighter Capabilities.** The capabilities available from fighters vary in a number of ways:

- a. **All-weather Day/Night.** Most modern fighters are equipped with air intercept radars and a weapon system which enable them to operate in all-weather, day or night. Their radars also provide a limited surveillance capability. Day fighters may also be used in the point defence role.
- b. **Air-to-Air Weapons.** Weapons fits can vary from guns through passive infrared-homing missiles and semi-active homing missiles to 'fire-and-forget' active homing missiles. All UK all-weather fighter aircraft carry a mixture of these weapons.
- c. **Tactical Data Links.** Some Allied AD fighter types are fitted with a tactical data link.⁸ This greatly improves the fighter's situational awareness and combat capability by permitting the fighter to receive, display and feed into the RAP.

217. **Employment.** Fighters will operate from airbases and/or from aircraft carriers as part of the Carrier Air Group (CAG). In AD terms, fighters are generally employed in 2 ways - from ground/deck alert ready to launch on notification of a threat,⁹ or from

⁸ RAF F3 aircraft are fitted with Link 16, and JRRF pool aircraft also have full JTIDS capability.

⁹ E.g. Quick Reaction Alert (Intercept) (QRA(I)).

Combat Air Patrols (CAP). In both cases, interception may be achieved autonomously or more effectively, with control from a land, sea-based or airborne control unit.

- a. **Ground/Deck Alert.** If warning time permits, maintaining aircraft at ground alert is usually the most efficient use of fighter assets by: minimizing flying hours, AAR utilisation, and turn-round requirements; reducing aircrew fatigue, allowing aircrews to rest when not required, and permitting groundcrews to prepare and service aircraft in order to provide maximum availability when required. However, it is essentially reactive in nature and relies upon an effective ASACS. Moreover, the high penetration speeds of adversary aircraft may well render interception extremely difficult or impossible when geography and airfield locations are unfavourable.
- b. **Combat Air Patrol.** CAPs enable more rapid reaction to enemy intrusion and may be positioned well forward of the areas to be defended. However, sustaining CAPs - particularly at long range and over long periods - can absorb a great deal of effort. In particular, CAPs may be highly demanding on resources such as aircraft and spares, aircrew and air refuelling support.

Surface-to-Air Weapons

218. SAW consist of SAM and guns. SAW can maintain high-readiness states over long periods, give quick response and may provide the best form of defence against targets which are particularly challenging for fighter aircraft (i.e. cruise missiles, UAV and helicopters). On land, SAW systems are described generically as Ground Based Air Defence (GBAD); the aim of GBAD is to prevent enemy interference from the air with the conduct of operations on the ground.

219. **Definitions of Long/Medium/Short-Range Surface-to-Air Weapons.** SAW are generally grouped by their horizontal range capability:

- | | | | |
|----|---------------------------|---|-------------------------|
| a. | Long-Range SAM | - | > 50 nm. |
| b. | Medium-Range SAM | - | 10 to 50 nm. |
| c. | Short-Range SAM | - | < 10 nm. |
| d. | Very Short-Range SAM/guns | - | < 3.0 nm. ¹⁰ |

220. **Long and Medium-Range Surface-to-Air Missiles.** Long and Medium-Range SAM (LR/MRSAM) can be either active or semi-active homing. They will generally have organic surveillance and fire control radars with associated IFF,

¹⁰ NATO doctrine does not define VSHORAD in this way. This is a national interpretation of the UK VSHORAD capability, which aids differentiation between the SHORAD and VSHORAD elements of GBAD.

however engagements may also be achieved through remote data link and/or voice facilities. Modern LR and MRSAM systems provide an inherent area AD capability, whereas with older systems this may be more limited. The RN currently possesses the only UK MRSAM capability (Sea Dart), which will be replaced by the Principal Anti-Air Missile System (PAAMS) in Type 45 destroyers. As well as providing area air defence to a maritime force, Sea Dart can provide a MRSAM capability in a littoral environment, although its sensors might be subject to degradation of radar coverage by terrain. The sensor and PAAMS performance in the Type 45 will greatly improve this littoral MRSAM capability.

221. Short-Range/Very Short-Range Surface-to-Air Weapon. Short Range SAW are characterised by swift reaction and engagement times using either Short-range or Very Short-range AD SAM or gun systems (SHORAD/VSHORAD). They may have organic sensors (either radar or electro-optical), be either visually or radar laid and, in the case of SAMs, be either active, semi-active or command-guided (again radar or visual):

a. **Ground Based Air Defence.** All UK GBAD assets are SHORAD or VSHORAD, however several other nations operate MRSAM. In order for GBAD assets to contribute most effectively to the joint AD plan, Army, RM and RAF GBAD must be interoperable between component GBAD tasks. All GBAD Fire Units (FU) are autonomous, i.e. they are not networked.¹¹ Each Fire Group of FUs is controlled by a control node at sub-unit or troop level.¹² Given the current lack of GBAD integration into the real-time air battle management network, weapon control is still largely achieved by procedural means, based on the Airspace Control Order, disseminated via the control node; the engagement decision is normally made at the level of an individual FU when possessing the appropriate WCS/WCO to do so. Situational awareness is normally disseminated via the appropriate control node and, where possible, a control node will have access to the RAP.¹³

b. **Short Range Air Defence/Very Short Range Air Defence Systems.** The UK's Rapier SHORAD system has organic IFF-equipped surveillance radars with a range in the order of 9 miles, and electro-optical and radar guidance modes for the Rapier missiles. It is fielded by the British Army and the RAF. Rapier has no armour protection and limited battlefield mobility and hence is best suited to providing protection to less mobile, more static assets. The UK's High Velocity Missile (HVM) VSHORAD¹⁴ system is operated by

¹¹ The GBAD Phase 1 programme will provide a networking capability.

¹² This equates to Army Battery Command Post (BCP) and RAF Squadron Command Post (SCP). Mixed Fire Groups will be controlled by an integrated Fire Control Centre (FCC).

¹³ Refer to Chapters 4 & 6 for details on the improvements to RAP access, and associated GBAD BMC4I, being implemented through the RAP Troop capability.

¹⁴ In the army, VSHORAD is provided by HVM-equipped Close Air Defence (CAD) regiments.

the Royal Marines and Army and comes in 3 variants: shoulder-launched, tripod-mounted (Lightweight Multiple Launcher (LML)) and light-armour mounted (Self-propelled (SP)). SP HVM is only operated by the army and is more suitable for the protection of mobile land forces. All variants are equipped with the ADAD daylight electro-optical surveillance device but currently have no IFF fitted¹⁵ and no night capability.¹⁶

c. **Ship Point Defence Missile Systems.** The maritime equivalent to SHORAD is the Seawolf Point Defence Missile System (PDMS), which is fitted to all RN frigates. Seawolf has similar operating parameters, and shares technologies with Rapier, however when these 2 systems are operated in close proximity to each other care must be taken to avoid mutual interference problems. By positioning a Seawolf frigate close to another high value asset, a degree of protection can be provided to the latter. PDMS control is integral to a ship's combat system.

d. **Ship Close-In Weapon Systems.** Various RN ships have very short-range radar-laid guns which are called Close-In Weapon Systems (CIWS), but have little practical utility outside the self-protection of their host platform. CIWS control is also integral to each ship's combat system.

e. **Anti-Aircraft Artillery.** Guns employed as SAW on land are called AAA (triple 'A'); the UK does not currently employ AAA.

f. **All Arms Air Defence.** Small arms fire can contribute to AD of ground or maritime forces. When properly co-ordinated, small arms or machine-gun fire can achieve the destruction of, or damage to, enemy aircraft, deter a pilot from completing a mission or force him to climb to heights where his aircraft may become vulnerable to other types of fire, and maintain the morale of own troops.

Fighter/Surface-to-Air Weapon Mix

222. The force mix of fighters and SAW within a joint AD system - and the nature of their deployment - will vary between each campaign. However, except in isolated air policing situations where SAW capabilities are unlikely to meet the operational requirement, the mix of fighter and SAW should be seen as complementary rather than competitive in nature. In general, SAW are best suited to point and limited area defence, whereas air defence fighters are best suited to wider area defence.

¹⁵ IFF will be fitted under the SIFF programme (SR(SLA)924).

¹⁶ A Thermal Sighting System (TSS) is due to be fitted to SP HVM from 2003.

SECTION III – ADDITIONAL AIR DEFENCE CONSIDERATIONS

223. **Other Surveillance Sources.** To increase further the effectiveness of the joint AD system, all other surveillance sources or weapon systems available in the JOA should be used to maximum advantage. For example, air-to-ground surveillance aircraft such as ASTOR are fitted with JTIDS/Link 16 and may be able to provide critical information on low-level or slow-moving air contacts. In most cases, tactical data link interfaces or dedicated voice communications may be available; in other cases, voice reports or close liaison may be the only means available.

224. **Integrated Mission Support.** Pre-deployment preparations will include the creation of an intelligence database containing all the relevant environmental and tactical data required for the operation that will be constantly updated. Operational Intelligence (OPINTEL) for AD operations will be available in theatre by various electronic means, utilising where appropriate, a UK National Intelligence Centre (NIC) or OPINTEL Support Group (OISG). Electronic Warfare and other mission support data will also be available from the Defence EW Centre (DEWC). The output from these cells will be focused on:

- a. The commander's decision-making process and all forms of mission planning.
- b. The conduct of current operations, including Integrated Battlespace Management and the generation and maintenance of the 'red' picture.
- c. Targeting and Information Operations.
- d. Combat Effectiveness Analysis.

The output from intelligence will be key to Integrated Mission Support (IMS) and it is essential that joint AD commanders make the maximum possible use of it. Once in theatre, those and other sources (Air-to-Ground Surveillance Systems, space-based sensors, ESM and UAVs) may provide indications of imminent hostile activity and possess the potential to provide early warning and positive hostile identification before it could otherwise be provided by other active means. Clandestine sources may augment such information (e.g. the observation of hostile airbases by UK Special Forces). The maximum possible use of this IMS information by AD forces is essential.¹⁷

225. **Civilian and Military Air Traffic Control Facilities.** ATC facilities in the JOA can contribute information of value to the joint AD system at both the theatre and local levels. These capabilities should be exploited and, where possible, fused into the ASACS product. However, ATC radars suffer the same line-of-sight problems as most

¹⁷ This will be covered in IJWP 3-70 'Joint Integrated Mission Support', due for publication in 2004.

surface-based sensors, mostly lack EPM and may utilise Secondary Surveillance Radar (SSR/Mode S) rather than primary surveillance (raw radar) modes.

226. **Non-Air Defence Air Assets.** All non-AD role-specific fast jet aircraft are equipped with air-to-air weapons for self protection which could contribute to the joint AD effort. Examples include Tornado GR4, Harrier GR7 and Jaguar GR3.

227. **Armed Helicopters.** Armed helicopters may have the capability to engage adversary air forces, predominantly helicopters and UAVs, in air-to-air (or air-to-surface) combat to protect themselves and other elements of the force. Such aircraft will normally be employed integral to the manoeuvre operations of the Maritime or Land Component, but in so doing complement joint counter-air objectives and should adhere to existing AD procedures. The UK currently has no air-to-air capability in its armed helicopters.

228. **Air Refuelling.** The facility to extend the range, endurance and/or payload of fighter and AEW aircraft by means of air refuelling can add significantly to the overall effectiveness and flexibility of AD operations. In the counter-air battle, in areas where the use of airspace is being strongly contested, use of air refuelling may be precluded because of the vulnerability of aircraft engaged in the refuelling process; in this event, tanker towlines may have to be established in safer areas.

229. **Multinational Ground Based Air Defence Operations.** UK GBAD will be expected to achieve full interoperability with the AD systems of other Allied and coalition nations. Interoperability between weapon systems and the SOPs employed in their use is important in this regard, but of primary concern is the ability to share situational awareness and related C2 data between relevant GBAD control nodes and other SAM Operations Centres (SAMOC) or Fire Control Centres (FCC). In multinational operations, other nations' GBAD assets could be taken under command for specific operations; where this happens, it is anticipated that a liaison element would be attached to the appropriate GBAD control node through which interoperability would be assisted.

SECTION IV – AIR DEFENCE COMMUNICATIONS AND INFORMATION SYSTEMS

230. **Network Capability.** All AD C2 elements should be networked to enable the gathering, fusion and dissemination of information to permit the real or near-real time tasking, control, integration and co-ordination of maritime, land and air AD capabilities. The communications architecture should have sufficient capacity, security, jam-resistance and survivability to accommodate information exchange between all levels of C2, including the capability to transmit operationally-essential information within a degraded communications environment.

231. **Voice and Data Communications.** Although voice communications remain important, there should be seamless connectivity and automatic exchange of real-time and near-real time information from sensors to weapon systems, overlaid with C2 directives, ideally by means of a tactical data link. This will permit the rapid dissemination of the RAP, early warning information and engagement orders down to the lowest practical level,¹⁸ which, within the ROE, will make most effective use of all sensors and weapon systems, enhance target engagement opportunities, and improve Combat ID. The tactical voice communications employed in AD should also allow rapid operational feedback to the relevant AD/AAW Commander to inform the battle management process and permit control by veto. Although the RAP Troop have access to UHF communications for air-land voice communications, the general lack of interoperability between UHF (maritime/air) and VHF (land) networks must be taken into account when establishing AD voice co-ordination circuits, however future land digitisation programmes should further alleviate this problem.

Tasking of Air Defence Operations

232. The UK Joint Force Air Component HQ (JFACHQ) CIS system is denoted as RAFCCIS. AD operations are notified by means of the Air Tasking Order (ATO) and maritime/air OPTASK AAW messages. Automated ATO compilation is undertaken by the Joint Air Operations Centre (JAOC) staff within the JFACHQ using the NATO Initial CAOC Capability (ICC) software tool, which is embedded in RAFCCIS. However, it is only likely to be fully deployed for a national or NATO operation. For operations with US forces, or in other coalition operations led by the US, the US Theatre Battle Management Core System (TBMCS) is required for ATO generation. TBMCS is currently incompatible with ICC, therefore when operating with US forces UK JFACHQ/JAOC personnel will use TBMCS for ATO production; the ATO can then be read and distributed to UK forces through a combination of RAF CCIS and the Joint Operational Command System (JOCS). The bearer used to transmit the ATO, or elements of it, to subsidiary units in the AD organisation will depend upon the overall C4 structure established for the operation.

Radio

233. The primary means of air-to-ground AD communications is UHF, however HF may be used as a fallback if available. Ground-to-ground AD communications are predominantly landline or VHF/HF. Land-based and maritime ASACS units use UHF or HF voice circuits to pass critical battle management information (including air picture information) to those AD units without access to a tactical data link picture, and a dedicated voice circuit for data link management may also be required. Notwithstanding the increasing use of tactical data links, voice circuits are still widely

¹⁸ Lowest practical level is usually the Fire Control Centre or Command Post for GBAD, the Tactical Director in AWACS platforms or equivalent position in the TACC, the AAW Officer (AAWO) for maritime platforms, and the crew for fighter aircraft.

used for the passage of supplementary battle management information between AD units, in a secure mode wherever possible. As currently configured, Army GBAD units do not have routine access to such tactical UHF or HF communications; battle management information passed over a tactical AD circuit may have to be relayed from the appropriate GBAD Control Node over the GBAD C4I system.

Tactical Data Links

234. Tactical data links have evolved to meet critical real-time and near real-time information exchange requirements, with particular significance for AD operations. There are a variety of data links used in AD operations that require co-ordinated and integrated management to ensure their efficient use within the ever-more crowded electro-magnetic spectrum.¹⁹ In order that TDL networks operate effectively, it is critical that a joint OPTASK LINK message is produced by the TDL Co-ordinating Authority (TDLCA) which is disseminated widely to co-ordinate participation in networks without mutual interference. Subsidiary data link management orders issued by components must be coherent with the joint OPTASK LINK. The major TDLs are described below.

235. **Link 1.** Link 1 is a point-to-point, non-secure, low-capacity data link for the exchange of unclassified air track data only between NATO ASACS sites using dedicated landlines. The NATO Air Command and Control System (NATO ACCS) programme will replace Link 1 as the backbone structure for the NATO Integrated Extended Air Defence System (NATINEADS), and also provide a deployable ASACS element for expeditionary air operations.

236. **Link 11.** Link 11, known as TADIL-A in the US, is an automatic, medium-speed, encrypted data link which utilises both HF, UHF and satellite bearers. It is very widely fitted and used throughout the RN, RAF, RM, NATO and beyond, and although it will have increasing difficulty with handling the ever-higher levels of tactical data, it is likely to remain the predominant data link for coalition operations for several years. Through the use of integrated or portable buffer sites, Link 11 can be fed into NATO ACCS or a deployed AD system. Link 11B, known as TADIL-B in the US, is the Link 11 message standard for point-to-point transmission over landlines and HF which is used mainly by the USMC.

237. **Joint Tactical Information Distribution System/Link 16.** The Joint Tactical Information Distribution System (JTIDS) is a sophisticated, high-capacity, high-speed, ECM-resistant and secure voice and data system with widespread application. It is UHF, line-of-sight based, but unlike Link 11 it can employ data forwarding to achieve wider network participation. To enable a Link 16 network to function, all network

¹⁹ Refer to JWP 6-00 Annex 4J and JDP 2/01 'Real-time Exchange of Tactical Data' for greater detail on data link operations.

participants must have pre-allocated time slots and the correct cryptographic material. The message catalogue used by JTIDS for the transmission of tactical data is Link 16, which has far greater security, network cycle speed and ECM-resistance over Link 11 messages. JTIDS/Link 16, also known in the US as TADIL-J, has a much larger and more comprehensive message catalogue than older data links (e.g. it supports TMD operations), can support multiple network operation and is the preferred data link for AD operations wherever it is available. Integrated or portable buffer sites, if available, can be used to integrate Link 16 into NATO ACCS or a deployed AD system; some of these buffers may be capable of Link 16 integration alongside Link 11, thereby assisting multiple data link networking.

CHAPTER 3 – THEATRE MISSILE DEFENCE

SECTION I – ASPECTS OF THEATRE MISSILE DEFENCE

301. **Background.** The proliferation of Theatre Ballistic Missiles (TBMs) and Tactical Aerodynamic Missiles (TAMs)¹ and their associated technologies has brought with it a greatly increased risk of the use of Weapons of Mass Destruction.

Furthermore, such Theatre Missile (TM) systems give opponents the ability to project asymmetric air power from long or very long-range. TMs may be as much a political weapon as a military one; indeed, in many cases, their political impact may outweigh their military significance. Consequently, commanders must consider the political implications as well as the military impact of the threat posed by TMs, particularly as the former may influence the latter; for example, the diversion of air assets into Conventional Counter-force (CCF) operations (see paragraph 317).

302. **Planning Assumptions.** Given the new strategic environment, the requirement for NATO to develop an Extended Air Defence (EAD) capability, particularly in defence of its Southern Region, is likely to strengthen. It is also highly likely that UK forces will be required to deploy to regions where a TM threat does exist. This means that the doctrine and tactics, techniques and procedures for Theatre Missile Defence (TMD) and the Intelligence, Surveillance Target Acquisition Reconnaissance (ISTAR) systems, weapon systems, communications architectures and other resources required to conduct TMD operations must be flexible enough, and interoperable with existing Air Defence (AD) systems, to provide timely and accurate TMD throughout the NATO Area of Responsibility, or relevant Joint Operations Area (JOA). The UK currently has no indigenous active capability to destroy a ballistic TM after launch, however given the likely nature of future deployed operations involving UK forces such a capability may be available from within Allied or Coalition forces. However, UK forces will fall under the umbrella of the national Ballistic Missile Early Warning System (BMEWS) and it can be expected that they will have access to other TM warning systems when deployed. It is on this basis that the doctrine within this chapter is written. Even though the UK currently does not possess an active TMD capability, the Joint Task Force Commander (JTFC), in conjunction with his respective Component Commanders (CC), must plan for TMD operations within a JOA, and be mindful of the effects of TMD in the wider theatre of operations. When an active TMD capability is not available within a coalition force, UK forces would have to focus on passive defence, CCF operations and Command, Control, Communications, Computers and Intelligence (C4I) measures.

303. **Definitions.** The following definitions are used in this JWP:

¹ TAMs include cruise missiles. NATO's Extended Air Defence policy considers these 2 systems separately; they are grouped together as Theatre Missiles (TMs) in this publication.

a. **Theatre Missiles.** These are ballistic, cruise and air-to-surface missiles whose targets are within a given theatre of operations,² with a range of a few hundred to several thousand miles. Shorter-range direct fire missiles, bombs, and rockets, even those that may pose a Nuclear, Chemical or Biological (NBC) threat, are not considered as 'TMs' for the purposes of this publication. Of primary concern are the increasingly accurate ballistic and cruise missiles armed with conventional or NBC warheads.

b. **Theatre Missile Defence.** This concerns the identification, integration, and employment of forces, supported by other theatre and national capabilities (if available), to detect, locate, identify, track, minimise the effects of, and/or destroy TMs. TMD doctrine covers the defence of deployed forces against TMs, it does not encompass the strategic threat posed by longer-range ICBMs. It includes the destruction of: TMs on the ground and in flight, and supporting infrastructure; TM-capable ships and vessels in port or at sea; and aircraft armed with TAMs. TMD operations are accomplished by integrating a mix of mutually-supportive passive defence, active defence, CCF operations, and C4I measures.

c. **Theatre Missile Defence System.** This refers to a system or systems with applicable capabilities that may be used to support passive defence measures, active defence measures, CCF operations and the C4I and countermeasures required to counter a TM threat.

304. **Objectives.** The objectives of TMD are as follows:

- a. To deter or prevent employment of TMs against friendly forces through the establishment of a TMD capability.
- b. To detect and target TM systems, either pre or post-launch.
- c. To detect, warn and report any TM launch within the JOA or surrounding theatre. Thereafter, to co-ordinate a response to the TM attack while integrating that response with other combat operations.
- d. To reduce the probability of damage from TM attack and to minimise the effects of damage.
- e. To provide warning to friendly forces and, if directed, to other agencies.
- f. To ensure that the JTFC has the freedom to conduct joint operations without undue restrictions.

² *Theatre of Operations* - A geographical area defined by the military strategic authority which includes and surrounds the area delegated to the operational commander within which he will conduct operations – known as the Joint Operations Area (JWP 0-01.1 'The UK Glossary of Joint and Multinational Terms and Definitions').

305. **Factors Affecting Theatre Missile Defence Operations.** TMs may pose a threat to all forces within the JOA, therefore all joint force TMD capabilities, including space-based assets, must be integrated within the overall Space, Strategic Air and Counter-air Operations planning process towards the common objective of neutralising or destroying an opponent's TM capability. TMD should not be considered solely as a Defensive Counter-air/Air Defence activity. It must be integrated into the JTFC's overall concept of operations and campaign objectives; strategic direction may in any case dictate the level of priority afforded to tasking of assets for TMD operations, and this may conflict with other tasking requirements. A related factor to consider is the far wider 'strategic horizon' that is involved in TMD operations, compared to the operational-level confines of the JOA. Co-ordination and control mechanisms for TMD operations may therefore be necessary beyond the physical limits of the JOA.

SECTION II – THE THREAT

306. **Proliferation.** The proliferation of TMs, combined with wider access to NBC weapon technology, poses a new challenge to military planners. As well as the political implications of their use, direct military threats from TMs include, but are not limited to:

- a. Attacks on deployed Allied and multinational forces.
- b. Attacks on logistic facilities or strategic deployment bases (ports, air bases, marshalling areas), and on lines of communication including area denial by the use of sub-munitions.
- c. Counter-TMD activity.
- d. Direct missile attacks on population or centres of government.

307. **Effects of the Use of Theatre Missiles.** The political intimidation posed by a TM threat may outweigh the actual military value likely to be achieved by the use of a TM system. This may lead an aggressor to consider using TMs against non-military targets such as civilian population centres, industrial centres, or political, cultural and religious structures and government buildings. Alternatively, an aggressor may consider propaganda value exists in attacking concentrations of Allied and multinational military forces, separate and apart from any military significance, in order to show the vulnerability of these forces to attack. Rest and recreation areas and rear support areas to which the media have ready-access should be considered potential target areas for TM attack for such political and propaganda reasons. TM-equipped nations may not need to own, or use large numbers of missiles to cause dramatic political change in a region because the mere threat or subsequent use of even a few weapons may be sufficient to achieve a regional goal. Despite the

similarities of weapon load the psychological impact of attack, or threat of attack, by TBMs tends to be greater than for attack by cruise missiles.

308. **Improvements in Technology.** A further problem particularly associated with the proliferation of TBMs is the impact of improved technology providing longer-range, increased accuracy and more lethal warheads (including chemical, biological, and possibly nuclear). Additionally, the future potential for the introduction and proliferation of penetration aids³ and multiple independently targeted re-entry vehicles cannot be discounted. The above improvements will pose an ever-more challenging and serious military threat, particularly in countering multiple re-entry vehicles with their own active defensive systems. Air, land, and sea-launched cruise missiles are likely to continue to proliferate and grow in sophistication over the coming years. These missile types are relatively inexpensive, of small physical size and have low electromagnetic signatures making them difficult to detect and, due to late detection, difficult to counter. Cruise missile firing platforms are generally more mobile and smaller than those for TBMs, making them more difficult to detect; they can be quickly brought into action and move rapidly after firing. Unlike TBMs, low-flying cruise missiles can be countered by Ground Based Air Defence assets, however improvements in cruise missile technology continues to exacerbate the threat.

SECTION III – PRINCIPLES AND CONDUCT OF THEATRE MISSILE DEFENCE OPERATIONS

Principles

309. **Integration.** TMD systems must integrate with the existing AD Command and Control (C2) architecture, and TMD should be an intrinsic part of any integrated strategic air defence operations.⁴ Strategic integration of TMD operations must combine deployed air defence and TBM defence capabilities within a JOA with wider global surveillance capabilities and TBM warning systems in order to provide the requisite level of operational support to the JTFC.

310. **Force Protection.** TMD is primarily a constituent of Strategic Air and Counter-air Operations, however Force Protection aspects must be taken into account guided by the following principles:

- a. **Measured Assessment of the Threat.** A threat assessment based on accurate and timely all-source intelligence must be conducted as the basis for selection of Force Protection measures for deployed forces.

³ Techniques and/or devices employed by the offensive aerospace weapon systems to increase the probability of penetrating enemy defences, (BMDO Glossary Ver 3.0 Jun97).

⁴ TMD is considered within the NATO Integrated Extended Air Defence System (NATINEADS).

- b. **Risk Management.** Force protection must be based on risk management, not risk elimination. A balance of risk is required within the context of the campaign end-state.
- c. **Joint and Multinational Concept.** Force Protection must embrace all components, including civilian support, within the Joint Operations Area (JOA) and address all aspects of the threat.
- d. **Priorities for Force Protection.** It is unlikely that the TMD capability will exist to protect all assets to the same degree. Priority should therefore be given to the defence of friendly Critical Capabilities.
- e. **Flexibility.** Force Protection policy and measures must be flexible and capable of responding to a rapidly changing threat. Availability of resources may limit flexibility.

311. **Prioritisation.** Operational circumstances will vary, however 2 main issues are likely to arise in assessing priorities for TMD operations within a JOA:

- a. Assets that are critical to defence must be protected, as must deploying/deployed forces.
- b. Population centres and other socio-economic assets that may become political targets must be defended when so directed.

Within the context of TMD, the above issues are often the main drivers in drawing up the Defended Asset Priorities List (DAPL). This document is agreed between the JTFC and other authorities, and in addition to any wider TMD considerations it takes into account the threat posed by TMs and the number of TMD assets and weapon stocks available. The DAPL will incorporate those TMD assets within the JOA as well as reinforcement forces that may become available.

Conduct of Theatre Missile Defence

312. **Elements of Theatre Missile Defence.** TMD is conducted using the 4 elements of Strategic Air Operations:⁵ passive defence, active defence (including Defensive Counter-Air), CCF operations (including Offensive Counter-Air) and Battle Management/C4I (BMC4I). The BMC4I architecture must be integrated with the deployed AD C4I system within the JOA. The growing TM threat is unlikely to be countered by a single technical solution due to the continuous advancement and proliferation of the associated technologies; this emerging threat can only be countered

⁵ Refer to AJP-3.3 'NATO Joint Air Space Operations Doctrine' and its UK Supplement, IJWP 3-30, for greater detail on Strategic Air Operations.

by co-ordinating and integrating all 4 of these operational elements together into the campaign plan.

313. **Passive Theatre Missile Defence Measures.** Passive TMD measures are those, other than the active destruction of TMs, achieved by defensive action. Many of these passive TMD measures may be implemented as part of the JTFC's overall Force Protection plan; they are outlined below.

a. **Warning.** The JTFC is responsible for establishing reporting systems within the JOA to disseminate available warning information to joint force components and, if directed, Host Nation (HN) elements. Component Commanders (CCs) are responsible for providing warning to their assigned forces which will trigger requisite passive defence actions.

b. **NBC Defence.** The JTFHQ will co-ordinate the structuring and operation of an NBC Warning and Reporting chain consistent with ATP 45(A); this will allow the reporting of NBC attacks by TMs and the rapid dissemination of hazard predictions. Where included in the deployed force, specialist NBC defence assets will be assigned for employment across the JOA on the basis of the assessed threat. Within the JTF, NBC defence, including that for TM-delivered weapons, should be based on the functional components listed in JWP 3-61, as follows:

- (1) Detection, Identification and Monitoring.
- (2) Warning and Reporting.
- (3) Physical Protection
- (4) Hazard management (Avoidance, Limitation of Spread, Decontamination and Exposure management).
- (5) Medical Countermeasures and Support.

c. **Information Operations.** UK responsibilities for Information Operations (Info Ops) will be directed by the JTFHQ, where appropriate, as part of a multinational campaign plan. This key activity must be related to protecting the integrity and capability of the force and the physical protection of HQs and communications assets. Specific measures (such as Electronic Warfare (EW), Operations Security (OPSEC) and Deception) within an Info Ops supporting plan will contribute towards passive TMD defence.

d. **Counter-Surveillance.** Effective counter-surveillance protects all force elements by making the locating and targeting of friendly forces, including TM

attack, more difficult for a potential aggressor. Counter-surveillance measures should be part of the TMD posture.

e. **Physical Protection.** The physical protection of the force has 3 aspects: structures (including field fortifications), equipment and the individual. Policy for the wearing of protective clothing, including delegation to local commands, should be issued by the JTFHQ.

314. **Active Theatre Missile Defence Measures.** The role of active TMD operations is to protect selected assets and forces from attack by destroying TMs in flight. Active TMD defence should follow the accepted Air Defence principle of centralised control and de-centralised execution and should, when possible, consist of defence in depth against all classes of TM, with the threat being engaged by all means available throughout the entire flight profile. Defence in depth provides multiple opportunities to counter TMs with differing capabilities, increases probability of kill, and prohibits the opponent from being able to counter a defensive system with a single technique. Active defence also includes those actions that mitigate the effectiveness of targeting and delivery systems through offensive EW conducted against remote or onboard guidance systems. CCF operations may also contribute to Active TMD (these can be considered analogous to Offensive Counter-air Operations, and would be planned as such). A TM launch observed and identified through national, strategic theatre, or tactical surveillance systems should immediately trigger the necessary active defence and CCF actions, supported by initiation of passive defence measures. The necessary command authority and Tactical Battle Management Functions (TBMF)⁶ must be delegated to the appropriate level to enable TM trajectory data to be passed in real-time to the relevant defensive systems.

315. **Countering Theatre Ballistic Missiles.** The flight envelope of a TBM can be considered in 3 stages, as follows:

a. **Boost Phase.** The boost phase immediately follows the launch of a TBM. Destruction of the missile during this phase of its trajectory is extremely difficult, as it requires real-time data exchange based on the point of launch that permits a Time Sensitive Targeting (TST) engagement to occur, however current kinetic warhead and target tracking technology is inadequate; advanced warhead technologies and real-time networking⁷ may provide an alternative solution. AD systems participating in active defence, both land and sea-based, should be provided with the means for real-time information exchange that allows for rapid assessment and engagement of TBMs at the earliest possible opportunity. However, political imperatives or geography may ultimately deny the opportunity to deploy TMD assets up-threat or in an

⁶ See Chapter 4 and Annex 4A.

⁷ For example, the US Co-operative Engagement Capability (CEC).

otherwise advantageous position to permit boost phase intercept. Remotely-generated warning is likely to be necessary to provide launch warning, launch point and time determination, threat type determination, impact point and time prediction, and cueing for eventual weapons system engagement. Obviously, an engagement early in the trajectory offers the greatest potential for eliminating problems associated with the type of warhead and the intended target, however early destruction of TMs may result in collateral damage through debris/warheads falling on neutral territory.

b. **Ascent and Mid-Course Phase.** Following a short but intense boost phase, a TBM enters a relatively long ascent and mid-course phase in the upper atmosphere, during which active defence systems are likely to receive warning and cueing information from external sensors and TMD C2 nodes. This information must be quickly refined to determine, based on established ROE, whether a TBM poses a threat that warrants engagement. Based on the predicted trajectory, TMD active defensive measures may be feasible, using the static and mobile active TMD capabilities available to the Air Defence Commander (ADC).

c. **Terminal Phase.** During the terminal phase, an incoming missile's trajectory descends through the lower atmosphere towards the targeted aiming point. Active engagement may be possible by TMD-capable Surface-to-Air missiles (SAM), however this may be hindered by the use of decoys.

316. **Countering Cruise Missiles.** The following considerations should be applied when countering cruise missiles:

a. **Trajectory.** Cruise missiles present a different challenge to TBMs. Cruise missiles can be air, land, or sea-launched, ranging from high-level supersonic to low-level subsonic profiles. TBMs tend to follow a predictable ballistic trajectory, and are less accurate. However, cruise missiles may adopt an unpredictable flight path that makes it difficult to determine point of launch or to predict their impact point, and their accuracy is far superior. The mobility of cruise missile launch platforms, the small launch signature of the missiles, and their small radar cross-section also complicate TMD operations. Stealth technologies can be incorporated into cruise missiles, making them an even more challenging target.

b. **Deployment of Assets.** The ability to destroy missiles in flight should be coupled with dynamic and responsive deployment of active defence systems to prevent the opponent from knowing what is defended. This redeployment capability assures responsiveness to changing theatre priorities and flexible protection of the force. Due to resource limitations, active defence operations may need to be prioritised for defence of important or critical assets, with some

risk being accepted should the opponent attack lower-priority assets that are not directly defended.

317. **Conventional Counter-force Operations.** CCF operations against TMs are characterised by offensive actions intended to destroy and disrupt TM capabilities before launch. They are not DCA or AD operations but like OCA contribute to the defence of the joint force. The objective of CCF operations is therefore to prevent the launch of TMs by attacking each element of the overall system, including such actions as destroying launch platforms, ISTAR platforms, C2 nodes, and missile stocks and infrastructure. CCF operations also strive to deny or disrupt employment of additional TMs that may be available to the opponent. Systems used for CCF operations may include rotary and fixed-wing aircraft, surface-to-surface fires, naval land attack missiles and Special Forces (SF). CCF operations are highly dependent upon predictive and developed intelligence and the BMC4I capability should permit real-time targeting and attack. SF may play a significant role in CCF operations.

318. **Counter-force Measures.** CCF operations are reliant upon a comprehensive Intelligence, Surveillance and Reconnaissance (ISR) system, a responsive sensor management and real-time data exchange network, and weapon systems capable of attacking targets, often at long range, as soon as adequate targeting information is available. Time Sensitive Targeting is a crucial element in CCF operations, particularly against mobile TM launchers and support facilities. Effective TST is dependent upon comprehensive operational intelligence and an element of prediction in the battlespace so that ROE can be formulated and engagement authority delegated before TST action is taken. The following factors will need to be considered:

- a. **Detection.** Detection requires rapid identification of pre-launch and post-launch TM signatures and the accurate location of the launch system. To support CCF operations in all environments, diminish the effects of opponent countermeasures, and capitalise on distinctive signatures of TM equipment and operations, the surveillance capability should, where possible, be multi-spectral and should integrate national-level intelligence and other externally furnished information with theatre-level surveillance. Space, air, sea, and ground-based surveillance and reconnaissance sensors may all be required.
- b. **Acquisition and Tracking.** Acquisition and tracking systems receive cueing from wide-area and local surveillance systems and warning data from other intelligence sources. Acquisition supports target identification and discrimination and timely target engagement by accurately locating and monitoring targets and transmitting information relative to target movement.
- c. **Identification.** Identification of TM launch platforms and supporting nodes requires maintenance of data on target movement, determination of the

type of TM system employed, and discrimination of the launch and support systems from decoys.

SECTION IV – DUTIES AND RESPONSIBILITIES FOR THEATRE MISSILE DEFENCE

319. **Joint Task Force Commander.** The JTFC establishes guidance and objectives for TMD within the JOA, and is responsible for assigning forces and delegating responsibilities for the conduct of TMD.⁸ The JTFC is responsible for ensuring that TMD plans and operations of subordinate forces are integrated at theatre level and documented in the appropriate operation plans. The JTFC guidance may include, but is not limited to:

- a. Priorities for joint/combined planning of TMD.
- b. The identification of what types of targets are most important for CCF operations and what assets must be protected by active defence.
- c. Guidelines for the use of active TMD systems, including disposition of components, co-ordination of TMD within the overall ADC plan and the policy for allocation of assets with multiple responsibilities.
- d. The response to a TM threat. For example, changes to deployment and policy on NBC defence.
- e. Apportionment of TMD assets.
- f. Specific Component co-ordination required to facilitate deconfliction and timely TMD operations.
- g. A statement of the role of the JTFC's staff in co-ordinating theatre-wide TMD activities.
- h. Specific ROE for TMD operations.

320. **Concept of Operations for Theatre Missile Defence.** The JTFC may draw up a TMD CONOPS which, once developed, specifies the objectives to be met and provides guidance for the employment of BMC4I, CCF operations, active and passive defence measures. The CONOPS should include, but not be limited to, the following TMD considerations:

- a. Specific joint force offensive or defensive objectives, or both.

⁸ These aspects will normally fall under the Air Defence Commander.

- b. Specific joint force guidance and objectives for TMD operations, to include: prioritisation of forces, critical assets, and areas of vital interest or political importance that should be protected with limited TMD resources – e.g. the DAPL.
- c. Requirements to develop, co-ordinate and deconflict plans to meet TMD objectives.
- d. Guidance for planning, employing, and allocating resources for TMD operations.
- e. Guidance for co-ordinating with allies and/or civilian authorities in preparing plans for TMD operations.
- f. Specific TMD aspects for consideration at the Joint Co-ordination Board.

321. **Planning Staff Responsibilities.** Responsibilities of the JTFHQ and component staffs for TMD operations normally encompass the following:

a. **J2 – Joint Intelligence Staff and Operational Intelligence Support Group**

- (1) Maintenance of a JOA-wide, all-source intelligence collection, analysis, production, and distribution programme on the TM threat.
- (2) Carrying out prioritised ISR requirements in concert with and as established by the J3 staff.
- (3) Generating or validating intelligence collection requirements on TMD targets that cannot be accomplished by JTFC resources through the supporting Joint Intelligence Centre.
- (4) Providing assigned and supporting TMD forces with targeting information.
- (5) Developing and executing, in conjunction with J3 and J6, plans for disseminating intelligence-derived launch warning information to all components, allies, and, if directed, civil authorities.

b. **J3 – Joint Operations Staff**

- (1) Establishing and prioritising JTFC-approved TM targeting guidance and objectives with input from, and in co-ordination with, the CCs.

- (2) Maintaining co-ordination with component staffs to ensure compliance with JTFC guidance and objectives for TMD operations.
- (3) Assisting J2 in developing TMD priority intelligence requirements.
- (4) Monitoring the quantity, operational status, and location of active missile defence and CCF operational assets for TMD operations.
- (5) Ensuring the development of plans to disseminate launch warning or information from sensor or data sources in co-ordination with the ADC, J2 and J6.
- (6) Establishing and maintaining, in co-ordination with the J2 and J6, real-time C4I for co-ordinating TMD operations and maintaining a data base of TMD operations.

c. **J5 – Joint Planning Staff**

- (1) Evaluating the ADC's and component plans for TMD operations.
- (2) Planning for required assets necessary to support TMD operations.
- (3) Assisting HN or Allied government officials, in conjunction with the J3 and political adviser, in planning for politico-military responsibilities.
- (4) Developing the DAPL. Co-ordinating this list with J3 before approval by the JTFC.

d. **J6 – Joint Communication and Information Systems Staff**

- (1) In co-ordination with J2 and the TDL Co-ordinating Authority (TDLCA), ensuring that real-time information exchange for TMD is integrated into the overall theatre or JOA-wide C4I network.
- (2) Providing, through the Chief Joint Force CIS,⁹ the necessary strategic CIS support for TMD operations.

e. **Component Commanders**

- (1) CCs are generally responsible for providing warning to assigned and attached forces in areas vulnerable to attack within their Areas of

⁹ Refer to JWP 6-00 '*CIS Support to Joint Operations*', Chapter 6, for details on the roles and responsibilities of the ChJFCIS.

Operation. Where CCs have control of integral, TMD-capable ground or sea-based SAM systems, their employment to counter the TM threat, other than purely for self-defence, must be considered when developing defensive plans and posture.

(2) Rapid component-to-component co-ordination and real-time information exchange will be required in most situations as a result of the compressed time lines and short reaction times inherent in TMD operations.

(3) The JTFC will normally assign responsibility for the planning and execution of TMD CCF operations within the JOA to the CC with the most capable assets and the means of controlling them.

f. **Air Defence Commander**

(1) The JTFC will normally assign operational responsibility for AD to an ADC (normally the JFACC). Authority to co-ordinate the integration of AD forces in adjoining national command areas will normally be delegated to the ADC. AD operations should also be co-ordinated with other tactical operations; it should be borne in mind that some TMD assets may remain under the TACOM of the Land CC, in particular where these are organic to army component elements.¹⁰ Specific TMD responsibilities for the ADC include:

(2) Developing a database of friendly active defence capabilities to facilitate planning the defence of prioritised assets.

(3) Developing, on behalf of the JTFC, and executing plans for dissemination of launch warning information to all components, allies, and, if directed, HN civil authorities.¹¹

(4) Developing and executing detailed plans, including weapon control procedures and measures, to disseminate launch warning and cue information by the fastest means available to components and active defence forces for engaging incoming TMs by the fastest means available.

(5) Developing and executing plans for TMD active defence operations and ensuring that they are included in the annexes for all relevant Operations Plans.

¹⁰ The US appoints a Theatre Army Air Defence Coordinator to conduct TMD functions utilising SAM assets on behalf of the JTFC (e.g. Patriot). He acts as the Deputy Area Air Defence Commander. He would co-ordinate TMD functions by appointing liaison officers to the other CCs HQs.

¹¹ This function may be conducted within the JTFC's HQ.

322. **Multinational Operations.** TMD operations may be required within an Alliance or coalition arrangement. Within this context, the JTFC must consider those areas peculiar to multinational operations such as force capabilities and disparities, information and equipment security levels, and procedural and organisational differences that may influence the ability to achieve the required level of combined unity of effort towards TMD. Respective commanders will need to identify the requirements and implications of allied and multinational operations, organise their forces, train to achieve force effectiveness, and conduct multinational operations as necessary. The following factors may need to be considered:

- a. Consensus on the priorities for dealing with a TM threat, a clearly defined chain of command, and a responsive, interoperable C2 structure are crucial to successful multinational TMD operations.
- b. When individual national forces of the coalition are not uniformly capable of actively defending against TMs or attacking an adversary's missile capabilities, provision should be made to ensure that TMD assets are apportioned for missile defence throughout the JOA in accordance with the JTFC established priorities.
- c. C4I systems should be sufficiently interoperable to respond to the needs of the multinational organisation. Information critical to TMD needs should be identified and systems established to speed the flow of critical information throughout the multinational chain of command.
- d. Intelligence requirements in support of TMD operations should be determined and prioritised in order to plan the targeting efforts and to allocate appropriate resources. Forces that are part of multinational commands will normally be supported by national intelligence systems to augment their organic intelligence systems. These should, where possible, be integrated to ensure responsiveness to operational needs and to prevent duplication of effort.
- e. An agreed set of ROE for multinational TMD operations should be developed and disseminated.

SECTION V – PLANNING CONSIDERATIONS

323. Successful TMD operations are highly dependent on the simultaneous and/or sequential execution of a wide spectrum of tasks and activities, some of which need to begin well in advance of a tasked TMD operation. All such activities must be integrated with other Counter-air and Strategic Air Operations planning, and be fully incorporated in the Joint Air Operations Plan (JAOP) and Air Operations Directive (AOD). Significant aspects of this planning are as follows.

324. **Intelligence Preparation of the Battlespace.** Analysis and target development of TM threats should be undertaken as an ongoing activity, not solely in response to an operational threat. Long-term Intelligence Preparation of the Battlespace (IPB) should drive the development of a tailored TMD intelligence collection plan, which in turn will permit development and refinement of a database on threat TM capabilities. Of particular significance is likely to be the availability of space-based sensor information.

325. **Early Deployment of Theatre Missile Defence Assets.** An early assessment of the likely TMD threat within a JOA will permit the JTFC to prioritise the strategic airlift requirement for transporting TMD assets into theatre before the arrival of main force elements. Ground-based TMD systems can be transported quickly by air into a theatre, but this might place an additional burden on the total airlift capacity. The JTFC must balance the risk of TM attack against the cost associated with diverting airlift assets for the immediate deployment of TMD forces; this consideration may be eased by the availability of a sea-based TMD capability.

326. **Environmental Considerations.** Within a theatre of operations, geographic features and ambient meteorological conditions relative to the threat will affect the balance of effort required to conduct TMD operations. The nature of the terrain will influence the employment and siting of TMD systems and the climate may also be a factor affecting the conduct of CCF operations, and must also be taken into consideration in determining the Force Protection posture. The environmental conditions may have a pronounced effect on the maximum effective range and trajectory for different launch angles of ballistic missiles, and must also be taken into account in determining the collateral damage that may be caused by falling missile debris.

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CHAPTER 4 – JOINT AIR DEFENCE COMMAND, CONTROL AND CO-ORDINATION

SECTION I – JOINT TASK FORCE HEADQUARTERS

401. **Joint Task Force Commander.** The command and control (C2) arrangements for air operations within the NATO Integrated Extended Air Defence System (NATINEADS) or Combined Joint Task Force (CJTF) structure are described in AJP-3.3 '*NATO Joint Air and Space Operations Doctrine*'.¹ This chapter discusses C2 of Air Defence (AD) operations by UK forces in an expeditionary, or NATO Out of Area (OOA) context. For UK Joint Rapid Reaction Force operations, a Joint Task Force Commander (JTFC) will be appointed who translates the Joint Commander's (Jt Comd) Mission Directive into a campaign plan and then directs subsequent operations. The JTFC has OPCON of the Joint Task Force (JTF)² and is responsible for AD within his Joint Operations Area (JOA). In the case of a small-scale, essentially benign operation, the JTFC may elect to exercise those responsibilities directly through his JTFHQ staff in concert with his component commanders. However, for the majority of operations, force elements will be grouped under one or more Component Commanders (CC) to whom the JTFC will normally delegate Tactical Command (TACOM).

402. **Joint Force Air Component Commander.**³ When the scale of air involvement in an operation demands, the JTFC will normally designate a Joint Force Air Component Commander (JFACC). The JFACC will usually be the service CC who has the preponderance of air assets under his command, and the ability to task and co-ordinate joint air operations. His responsibilities include, but are not limited to, the planning, co-ordinating, allocating and tasking of joint air operations based on the JTFC's campaign plan. Whichever method he chooses to exercise command, the JTFC will usually vest authority for AD operations in the Joint Force Air Component Commander (JFACC), who will also assume the responsibility of Air Defence Commander (ADC) for the JOA.

403. **Air Defence Commander.** The JFACC will have primary responsibility for all aspects of the planning and conduct of AD operations. In this respect he acts as ADC, however detailed management and co-ordination of joint AD activities will be undertaken on his behalf by the Senior AD Officer (SADO) in the AD Operations

¹ The doctrine in AJP-3.3 is largely derived from Bi-SC Directive 80-80 (2nd Edition), however this will require amendment in compliance with the recently-revised NATO C2 structure and development of Extended Air Defence (EAD) and expeditionary air operations doctrine.

² Detailed responsibilities of the JTFC are contained in JWP 0-10 '*UKOPSDOC*' and JWP 3-00 '*Joint Operations*'.

³ Refer to AJP-3.3.7 '*Combined Joint Force Air Component Commander Doctrine*' and the UKJFACHQ CONOPS document for greater detail.

Centre (ADOC) embedded in the Joint Air Operations Centre (JAOC). The ADC's responsibilities are detailed at Annex 4A, however these broadly entail:

- a. Integration or co-ordination of the AD assets of each force component into a joint AD system. This could include the co-ordination of the joint plan with Host Nation (HN) AD systems and the exchange of information necessary to support TMD or civil defence.
- b. Application of the principles of AD to counter the opponent's activity within the constraints of Rules of Engagement (ROE) authorised by higher authority.
- c. Acting as the Airspace Control Authority (ACA) to ensure that the airspace control plan best supports AD operations.
- d. Adoption and promulgation of common procedures for air battle management, tactical data link operations and reduction of mutual interference across all environments.
- e. Integration and co-ordination of AD assets into wider Counter-Air, Strategic Air and Combat Support Air Operations activities.

404. Tactical Battle Management Functions. Two guiding principles of air operations doctrine are especially pertinent to AD: centralised control with decentralised execution, and control by veto. To enable the ADC to apply these principles and be able to dynamically and rapidly delegate, re-delegate or re-assume specific aspects of his control authority, a pre-determined system should be put in place that is understood and implemented by all AD elements, which provides AD commanders with the flexibility to conduct AD tasks at the optimum level, and at an appropriate tempo. Air forces implement such a system by means of promulgated ADC Responsibilities and delegated Tactical Battle Management Functions (TBMF), and maritime forces implement an equivalent system under maritime Composite Warfare Commander (CWC) functions.⁴ TBMF functions may cover all aspects of air battle management, but they are particularly relevant to AD operations, Air Surveillance and Control (ASACS) and airspace control. The degree of TBMF/CWC functions delegation will depend on the nature and complexity of the operation. Such delegations may be restricted in terms of unit, area or time however, to ensure coherent implementation, a joint 'delegation matrix' should be drawn up by the ADC

⁴ Whilst these are complementary procedures, each has been developed, and implemented, separately within the NATO maritime and air doctrine working groups. TBMFs are focused on AD operations, whereas CWC functions cover all maritime warfare areas. However, a proposal has been submitted to NATO for development of a joint STANAG to provide a 'master list' of such environmental duties and responsibilities to assist inter-component co-ordination.

which can be modified as circumstances dictate.⁵ TBMF and CWC functions, and their linkages, are shown at Annexes 4A and 4B respectively.

405. **Airspace Control Authority.** The JTFC will appoint an ACA.⁶ The broad responsibilities of the ACA include implementing and co-ordinating Airspace Control Means (ACM) within the JOA; in all but exceptional circumstances, the JTFC will combine the responsibilities of ADC and ACA in the JFACC. The ACA will develop and implement procedures for airspace control within the JOA in an Airspace Control Plan (ACP). Through this ACP, the ACA is charged with establishing an Airspace Control System (ACS) that is responsive to the needs of the JTFC and his CCs, providing integration with that of the HN (where applicable), and for co-ordinating and deconflicting user airspace requirements.

406. **Unity of Responsibilities.** The interrelationship of the ACA's and ADC's responsibilities is such that they should normally be assigned to one individual. The JFACC - if one is appointed - would normally be vested with these responsibilities. However, this will be dependent on the scale and conduct of operations, available facilities and the expertise of individuals concerned. Whether or not the functions and responsibilities of the JFACC, ACA and ADC are vested in a single commander, the functions of developing, co-ordinating and publishing airspace control procedures, and the integration of all AD assets, must be centrally harmonised and focused to produce complementary airspace control and air defence plans.

407. **Air Defence Commander Headquarters.** The ADC will generally require access to a headquarters, staff element and appropriate CIS by which to exercise his control. If the JFACC is appointed as the ADC, he would usually exercise that authority through the Joint Air Operations Centre (JAOC) element of the JFACHQ.⁷ The JAOC AD Cell within Combat Operations will act as an AD Operations Centre (ADOC) under a duty Senior AD Officer (SADO), directed by Chief, Combat Operations.⁸ Wherever possible, the JFACHQ will be collocated with the JTFHQ and have the JAOC embedded within it.

408. **Joint Air Defence Staff and Component Liaison.**⁹ To ensure that the JTFC's AD objectives are met within the overall air operations plan, and environmental CCs

⁵ Methods vary for providing this important level of Operational Direction based on a joint 'delegation matrix'. Maritime forces use the Maritime Tactical Messaging System (OPGEN and OPTASK messages), which RAF AD/ASACS forces are familiar with, however in general air forces otherwise use a variety of written orders. Land forces also predominantly use written Fragmentary Orders.

⁶ The detailed responsibilities of the ACA are contained in ATP-40C/AJP-3.3.5.

⁷ Refer to IJWP 3-30 '*Joint Air Operations*', Chapter 3, for full details of the UK JFACHQ structure. The JAOC has the same function as a NATO CAOC.

⁸ There may be circumstances where a MAOC could support an equivalent organisation for a JFACHQ afloat or when MCC is appointed as JFACC.

⁹ Refer to IJWP 3-30, Chapter 3, for fuller details of component liaison elements and integration of component air activities with the JFACHQ.

have an appropriate and robust level of 2-way specialist AD advice and component liaison, a component liaison structure is established within the JFAC and CC HQs:

a. **Joint Force Air Component Headquarters/Joint Air Operations Centre.** The staff of the Maritime Component Commander's (MCC's) Maritime Co-ordination Element (Air) (MCE(A)) and the Land Component Commander's (LCC's) Battlefield Co-ordination Detachment (Air) (BCD(A)) are collocated with the JAOC. Working within the JAOC, but responsible to their respective CC, they facilitate the most effective co-ordination and integration of all AD capabilities by providing expert advice, monitoring effectiveness, and, if necessary, recommending changes to the way in which component capabilities are employed. The number of liaison staff required is scaleable and would depend on the intensity and type of operation, and the number of AD assets available. At one extreme, with few AD assets involved (e.g. in limited air policing operations), the liaison, plans and operations functions might be adequately covered by just one or 2 personnel. However, for intense AD combat operations there may be a requirement for 24-hr coverage by MCE and/or BCD AD specialists in both the Combat Operations and Combat Plans cells of the JAOC. Furthermore, the MCC's and LCC's senior liaison officers within the JFACHQ would have direct access to the ADC to represent their respective CC's joint AD requirements.

b. **Air Operations Co-ordination Centres.** Subordinate to the JAOC would be the Air Operations Co-ordination Centres (Maritime) and (Land) (AOCC(M) & (L)), collocated with the headquarters of the MCC and LCC respectively. The AOCC staffs provide air expertise to those CC HQs and should be responsive to the requirements of their host CC with respect to the development of joint AD plans, procedures, and the air assignment process. Within the context of AD operations, they will be primarily responsible for:

- (1) Overall co-ordination of AD planning between the respective CC HQ and the JFACHQ/JAOC. If the JFACC is not the ACA then a further line of co-ordination will be necessary.
- (2) Processing requests for non-organic AD assets on behalf of the respective CC.
- (3) Providing the essential two-way liaison between the respective CC and the JAOC.

SECTION II – SECTOR AND LOCAL AIR DEFENCE

409. **Sector Air Defence.** The ADC retains ultimate responsibility for the conduct of AD throughout the JOA. However, if the overall AD area,¹⁰ based on the JOA, to be defended is large and the intensity of operations is likely to be high, a number of defensive geographic AD sectors can be established, each under the control of a Sector AD Commander (SADC) who reports to the ADC. A SADC will be subject to the overriding authority of the ADC, but could otherwise be vested with some of the responsibilities of the ADC necessary for the conduct of AD operations within his allocated Sector. This consideration might be particularly relevant for relatively large or significant portions of airspace or for predominantly maritime airspace allocated to the MCC. Ideally, such AD Sectors should be geographically aligned with all or part of a CC's Area of Operations (AO); however, as such, SADC responsibilities could only be assigned directly to a CC if that commander had the facilities to control and co-ordinate the necessary AD activities within his AO. Subject to the ADC's delegation of TBMFs, SADCs may have the following responsibilities within their AOs:

a. **Direction Functions.**

- (1) Designating Local AD Commanders (LADCs).¹¹
- (2) Assigning AD aircraft to appropriate units for control.
- (3) Initiating action against an air threat, if no action has been initiated by higher authority or other units in his Sector.
- (4) Exercising control by veto over all AD actions initiated by other units in his Sector.
- (5) Exercising control of tactical data link operations, and acting as Identification Authority for any Track Production Area(s), within his Sector.

b. **Co-ordination and Weapon Control Functions.**

- (1) Resolving with the ADC/other SADCs problems of co-ordination on or near the boundaries between Sectors, to ensure the efficient change of reporting responsibility and to avoid mutual interference.

¹⁰ A specifically defined airspace for which AD must be planned and provided (AAP-6).

¹¹ In this context, LADC equates to a maritime Local AAW Co-ordinator (LAAWC).

(2) Co-ordinating the effective employment of all allocated and tasked AD weapon systems within his Sector.¹²

c. **Communication and Information Systems and Tactical Datalink Control Functions.** Controlling the AD voice and data communications nets within his Sector.

d. **Additional Duties.**

(1) Requesting the appropriate AD forces to meet the perceived threat/task in the Sector.

(2) Keeping his superior ADC informed of evaluated threats, and of the location of friendly/neutral aircraft that could be mistaken as hostile.

(3) Issuing SITREPS and air threat warnings for the benefit of the units in his Sector.

(4) At an early stage, detailing common geographical reference boundaries for land/maritime and air operations within his Sector, especially concerning safety sectors and arcs of manoeuvre.

410. **Local Air Defence Commander.** When a number of AD-capable units are within close proximity, a LADC may be designated for that locality. Similarly, a LADC may be established for a specific location such as a Deployment Operating Base (DOB). LADCs will have the following functions:

a. **Direction Functions.**

(1) Delegating, as appropriate, specified functions to local units.

(2) Establishing air watch zones for local units.

(3) Broadcasting the air picture to local units on a local AD co-ordination net.

b. **Co-ordination Functions.**

(1) Correlating and evaluating reports from local units and, where appropriate, relaying this information to his superior ADC on the relevant AD co-ordination net.

¹² For example, where the ADC is unable to directly co-ordinate or control weapons employment in an adjoining maritime AD Sector, a Co-ordinated AD Area (CADA) may be established within which the maritime Sector AAWC, or Supporting Arms Co-ordinating Centre (SACC) in amphibious operations, may be given appropriate responsibility for the co-ordination and control of weapon engagements.

(2) Issuing local AD threat warnings. If the local threat warrants a higher warning than that in effect beyond his allocated area, the LADC is to keep his superior ADC informed.

(3) Passing pertinent information to assigned units regarding weapon engagement zones, weapon control orders and safety sectors, and targets which have been designated to sector/force AD weapon systems.

c. **Control Function.** Controlling the local AD co-ordination net.

411. **Individual Unit Responsibilities.** The following individual responsibilities always apply:

a. **Self-Defence.** Each commander is responsible for the self-defence of his unit. When his unit is under direct attack, qualifying orders, directives or plans from higher authority must not deny him the right of self-defence.

b. **Degree of Readiness.** Each unit commander is responsible for establishing an appropriate degree of AD readiness within his unit. The degree of readiness he sets must not be lower, but may be higher, than that ordered by his superior AD commander.

c. **Reporting.** Subject to any restrictions imposed by the EMCON plan, each unit is responsible for reporting promptly to the appropriate AD commander or co-ordinator all AD information which may be of wider interest, including any deficiencies of equipment.

d. **Initiation of Air Defence Measures.** Each unit is responsible for initiating AD measures without delay, whenever available information indicates the necessity of such action.

Air Defence Command and Control Structure

412. **Joint Task Force.** Figure 4.1 illustrates an example of a typical JTF AD C2 structure. The AD structure adopted should adhere to the overall air C2 structure implemented within the JOA under the JFACHQ and, where appropriate, apply any Sector and Local AD division and/or levels of control in a flexible rather than a rigid manner. For instance, the LADC for a geographically-isolated or autonomous element may report directly to, and be tasked by, a SADC. Alternatively, a SADC might have no need to consider delegation of duties to a LADC in a specific Sector where the communications and degree of situational awareness are good. In view of the potential speed and ubiquity of AD operations in a three-dimensional area, the AD control and supporting CIS structure should enable the rapid passage of information and orders; this will generally require the control structure to be as 'flat' as practicable.

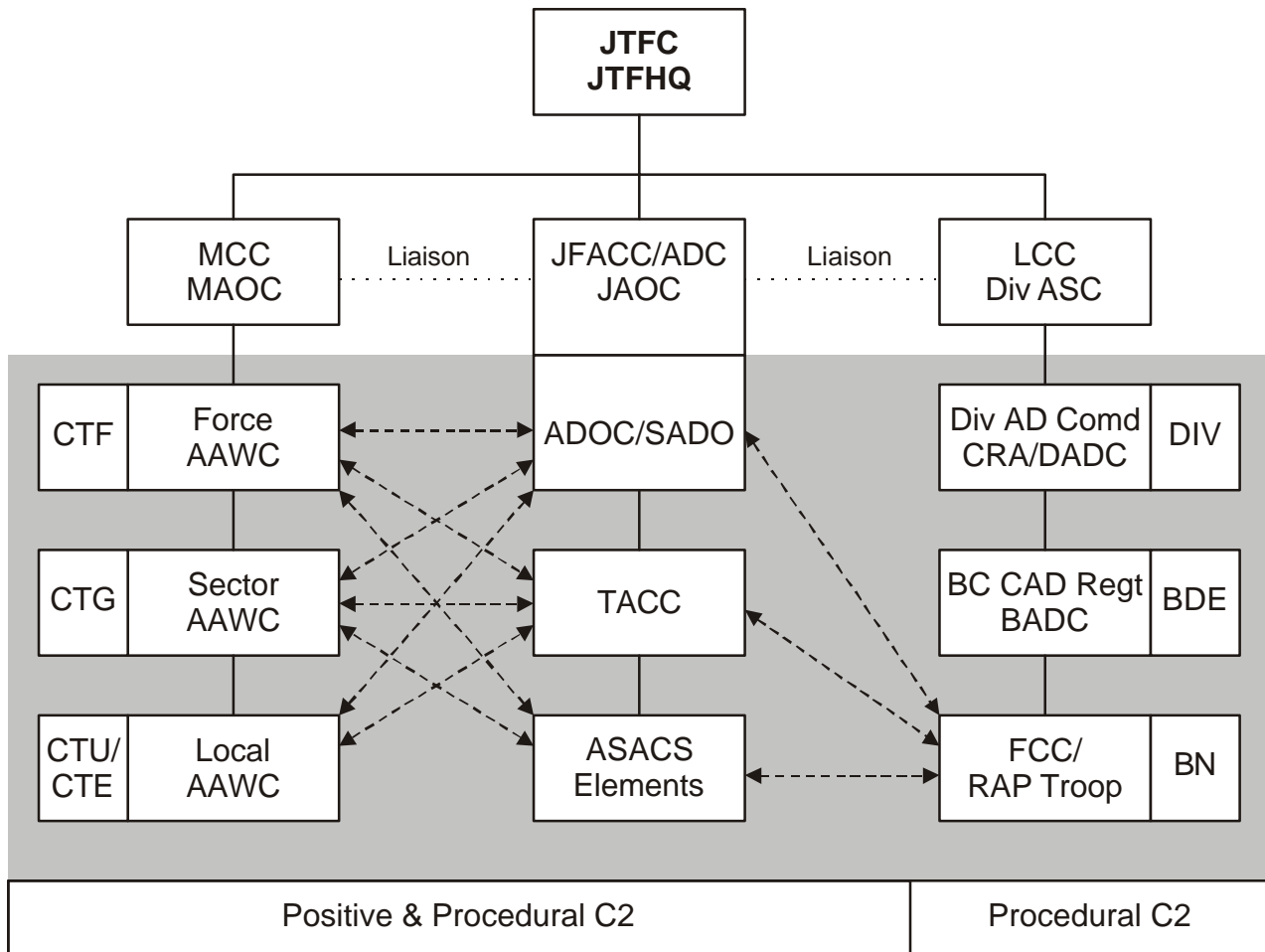


Figure 4.1 - Exemplar Joint Task Force Air Defence Command and Control Structure

413. **Level of Air Defence Control Authority.** By virtue of their traditionally similar approaches to delegation of TACON authority through TBMF and CWC functions, and widespread access to a real-time RAP and air battle management network, maritime and air AD forces inherently use a mix of positive and procedural methods for the conduct of AD operations at all levels. Conversely, land forces largely adopt procedural methods for AD. However, the ongoing digitisation of land operations, for example the introduction of the RAP Troop, and fuller integration of joint GBAD assets into a JTF will allow land-based AD elements to increasingly adopt

a more positive control posture that matches the functions performed at the level of Sector and Local AD Commander.¹³

SECTION III – SECTOR AND LOCAL AIR DEFENCE RESPONSIBILITIES WITHIN COMPONENTS

414. This Section covers the AD C2 elements within components, and briefly describes how each integrates into the overall JTF structure at Sector and Local level. To understand how these elements integrate with NATO and US AD forces, a table showing the approximate functional equivalence of each is at Annex 4C. Assignment of component AD assets for particular operations will be in accordance with the JTFC's apportionment decisions, and specific control authority and responsibilities will be determined by the ADC's preferred C2 structure and delegation of TBMFs.

Maritime Component

415. **Command and Control of Anti-Air Warfare.** RN aircraft carriers and Type 42 destroyers offer an AD C2 capability which includes: AD/AAW co-ordination facilities and specialist personnel; long-range air warning radar and a supporting EW suite; aircraft control facilities including fighter controllers and comprehensive CIS and data link facilities for exchange of information with other AD ships, AWACS aircraft and the land-based ASACS. The maritime AAW Commander (AAWC) would always reside in one of these units. Due to limited space and facilities, only an aircraft carrier is likely to have the capacity to embark JFACHQ elements and therefore host the ADC and his staff, however both types of ship could operate as a maritime SADC. In functional terms, maritime component ADC, Sector and Local AD duties are carried out as follows:

- a. **Air Defence Commander.** If circumstances required, the MCC could act as ADC, advised by the Force AAWC (FAAWC).
- b. **Sector Air Defence Commander.** MCC, or more likely Sector AAW duties delegated to the FAAWC.
- c. **Local Air Defence Commander.** SAAWC, or more likely delegated to appropriate Local AAWC.

416. **Airborne Early Warning.** Most maritime AEW aircraft, including the SKASaC Mk 7, have a limited aircraft control capability, and in certain circumstances could act as an LADC/LAAWC.

¹³ Refer to JWP 3-63.1 'Ground Based Air Defence'.

Land Component

417. **Headquarters 7th Air Defence Brigade.** Headquarters 7th Air Defence Brigade (7 AD Bde HQ) is the highest level GBAD formation HQ in the British Army. It is primarily configured to command British, and other NATO nations' assigned GBAD units subordinate to HQ Allied Command Operations (ACO) Rapid Reaction Corps (HQ ARRC). As such it is established as an element of the ARRC and works in close conjunction with the HQ ARRC Air Branch and the ARRC-affiliated AOCC (L), both of which are responsible for the overall co-ordination and planning of ARRC AD operations and airspace control. HQ 7 AD Bde is also capable of commanding GBAD units in a national role.

418. **Divisional Air Defence Cell.** At divisional HQ level for a deployed UK land force, the Commanding Officer of the organic Close AD (CAD) regiment becomes the Divisional AD Commander (Div AD Comd) who heads the Divisional AD Cell (Div AD Cell) within the Divisional HQ. The Div AD Comd is responsible to the Commander Royal Artillery (CRA) for:

- a. Providing advice to CRA and the LCC staff on air and aviation operations.
- b. Commanding all AD assets assigned to the Division.
- c. Tactical employment and tasking of Divisional AD assets.
- d. Airspace management, including dissemination of the Airspace Control Order.

419. **Formation Air Defence Cell.** When required, the Army Rapier regiment may provide SHORAD support to a particular formation, such as a Forward or Rear element of a Combat Service Support Group (CSSG) or a particular Brigade. In this case the Rapier regiment will provide a Formation AD Cell (FADC) which may work in close co-operation with the formation air and aviation cells.

420. **Brigade Air Defence Cell.** Within each Brigade HQ of the deployed formation, the Battery Commander (BC) of the CAD Battery affiliated to that brigade heads the Brigade AD Cell (BADC), supported by the CAD Battery HQ staff. The BADC provides AD advice within the Brigade HQ and has TACOM of all AD assets assigned to the Brigade. The BC and his BADC work in conjunction with the Brigade aviation and Air Liaison Officers. A number of GBAD Fire Control Centres (FCCs) may fall under each BADC.

421. **Recognised Air Picture Troop.** Hitherto, other than the Autonomous Link 11 System (ALES) deployed by 3 Cdo Bde RM, land forces¹⁴ have not had access to a RAP derived from a real-time tactical data link, therefore UK GBAD has until recently relied on autonomous Fire Unit (FU) sensors for limited early warning and situational awareness. Weapon direction is achieved by comparatively over-restrictive procedural control means. This has severely constrained weapon capabilities, especially since a lack of external identification information has necessitated visual techniques. However, the RAP Troop capability now provides GBAD assets with much-improved situational awareness through access to ALES or a vehicle-mounted Link 16 picture at GBAD control nodes,¹⁵ which can then be transmitted onward to subsidiary GBAD elements. The RAP Troop, a joint capability within 7 AD Bde administered by 16 Regt RA, is manned by Royal Artillery and RAF personnel. The RAP Troop is the forerunner to further GBAD BMC4I improvements within the GBAD Phase 1 programme.

422. **Land Component Command and Control of Air Defence.** In functional terms, land component Sector or Local AD Commander duties are carried out as follows:

- a. **Sector Air Defence Commander.** Commander Royal Artillery (CRA) (on behalf of JFLCC), or delegated to Div AD Comd/DADC.¹⁶
- b. **Local Air Defence Commander.** BADC,¹⁶ or delegated to appropriate FCC or Rapier/HVM control node.¹⁷

Air Component

423. **Tactical Air Command and Control Centre.** The TACC is the primary UK deployable tactical AD C2 element in the land-based ASACS organisation. It comprises the Aircraft Control Centre, Recognised Air Picture Production Centre and Sensor Fusion Post (ARS). No 1 ACC provides the TACC and is responsible to the ADC, through the SADO, for the real-time and near real-time execution of AD by the ARS and acts as the fusion centre for the RAP that it generates. 1 ACC can act as a Control and Reporting Centre (CRC) and normally has TACON of assigned AD aircraft (both AEW and fighters) and LR/MRSAM, and co-ordinates AD functional control of SHORAD within its AD Operations Area. It can also provide a very limited

¹⁴ Not just land component elements, but all forces likely to be operating in the land environment.

¹⁵ This picture is most likely to be available at an FCC or Battery Command Post (BCP – army) or Squadron Command Post (SCP – RAF), but may also be deployed at a BADC or other HQ element if necessary (subject to the RAP Troop deployment plan). On receipt, the Link 16 picture can be transmitted onward via the Distributed Situational Awareness Picture (DSAP) to subsidiary GBAD elements.

¹⁶ Until full implementation of the land digitisation programme is achieved, and relevant expertise is integral to these elements, procedural limitations in the execution of these functions will persist.

¹⁷ Army (and RAF) GBAD elements have no integral aircraft control capability, but with the advent of the RAP Troop a limited reporting capability is possible.

alternate facility for the JAOC. The TACC also provides an airspace control facility for the ACA.

424. **Airborne Warning and Control System.** The UK E-3D has the capability to carry an Airborne Command Element (ACE). The ACE role can hold a command function up to SADC level, for a limited period, during contingency operations where no land-based or maritime C2 facility is available. The E-3D also has a considerable capability as an Aircraft Control Unit (ACU), and would expect to be allocated TACON of fighter assets.

425. **Airbase Operation Centres.** Each airbase will have a Base Operations Centre (BOC) which will co-ordinate operations conducted at the airbase and launch reactive missions as directed by the appropriate control agency. However, the TACC will normally retain tactical control over GBAD elements deployed in defence of airbases. Through their access to the RAP and AD voice circuits with the TACC, GBAD elements can provide threat warnings and relay important tactical information to the BOC.

SECTION IV – CO-ORDINATED LAND-AIR-MARITIME PROCEDURES

426. NATO maritime and air doctrine lays down a set of procedures, known as Co-ordinated Air-Sea Procedures (CASP), which assist the co-ordination of AD operations between maritime and air forces. Procedures are laid down within 4 CASP Categories (CASP 1-4), which enable the relevant air and maritime AD commanders to change or alternate C2 functions, even to the extent of a maritime AD unit being allocated to the TACON of an appropriate ADC or SADO for control of its movement, stationing and/or weapon engagements (CASP 1). In order to integrate land component AD operations more fully into the joint environment, this model is expanded in UK doctrine into Co-ordinated Land-Air-Maritime Procedures (CLAMP) for AD.

427. **General Principles.** All air assets within the JOA will comply with the ATO and ACO. The MCC and LCC will contribute to the overall AD battle in their AOs by providing early warning and by engaging adversary aircraft with their AD assets in accordance with the JTFC's apportionment plan and in strict adherence to ROE. The ADC will retain or delegate functions for the conduct of the AD plan, and the essential co-ordination will be the responsibility of the established liaison elements in the JAOC and component HQs. The dynamic nature of AD demands a much closer and timelier co-ordination between maritime and land component AD elements and those of the ADC, to ensure that:

- a. A flexible yet robust AD C2 system is in place to ensure adversary air forces are efficiently engaged, even with minimal notice.

- b. Friendly (and neutral) air forces are not endangered by friendly AD forces.
- c. AEW aircraft are tasked to support components simultaneously where appropriate.
- d. MCC and LCC protection is enhanced by joint assets.
- e. AD early warning to the ADC/JAOC is increased by MCC's and LCC's sensor input.

428. **Categories of Co-ordination.** MCC and LCC AD assets' primary tasking, capability and location will determine the CLAMP category which may be allocated. CLAMP categories are:

- a. **CLAMP 1.** CLAMP 1 AD assets are those with an Area AD capability¹⁸ which are allocated to the ADC for AD duties as their primary task. The MCC/LCC will delegate TACON of CLAMP 1 AD assets to the ADC/JAOC who may, in turn, delegate this TACON to a SADO. TACOM and responsibility for logistic supply will remain with the respective CC/Establishing Authority. The primary task of a CLAMP 1 AD asset will be to assist the JAOC in compiling the RAP; additional tasks, as directed by the ADC/JAOC, may include aircraft control and target engagements. CLAMP 1 AD assets will normally have the following capabilities:
 - (1) Long-range air warning radar and data link capability.
 - (2) ESM/ECM.
 - (3) LR/MRSAM.
 - (4) AD aircraft control capability.
- b. **CLAMP 2.** CLAMP 2 AD assets are those with AD sensors, capable of assisting in the RAP compilation, but whose primary tasking does not allow them to be allocated to CLAMP 1.¹⁹ The use of their LR/MRSAM or allocated AD Fighter assets against targets which do not pose a threat to the AD asset itself or units being supported will be co-ordinated by the ADC/JAOC (or SADO). TACON of the AD asset remains with the respective CC.

¹⁸ When the situation dictates, AD assets with limited facilities may still be allocated to CLAMP 1, resulting in a reduced CLAMP 1 posture. A classic example of CLAMP 1 is the use of a Type 42 to cover gaps in existing ASACS coverage and/or act as a MRSAM picket.

¹⁹ With the introduction of the RAP Troop, it is now feasible for it, and the Rapier radar capability, to be considered for CLAMP 2 tasking. Another example in a multinational context is the use of Patriot/Hawk SAM under CLAMP 2.

c. **CLAMP 3.** CLAMP 3 AD assets are those which, due to equipment fit or emissions policy or other reasons, are unable to contribute to the RAP but nevertheless require to receive it. The use of their LR/MRSAM, if available, against targets which do not pose a threat to units being supported will be co-ordinated by the ADC/JAOC (or SADO). TACON of the AD asset remains with the respective CC.

d. **CLAMP 4.** CLAMP 4 AD assets are those with an AD capability (weapon, sensor or aircraft control) not actively involved in their environmental CC's primary task²⁰ and able to assist the ADC in his overall responsibility for the AD of vital assets/areas. TACON for the AD employment only of CLAMP 4 AD assets will be delegated by the parent CC to the ADC who will in turn delegate TACON to the appropriate LADC if one is appointed, through the appropriate SADO. Alternatively, and with the agreement of the respective CC, a CLAMP 4 AD asset could be designated as LADC for the vital asset/area. No other aspects of TACON other than AD are affected by CLAMP 4.

429. **Detailed Procedures.** Details of CLAMP planning, co-ordination, responsibilities and procedures should be developed within the guiding principles of CASP in AJP-3.3.3 '*The NATO Air-Maritime Co-ordination Handbook*'.

²⁰ E.g. Use of Rapier in CLAMP 4 to provide land-based AD for ports/anchorages; air and sea ports of em/debarkation; Force Maintenance Areas; administrative harbour areas, etc. Similarly, FF/DD can be used from seaward in CLAMP 4 for the same purpose.

ANNEX 4A – AIR DEFENCE COMMANDER RESPONSIBILITIES AND TACTICAL BATTLE MANAGEMENT FUNCTIONS

Air Defence Commander Responsibilities

4A1. The Air Defence Commander's (ADC's) responsibilities are listed below. The matching or equivalent maritime Composite Warfare Commander (CWC) functions for Anti-Air Warfare (AAW) are shown in brackets (refer to Annex 4B for more detail on CWC functions).

- a. Responsibilities vested in the ADC by the Joint Task Force Commander:
 - (1) Formulating and promulgating the Air Defence (AD) plan and oversight of its execution.
 - (2) Requesting, developing, co-ordinating, and promulgating AD Rules of Engagement.
- b. ADC's responsibilities equating to those maritime CWC functions which *may* be delegated to the Force Anti-Air Warfare Commander (AAWC) by the Maritime Component Commander (MCC):
 - (1) Promulgating Electronic Warfare (EW) policy as it affects AD. (221)
 - (2) Formulating and promulgating policy on planned responses in AD.¹ (222)
 - (3) Ordering AD states of readiness. (223)
 - (4) Establishing and promulgating the air surveillance area. (226)
 - (5) Developing and implementing the joint air surveillance and AD plan. (240)
 - (6) Tasking allocated AD units for surveillance, ID/recognition and reporting air contacts. (227)
- c. ADC responsibilities equating to those maritime CWC functions normally delegated to the Force AAWC (but which *may* be retained by the MCC):

¹ Such responses should be co-ordinated with those implemented by maritime forces (e.g. chaff or EMCON posture).

- (1) Dividing the Joint Operations Area/AD Area into Sectors, if required. (241)
- (2) Designating AD commanders for AD Sectors as required. (242)
- (3) Designating the Air Surveillance Manager (ASM) (FTC-A in data link operations). (243)
- (4) Designating AD tactical data link management units. (244)
- (5) Designating AD aircraft control units. (246)
- (6) Establishing and promulgating procedures for aircraft safety and identification or to prevent mutual interference, in co-ordination with the Joint Airspace Control Centre. (247) (248)
- (7) Promulgating identification criteria. (249)
- (8) Issuing criteria for AD weapon release and expenditure (a matrix if applicable) (250)
- (9) Establishing AD Weapons Engagement Zones.
- (10) Exercising AD TACON in accordance with the joint AD plan. (252)
- (11) Co-ordinating and controlling air surveillance. (253)
- (12) Co-ordinating and controlling all AD sensors. (254)
- (13) Designating and disseminating (as appropriate) all reported contacts and using all available information to maintain a complete plot of the surveillance area. (255)
- (14) Co-ordinating the movements of friendly (and neutral) aircraft, in co-operation with the maritime Air Co-ordinator (AC). (256)
- (15) Issuing periodic AD SITREPS (when required by the tactical situation) and other reports, including SITSUMS. (257)
- (16) Controlling AD communications nets, especially with respect to procedural integrity and security in reporting. (258)
- (17) Issuing air threat and air raid warnings. (260)
- (18) Issuing Weapons Restrictions. (261)

- (19) Co-ordinating and controlling employment of all force AD weapons, resolving conflicts between tactical use of weapons and demands of aircraft safety. (262)
- (20) Co-ordinating and ordering the launching and stationing of AD aircraft. (263)
- (21) Directing the employment of force electronic countermeasures (including CHAFF resources) for AD. (264)
- (22) Unless delegated, exercising control by veto over all AD actions initiated by other units of the force. (265)

Tactical Battle Management Functions

4A2. It is a function of leadership that a task may be executed by a commander, or the execution of that task may be delegated. Tactical Battle Management Functions (TBMFs) give the AD commander the tool by which to allocate/resume these tasks to/from subordinates. The general principle is that TBMFs should be delegated early enough to that level from which they can be executed most effectively to guarantee the fastest reaction time and highest efficiency. Where necessary, TBMFs may be restricted by unit, area or by time. Delegated functions may be reassessed or re-assumed by higher authority at any time.

- a. TBMFs are listed below together with a brief definition:
 - (1) **Function 1** - Identification Authority. The authority to recognise and apply a specific identity to a track.
 - (2) **Function 2** - Interrogation Authority. The authority to take action in an attempt to visually determine the identity of a track.
 - (3) **Function 3** - Intervention Authority. The authority to take action to divert an aircraft from its flight path or mission.
 - (4) **Function 4** - Engagement Authority. The authority to order engagements or to engage.²
 - (5) **Function 5** - Choice of Weapons Systems. The authority to select AD Fighter or surface-based AD weapons systems to engage.
 - (6) **Function 6** - Weapon Co-ordination Authority. The Authority for mixed employment of AD Fighters and Surface-based AD weapons.

² Does not over-ride the inherent right of self-defence that can be applied by all AD assets.

The authority to employ AD Fighter aircraft and surface-based AD defence systems in the same airspace at the same time.

(7) **Function 7** - Surface to Air Weapon (SAW) Weapon Control Authority. The authority to implement Weapon Control Orders (WCOs) for Surface to Air Missile (SAM) and Short Range Air Defence (SHORAD) units.

(8) **Function 8** - Authority for manning of Combat Air Patrols (CAPs) and Fighter Areas of Responsibility (FAORs). The authority to use AD fighter resources in CAPs and FAORs.

(9) **Function 9** - EMCON Authority. The authority to order any specific EMCON status for allocated units.

(10) **Function 10** - Deployment Authority. The authority to order positioning of mobile surface-based AD assets into formation for battle.

(11) **Function 11** - Air-to-Air Refuelling (AAR) Aircraft Positioning Authority. The authority to direct the positioning of AAR aircraft on towlines within a specified area of operations.

(12) **Function 12** - Airborne Early Warning (AEW) Management Authority. The authority to manage and dictate the employment of AEW aircraft.

(13) **Function 13** - Authority for the Employment and Management of Communications and Data Links Systems. The authority to manage and dictate the employment of communications and data link equipment and systems.

(14) **Function 14** - Warning Authority. The authority to order Sector or Area Threat Warnings or specific Air Attack Warnings.

(15) **Function 15** - Readiness Posture Authority. The authority to order Readiness States for allocated units.

Tactical Battle Management Function/Composite Warfare Commander Authority Matrix

4A3. The following matrix shows the lowest level to which each TBMF may be delegated. For ease of reference, the equivalent primary maritime AAW CWC Duty Numbers are shown under the relevant TBMFs:

TBMF		LOWEST LEVEL OF DELEGATION
ONE (243, 249)	Identification	SADC/AAWC (Policy) FTC/ASM/Data Link Control Unit (Execution)
TWO (253, 254, 255)	Interrogation	AWACS/LAAWC/GBAD Control Node
THREE (262)	Intervention	AWACS/SADC/AAWC
FOUR (250, 261, 262)	Engagement	LADC/LAAWC/GBAD FU at WCS Free or Tight
FIVE (250, 259)	Choice of weapons	SADC/AAWC
SIX (259, 262)	Mixed Employment of Fighters & SAW	SADC/AAWC
SEVEN	GBAD WCS - SAM - SHORAD	GBAD Control Node GBAD Control Node
EIGHT (263)	CAP/FAOR Manning	SADC/AAWC
NINE (221) ³	EMCON - UKADGE - AD A/c - SAW - CASP 1 Ships	Radar Convoy Weapons Platform GBAD Control Node TACON Authority
TEN	Deployment - Mobile ASACS elements - CASP 1 Ships	ADC/SADC SADC
ELEVEN (246)	AAR Tanker positioning	SADC/AAWC
TWELVE (245, 246)	AEW - Mission and Data Link priority - Positioning of AEW barrier	SADC/AAWC SADC/AAWC
THIRTEEN (244)	Communications & Data Links - Data Link Buffer systems	SADC/AAWC SADC/AAWC
FOURTEEN (260)	Warning Authority - Threat Warning - Air Attack Warning	SADC/AAWC LADC/LAAWC/GBAD Control Node

³ In maritime operations EMCON policy will be laid down by the MCC. Implementation of, and adherence to EMCON plans is a function delegated to the maritime EW Co-ordinator (CWC Duty number 842). AAWC may be delegated Duty 221 for promulgation of EW policy (including specific EMCON measures), but only as it affects AD/AWW.

FIFTEEN (223)	Readiness Posture	LADC/LAAWC/GBAD Control Node
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ANNEX 4B – MARITIME COMPOSITE WARFARE COMMANDER FUNCTIONS FOR AIR DEFENCE

Anti-Air Warfare Functions

Functions which may be delegated to the Force AAWC by the MCC:

Duty No:¹

- 220 Formulating and promulgating general AAW/AD plans and, when necessary, specific guidance to the force.
- 221 Promulgating EW policy as it affects AAW/AD within assigned AO/AD Sector (TBMF NINE).
- 222 Formulating and promulgating policy on planned threat responses in AAW/AD (i.e. counter-ASM procedures, Barrier CAP, repositioning of assets, etc)
- 223 Ordering AAW/AD degrees of readiness.
- 224 Stating requirements for non-organic air support for AAW/AD and forwarding such requests.
- 225 Designating the AAWC and standby AAWC.
- 226 Establishing and promulgating the air surveillance area.
- 227 Assigning air and surface AAW/AD units to AAWC for detection/localization/identification/recognition and reporting of air contacts.

The following functions are normally delegated to the Force AAWC, but may be retained by the MCC:

- 240 Developing and implementing the air surveillance and AD plan (normally associated with task of drafting and issuing the OPTASK AAW message).
- 241 Dividing the AAW/AD Sector (if applicable) into sub-sectors.
- 242 Designating Sector AAWCs and/or Local AAWCs as required, plus Inner & Outer Defence Zone Co-ordinators.
- 243 Designating maritime Force Track Co-ordinator (Air) (TBMF ONE).
- 244 Designating Data Link Management units (TBMF THIRTEEN).
- 245 Establishing the requirements for shipborne/organic AD air support and forwarding requests (TBMFs EIGHT, ELEVEN & TWELVE).
- 246 Assigning stations, sectors and/or patrolling areas and designating control units for AD aircraft, keeping Air Co-ordinator informed (TBMFs SIX & TWELVE).
- 247 Establishing and promulgating the Identification Safety Range and safety sectors for all friendly aircraft and any special areas or zones for aircraft safety and identification or to prevent mutual interference, in co-ordination with AC.

¹ The 'Duty Numbers' shown in this Annex relate to those laid down in the appropriate maritime CWC Duty Tables. These numbers are used for allocation or reference purposes in relevant OPGEN and OPTASK messages or other directives. Directly equivalent TBMFs are shown in brackets.

- 248 Establishing joining procedures for AD aircraft, keeping AC informed.
- 249 Promulgating identification criteria, required recognition levels, and required recognition confidence levels for the air surveillance area (TBMF ONE).
- 250 Issuing criteria for weapon release and expenditure.
- 251 Establishing and promulgating the counter-ASM/ARM plan.
- 252 Exercising TACON, including stationing and manoeuvring of assigned surface AAW/AD assets, in accordance with the OTC's policies and plans.
- 253 Co-ordinating and controlling air surveillance (TBMF TWO).
- 254 Co-ordinating and controlling the use of all force sensors as required for AAW/AD (TBMF TWO).
- 255 Designating and disseminating as appropriate all reported contacts and using all available information to maintain a complete air plot of the surveillance area (TBMF TWO).
- 256 Co-ordinating movements of friendly aircraft within the air surveillance area, in co-operation with the AC (see 600-series AC functions below).
- 257 Issuing periodic AAW SITREPs and other reports, including SITSUMs and daily AAWC intentions message.
- 258 Controlling AAW/AD nets. The AAWC may in turn assign some of this responsibility to Sector or Local AAWCs or the FTC(A).
- 259 Co-ordinating with land-based AD authorities (TBMFs FIVE & SIX).
- 260 Issuing Threat Warnings.
- 261 Issuing Weapon Restrictions (TBMF FOUR).
- 262 Co-ordinating and controlling employment of all force AAW weapons and resolving conflicts between tactical use of weapons and demands of aircraft safety (TBMFs THREE & FOUR).
- 263 Co-ordinating and ordering the launching and stationing of alert AD aircraft (TBMFs EIGHT, ELEVEN & TWELVE).
- 264 Directing the employment of force chaff resources for AAW.
- 265 Exercising control by veto over all AAW actions initiated by other units within the force.
- 266 Exercising control over force counter-ASM/ARM actions.
- 267 Providing assets as available to assist other commanders in prosecution of the threat.

Air Co-ordination Functions

Functions which may be delegated to the Force AAWC by the MCC:

- 620 Promulgating air co-ordination policy.
- 621 Establishing (when this is not established by civil ATC authorities) and promulgating aircraft separation and aircraft co-ordination procedures in the Force AAWC area.
- 622 Designating the Air Co-ordinator (AC) and standby AC.

- 623 Establishing and promulgating within the force and to relevant outside authorities the dimensions and location of Force Air Co-ordination Area (FACA).

The following functions are normally delegated to the AC, but may be retained by the Force AAWC:

- 640 Designating Air Control Units (ACU) for aircraft not assigned to maritime warfare commanders.
- 641 Supporting other AD commanders in establishing airspace co-ordination measures, such as special areas or zones for aircraft safety, identification, or prevention of mutual interference.
- 642 Supporting relevant warfare commanders and co-ordinators in establishing joining and control procedures for aircraft, if required.
- 643 Ensuring safe co-ordination and control of all aircraft when they are under the TACON of units within the maritime force.
- 644 Co-ordinating air traffic, controlling, and monitoring aircraft movements within the FACA, ensuring altitude separation and traffic control, keeping AAWC informed.
- 645 Co-ordinating and monitoring tactical employment of all force aircraft.
- 646 Ensuring that available weather information, including the altimeter pressure setting in millibars and inches, is promulgated within the FACA.
- 647 Support the AAWC in co-ordinating and reporting the movement of friendly aircraft.
- 648 Monitoring aircraft safety and co-ordination nets in conjunction with the relevant ACU.
- 649 Maintaining up-to-date information on all national and international airspace reservations that are likely to affect the force, ensuring adequate clearance and non-violation by the force.
- 650 Promulgating restrictions on flying operations, due to met conditions, keeping the OTC informed.
- 651 Supporting the AAWC in resolving conflicts between tactical use of weapons and demands of aircraft safety.

(INTENTIONALLY BLANK)

ANNEX 4C - APPROXIMATE EQUIVALENCE OF FUNCTIONALLY SIMILAR AIR DEFENCE ASSETS

Serial	Current Allied Command Operations (ACO) ACCS	Future ACO ACCS	Royal Navy	British Army	Royal Air Force	US Navy	US Marine	US Army	US Air Force
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
1	Combined Air Operations Centre (CAOC)	Combined Air Operations Centre (CAOC)	Maritime Air Operations Centre (MAOC) MCC/CVS (Inc Air Operations Co-ordination Centre (Maritime) (AOCC(M))	Divisional Air Support Cell (DASC) (Inc Air Operations Co-ordination Centre (Land) (AOCC(L))	Joint Air Operations Centre (JAOC) ADOC/SADO (Inc Maritime Co-ordination Element (MCE) & Battlefield Co-ordination Detachment)	Tactical Air Control Centre (TACC)	Tactical Air Command Centre (TACC)	-	Air Operations Centre (AOC)

Serial	Current Allied Command Operations (ACO) ACCS	Future ACO ACCS	Royal Navy	British Army	Royal Air Force	US Navy	US Marine	US Army	US Air Force
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2	Control & Reporting Centre (CRC)	<u>A</u> ir Control Centre (ACC), <u>R</u> ecognised Air Picture (RAP) Production Centre (RPC) & <u>S</u> ensor Fusion Post (SFP) = (<u>ARS</u>)	Force Anti-Air Warfare Commander (FAAWC) CVS/DD AD-capable units	DADC*	Tactical Air Control Centre (TACC) (No 1 ACC) P-DARS	Force Air Warfare (AW) Commander (FAWC)	Tactical Air Operations Centre (TAOC)	-	CRC/TACC
3	Control & Reporting Post (CRP) Reporting Post (RP)	DARS	Sector AAW Commander (SAAWC) (CVS/DD) AD-capable units	BADC* RAP Tp*	P-DARS (No 1 ACC)	Sector AW Commander (SAWC)	Deployable Early Warning and Control Sites	-	Control & Reporting Element (CRE)

Serial	Current Allied Command Operations (ACO) ACCS	Future ACO ACCS	Royal Navy	British Army	Royal Air Force	US Navy	US Marine	US Army	US Air Force
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
4	Local Air Defence Command Post (LADCP)	FCC	Local AAW Co-ordinator DD/FF (LAAWC)	FCC Battery Command Post (BCP – Rapier) Troop Command Post (TCP – HVM)	FCC Squadron Command Post (SCP – Rapier)	Local AW Co-ordinator (LAWC)		AD Artillery Battery Command Post	
5	Wing Operations Centre (WOC)	WOC	Carrier Air Group (CAG) Air Ops	-	WOC	CAG Air Ops	-	-	WOC

Serial	Current Allied Command Operations (ACO) ACCS	Future ACO ACCS	Royal Navy	British Army	Royal Air Force	US Navy	US Marine	US Army	US Air Force
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
6	Surface to Air Missile Operations Centre (SAMOC)	SAMOC	AAWC Function	N/A	TACC (SAM/GBAD Liaison)	AWC Function	-	Air Defence Artillery Brigade (ADA Bde) Tactical Operations Centre (BTOC)	-

*RAP Troop will provide limited reporting capability at these elements, however DADC, BADC and RAP Tp have no integral control capability. In that context, RAP Tp can be considered to equate to a Reporting Post (RP) only.

CHAPTER 5 – JOINT AIR DEFENCE PLANNING

501. Guidance on the overall air operations planning process is given in AJP-3.3 ‘*NATO Joint Air & Space Operations Doctrine*’, amplified in IJWP 3-30. Air operations aspects pertaining to Air Defence (AD) are also covered in AJP-3.3.1 ‘*NATO Counter-air Operations Doctrine*’. The purpose of this chapter is to provide additional guidance on the planning of joint AD operations in a national context.

502. **Wider Planning Considerations.** The primary responsibility of the Air Defence Commander (ADC) is to develop the AD plan for the Joint Operations Area (JOA) on behalf of the Joint Task Force Commander (JTFC). Whilst Counter-air and Combat Support Air Operations constitute a significant portion of the overall air estimate, AD is not wholly dependent on the air scheme of manoeuvre. The Joint Air Operations Plan will incorporate the Joint Force Air Component Commander’s (JFACC) execution responsibilities of the AD plan. AD capabilities are likely to be at a premium, therefore it is essential that all AD effort, both organic and jointly assigned, be focused towards overall campaign objectives by exploiting the potential benefits from the integration of all AD assets within the JOA under a networked AD Command and Control (C2) structure.

503. **The Campaign Plan.** AD integration and co-ordination must begin at the very earliest stages of the campaign planning process and be integral to all lines of operation throughout the course of an operation. By its very nature, the joint AD planning process cannot be carried out in isolation as it will be inextricably linked to other Component Commanders (CCs) estimates and plans. Furthermore, the priority afforded to AD will likely vary throughout a campaign. During the early stages there may be great emphasis upon controlling the air and securing the lines of communication as the Joint Task Force (JTF) is deployed and positioned. Once the required control of the air is achieved, then the relative priority of AD, and the corresponding level of apportionment of AD assets, may change. However, regardless of the intensity or degree of weapons platform involvement required for specific AD operations, the surveillance and identification elements of AD may demand priority apportionment of appropriate Intelligence, Surveillance and Reconnaissance (ISR) and combat support air assets, possibly for the duration of the campaign.

SECTION I – CAMPAIGN PLANNING CONSIDERATIONS

504. The estimate process is central to the formulation and updating of the joint AD plan. The standard 4 key stages of an estimate comprise:

- a. Mission analysis.
- b. Evaluation of Factors.

- c. Consideration of Courses of Action (CsoA).
- d. The commander's decision (or recommendation).

The level of detail within any estimate and the resulting plan will be a function of the resources, information and time available for the process; AD-specific considerations are discussed below.

505. Mission Analysis. Establishing the appropriate mission is fundamental to the success of joint AD operations. Essentially there are 2 choices of emphasis: firstly, to minimise the damage sustained by friendly forces and facilities or, secondly, to inflict the maximum attrition on the enemy. To a certain extent these 2 aims are interdependent: the more enemy aircraft that are shot down, the fewer that are available to inflict damage in future raids. The less damage friendly forces sustain, the more capable they are of defending themselves if the enemy continues with attacks. If minimum damage to friendly capabilities is the prime aim, then all resources need to be devoted to deterring or containing the incoming raids, even if that means allowing vulnerable homebound enemy aircraft to escape. In contrast, if the over-riding priority is to inflict maximum attrition, then enemy aircraft can be intercepted wherever they can be found, before or after they have attacked their targets. Deciding where the priority lies between the 'minimum damage' and the 'maximum attrition' aim will depend partly on friendly vulnerability and partly on the nature of the threat. Deciding where the priority lies between these 2 aims has major implications for operational deployment and force structuring, and thus for resource allocation, and will rest initially with the Joint Commander (Jt Comd) and subsequently with the JTFC.

506. Factors. The following fundamental factors should be considered:

- a. Environment including weather, terrain, aircraft carrier operating areas, airbases (both friendly and adversary), transit distances, dimensions of the JOA etc.
- b. The enemy's capabilities and potential courses of action.
- c. The friendly Centres of Gravity (CsoG) and critical vulnerabilities. CsoG may be military-strategic, operational, tactical, political or economic in nature.
- d. Analysis of friendly (and neutral) vital areas or assets which are likely to be adversary targets. Vital areas or assets could comprise, but are not limited to: high value Command, Control, Communications, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance (C4ISTAR) assets; own AD/air forces; major logistics infrastructure including Air Ports of

Disembarkation (APODs) or Sea Ports of Disembarkation (SPODs); maritime units; concentrations of tactically mobile land manoeuvre forces; operational reserves; population centres; and industrial facilities.

- e. The Rules of Engagement (ROE) should enable the required level of protection against the threat within the constraints of the AD system's capabilities.
- f. Host nation AD and contributing elements/capabilities (e.g. fixed AD system).
- g. UK AD and contributing elements/capabilities including land, sea and air platforms.
- h. Other commanders' estimates and plans.

507. **Analysis of Vital Areas/Assets.** The available AD and contributing elements/capabilities are unlikely to ensure strong AD coverage over an entire JOA in all circumstances. Therefore, a stringent analysis should be carried out for each vital area/asset based on the following considerations:

- a. **Criticality.** The degree to which an area/asset is critical to the accomplishment of the JTFC's mission and campaign objectives in terms of its: inherent military importance; political sensitivity or economic value; redundancy; and relative scarcity.
- b. **Vulnerability.** The degree to which an area/asset is vulnerable to air attack which will tend to depend upon its: mission/task; location within the JOA; ease of targeting by Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR); level of mobility; intrinsic hardness; viability of passive defence measures; and organic active defence.
- c. **Recuperability.** The degree to which an area/asset could be recovered in terms of manpower, materiel, time, effort and morale.
- d. **Weapon Matching.** The availability of appropriately capable adversary weapon systems and the probability of their employment against the vital area/asset.
- e. **Time.** The time and stage of the campaign.

From the analysis of each area/asset a Critical Asset List (CAL) can be constructed, the defence of which can then be decided. Those critical assets that can be defended with the forces available form the Defended Asset Priorities List (DAPL). Although

the CAL can be decided by each component the DAPL should be decided on a joint basis.

508. **Summary of Tasks and Prioritisation.** As the estimate progresses, the various AD tasks should be summarised and prioritised. It is probable that the summary and prioritisation will vary according to the phase of the joint campaign plan.

509. **Supporting Considerations.** As the estimate progresses additional factors should be considered that will influence the formulation of possible courses of action:

- a. Sensor coverage and co-ordination, communications, airspace control/management and Recognised Air Picture (RAP) production/dissemination.
- b. Emission Control (EMCON).
- c. Logistics support.

510. **Pre-planned Air Defence Responses.** Prior to and during the campaign, pre-planned AD responses should be jointly developed and agreed between components which must be consistent with any applicable ROE. These pre-planned responses should be embodied within the joint AD plan, orders and procedures, and form the basis of decentralised execution.¹ In coalition operations, difficulties in the wider exchange of countermeasures information should not be underestimated.

SECTION II – JOINT AIR DEFENCE OPERATIONS PLANNING

Establishing an Air Defence Structure

511. **Pre-deployment.** Joint AD considerations must be addressed prior to deployment of forces to ensure that the needs of the potential JTF are considered, particularly those that do not fall neatly into the immediate area of responsibility of the CCs. In addition, the need to integrate UK forces into an existing fixed AD/civil Air Traffic Control (ATC) infrastructure, or to provide a full deployable capability where these do not exist, will be of prime concern to the ADC. To assist the Permanent Joint Headquarters (PJHQ) or Joint Force Headquarters (JFHQ) in this aspect of planning, it is likely that lead responsibility will be assigned at an early stage to the Front Line Command (acting as a Supporting Command for a particular operation) from which the ADC is nominated. In a predominantly maritime scenario (particularly where the US Navy has the lead), this could be undertaken by HQ FLEET/ UKMARFOR,

¹ Pre-planned responses may include EMCON, QRA(I), dispersal or ASM defensive reactions, such as deployment of chaff, decoy or jamming systems.

however for UK or UK-led operations this function would invariably fall to HQSTC/JFACHQ.

512. Once this responsibility is established, the Front Line Command (HQSTC/JFACHQ) should liaise with the AD staffs at PJHQ, JTFHQ and the other Supporting Commands to achieve a deployable AD system that can accommodate the predicted threat in theatre. Joint AD requirements can then be subsumed into the JTFC's Estimate, to ensure that appropriate AD forces are assigned to meet the mission (and constraints) placed upon him. In addition, the initial joint AD framework can be established and then reflected in the JTFC's Planning Guidance for use by CCs in formulating their AD plans.

513. **Component Planning.** Each individual CC will undertake his own AD planning in which he will understandably tend to focus primarily on his own component's environmental area. Inter-component co-ordination is facilitated by early nomination of the ADC, senior component liaison officers and their respective staffs followed by their collocation with the ADC staff as soon as possible after nomination. The ADC can then provide objectives and guidance to his joint staff, review the AD elements/capabilities available, both active and passive, and after joint liaison/consultation, formulate the joint AD plan parallel to, and in concert with, the work of the other components. Ultimately, it is the JTFC who will determine the priorities for AD in support of his joint campaign objectives. Therefore, the JTFC will approve the joint AD plan as an integral element of his campaign plan, most especially in his initial deployment of AD forces and the arrangements for the AD C2 structure in theatre.

514. **Deployment and Establishment of the Joint Task Force.** AD requirements will need to feature in the planning for the deployment and establishment of the JTF. The initial joint AD posture will influence the Desired Order of Arrival (DOA) (and Staff Tables). Furthermore, there may be a requirement to provide AD for lines of communication through potentially hostile environments. The C2 arrangements for such AD will require careful consideration as the transfer of authority for maritime and air forces from the Jt Comd to the JTFC normally occurs as those forces transit into the theatre of operations. Transfer of OPCON of JTF-assigned forces takes place on their arrival in the JOA, providing the JTFC is in a position to discharge this responsibility.

Air Defence Operations in the Joint Operations Area

515. **Joint Air Operations Centre.** Once in theatre, joint AD planning will continue to be an iterative process. If the ADC is dual-hatted as the JFACC, he will use his Joint Air Operations Centre (JAOC) staff to undertake the ongoing day-to-day joint AD planning. The liaison staffs within each CC's HQ will be fundamental to ensuring the appropriate level of specialist advice is available to the ADC and

effective component liaison is undertaken. They also facilitate: the introduction of recommendations by their CCs; any change in their CC's AD requirements; and identify their CC's ability to support other components and the ADC. The Air Operations Co-ordination Centre (Maritime) ((AOCC)(M)) and (Land) (AOCC(L)) staff will fulfil a complementary role on behalf of the ADC/JFACC in the component HQs. On behalf of the ADC, the JAOC AD staff will co-ordinate the AD requirements and resources of each CC with those of the joint AD plan and make recommendations to the ADC, and thence the JTFC. This may take the form of a recommendation to change the joint AD plan or, more likely, to apportion AD effort between various roles or tasks and geographic areas, by priority, for a given period of time.

516. Airspace Control Plan. The theatre Airspace Control Plan (ACP) and AD plans must be developed in parallel to ensure seamless integration. The ACP is approved by the JTFC to establish procedures for airspace control (ASC) in the JOA. Normally, the ASC boundaries will be co-incident with the AD boundaries. Therefore, the ACP must provide for co-ordination between combat zone ASC and joint AD operations. The ACP must be fully harmonised with the AD plan and in this context, take account of the AD ROE, AD operations, the general AD deployment and AD weapon capabilities.

517. Joint Operations Planning Group. The Joint Operations Planning Group (JOPG) is the forum in which the JTFC or his representative meets with the CCs or their representatives to discuss, assess and plan the joint campaign. As such it will provide the ADC with the opportunity to consult regularly with the CCs to assess the effectiveness of AD operations and consider the overall campaign strategic direction and future plans. Any changes to the joint AD plan should be processed through the JOPG for approval by the JTFC. An apportionment recommendation for air assets, including AD assets, should be processed through the Joint Co-ordination Board before the ultimate approval of the JTFC.

518. Tasking of Air Defence Assets. Once an apportionment decision is made by the JTFC, and AD assets are allotted to the JFACC, the Combat Plans cell of the JAOC will produce and disseminate the Air Tasking Order. This is co-ordinated with the Airspace Control Order production and dissemination task undertaken by the Joint Airspace Control Cell. To enable overall co-ordination of air operations, the employment of all AD assets will be reflected in the ATO although it will only constitute formal tasking of those AD assets allotted to the JFACC/ADC (or assigned to him under Co-ordinated Land Air Maritime Procedures. The ATO is then implemented by the Combat Ops cell who transmit it to the AOCC(M) and AOCC(L) to enable their host CCs to undertake tasking of assigned or organic AD assets. Where pre-planned tasking is insufficient, immediate requests for AD support from components are processed by the Senior Air Defence Officer in Combat Ops.

CHAPTER 6 - JOINT AIR DEFENCE OPERATIONS

601. **Air Defence Battle Management.** The hierarchy of doctrine and tactics, techniques and procedures publications used in Air Defence (AD) all contribute to the successful accomplishment of AD Battle Management. Joint application of these aspects of AD Battle Management has been hindered in the past in 2 ways: by the development within NATO of separate AD doctrine for collective defence tasks and those relating to expeditionary operations, and nationally by separate implementation of tactical doctrine at component level, particularly for Ground Based AD (GBAD). However, the former is being steadily consolidated by the rationalisation of NATO Combined Joint Task Force (CJTF) air operations doctrine under a unified Strategic Allied Command for Operations; the latter will be significantly improved through this 2nd Edition of JWP 3-63 and adherence to joint tactical doctrine such as that contained in its supplement, JWP 3-63.1 '*Ground Based Air Defence*'. The purpose of this chapter is not to duplicate the principles and procedures of AD Battle Management discussed in earlier chapters or contained in other publications, but to provide national guidance on specific aspects that relate to the conduct of joint AD operations.

SECTION I - AIRSPACE CONTROL AND AIR CO-ORDINATION IN AIR DEFENCE OPERATIONS

602. **Airspace Control.** Airspace Control (ASC) procedures utilised in AD operations should adhere to ATP-40/AJP-3.3.5 '*Doctrine for Airspace Control in Times of Crisis and War*' and JWP 3-34.1 '*Airspace Control for Joint Operations*'. The Airspace Control Authority (ACA) is responsible for developing the Airspace Control Plan (ACP) and, after JTFC approval, promulgating it throughout the Joint Task Force (JTF) by means of the Airspace Control Order (ACO). By combining the functions of ACA and Air Defence Commander (ADC) in the Joint Force Air Component Commander (JFACC), the greatest degree of ASC co-ordination can be achieved.

603. The procedures used to de-conflict the activities of AD assets with all other airspace users, including civilian aircraft, must achieve the following:

- a. Prevent mutual interference between AD assets and friendly users of the airspace.
- b. Facilitate AD identification.
- c. Prevent fratricide.
- d. Safely accommodate and aid the flow of all airspace traffic in the Joint Operations Area (JOA).

- e. Enhance the effectiveness of all AD operations in support of the Joint Task Force Commander's (JTFC) campaign objectives.

De-confliction, co-ordination and integration of airspace users is achieved by using established positive and procedural control methods. However, these ASC methods alone will not ensure complete de-confliction of AD operations within the airspace; AD must be implemented coherently alongside any other procedures employed for air co-ordination or weapons control.

604. **Airspace Control Areas.** It is for the JTFC, in consultation with the ACA, ADC and Component Commanders (CCs), to decide the appropriate methods to implement for ASC, based on the capabilities available and the nature of the operation. However, unless the whole airspace volume is subject to seamless 24-hour, all-weather surveillance, an ASC system will undoubtedly comprise a mix of both positive and procedural control. Procedures must always be available to provide an immediate fallback system should positive control be degraded, or when positive control is not considered appropriate to the operation at hand. Although the ACP will cover the whole JOA airspace, the ACA may assign ASC responsibilities to subordinate commanders within delegated Sub-area Airspace Control Areas (SACA). It is preferable that the geographic limits of such SACAs, and equivalent levels of delegated ASC functions, match those assigned to appropriate Sector AD Commanders.

605. **Air Co-ordination.** In crisis or war, all friendly and neutral air movements, whether under procedural or positive control, should adhere to the Airspace Control Means (ACM) ordered in the ACO. A high degree of air co-ordination with civil Air Traffic Control (ATC) authorities will ease the air surveillance task and assist in air co-ordination, thus enhancing AD effectiveness. An Air Co-ordinator (AC) is likely to be assigned within a maritime force responsible to the Anti-air Warfare Commander for co-ordinating air traffic, monitoring and controlling friendly aircraft movements within the Force Air Co-ordination Area (FACA) and ensuring adequate altitude separations are maintained. Aircraft control duties should be assigned to the unit in the best location to provide control in the area required, however the capability of fitted electronic aids for aircraft navigation and control, number of experienced air control personnel, and availability of real-time air picture facilities should be taken into account.

SECTION II - AIR DEFENCE WEAPON CO-ORDINATION AND CONTROL

Fighter/Surface-to-Air Weapon Co-ordination

606. Rules and procedures for the integration of fighters and Surface-to-Air Weapons (SAW) must, in order of priority:

- a. Maximise weapon effectiveness.
- b. Minimise mutual interference.
- c. Prevent fratricide.

607. **Methods of Co-ordination.** There are 2 principal methods of fighter and SAW co-ordination:

- a. **Area Co-ordination.** Fighters, SAW and Electronic Countermeasures (ECM) are employed in the same airspace. The ADC or delegated AD commander resolves any conflict either by ordering an engagement with a specific weapon system or by ordering one weapon to hold off in favour of another. These orders are given in Target Engagement Messages (TEMs) which are used between AD units to report the progress of the wider AD battle, but are generally not utilised for Short-range Air Defence/Very Short-range Air Defence (SHORAD/VSHORAD) engagements. This method is the preferred option but only recommended for use against an enemy with little or no ECM capability, when it is likely that a clear and coherent air picture can be maintained, communications are good and AD/ASC co-ordination is of a high standard. When Area Co-ordination is in operation, plans and procedures for Zone Co-ordination should be nominated and left dormant, ready for adoption as a fallback if necessary.
- b. **Zone Co-ordination.** When the situational awareness or AD Command and Control (C2) capability is more limited, fighters and SAW may be employed in delineated volumes of airspace, either called Fighter Engagement Zones (FEZ), Missile Engagement Zones (MEZ), or Short-range AD Engagement Zones (SHORADEZ). The position and shape of the zones will depend upon the threat, own weapon characteristics, availability of aircraft, expenditure of missiles and disposition of Surface-to-Air Missile (SAM) units. ECM may be employed in all zones. Zones may be activated or de-activated by the relevant controlling authority, and use of these zones does not preclude engagement of higher priority targets by more than one type of weapon system if co-ordination and de-confliction can be achieved for a particular engagement.

608. **Promulgation.** A number of FEZ, MEZ or SHORADEZ are likely to be planned in advance; the choice of zones and method of co-ordination will normally be promulgated by the Air Tasking Order (ATO), Airspace Control Order (ACO) and/or in the maritime OPTASK Anti Air Warfare (AAW) message. Dynamic or urgent management of the zones can be ordered by the ADC or delegated AD commander over the tactical AD voice circuit. It is the responsibility of the relevant ADC/Anti-Air Warfare Commander (AAWC) to ensure that the forces involved are aware of the

method of co-ordination in use; this should include GBAD forces, which may not have access to in-use tactical voice circuits.

Fighter and Airborne Early Warning Aircraft Support

609. **Aircraft Employment.** A dynamic means of tasking and controlling fighter and Airborne Early Warning (AEW) aircraft for joint AD operations is required. This is achieved by the flexible use of the 3 types of air support, which clarify the degree of support provided, and the C2 arrangements implied, when aircraft provide support to another unit or force. The types of air support are as follows:

- a. **Direct Support.** Direct Support (DS) air operations are those where air assets are tasked by the Establishing Authority, under joint procedures, to the support or protection of a particular unit/force, or to the conduct of a specific mission. The supporting aircraft joins and fully integrates with the supported unit/force for a specified period in prosecution of the same mission, under the supported unit/force's Tactical Command (TACOM) or Tactical Control (TACON). Whilst on DS, aircraft may be required to communicate with a variety of agencies, but will mainly work under the tactical control of a designated Aircraft Control Unit (ACU) in the supported unit or from within the supported force.
- b. **Associated Support.** Associated Support (AS) air operations are those where air assets provide assistance to another unit or force that is under independent tactical command, neither being subordinate to the other. The supporting aircraft does not fully integrate with the supported unit or force, however all assets are likely to prosecute the same mission. The aircraft and supported unit/force will co-ordinate their tactical operations and exchange tactical information. TACOM/TACON of assigned AS aircraft generally remains with the relevant authority who co-ordinates their tasking and movement in response to the Supported Commander's requirements; however, TACON may be transferred for limited periods if the tactical situation demands.
- c. **Area Operations.** Area Operations are those conducted by aircraft in a geographic area that are not directly related to the support or protection of a specific unit or force. The Establishing Authority for the aircraft will retain TACOM/TACON and has discretion how best to provide support. Area Operations differ from DS and AS in that the missions of the respective aircraft and other units/forces may be different. Close co-ordination and liaison between relevant authorities is therefore an important prerequisite of Area Operations to eliminate mutual interference, enhance Combat ID and ensure efficient use of resources.

610. **Aircraft Control.** Dependent upon the task and the operational environment, fighter aircraft may be allocated to the tactical control of an Aircraft Control Unit (ACU) located in an air, land or maritime-based Airspace Surveillance and Control System (ASACS) platform. Aircraft are controlled using either positive or advisory control methods, however given the increased level of situational awareness now available to UK fighter aircraft through Joint Tactical Information Distribution System (JTIDS)/Link 16, broadcast control, with reference to a 'Bullseye' datum position, is the usual type of control employed for RAF and RN operations.

Ground Based Air Defence Control and Co-ordination

611. The introduction of the army Recognised Air Picture (RAP) Troop¹ capability has given UK GBAD forces an improved GBAD control function and the added ability to undertake a limited battlespace management role for land forces. Tactical doctrine and Standard Operating Procedures covering the use of this improved capability are contained in JWP 3-63.1 '*Ground Based Air Defence*' and other manuals, however general guidance on these 2 new roles is given below.

a. **Ground Based Air Defence Role.** In the GBAD role the Autonomous Link 11 System (ALES) fielded by the Royal Marines and the RAP Tp Link 16 equipment will provide early warning significantly sooner than can be achieved with the current generation of sensors attached to Fire Units (FUs). The RAP Troop picture is received at a JTIDS Link Vehicle (JLV), which can then further disseminate a Distributed Situational Awareness Picture (DSAP) of the RAP to other chosen remote sites by means of HF radio. However, as GBAD FUs are not networked, a limitation in the provision of real-time early warning to all FUs is the requirement to pass perishable data from the JLV or DSAP vehicles to other remote FUs over a tactical voice circuit. The RAP information will lose latency rapidly if relayed across more than one voice net. The JLV or DSAP must therefore disseminate its information as a priority on the GBAD sub-unit or troop voice nets. Until full GBAD FU networking is achieved, the only practical solution to this limitation is to deploy the JLV, or alternatively a DSAP, with or in close proximity to the GBAD sub-unit Control Node. Careful liaison will be required by the JLV or DSAP crew to ensure that they provide Local Air Defence Commanders (LADCs) with the tactical voice information required, and in an appropriate format. Another important GBAD planning consideration at Brigade or Squadron level is the requirement to provide the JLV and DSAP crews with all the necessary data link management messages required for initialising and operation of the data link.

¹ As well as the fielded 7 AD Bde RAP Tp, 16 Air Assault Bde is also acquiring a RAP Tp.

b. **Airspace Management Role.** In addition to GBAD control, the RAP Troop can fulfil an airspace management role that hitherto has been unavailable to land formation HQs. However, depending on the chosen employment of the limited number of JLV/DSAP equipments, a conflict may arise between the 2 roles. The Airspace Control Authority (ACA) is unlikely to delegate Subordinate Airspace Control Authority (SACA) responsibilities to any level below Bde HQ, therefore access to the RAP may be required at the Divisional Air Defence Cell/Brigade Air Defence Cell for airspace management purposes, as well as at GBAD Control Nodes for early warning and GBAD control. Additional calls on RAP access for land forces may arise from Air Manoeuvre Battlegroup HQs and/or Support Helicopter Force Deployed Operating Bases. In any case, it is unlikely that land formation HQs would have the necessary staff expertise or communications facilities to manage a Link 16 net or exercise positive control over GBAD until Army Digitisation Stage 2 and/or GBAD Phase 1 is achieved. Nevertheless, given a fully deployed current RAP Troop capability of 3 JLVs and 3 DSAPs, and adequate supporting voice communications, options in the deployment of one JLV at Div/Brigade and another at a GBAD Control Node, with DSAP vehicles deployed at other formation elements, may satisfy both remits. Regardless of the JLV/DSAP deployment plan adopted, the RAP Troop will facilitate the following activities:

- (1) Monitoring the real or near-real time RAP on which own, other friendly, neutral and enemy air tracks² are displayed. This can assist in control of activities such as Joint Air Attack Team (JAAT) and Air Manoeuvre/helicopter missions, and de-confliction of ground-to-ground weapons and aircraft movements. It also enables checking on adherence to procedural Airspace Control Means.
- (2) Real-time information source for generation of timely Air Raid Warnings and policing of no-fly zones.
- (3) Awareness of the location of other SAM/GBAD sites (including sea-based assets), SHORADEZ and FEZ/MEZ.
- (4) Awareness of supporting C2 messages passed over Link 16.

² The RAP Tp capability not only facilitates positive control to the extent that it gives access to a real-time air picture, under the GBAD Phase 1 improvement programme Target Indication (TI) directly to networked GBAD Fire Units may be possible.

SECTION III – ADDITIONAL CONTROL AND RESTRICTION CONSIDERATIONS

Identification

612. Identification of airborne objects is vital so that threats can be detected and, where appropriate, action taken by the AD system. The means by which objects may be identified include:

- a. Electronic Warfare Support Measures.
- b. Non Co-operative Target Recognition.
- c. Identification Friend or Foe (IFF)/Successor IFF (SIFF) Modes/Codes.
- d. Link 16 Precise Participation Location and Identification message (PPLI).³
- e. Track Behaviour.
- f. Visual Sighting.
- g. Rules and Procedures for Routing, Recognition and Regulation.
- h. Adherence to Flight Plans.

613. **Identification Authority.** The identification criteria and responsibilities for the conduct of AD in the JOA should be laid down by the appropriate commander; the JTFC is likely to delegate this to the ADC. The level to which specific identification authority is delegated - and co-ordination of that with the function of the Force Track Co-ordinator (FTC) for data link operations - will depend on a number of factors such as scenario, integral surveillance and identification capabilities, Rules of Engagement (ROE) or tactical data link or communications capability. Where possible, this authority should be delegated to the lowest practicable level, and it should be vested in the same individual or unit fulfilling the role of FTC.⁴

³ PPLI is the fundamental message parameter of Link 16, which all JTIDS Units (JUs) automatically provide when active on a Link 16 network. It equates to a Participating Unit (PU) Message 1 in Link 11. PPLI clearly identifies all friendly forces participating in a Link 16 network, and establishes a Link 16 participant's position without ambiguity.

⁴ If ID Authority and FTC duties for the conduct of other warfare areas, such as maritime or land surface operations, is not also vested in the ADC, the JTFC must ensure that promulgated ID criteria and FTC responsibilities in all warfare areas are co-ordinated throughout the JOA.

Intervention/Engagement

614. Intervention is action taken to divert an aircraft from its flight path or mission. Intervention and engagement procedures are inextricably linked to those for identification. Such procedures must be centrally directed by the ADC for all forces. It is likely that identification authority will be delegated to a lower level than engagement authority but not visa versa.

Emission Control, Readiness and Equipment States

615. Differing methods have been developed within each Service for implementing Emission Control (EMCON), Readiness and Equipment States in AD operations. Maintenance of AD forces at an unnecessarily high state of readiness is wasteful in terms of resource management and may dull reactions when a threat presents itself. Significant rationalisation of GBAD procedures in these areas has been achieved, the details of which are contained in JWP 3-63.1; however some differences remain elsewhere. The table at Annex 6A shows a summary of the different methods employed in each environment.

Defence and Control Zones

616. The following Airspace Control Means can be employed to establish Defence and Control Zones around specific protected assets. It is important that any delegated AD-related authority associated with any of these zones should be promulgated at the same time as, or within, the ACO:

- a. **Base Defence Zone.** A zone established around an airbase to enhance the effectiveness of local Ground Based AD (GBAD) systems.
- b. **High Density Airspace Control Zone.** Airspace of defined dimensions, designated by the ACA, within which there is a concentrated employment of numerous and varied weapons/airspace procedures.
- c. **Weapons Free Zone.** A zone established around key assets or facilities which merit special protection by GBAD assets, other than airbases, where weapons may be fired at any target not positively identified as friendly.

Weapon Restrictions

617. The freedom to fire AD weapons⁵ can be controlled by the use of Weapon Restrictions, the prime purpose of which is to ensure an appropriate level of safety for friendly (and neutral) aircraft. Weapon Restrictions comprise of Weapons Control Status (WCS) and Weapon Control Orders (WCOs). Changes to Weapon Restrictions

⁵ Although very rarely used, Weapon Restrictions also apply to aircraft.

may be ordered by designated AD/AAW Commanders according to the level of delegation in Tactical Battle Management Function (TBMF) SEVEN or its land or maritime equivalent. They may be ordered in a general sense, or specifically for a given area or for a given type of weapon.

618. **Weapon Control Status.** The following WCS may be promulgated to establish the criteria an AD unit must use to engage a target. They are usually prefixed by the appropriate weapon code word or descriptor:

- a. **(Weapons.....) Free.** Fire may be opened on any target(s) that has (have) not been identified as FRIEND.
- b. **(Weapons.....) Tight.** Do not open fire unless target(s) has (have) been identified as HOSTILE.
- c. **(Weapons.....) Hold.** Do not open fire/cease firing. Fire may be opened only in self-defence or in response to a formal order. Maritime forces use the term 'Weapons....Safe' which has the same meaning.

WCS may be qualified by one or more of the following:

- a. A Sector.
- b. A Safety Sector.
- c. A period of time.

619. **Use of Weapon Control Status.** WCS can be used to communicate the commander's assessment of the required balance between best protection and fratricide prevention in response to a changing situation. WCS are of particular utility when procedural airspace control is in force and/or AD units are operating autonomously (which hitherto has been the primary operating mode for UK GBAD). Confidence in the presence or absence of friendly/hostile/neutral aircraft (i.e. sound situational awareness), based upon the RAP, is likely to be a factor in determining the particular WCS selected. When the tactical situation dictates and the ADC/AAWC may be unable to issue timely changes to the WCS, the authority may be delegated, typically to the Local Air Defence Commander (LADC).

620. **Weapon Control Orders.** Independent of whatever WCS are in effect, the following WCOs may be directed by the appropriate AD/AAW Commander to direct or inhibit firing of SAW based on rapidly-changing battle situations:

- a. **Hold Fire.** Do not open fire/cease firing (missiles in flight must be destroyed).

- b. **Cease Fire.** Do not open fire/cease firing (missiles in flight continue to intercept).
- c. **Engage.** Direction or authorisation for units and/or weapon systems to fire on a designated target.

WCOs may be qualified by one or both of the following:

- a. A particular unit.
- b. A particular contact (track number or position).

621. **Fire Control Orders.** Other terms may be used as Fire Control Orders, usually concerning the operation or firing of specific weapon systems. Fire Control Orders should not be used in lieu of WCS and WCO, but merely as a means of applying local control over weapon systems.

Provision of Warning

622. **Threat Warnings.** Air Threat Warnings may be issued by the appropriate delegated authority. Air Threat Warnings are generally of an informative nature and are issued to cover Sector areas of responsibility, however specific AD measures may be linked to a Threat Warning if required; such pre-planned measures or responses must be clearly promulgated within the AD Plan. The Threat Warnings are:

WARNING WHITE - Attack is unlikely without adequate warning.

WARNING YELLOW - Attack is probable.

WARNING RED - Attack is imminent, or has already commenced.

623. **Air Attack Warnings.** In addition to threat warnings within a Sector or AD Area, localised air attack warnings may be ordered by the appropriate authority, consisting of:

Air Attack Warning RED - Attack is imminent in designated area.

ALL CLEAR - Attack is over.

ANNEX 6A – AD/GBAD EMCON AND READINESS STATES

EMCON			READINESS STATES		EQUIPMENT STATES	
RN	EMCON PLANS <ul style="list-style-type: none"> - Cover all Emitters - Use of Radiation Status Indicators - Overt or Covert Plans 		SAW	AD AIRCRAFT	Weapon State Reports: <ul style="list-style-type: none"> - BITTER } - SUGAR } Reports - CANDY } 	
			Readiness States stated in time (mins) for each weapon	RS 15, 30 ,45 - Scramble Procedures		
ARMY (incl RM Rapier)	RAPIER	HVM	GBAD	AD AIRCRAFT	RAPIER	HVM
	USOPS EMCON 1 - 9	USOPS EMCON 1 - 9	RS 1 – RS 11	N/A	EQUIPMENT STATES 0 - 5	EQUIPMENT STATES 0 - 5
RAF	EMCON 1 - 9	N/A	GBAD	AD AIRCRAFT	RAPIER	HVM
			RS 1 – RS 11	RS 15, 30 ,45 - QRA(I) - Scramble Procedures	EQUIPMENT STATES 0 - 5	N/A

(INTENTIONALLY BLANK)

GLOSSARY OF TERMS AND DEFINITIONS

The reference for the terms and their definitions used in this Glossary is indicated in parentheses.

Active Air Defence

Direct defensive action taken to nullify or reduce the effectiveness of hostile air action. It includes such measures as the use of aircraft, air defence weapons, weapons not used primarily in an air defence role and electronic warfare. (AAP-6)

Air Battle Management

The control of all joint assets that operate in or influence the air environment during operations. (JWP 3-63)

Air Controller

An individual especially trained for and assigned the duty of the control (by use of radio, radar, or other means) of such aircraft as may be allotted to him for operation within his area. (AAP-6)

Air Defence

All measures designed to nullify or reduce the effectiveness of hostile air action. (AAP-6)

Air Defence Action Area

An area and the airspace above it within which friendly aircraft or surface-to-air weapons are normally given precedence in operations except under specified conditions. (AAP-6)

Air Defence Area

A specifically defined airspace for which air defence must be planned and provided. (AAP-6)

Air Defence Command

The authority and responsibility for the air defence of a designated area. (AAP-6)

Air Defence Commander

A duly appointed commander responsible for the air defence of a designated area. (AAP-6)

Air Defence Ground Environment

The network of ground radar sites and command and control centres within a specific theatre of operations which are used for the tactical control of air defence operations. (AAP-6)

Air Defence Identification Zone

Airspace of defined dimensions within which the ready identification, location, and control of aircraft is required. (AAP-6)

Air Defence Operations Area

A geographical area defining the boundaries within which procedures are established to minimize interference between air defence and other operations and which may include designation of one or more of the following:

- a. Air defence action area;
- b. Air defence area;
- c. Air defence identification zone;
- d. Firepower umbrella.

(AAP-6)

Air Defence Operations Centre

The principal information, communications and operations centre from which all AD aircraft, anti-aircraft operations, air defence artillery, guided missiles and air warning functions of a specific area of AD responsibility are supervised and co-ordinated.

(JWP 3-63)

Air Defence Region

A geographical subdivision of an air defence area. (AAP-6)

Air Defence Sector

A geographical subdivision of an air defence region. (AAP-6)

Air Interception

An operation by which aircraft effect visual or electronic contact with other aircraft.

(AAP-6)

Air Liaison Officer

A tactical air force or naval aviation officer attached to a ground or naval unit or formation as the advisor on tactical air operation matters. (AAP-6)

Air Picket

An airborne early warning aircraft positioned primarily to detect, report and track approaching enemy aircraft or missiles and to control intercepts. *Also called 'aerial picket'.* (AAP 6)

Air Policing (Area)

The use of interceptor aircraft, in peacetime, for the purpose of preserving the integrity of a specified airspace. (AAP-6)

Air Superiority

That degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea and air forces at a given time and place without prohibitive interference by the opposing force. (AAP-6)

Air Support

All forms of support given by air forces on land or sea. (AAP-6)

Air Supremacy

Air supremacy is defined as that degree of air superiority wherein the opposing air force is incapable of effective interference. (AAP-6)

Air Surveillance

The systematic observation of air space by electronic, visual or other means, primarily for the purpose of identifying and determining the movements of aircraft and missiles, friendly and enemy, in the air space under observation. (AAP-6)

Air Surveillance and Control System

An organization set up for:

- a. Air Surveillance.
- b. Control of all active air defences.

It comprises primarily of ADGE and AEW together with the necessary communications network. (JWP 3-63)

Air Surveillance Officer

An individual responsible for coordinating and maintaining an accurate, current picture of the air situation within an assigned airspace area. (AAP-6)

Airborne Alert

A state of aircraft readiness wherein combat-equipped aircraft are airborne and ready for immediate action. (AAP-6)

Airborne Early Warning and Control

Air surveillance and control provided by airborne early warning aircraft which are equipped with search and height-finding radar and communications equipment for controlling weapon systems. (AAP-6)

Aircraft Control Unit

A unit with facilities and personnel, including controllers, for conducting aircraft control and which exercises tactical control of aircraft or a unit(s). (AAP-6)

Aircraft Handover

The process of transferring control of aircraft from one controlling authority to another. (AAP-6)

Aircraft Scrambling

Directing the immediate take-off of aircraft from a ground alert condition of readiness. (AAP-6)

Airspace Control

A combination of airspace organisation planning procedures, the resulting control structure and co-ordinating functions to minimise risks and to allow for efficient and flexible use of airspace by all elements involved in air, land and sea operations.¹ (AAP-6)

Airspace Control Area

Airspace which is laterally defined by the boundaries of the area of operations. The airspace control area may be subdivided into airspace control sub-areas. (AAP-6)

Airspace Control Authority

The commander designated to assume overall responsibility for the operation of the airspace control system in the airspace control area. (AAP-6)

Airspace Control Boundary

The lateral limits of an airspace control area, airspace control sub-area, high-density airspace control zone or airspace restricted area. (AAP-6)

Airspace Control System

An arrangement of those organizations, personnel, policies, procedures and facilities required to perform airspace control functions. (AAP-6)

Airspace Restrictions

Special restrictive measures applied to segments of airspace of defined dimensions. (AAP-6)

All Weather Air Defence Fighter

A fighter aircraft with equipment and weapons which enable it to engage airborne targets in all weather conditions, day and night. (AAP-6)

Allocation

The translation of the apportionment into total numbers of sorties by aircraft type available for each operation or mission. (AAP-6)

¹ While airspace control is provided to promote greater flexibility of operations, the authority to approve, disapprove, or deny combat operations is vested only in the operational commander.

Allotment

The temporary change of assignment of tactical air forces between subordinate commands. The authority to allot is vested in the commander having operational command.² (AAP-6)

Apportionment

The quantification and distribution by percentage of the total expected effort, in relation to the priorities which are to be given to the various air operations in geographic areas for a given period of time. *See also allocation.*³ (AAP-6)

Area of Operational Interest

In air defence, an area in which automatic cross-telling of tracks of interest is provided to an adjacent site based on established criteria, such as identity and location. (AAP-6)

Area of Operations

An operational area defined by a joint commander for land or maritime forces to conduct military activities. Normally, an area of operations does not encompass the entire joint operations area of the joint commander, but is sufficient in size for the joint force component commander to accomplish assigned missions and protect forces. (AAP-6).

Area of Responsibility

The geographical area assigned to each NATO strategic command and to each regional command of Strategic Command Europe. (AAP-6)

Assign

To place units or personnel in an organization where such placement is relatively permanent, and/or where such organization controls and administers the units or personnel for the primary function, or greater portion of the functions, of the unit or personnel. (AAP-6)

² In UK doctrine, the process of allotment derives from the strategic estimate and is not limited to assignment of air forces; it is used in constructing the balanced force required to achieve the mission stipulated in the Jt Comd's directive to the JTFC. The authority to allot may be delegated to the Joint Task Force Commander.

³ In UK doctrine, apportionment applies to all types of effect, not just those applying to air forces; it is the responsibility of the JTFC. It will be used to prioritise and synchronise those tasks which must be carried out by component assets in order to achieve joint campaign objectives, with the required probability of success, in light of predicted availability of resources.

Associated Support

In naval usage, operations in which a designated unit operates independently of a specified force or group, but is tasked to provide contact information to, receive intelligence from and, if authorised, to co-operate and co-ordinate operations with the supported force. Tactical control of the unit remains with the assigning authority who co-ordinates tasking and movement of the unit in response to the requirements of the supported commander.⁴ (AAP-6)

Attach

To place units or personnel in an organization where such placement is relatively temporary. Subject to limitations imposed in the attachment order, the commander of the formation, unit, or organization receiving the attachment will exercise the same degree of command and control thereover as he does over the units and persons organic to his command. However, the responsibility for transfer and promotion of personnel will normally be retained by the parent formation, unit, or organization. (AAP-6)

Autonomous Operation

One mode of operation of a unit in which the unit commander assumes full responsibility for control of weapons and engagement of hostile targets. This mode may be either directed by higher authority or result from a loss of all means of communication. (AAP-6)

Ballistic Missile

Any missile which does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated. (AAP-6)

Broadcast Control

A form of aircraft mission control used in the absence of full capability or if the tactical situation precludes close or loose control, in which tactical/target information is passed to enable the aircraft to accomplish the assigned task. (JWP 0-01.1)

Carrier Air Group

A group of aircraft squadrons placed under a single command for administrative and tactical control of operations from an aircraft carrier. (AAP-6)

Cease Engagement

In air defence, a fire control order used to direct units to stop the firing sequence against a designated target. Guided missiles already in flight will continue to intercept. (AAP-6)

⁴ In UK doctrine, associated support is afforded a wider application in all types of air operations, *with the view that it may have utility for specifying degrees of support provided in other environments.*

Centralized Control

In air defence, the control mode whereby a higher echelon makes direct target assignments to fire units. *See also decentralized control.* (AAP-6)

Clear Weather Air Defence Fighter

A fighter aircraft with equipment and weapons which enable it to engage airborne targets by day and by night, but in clear weather conditions only. (AAP-6)

Close Control

A form of aircraft mission control in which the aircraft is continuously controlled for altitude, speed and heading, to a position from which the mission can be accomplished. (AAP-6)

Combat Air Patrol

An aircraft patrol provided over an objective area, over the force protected, over the critical area of a combat zone, or over an air defence area, for the purpose of intercepting and destroying hostile aircraft before they reach their target. (AAP-6)

Combat Available Aircraft

An aircraft capable of fulfilling its normally assigned mission. It will have its primary weapon system serviceable but may require to be fuelled, armed or have combat ready crews. (AAP-6)

Combat Ready Aircraft

A combat available aircraft which is fuelled, armed and has a combat ready aircrew available. *See also combat available aircraft.* (AAP-6)

Command

The authority vested in an individual of the armed forces for the direction, coordination, and control of military forces. (AAP-6)

Command Net

A communications network which connects an echelon of command with some or all of its subordinate echelons for the purpose of command control. (AAP-6)

Communications and Information System

Collective term for communication systems and information systems. (AAP-6)

Components

Force elements grouped under one or more component commanders subordinate to the operational level commander. (JWP 0-01.1)

Concept of Operations

A clear and concise statement of the line of action chosen by a commander in order to accomplish his mission. (AAP-6)

Control

That authority exercised by a commander over part of the activities of subordinate organizations, or other organizations not normally under his command, which encompasses the responsibility for implementing orders or directives. All or part of this authority may be transferred or delegated. (AAP-6)

Control and Reporting Centre

A subordinate air control element of the tactical air control centre from which radar control and warning operations are conducted within its area of responsibility. (AAP-6)

Controlled Airspace

An airspace of defined dimensions within which air traffic control service is provided to controlled flights. (AAP-6)

Controlled Interception

An aircraft intercept action wherein the friendly aircraft are controlled from a ground, ship, or airborne station. (AAP-6)

Co-ordinating Authority

The authority granted to a commander or individual assigned responsibility for co-ordinating specific functions or activities involving forces of two or more countries or commands, or two or more services or two or more forces of the same service. He has the authority to require consultation between the agencies involved or their representatives, but does not have the authority to compel agreement. In case of disagreement between the agencies involved, he should attempt to obtain essential agreement by discussion. In the event he is unable to obtain essential agreement he shall refer the matter to the appropriate authority. (AAP-6)

Correlation

In air defence, the determination that an aircraft appearing on a detection or display device or visually, is the same as that on which information is being received from another source.⁵ (AAP-6)

⁵ In UK doctrine, correlation is applied to any type of track information.

Counter-Air Operation

An air operation directed against the enemy's air offensive and defensive capability in order to attain and maintain a desired degree of air superiority. (AAP-6)

Day Air Defence Fighter

A fighter aircraft with equipment and weapons which enable it to engage airborne targets, but in clear weather conditions and by day only. (AAP-6)

Decentralized Control

In air defence, the normal mode whereby a higher echelon monitors unit actions, making direct target assignments to units only when necessary to insure proper fire distribution or to prevent engagement of friendly aircraft. (AAP-6)

Delegation of Authority

An action by which a commander assigns to a subordinate commander a clearly stated part of his authority. (AAP-6)

Deployment Operating Base

A base, other than the peacetime base, having minimum essential operational and support facilities, to which a unit or part of a unit will deploy to operate from in time of tension or war. (AAP-6)

Direct Support

1. The support provided by a unit not attached to or under the command of the supported unit or formation, but required to give priority to the support required by that unit or formation.
2. In maritime usage, operations related to the protection of a specific force by other units, normally under the tactical control of that force. (AAP-6)

Directive

1. A military communication in which policy is established or a specific action is ordered.
2. A plan issued with a view to putting it into effect when so directed, or in the event that a stated contingency arises.
3. Broadly speaking, any communication which initiates or governs action, conduct, or procedure. (AAP-6)

Drone

An unmanned vehicle which conducts its mission without guidance from an external source. (AAP-6)

Early Warning

Early notification of the launch or approach of unknown weapons or weapons carriers. *Also called air defence early warning.* (AAP-6)

Electronic Countermeasures

That division of electronic warfare involving actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum through the use of electromagnetic energy. There are three subdivisions of electronic countermeasures: electronic jamming, electronic deception and electronic neutralization. (AAP-6)

Electronic Intelligence

Intelligence derived from electromagnetic non-communications transmissions by other than intended recipients or users. (AAP-6)

Electronic Protective Measures

That division of electronic warfare involving actions taken to ensure friendly effective use of the electromagnetic spectrum despite the enemy's use of electromagnetic energy. There are two subdivisions of electronic protection measures: active electronic protection measures and passive electronic protection measures. (AAP-6)

Electronic Warfare

Military action to exploit the electromagnetic spectrum encompassing: the search for, interception and identification of electromagnetic emissions, the employment of electromagnetic energy, including directed energy, to reduce or prevent hostile use of the electromagnetic spectrum, and actions to ensure its effective use by friendly forces. (AAP-6)

Electronic Warfare Support Measures

That division of electronic warfare involving action taken to search for, intercept, and identify and electromagnetic emissions and to locate their sources for the purpose of immediate threat recognition. It provides a source of information required for immediate decisions involving electronic countermeasures, electronic protection measures and other tactical actions. (AAP-6)

Emission Control

Selective control of emitted electromagnetic or acoustic energy. The aim may be twofold:

- a. to minimize the enemy's detection of emissions and exploitation of the information so gained,
- b. to reduce electromagnetic interference thereby improving friendly sensor performance. (AAP-6)

Engage

In air defence, a fire control order used to direct or authorize units and/or weapon systems to fire on a designated target. (AAP-6)

Engagement Control

In air defence, that degree of control exercised over the operational functions of an air defence unit that are related to detection, identification, engagement, and destruction of hostile targets. (AAP-6)

Favourable Air Situation

A situation in which the extent of air effort applied by enemy air forces is insufficient to prejudice the success of friendly land, sea, or air operations. (JWP 0-01.1)

Fighter Cover

The maintenance of a number of fighter aircraft over a specified area or force for the purpose of repelling hostile air activities. (AAP-6)

Fighter Sweep

An offensive mission by fighter aircraft to seek out and destroy enemy aircraft or targets of opportunity in an allotted area of operations. (AAP-6)

Fire-Control

The control of all operations in connection with the application of fire on a target. (AAP-6)

Fire-Control Radar

Radar used to provide target information inputs to a weapon fire control system. (AAP-6)

Fire-Control System

A group of interrelated fire control equipments and/or instruments designed for use with a weapon or group of weapons. (AAP-6)

Fire-Power Umbrella

An area of specific dimensions defining the boundaries of the airspace over a naval force at sea within which the fire of ships anti-aircraft weapons can endanger aircraft, and within which special procedures have been established for the identification and operation of friendly aircraft. (AAP-6)

Fire Unit

The smallest artillery or mortar organization, consisting of one or more weapon systems, capable of being employed to execute a fire mission. (AAP-6)

Friend(ly)

In identification, the designation given to a track, object or entity belonging to a declared, presumed or recognised friendly nation, faction or group. (JWP 3-63)⁶

Functional Command

A command organization based on military functions rather than geographic areas. (AAP-6)

Functional Control

The authority vested in a commander of one of the Services, a specialist agency, or MOD branch acting on behalf of a Service board of the Defence Council, to direct the method of operation and manner of employment of the Service units under their control in order to achieve a policy objective. (JWP 0-01.1)

Ground Alert

That status in which aircraft on the ground/deck are fully serviced and armed, with combat crews in readiness to take off within a specified short period of time (usually 15 minutes) after receipt of a mission order. (AAP-6)

Ground-Controlled Interception

A technique which permits control of friendly aircraft or guided missiles for the purpose of effecting interception. (AAP-6)

High Density Airspace Control Zone

Airspace of defined dimensions, designated by the airspace control authority, in which there is a concentrated employment of numerous weapons/airspace users. (AAP-6)

Hold Fire

In air defence, an emergency order to stop firing. Missiles already in flight must be prevented from intercepting, if technically possible. (AAP-6)

Hostile

In identification, the designation given to a track, object or entity whose characteristics, behaviour or origin indicate that it is a threat to friendly forces. Note: designation as Hostile does not necessarily imply clearance to engage. (JWP 3-63)⁷

Identification

The determination of the origin, nature, and characteristics of a detected person, object or phenomenon. This may be accomplished by various means including visual recognition, electronic interrogation, flight plan correlation and the interpretation of acoustic information, behaviour and/or hostile action. (AAP-6)

⁶ Proposal for AAP-6.

⁷ Proposal for AAP-6.

Joint Airspace Co-ordination Cell

A joint cell with appropriate representation from the components and, if applicable, host and coalition nations, to provide the Airspace Control Authority with the capability to plan, coordinate, integrate and regulate Airspace Control within the Joint Operations Area. (JWP 3-34.1)

Joint Commander

The Joint Commander, appointed by CDS, exercises the highest level of operational command (OPCOM) of forces assigned with specific responsibility for deployment, sustainment and recovery. (JWP 0-01.1)

Joint Force Commander

A general term applied to a commander authorised to exercise operational command or control over a joint force. (JWP 0-01.1)

Joint Operations Area

An area of land, sea and airspace, defined by higher authority, in which a designated Joint Task Force Commander plans and conducts military operations to accomplish a specific mission. A Joint Operations Area including its defining parameters, such as time, scope and geographic area, is contingency/mission-specific. (JWP 0-01.1)

Joint Task Force Commander

The operational commander of a nominated joint force. (JWP 0-01.1)

Local Air Picture

A manually- or electronically-produced display compiled from a combination of local sources covering a limited three-dimensional volume of interest. Sources could include local Air Traffic Control radars, other short-range radars and position reporting by transiting aircraft. The Local Air Picture may be associated with the area of Air Defence responsibility of a Local Air Defence Commander. Those contacts within the Local Air Picture which are of value to the Recognised Air Picture should be exported to the latter. (JWP 3-63)

Loose Control

A form of aircraft mission control in which the aircraft commander selects his own speed, altitude, heading and the appropriate tactics required to accomplish the assigned task. The controlling unit will advise the aircraft of the current tactical picture and will provide further advice if and when available. (STANAG 3993)

Neutral

In identification, the designation given to a track, object or entity whose characteristics, behaviour, origin or nationality indicate that it is neither supporting nor opposing friendly forces. (JWP 3-63)⁸

⁸ Proposal for AAP-6.

Offensive Counter Air Operation

An operation mounted to destroy, disrupt or limit enemy air power as close to its source as possible. (AAP-6)

Operational Command

The authority granted to a commander to assign missions or tasks to subordinate commanders, to deploy units, to reassign forces, and to retain or delegate operational and/or tactical control as may be deemed necessary. Note: it does not include responsibility for administration. (AAP-6)

Operational Control

The authority delegated to a commander to direct forces assigned so that the commander may accomplish specific missions or tasks which are usually limited by function, time, or location; to deploy units concerned, and to retain or assign tactical control of those units. It does not include authority to assign separate employment of components of the units concerned. Neither does it, of itself, include administrative or logistic control. (AAP-6)

Passive Air Defence

All measures, other than active air defence, taken to minimise the effectiveness of hostile air action. These measures include deception, dispersion, and the use of protective construction. (AAP-6)

Recognised Air Picture (RAP)

An electronically-produced display compiled from primary and secondary radar, and Electronic Support Measures sources covering a three-dimensional volume of interest in which all detected air contacts have been evaluated against specific threat parameters and then assigned a recognition category and track number. (JWP 0-01.1)

Recognised Land Picture (RLP)

The fullest achievable agreed level of identification and tracking of all land surface contacts in the area of interest. The Recognised Land Picture is normally associated with the Recognised Air Picture of the same area. (IJWP 3-30 & JWP 3-63)

Recognised Maritime Picture (RMP)

The fullest achievable agreed level of identification and tracking of all surface and sub-surface contacts in the area of interest. The Recognised Maritime Picture is normally associated with the Recognised Air Picture of the same area. (JWP 0-01.1)

Recognition

The determination of the nature of a detected person, object or phenomenon, and possibly its class or type. This may include the determination of an individual within a particular class or type. (AAP-6)

Rules of Engagement

Directives issued by competent military authority which specify the circumstances and limitations under which forces will initiate and/or continue combat engagement with other forces encountered. (AAP-6)

Strike

An attack which is intended to inflict damage on, seize, or destroy an objective. (AAP-6) *See also 'Attack'.*

Suppression of Enemy Air Defences

That activity which neutralises, temporarily degrades or destroys enemy air defences by a destructive and/or disruptive means. (AAP-6)

Surface-to-Air Weapons

A surface launched or fired weapon for use against air targets. Surface-to-air weapons include surface-to-air missiles and anti-aircraft artillery. (JWP 3-63)

Supported Commander

A commander having primary responsibility for all aspects of a task assigned by higher authority. (JWP 0-01.1)

Supporting Commander

A commander who furnishes forces, logistics or other support to a supported commander, or who develops a supporting plan. (JWP 0-01.1)

Tactical Air Operation

The employment of air power in co-ordination with ground or naval forces to:

- a. attain and maintain air superiority;
- b. prevent movement of enemy forces into and within the combat zone and to seek out and destroy these forces and their supporting installations; and
- c. assist in attaining ground or naval forces objectives by combined/joint operations.

(AAP-6)

Tactical Battle Management Functions

A method of division of Air Defence Commander functions within NATO Air Defence forces which can then be discretely and flexibly delegated for use, including engagement authority, identification and recognition authority, authority to activate airspace control measures, and emission control. Delegation may be restricted in terms of unit, area or time. They should be delegated early enough to that level from which they can be executed most effectively. They may be reassumed by higher authorities at any time. (JWP 3-63)

Tactical Command

The authority delegated to a commander to assign tasks to forces under his command for the accomplishment of the mission assigned by higher authority. (AAP-6)

Tactical Control

The detailed and, usually, local direction and control of movements or manoeuvres necessary to accomplish missions or task assigned. (AAP-6)

Theatre Missiles

Ballistic, cruise and air-to-surface missiles whose targets are within a given theatre of operations, with a range of a few hundred to several thousand miles.⁹ (JWP 3-63)

Theatre Missile Defence

The identification, integration, and employment of forces, supported by other theatre and national capabilities (if available), to detect, locate, identify, track, minimise the effects of, and/or destroy Theatre Missiles. (JWP 3-63)

Theatre Missile Defence System

A system or systems with applicable capabilities that may be used to support passive defence measures, active defence measures, counter-force operations and the C4I and countermeasures required to counter a Theatre Missile threat. (JWP 3-63)

Unknown

In identification, the designation given to an evaluated track, object or entity that has not been identified. (JWP 3-63)¹⁰

Unmanned Aerial Vehicle

A powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal and non-lethal payload. Ballistic or semi-ballistic vehicles, cruise missiles, and artillery projectiles are not considered unmanned aerial vehicles. (JWP 3-63)

Weapon Engagement Zone

In air defence, airspace of defined dimensions within which the responsibility for engagement normally rests with a particular weapon system. (AAP-6)

Weapons Free

In air defence, a weapon control order imposing a status whereby weapons systems may be fired at any target not positively recognized as friendly. (AAP-6)

Weapons Hold

In air defence, a weapon control order imposing a status whereby weapons systems may only be fired in self-defence or in response to a formal order. (AAP-6)

Weapons Tight

In air defence, a weapon control order imposing a status whereby weapons systems may be fired only at targets recognized as hostile. (AAP-6)

⁹ Shorter-range direct fire missiles, bombs, and rockets, even those that may pose a Nuclear, Chemical or Biological (NBC) threat, are not considered as 'Theatre Missiles' for the purposes of this publication. Of primary concern are the increasingly accurate ballistic and cruise missiles armed with conventional or NBC warheads.

¹⁰ Proposal for AAP-6.

GLOSSARY OF ABBREVIATIONS

AAA	Anti-Aircraft Artillery
AAAD	All Arms Air Defence
AAC	Army Air Corps
ACCS	Air Command and Control System
ACE	Airborne Command Element
ADAD	Air Defence Alerting Device
ADCIS	Air Defence Command and Information System
AAR	Air-to-Air Refuelling
AAW	Anti-Air Warfare
AAWC	Anti-Air Warfare Commander
ACA	Airspace Control Authority
ACC	Air Control Centre
ACM	Airspace Control Measures
ACO	Airspace Control Order
ACP	Airspace Control Plan
ACR	Airspace Control Request
ACS	Airspace Control System
ACU	Aircraft Control Unit
AD	Air Defence
ADC	Air Defence Commander
AEW	Airborne Early Warning
AI	Air Interdiction
ALO	Air Liaison Officer
AO	Area of Operations
AOC	Air Operations Centre
AOCC(M)	Air Operations Co-ordination Centre (Maritime)
AOCC(L)	Air Operations Co-ordination Centre (Land)
APOD	Air Port of Disembarkation
ARM	Anti-Radiation Missile
ARRC	ACE Rapid Reaction Corps
ASACS	Airspace Surveillance and Control System
ASC	Airspace Control
ASM	Air Surveillance Manager
ATC	Air Traffic Control
ATM	Air Tasking Message
ATO	Air Tasking Order
AWACS	Airborne Warning and Control System
BADC	Brigade Air Defence Cell
BC	Battery Commander
BCD	Battlefield Co-ordination Detachment

BOC	Base Operations Centre
C2	Command and Control
C4I	Command, Control, Communications, Computers and Intelligence
CAD	Close Air Defence
CADA	Co-ordinated Air Defence Area
CADIMS	Co-ordinated Air Defence in Mutual Support
CAG	Carrier Air Group
CAOC	Combined Air Operations Centre
CAP	Combat Air Patrol
CAS	Close Air Support
CASP	Co-ordinated Air/Sea Procedures
CCF	Conventional Counter-force
CIS	Communications and Information Systems
CIWS	Close-In Weapon System
CJFORT	Chief of Joint Force Operational Readiness and Training
CJO	Chief of Joint Operations
CJTF	Combined Joint Task Force (NATO) / Commander Joint Task Force (US)
CLAMP	Co-ordinated Land/Air/Maritime Procedures
CM	Cruise Missile
COMAO	Composite Air Operations
CP	Control Post
CRC	Control and Reporting Centre
CRP	Control and Reporting Post
CTG	Commander Task Group
CVS	Aircraft Carrier, ASW
CWC	Composite Warfare Commander
DADC	Divisional Air Defence Cell
DAPL	Defended Asset Priorities List
DCA	Defensive Counter Air
DIS	Defence Intelligence Staff
DSAP	Distributed Situational Awareness Picture (RAP Troop)
ECM	Electronic Counter Measures
EMCON	Emission Control
EO	Electro-Optical
EPM	Electronic Protection Measures
ESM	Electronic Warfare Support Measures
EW	Electronic Warfare/Early Warning

FADC	Formation Air Defence Cell
FCC	Fire Control Centre
FCO	Fire Control Order
FEZ	Fighter Engagement Zone
FGA	Fighter Ground Attack
FLOT	Forward Line of Own Troops
FSCL	Fire Support Co-ordination Line
FSE	Fire Support Element
GBAD	Ground Based Air Defence
GRAP IOC	GBAD Recognised Air Picture Interim Operating Capability
HVM	High Velocity Missile
ICC	Initial CAOC Capability
IFF	Identification Friend of Foe
ISTAR	Intelligence, Surveillance Target Acquisition Reconnaissance
JACC	Joint Airspace Control Centre
JAOC	Joint Air Operations Centre
JAOP	Joint Air Operations Plan
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
JFPG	Joint Force Planning Group
JFLCC	Joint Force Land Component Commander
JFLogCC	Joint Force Logistic Component Commander
JFMCC	Joint Force Maritime Component Commander
JIPTL	Joint Integrated Prioritised Target List
JITL	Joint Integrated Target List
JLV	JTIDS Link Vehicle (RAP Troop)
JOA	Joint Operations Area
JOC	Joint Operations Centre
JPITL	Joint Prioritised Integrated Target List
JRRF	Joint Rapid Reaction Force
JTCB	Joint Targeting Co-ordination Board
JTFC	Joint Task Force Commander
JTFHQ	Joint Task Force Headquarters
JTIDS	Joint Tactical Information Distribution System
LAAWC	Local Anti-Air Warfare Co-ordinator
LADC	Local Air Defence Commander
LADCP	Local Air Defence Command Post
LAP	Local Air Picture

LML	Lightweight Multiple Launcher
LOS	Line of Sight
LRSAM	Long Range Surface to Air Missile
MAAP	Master Air Attack Plan
MCE	Maritime Co-ordination Element
MRSAM	Medium Range Surface to Air Missile
MTI	Moving Target Indication
MEZ	Missile Engagement Zone
NAEWFOR	NATO Airborne Early Warning Force
NCTR	Non-Co-operative Target Recognition
OCA	Offensive Counter Air
OISG	Operational Intelligence Support Group
OTC	Officer in Tactical Command
OPCOM	Operational Command
OPCON	Operational Control
PJHQ	Permanent Joint Headquarters (UK)
PPLI	Precise Participant Location and Identification
RAP	Recognised Air Picture
RCS	Radar Cross Section/Rapier Control System
ROE	Rules of Engagement
RWR	Radar Warning Receiver
SADC	Sector Air Defence Commander
SADO	Senior Air Defence Officer
SAM	Surface to Air Missile
SAW	Surface to Air Weapon
SHORAD	Short Range Air Defence
SHORADEZ	Short Range Air Defence Engagement Zone
SIFF	Successor IFF
SK	Sea King (RN helicopter)
SOP	Standard Operating Procedure
SPINS	Special Instructions
SSR	Secondary Surveillance Radar
TACC	Tactical Air Control Centre
TACCS	Theatre Air Command and Control System
TAM	Tactical Aerodynamic Missile
TASM	Tactical Air to Surface Missile
TBM	Theatre Ballistic Missile

TBMF	Tactical Battle Management Function
TDL	Tactical Data Link
TEM	Target Engagement Message
TPA	Track Production Area
TST	Time Sensitive Targeting
UAV	Unmanned Aerial Vehicle
UCAV	Unmanned Combat Air Vehicle
VSHORAD	Very Short-Range Air Defence
WCO	Weapon Control Order
WEZ	Weapon Engagement Zone
WOC	Wing Operations Centre

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