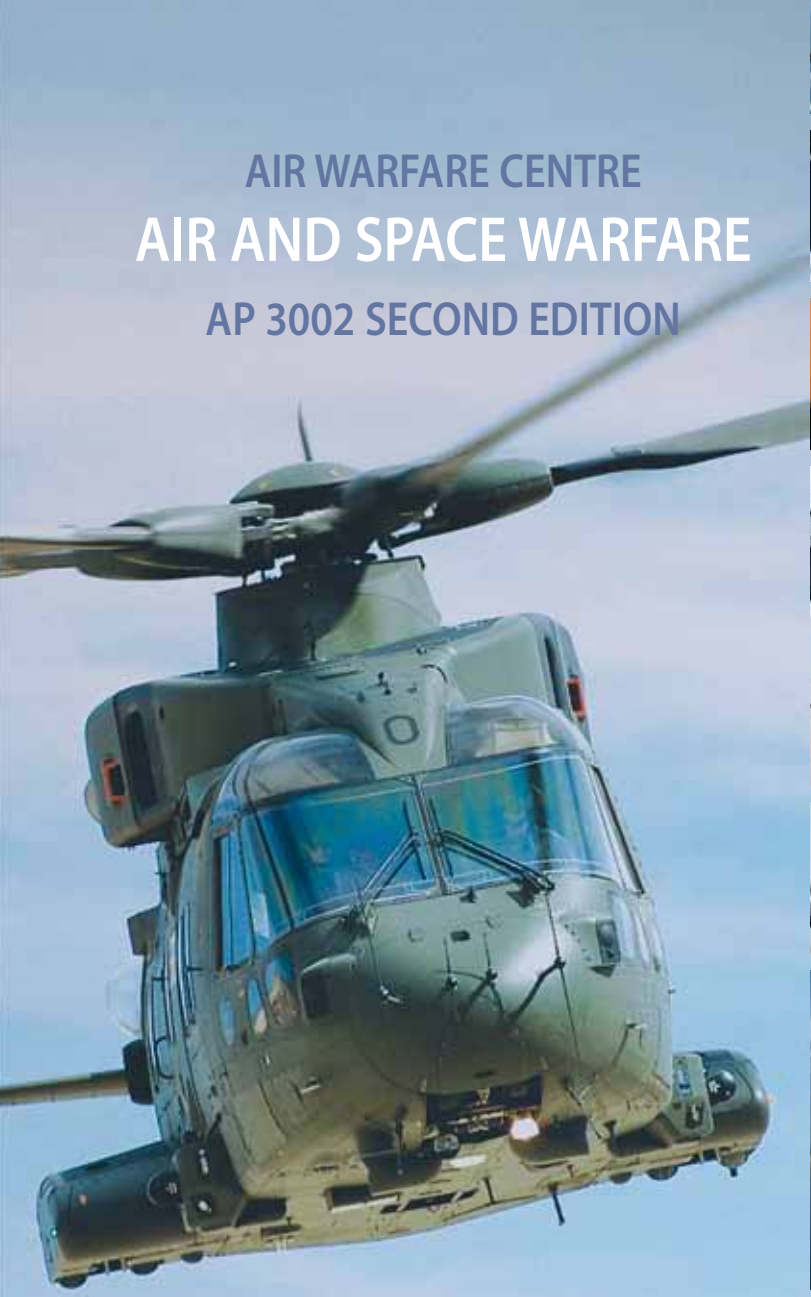
AIR WARFARE CENTRE

AIR AND SPACE WARFARE

AP 3002 SECOND EDITION



AP 3002

AIR AND SPACE WARFARE

SECOND EDITION

AIR WARFARE CENTRE
RAF WADDINGTON

CONDITIONS OF RELEASE

FOREWORD

AIR WARFARE CENTRE COMMANDANT
AIR CDRE E STRINGER CBE BEng RAF

"The very flexibility of air forces makes true cooperation essential. Air forces, at very short notice, can be switched from one sort of target to another and, within limits, from one type of operation to a quite different type. There is, therefore, a constant temptation to use them piecemeal to meet an immediate requirement, rather than to use them on a long-term joint plan, and to utilize their flexibility in the methods of achieving a consistent aim which is an integral part of our government's policy and our strategy to implement that policy."

Air Marshal Sir John Slessor

All too often the warnings of Air Marshal Slessor risk being ignored; it is therefore essential that all airmen understand, and are able to articulate the essence of air power, air operations and air warfare (including the application of space capabilities) if we are to contribute most effectively to the joint fight. AP 3002 will assist us in this endeavour.

Control of the air represents a massive asymmetric advantage, but it would be wrong to assume that because UK Forces have typically enjoyed it, that they will always continue to do so. Current dominance of the air is derived from investment in the technical and tactical excellence of western air forces.

It is unlikely to remain unchallenged. Non-western high performance fighters and advanced Surface-to-Air Missiles (SAMs) have been exported to potential adversaries and represent potent threats, indicating that the need to control the air (or deny it to an enemy) are lessons that have been learned across the globe.

Similarly, space capabilities offer a significant asymmetric advantage in terms of force enhancement, which has resulted in approximately 90% of UK military capability being reliant on space in some form. With the advent of fielded anti-satellite systems and cyber technologies, our access to space is not assured and thus, we must understand space power in order to exploit its strengths and mitigate its weaknesses. Space, as a

contested environment, will present new challenges and threats to military commanders, who may have to attain freedom of action in space in order to ensure freedom of action in the other domains.

Air and space operations, and by implication, joint operations are thus likely to be more demanding and more complex in future. Russia has recently resumed long-range air operations over the Atlantic and Pacific for political and strategic effect, which, together with the potential for asymmetric air attack demonstrated by 9/11, has reinforced the RAF's importance in maintaining the integrity of national airspace.

Similarly, the development of anti-satellite weapons in China and other countries will hold at risk those space capabilities upon which UK Forces rely. To operate effectively, any future joint force must have the assured air and space capabilities to win and maintain control of the air, and only a balanced air force, enabled by space, can hope to meet the range of scenarios that the UK could be confronted with.

AP 3002 is the companion publication to AP 3000 (British Air and Space Power Doctrine). It builds on the 'what and why' of AP 3000 and captures those established and emerging practices that guide 'how' air forces plan and conduct air and space warfare. In addition, it complements subordinate publications such as the AWC Tactics Manuals 'use of systems' series.

This document is for the benefit and education of all members of the RAF and is applicable to all units and personnel. Whilst authoritative, AP 3002 does not consist of procedures to be applied in specific situations, rather it sets out general guidance that will require judgment by commanders at all levels prior to application. Readers of AP 3002 are encouraged to contribute to the further development of air and space warfare doctrine through the SO1 Doctrine, (AWC-Ops Doctrine SO1), Air Warfare Centre, Thomson Building, RAF Waddington, Lincoln, Lincolnshire, LN5 9WA.

Dated: Nov 09

AP 3002 is sponsored by the Assistant Chief of the Air Staff and authored by the Air Warfare Centre.

PREFACE

Purpose and Context

The purpose of AP 3002 is to introduce RAF personnel to the fundamentals of air and space warfare as they might apply in the 'most likely' interoperability scenarios articulated in Defence Strategic Guidance. The principles espoused are equally applicable to all scenarios; however, structures and manning levels will vary for any given operation depending on whether operations are US-led, NATO-led, UK-led within a NATO framework, multinational coalition or UK standalone.

AP 3002 addresses the command and direction of air and space power at the operational level in pursuit of strategic level objectives and execution at the tactical level. It is focused on the employment of air forces in expeditionary warfare, though operations of a non-expeditionary nature are not excluded.

AP 3002 is not RAF-specific and recognizes that air and space operations encompass single-Service, Allied, multinational and national joint operations. Where it is advantageous, RAF doctrine and practices should reflect those of our major allies in order that RAF senior commanders and staff can operate efficiently in a NATO or multinational headquarters.

These considerations have been borne in mind during the development of this publication, and the reader will appreciate that much of the terminology used, and the generic command structure described, reflect these probabilities. Where there are fundamental differences in UK-only operations then they are brought out within the publication.

Caveats

AP 3002 draws material from a number of Allied Joint Publications (AJPs), national Joint Warfare / Doctrine Publications (JWPs / JDPs), Allied Tactical Publications (ATPs) and SOPs ratified and / or adopted by the UK. In addition, US Multi-Service TTPs have been used to provide details of current 'theatre' practice that has yet to be articulated in NATO or national doctrine.

However, to keep AP 3002 to a manageable size its scope has been limited to that of a general overview of the many aspects associated with operational planning, deploying, commanding and controlling, employing and executing air and space warfare. It is not intended to be a 'one-stop' shop and the level of detail in any particular area is necessarily limited. Readers who require authoritative direction must refer to the appropriate doctrine publication.

LINKAGES AND ORIGINAL SOURCE DOCUMENTS

AP 3000	*British Air and Space Doctrine*
AJP 3.3	*Joint Air and Space Doctrine*
IJWP-3.30	*Joint Air Operations*
AJP 3.3.1	*Counter-air*
JWP-3.63	*Joint Air Defence*
JWP-3.63.1	*Joint Ground-Based Air Defence*
JWP-3.63.1.1	*Joint GBAD Fighting Book*
AJP-3.3.2	*Air Interdiction and Close Air Support*
ATP-3.3.2.1	*Close Air Support TTP*
AJP-3.3.3	*Air Maritime Coordination*
ATP-3.3.3.1	*Air Maritime Coordination TTP*
AJP-3.4.3	*Air-to-Air Refuelling*
AJP-3.3.4.3	*Air Transport*
AJP-3.3.5	*Airspace Control*
ATP-3.3.5.1	*Airspace Control TTP*
JDP-3.70	*Battlespace Management*
JDP-3.64	*Joint Force Protection*
AP 3241	*Force Protection for Air Operations*
AP100C-72	*Air Operations Logistics Doctrine*
ATP-49 Vol 1	*Use of Helicopters in Land Operations*
ATP-49 Vol 2	*Use of Helicopters in Land Operations TTP*
AJP-3.6	*Electronic Warfare*
AJP-3.9	*Joint Targeting*
JWP-3-60	*Information Operations*
ATP-10	*Personnel Recovery*
ATP-62	*Search and Rescue*
JWP-3.66	*Joint Personnel Recovery*
AJP-2.7	*Reconnaissance and Surveillance*
	JEACHQ SOPS
	HQ Air Command A5 Staff Planning Guide
ALSA MTTP	*Joint Fires*
ALSA MTTP	*Kill Box Procedures*
JSP 398	*UK National ROE*

UK and NATO publications are hosted on the RLI at the following site:

http://www.dcdc.dii.r.mil.uk/Objects/5/6E0CC45E3FF746A7A631CDD47A82C9AC.htm

CONTENTS

CHAPTER 1

THE BASIC PRINCIPLES

"Get your principles straight; the rest is a matter of detail."

Napoleon

INTRODUCTION

Air power is not synonymous with the Royal Air Force - all environmental forces, whether sea, land or air, possess air capabilities and forces that may be made available for joint air operations under a Joint Force Commander (JFC). However, it is important to understand that maritime or land organic air capabilities / forces, used by the components as an integral part of their own operations, are not considered to be joint air assets until such time that they are released for air component tasking.

Notwithstanding, such assets must adhere to the guidance provided by applicable plans, orders and Special Instructions (SPINS) to assure deconfliction, minimize the risk of fratricide and optimize joint force capabilities in support of the JFC's objectives.

JOINT AND MULTINATIONAL AIR AND SPACE OPERATIONS

Success in joint operations invariably relies on synergies achieved when operations are fully integrated. This cannot be achieved through the simple segregation of joint force elements by division of the battlespace into smaller areas of operations.

Indeed, that may create competition for scarce, high-demand and generally low-density capabilities and may effectively reduce overall combat effectiveness, particularly when aircraft offer the ability to operate over the entire battlespace, generally unaffected by the physical limitations that constrain surface forces.

Similarly, the employment of satellites enables over flight of hostile territory without legal restriction, at altitudes beyond the range of most adversary weapon systems [1]. The use of airspace must not be constrained by overly restrictive airspace or fire support control measures. It is also important to understand the factors that affect capability and integration.

Interoperability

Interoperability is essential to operational effectiveness and is achieved through commonality of equipment and design, or mitigated through the adoption of common doctrine and procedures.

Language and Culture

Language and cultural differences will often dictate the overall level of integration that can be achieved, which may have an adverse impact on a commander's decision cycle.

NOTE: A common language does not infer a common culture.

Political Cohesion

The political cohesion of coalitions can vary significantly, depending on their composition and external strategic circumstances, and there is a real likelihood of shifting national political objectives impacting significantly on how air and space operations are conducted.

Perceptions

Perceptions of conflict, whether within the mind of the coalition, the enemy, non-combatants or neutrals, may differ between nations and coalition partners; consequently the end-state and the manner in which a conflict has to be resolved may be more, or less, important to the different parties.

[1] *The exception being those few nations that possess operational anti-satellite systems.*

Training and Exercises

Training and exercises are essential in determining the likelihood of operational success in complex joint and multinational air operations. The goal for any training is to have personnel train with realism and intensity. Whilst specific space training and exercising opportunities are limited, all other joint, Allied and single-Service exercises and war games should have a space element.

Such training is critical to war fighting and the subsequent ability for personnel to efficiently and effectively integrate into whatever environment they are thrust, invariably at short notice. Experience in war and peace has shown that effectiveness and aircrew survivability increase dramatically with combat experience.

To that end, the aim of any peacetime training must be to provide the most realistic quality and quantity of training that resources can support.

- **Operational Training.** It is essential that operational training involves all command echelons if we are to understand, develop and assess the operational preparedness of those Force Elements (FE) involved. Joint exercises that focus solely on force engagement are generally of poor value as they do not address strategy and hence restrain participants to thinking only at the tactical level.
- **Exercises.** Exercises must be appropriate and should be planned and conducted in a way that replicates live operations and, where appropriate, combat situations by both night as by day. Moreover, the complete air and space warfare process from policy, through strategy, to task must be exercised on a regular basis. Those that are conducted on too small a scale, or ones that are limited in scope, risk teaching the wrong lessons and may lead to inappropriate conclusions.
- **Validation.** Validation must be conducted through rigorous analysis and meaningful assessment in order to provide an essential basis for subsequent joint and multinational operational planning.

Flight Safety.

Flight Safety (FS) dictates a balance be struck between realistic training and ensuring that combat ready assets are available when operations start. A disciplined and FS conscious organization must be maintained as tension rises to prevent unnecessary losses of valuable assets.

THE FOUR AIR POWER ROLES

Air and space power capabilities can be defined in terms of four fundamental roles, from which all other activities flow. These are control of the air and space, air mobility, intelligence and situational awareness, and attack.

Furthermore, the full exploitation of air and space power depends upon the two key enabling functions of air-minded Force Protection (FP) and air logistics.

AIR COMPONENCY

The JFC could elect to plan, direct and control joint air operations from his own HQ when the duration and scope of air operations are of a very limited nature. In that case, his staff would be augmented by appropriate component Subject Matter Expert (SME) staff to perform specialist functions and assist in planning and coordination [2]. However, it is more usual for the JFC to appoint a Joint Force Air Component Commander (JFACC) to command and control air operations.

The JFACC is usually nominated from the component with the preponderance of air assets and the capability to plan, task and control joint air operations (usually an aviator but not necessarily an air force officer). He plans, coordinates, allocates, controls and tasks joint air operations based on the JFC's guidance and objectives, in accordance with the air apportionment decision and the authority, relationships and responsibilities laid down by the JFC.

The JFACC may also be nominated to plan, task and coordinate space operations in support of the JFC's objectives, although Tactical Control [3] (TACON) for space capabilities will reside with the asset owner / operator.

Factors that are considered in determining whether or not to appoint a JFACC centre on scale and span of control. For example, does the JFC have the capacity and ability to effectively manage the responsibilities of a JFACC? Span of control is based on the number of subordinates, number of activities, range of weapon systems, force capabilities, the size and complexity of the operating area and the method used to control operations (centralized or decentralized).

AIR COMMAND AND CONTROL PRINCIPLES

The versatility of air and space forces makes identifying an objective particularly important. From the outset of operations, air and space forces can pursue strategic, operational or tactical objectives, in any combination, or all three simultaneously. It is therefore essential that a degree of unified action is taken to effectively exploit potentially diverse and multiple tasks simultaneously. Unified action in planning and conducting air and space operations is achieved using a number of key principles.

Unity of Command

Unity of the air effort is achieved when assets are commanded from the highest practicable level that the relative priorities of conflicting demands for assets can best be assessed.

Centralized Planning

Centralized planning of the air effort is essential to ensure that operations are effectively integrated in order to meet the JFC's overall intent and avoid mutual interference. Centralization allows, generally limited, air and space assets to be concentrated at the critical time and place to achieve decisive results, maximizing joint synergy. It also prevents assets being randomly tasked by uncoordinated users against impractical objectives or being divided into small and ineffective packages that would inhibit flexibility and hinder

[2] For the UK this concept is encapsulated in a Memorandum of Understanding between the JFHQ and the UK JFACHQ.

[3] TACON is the detailed, and often usually local, direction and control of movements or manoeuvres necessary to accomplish missions or tasks assigned.

rapid concentration of force. Although the provision of space capabilities should form an essential part of any commander's plan, the global nature of space power usually requires space asset apportionment to be conducted separately to theatre planning processes.

Centralized Control

Centralized control places responsibility and authority for planning, directing and coordinating air capabilities with a single commander. It maximizes operational effectiveness and avoids duplication of effort by allowing prioritization, synchronization [4], integration [5] and deconfliction [6] of the actions of assigned, attached and supporting capabilities in time, space and purpose to achieve objectives as rapidly and as effectively as possible.

Decentralized Execution

Decentralized execution delegates execution authority to responsible and capable subordinate commanders to allow them to make on-scene decisions that exploit opportunities in complex, rapidly changing or fluid situations. It provides for maximum responsiveness to cope with the uncertainty, disorder and fluidity of operations and makes it possible to generate the tempo of operations.

Strategy-to-task

Strategy-to-task [7] and the principle of objectives shape priorities and seek to avoid the siphoning of FE to fragmented objectives. To optimize finite resources the objective of every air and space task must be linked to the aim of the overall strategy. The strategy must also be linked through the operational level to what is actually realistic and achievable. It is of prime importance for the operational level commander to clearly understand how his activities mesh with the other strategic lines of operation.

Initiative

Initiative can be developed and fostered through trust and mutual understanding, and by training. It is about recognizing and seizing opportunities and solving problems in an original manner. Commanders must be encouraged to take the initiative without fearing the consequences of failure, which requires a training and operational culture that promotes an attitude of risk taking in order to win rather than to prevent defeat.

Synergistic Effects

Synergistic effects are achieved when activity is integrated with other organizations, whether they are other services, Other Government Departments (OGDs), civilian and industrial organizations, including Non-Governmental Organizations (NGOs) or coalition partners, to produce disproportionate effects that exceed the contributions of forces employed individually.

[4] Synchronization - the focusing of resources and activities to produce maximum combat power at the decisive time - JDP 0-01-1.

[5] Integration - the act of combining into an integral whole.

[6] Deconfliction - to change the flight path of a craft or weapon in order that there is less chance of an accidental collision.

[7] Strategy-to-task is discussed further in Chapter 3.

There are occasions or situations when these fundamental principles may be adapted to exploit dynamic situations. Examples include:

- **Centralized Control and Centralized Execution.** The rapid development of technology and other enablers means that there is a real possibility (and temptation) for centralized control and centralized execution. Whilst there are occasions when this concept may be valid, for example when the JFC may wish to achieve strategic effects even at the sacrifice of tactical efficiency, this should not become the norm. No single person can achieve and maintain the detailed level of Situational Awareness (SA) that is required in a dynamic combat environment involving multiple simultaneous engagements across a theatre of operations, or globally in the case of space assets.

NOTE: Too much centralized execution results in a rigid campaign unresponsive to local conditions and lacking in tactical flexibility.

- **Decentralized Control and Decentralized Execution.** The decentralized control and decentralized execution of air assets may be allocated to specific subordinate commanders for finite periods to improve responsiveness and assurance. There is also considerable value in nominated land and air units integrating as task organised teams for certain operations. However, there will be other periods when centralized control is more apt. The challenge is to determine when decentralized control and execution is more appropriate. In operations involving land forces, the responsibility for planning, controlling and execution air power may frequently be delegated to an Air Support Operations Centre (ASOC), which forms an integral part of the senior-fielded army formation with which it is collocated.

PRINCIPLES OF WAR IN AIR AND SPACE OPERATIONS

An understanding of the Principles of War is an essential starting point in understanding how to plan and conduct air and space operations. They are captured below with 'air specific' amplification.

Selection and Maintenance of the Aim

The selection and maintenance of the aim is essential because every military operation must have a single, attainable and clearly defined aim that remains the focus of the operation. The aspiration at the outset is always a clear political aim but the complexity of operations usually militates against clarity, placing a much greater emphasis on the articulation of the limits of constraint. The JFACC selects his aim during the Joint Air Estimate [8] (JAE) process, which considers all of the circumstances affecting the situation and identifies one or more Courses of Action (COA) in line with the military strategic objectives and the JFC's campaign objectives. The output is the Joint Air Operations Plan (JAOP) that provides carefully focused and highly visible JFACC objectives that are to be used in the deduction of tactical decisive conditions and COA. The JAOP is broken down on a periodic (usually daily) basis into an Air Operations Directive (AOD), which provides a 'snap-shot' (usually over 24 hours) of the JAOP that details the prioritization of objectives and allocation of weight of effort.

[8] *A decision making tool using a logical process of reasoning discussed in greater detail in Chapter 2.*

Maintenance of Morale

The maintenance of morale is the most important element in ensuring cohesion and the will to win. Commanders must give their command an identity, promote self-esteem, inspire it with a sense of common purpose and unity of effort, and give it achievable aims. High morale depends on good leadership, which instils courage, energy, determination and care for the personnel entrusted. Constraints may well prevent achieving 'success in battle' and, particularly in the absence of a clear political aim, the JFACC must identify and exploit the most effective 'stimulant'.

Offensive Action

Offensive action provides a distinct advantage that confers the initiative, gives freedom to take offensive action and denies this advantage to an opponent. The extent to which the JFACC is able to seize the initiative through decisive action will be dictated by the constraints placed upon him, not least those politically driven through the Rules of Engagement (ROE). If forced to be reactive, tasking procedures will need to be timely and flexible in order to enable rapid transition to offensive action.

Security

Security serves to guard vulnerabilities and protect vital interests. It provides freedom to take offensive action and denies this advantage to an opponent. Air and space FE are most vulnerable on the ground, thus FP is an essential and integral part of air and space power employment. Deployed operations often create additional FP problems, including constraints applied by the Host Nation (HN) and the need for continued functioning of the civilian airspace infrastructure, which may place limits on control of the air. In addition, the increasing vulnerability of space-based systems to both physical and electronic attack will present military commanders with a range of new challenges. Space assets must also be protected, where possible, against environmental threats such as debris and space weather (i.e., the emission of high energy particles and electromagnetic (EM) radiation from the sun).

Surprise

Surprise can produce effects out of proportion to the effort expended. An opponent who is surprised is generally ill prepared and unable to mount an effective opposition. The speed and range of aircraft, coupled with their flexibility and versatility, allows the engagement of an enemy at a time, place and in a manner for which they are not prepared. The JFACC will rely heavily on Intelligence, Surveillance and Reconnaissance (ISR) assets to provide the Operational Intelligence (OPINTEL) needed to surprise an opponent; however,

even then global media capability may mean that he is unlikely to achieve surprise at the strategic or operational levels.

He must therefore aim to achieve tactical surprise through the speed and efficiency of his decision cycle. The effective employment of ISR assets will be required to enable this, together with lateral thinking amongst planning staffs to achieve surprise through deception. The relative ubiquity and responsiveness of both space systems and Computer Network Operations (CNO) will demand accelerated decision cycles.

Concentration of Force

The concentration of force ensures that fighting power is concentrated at a decisive time and place to achieve decisive results. The flexibility of air and space forces, complemented by the accuracy and lethality of precision weapons and advances in information technology, allows concentration of force through the effectiveness of attack, not just overwhelming numbers. However, the versatility of air and space power makes it an attractive option for almost any strategic, operational or tactical task, and demand will often exceed availability. This has the potential to fragment the integration of air and space operations in attempts to fulfil the many demands of an operation.

The JFACC achieves concentration of force at the operational level by compiling the air apportionment recommendation for the JFC's decision. He is also heavily dependent on the timely collection, analysis and fusion of relevant tactical information when deciding his priorities for concentration of force and air intelligence in day-to-day air operations.

Economy of Effort

Economy of effort ensures that air and space forces, which are invariably limited in number, are not wasted where they are not needed. The sheer flexibility and versatility of air and space power will result in over demand unless appropriate priorities are established between the Component Commanders (CCs) and the JFC. Air and space power must be applied where it can make the greatest contribution to the most critical JFC requirements.

The JFACC must balance opportunity, necessity, effectiveness, efficiency and the impact of achieving assigned objectives against the risk to his air and space FE, and effectively communicate the intended effects of air and space power to the JFC and other CCs. The importance to the JFACC of combat assessment, which includes Battle Damage Assessment (BDA), in achieving economy of effort, cannot be over-emphasized; it is key to the JFACC achieving the necessary balance of investment of effort in meeting a task and will have an immediate effect on the targeting and tasking processes.

Flexibility

Flexibility and agility ensures that any plan can accommodate new factors of chance and opposition. Success requires the ability to alter plans to take advantage of opportunities or to counter difficulties. Aircraft can perform a wide variety of actions, create a wide range of effects and be adapted with comparative ease to meet changing circumstances and situations. A critical consideration for the JFACC in achieving the optimum degree of flexibility is the extent to which he delegates authority and control to subordinate formations, and which air support tasking arrangements are established. The principle of centralized control and decentralized execution produces a constantly changing dilemma for the JFACC; efficient use of scarce assets demands centralization whilst flexibility usually requires decentralization.

Getting the balance in Command and Control (C2) arrangements right and providing mechanisms for their rapid adjustment is a critical part of the JFACC's operational art. The impermanence of aircraft has been reduced through the wider use of Air-to-Air Refuelling (AAR), geostationary satellites and high-endurance Unmanned Aircraft Systems (UAS), whilst the constraints imposed by weather have been significantly reduced through the application of technology, including the use of satellites for navigation and Precision Guided Munitions (PGMs).

Cooperation

Cooperation amongst elements of a joint force maximizes its capabilities. It entails a unified aim, team spirit and interoperability, division of responsibility and coordination of effort to achieve maximum effectiveness. The Collective Training (CT) of joint forces from the commander downward is critical to producing the levels of cooperation necessary for operational effectiveness of HQ staffs and front-line units. Joint and multinational operations demand that particular skills are acquired and maintained. Bilateral or multinational standing air elements such as the North Atlantic Treaty Organization (NATO) Airborne Warning and Control System (AWACS) Force or Air Operations Centre [9] (AOC) staffs greatly assist this process; however, opportunities for CT in these environments are scarce.

A JFACC has an important responsibility to ensure the CT objectives of his, and the wider joint force (particularly on exercises), are focused on the optimum improvement in capability through cooperation and adherence to interoperability standards.

Sustainability

Sustainability is essential because no plan or operation can succeed without adequate logistical support. Scarce resources and critical materiel must be controlled to ensure effective and economic usage. Logistic support is critical to the success of air operations, especially when operating from Deployed Operating Bases (DOBs). It is vital, therefore, that the JFACC involves his logistic staff in the earliest stages of planning for deployed air operations - the initial JAE, and continuously thereafter. In that way, the operational priorities will always directly drive those for sustainability. For example, offensive action to achieve initiative may rely on surge rates of flying which must be matched by equivalent surge rates of sustainability.

Legitimacy

Legitimacy, whilst not a fundamental principle of war, encompasses the legal, moral, political, diplomatic and ethical considerations and principles that justify air and space operations. Perceptions of legitimacy are unlikely to be shared universally or unequivocally and may be shaped by influences such as the media. Once

[9] For the remainder of this document the AOC is referred to as the Combined Air Operations Centre (CAOC) to reflect the most likely nature of coalition air operations.

established, the legitimacy of a particular line of operation will depend on continued justification, political resolve, moral and ethical considerations, and the prospect of a successful outcome.

Should one or other of these elements falter, this may cause perceptions to change about the rightfulness of military action. Air power has the capability to adversely influence perceived legitimacy, particularly in irregular operations, where the perceived disparity in technology and risk to participants may lead to perceptions being developed that can be difficult to challenge. As counter-space systems proliferate, military commanders will be required to understand the unique legal, moral, political, diplomatic and ethical considerations associated with operating in the space domain.

RISK MANAGEMENT

By its very nature, military activity is about understanding and managing risk, rather than avoiding hazards [10]. Risk is an expression of the probability and implications of an activity or event, of positive or negative consequences, taking place. It is a measure of the likelihood of something going right or wrong, and the associated impact, good or bad. The acceptance of risk can present real opportunities but also bring grave consequences.

Commanders must therefore differentiate between taking calculated risks and gambling. For the former, provision can be made to enable recovery; for the latter, the unintended and undesirable consequences may be catastrophic. Risk in campaigning and on operations is examined extensively within JDP 5-00 *'Campaign Planning'*, [11] and also addressed in JDP 01 *'Campaigning'* and JDP 3-00 *'Campaign Execution'*.

CONFLICT AND THE LAW

Commanders at all levels must plan and execute their missions effectively within the constraints of international and UK domestic law and understand the regime within which they can operate. They must also understand the constraints and freedoms conferred by the ROE within the context of the law, consulting their Legal Advisor (LEGAD) where any doubt exists.

Legal Support

Legal support ensures that air and space operations are conducted in a legal manner and conform to the principles of international law, agreements, customs and practices (including, but not limited to, national sovereignty regimes and the Law of Armed Conflict (LOAC)) through the appropriate analysis and evaluation of circumstances, the identification of options and the provision of timely advice to a commander.

Law of Armed Conflict

The LOAC is a part of that body of international law that governs the relations between states. It regulates the rights and duties of the belligerents in time of armed conflict. It seeks to protect combatants and non-combatants from unnecessary suffering and to provide safeguards for civilians and persons who fall into the hands of an adversary. LOAC is derived from two main sources of international law - treaty law and customary law (rules developed from the practice of states which are binding on all states). The four customary principles of LOAC are:

- **Military Necessity.** The principle of military necessity permits a state engaged in an armed conflict to use only that degree and kind of force, not otherwise prohibited by the LOAC, that is required to achieve the legitimate military purpose of the conflict.
- **Humanity.** The principle of humanity forbids the infliction of suffering, injury or destruction not actually necessary for the accomplishment of legitimate military purpose.
- **Distinction.** The principle of distinction separates combatants from non-combatants and legitimate military targets from civilian objects.
- **Proportionality.** The principle of proportionality requires that nations must refrain from attacks that may be expected to cause collateral damage that would be excessive in relation to the concrete and direct military advantage anticipated.

Rules of Engagement

ROE are directives to military forces and individuals that define the circumstances, conditions, degree and manner in which the use of force or other action may or may not be applied. ROE are intended to avoid the ambiguity that could lead to a commander inadvertently violating Allied or national policy and objectives. ROE are written as a series of prohibitions and permissions applicable to situations spanning the entire range of military operations and only exist to give guidance and cannot, by themselves, guarantee the lawfulness of any action. It remains the commander's responsibility to ensure that only the degree of force that is necessary, reasonable and lawful in the circumstances is used.

Although coalition participants may have similar political mandates, each nation is likely to have different national ROE reflecting its unique political and legal interests and its reason for entering the coalition. Some national ROE will be relatively free of constraint, while others may be severely restricted. Commanders of deployed forces may also lack the authority to speak on behalf of their nation in the ROE development process and, whilst consensus on standardization of ROE should be sought, it may not be achievable. It may even be necessary to tailor the employment of given troop contingents within the context of the ROE permissible to those contingents.

ROE should be timely, appropriate, current, responsive to change and not unnecessarily specific or restrictive. Commanders (at any level) who require a change to the extant ROE in order to carry out their assigned task may request a change, with justification, through their command chains when the need is identified. It is also essential that adjacent or mutually supporting formations and international forces understand each other's ROE, as it cannot be assumed that each will react similarly to a given situation.

Such assumptions could in turn contribute to confusion, misperceptions and even fratricide. ROE provides political, legal and policy direction for the conduct of military operations. It should be noted that the ROE do not limit an individual's inherent right to self defence.

[10] *JDP 0-01 British Defence Doctrine, Chapter 5, Para 526.*

[11] *See in particular JDP 5-00 Campaign Planning (2nd Edition), Annex H to Chapter 2.*

UK national ROE concerning the use of conventional weapons are annunciated in JSP 398. They apply equally to all arms of the Services, and to all environments, when conducting national operations world-wide. When UK forces are operating as part of an international force under other than UK command, then UK ROE will continue to apply to UK forces unless specific approval has been given to act under the ROE of the international force, or national amplifying instructions have been issued.

Status of Forces Agreements

Status of Forces Agreements (SOFA) provide a formalized agreement of HN consent for a national, or international, military force to have a lawful presence within a foreign country. The SOFA regulates the privileges and immunities of the forces, with respect to civil and criminal jurisdiction; taxation; customs and regulations; communications and postal services; freedom of movement; use of the roads; waterways, port facilities and airfields; use of water, electricity and other utilities; local currency availability; provisions, supplies and services; settlement of disputes and claims; liaison between armed forces, security personnel of the HN and the force; employment of local personnel; and identification and status.

War crimes

War crimes comprise grave breaches of the 1949 Geneva Conventions (as specified in the Conventions themselves) and serious violations of the laws of war. They also include the crime of aggression, crimes against humanity and genocide. Commanders and servicemen at all levels of command are responsible for compliance with international and domestic law in the conduct of operations. The UK is a party to the 1998 Treaty of Rome that established the International Criminal Court (ICC). The ICC has jurisdiction to investigate and try offences specified as war crimes.

Under the provisions within the Treaty relating to jurisdiction, states have the right to exercise primary jurisdiction over their subjects. Hence, in any circumstance where UK service personnel stand accused of having committed war crimes, the UK may opt to exercise jurisdiction to investigate and (if appropriate) prosecute the accused, which would preclude further proceedings within the ICC.

Space Law

Space law is primarily encapsulated in the 1967 Outer Space Treaty [12], which advocates for the peaceful use of space by all nations, although the only specific prohibition relates to the basing of Weapons of Mass Destruction (WMD) in space, on the moon or other celestial bodies. Attribution of an attack on a satellite in space will often present a significant challenge (particularly in the case of directed energy weapons); therefore, a military response to such an attack may not be possible.

Even with legal legitimacy, our military action in space will likely be non-destructive in nature due to the risk of creating collateral damage (i.e., debris) with global implications. However, not all of our adversaries will necessarily constrain their counter-space operations in such a manner.

[12] *The Outer Space Treaty is formally recognized as a treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies, Jan. 27, 1967. Additional treaties which have impact on international community regarding space include: The Agreement on the rescue of astronauts, the return of astronauts and the return of objects launched into outer space, Apr. 22, 1968; the Convention on international liability for damage caused by space objects, Mar. 29, 1972; and the Convention on registration of objects launched into outer space, Jan. 14, 1975.*

CHAPTER 2

STRATEGY AND PLANNING

"The nicest thing about not planning is that failure comes as a complete surprise, rather than being preceded by a period of worry and depression."

Sir John Harvey Jones

INTRODUCTION

Campaign success can only be achieved by applying the appropriate effort in campaign planning at all levels. Historically, military campaign planning focussed on dominating and defeating the enemy's military capability by breaking his will to fight and to occupy his terrain.

In the modern context, the philosophy of a Comprehensive Approach (CA) envisages that the objectives and activities of the diplomatic, military and economic instruments of power be coordinated across government departments in the identification, analysis, planning and execution of activities to affect an opponent's behaviour. How can we compel or coerce our opponent to behave differently?

Policymakers are generally presented with a range of practical response options in which the relative weight of effort and influence of each individual instrument will vary. For example, military activity is often required to create the security conditions for other instruments or organizations to achieve an enduring outcome. The timing and nature of contributions from the three instruments will vary with the chosen response option and there will rarely be a direct linkage between activities under a single instrument and the strategic end-state. The military contribution to the CA is framed within an effects-based approach to operations.

STRATEGY

Strategy provides the aims on how operations will be conducted to accomplish policy objectives, whilst doctrine addresses how best to use air and space power as means to that end. However, the reality is that operations and strategies are invariably constrained and restrained by political, economic or social considerations. Military strategy sets the manner in which military power should be developed and applied to meet national objectives; however, where policy decisions seriously affect the application of doctrine, commanders must emphasize any potential military consequences.

Within a campaign, joint forces may conduct a wide variety of activities, including combat, humanitarian assistance, enforcing order, managing confrontation and security sector reform. At any particular time there may be a humanitarian crisis in one place, an insurgency in another, and intense fighting between forces nearby, while at any one location there may be house-to-house fighting one day, collection of forensic evidence the next day, and restoration of electricity and water supplies the day after, or a return to fighting. States of peace, tension, conflict and combat may be local or widespread, as well as transient or prolonged.

The character of any particular campaign may be difficult to define precisely and is likely to change over time. It will probably consist of a wide variety of activities across the spectrum of conflict, changing over time; nevertheless, it is possible to broadly discriminate between campaign themes using the following criteria:

- **Political Risk.** Political risk is a measurement of the level of acceptable risk, including risk of casualties, in proportion to the threat to national, alliance or coalition interests.
- **Strategic End-State.** The strategic end-state that is sought should determine the character of a campaign and the effects sought. Defeat of a hostile state will demand a different approach to that required for intervention operations to stabilize a failing or failed state.
- **Character of Combat.** Combat can be characterized by prevalence, scale and intensity. Prevalence is a measure of its frequency. Scale describes the scope of the conflict, be that localized, regional or national, and may be defined by the size of required FE. Intensity describes the degree of concentration of combat, which is measurable by the rate of consumption of resources.
- **Type of Adversary.** The type of adversary and their nature and numbers will have a major influence on the character of the conflict. Adversaries may range from sophisticated networked state forces to local tribesmen; however, even these are not simple constants because adversaries are adaptive. For example, once a regular army has been defeated, it may mutate into an irregular force and change the character of the conflict; alternatively a successful insurgent group may evolve into a regular army.
- **Hybrid Threat.** The hybrid threat describes the blurring of the boundaries between states and non-state actors (such as insurgents, terrorists and criminals), who routinely operate independently, but are quick to cooperate where they see mutual benefit, even if they are ideologically opposed. Such 'forces' may be content to avoid defeat, rather than seek victory and will avoid large-scale military engagement.

PLANNING

Joint planning is conducted through advance or crisis response mechanisms, the important differences are the time and fidelity of information available to conduct planning.

Advance Planning

Advance planning is the norm, where the Government and MOD monitor world events and may direct that contingency plans be developed in case the UK has to exercise a military option. The MOD's Operational Tasking Group (OTG) agrees on the priorities for planning and intelligence collection and the Chief of the Defence Staff (CDS), through the Deputy Chief of the Defence Staff (Commitments) (DCDS(C)), directs the Permanent Joint Headquarters (PJHQ) to develop one of three types of contingency plans with support from appropriate Front Line Commands (FLCs). The Joint Planning Guide (JPG) provides generic planning data for a particular country, region or theatre; the Joint Contingency Plan (JCP) builds on the JPG with specific details on the type of military capabilities required, deployment options and readiness states (where appropriate); and the Joint Operations Plan (JOP), which is an 'embryonic' campaign plan, details a Concept of Operations (CONOPS) that is used as the basis for an Operations Order (OPORD).

Crisis Response Planning

Crisis response planning occurs when the UK will be involved militarily in operations where lead times are short. It may utilize plans developed under contingency planning processes or may start afresh.

THE UNITED KINGDOM PLANNING PROCESS

The Defence Intelligence Staff (DIS) and the PJHQ are usually the first agencies that alert of an impending crisis. If the crisis develops, the Defence Crisis Management Organization (DCMO) Contingency Operations Group (COG) is formed and a Current Commitments Team (CCT) stood up with a PJHQ Contingency Planning Team (CPT) to plan the UK military response.

Campaign planning is conducted prior to operations and sets the long-term goals through the provision of a general plan for how a campaign is to be conducted and specific guidance for a campaign's various phases. In addition, the plan should state how to defeat the enemy, at the lowest cost in lives and materiel, utilizing an effective COA that is militarily achievable.

In formulating the plan, the PJHQ conducts an estimate [13] process that considers the political, religious, cultural, economic, military and social forces affecting the operational area in order to identify the feasibility, nature and scale of forces, and the likely implications and costs of UK involvement. The estimate identifies a number of COAs which are offered for Cabinet Office approval. Once a particular COA is decided it is woven into a CDS directive that directs the PJHQ to commence operations and the Joint Force Headquarters (JFHQ) to develop a campaign plan. The JFC also issues planning guidance to enable other CCs to complete their own estimates and plans. CCs subsequently feed back their estimates to enable the JFC to sequence their activities and produce the overall coordinated campaign Operations Plan (OPLAN).

NOTE: The JFC needs a JAE that includes the JFACC inputs and not just the JFC HQ Operations Staff (J3) inputs.

In reality, the planning process is generally driven by the timescale given to implement the plan, which results in many actions and lines of operation running concurrently. Early and frequent communication between all interested parties is the key to a coherent and workable plan and ensures that air and space power is fully considered and integrated from the start. This requires robust, informed and appropriate representation within joint fora from experienced and appropriately trained airmen who appreciate the capabilities and limitations of air and space forces, and how they can best contribute to the joint operation.

THE PLANNING STAFFS

Defence Crisis Management Organization

The DCMO manages policy and operational issues in accordance with the UK Government's foreign policy. It comprises the MOD Defence Crisis Management Committee and the PJHQ. Regular meetings are chaired by DCDS(C), with political input from the Director General Operations Policy (DG Ops Pol) and attendance from supporting FLCs. DCDS(C) provides MOD strategic direction for the commitment of UK forces in support of CDS who is the principal military advisor to the Government.

Permanent Joint Headquarters

The PJHQ plans, directs, sustains and recovers all joint forces assigned under the direction of the Chief of Joint Operations (CJO). CJO is responsible for planning and executing UK-led joint, combined and multinational operations, and for exercising Operational Command [14] (OPCOM) of UK forces on joint and multinational operations led by others. From a planning perspective, PJHQ is chiefly responsible for preparing the strategic estimate which covers the feasibility, nature and scale of forces, implications and costs of any operation.

Planning Groups, Functions And Output

GROUP	FUNCTION	OUTPUT
MOD Current Operations Group	Expert advice; study emerging crisis; assess severity; options for intervention.	Brief CDS and COS Form SPG and CCT
MOD Strategic Planning Group	Political Strategic Analysis; forward planning; liaison with OGDs on future issues.	CDS Planning Directive
MOD Current Commitments Team	Monitor current operations and issues; liaison with PJHQ; liaison with OGDs and DCMO on current issues.	Strategic Estimate, CDS Directive, ministerial submissions
PJHQ Contingency Planning Team	Liaison with MOD; detailed contingency planning and assist with Strategic estimate.	JFC's Planning Directive
PJHQ Operations Team	Run current operations.	Joint Commander's Mission Directive
JFHQ Situation Awareness Group	Monitor crisis development.	Initial and deployment planning
HQ AIR CAG	Manage contingency operations; input to strategic estimate; advise PJHQ on force capability.	Generate and deploy FE
HQ AIR Contingency Plans	Provide specialist air advice to PJHQ for the strategic and operational estimate and wider planning process; coordinate and planning input to CAG; interface and liaison with PJHQ; lead Air Estimate; assist PJHQ recce teams.	Air Estimate; Warning order; OPORD
JFACHQ Command Group & Planning Group	Provide specialist expert air and space advice to higher HQ; coordinate with and provide planning input to CAG/CP processes; lead Air Estimate.	Air Estimate, JAOP, AOD & /ATO

[13] *A decision making tool using a logical process of reasoning.*

[14] *The authority delegated 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 command as the commander deems necessary.*

Joint Force Headquarters

The JFHQ provides a high-readiness deployable HQ, and the nucleus of a second at lower readiness, for the C2 of joint operations. This includes the provision of dedicated communications, life support and the ability to expand to command a larger joint task force if required.

Headquarters Air Command

HQ AIR is responsible for ensuring RAF readiness; conducting contingency planning; providing operational advice to the PJHQ; identifying capability gaps; preparing and planning for deployments; deploying air assets to a theatre; leveraging space capabilities [15]; and sustaining, rotating and recovering forces.

The Contingency Action Group (CAG) is the HQ AIR organization that manages crises. Group staffs are responsible for the preparedness of their respective FE and are members of the CAG.

Joint Force Air Component Headquarters

The Joint Force Air Component Headquarters (JFACHQ) provides a high-readiness deployable air component HQ for the C2 of air operations for joint campaigns. The unit has dedicated communications and life support as well as external support from specialist units.

THE AIR PLANNING PROCESS

The JFACC has the responsibility for developing a JAOP to support the JFC's overall campaign plan. JAOP planning begins with the understanding of the JFC's mission in which the JFACC's staff will take the JFC's mission, estimate and objectives, commander's intent, concept of operations, tasks to subordinate units, Commander's Critical Information Requirements (CCIRs) and the component's objectives to devise a JAE [16].

When the JAE is approved by the JFC it becomes the basis for the JAOP, which is planned in a collaborative manner with the other components.

NOTE: Planning is a continuous process that only ends when the mission is accomplished and the forces are redeployed or when the national command authorities terminate the mission and direct the redeployment of forces. Adversaries will always attempt to frustrate a plan and the JFACC HQ staff must expect changes and be ready to make them in a time-constrained environment.

THE JOINT AIR ESTIMATE

The JAE is similar to the joint operational estimate, in that it comprises a systematic series of steps to formulate one or more COA. The JFACC's role in the JAE process is to provide focus, guidance, direction and purpose to the staff to generate the effects associated with the Commanders Intent; however, his degree of direct involvement will depend on the time available, his own preferences and the experience and accessibility of the staff.

The Friction in Planning

- Understanding mission, intent and end-state
- Conducting and sharing a thorough Joint Intelligence Preparation of the Environment (JIPE)
- Focusing on Centres of Gravity (COGs)
- Developing real alternative COAs
- Planning for surprise and deception from the start
- Red teaming alternative COA before selecting the actual COA
- Testing COA for logistics feasibility before selection
- Allowing sufficient time for parallel component planning
- Providing for appropriate liaison (upwards and laterally)
- Providing time to back brief and rehearse

During the planning phase his staff will explore the full range of probable and likely adversary and friendly COA and then analyze and compare friendly air and space capabilities against the likely threat. The planning staff should also include representation from all components providing air capabilities/forces to enable coordination and greater understanding of all component capabilities/forces. The JAE is a continuous process that consists of a number of key steps:

- **Background Analysis.** Background analysis ensures a common understanding of the background and underlying causes of the problem. It assesses, in outline, the enemy's most dangerous and most likely COA and conducts an analysis of the enemy's COG.
- **Mission Analysis.** Mission analysis looks at the JFC's mission and guidance to gain a clear understanding of the problem that has been set in order to produce a joint air component mission statement that outlines how the air component can contribute to the joint aims. Examination of the friendly COG is a key factor in this analysis.
- **Evaluation of Factors.** The evaluation of factors consists of an informed factor analysis in order to establish the art of the possible. It examines enemy and friendly capabilities and deployment timelines, force availability, ROE and environmental considerations.

[15] *Through the Space Operations Coordination Centre (SpOCC).*

[16] *The JAE should encompass both friendly and adversary space capabilities to ensure a comprehensive JAOP planning process. Ideally, all environmental estimates should contain a space element.*

- **Course of Action Formulation.** The COA formulation develops several COAs that might be taken by air and space forces. Each COA should be feasible, acceptable, complete, exclusive from each other, and suitable to accomplish the mission. They should support the JFC's objectives and consider the desired end-state. The enemy's most likely and most dangerous COA from background analysis should be assessed in more depth and war gamed against each friendly COA.
- **Course of Action Decision.** The JFCs COA decision follows the JFACC's presentation of a recommended COA to the JFC. When approved, it becomes the JFACC's concept of joint air operations and basis for the JAOP.

NOTE: While the phases are presented in sequential order, work on them can be either concurrent or sequential. Nevertheless, the phases are integrated and the products of each phase are checked and verified for coherence; moreover, the process is iterative.

THE JOINT AIR OPERATIONS PLAN

The JAOP is the JFACC's blueprint for integrating and coordinating joint air operations and encompasses operations of air assets from all components. It is a collaborative effort of the JFACC staff, the JFC staff and other CC staff, which will eventually be implemented through the daily Air Tasking Order (ATO) process. The ATO is typically not developed until operations actually commence, but some contingency plans may include an 'on-the-shelf' ATO for the first few days of a possible conflict.

More specifically, the JAOP integrates joint air asset efforts in achieving JFC objectives. It identifies objectives and tasks by priority order, describing in which order they should be actioned, the desired effects and the weight of effort required; identifies measures or indicators of success that are to be used to determine whether air operations are meeting assigned objectives; accounts for current and potential enemy offensive and defensive COA; indicates and synchronizes the phasing of air operations with the JFC's plan; indicates what air capabilities and forces are required to achieve joint air objectives, including force availability, deployment timing, basing availability and sustainment requirements; allows the JFACC to re-evaluate and adjust his mission as required; and develops specific procedures for allocating, tasking, exercising and transitioning C2 of joint air capabilities and forces.

Tasking of Space Assets

The tasking of space assets will most likely be effected through the established processes of our coalition partners, such as the US Space Tasking Order. Within these processes, specific UK space support requirements will be prioritized in accordance with international agreements but resource conflictions may arise that limit the provision of certain space effects.

NOTE: The JAOP should also include plans to transition from initial to sustainment forces as appropriate, for conflict termination and the subsequent redeployment of forces, as well as procedures to capture lessons identified / lessons learned.

PHASING

Phasing is a tool used by commanders to achieve synchronization in time by providing an orderly schedule of military decisions and indicating pre-planned shifts in priorities and intent. Phasing is usually defined by geography, objectives or time and should have clearly identified start points, objectives, tasks, priorities and measures of merit/effectiveness that define when a phase is complete.

However, there is a risk of artificially constraining the flexible use of air and space assets because air and space operations usually occur simultaneously and are considered complete when the desired effect is achieved, not after a given time or when a specific geographic point is reached. However, phasing can be a useful tool to communicate the JFACC's CONOPS.

A typical example of phasing might start with ISR as part of JIPE, air mobility support to deploy the joint forces, counter-air operations to gain a degree of control of the air over a specific area and/or at a specific time, so that friendly forces can operate without unacceptable risk from enemy attack. Thereafter, the swing may be toward strategic operations to achieve maximum effect in support of campaign objectives and concurrent counter-land Air Interdiction (AI) to shape the battlefield for surface forces and finally Close Air Support (CAS) to troops in contact.

NOTE: Phases are not necessarily linear; they usually overlap to some extent and may occur simultaneously.

CONFLICT TERMINATION

From the outset the JFC will need to consider how to recognize when the theatre campaign is reaching, or has achieved, its end-state. Recognizing the inevitability of defeat may be relatively straight-forward, but the adversary may not be able to rationalize his defeated state in the same manner and sue for peace. In these circumstances the JFC may have to revise his overall aims and continue with operations to force the adversary to recognize his defeat. In so doing the JFC, in consultation with the JFACC, should consider exploiting his air and space forces to achieve that ultimate strategic effect.

There is also the possibility of the opposite situation occurring whereby the adversary seeks negotiation and the conflict terminates positively but prematurely, or it just fades out before reaching the previously declared campaign end-state. Such a situation could create a vacuum where the population may need to be protected from dissident forces, humanitarian aid may be required or monitoring operations may need to be implemented.

However, the termination of the conflict and the setting up of the conditions for termination is primarily a political matter and decision. In either event the JFC's OPLAN and the associated component plans must recognize the need for multinational forces to be reconstituted and redeployed, possibly on peacekeeping

operations for an indeterminate period after the cessation of hostilities. It is probable that all component forces will need to undertake operations in support of such with consequent changes to the ROE.

THE RAF PLANNING PROCESS

Planning seldom follows a 'doctrinally pure' path and can become frenetic when timelines are imposed and other agencies become involved. HQ AIR will normally carry out contingency planning activities with little or no initial input from the PJHQ. This may range from an internal A5 scoping process through to the full participation of all CAG cells.

Contingency Action Group

The CAG acts as the single point of contact for the management of the AIR contribution to crises and in meeting DCMO, PJHQ and NATO tasks. For new or emerging operations, an initial CAG is normally called when the MOD CCT and the PJHQ CPT form.

Scales of Effort

Scales of effort define the overall size and shape of the HQ AIR deployable force structure to meet a number of likely concurrent operations. The following scales of effort give an illustration of numbers of assets that might be required for a particular scenario; they do not prejudge the numbers that might be committed to a contingency.

- *Small Scale* — *< 10 fast-jet and 18 other aircraft.*
- *Medium Scale* — *< 48 fast-jet and 40 other aircraft.*
- *Large Scale* — *< 80 fast-jet and 66 other aircraft.*

Concurrency

Concurrency guidance for operations is contained in Defence Strategic Guidance (DSG) and 'The RAF Management Plan'. The baseline for concurrent capability is that UK forces should be able to respond to the following concurrency suites:

- Routinely, and without creating overstretch, to be able to mount an enduring medium-scale (MS) military assistance to stabilization and development, or peacekeeping operation, simultaneously with an enduring small-scale (SS) peacekeeping or power projection operation and a SS power projection, peace enforcement or focused intervention.

- Accepting that it will place greater stress on our force structure and cause harmony guidelines to be exceeded for many force elements, be able to reconfigure our forces rapidly to carry out:
  - An enduring MS peacekeeping or military assistance to stabilization and development or peacekeeping operation.
  - An enduring SS peacekeeping or power projection operation simultaneously with a limited duration MS power projection, peace enforcement or focused intervention operation.
  - That given time to prepare, be capable of undertaking a demanding one-off large-scale intervention operation while still maintaining a commitment to a simple enduring SS peacekeeping operation.
- Additionally, to take account of the need to meet standing commitments, for example, Quick Reaction Alert (QRA) aircraft for the integrity of the UK airspace and contingent forces.

ADDITIONAL PLANNING CONSIDERATIONS

Air-Minded Force Protection

As one of the key enablers, air FP must be considered from the outset. Due to the vulnerability of air platforms whilst on the ground and when operating in close proximity to airfields, air FP aims to coordinate the measures by which threats and hazards to air assets are countered and mitigated, in order to maintain freedom of air operations. They can be both proactive, to counter assessed threats and hazards, as well as reactive, to respond rapidly once a threat or hazard has occurred.

Air FP planning should therefore consider threat and hazard assessment and use risk analysis and risk management techniques in order to militate against vulnerabilities. The level of acceptable risk will invariably alter over time, and FP measures need a degree of flexibility to reflect this. Within the Air Component FP planning is conducted by the HQ's organic FP staff and at the Deployed Operating Base (DOB) level by the RAF FP Wg HQ. Greater detail on Air FP planning can be found within AP 3241 *'Force Protection for Air Operations'*.

Basing

The basing of FE is an important consideration. Suitable airfields are categorized as Main Operating Bases (MOBs), DOBs, Support Operating Bases (SOBs), Forward Mounting Bases (FMBs) and Staging Airfields (SAs). The preferred choice would always be to conduct operations from an MOB or well-found DOB. Key factors that drive basing options include HN agreements, logistics support, available facilities and agreement on over-flight rights. In reality, real world airspace limitations or competition from other coalition members will often dictate the use of austere and bare operating bases at which the requisite

facilities, length of runway and infrastructure may be limited, but still drive base selection irrespective of FP concerns. These types of bases are defined as follows:

- **Well-Found.** Well-found bases are assumed to provide 50-90% of required facilities including inter-base and intra-base communications, domestic and technical accommodation, and storage. The HN should provide aviation / ground fuels, cryogenic products and Mechanical Transport (MT) support. Few potential DOBs are actually well-found and the addition of coalition aircraft may quickly reduce a well-found base into an austere or bare-base category.
- **Austere.** Austere bases should provide 25-50% of required facilities with limited communications and some domestic and technical accommodation. Augmentation would be required to provide operational support, which could include Air Traffic Control (ATC), Ground-Based Air Defence (GBAD) and FP.
- **Bare.** Bare bases provide less than 25% of the required facilities but should include aircraft operating surfaces, airfield lighting and access to domestic electrical power and water supply.

Basing Structures

Basing structures will obviously vary according to the theatre and the extent of operations; however, they are likely to include a mixture of the following:

- **Staging Airfields.** SAs are well-found bases located outside of the Joint Operations Area (JOA) that may require augmentation for 24 hour operation.
- **Deployed Operating Bases.** DOBs are well protected overseas bases, with robust sea and / or air access that are used to support permanently deployed forces.
- **Support Operations Bases.** SOBs are generally well-found and usually established on a HN MOB to ensure adequate dispersal of high-value assets beyond the immediate threat area.
- **Forward Mounting Bases.** FMBs are the main logistic airhead for 'hub and spoke' operations and are usually established on a well-found HN MOB. FMBs may require FP, Air Combat Support Units (ACSUs) and Air Combat Service Support Units (ACSSUs) augmentation. Further, FMBs can be used to position forces prior to the appropriate decision being taken to deploy to the JOA. Note that SAs and FMBs may be collocated.
- **Forward Operating Locations.** Forward Operating Locations (FOLs) consist of airstrips and airfields close to an operating area and are used temporarily by aircraft based elsewhere.
- **Emergency Landing Strips.** Emergency Landing Strips (ELS) have no facilities other than a suitable landing area.
- **Tactical Landing Zones.** Tactical Landing Zones (TLZs) are established temporarily for a specific purpose such as Forward Arming and Refuelling Point (FARP) or inserting or extracting Special Forces (SF).

FORCE GENERATION AND PREPARATION

FE and enablers are identified and generated through a force generation and preparation process conducted by the PJHQ and the CAG. Forces are held at a variety of readiness states (FE@R) expressed as within 'x days notice to move'.

The HQ AIR Groups are responsible for ensuring that FE@R are appropriate, manned, equipped, trained and supported to meet defined requirements and standards. Manpower is assigned to operations in one of two ways:

- **Formed Units.** Formed Units (FU) are organizations, such as flying and Regiment squadrons, which deploy as a single entity with their equipment and personnel.
- **Non-Formed Units.** Non-Formed Units (NFU) are organizations that form at a deployed location and consist of manpower and equipment originating from units across the RAF.

Expeditionary Air Wings

Expeditionary Air Wings (EAWs) are established at certain UK MOBs with their station commanders dual-hatted as EAW Force Commanders. Two EAWs are generally held at readiness for deployment to form the core C2 and support staff of a DOB. Once activated, the C2 and support elements of the EAW detaches from its MOB to a DOB, where it establishes its operational structure and capability for appropriate FE@R, ACSU or ACSSU units to 'plug' into. The EAW retains its identity at the deployed location and attached personnel become members of the deployed wing.

NOTE: Aircraft deployed to the DOB may not include the EAW's peacetime wing or squadrons. FE@R may be drawn from across the RAF depending on the type of operations to be conducted.

DOBs invariably require a degree of preparation and infrastructure work before being suitable for operations. A bare base can take up to 30 days to prepare for FE arrival, not allowing for any diplomatic clearances required. DOB commanders and their core C2 team are usually drawn from one of the two EAWs held at readiness, irrespective of their background or platform expertise. However, in exceptional circumstances a DOB commander could be selected from elsewhere within the RAF.

Infrastructure work is usually completed by No 12 (Air Support) Group, Royal Engineers (RE) who are able to assess, construct or repair a number of the required facilities. These may include aircraft operating surfaces; hangars; domestic and operational accommodation; Emergency Explosive Storage Areas (EESAs);

the hardening of existing infrastructure; the preparation of shelters, blast protection, security fencing/barriers; and the provision of water, power, fuel and drainage.

DEPLOYMENT, SUSTAINMENT AND RECOVERY

Once the PJHQ authorizes deployment, call forward instructions are issued by a lead mounting command for supporting FLCs to deploy individual FE. Logistic support is normally delegated to the JFC (or the UK National Contingent Commander (NCC) for the UK element of a multinational operation).

The PJHQ Sustainability Statement (SUSTAT) forms the basis for the JFC's logistic sustainment plan that should include concept and implementation plans for weapon stock holdings; Petrol, Oil and Lubricants (POL); rations; water; transport; medical support; HN support; in-country resources; contracts; and equipment support. Overall responsibility for the recovery of FE lies with the PJHQ through the in-theatre commander.

Responsibility for planning the timely recovery of RAF manpower and materiel to parent units in the UK rests with the UK Air Component / Air Contingent Commander (ACC) supported by the HQ AIR CAG and Logistics Support Centre (LSC).

NOTE: It is extremely difficult to formulate a recovery plan before the required end-state has been achieved and subsequent operations determined, however, a rushed, poorly planned recovery will reflect poorly on an operation. To that end, adequate time must be being given to planning and preparation through a 'Recovery Estimate' that provides clear and detailed operational and logistic end-states to determine the scale of the recovery.

CHAPTER 3

PLANNING AIR OPERATIONS

"Whereas to shift the weight of effort on the ground from one point to another takes time, the flexibility inherent in Air Forces permits them without change of base to be switched from one objective to another in the theatre of operations."

Field Marshal Viscount Lord Montgomery of Alamein

INTRODUCTION

The strategic aim of a campaign is always political, and the art of military planning is to derive a plan that incorporates a series of attainable military objectives in support of the political aim, which is the strategic end-state.

Planning starts with the desired end-state and is followed by the subordinate objectives needed to bring it about, the effects and underlying links needed to accomplish those objectives, and the actions and resources need to create those effects. The process is known as strategy-to-task.

Any tendency towards 'reverse planning', starting with available resources and capabilities to formulate a range of possible actions, must be resisted as it provides no guidance on how operations support overarching campaign or national objectives. Good planning should anticipate and plan for the full range of possible unintended, undesirable effects and enemy counter actions in order to increase the probability of intended or predicted effects and mitigate those that are undesirable. Whilst this section will focus on the planning of air operations, the underlying principles are also applicable to the planning of space operations.

EFFECTS-BASED APPROACH

An effects-based approach encompasses a comprehensive way of thinking that focuses on the end-state and seeks the most efficient and effective way of achieving objectives. The approach aims to negate unnecessary attrition, destruction and occupation by focusing primarily upon behaviour and not just physical changes. Effective planning must consider all of the possible types of effects and their likely or possible consequences. However, even with the most sophisticated effects-based planning and the advent of precision and cyber war, some traditional aspects of war will still be necessary.

This will be particularly true where enemies adopt tactics (such as operating in cities and urban sprawl; exploiting forests, jungles and mountains; and utilizing distributed logistical and C2 systems) to avoid being defeated by precision and finesse. In such cases, some operations will still have to be 'up close and personal'.

OBJECTIVES AND STRATEGY-TO-TASK

Objectives prescribe friendly goals. They describe what needs to be accomplished and the goals to be achieved, not the tasks that will have to be carried out to achieve them. Use of the past tense (delayed, minimized, prevented, deterred, etc) can help in determining whether the phrase used is truly an objective or merely a task. For example, 'attack specified Lines of Communication (LOCs)' is a likely task, but should not be used as an objective. If using a task as an objective appears unavoidable, asking why the task has to be carried out will usually result in a clearer definition of an objective. Reworking the example above, the reason that LOCs would be attacked is more likely to be along the lines of 'enemy 2nd echelon engagement prevented'. Once this objective is identified, it becomes obvious that there may be other approaches that can be added to aid in achieving it; not just destroying bridges.

Operational air objectives directly support one or more campaign objectives. They are disassembled into a number of tactical air objectives that are themselves reached through satisfactory completion of a set of tactical air tasks. Arranged into a hierarchy, objectives and tasks must be logically tied to each other and to the desired end-state. They should be clearly defined and be decisive, attainable and measurable. Additionally, the number of levels that the objective is worked through is not limited. The nature of the specific campaign may dictate that either (or both) the operational-level and tactical-level objectives be broken down further into an appropriate number of sub-objective levels.

The completed hierarchy is the culmination of a strategy-to-task that originated with the grand strategic objectives set by the Government. Through strategy-to-task, it is possible to demonstrate that every target attack contributes towards the success of a campaign. If the process is completed thoroughly, no vital targets will be overlooked, and no unnecessary targets will be included. Operational air objectives, tactical air objectives and tactical air tasks are described below.

- **Operational Air Objectives.** Operational air objectives sit directly under campaign objectives. Potentially (but not always) they can be distilled from a line of operation for the Joint campaign. For example, 'disruption of own ground operations minimized' would concentrate on the contribution made by air power to that element of the campaign.
- **Operational Air Sub-Objectives.** Operational air sub-objectives, if required, are a breakdown of the higher-level objective into its component parts. For example, the objective above could be disassembled into (amongst others) 'enemy ability to conduct CAS operations limited, enemy attacks on own LOCs prevented, etc'. As many sub-levels as deemed necessary may be used to reach the tactical level.
- **Tactical Air Objectives.** Tactical air objectives likewise break-down the operational objective (or sub-objective) into its component parts, this time at the tactical level. For example, minimizing CAS engagements could include 'generation of CAS sorties reduced' and 'all enemy CAS sorties engaged'.
- **Tactical Air Sub-Objectives.** Tactical air sub-objectives may be used if required to reach the task level. (They are not needed in this worked example.)
- **Tactical Air Tasks.** Tactical air tasks define the types of kinetic or non-kinetic, lethal or non-lethal actions that should be taken to achieve required effects. For example, reducing CAS sortie rate could include 'destroy CAS capable aircraft on ground' and 'disrupt aviation fuel supplies'.

TASKS

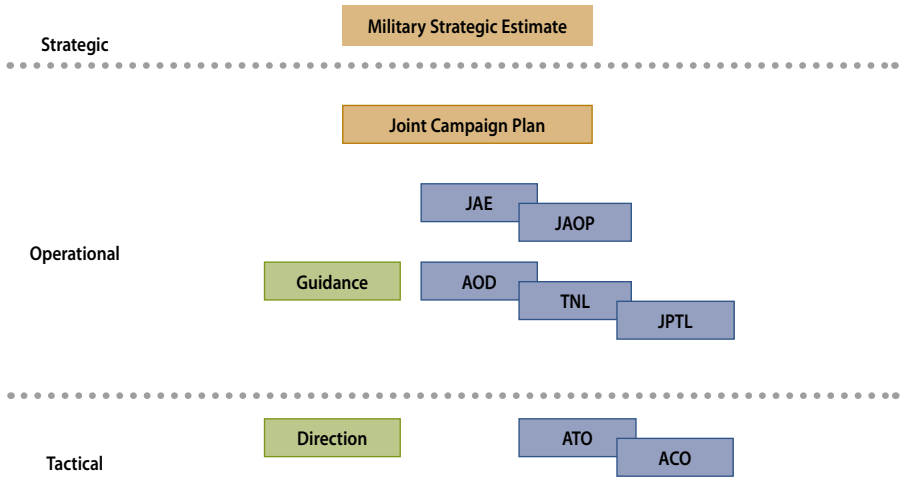
Tasks direct friendly action. The task contains one or potentially two elements. The principle element is a description of the effect which the superior commander wishes the subordinate to achieve, at the time of issuing the order. The second element is a description of the activity to be undertaken in order to achieve that effect. That activity should only be specified if necessary, for example, to coordinate activities across a command. The following are examples of typical tasks drawn from NATO STANAG 2287 - *'TASK VERBS FOR USE IN PLANNING AND THE DISSEMINATION OF ORDERS'*:

- **Attack:** Take offensive action against a specified objective.
- **Defeat:** Diminish the effectiveness of the enemy, to the extent that he is unable to participate in combat or at least cannot fulfil his intention.
- **Delay:** Prevent an enemy force arriving at a specified location for a specified length of time, or until a specified time or event.
- **Demonstrate:** Deceive the enemy by making a show of force without seeking contact.

- **Deny:** Prevent enemy use of a specified thing.
- **Destroy:** Damage an object or an enemy force so that it is rendered useless until reconstituted.
- **Disrupt:** Break apart an enemy's formation and tempo, interrupt the enemy timetable, and cause premature and/or piecemeal commitment of forces.
- **Exploit:** Follow a successful attack to disorganize the enemy in depth.
- **Fix:** Prevent an enemy from moving any part of his forces from a specified location for a specified period of time.
- **Interdict:** Keep an enemy force out of range so that it cannot be used effectively against a friendly force.
- **Isolate:** Seal off an enemy force from its source of support, to deny it freedom of movement, and prevent it from having contact with other enemy forces.
- **Locate:** Determine the position of a specified thing.
- **Neutralize:** Render an enemy element temporarily incapable of interfering with the operation.
- **Penetrate:** Break through enemy defences and disrupt the defensive system.
- **Suppress:** Temporarily degrade an enemy capability to enable a friendly action.

NOTE: The description of effect and that of purpose should each contain a single verb whose effect is measurable; on the enemy, the environment or friendly forces.

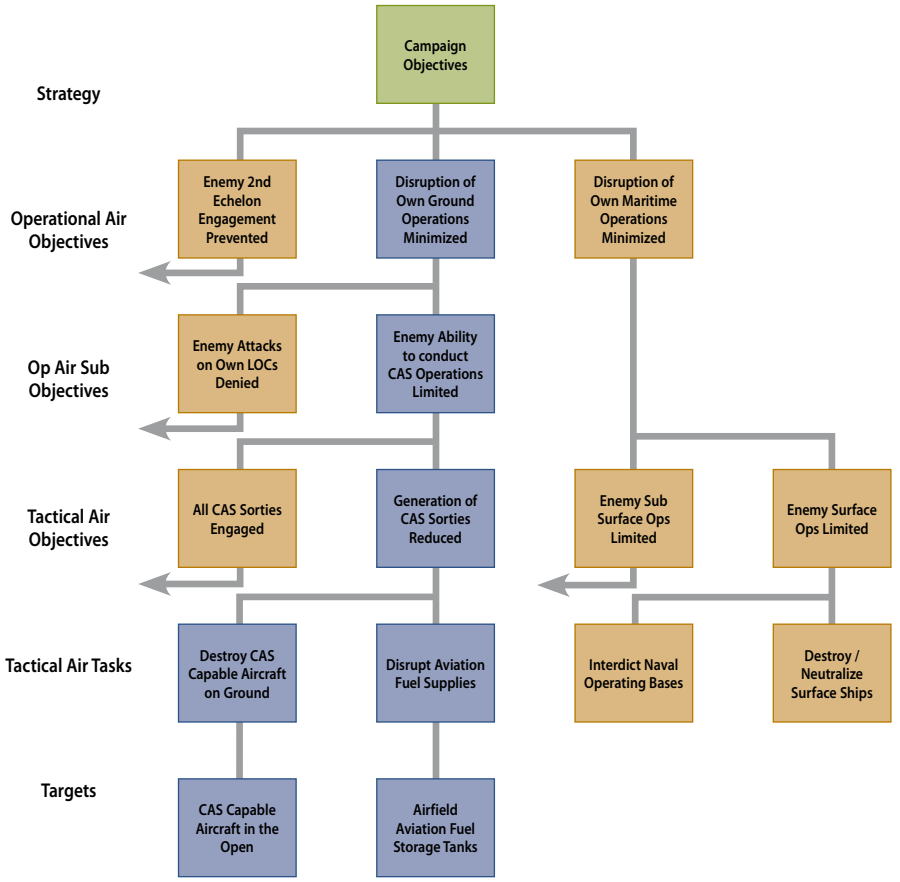
Translating Strategy-to-Task - Example of Product



KEY

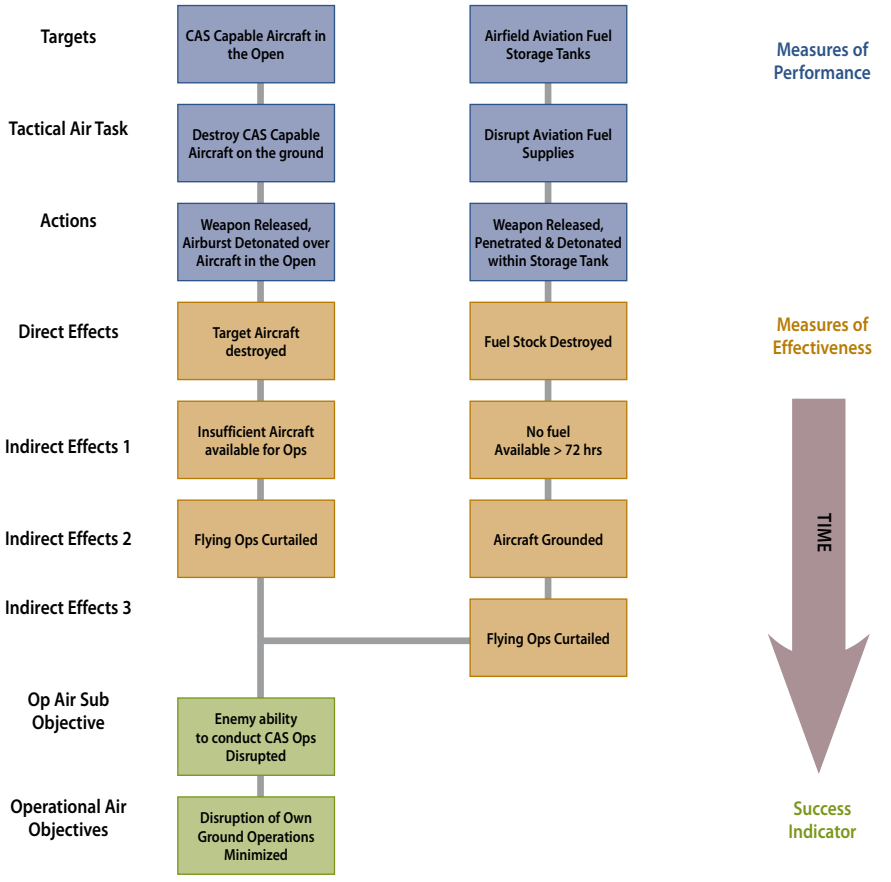
JAE	*Joint Air Estimate*	*TNL*	*Target Nomination List*
JAOP	*Joint Air Operations Plan*	*JPTL*	*Joint Prioritized Target List*
AOD	*Air Operations Directive*	*ATO*	*Air Task Order*
		ACO	*Airspace Control Order*

Example of Strategy-to-Task



NOTE: The strategy-to-task methodology effectively ends at the operational level with the determination of tactical air tasks - targets selection is a tactical-level task included here to provide a link to the next diagram - action-to-effect.

Example of Action-to-Effect



ACTIONS

Actions are taken in order to achieve desired effects. Actions produce direct effects that in turn may produce other indirect effects; it is this chain of cause and effect that creates the mechanism through which objectives, and ultimately the end-state, are achieved. In general, there are two broad categories of actions relevant at the tactical and operational levels, either or which can be lethal or non-lethal [17]. Actions can be:

[17] *Discussion on lethal and non-lethal effects is still the subject of ongoing joint development work.*

- **Kinetic.** Kinetic actions are those taken through physical, material means like bombs and bullets.
- **Non-kinetic.** Non-kinetic actions are logical, EM or cognitive, such as a computer network attack or a psychological operation.

EFFECTS

Effects describe system behaviour in the operational environment. They are the physical or behavioural state of a system that results from an action, a set of actions or another effect.

Effects comprise the full range of outcomes, events or consequences that result from a particular action or set of actions (whether desired or undesired; ultimate or intermediate; expected or unexpected; intended or unintended; sequential, parallel, cumulative or cascading; physical, functional or psychological) and can occur at all levels of war. Desired effects are the conditions related to achieving objectives.

There are four broad categories of effects, which often overlap.

- **Intended.** Intended effects are the desired, planned for and predicted outcomes, events or consequences of an action or set of actions. They can be direct or indirect and should always represent a net gain in terms of accomplishing objectives or the conflict's end-state.
- **Unintended.** Unintended effects are the outcomes of an action that are not part of the original intent. They can be direct or indirect and, if unplanned, may be desirable or undesirable from the friendly point of view, leading to outcomes that help or hinder achievement of friendly objectives.
- **Direct.** Direct effects are the 1st order effects that result from an action with no intervening effect or mechanism between act and outcome. In most cases they are physical, immediate and easy to recognize, and can be assessed empirically and often quantified in a meaningful way.
- **Indirect.** Indirect effects trigger additional outcomes that produce a final outcome or result (known as higher or 2nd, 3rd, 4th, etc … order effects) relative to the initial action. They may be physical, functional, systemic or psychological and occur in a cumulative or cascading manner. Because they are seldom immediate and are usually displaced from the direct effects in time and/or space, they are often hard to quantify or measure empirically and are often assessed or evaluated in qualitative terms. Generally, the less direct the effect, the harder it is to predict before the fact and measure after. It is generally not possible to predict beyond 3rd order effects with any degree of certainty.

Indirect effects can be further sub-divided:

- **Physical.** Physical effects result from actions or effects that physically alter an object or system.
- **Cognitive or Psychological.** Cognitive or psychological effects result from actions or effects that influence the emotions, motives and reasoning of individuals, groups, organizations and governments. It is seldom possible to measure psychological effects directly; however, their behavioural results can be measured.
- **Functional.** Functional effects are the direct or indirect effects of a target or target system to function properly.
- **Systemic**. Systemic effects relate to how well the targeted system functions as part of larger systems of which it is a part.
- **Cumulative and Cascading**. Cumulative and cascading effects result from the aggregation of many direct and indirect effects. Cumulative effects typically flow from lower to higher levels of employment, whilst cascading effects ripple through an enemy system, affecting nodes that are critical to many related systems or sub-systems.
- **Parallel.** Parallel effects result from actions or effects that are imposed at the same time or near-simultaneously. Such operations are generally quicker to achieve desired effects and objectives by overwhelming an enemy's capacity to adapt. However, parallel operations are almost always harder to impose, require more of all resources except time, are more complex and must be planned more thoroughly.
- **Sequential.** Sequential effects result from actions or effects that are imposed one after another. They may coerce a particular political solution from an adversary against whom a no holds barred attack is either not warranted or constrained by political considerations.

ASSESSMENT

Assessment is the process that considers the accomplishment of effects through specific measures that gauge results achieved in the overall mission and performance of assigned tasks.

- **Measures of Activity/Performance.** Measures of Activity/Performance (MOA/MOP) consist of the objective or quantitative measures assigned to actions.
- **Measurement of Effect/Measures of Effectiveness.** Measurement of Effect/Measures of Effectiveness (MOE) provide independent qualitative or quantitative assessment of the realization of specified effects.
- **Success Indicators/Campaign Effectiveness Assessment.** Success Indicators (SI) or Campaign Effectiveness Assessment (CEA) describe the conditions indicating attainment of objectives.

NOTE: In moving from direct to indirect effects, measures become less empirical and quantifiable.

The MOP measures how well a tasked mission was executed. For example, an aircraft flew to the target (a bridge); the weapon was released, armed, fuzed, hit the bridge and detonated. The MOE is a measure of what level of desired effect was sustained by the target. For example, the bridge was subsequently rendered 100% unusable by vehicular traffic.

However, whilst MOPs always measure accomplishment of tactical actions, there may be 'grey areas' within lower-level indirect effects where it is difficult to distinguish between MOP and MOE or SI / CEA. Planners must identify the Essential Elements of Information (EEI) needed to support the MOE and develop strategies for obtaining them.

NOTE: There can be a significant qualitative and even subjective component to MOE evaluation, depending upon how terms are defined.

TIMING

The temporal aspects of effects must be considered throughout the planning, conduct and assessment of an effects-based approach. Such aspects include, but are not limited to, the timing of attacks to apply the greatest amount of psychological and physical stress possible on an enemy, speeding up one's own decision making cycle relative to one's enemy and allowing sufficient time for effects to be realized.

Even the best assessment measures may indicate no significant changes in the enemy's situation, when in fact the chosen COA may be working. Commanders must consider how long a delay between action and ultimate effect they are willing to accept, against counter-actions that an enemy may impose in the interim.

WARNINGS. The level of detail required in the strategy-to-task process can tend to create a slave to process mentality and yet an estimate must be command led not process driven. The commander must identify the mission analysis, mission statement and COA comparison criteria, which require his input, leaving his staff to enact his direction. Additionally, he must be prepared to provide guidance at all stages of the process. The trinity between command, leadership and management must be understood, and the JFACC must leave the management to his staff and concentrate on the command and leadership elements.

OPERATIONAL ANALYSIS SUPPORT

Contemporary military Operational Analysis (OA) can contribute to the planning and execution of a campaign at all levels of warfare through the application of scientific method. At the military strategic level it can aid in the development of, and help to justify, the estimate and the deployment plan.

At the operational level it can assist the JFC in estimating the potential course of the campaign and the JFACC in his daily apportionment recommendation regarding air assets.

OA can reveal key campaign issues and identify parameters against which the operational effectiveness and efficiency of the battle can be measured. It can also provide the JFACC with a coherent and consistent way of comparing the opponent's means and their employment in achieving their intentions.

Support to an Operational HQ

Experience has shown that civilian scientific support to operational commanders will be at its most valuable when those providing it are recognized as an integral and trusted part of the HQ team; this relationship having been developed through peacetime training and deployments with their military colleagues. Scientific support teams need to be included at each command HQ level in a crisis situation. These teams would provide OA and technical scientific advice from their own resources and act as the focal point through which advice is drawn in from MOD agencies and establishments. They would have a primary role in framing requests for external scientific and technical support, as well as interpreting advice received when deployed to theatre. However, their most comprehensive role is the provision of OA to the operational commanders and the collection of data for subsequent analyses. OA is invaluable at all levels:

- **Strategic Level.** At the strategic level OA relates the interactions of the mass of personnel and materials in all three environmental areas to the over-riding military strategic goals. However, because of the nature of the problem at this level it can only identify trends, strengths and weaknesses in the broadest sense. In essence it seeks to enumerate and thus balance and constrain military and political judgements. The process is well suited to informing the estimate process and in helping validate its adequacy and comprehensive aspects. OA can provide detailed estimates of major deployments by relating the FE to their planned order of arrival in theatre and the phasing which has to be accomplished to result in a balanced fighting force. In so doing it takes account of the modes of transport, supporting infrastructure, constraints and choke points that might apply to reveal the robustness of the plan and its susceptibility to disruption. On occasion analysis can identify the optimum mechanisms for deployment.
- **Operational Level.** At the operational level OA can associate the utilization of assets with estimates of the resupply and likely logistic demands. Assessments of risk, especially attrition risks, can be made and demonstrate how these risk levels can vary with differing levels and types of combat support air operations. Key operational areas can be identified, and measures of progress can be estimated through combat assessment. It can compare the efficiency of conducting operations according to differing concepts of operations. It can also provide the JFC with predictions of cumulative battle damage assessments, operational thresholds and changes in phase that may indicate the need for reviewing the campaign plan. The same techniques can be applied to the opponent's intentions and capabilities but with greater uncertainty. Analysis is at its most useful and powerful when used to compare and contrast options; it is at its best when used to guide and inform the commander in making his operational judgements. Commanders should not expect or seek OA to predict the outcome of a battle or campaign.
- **Tactical Level.** At the tactical level the use of OA to support JFACC operations is pervasive, and OA staffs are located within the CAOC. It can investigate the optimum employment, deployment and

effects of individual weapons; analyze the planning and execution of air missions; and provide short-term battle damage assessment to support re-attack recommendations. Routings, profiles, risks and counter measures can be analyzed and assessed in parallel with the weight and placement of weapons necessary to meet damage objectives at individual targets. It can predict the likely levels of collateral and self-damage and provide guidance when an unusual weapon or delivery profile is being considered.

Operational Analysis Method

The intentions of the commander, along with all facts and data pertaining to the operation, are the foundation of OA. For it to contribute in a meaningful way to the campaign, commanders must be prepared to provide this information to the analysts from the outset.

It is accepted that at the start of the campaign information will be incomplete and possibly inaccurate which means that early analysis will be less precise. The timeliness and relevance of initial predictions will largely depend upon the comprehensiveness and operational depth of contingency plans as well as the available intelligence.

However, as more data is gathered and refined the results will be more timely and accurate. Analysis is not confined to planning, and analysts must have access to the full spectrum of operational information. The importance of constructing and maintaining accurate databases relating every detail of the course of the conflict cannot be over emphasized. The basis of the OA method is to:

- Observe and measure.
- Identify, define and enumerate the relationships between causes and effects.
- Test the relationships against similar events.
- Use the relationships to predict.

Some factors like morale and individual fighting performance cannot be measured. However, an allowance can be made to account for these factors to limit the effects on potential outcomes. The value of the approach is in the discipline and objectivity it imparts on what is otherwise a subjective process. Often the process alone can be more revealing than the prediction it provides.

The Utility of Operational Analysis

To be at its most effective in application, OA must be accepted as a joint activity between the scientific analyst and the military practitioner. It cannot replace the decision maker or those who collate and weigh the evidence prior to offering advice, but it can point to the decisive issues and constrain the subjective influence within the framework of numeracy.

Applied systematically, the method produces information and relationships that allow the methodical study of variations in actions and assumptions. It discriminates between critical activities and the likely consequences of their execution.

The key to the efficient management of a battle has long been recognized as not being simply the possession of information, but the ability to manipulate, investigate and relate various apparently disparate items of information. The application of OA will make apparent the strength and weaknesses, the efficiencies and inefficiencies of key lines of action and those wasting resources.

It should speed corroboration of observation, interpretation and hypotheses; reveal trends; and enable the full power of statistical analysis to be harnessed to the intentions of the operational commander in a timely manner. OA can provide commanders at all levels with the most powerful tool to aid their decision making.

CAMPAIGN PLANNING TOOLS

The analysis of COGs through critical capability, requirement and vulnerability is often referred to as the four-box methodology. The methodology provides an understanding for what is likely to be decisive within an operation by exposing an enemy's vulnerability that can be exploited, whilst identifying our own vulnerabilities that need protecting.

It helps determine military objectives.

- **Centres of Gravity.** COGs are the characteristics, capabilities or localities from which a nation, an alliance, a military force or other grouping derives its freedom of action, physical strength or will to fight. COGs can be broken down into critical capabilities and critical requirements that are used to derive the Critical Vulnerabilities (CVs) that can be exploited.
- **Critical Vulnerabilities.** CVs are those vulnerabilities, which, if destroyed or otherwise controlled, will lead to systemic disruption of that force. It is logical to target a CV to neutralize the COG rather than directly attack the COG, which is the enemy's strength. A COG may have multiple CVs that need to be continually revisited and assessed.

Historical Example of the Four-Box Methodology:

Alexander the Great had a strong army but a very weak navy; he identified in his campaign against the Persians that his success depended on gaining control of the Mediterranean Sea and he determined that the Persian COG was their shore bases. Securing those bases with his army meant that he was able to gain control over the sea without a naval battle.

CENTRE OF GRAVITY	CRITICAL CAPABILITY
The Persian Navy	Able to raid anywhere on Mediterranean littoral to threaten Macedonian LOCs and enforce Persian domination of subject nations
CRITICAL REQUIREMENT	**CRITICAL VULNERABILITY**
Need to retain ports to provide shelter, logistics, ship repair and replacement	Weakness of ports to land attack

CHAPTER 4

EMPLOYING AIR AND SPACE POWER

"The potential of aircraft was not recognised immediately. Their initial use was confined to observation …until one day, the full advantage of applying force from the air was realized, and the rest was history. So too with the business of space."

General H. M. Estes (USAF)

INTRODUCTION

Neither peace nor war exists in extreme form: perfect peace is utopian; absolute war is a theoretical construct with no restraint on violence. The increasing complexity of conflict no longer lends itself to linear definition. It is a social as well as a military phenomenon, and therefore, the use of force, and the various constraints upon it, will be defined by wider issues than military capability.

Moreover, while states tend to fight over material interests or values, social groups may compete over resources, identity, religion or emotional release.

FUNDAMENTAL CONSIDERATIONS

Air power's reach and concentration of force allow it to be employed at all levels of operations including the strategic level to achieve both lethal and non-lethal effects; examples of the latter are the gathering of strategic information and strategic airlift for humanitarian support. Air power, or the threat of its use, therefore offers a variety of ways of attacking an opponent's cohesion and will to fight while maintaining significant economy of effort.

It is the independent application of air power, along with its speed, mobility, precision and the possibility of independent application, which gives it its unique position as a politico-military instrument. In any crisis air power, supported by space, can be made available around the world rapidly with either a small or significant force. The force can provide a show of determination or destroy targets with great precision, while exposing multinational forces to minimal risk.

The use of air power may be rapidly escalated or de-escalated in any kind of conflict, and if used correctly, it can be a cost-effective means of achieving objectives. However, the effective use of air power is conditioned by many factors, not least of which is the capabilities and attributes of the assets themselves. By virtue of their speed and range, air assets are capable of rapidly establishing precision combat power and presence throughout the world, with space assets providing complementary or enhancing effects. Furthermore, the flexibility, mobility and responsiveness of air power allows for the element of surprise.

Those planning for the use of air power must take into account the unique capabilities of individual types of air assets. When correctly coordinated and packaged, these air assets can provide a concentration of firepower which, given the lethality and precision of modern airborne munitions, can have a disproportionate effect on the conflict. As highly valued resources, air assets must be afforded an appropriate degree of protection against any kind of threat. Air power has the unique ability to rapidly concentrate forces originating from diverse locations, perform a coordinated attack in time and space and then disperse quickly.

The use of air and space power may avoid the military and political liabilities that can arise from an extended presence in, or over, a foreign country. As air power can operate without having to put troops on the ground throughout the area of operations, it may be able to influence a conflict with reduced risk to friendly forces and to minimize potentially unfavourable international reaction. Moreover, should an extended presence in the country be deemed essential, air power can support this presence efficiently.

ENDURING ASPECTS OF CONFLICT

- **Friction.** Friction frustrates action, which makes the simple difficult and the difficult seemingly impossible. Friction may be mental-indecision over what to do next. It may be physical - the effects of intense enemy fire. It may be externally imposed - by the action of an adversary or the weather. It may be self induced - by a poor plan or clashes of personality.
- **Chaos and Uncertainty.** Chaos and uncertainty results from incomplete, inaccurate or contradictory information. It creates a 'fog of war' that limits perceptions and causes confusion. Because armed conflict is essentially chaotic, chance always plays a role.
- **Danger and Fear.** Danger and fear result when force is applied or threatened as the primary means of compelling an enemy to do what one wants.

EMPLOYMENT OPTIONS

Growing effectiveness has tended to progressively widen air and space force applications. Air and space power offer decision makers an unprecedented wide range of options to prosecute Defence and national security policy.

Such options begin long before any shooting starts and can make air and space power as important an instrument for preserving peace and managing crises, as they are for waging war. Air and space power can be employed across the full spectrum of conflict to exploit the 3rd dimension to enhance and project military power.

Aircraft offer the agility, capability and adaptability to operate across an entire theatre to achieve flexible and effective kinetic and non-kinetic, lethal or non-lethal actions in the pursuit of desired effects at the strategic, operational and tactical levels. Such options include preserving peace; managing international crises; and armed conflict.

Preserving Peace

Air and space power can be used to help preserve and strengthen international security, both by promoting good international relations and by providing reassurance to nations that they are not under threat of attack.

- **Promoting International Relations.** Speed of response is vital when disasters such as earthquake, tsunami, flood and famine strike, where air power helps play a key role in alleviating suffering. In such situations space-based sensors will often provide the first look at the affected area well in advance of the deployment of air assets. The potential security benefits of such high-visibility operations can also generate a spirit of goodwill, help to remove suspicion, alleviate grievances and be key in promoting stability and security.
- **Providing Reassurance.** Air and space power can be used to help avert threats to peace (both real and imagined), for surveillance purposes (to provide assurance that a potential antagonist is not about to attack) and to further confidence and security building measures. By leveraging commercial satellite imagery, data products can be released into the public domain without compromising national and military capabilities.

Managing International Crises

Air and space power can play a major part in managing international crises by offering a wide variety of important crisis management applications, most of which involve no recourse to violence. In terms of increasing seriousness, these include:

- **Warning.** Air and space power can be used to give prior and timely warning of an intended aggression (often without being detected by the aggressor) and thus allow appropriate preventative action to be taken.
- **Signalling.** Air power, and to a lesser degree space power, can be used to send clear political signals through a range of measures from overt increases in readiness states, intensified peacetime training exercises or presence flights. These can help to remove uncertainty over intentions and thus reduce what is arguably the greatest danger in any crisis: Miscalculation.
- **Providing Support.** Air and space power can be used to provide timely moral and physical support for allies and friends, thus strengthening their resolve in times of tension.
- **Rescue.** The use of air and space power to mount rescue operations in crises situations has a long history; however, such operations tend to involve high risks and demand the most careful preparations.
- **Stability.** Air power can be used to insert land forces to improve stability in a region threatened with civil strife or in areas where regional conflict threatens to spill over into neighbouring states.
- **Implicit Deterrence.** At the lowest end of the deterrence scale, the deployment of reconnaissance or surveillance aircraft can have a valuable deterrent effect on a potential aggressor. They can be used to warn him that his actions are being watched and could provoke a response.
- **Explicit Deterrence.** The proven ability to undertake rapid retribution, strike deep into unfriendly territory and deny the potential aggressor the assurance that his homeland can be kept safe from attack is a strong and explicit deterrent. In many situations air and space power will often be the only instrument that has the requisite speed, reach and potential to deter aggression.
- **Non-Lethal Coercion.** Towards the top-end of crisis management options, air power can be used to 'face down' a potential or actual aggressor without resort to physical violence, by the rapid and overt deployment of combat air power to a region.
- **Punishment.** If necessary, non-lethal coercion can be taken one step further and air power used for precise punishment operations. However, these operations tend to be reactive rather than proactive and depend on surprise for their effect. Hence, they are usually planned at short-notice on a 'one-off' basis, with little opportunity for practice and much scope for error.

Armed Conflict

Should crisis management measures fail, and crisis degenerate into armed conflict, then air and space power can make a decisive contribution to prosecuting operations successfully and with minimum loss of life.

Combat operations are usually the most demanding military operations typically characterized by frequent, widespread and intense operations.

Such operations normally seek to achieve national objectives and conclude hostilities on conditions favourable to the UK (and its alliance or coalition partners), generally as quickly and with as few casualties as possible. Establishing these conditions will usually require follow-on stability operations to restore security, provide services and humanitarian relief and conduct reconstruction.

The unique ability of air and space to concentrate military power in time and space, when and where needed, continues to be the dominant feature of contemporary high-intensity conflict. Here air and space power offers decision makers a wide range of options, including observation, destruction, lethal coercion, denial or containment, dislocation, delay, diversion and demoralization.

- **Observation.** Observation of the enemy provides the basis for intelligent planning and successful execution of military operations. The ability to exploit the 3rd dimension allows air and space forces to make a major contribution to monitoring activities, deployments and discovering intentions.
- **Destruction.** Air power's most obvious application is to destroy. The ability to concentrate firepower confers air power enormous potential destructive power, the consequential effects of air power's destructive capacity that gives air and space power a true war-winning potential.
- **Lethal Coercion.** The ability of air and space power to reach deep into enemy territory at any time to observe and engage the full spectrum of target sets allows it to be used to coerce an enemy during conflict. An enemy that faces strong air and space forces has to accept the possibility that an opponent can escalate the scale and scope of the conflict rapidly, and at will, by extending the intensity and scope of his attacks.
- **Denial or Containment.** Air and space power can be used to deny an enemy the ability to employ his air, surface and sub-surface forces effectively or contain him within a geographic area.
- **Dislocation.** The ability of air power to inflict dislocation is a key quality. Even if an aircraft fails to destroy its target, the impact on morale of a near miss or collateral damage may cause the enemy major mental, moral and physical dislocation. Dislocation causes delay and confusion, and it breaks unit cohesion. It also makes an enemy more vulnerable to follow up attacks by all types of forces.
- **Diversion.** Air and space power can be used to divert enemy forces in order to delay or destroy them. At the strategic and operational levels diversion can be achieved by concentrating attacks against sensitive target sets, compelling an enemy to divert force and resources from offensive to defensive duties. At the tactical level air power can achieve diversion by selectively observing or attacking choke points such as bridges etc. This can either delay the arrival of enemy surface forces or channel their movement into areas where they can be more easily contained or destroyed.
- **Delay.** The effects of dislocation, destruction or diversion can, in turn, create delay. In defensive situations imposing delays on the enemy allows friendly forces to deal more effectively with an attack, either by strengthening defences or by launching spoiling attacks. In offensive situations it allows friendly forces to prevent an enemy's escape.

- **Demoralization.** Demoralization is a factor that pervades all aspects of combat capability, and air attack has always had a particularly sapping effect on morale, almost irrespective of the damage inflicted.

EMPLOYMENT PRINCIPLES

The flexibility, reach and ability to concentrate force enable air power to conduct or support different lines of operation against different targets, and at different levels of war concurrently. Furthermore, air power can be switched from one role or objective to another within or between theatres, with out change of base, whilst the presence and readiness of air power can provide a strong deterrent in pre / post conflict periods and may contribute to stabilization of the overall situation.

Although space power by its very nature [18] is less flexible, it enhances the effectiveness of air power delivery and underpins many of the characteristic advantages expected of a modern air force (for example, precision, reach and flexibility). Thus, air power can be rapidly adapted with comparative ease to meet evolving operational requirements.

This provides the JFC with the ability to refocus effort at will, or permit operational pauses in other lines of operation without relaxing pressure on the enemy. The net effect is to achieve a tempo of operations that will defeat the opponent's cohesion and his desire to continue the fight.

In symmetric and asymmetric operations air power provides the JFC with the means to take advantage of both friendly strengths and opponent weaknesses whilst preserving his own freedoms of action. In so doing he may direct symmetrical actions where the opposing forces and friendly forces are similar, or pit its strengths against the opponent's vulnerabilities. Most importantly, air power enables the JFC to complement the strengths and compensate for limitations in other components to achieve the synergy that is essential for success in the joint campaign.

In terms of effects, particular care needs to be applied to the use of air power in counterinsurgency (COIN) and similar type operations. The synergy of air forces/capabilities and surface forces, operating as an integrated joint force, can often be overwhelming in cases where a single component cannot be decisive by itself; however, there can be a temptation to use air power principally as a source of kinetic effects. Commanders must realize that the use of aircraft in connection with destructive action can be abused; the danger of misuse lies in the very facility of aircraft.

Their power to cover great distance at high speed, instant readiness for action, indifference to obstacles and low risk to personnel can combine to encourage their offensive use more often than the occasion warrants.

Close integration of air and surface forces, particularly with the use of ISR assets, can enable an approach that is much more likely to yield effects that support the desired strategic end-state. This is essential if the asymmetric advantage that air power, supported by space, brings is to be utilized to the full.

An understanding of the aspects of posture, profile and presence as they relate to air power is needed, and must be tailored through an understanding of the culture of the environment within which it is to operate.

[18] *Fixed orbital parameters; relative paucity of assets to meet national, Joint and Coalition objectives; and sensor capabilities than cannot be easily reconfigured to meet new requirements.*

Applications of Air and Space Power

SITUATION	EFFECTS	ACTIONS
Preserving Peace	Promoting International Relations Providing Reassurance	Disaster Relief Observation
Managing International Crisis	Warning	Observation and Reporting
	Signalling	Demonstration Flights and Shows of Force
	Providing Support	Resupply and Redeployment
	Rescue	Evacuation
	Stability	Force Insertion
	Implicit Deterrence	Redeployment, Surveillance
	Explicit Deterrence	Increased Readiness, Overt Demonstration Flights, Show of Force
	Non-lethal Coercion	Implicit and Explicit Threat
	Punishment	Precise Actions
Armed Conflict	Observation	Reconnaissance
	Destruction	Actions to Destroy
	Lethal Coercion	Actions to Coerce
	Denial or Containment	Holding Actions
	Dislocation	Consequential Effect
	Diversion	Consequential Effect
	Delay	Consequential Effect
	Demoralization	Consequential Effect

APPLICATION PRINCIPLES

Where air and space assets are the only forces immediately available and capable of providing an initial response, for example, early in a crisis, before significant friendly surface forces can build up, employment should be focused on reducing an enemy's ability to achieve immediate war-winning aims. When employed aggressively, air and space forces can accomplish joint force objectives by striking directly at enemy COG and CVs without reliance on concurrent surface operations to be effective.

In specific circumstances, air and space operations can be conducted globally, reducing or even negating the requirement for the forward deployment of surface forces. However, where surface forces are present, rapid and decisive effects are best achieved when air and space operations are integrated with other elements of a joint force.

Air and space power are normally best employed in parallel [20] and asymmetric air operations where speed and range, coupled with a pervasive four-dimensional advantage, allow for the simultaneous and rapid engagement of key nodes and forces, to produce effects that overwhelm the enemy's capacity to adapt or recover.

As a result, the effects of parallel operations can be achieved quickly and may have decisive impact. In addition to the physical destruction from parallel attack, the shock and surprise of such attacks, coupled with the uncertainty of when or where the next blow will fall, can negatively affect the enemy's morale and may shut down an enemy's decision cycle and open further opportunities for exploitation.

NOTE: Symmetric [19] force-on-force warfare is sometimes required, for example in gaining air superiority; however, other offensive operations can usually be accomplished in parallel with counter-air operations. Where an enemy threatens our air superiority aims, we may be forced into sequential operations in which all available assets must be dedicated to winning air superiority before any other offensive operations are flown.

COMPOSITE AIR OPERATIONS

Concentration of force is a fundamental principle of war that is particularly well suited to air power. Experience has shown that air power concentrated in both time and space is more effective in achieving an objective than if it were dispersed over a wider area and longer time. Moreover, a concentrated force will use support forces more efficiently, increasing overall capability and survivability. The Composite Air Operation (COMAO) concept involves packaging a large number of aircraft, with a variety of roles, to complement each other to achieve a task. Additional benefits of packaging include minimizing attrition by optimizing mutual support and saturating enemy air defences en route to and/or in the target area. COMAOs may be tasked as force packages or force flows.

- **Force Packaging.** Force packaging consists of formations of aircraft with different roles tasked as an entity against a single objective or target area within a given Time on Target (TOT) window. The idea being to maximize weapons effects by concentrating weapons employment in a compressed time frame on a single target or array of targets. Force packaging requires careful planning and close coordination between the Combined Air Operations Centre (CAOC) COMAO coordinator, COMAO Package Leader (PL) and individual mission leaders to assure clean execution.
- **Force Flow.** Force flow involves a large number of aircraft employed as separately tasked attack missions. It is usually employed when there are a limited number of support assets, not necessarily dedicated to a particular package, or where mission objectives require an array of targets to be prosecuted nearly simultaneously. The major difference between packaging and flow is the level of planning and coordination. Flow requires detailed coordination by the CAOC COMAO coordinator to achieve a compressed and deconflicted flow into and out of the target area, whilst deconfliction over the target area is the responsibility of respective mission leaders.

Planning

COMAO planning can be complex and time consuming, and the appointed CAOC COMAO coordinator will designate a unit to provide a PL and nominate a CAOC point of contact.

Key planning considerations include the objective of the task, the priority of the task, route and target weather, availability of suitable aircraft/forces or capabilities, availability of suitable weapons, airbase locations relative to the target(s), availability of AAR, availability of multi-role aircraft to counter / assist in air-to-air threat mitigation, collocation at given airbases and the availability of units of the same nationality.

Additional force flow planning considerations include the number of targets to be serviced, the priority of the targets selected, target objectives, availability of support assets (including space capabilities), and enroute and target area threats.

Execution

COMAO execution details are disseminated through the ATO; however, it is the responsibility of the COMAO coordinator and PL to communicate additional information clearly and concisely. The COMAO coordinator is also responsible for determining and delegating planning responsibilities. Individual mission leaders are responsible for mission planning and for informing the CAOC coordinator and PL of any aspects requiring further coordination.

Areas for consideration include rendezvous procedures that cater for Visual Meteorological Conditions (VMC), Instrument Meteorological Conditions (IMC) or night operations, rendezvous points and areas, timing criteria and hold/feed parameters, ingress options (low/medium/high or combination, stream/horizontal spread/vertical stack or wall), egress options (VMC, low threat, IMC or high threat), threat reactions (immediate/long-range threat and TOT contract, target area tactics/procedures including attack coordination, weapons, re-attack, TOT, alternate TOT, alternate target, attack sequencing, attack deconfliction and off target procedures.

[19] *Symmetric warfare pits a capability against the same or similar capability.*

[20] *Parallel operations aim to place as much stress as possible on an enemy system, by applying pressure at many points across a system in a short period of time to cause maximum shock and dislocation effects to limit an enemy's ability to react and adapt.*

The Friction in Execution

- Recognizing no plan survives contact with the enemy
- Distinguishing between the vital and the interesting
- Properly handing off plans to the operators for execution
- Resolving ROE prior to engagement
- Providing adequate feedback to other components
- Providing for appropriate liaison (upwards and laterally)
- Shipping what is needed in the order required for use
- Explaining air and space power's strengths and limits to other CCs
- Fully communicating
- Providing time to back brief and rehearse

Cancellation

COMAO cancellation involving part of or all of the entire COMAO requires specific procedures be laid down because of the various units involved, and the viability of the COMAO should key FE become unavailable. Authority to cancel rests solely with the CAOC; therefore, the COMAO coordinator must be informed immediately of any circumstances affecting the readiness, the capability of tasked forces or any change concerning mission objectives.

Once airborne, the PL has the authority to abort the package. Unless briefed otherwise, individual mission leaders only have the right to abort their own mission. Examples of reasons for cancellation include new intelligence information on the target or target area, unexpected weather deterioration, a change in target priorities and the loss or non-availability of key COMAO component forces or capabilities.

CHAPTER 5

COMMAND AND CONTROL

"The war in the air is the true war of movement, in which swift intuition, swifter decision, and still swifter execution are needed. It is the kind of warfare in which the outcome will be largely dependent upon the commander."

Giulio Douhet

INTRODUCTION

Effective exploitation of air and space forces relies upon effective, coordinated and concurrent employment of air and space assets on often discrete and distinct activities. Consequently, and notwithstanding the inherent flexibility of air and space forces, effective employment is often complex when capability is leveraged across the full spectrum of air and space power activities.

NOTE: The C2 structures discussed in this chapter are based on a US or NATO-led operation. In the case of standalone UK-only operations the air C2 structures detailed here will be appropriately adapted and scaled. There is a section entitled UK JFACHQ which discusses C2 relationships for UK national operations.

THE JOINT FORCE AIR COMPONENT COMMANDER

The JFACC is given the authority necessary to conduct air operations to accomplish missions and tasks in accordance with the JFC's intent and CONOPs. He typically exercises tactical control over air assets made available for tasking, though the JFC may also establish supporting [21] and supported [22] relationships between the JFACC and other components to facilitate operations.

The JFACC recommends the proper employment of air and space forces from multiple components and also plans, coordinates, allocates, tasks, executes and assesses air operations to accomplish assigned operational missions. Because of the theatre-wide scope of air and space operations, the JFACC typically maintains the same theatre-wide perspective as the JFC.

The JFACC operates from either a static or deployed HQ, depending on the characteristics and requirements of the operation. In deciding that location, the JFC ensures the JFACC has necessary access to him, whilst, in turn, the JFACC strikes the balance between the advantages of face-to-face contact with the JFC and the need to exercise his tactical responsibilities. Normally the JFACC HQ is collocated with that of the JFC because the JFACC operates across the whole theatre and generally has no specific Area of Operations (AOO).

The responsibilities of the JFACC are assigned by the JFC and include, but are not limited to, planning, integrating and monitoring joint air operations and space support, and the allocation and tasking of joint air operations forces based on the JFC's CONOPS and air apportionment decision.

Specific responsibilities include developing the JAOP and an AOD to support the JFC's objectives, recommending apportionment to the JFC, allocating and tasking air assets made available based on the JFC's air apportionment decision, overseeing and guiding the execution of air operations, adjusting tasking in coordination with the JFC and affected CCs (as appropriate), integrating joint air operations with operations of other CCs and forces assigned to or supporting the JFC, evaluating the results of joint air operations and forwarding assessments to the JFC to support the overall assessment effort, providing and receiving appropriate liaison personnel as required, performing the duties of the Airspace Control Authority (ACA), performing the duties of the Air Defence Commander (ADC) and functioning as a supported or supporting commander as designated by the JFC.

LIAISON WITH COMPONENT COMMANDS

Effective liaison between forces is essential for coordinated operations and is a key factor in the success of joint operations. Component liaisons serve as conduits for direct coordination between their respective CCs and have the responsibility of presenting component perspectives and considerations regarding planning and executing joint air operations.

[21] *A supporting commander furnishes forces, equipment, logistics or other support to a supported commander, or develops a supporting plan.*

[22] *A supported commander has primary responsibility for all aspects of a task assigned by a higher authority.*

They should possess the authority to represent their CC on time-sensitive and critical issues and must be equipped and authorized to communicate directly with their respective CC. Component Liaison Officers (LOs) must be familiar with the details of all component air, surface and subsurface missions, their impact on joint air operations and its impact upon them.

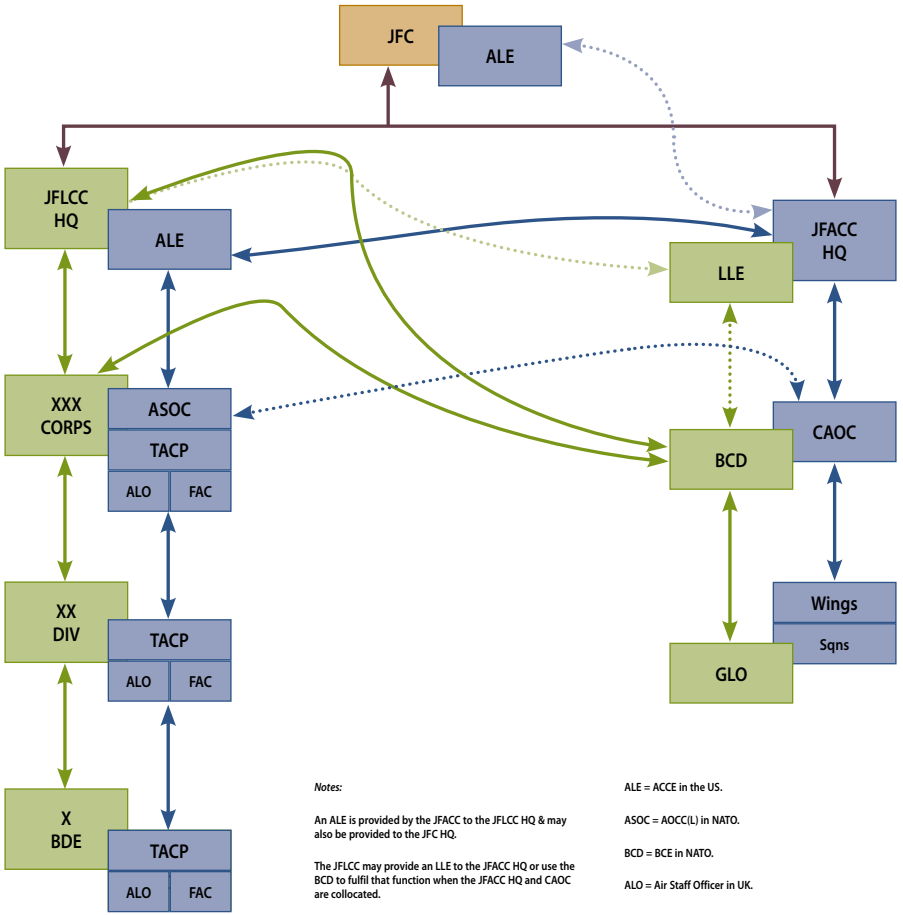
Senior component liaisons represent their CC on time-sensitive and critical issues and help integrate their component's participation in joint operations: whilst experienced specialists provide component planning and tasking expertise, and coordinate and deconflict component direct support air operations.

- **Air Liaison Elements.** Air Liaison Elements (ALE [23]) are the JFACC's senior air force liaison element established within the JFC HQ (where the JFC and JFACC are not collocated) and within appropriate CC HQs. The ALE is normally organized with expertise in plans, operations, space, intelligence, airspace management and airlift in order to assist in planning air component supporting and supported requirements. Its interface should include exchanging current intelligence and operational data, support requirements, coordinating the integration of Airspace Control Means (ACMs) and Fire Support Coordination Measures (FSCMs).
- **Maritime Liaison Element.** Maritime Liaison Element (MLE) staffs serve as the Joint Force Maritime Component Commander's (JFMCC's) primary representative to the JFACC.
- **Land Liaison Element.** Land Liaison Element (LLE) staffs act as the Joint Force Land Component Commander's (JFLCC's) representative to the JFACC.

NOTE: Where a JFACC is sea based, space and communication limitations may restrict the size and capability of any liaison.

[23] *Known as the Forward Air Element (FAE) in NATO.*

Example of Liaison Elements – Air/Land Operations for Typical large-scale Multinational Operations



ALE	*Air Liaison Element*	*BCD*	*Battlefield Coordination Detachment*
ALO	*Air Liaison Officer*	*BCE*	*Battlefield Coordination Element*
ACCE	*Air Component Coordination Element*	*BDE*	*Brigade*
AOCC(L)	*Air Operations Coordination Centre (Land)*	*CAOC*	*Combined Air Operations Centre*
ASOC	*Air Support Operations Centre*	*Div*	*Division*

FAC	*Forward Air Controller*	*JFLCC*	*Joint Force Land Component Commander*
GLO	*Ground Liaison Officer*	*LLE*	*Land Liaison Element*
JFC	*Joint Force Commander*	*TACP*	*Tactical Air Control Party*
JFACC	*Joint Force Air Component Commander*		

LIAISON WITH SUBORDINATE COMMANDS

Land Forces

The principal air liaison element embedded with land manoeuvre units from battle group to corps is known as the Tactical Air Control Party (TACP). TACP are functionally subordinate to the JFACC through the CAOC, but responsive to the ground element that they are collocated with. TACPs are found at corps, division, brigade or battle group levels.

TACPs consist of Air Liaison Officers (ALOs) (known as Air Staff Officers (ASO) in the UK), Forward Air Controllers (FACs) (known as Joint Terminal Attack Controllers (JTAC) in the US), radio maintenance personnel, supply personnel, fleet management personnel and information management personnel.

- **Air Support Operations Centre.** The ASOC is the senior TACP collocated with the senior fielded land formation (usually corps or division). The ASOC allocates support tasks to its associated and subordinate TACP and facilitates CAS, AI, Suppression of Enemy Air Defence (SEAD), air mobility and ISR missions within its assigned area of control. The ASOC is the primary control agency responsible for the execution of CAS in direct support of surface forces and processes immediate requests submitted directly by ground manoeuvre forces. When the CAOC has granted the ASOC authority of missions designated to it on the ATO, it can directly task on-call missions or divert scheduled missions to satisfy approved immediate requests. The ASOC is also responsible for liaison with the CAOC to launch or divert missions when its own allocation of aircraft is insufficient to meet demand. In a multi-corps environment there will normally be one ASOC with each corps and each ASOC reports individually to the CAOC.
- **Air Liaison Officers / Air Staff Officers.** ALO/ASOs are located at division and brigade level where they provide SME advice on air operations and coordinate directly with army airspace and fire support agencies to integrate, synchronize or deconflict air operations in the ground sector.

Maritime Forces

- **Air Liaison Element (Maritime).** Air Liaison Elements (Maritime) (ALE(M)), formerly known as the Air Operations Coordination Centre (Maritime) AOCC(M), are established within maritime formations to provide air expertise, to coordinate planning, to monitor the execution of air missions in

support of maritime operations and to liaise with the appropriate maritime commander. The ALE(M) is functionally subordinate to the JFACC through the CAOC, but responsive to the maritime element with which it is collocated (normally alongside the Maritime Air Operations Centre (MAOC).

- **Maritime Air Operations Centre.** The MAOC is responsible for the planning and execution of maritime air operations and tasks organic air assets in direct support of maritime operations. The MAOC is also responsible for providing input to the ATO and Airspace Control Order (ACO) via the MLE as appropriate.

LIAISON WITH OTHER ORGANIZATIONS

Liaison with intergovernmental organizations, other government agencies and NGOs is often appropriate. It is particularly important when such organizations conduct activities near to, or within, areas that the military is operating to ensure that, to the maximum extent possible, these organizations' efforts and the military efforts are integrated, complementary, or at least not in conflict.

SPACE COMMAND AND CONTROL

Space brings another level of complexity into C2 because many space assets that support military activities come from a variety of organizations, some of which are outside of military channels or are considered national assets and are not readily available to a coalition or partner nation. These capabilities often have non-traditional chains of command. In some cases, authority may be split between organizations due to shared interagency responsibilities. Coordination at the strategic political level may be a requirement to fully access national space assets. Within a regional operation, the JFC can designate a Space Coordinating Authority (SCA) to facilitate unity of effort with member-nation space operations and military component space capabilities. SCA is an authority, not a person.

As such, the commander with SCA serves as the focal point for gathering space requirements from the JFC's staff and each CC; SCA will usually reside with the JFACC. This provides unity of effort for space operations in support of the JFC's campaign. These requirements include requests for space forces (for example deployed space forces), space capabilities and implementation of specific command relationships.

The commander with SCA develops a recommended prioritized list of space requirements for the joint force based on JFC objectives. While a commander with SCA can facilitate non-traditional uses of space assets, planning staffs should utilize the established processes for fulfilling intelligence and communications requirements. As the UK possesses relatively few space assets, space support to UK-only operations should be leveraged through the Space Operations Coordination Centre (SpOCC).

THE JOINT FORCE AIR COMPONENT COMMANDER HEADQUARTERS

The following description of a generic JFACC HQ is based on a large-scale multinational scenario. The actual size of the JFACC HQ and the internal manning and composition of the elements will vary according to the type and scope of the mission. The structure could vary from an organization with a formal A-1 to A-9 staff structure, in functional areas with a separate and readily identifiable CAOC, to one in which the staff might carry out the CAOC functions without being formally structured as one.

- **NATO-led Operations.** For NATO-led operations the JFACC HQ will generally form from one of the two CC-Air HQ, at Ramstein (Germany) or Izmir (Turkey), utilizing its organic C2 structure and supported by one or more NATO static CAOCs.
- **UK National Operations.** For UK national operations the JFACC HQ will form from the cadre of SME within the JFACHQ at Air Command. The UK JFACHQ is covered in greater detail in the next section of this chapter.

The option does exist for the JFACC HQ to deploy to a forward land or sea-base with an embedded Deployable CAOC (DCAOC). The location decision will be based on the specific mission, the type and composition of assigned forces, the tempo of the operation, the required tasking capability, the availability of suitable HQ location and supporting infrastructure, and the necessity to collocate with the JFC HQ or not. Ultimately, the capacity to provide working space and Communications and Information System (CIS) support will usually be the driving factor.

NOTE: There are national variations to the JFACC planning responsibilities, which see more of the planning effort devolved to a CAOC.

The Headquarters Staff

The JFACC will stand up a Battle Staff (BS) to form the operational centre and main coordinating element of his HQ. The BS will work alongside the existing divisional A-level structure, with sections and cells below the division level operating along functional lines. An additional HQ Support Group is responsible for providing administrative, logistical and security support to all elements of the HQ.

- **A-Level Staff.** The A-Level staff comprises the Division Chiefs, A1 Personnel and Administration, A2 Intelligence, A3 Operations, A4 Logistics, A5 Policy and Plans, A6 Communications and Information Systems, A7 Doctrine and Training, A8 Budget and Finance (BUDFIN) and A9 Civil-Military Cooperation (CIMIC).
- **Battle Staff.** The BS comprises the Director (DIR), Deputy BS Director Operations (DDIR), Coordination Officer / Information Manager (COORDO/IM), Divisional Representatives (DR), Political Adviser (POLAD), Legal Adviser, Public Information Officer (PIO) and the component (LOs).

The JFACC HQ staff will also include appropriate component representation and SMEs to provide the knowledge and experience required to effectively employ any capabilities/forces made available to the JFACC for tasking. To be most effective, the JFACC must integrate component representation throughout his staff, rather than just limiting them to a liaison position. Ideally, JFACC HQ staff billets requiring specific expertise or individuals will have been identified, staffed accordingly, trained and employed during peacetime exercises to ensure their preparedness for operations.

A3 Division

The A3 Division has the overall responsibility of integrating various inputs into consolidated operations orders and directives that facilitate effective and efficient air operations through a number of cells.

- **Air Operations Directive Team.** The Air Operations Directive Team (AODT) translates the Joint Coordination Order (JCO) and JAOP into the AOD and supporting Joint Prioritized Target List (JPTL).
- **Current Operations.** The Current Operations Cell (COC) is split into an offensive and defensive section responsible for managing all aspects of ongoing air operations and associated space support functions. It synthesizes the Recognized Air Picture (RAP), various reports, and direct dialogue with the CAOC and the ALE to maintain overall SA. The COC also coordinates changes to the AOD and prioritized target lists and coordinates with the target cell to execute all mobile, time-sensitive and conventional targeting.
- **Ground-Based Air Defence / Theatre Missile Defence Coordination Cell.** The GBAD / Theatre Missile Defence Coordination Cell (TMDCC) monitors, assesses and advises on GBAD and Theatre Missile Defence (TMD) operations and plans.
- **Electronic Warfare Coordination Cell.** The Electronic Warfare Coordination Cell (EWCC) is responsible for the planning and coordination of all air Electronic Warfare (EW) and related activities in liaison with the joint and CC EWCCs.
- **Air-to-Air Refuelling / Airlift Cell.** The AAR/Airlift cell is responsible for coordinating AAR planning for all CCs and establishing appropriate airspace.
- **Personnel Recovery Cell.** The Personnel Recovery (PR) cell assists in planning, risk assessment and guidance to the Combined Joint Rescue Coordination Centre (CJRCC) embedded in the CAOC.
- **Force Protection Coordination Cell.** The Force Protection Coordination Cell (FPCC) advises the JFACC on appropriate FP measures considering threat, mission criticality and risk-taking philosophy, and coordinates Chemical, Biological, Radiological and Nuclear (CBRN) warning and reporting. The cell maintains close liaison with FP staff at JFC, other CC and subordinate HQs.
- **Joint Airspace Coordination.** The Joint Airspace Coordination Centre (JACC) develops the Airspace Control Plan (ACP), manages and publishes the ACO; receives, coordinates and approves or denies requests for ACMs, coordinates or deconflicts requests for the activation of ACMs extending into adjacent JOAs, establishes liaison with CCs, appropriate NATO, national and international organizations, and ensures the timely and adequate distribution of the ACO.
- **Airspace Surveillance and Control System.** The Airspace Surveillance and Control System (ASACS) cell monitors, assesses and advises on integrated Air Defence (AD) operations and data links.

A5 Division

The A5 Division leads on the development of the short-term air strategy and overall assessment of the air operations based on the JAOP and ongoing operational, intelligence and logistic constraints. A5 also maintains the medium to long-term vision for air operations, monitors force composition, analyzes and assesses the operational effectiveness of the air operations and compiles branch and sequel plans. A5 leads the translation of the JCO into a comprehensive air strategy for execution in the short-term as well as the development of plans for the medium and longer terms. A5 will also monitor the operations and plans of other CC HQs to identify their impact on air strategy and the overall joint campaign, recommending new COA as appropriate. The A5 division consists of the following sections:

- **Coordination and Administration.** The Coordination and Administration Section provides overall management, coordination and control of A5 administration, signals traffic and correspondence.
- **Air Operations Planning.** The Air Operations Planning Group (AOPG) develops the long-term vision, identifies friendly COG with higher-HQ (HHQ) staff, translates HHQ direction and guidance into the JFACC's direction and guidance, acts as the JFACC's link to HHQ planners. It identifies desired effects and refines phased air objectives, advises the JFACC on planning issues and requirements, represents the JFACC in the Joint Coordination Board (JCB) as required, leads the development of apportionment and air target requirements, works on bed-down issues with A4 as required, and supports and contributes to the AOD decision meeting.
- **Analysis and Assessment.** The Analysis and Assessment Section is part of the AOPG and evaluates results against objectives, advises on any changes to current objectives and estimates likely achievement timescales, produces the Air Strategy Assessment and Assessment Report (ASSESSREP) and supports the air strategy section.

THE UK JOINT FORCE AIR COMPONENT HEADQUARTERS

The UK JFACHQ provides the UK with a full time deployable core Air C2 capability, held at Very High Readiness (VHR), for Joint Rapid Reaction Force (JRRF) operations. The UK JFACHQ forms part of HQ AIR and comprises approximately 400+ personnel [24], associated air C2 CIS equipment and organic deployment infrastructure that is capable of providing basic working accommodation with minimal external support. During crisis response, deployed elements of the JFACHQ are subordinated to the PJHQ under its Joint Task Force HQ (JTFHQ) element.

[24] *This provides a mixture of cadre and augmentee personnel to activate one MS (up to 242 persons)*

All cadre personnel within the JFACHQ are held at VHR for deployment in support of national and coalition operations. The majority of non-cadre augmentees are held at a lower readiness state and only deploy if required to meet specific task force requirements.

The unit is tasked to provide the full range of expeditionary air C2 in support of the JFACC for UK operations up to MS, framework nation status or the augmentation of coalition HQs (including NATO). The JFACHQ is also certified for employment as the high readiness air C2 element of a NATO Response Force (NRF). The JFACHQ is fully scalable and will deploy in a configuration dependent upon the requirements of the operation to be supported and the juxtaposition of other elements of the air C2 organization. Dependent on the nature of the theatre and role, the deployed HQ may range from the full establishment through to a small group of personnel hand-carrying any CIS and personal equipment. Types of operation supported include:

- **UK National-only Deployment.** In the case of a national-only deployment the UK will provide its own JFACC, and all support and logistics functions will be carried out by UK personnel [25].
- **UK-Led Coalition Operation.** In the case of a UK-led coalition operation, UK personnel will provide the key elements of the command hierarchy and JFACC; with most key functions being carried out by UK personnel. The expectation is that the senior coalition partner will provide a Deputy JFACC (DJFACC). CIS elements will be led by UK systems.
- **Augmentation of a Coalition-led Deployment.** In the ideal case the UK would provide the DJFACC, some key elements of the HQ structure and some elements of C2 functionality and hierarchy. There will normally be a requirement to deploy a national coordination team to monitor UK-specific issues under a UK Air Contingent Commander (ACC) who may dual-hat as the DJFACC. Deployment of UK CIS into theatre will generally be required for the passing of UK-specific information to UK FE.
- **NATO Reinforcement.** In this case the JFACHQ C2 SME will deploy to support or reinforce the NATO HQ system. It is likely that JFACHQ personnel will deploy individually to separate NATO HQs as required rather than deploying as formed cells.
- **NATO Response Force.** The JFACHQ is certified for employment as the High Readiness air C2 element of a NRF.

The JFACHQ would ideally be deployed to one location; however, the HQ can function as three parts, a Command Group and Strategy Division, an Air Component Support (ACS) Division, and an Operations Division (which forms the CAOC). Each part can be established in different locations if circumstances dictate. The JFACHQ's preferences are collocation with the JTFHQ, collocation at a DOB, FMB or FOB, collocation with another CC's HQ or deployment to a discrete stand-alone site as a complete unit.

The UK JFACHQ is structured into four main areas, the Command Group, the Strategy Division, Operations Division and the Air Component Support Division. The generic organizational hierarchy of the JFACHQ is as follows:

[24] This provides a mixture of cadre and augmentee personnel to activate one MS (up to 242 persons) and one SS (up to 186 persons) Air Component Headquarters, with an associated Air Support Operations Centre (ASOC). Note that numbers will be decided post estimate and may be as small as 7-12 in SS operations.

- **Command Group.** The Command Group consists of the JFACC (when appointed), the HQ Director and the Chief of Staff (COS) plus support personnel. The COS also carries out the responsibilities of Deputy Director.
- **Divisions.** The divisions consist of an SO1 Head and a grouping of subordinate elements conducting a specific aspect of air C2.
- **Branches.** The branches consist of an SO1/SO2 Chief and staff that generally mirror the standard A1-9 staff disciplines. The exception is A3, which is divided into two separate branches: Combat Plans and Combat Operations.
- **Sections.** The sections consist of an SO2/3 Chief and staff that group like-functions within a branch (for example, the Battlespace Section of A3 Combat Plans deals with airspace, tactical data link planning and coordination, space/ISR planning and coordination, and EW planning).
- **Cells.** The cells undertake specific, discrete tasks within the HQ, for example, the Joint Accelerated Targets Cell within the Offensive Operations Section of A3 Combat Operations Branch focuses on Time Sensitive Targeting (TST).
- **Desk.** The desks are the lowest level of organizational hierarchy within the JFACHQ.

A7 Branch

The A7 Branch is a supporting element to the JFACHQ, with an in-garrison remit to train both cadre and augmentee personnel. During concurrent operations, A7 forms the core of the 2nd JFACHQ, with SO1 A7 assuming the responsibilities of COS for that 2nd HQ. Should only one JFACHQ deployment be required, A7 remain in-garrison to continue with ongoing training tasks.

THEATRE AIR COMMAND AND CONTROL SYSTEM

Air operations are controlled through an overarching air C2 structure centred on the CAOC known as the Theatre Air Command and Control System (TACCS). It includes the structures, personnel, procedures and equipment necessary to plan, direct and control air operations and to coordinate air operations with other components. There are additional air C2 elements that sit below the CAOC to provide tactical control for forces executing air missions.

Combined Air Operations Centre

The CAOC is the principal centre from which air and space operations are directed, monitored, controlled, executed and coordinated with the other components. They are structured to operate as a fully integrated facility and include the equipment and personnel necessary to accomplish the planning, directing, controlling and coordinating of theatre-wide air operations. Actual CAOC organization may vary with specific theatre or national requirements. DCAOCs provide the operational flexibility to either increase the

[25] And exchange personnel on the HQ Establishment.

tasking capacity of a static CAOC or to deploy to where they are needed. The CAOC is covered in greater detail in Chapter 6.

Control and Reporting Centre

The Control and Reporting Centres (CRCs) are radar, datalink and C2-equipped organizations that are subordinate to the CAOC and are responsible for the decentralized control of air operations, battle management and Airspace Control (ASC) as well as supporting offensive air operations. The CRC manages all air and airspace management activities within its assigned operational area through surveillance, identification, weapons control, positive and procedural airspace control, and link management, and produces a RAP.

Further control, surveillance and battle management may be delegated to subordinate radar units such as Airborne Early Warning (AEW) or AWACS, or to flight procedural agencies such as ASOCs, where they have interoperable and better radio and / or radar coverage. CRCs are ground-based and may be static or mobile and deployable.

Air Support Operations Centre

ASOCs are the senior TACP collocated with the senior fielded land formation. They are described in more detail in the previous section of this chapter.

Officers in Tactical Command

The Officer in Tactical Command (OTC) is responsible for coordinating all friendly air movement within the maritime Force Area Coordination Area (FACA). The OTC ensures that airspace requirements such as FACA, Missile Engagement Zones (MEZs) and entry gates are coordinated with the ACA and that the ACO is adhered to.

Air Ground Surveillance System

Air Ground Surveillance Systems (AGS), such as the Joint Surveillance and Target Attack Radar System (JSTARS) and Airborne Stand Off Radar (ASTOR), build ground SA through surveillance to support operations or targeting. They are described in more detail in Chapter 10.

Airborne Early Warning

AEW aircraft are flexible and capable integrated surveillance platforms that can provide a real-time, accurate and reliable all altitude / all weather battlespace picture of friendly, neutral and hostile activity beyond the coverage of ground-based radar. On board controllers provide an offensive and defensive control capability. AWACS provide an additional air battle management capability, EW and intelligence capability above and beyond pure AEW.

Signals Intelligence

Signals Intelligence (SIGINT) is the individual or collective gathering of communications intelligence, electronic intelligence and foreign instrumentation signals intelligence that allows airborne assessment of air and surface based electronics emitters. In addition, the correlation of location, type and mode of emitted signal can be made with the radar tracking information from AEW and AGS type aircraft.

Wing Operations Centre

The Wing Operations Centre (WOC) performs continuous coordination between a flying station operations wing and the CAOC as well as between a wing and associated squadrons. The WOC assesses the feasibility of tasking throughout the mission preparation process and adjusts mission relevant information that is within the wing's capabilities. The WOC generates mission launch schedules and assigns missions to individual squadrons or to individual aircraft. The WOC also monitors and ensures mission result reporting and provides continuous near-real-time status information to the CAOC and associated CRC.

Squadron Operations Centre

The Squadron Operations Centre (SQOC) performs continuous coordination with the WOC for final mission preparation. The SQOC is primarily responsible for the preparation of assigned missions, their timely execution and the subsequent reporting of mission results through the WOC to the CRC and associated CAOC.

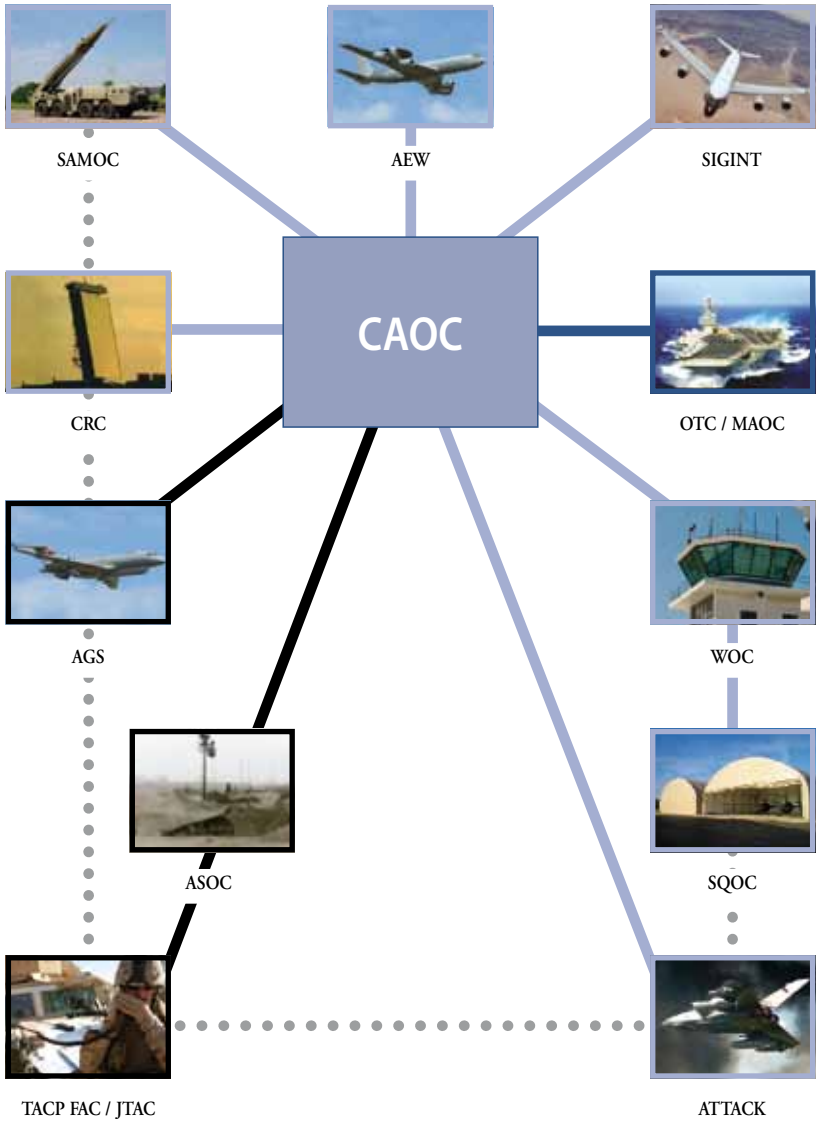
Surface-to-Air Missile Operations Centre

The Surface-to-Air Missile Operations Centres (SAMOC) performs management and control of GBAD weapons systems and provides continuous near-real-time GBAD status information to the CAOC, CRC and the ASOC (when the SAMOC provides support to ground forces). The SAMOC is normally deployable, but may be implemented at static installations.

Forward Air Controllers / Joint Terminal Attack Controller

FACs/JTACs are qualified individuals who direct combat aircraft engaged in CAS from a forward position on the ground or from the air. FACs may form part of a TACP or be individuals drawn from ground forces who, in addition to their primary duties, are qualified as ground FAC/JTACs or helicopter-based Airborne FACs (AbFACs). FAC (Airborne) (FAC(A)) are fixed-wing based FACs acting as an airborne extension of the TACP with the authority to direct aircraft onto specific targets and the ability to provide procedural airspace control.

Example of Typical TACCS Components



CHAPTER 6

THE GENERIC COMBINED AIR OPERATIONS CENTRE

INTRODUCTION

Dependent on theatre and contingency, and whether the mission involves war or peace support operations, the composition, organization and functions of the CAOC may need to be tailored. However, the basic framework still applies. The CAOC is led by a Director who focuses on integrating planning and coordinating, allocating, tasking and executing tasks.

He also coordinates with appropriate airlift coordination organizations to meet the airlift priorities. Each of the CAOC's major activities relies on expertise from LOs to coordinate requests or requirements and maintain a current and relevant picture of the other component operations.

NOTE: In general terms a NATO CAOC develops, issues and controls the execution of the ATO and related instructions to subordinate units, who will execute the plan. AOD development is the purview of the appropriate NATO CC-Air HQ.

Functions that should be common to all CAOCs are a Plans and a Current Operations Division (Current Operations may also be known as Combat Operations in some nations) with other divisions, cells or teams being established as required. Typically, planning future joint air operations and assessing past operations is the responsibility of a Strategy Division, while a Plans Division is devoted to near-term planning and drafting the daily ATO.

Execution of the daily ATO is carried out by Combat or Current Operations and closely follows the action of current joint operations, shifting air missions from their scheduled times or targets and making other adjustments as the situation requires. A separate Air Mobility Division (AMD) may be responsible for integrating inter-theatre and intra-theatre airlift, AAR and aeromedical evacuation into the air plan and providing liaison with national transport agencies, while an ISR Division (ISRD) will match collection requirements with integrated ISR assets.

The role of intelligence is extremely important and an integral part of the daily functions of the CAOC. Intelligence personnel monitor and assess adversary capabilities and intentions and provide assistance in target, weapon and platform selection, Unmanned Aircraft (UA) tasking and WMD response. They also conduct combat assessment and provide an up-to-date picture of the enemy, expected adversary operations and the status and priority of assigned targets to assist in execution day changes.

NOTE: The use of the word 'combat' in titles does not necessarily imply combat operations as activities in supporting joint air operations may span the range of military operations. Furthermore, whether an activity is called a division, cell, branch or specialty team, is dependent upon the scope and complexity of the operation. For simplicity, the major activities described below are labelled divisions.

PLANS DIVISION

The Plans Division is responsible for the near-term operations planning function of the CAOC. It develops detailed plans for the application of air resources based on JFACC-approved guidance received from the JFACC AOD. These plans provide the near-term guidance, allocation and apportionment, and tasking instructions for assigned and attached forces, and include the Master Air Plan (MAP), air component target nomination list, JPTL, ACP, Air Defence Plan (ADP), ATO, ACO and SPINS. The Plans Division is normally task-organized into four functionally oriented core teams:

- **Guidance, Apportionment and Targeting Team.** [26] The GAT Team develops the daily JFACC planning guidance, air component target nomination list and air apportionment recommendation. The team receives all target nominations, reviews them for compliance with the LOAC and ROE, and prioritizes them into the draft JPTL.
- **Master Air Plan Team.** The MAP Team develops the daily MAP in accordance with JFACC guidance, the air apportionment recommendation and prioritized target list to accomplish the JFACC tasks and objectives. The team is staffed by representatives of most of the types of aircraft or systems that may be on the ATO.
- **Air Task Order and Airspace Control Order Production Team**. The ATO and ACO Team is directly responsible for the technical production and distribution of the ATO, ACO and SPINS.
- **Battlespace Management Team.** The Battlespace Management Team develops the detailed C2 execution plans and the data link architecture for the JFACC. Major elements include airspace management, theatre AD planning, link interface planning and C2 architecture support planning.

CURRENT / COMBAT OPERATIONS DIVISION

This Division is responsible for monitoring and executing the current ATO as soon as it is released, usually 12 hours prior to execution. The Division may be further sub-divided into offensive and defensive cells. Defensive operations normally include specific AD and ASC control duties to coordinate all AD and/or airspace activities, which might include ensuring that flying activities are compatible with mission requirements and coordinating with HN agencies and components. A meteorological support branch provides forecasts and reports significant weather for AAR tracks and recovery bases.

INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE DIVISION

The ISRD provides ISR support to the CAOC and subordinate units. It also oversees and manages internal and external ISR processes to ensure that appropriate reporting, planning, tasking and deconfliction occurs in order to build a common all-source threat and targeting picture. The ISRD is functionally aligned to provide support for core ISR duties and to fully integrate sensor experts, platform experts and intelligence experts within the other CAOC divisions.

The ISRD has five core teams. An Analysis, Correlation and Fusion Team; a Targeting and BDA Team; an ISR Management Team; a Processing, Exploitation and Dissemination Team; and a Sensitive Compartmented Information Management Team. The ISRD also has a number of integrated teams to provide direct ISR support to specific strategy, planning, execution and assessment activities to ensure that the ISR system is meeting the information requirements of the division being supported.

AIR MOBILITY DIVISION

The AMD [27] plans, coordinates, tasks and executes the air mobility mission. It coordinates with the JFC's movement requirements and control authority to derive apportionment guidance, to compute allocation and to collect requirements. The AMD is responsible for ensuring that inter-theatre assets arriving and departing the JOA are included in the ATO. The AMD is normally comprised of four core teams, the Airlift Control Team, the Air-to-Air Refuelling Control Team the Air Mobility Control Team and the Aeromedical Evacuation Control Team.

AMD responsibilities normally include integrating and directing the execution of intra- and inter-theatre air mobility forces operating in the JOA; coordinating air mobility support requests; coordinating AAR planning, tasking and scheduling; participating in the air assessment, planning and execution process, and ensuring air mobility missions are catered for in the ATO and ACO.

[26] *Known as the Targets Effect Team (TET) in the US.*

[27] *Known as the Air Combat Support Division within the UK JFACHQ.*

LIAISON ELEMENTS

Liaison elements are embedded throughout the CAOC divisions and include:

- **Battlefield Coordination Detachment.** The JFLCC establishes the Battlefield Coordination Detachment [28] (BCD) to act as the interface between the CC and the CAOC. The BCD processes ground force requests for air support, monitors and interprets the ground battle situation in the CAOC, and provides the necessary interface for the exchange of current operational and intelligence data. The BCD also expedites the exchange of information through face-to-face coordination with elements in the CAOC and coordinates AD and ASC matters. The BCD is discussed in greater detail in Chapter 10.
- **Special Operations Liaison Element.** The Special Operations Liaison Element (SOLE) coordinates and synchronizes SF operations with joint air operations to prevent fratricide and ensure achievement of mission objectives.
- **Maritime Liaison Element.** The MLE processes landing force requests for air support and monitors and interprets the maritime battle situation in the CAOC. It also provides the necessary interface for the exchange of operational and intelligence data and coordinates maritime requirements for AD support, interdiction and monitors Navy airspace and ATC requirements and changes.
- **US Marine Liaison Officer.** The Marine Liaison Officer (MARLO) is the US Marine Corps commander's representative within the CAOC and is responsive to the JFACC on matters pertaining to Marine Corps operations.
- **Other Liaisons.** Other liaisons are established to represent coalition forces or interagency organizations that improve CAOC SA and contribute to unity of effort. They provide invaluable information on their nation's (or agencies) capabilities and sensitivities. They can also help overcome cultural barriers.

DIRECTOR OF SPACE FORCES

The Director of Space Forces (DIRSPACEFOR), who is normally a senior air force officer, facilitates the coordination, planning, execution and assessment of space operations to meet the JFC's campaign objectives. The DIRSPACEFOR will normally report to the JFACC or whoever holds SCA.

[28] Known as the Battlefield Coordination Element (BCE) in NATO and Battlefield Coordination Detachment (Air) (BCD(A)) in the UK JFACHQ.

CHAPTER 7

FUNDAMENTAL ROLE – CONTROL OF THE AIR AND SPACE

"If we lose the war in the air, we lose the war and we lose it quickly."

Field Marshall B. Montgomery

INTRODUCTION

Establishing and maintaining control of the air, and to a lesser degree space [29], are prerequisites for a successful campaign or operation; they prevent enemy air and missile threats from interfering with friendly operations and assure freedom of action and movement whilst limiting/denying the use of the air and space by an adversary [30]. Control of the air also provides protection for friendly population centres, logistic sites and other critical assets, and politically sensitive assets of HNs.

[29] This will depend on the adversary's reliance on space and his ability to project power into space.

[30] Air FP remains a critical enabler for the control of the air battle.

Control of space ensures the protection of critical force enhancement and supporting capabilities. In their absence all other military operations are constrained. Control of the air can vary from local superiority in a specific area to control over an entire area of operations; space control, even when applied locally, may have global implications. Control of the air may vary over time based on the overall situation, the level of acceptable risk and the JFC's concept of operations.

NOTE: No degree of control of the air guarantees that an enemy will not inflict damage or losses.

To lose control of the air is to lose a war, particularly in an era when deployable expeditionary forces are small and thus particularly vulnerable to the tremendous leverage an adversary might gain with a sudden and swift air attack. Control of the air is not a permanent state and has to be constantly fought for if it is to be assured.

It is achieved by integrating a variety of weapon systems and sensors, and the offensive and defensive counter-air capabilities from all components to destroy, neutralize or minimize air and missile threats to an acceptable level, both before and after launch. Control of the air is enabled by ASC and FSCMs. To lose control of space would seriously degrade the effectiveness of deployed forces and potentially threaten all elements of our critical national infrastructure.

AIRSPACE CONTROL AND AIR DEFENCE

The goal of ASC is to increase combat effectiveness by promoting the safe, efficient and flexible use of airspace through the ACP. It helps prevent fratricide by facilitating the safe passage of friendly and neutral aircraft, and the engagement of enemy aircraft and missile threats in airspace that may be used by all component and/or civilian air traffic. ASC and AD are the responsibility of the ACA and ADC; both responsibilities are normally assigned to the JFACC.

AD operations are integrated with other tactical air operations through the ADP, weapon control procedures, as well as ACMs that are established for all AD weapon systems and forces in order to facilitate defensive air operations while minimizing the risk of fratricide.

NOTE: Whilst all components are required to comply with the ACP that does not imply operational or tactical control over any air asset.

- **Airspace Control Authority.** The ACA establishes and coordinates an airspace control system that responds to the needs of the JFC, provides for integration into the airspace control system of the HN, and coordinates and deconflicts user requirements. He develops the ACP in consultation with the other components to ensure the requirements of maritime and land units are met. He directs the execution of the ACP through the implementation of ACMs promulgated in the periodic (usually daily) ACO and any SPINS through the JACC in the CAOC. All air missions are subject to the ACO, which provides direction to deconflict, coordinate and integrate the use of airspace through deconfliction, coordination or integration.
- **Air Defence Commander.** The ADC integrates and coordinates the AD assets of each force component into a coherent joint ADP. This includes establishing weapons control procedures and measures for all Defensive Counter-air (DCA) weapon systems and forces, coordinating with regional and/or HN AD systems and exchanging of information necessary to support civil defence activities. When the area to be defended is large and the intensity of operations likely to be high, the ADC may establish a number of geographic AD sectors, each under the control of a Sector Air Defence Commander (SADC).

COUNTER-AIR OPERATIONS

Counter-air involves those operations conducted to achieve a desired or necessary level of control of the air, through the destruction, degradation or disruption of enemy aircraft and missiles, in order to allow all friendly forces greater freedom of action, whilst minimizing their vulnerability to detection and attack.

Counter-air operations include all actions, taken by any component, to gain and maintain the required degree of control of the air. Effective counter-air requires timely collection, processing, analysis, production and dissemination of reliable and accurate intelligence. Real-and/or near-real-time information from air, surface and space based sensors is used to provide warning, SA, targeting and combat assessment. Additionally, proper JIPE is a crucial step in determining an enemy air order of battle prior to conducting counter-air operations.

Command and Control

The lethality and growing diversity of air and missile threats continues to make counter-air operations more vital, requiring joint forces to be more responsive, flexible and integrated in order to effectively counter them.

The JFACC is usually the supported commander for counter-air operations and sets the timing, priority and effects required for the counter-air effort taking advantage of all forces/capabilities apportioned or made available for tasking by other components.

Theatre-wide AD priorities are implemented through the ADP with the ADC establishing weapons control procedures and measures for all counter-air weapons systems and forces. The ADC and ACA establish procedures within the airspace control system to positively identify all airborne assets and active AD units.

NOTE: Whilst centralized planning is fundamental to achieving objectives, it does not preclude individual components and units from taking appropriate actions to accomplish their missions and protect their forces.

The Offensive and Defensive Balance

In general, offensive operations are proactive and seek to dominate the enemy's airspace and prevent the launch of threats; whilst defensive operations are responsive and seek to nullify or reduce the effectiveness of enemy air and missile threats after launch. The preferred method of countering air and missile threats is to use offensive operations to destroy or disrupt them prior to launch. Whilst some defensive missions are normally scheduled when enemy air attack is expected, offensive attack is typically the best way to employ limited assets against an air threat because it employs concentration of effects. Defensive operations tend to disperse the counter-air effort and many missions do not actually engage the enemy, since attacking aircraft have the initiative.

However, the balance between an offensive or defensive stance presents a complex challenge dependent upon the nature and stage of the campaign. The most important variables being Border Crossing Authority (BCA) and the depth, density and capabilities of the enemy's AD system. The further an offensive attack has to penetrate hostile territory to reach a target, the more vulnerable it is to defensive air action. The greater the effectiveness of the defence-in-depth, the earlier attacking air systems can be detected and defending forces activated.

OFFENSIVE COUNTER-AIR OPERATIONS

Offensive Counter-air (OCA) operations aim to destroy, disrupt or degrade enemy air and missile threats. Operations may be pre-planned or immediate and are conducted across enemy territory at the initiative of friendly forces.

Ideally, most OCA operations will prevent the launch of aircraft and missiles by destroying them and their supporting systems on the ground, or failing that, as close to their source as possible. Pre-planned ops rely on continuous and accurate intelligence for targets expected at particular locations and times, whilst immediate ops are conducted against unexpected mobile and time-sensitive targets where minutes often define the timeline when these targets are vulnerable to attack. OCA includes surface attack operations, air-to-air operations and SEAD.

Surface Attack Operations

Surface attack operations are performed by fixed- or rotary wing aircraft, surface-to-surface fires, SF or ground forces to disrupt or destroy targets including aircraft, Anti-Aircraft Artillery (AAA), SAMs, airfields, cruise and ballistic missiles, ground/sea/air-based launch platforms, supporting infra-structures and associated C2. Typical target sets include:

- **Airfields and Operating Bases.** Airfields and operating bases are vulnerable to the damaging of runways or taxiways to prevent use of an airfield for short periods, thus preventing subsequent takeoffs and reducing the enemy's offensive capabilities. Destruction of hangars, shelters, maintenance facilities, POL and other storage areas helps degrade the enemy's ability to generate aircraft sorties.
- **Aircraft on the Ground.** Aircraft on the ground are often the most lucrative targets for OCA operations. Given advanced technology, timely intelligence and PGMs, aircraft on the ground can be destroyed whether they are in revetments, shelters or in the open.
- **Theatre and Support Infrastructure.** Theatre and support infrastructure such as ballistic, cruise and surface-to-surface missiles present a serious threat. Destruction of known missiles, launch platforms, support facilities and infrastructure greatly limits effective attacks against friendly forces. Moreover, OCA missions should be capable of being rapidly re-tasked to attack mobile launchers, once they are located.
- **Command and Control, and Intelligence, Surveillance and Reconnaissance Systems.** C2 and ISR systems are critical to the effective employment of forces and should be given a high priority during OCA targeting. Intelligence gathering, warning and control systems include ground-controlled intercept, early warning, acquisition and other sensors together with their supporting facilities. Prosecution of such target sets should substantially reduce the enemy's capability to detect, react and bring forces to bear against friendly forces.
- **Air Defence Systems.** AD systems that are disrupted or destroyed, including the personnel who control, maintain and operate them, may render those systems ineffective.

Air-to-Air Operations

Air-to-air operations are performed by fighter type aircraft and consist of a number of missions:

- **Fighter Sweep.** Fighter sweep is an offensive mission utilizing AD fighters to sweep through a designated area of enemy airspace, seeking out and destroying airborne enemy target sets, to sanitize any enemy air-to-air threat in either indirect support of an offensive package or as an independent mission. Aircraft usually fly a set time ahead and/or a set distance displaced from the supported package. Fighter sweep offers the advantage of a great degree of tactical flexibility that allows the freedom to react defensively and still accomplish the mission. Sweep usually provides the most liberal commit [31] criteria, the earliest threat warning to the 'package' and night/IMC compatibility. Moreover, it requires minimal coordination. Disadvantages centre on the high probability of the fighters being drawn away from the package to engage non-factor [32] bandits.

NOTE: Swing-role aircraft often practice self-escort through the mixed carriage of air-to-air and air-to-ground ordnance.

- **Fighter Escort.** Fighter escort is a protection mission against enemy aircraft and AD systems that employs AD fighters to protect such missions as AI, reconnaissance, airlift, Search and Rescue (SAR), AAR, airborne C2 and EW.

[31] *A series of triggers are met that would initiate interception.*

[32] *Aircraft that are not a direct threat to it.*

- **Detached Escort.** Detached escort places AD fighters a set time ahead of, or displaced from, the supported package. The advantages are less of a possibility of being out-flanked by factor bandits and a decreased possibility of targeting non-factor bandits. Disadvantages include less tactical flexibility than sweep, which may hinder Beyond Visual Range (BVR) tactics and increase the level of risk to the escort fighters, and an increased requirement for coordination. There is also the possibility that the escort may draw attention to the supported package.
- **Embedded/Close Escort.** Embedded or close escort places the supporting AD fighters within a package or in visual contact. These aircraft have the least tactical flexibility as they are tied directly to the package and consequently have the least freedom to manoeuvre and generally the most restrictive of commit criteria. Moreover, they require the closest coordination. Improvements in the air-to-air capabilities of most 'bombers' has reduced the likelihood of embedded / close escort tasking.

- **High Value Airborne Asset.** High Value Airborne Asset (HVAA) protection uses fighter aircraft to protect critical airborne assets such as AEW/AWACS, SIGINT and AGS.

Suppression of Enemy Air Defence

SEAD operations are designed to neutralize, destroy or temporarily degrade enemy air defences by destructive or disruptive means.

- **Destruction.** Destruction of an enemy Integrated Air Defence Systems (IADS) or its components is preferable to temporarily suppressing it; it removes a threat and reduces sortie requirements, frees crews and aircraft whilst increasing the safety factor of future attack missions. However, it may be impossible to accurately locate the threat; alternatively, destruction may be prohibited by the ROE. Moreover, destruction may place large demands on available air assets. Nevertheless, wherever possible, destruction is the preferred option. Means include Electronic Attack (EA), Anti-Radiation Missiles (ARM) and Directed Energy (DE).

Types of suppression:

- **Disruption.** Disruption in the form of denial, degradation, deception, delay or neutralization of the enemy's AD systems can temporarily increase aircraft survivability; however, the effects will be of a limited duration. Disruption may be by active or passive means and might include Computer Network Attack (CNA).
- **Area Suppression.** Area suppression consists of operations conducted against specific enemy AD systems to destroy, disrupt or degrade their effectiveness for a designated period of time. It targets those high pay-off AD assets that could inflict the greatest degradation on friendly operations.
- **Localized Suppression.** Localized suppression is normally confined to geographical areas associated with specific ground targets or friendly transit routes, contributing to local control of the air.
- **Corridor Suppression.** Corridor suppression occurs along a narrow section of a route for a designated period of time to allow for the transit of friendly aircraft. Supporting aircraft often operate in a Restricted Operating Zone (ROZ) next to the Forward Line of Own Troops (FLOT) in order to support multiple force packages transiting the corridor.
- **Direct Support.** Direct support provides for SEAD capable platforms to operate directly in support of a package enroute to the target area.
- **Opportune Suppression.** Opportune suppression is usually unplanned and includes aircrew self-defence and attack against targets of opportunity.

Resources and Forces

The effectiveness of OCA operations depends on the availability and capabilities of certain resources and systems. The choice of system depends upon the situation, threats, weather and available intelligence. Whenever possible, systems and methods that minimize risk to friendly forces should be employed. For example, SF should not be used for a direct action mission when aircraft employing stand-off weapons could accomplish the same aim.

The following are some of the forces and weapon systems used to conduct OCA:

- **Fixed-Wing Aircraft.** Fixed-wing aircraft provide the bulk of the forces for OCA operations. However, other types of fixed- and rotary wing aircraft are often critical enablers.
- **Missiles.** Missiles include surface-to-surface and air-to-surface, air-to-air guided missiles as well as air, land- and sea-launched cruise missiles. Many of these weapons have long launch ranges, and some have very quick reaction times, which can eliminate or reduce the risk of harm to friendly forces, and should be used against mobile AAA and SAMs.
- **Artillery and Naval Surface Fire Support.** Artillery and Naval Surface Fire Support (NSFS) may also be employed when enemy targets are within their range. With proper coordination, this can be a very effective way to destroy enemy targets whilst minimizing risks to friendly forces.
- **Unmanned Aircraft Systems.** UAs may be pre-programmed or remotely piloted. They provide surveillance, reconnaissance, deception, jamming, harassment and can attack enemy forces and AD systems.
- **Special Forces.** SF can conduct direct attacks, collect intelligence and provide terminal guidance and attack control for attacks. They are particularly useful against concealed valuable enemy targets or those hidden close to no-strike targets.

- **C2 and ISR Systems.** C2 and ISR systems include early warning and surveillance systems, satellites, radar, identification systems, communications systems and surface-, air- and space-based sensors that provide early warning, intelligence and targeting data as well as C2 for friendly forces.
- **Information Warfare.** Information Warfare (IW) is a resource that can reduce the demand for sorties. Many OCA targets can be affected by various IW techniques such as malicious codes, EW or EM pulse (EMP) generators, and some of these techniques may afford access to a target that is inaccessible by other means.
- **Surface Forces.** Surface forces offer the ability to occupy and secure key areas with supporting surface fires. Examples include occupying an airfield, securing a vulnerable area from surface threats or providing a smoke screen to prevent cueing of visually laid SAMs or AAA.

DEFENSIVE COUNTER-AIR OPERATIONS

The objective of DCA operations is to protect friendly forces and vital interests from enemy air and missile attacks; as such, it is synonymous with AD.

DCA consists of all active and passive AD operations to detect, identify, intercept, destroy or negate enemy air and missile forces attempting to attack or penetrate friendly battlespace, or to nullify or reduce the effectiveness of such attacks should attackers escape destruction.

The ADC is responsible for the integration of all AD efforts regardless of system ownership. AD can be active or passive.

- **Active Air Defence.** Active AD involves any direct defensive action taken to destroy, nullify or reduce the effectiveness of enemy air and missile attack against friendly forces and critical elements. It is achieved through integrated detection, identification, assessment, interception and engagement and is usually characterized by layered defence-in-depth affording multiple engagement opportunities, utilizing reactive air-to-air fighters, SAMs and other assets placed on airborne or ground alert.
- **Passive Air Defence.** Passive AD includes all other measures taken to minimize the effectiveness of hostile air and missile attacks, through individual and collective protection for friendly forces and critical assets. Elements of passive AD include early warning, camouflage, concealment and deception, hardening, dispersion, reconstitution and Low Observable (LO) or stealth technologies.

NOTE: Passive AD measures do not involve the employment of lethal weapons, but do improve survivability.

Execution and Integration

Effective execution of DCA operations requires a surveillance and reporting system capable of the near-real-time production and dissemination of tracking data. Realization of that requirement is dependent upon

the ability to fuse all source sensor data, whether from ground-based radar, sea-based radar or space-based sensors, into an accurate theatre attack assessment.

As a track is detected, it must be identified, labelled with the track information and disseminated as rapidly as possible and in sufficient detail to permit the C2 system to evaluate the track, determine the significance of the threat and either designate AD forces for interception or engagement, or advise units of the passage of friendly aircraft. Clear and concise ROE are key. The optimum employment of AD weapon systems involves the earliest possible detection and discrimination of friend from foe to maximize BVR engagement and to avoid fratricide.

Weapons Control and Coordination

Optimum effectiveness requires an integrated execution system that provides real-time or near-real-time information to all DCA assets. Most DCA weapon systems are capable of autonomous operations; however, should they become separated from the integrated execution system, their effectiveness may be degraded and they may be forced to rely on procedural means to permit the safe passage of friendly aircraft and to enable the use of AD weapons.

Because many DCA assets are owned by different components and allies, integration, coordination and normal ASC procedures are required to enhance the synergistic capabilities of the various systems. Area control measures include Fighter Engagement Zones (FEZ) and MEZ of a defined dimension of airspace in which the responsibility for engagement rests with a particular weapon system. The ideal aim of area control is to have a Joint Engagement Zone (JEZ) where all air and ground defence systems employ and operate simultaneously, in the same airspace. Only those airborne objects positively identified as hostile should be targeted and engaged, which reduces fratricide and minimizes overly restrictive ASC procedures.

Weapons Employment

Effective and efficient weapons employment usually centres on defence-in-depth with the siting of mutually supporting defensive positions designed to absorb and progressively weaken intruding enemy aircraft and missiles as early as possible and as far away as feasible. To be most effective and to maximize attrition of the enemy force, the engagement process should be continuous throughout the threat's approach, entry to, and departure from the friendly operational area. Types of defence include:

- **Area Defence.** Area defence defends a broad area using a combination of weapon systems.
- **Point Defence.** Point defence protects a limited area, normally in defence of the vital elements of forces and installations.
- **Self-Defence.** Self-defence is conducted by friendly units to defend themselves against direct attack or threat of attack through the use of organic weapons and systems. Inherent to all ROE and weapon control procedures is the right of self-defence.

Weapons Control Orders

Weapons control orders provide for the control of surface-to-air units and are expressed as a status declared for a particular area and time.

- **Weapons Free.** The order 'weapons free' permits weapons systems to fire at any target not positively identified as friendly.
- **Weapons Tight.** The order 'weapons tight' allows weapons systems to fire only at targets recognized as hostile.
- **Weapons Hold.** The order 'weapons hold' allows weapons systems to fire only in self-defence or in response to a formal order.

Fire Control Orders

Fire control orders are given to direct or to inhibit firing by surface-to-air weapons units based on rapidly changing battle situations.

- **Engage.** The order 'engage' directs or authorizes units and weapon systems to fire on a designated target.
- **Cease Engagement.** The order 'cease engagement' directs a unit to stop the sequence against a designated target.
- **Hold Fire.** The order to 'hold fire' is used in an emergency to direct units to stop firing and prevent missiles already in the air from intercepting their targets.

Resources and Forces

AD systems are integrated to provide efficient control and exchange of essential real-time information to all AD resources; however, capabilities can vary widely, though the limitations of some assets are balanced by the advantages of other assets. Prime resources (and typical employment) options include:

- **Fighter Aircraft.** DCA missions for AD fighters include HVAA protection, point defence and area defence. Their normal method of employment involves the establishment of a Combat Air Patrol (CAP), with the objective of intercepting and destroying hostile missiles and aircraft before they can reach their intended targets. These CAPs ensure rapid reaction to enemy intrusion and may be positioned well ahead of forces being protected. When the CRC or AWACS detects a hostile, potentially hostile or unknown target, they usually assign or commit AD fighter aircraft to intercept the target. Whenever possible, AD fighters remain under the direction of the initiating control agency and are continuously directed until the crew confirms visual or radar contact. When required, or appropriate, this control may be transferred to adjacent sectors of responsibility. Intercept control can be transferred to the crew when the aircraft is in positive contact with the target or when the environment precludes positive direction by the controlling agency. In the latter situation, alternative procedures such as the broadcast of an air picture of enemy activity, or autonomous action by the aircrew may be required.
- **Armed Helicopters.** Armed helicopters can engage suitable targets, such as enemy helicopters, battlefield air defences and other targets within their combat range; however, the issue of C2 relationships regarding armed helicopters performing DCA missions will need careful determination by the JFC.
- **Surface-to-Air Weapons.** SAMs or AAA are employed in area or point defence operations. These weapons can offer tremendous firepower and quick responsiveness to defended assets; however, because the optimum range and altitude capabilities of each weapon system are different, the employment of various types of surface-to-air weapons must be fully coordinated and integrated into the overall AD system for mutual support, maximum effect, most efficient coverage, and to ensure minimum risk to friendly aircraft. Surface-to-air weapons effectiveness requires a highly reliable centralized link up with air operations and an adequate identification process to minimize the risk of fratricide and unnecessary expenditure of valuable resources.

Passive AD Measures

Camouflage, Concealment and Deception (CCD) helps deny accurate location and targeting of friendly assets by employing misleading and false information through actions taken in the Radio Frequency (RF), Infra-red (IR) and visual ranges of the EM spectrum to alter or hide the appearance of personnel or fielded equipment, whilst also reducing vulnerability of friendly assets by limiting their exposure to targeting.

CCD denies an enemy vital data about friendly forces and, when conducted continuously over time in response to warning or under the cover of darkness, may cause him to abort, delay or modify an attack, or deplete valuable resources by attacking false targets. Timely and accurate intelligence concerning the over flight of enemy satellite and aircraft collection systems enhances the effectiveness of CCD. Activities include:

- **Hardening.** Hardening is applied to valuable assets and their shelters to protect against hostile attacks. Hardening actions should be accomplished during preparations for operations, though it may be a continual process throughout operations.
- **Reconstitution.** Reconstitution provides for the rapid repair of damage resulting from enemy attacks and the return of damaged units to a desired level of combat readiness. Reconstitution includes the ability to repair valuable assets (such as airfields and communications, warning and surveillance systems) and to restore essential services (such as power, water and fuel supplies).
- **Chemical, Biological, Radiological and Nuclear.** CBRN equipment and facilities allow for collective protection by providing contamination detection and avoidance, identification and decontamination.

Use of Individual Protective Equipment (IPE) for friendly forces ensures continuous operations in a CBRN environment.

- **Redundancy.** Redundancy is provided by the duplication of critical capabilities to keep vital systems functioning even when critical nodes are destroyed or damaged. Redundancy includes dual, contingency or back-up capabilities which can assume primary mission functions, in whole or in part, upon failure or degradation of the primary system.
- **Detection and Warning.** Detection and warning systems should give timely detection and warning of air and missile threats to provide maximum reaction time for friendly forces to seek shelter or take appropriate action against enemy attacks. Connectivity of available air, space and surface-based detection and CIS is required to transmit accurate, real-time data to friendly forces in order to maximize opportunities for missile detection and warning times.
- **Dispersal.** Dispersal complicates the enemy's ability to locate and target friendly assets by spreading them out and bringing them together in concentration only when required. Combined with mobility and deception, dispersal increases uncertainty as to whether a location is occupied or will remain occupied. It forces the enemy to search more locations, requiring more resources and time.
- **Mobility.** Mobility is the capability of easily moving from one location to another and is enhanced by a smaller footprint. Mobility reduces vulnerability and increases survivability of friendly assets by complicating enemy surveillance, reconnaissance and targeting. Frequent movement of units, inside the enemy's decision cycle, can be of critical importance.
- **Stealth and Low Observables.** Stealth and LO technologies attempt to hide the presence of a system during mission execution or to reduce an envelope of vulnerability to enemy threat systems.

Air Minded Force Protection

Many of the passive AD measures are coordinated by air FP; however, air FP is broader than this. Within the contemporary operating environment the fight for control of the air could take place within the lower airspace, beneath 10,000 ft. For example, within a COIN operation insurgents are unlikely to be able to compete against modern air platforms, except when they are low, slow or on the ground. In addition, the operating bases that modern platforms depend upon are difficult to disguise or relocate, and they often have little redundancy.

Therefore, air FP, and in particular counter-surface to air fire and counter-indirect fire, has a fundamental role to play within the battle for control of the air. This is even more important when considered against the relative fragility of modern platforms, their low numbers and exceptionally high value. From a risk perspective the potential loss of modern air platforms becomes a critical issue given the move towards ever reducing numbers of more capable platforms.

As an example, the loss of a strategic aircraft with large numbers of passengers would undoubtedly have an immediate effect upon a campaign and must be militated against by specialist air-minded FP forces. The requirement for air FP is therefore a particular characteristic of air and space power and it provides a critical enabler for achieving control of the air [33].

[33] *AP 3000 4th Edition.*

[34] *JDP 3-64 Joint Force Protection.*

The vulnerability of air operating locations necessitates protection in depth through a layered approach that involves both proactive and reactive measures. This should also include the establishment of a Ground Defence Area (GDA), extending well beyond the perimeter of the base, in order to prevent direct and indirect attacks being targeted against aircraft, facilities or personnel.

Furthermore, the linkage between countering and mitigating adversary action and the immediacy of air operations requires that the GDA is placed under the control of the air base commander [34].

SPACE OPERATIONS

Space Control (SC) involves those operations conducted to attain and maintain a desired degree of space superiority by the destruction, degradation or disruption of an enemy's space capability to allow friendly forces to exploit space capabilities, whilst negating an adversary's ability to do the same.

Space Situational Awareness

Space Situational Awareness (SSA) is the integration of a number of related processes that provide sufficient knowledge of space events, threats, activities, conditions as well as space systems status, capabilities, constraints and employment to enable commanders, decision makers, planners and operators to gain and maintain freedom of action in space across the spectrum of conflict.

SSA ensures space operations and spaceflight safety; implements international treaties and agreements; and, protects space capabilities, military operations and national interests. This SSA data should reside within a Recognized Space Picture (RSP) as a sub-set of a JOP. SSA is key to SC operations.

Offensive Counter-Space

Offensive Counter-Space [35] (OCS) operations deny, degrade, disrupt, destroy or deceive an adversary's space capability or the service provided by a 3rd-party's space asset(s) to the adversary at a time and place of our choosing through attacks on the space nodes, terrestrial nodes or the links that comprise a space system.

These operations range from dropping ordnance on terrestrial nodes of space systems to jamming enemy satellite uplink or downlink frequencies.

OCS operations initiated early in a contingency can result in an immediate advantage in space capabilities and control of the space medium, whilst potentially degrading the adversary's ability to operate in the other domains through the denial of space-based ISR, communications, navigation and timing.

Defensive Counter-Space

Defensive Counter-Space [36] (DCS) operations preserve space capabilities, withstand enemy attack, restore or recover space capabilities after an attack and reconstitute space forces. DCS operations should be proactive in nature to protect friendly capabilities and prevent the adversary from disrupting overall friendly

[35] *Known as offensive space control in the US.*

[36] *Known as defensive space control in the US.*

operations. Suppression of the full spectrum of threats to friendly space capabilities (including conventional attacks on terrestrial infrastructure) is a key factor of DCS operations.

Space Force Enhancement

Space Force Enhancement (SFE) operations multiply effectiveness by enhancing battlespace awareness and providing support across five functions: ISR; integrated tactical warning and attack assessment, environmental monitoring, communications, and position, velocity, time and navigation through the Global Positioning System (GPS).

Space Support

Space support consists of operations that launch, deploy, augment, maintain, sustain, replenish, de-orbit and recover space forces, including the C2 network configuration for space operations. Space support consists of:

- **Space Lift** provides for the timely and responsive deployment and replenishment of satellites, payloads and materiel to space. To satisfy this requirement, space lift must be functional, flexible and capable of meeting the full range of military, commercial and civil launch requirements. Space lift can be achieved by launch-on-schedule (based on priority as well as launch vehicle and payload readiness) or launch-on-demand (when required to accommodate user needs).
- **Satellite Operations** are conducted to manoeuvre, configure and sustain on-orbit forces and to activate on-orbit spares through a host of dedicated and common-user networks.
- **Reconstitution of Space Forces** refers to plans and operations for replenishing space forces in the event of loss of space assets. This could include repositioning and reconfiguring surviving assets, augmentation by civil and commercial capabilities and replacement of lost assets.

Space Force Application

Space Force Application (SFA) consists of attacks against terrestrial-based targets carried out by military weapons systems operating in or through space, which includes ballistic missile defence and force projection. Currently, there are no force application assets operating in space.

Planning Considerations

The special characteristics of space and the difficulty in gaining access to it present unique planning and operational considerations, and there are numerous resource, logistical and legal considerations that must be weighed during planning stages in order to ensure mission success. Not least of which is the need for accelerated C2 and planning processes to deal with the unique temporal characteristics of the space domain.

Space planners must understand the planning and operational considerations for employment of space capabilities and have a firm knowledge of the threats to the use of those systems by an enemy, what can be done to limit an enemy's use of space capabilities and how to protect their own use of space.

When engaged in coalition operations, space planners should be aware of any differences in national policies that could constrain military space activities, particularly in the area of OCS operations.

Space Weather

Space weather includes conditions on the Sun and in the solar wind, magnetosphere, ionosphere and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems and can endanger human life or health. Space weather affects satellite missions in a variety of ways, depending on the orbit and satellite function.

Energetic particles can penetrate electronic components, causing bit-flips in a chain of electronic signals that can result in spurious commands within the spacecraft or erroneous data from an instrument. Major geomagnetic storms result in heating and expansion of the atmosphere, causing significant perturbations in satellite trajectories. Communications at all frequencies are affected by space weather.

High Frequency (HF) radio wave communication is more routinely affected because this frequency depends on reflection from the ionosphere to carry signals great distances. Higher frequency radio waves that penetrate the ionosphere and are relayed via satellite to other locations can be changed by ionospheric conditions so that they can no longer be accurately received at the Earth's surface.

CHAPTER 8

FUNDAMENTAL ROLE - AIR MOBILITY

"Strategically, time and space are relative, and as the history of war has shown again and again, a handful of men at a certain spot at a certain hour is frequently a far more powerful instrument of war than ten times the number on the same spot twenty-four hours later."

J. F. C. Fuller

INTRODUCTION

Air mobility encompasses those operations that move and support personnel, materiel and assets at speed over strategic distances. It is key to maintaining global presence and a rapid response capability.

AIRLIFT

Airlift provides rapid and global mobility allowing a JFC to move and sustain limited forces anywhere in the world and across the entire range of operations. It provides flexible mobility options to military, national and international government agencies to quickly respond to various crisis situations worldwide. Airlift can deliver packaged forces with minimum delay and is often a crucial capability for operational and tactical commanders within a theatre or JOA. Operations are typically classified as inter or intra-theatre.

- **Inter-theatre Lift.** Inter-theatre airlift provides the airbridge that links theatres to the UK, UK sovereign bases or to other theatres. Given the ranges usually involved, inter-theatre airlift is normally comprised of heavy, Strategic Air Transport (StratAT), supplemented by chartered airlift and augmented by Tactical-range Air Transport (TacAT) if and when required.
- **Intra-theatre Lift.** Intra-theatre airlift provides air movement within a specific theatre or JOA and is normally fulfilled by fixed- or rotary wing Support Helicopters (SH) capable of operation under a wide range of tactical conditions, including small, austere and unimproved field operations. Intra-theatre operations generally provide the time-sensitive airlift that is often critical to achieving tactical or operational objectives.

C2 of Strat AT is normally retained at the strategic level to ensure the most efficient use of the force. The Joint Force Movements Staff (JFMS) at the JFHQ coordinates and prioritizes all bids for UK Strat AT. This task may be delegated to the UK logistics component, depending on mission scale.

The Defence Supply Chain Operations and Movements (DSCOM) organization is responsible for the allocation and tasking of UK StratAT from the home base to a theatre. For TacAT, the CAOC AMD plans, coordinates, manages and monitors operations, with the logistics component, within the theatre or JOA.

Employment Options.

Employment options are based on the concepts of hub and spoke operations or direct delivery.

Hub and Spoke Operations

Hub and spoke operations integrate both inter-theatre and intra-theatre airlift operations. Starting from an Airport of Embarkation (APOE), the movement of cargo and personnel progresses through one or more en route staging bases to arrive at an Airport of Debarkation (APOD) or DOB within a theatre.

The hub is the focal point for follow-on intra-theatre airlift missions and generally allows for the safest and most efficient logistical support to a theatre or JOA. Cargo and personnel are processed and readied for trans-shipment by intra-theatre assets to FOBs, which are the spokes located throughout the theatre or JOA.

Direct Delivery

Direct delivery utilizes two methods to deliver personnel and materiel directly to the point of need, each of which offers distinct advantages and disadvantages.

- **Airland.** Airland procedures see an aircraft land directly at its objective and unload its cargo entirely on the ground. It is the preferred method because it is the most efficient and least expensive and may be conducted at sites from established airfields to TLZs. Procedures range from engine shutdown, through engine running aircraft stopped offload, to offloading whilst taxiing. The preferred procedure is an engine running offload, as it significantly reduces an aircraft's ground time; however, ground personnel are subject to increased safety risks. A more expeditious procedure is the combat offload method which entails offloading cargo while taxiing, further reducing the aircraft ground time and reducing the requirement for handling equipment at the air terminal. This procedure cannot be accomplished by all aircraft types and subjects cargo and taxiways to possible damage. In addition, the combat offload is potentially more hazardous due to the dynamic nature of the operation.
    - **Advantages.** Airland offers a greater degree of unit integrity permitting units to rapidly deploy after landing, carries the least risk of injuring personnel and damaging loads, requires minimal specialized training and equipment for transported personnel, requires less special rigging and packaging of materiel than airdrop, permits the maximum utilization of allowable cabin loads by eliminating the volume and weight penalties of preparing loads for airdrop deliveries, and maximizes the opportunity to backload cargo and evacuate personnel.
    - **Disadvantages.** Airland requires suitable airfields or Landing Zones (LZs) that are moderately level, unobstructed, able to sustain the aircraft's weight and available for the anticipated operation. It can also increase intervals between aircraft deliveries depending on an airfield's infrastructure and support capability, and requires mission support such as ground-handling and transportation assets. Airland prolongs exposure to air or ground attacks.
- **Airdrop.** Airdrop is delivery from an aircraft in flight directly to a Drop Zone (DZ) using either parachutes or free fall delivery. Airdrop allows commanders to project and sustain combat power into areas where a suitable LZ or a ground transportation network may not be available. This delivery method maximizes the principles of surprise and manoeuvre and allows rapid insertion of combat forces to numerous objective areas.
    - **Advantages.** Airdrop delivery offers a number of advantages including minimizing aircraft and personnel exposure to threats at the objective area and permitting sustainment deliveries to be made to units operating away from airfields and LZs, and often in conditions that would prevent airland operations. In addition it eliminates the need for ground support infrastructure and personnel.

- **Disadvantages.** The disadvantages of airdrop delivery include an increased risk of injury to personnel or damage to cargo; the requirement for special training for riggers, transported personnel and aircrews; a limit on cargo loads because of the additional rigging required; and a possible decrease in aircraft range when low-level ingress / egress and formation tactics are employed. In addition, an airdrop increases mission planning time and complexity and requires additional intelligence preparation.

Aeromedical Evacuation

Aeromedical Evacuation (AE) is a specialized form of airlift for transporting ill or injured personnel under medical supervision to appropriate medical treatment facilities. Aeromedical transportation of patients requires aeromedical crew members to be with the patient prior to and during the movement.

During contingency operations, a capable AE system complements and supports the theatre or JOA medical infrastructure, allowing a smaller in-theatre medical footprint.

AIR-TO-AIR REFUELLING

AAR is an essential capability that increases the range, endurance, payload and flexibility of all capable receiver aircraft. AAR is especially important when overseas basing is limited or unavailable for political or other reasons. The drawback to utilizing AAR is increased mission duration, which reduces the total number of sorties possible in a given period. The high demand placed on these assets makes proper employment critical.

AAR enhances the ability of air power to achieve surprise by allowing indirect approaches, terrain masking and multiple axes of attack to seek out targets the enemy least expects to be attacked. AAR also maximizes the use of each combat or combat support asset launched by increasing their airborne time. This increased flight time lets combat aircraft strike multiple targets on the same sortie and allows combat support assets to increase station time.

In addition, increasing an aircraft's flight time will make additional aircraft available for reassigning towards other objectives, thus achieving economy of force. Additional fuel provides attack aircraft the ability to fight longer and out-last the engaged enemy's extended range and endurance, putting enemy aircraft at a distinct disadvantage. Because their range is increased by AAR, aircraft can be based beyond the effective range of enemy weapons. This increases security and frees up assets for offensive operations.

Global Mobility

AAR's contributes to rapid global mobility by escorting and refuelling deploying aircraft in order that they may fly non-stop to their destination. This significantly reduces reliance on enroute staging bases for support. The majority of tankers can also deploy with almost all of their support equipment, personnel and supplies on board the unit's aircraft to allow them to begin immediate operations at the deployed location with minimal impact on the airlift system. Typical AAR employment options include:

- **Global Support.** Global support AAR allows expeditionary forces to deploy in hours. It also allows offensive aircraft to operate anywhere in the world and airlift FE to provide humanitarian assistance, or to deliver peacekeeping forces or combat troops directly from the UK or UK Sovereign Base without reliance on Host Nation Support (HNS).
- **Air Bridge Support.** Air bridge support AAR supports an airborne LOC that can eliminate the requirement for enroute stops, thereby reducing reliance on suitable HNS and the possibility of delay or disruption due to maintenance or airfield/airspace saturation.

- **Deployment Support.** Deployment support AAR can eliminate enroute stops for deploying attack aircraft thus avoiding the need to secure landing rights for armed aircraft. Moreover, dual-role tankers can often ferry support personnel and equipment with their FE to ensure that the ferried unit can begin immediate operations once in the theatre or JOA.
- **Force Extension.** Force extension AAR uses one tanker to refuel another thereby reducing the overall number of tankers used for deployment support.
- **Theatre Support.** Theatre support AAR is normally highest priority for AAR, particularly during the early phases of air operations when aircraft may be based outside enemy threats to protect them from enemy attack.

Airspace Requirements

Airspace is a primary limitation to AAR operations, and the standardizing of multinational cell formation procedures is essential to allow a variety of AAR assets to operate in compressed airspace. Many missions require tankers to refuel multiple-ship formations and may dictate several different types of tankers and multiple receiver types in the same formation.

Formation refuelling is one of the most demanding operations due to the number of aircraft in a confined block of airspace and the fact that receivers may be constantly joining and leaving the formation. Cell formation operations help alleviate airspace constraints by allowing the same number of tankers to operate in less vertical airspace than if they were to operate individually.

This is particularly important when large tankers may be refuelling multiple receivers or formations of receivers. AAR is normally conducted in an anchor area or along an AAR track.

- **Anchor Area.** In an anchor area the tanker flies a racetrack pattern within defined airspace while waiting for receiver aircraft to arrive. Once joined with the receiver, the tanker then flies in an expanded racetrack pattern while refuelling the receiver. Anchor areas are normally used for intra-theatre operations where airspace is confined or where receivers operate in a central location. They are best suited for small, highly manoeuvrable aircraft, especially in marginal weather conditions. Tanker aircraft are vulnerable when flying on the anchor, and therefore, the anchor area is normally situated over friendly territory or, at least, in an area where the desired degree of control of the air can be guaranteed for the period of the mission.
- **Air-to-Air Refuelling Tracks.** AAR along a pre-determined track is the preferred method for inter-theatre operations. The tanker either orbits at a designated point along the track awaiting the receiver's arrival, or the tanker and receiver can be pre-planned to simultaneously arrive at a designated rendezvous point. In certain circumstances, it may be advantageous to combine the anchor and track methods on a single mission. This can be especially useful when multiple strike packages refuel with multiple tanker formations.

Planning Considerations

There are several important limitations associated with AAR that must be borne in mind when planning:

- **Time.** It takes a finite and sometimes protracted time to transfer fuel between aircraft. Time depends on fuel flow rate (usually governed by receiver aircraft fuel system design), the number of tanker refuelling points, the number of tankers available and receiver aircraft requiring fuel as well as aircrew proficiency. An approximation is to allow 10 minutes for each pair of fast jet aircraft.
- **Airspace.** Closely linked to the time factor, the amount of airspace required to mount an anchor operation can be extensive. AAR operations will need to be incorporated in the ACP and airspace reserved for specific missions in the ACO.
- **Vulnerability.** All aircraft involved in AAR operations are vulnerable to an enemy's action while transferring fuel. High terrain under the racetrack could offer a firing solution to a Man-Portable Air Defence System (MANPADS) equipped adversary. Friendly fighter escorts may offer some protection against an enemy's fighters, but this is costly and does not cope with an enemy's SAMs. For these reasons, AAR anchors must invariably be positioned where control of the air can been secured, at least for the required period. Tanker aircraft vulnerability on the ground must also be considered when choosing basing options with low threat locations favoured.
- **Basing Options.** The size of tanker aircraft usually militates against the use of hardened shelters for protection and lateral dispersal is the most favoured option. This will itself be limited by the availability of suitable dispersal airfields possessing runways of around 9000 feet long, with taxiways and hard-standings of adequate strength, fuel storage capacity and communications facilities.

PERSONNEL RECOVERY

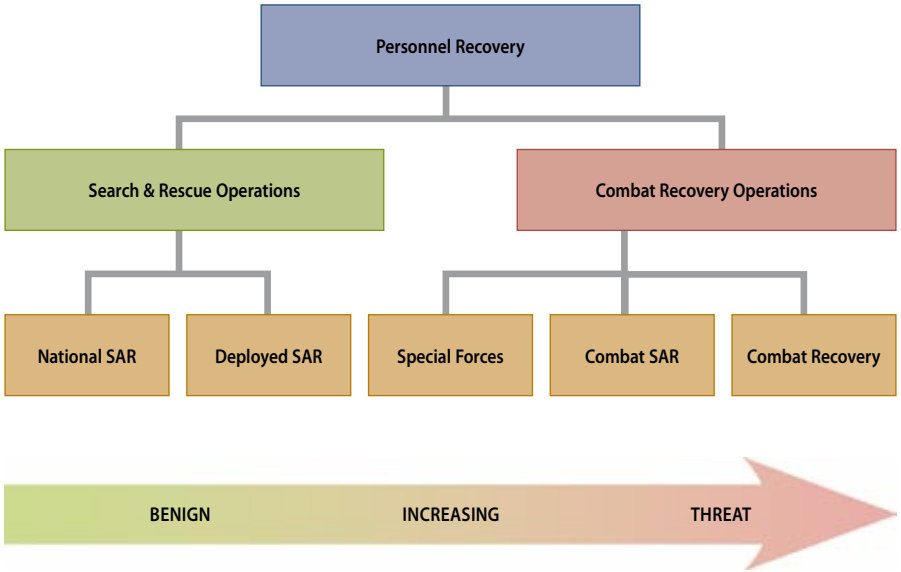
PR is the recovery and reintegration of personnel from uncertain or hostile environments and denied areas whether they are captured, missing or isolated.

It includes SAR, Combat Recovery (CR), Survival, Evasion, Resistance and Extraction (SERE) training and Care After Recovery (CAR).

PR represents a broad span of different types of operation covering a disparate group of missions, roles and tasks but consolidated into a single and coherent spectrum covering a number of parameters, the principal ones being location and threat.

SEARCH AND RESCUE OPERATIONS

SAR operations recover personnel in distress where no threat is posed by hostile interference. They comprise the following elements:



- **National Search and Rescue.** Military SAR, which includes mountain rescue, is directed principally towards the rescue of military personnel. However, subject to military requirements and operational practicability, SAR assistance is also provided to civil authorities. Additionally, some nations have parallel civil SAR assets, which can respond to military SAR incidents.
- **Deployed Search and Rescue.** Deployed SAR (DSAR) is SAR in support of deployed operations and exercises that could include deployment to cover a catastrophe or disaster. It is used to augment a HN SAR capability or to provide one where no SAR capability exists.

COMBAT RECOVERY OPERATIONS

CR operations recover isolated personnel from an environment where hostile interference is expected. The threat environment may range from a low risk environment through to a situation where an opposing force is attempting to prevent the recovery.

Because of the varied threat scenarios, the scope and scale of CR operations can vary widely. In addition, SF may conduct unconventional assisted recovery tasks within their own planning and execution criteria.

- **Combat Recovery.** CR is the recovery of isolated personnel in distress (or the recovery of equipment), from an environment in which a threat is posed by hostile interference, who are not trained and/or equipped to receive Combat SAR (CSAR).
- **Combat Search and Rescue.** CSAR is the recovery of isolated personnel in distress, from an environment in which a threat is posed by hostile interference, who are trained and equipped for CSAR. CSAR is amongst the most time-sensitive of operations. After 4 hours on the ground the chance of recovering a survivor in combat is historically less than 20%.
- **Survival, Evasion, Resistance and Extraction.** SERE encompasses all practical and theoretical measures required to prepare personnel for isolation, captivity and recovery such as Escape and Evasion (E&E) and Conduct after Capture (CAC) training.
- **Care After Recovery.** CAR describes a range of support measures for recovered personnel including, debrief, repatriation, rehabilitation, counselling and medical assessment. It incorporates the successful return of the recovered individual to duty, where possible, and extends into long term monitoring and support where necessary.

Planning and Execution Considerations

A rescue could involve an aircrew bailout over hostile territory, crash landing, ditching at sea, foundering naval vessels or ground forces cut off from friendly lines. Rescue Operations need to consider the following:

- **Threat Environment.** The threat environment defines the enemy's ability to detect and engage rescue forces and requires considered evaluation prior to determining appropriate recovery techniques or methods. Operations are reliant on real-time intelligence to assess operational risk management and threat analysis.
- **Nominal Threat.** A nominal threat risk is said to exist when threats have been destroyed, suppressed, negated or are widely scattered or even non-existent. In a nominal threat environment recovery can usually take place with a minimum of support assets.

Phases of a Typical Rescue

- **Awareness and notification.** Assessing the situation. Selecting an appropriate recovery force.
- **Planning the mission.** Launching the recovery vehicles and refuelling at a FOB or AAR prior to ingress.
- **Ingress enemy territory.** Locating the isolated personnel. Authenticating and recovering the isolated personnel.
- **Egress enemy territory.** Refuelling, as required. Recovering to a suitable friendly base. CAR.

- **Increased Threat.** An increased threat risk exists when significant threats are active requiring extensive mission planning for threat avoidance or degradation by suitable support assets such as Rescue Escort (RESCORT), SEAD, Rescue CAP fighters (RESCAP) and other strike assets.
- **Mission Planning.** Threat avoidance requires thorough mission planning interfaced with real time threat information and precise C2 coordination. Specific information requirements will include the threat, weather, terrain, the objective, codes and authentication, safe passage corridors and refuelling points. Moreover, considerations must be given to HN, other component and multinational force capabilities during all phases of planning.

Key elements of a recovery force may include the following.

- **Rescue Mission Commander.** The Rescue Mission Commander (RMC) establishes communications, locates, authenticates and protects isolated personnel until recovery forces arrive, and controls all assets involved in the recovery including RESCAP, SEAD, additional strike assets and AAR.
- **Rescue Escort.** RESCORT aircraft provide navigational assistance, route sanitization and armed escort for recovery vehicles. Ideally, they should be tactical aircraft capable of operating in the same environment as recovery vehicles and be proficient in rendezvous procedures, escort tactics at medium and low levels, and the defence of recovery assets during mission execution. RESCORT may be provided by specialist aircraft such as the USAF A-10 or other CR qualified fixed- and rotary-wing aircraft.
- **Airborne Mission Coordinator.** The Airborne Mission Coordinator (AMC) coordinates the flying mission and acts as an airborne communications and data relay platform between the CAOC and rescue forces. AMC is usually performed by an AWACS or JSTARS.
- **On-Scene Commander.** The On-Scene Commander (OSC) is the individual who initiates rescue efforts in an objective area until rescue forces arrive. His initial actions include attempting to establish communication, locating and authenticating isolated personnel, and passing essential elements of information to the AMC. The OSC role transfers to the RMC or lead recovery vehicle on arrival.
- **Forward Air Controller (Airborne).** The FAC (A) controls air strikes in close proximity to the isolated personnel and may be able to provide current and accurate assessment of enemy activity as well as functioning as the OSC.

Intelligence, Surveillance and Reconnaissance Support

Surface-, air- and space-based ISR assets offer the capability for detecting and locating isolated personnel, as well as monitoring threat systems in the objective area.

Suppression of Enemy Air Defences

SEAD forces can minimize the surface-to-air threat; however, interoperable communications between SEAD forces, rescue forces and ISR assets are critical.

Mission Execution

As information of a potential CR mission is received, it should be disseminated to all potential participants in the recovery operation. Once the mission is assessed as feasible, participating units will generally be tasked from ground or airborne alert. Some rescue forces may be forward located to decrease flight time and refuelling stops enroute to anticipated recovery areas. Key activities include:

- **Ingress.** The method of ingress will be generally be dictated by the threat risk. Whilst the use of AD fighters, attack, EW and SEAD assets can greatly enhance mission success by protecting assets and suppressing enemy AD, covert operations and tactical deception techniques with rescue forces penetrating hostile or denied territory with minimal direct support, using terrain masking, darkness or adverse weather may also be used to advantage when appropriate.
- **Locating Isolated Personnel.** Regardless of the threat level, friendly forces should always locate and authenticate isolated personnel before committing CSAR forces to operating environments that present increased risk. Several methods exist to determine location such as area electronic surveillance, reconnaissance, global satellites, wingman reports and battlefield radar control posts and centres.

Recovery vehicles, aircraft and RESCORT aircraft equipped with personnel locator systems can also pinpoint the isolated personnel's position when isolated personnel are equipped with specialized communications devices. The concept of actual search associated with CR should be considered extremely limited in scope. In most cases, the search will be primarily electronic as the vulnerability of rescue resources in a threat environment will preclude extended aerial search operations in all but a permissive environment. As such most CR rescue efforts will be primarily dedicated to recovering isolated personnel from previously identified geographic positions.

- **Authentication.** During combat operations, successful recovery of isolated personnel depends on early authentication. Isolated personnel will not normally be recovered until their identity has been positively confirmed. An effective authentication system is essential to protect CR forces from enemy entrapment; therefore, authentication data must be strictly controlled and used in a manner that maintains security and viability. CR assets are extremely vulnerable during the execution phase and need exact and reliable authentication information; extreme care should be taken by the isolated personnel and the rescue forces to ensure authentication information is never compromised. The information should be used in a manner that allows CR forces to continue to authenticate isolated personnel over extended periods. There are a number of means to authenticate isolated personnel in hostile environments, including Isolated Personnel Report (ISOPREP) data, ATO code words, letters, numbers and visual signals. ISOPREP is the most common means of authentication and, in the case of CSAR, should be readily available to the rescue forces on scene. Actual theatre or JOA procedures are normally published in appropriate directives and/or SPINS.

CHAPTER 9

FUNDAMENTAL ROLE – INTELLIGENCE AND SITUATIONAL AWARENESS

"What enables the wise sovereign and the good general to strike, conquer and achieve things beyond the reach of ordinary men, is foreknowledge."

Sun Tzu

INTRODUCTION

SA relies on the integration of ISR capabilities from all components to provide the battlespace awareness essential for successful planning and conduct of operations, through the collection, processing, exploitation and dissemination of accurate and timely information.

Successful ISR should help to reduce uncertainties in the decision-making process and facilitates our ability to gain and maintain information superiority, which in turn increases our flexibility, enhances effectiveness, increases responsiveness and aids in FP.

KEY PRINCIPLES

To be effective ISR products must be responsive to a commander's needs. As such it must be:

- **Integrated.** Integration of surveillance and reconnaissance operations with the intelligence process is essential to ensure timeliness and accuracy in the delivery of essential information. Integration of cross component ISR helps preserve forces by avoiding duplication and achieving economies of effort.
- **Fused.** Fusion consists of the combination, evaluation and analysis of information derived from multiple sources to produce accurate, reliable and precise intelligence. Fusion helps defeat an enemy's efforts to deny information and overcome the inherent limitations of reliance on a single source, thus providing adequate information for decision making. However, care must be taken not to promote fusion at the expense of timeliness.
- **Accessible.** Accessibility of derived intelligence information is essential to ensure that it is used and not just collected. It must be easily retrievable and should always be classified at the lowest possible classification consistent with security. Understandably, some intelligence will require higher levels of protection (for example, to protect sensitive sources and methods or the fact that certain knowledge is held) which will make it harder to share.
- **Coordinated.** Coordination is essential. The proliferation of intelligence specific CIS and the ever-increasing capabilities of intelligence collection assets, means that there is a real danger of disparate organizations making different assessments from similar information. Therefore, it is essential that cross-component coordination is employed to ensure that commanders are in receipt of all aspects of intelligence that may affect their input to the campaign and not merely deluged with data.
- **Timely.** Timeliness of the product is key to effective planning and execution of operations. This applies to identifying and stating requirements, collecting information and producing actionable intelligence. Intelligence is of very limited or no value if disseminated too late to be acted upon. Conversely, if raw intelligence is disseminated without validation or analysis, it may give a distorted or incorrect view.
- **Objective.** Objectivity must be maintained. If the available evidence does not fit an assessment, the likelihood is that at least part of that assessment is wrong. Accordingly, pressure from the commander or politician to interpret intelligence in such a way as to support a chosen or desired COA must be resisted, as should any inclination by the analyst involved to fit intelligence to a pre-conceived view.
- **Continuously Reviewed.** Continuous review is imperative as the battlespace is a fluid environment, affected by infinite variables. An intelligence assessment on one day may no longer be valid on another and needs to be reviewed constantly in line with intelligence requirements.
- **Survivable, Sustainable and Deployable.** Survivability, sustainability and deployability of ISR resources, activities and communications are essential to ensure support is available to a commander when required. It is also imperative that support can be sustained at a necessary level for the duration of operations and that equipment is constructed to facilitate ease of transport and rapid establishment and connectivity.
- **Connected and Interoperable.** Connectivity and interoperability is crucial to the responsiveness and survivability of ISR systems and essential to the ability to share accurate, useable and timely information between a wide variety of users. An ISR system's effectiveness depends on its ability to 'plug and play' with a wide variety of users. Commonality and connectivity also improve the overall ISR process through cross-cueing, information enhancement and analytical exchange to accurately portray the battlespace.

INTELLIGENCE

Intelligence is the product of processing, integrating, analyzing, evaluating and interpreting available information. It should provide clear, brief, relevant and timely analysis on capabilities and intentions for planning and directing operations. Intelligence organizations integrate technical and quantitative assessments with analytical judgments based on detailed knowledge of the way the enemy thinks and operates.

The overall objective of intelligence is to enable commanders and combat forces to 'know the enemy' by providing the right information to the right commander at the right time for key decision making.

That is achieved by providing indications of enemy intentions which will guide decisions on how, when and where to engage enemy forces to achieve the commander's objectives. It also assists with combat assessment through weapons-effects assessment and BDA.

Joint Intelligence Preparation of the Environment

JIPE is the systematic and continuous analysis of the threat and environment that assists in determining an enemy's COA, named areas of interest and high-value targets. Those in turn are inputs to the JFC planning, intelligence collection and targeting processes. Done properly, JIPE facilitates getting 'inside' the enemy's decision-making cycle.

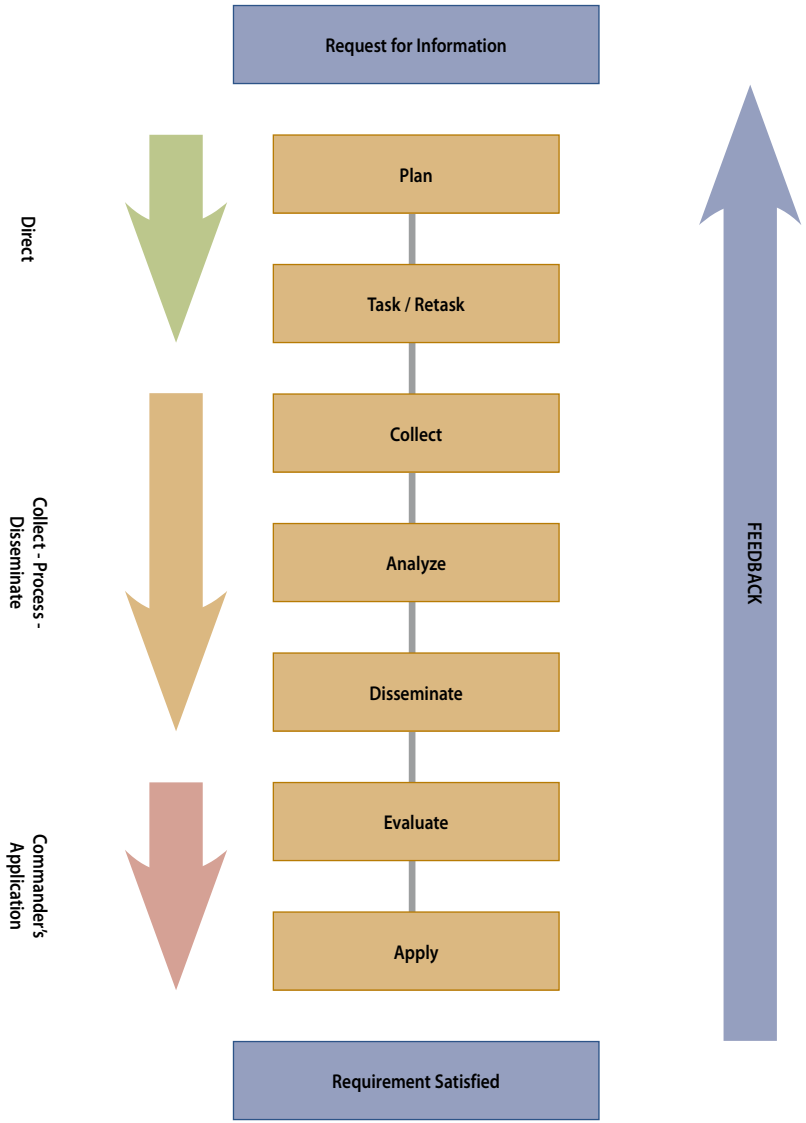
Signals Intelligence

SIGINT is a category of intelligence comprising of individually or multi-sensor derived communications intelligence, electronic intelligence and foreign instrumentation signals intelligence, however transmitted.

Airborne SIGINT capabilities allow real- (or near-real-) time assessment of hostile air or surface based electronic emitters and the correlation of location, type and mode of emitted signal with the radar tracking information from both manned and unmanned surveillance type aircraft.

The ISR process has seven continuous steps, briefly summed up below and discussed in greater detail in the planning and execution chapters.

The ISR Process



SURVEILLANCE

Surveillance is a continuing and systematic observation of air, space, surface or subsurface areas, places, persons or things by visual, aural, electronic, photographic or other means. It is not oriented to a specific target, but designed to provide warning of enemy initiatives and threats (indicators and warnings), and to detect changes in enemy activities. Airborne and space-based surveillance assets exploit unconstrained over flight and elevation to detect enemy initiatives at long-range.

RECONNAISSANCE

Reconnaissance complements surveillance through visual observation or other detection methods to obtain specific information about the activities and resources of an enemy or potential enemy or to secure data concerning the meteorological, hydrographical or geographic characteristics of a particular area.

Reconnaissance generally has a time constraint associated with tasking or the endurance of assets involved. Intelligence critical to the prosecution of current operations is derived from reconnaissance operations and should be evaluated and transmitted in near-real-time to those elements needing that information.

Tactical Air Reconnaissance

Tactical air reconnaissance is a sub-set of reconnaissance carried out by tactical aircraft and comprises the following specialist roles:

- **Armed Reconnaissance.** Armed reconnaissance missions are flown with the primary purpose of locating and interdicting targets of opportunity in assigned general areas or along assigned ground communications routes. They are not flown for the purpose of attacking specific briefed targets.
- **Reconnaissance/Attack Interface.** Recce/Attack Interface (RAI) and Attack/Attack Interface (AAI) procedures allow for attack aircraft to be passed up-to-date target information from reconnaissance or other attack aircraft, while airborne, immediately prior to attacking a target.

TARGET ACQUISITION

Target acquisition is the detection, identification and location of targets in sufficient detail and in the appropriate time-scale to permit the effective employment of weapons.

Targeting

Targeting consists of detection, location, identification, decision, execution and assessment. ISR operations play a prominent role in detection, location, identification and assessment.

- **Detection.** Detection utilizes ISR assets to detect potential new targets or significant changes to existing targets. This step is an ongoing process, which is conducted before, during, and after military operations, and it initiates action for the remaining targeting steps.
- **Location.** Location allows a target to be positioned accurately within a designated reference system to support the identification, decision and execution steps that follow. Mobile targets pose significant problems during this step because their data are so perishable, and current data is essential to target analysis and later to target acquisition.
- **Identification.** Identification involves recognizing and classifying targets in sufficient detail to allow decisions to be made. Because of limitations in sensor system capabilities, multiple ISR operations may be necessary to identify and verify the target. Frequently, the information from one ISR source can be used as a cue to initiate other ISR operations.

Execution and assessment are covered in greater detail throughout AP 3002.

CHAPTER 10

FUNDAMENTAL ROLE - ATTACK

STRATEGIC ATTACK

"It is not necessary for an air force, on order to defeat an enemy nation, to defeat its armed forces first. Air power can dispense with that intermediate step, can pass over the enemy navies and armies, penetrate the air defences and attack direct the centres of production, transportation and communication from which the enemy war effort is maintained."

Viscount Trenchard

The aim of strategic [37] attack is to conduct actions, sufficiently early, to achieve coercive or decisive effects in disrupting an enemy's strategy, ability or will to wage war or carry out aggressive activity. It is achieved through the disruption or destruction of COGs or other vital target sets such as leadership, command elements, war production resources, fielded forces and key supporting infrastructure. Air power can strike

[37] *AP 3000 Ed 4 introduces the term 'deep' to replace the term 'strategic'.*

directly at the heart of the enemy, disrupting critical leadership functions, war-sustaining resources and strategy, whilst avoiding the need to sequentially fight through layers of ground forces to get there. Such operations can often be the most effective use of limited air assets.

NOTE: Strategic attack is defined by expected effects not the specific weapon systems, delivery platform or the type of target attacked.

Centralized control and decentralized execution is vital to exploit the synergy of all applied FE in debilitating an enemy's willingness and capability to wage war and to avoid the diversion of resources to other efforts unless such diversions are vital to attaining objectives or to the survival of an element of the joint force.

Kill Chain Considerations

Striking strategic target sets will invariably have high-level political implications and will generally require approval from the JFC or even national leaders. This will add additional layers to the target approval process, which costs the executing commander time. Successful strikes, however, may require swift action and this essential 'conflict' has led to the escape of important fleeting targets in the past.

Modern CIS has made it possible to compress the time required to find, fix, track and engage such targets, but has not compressed the time required to decide whether to attack them. Effective operations against such targets require careful planning beforehand and a thorough understanding of the risks and consequences of ad hoc strategic attack without careful prior coordination at all levels of command and a shared view of the intent of commanders above component level.

Planning and Employment Considerations

Strategic attack is often most effective when employed using the parallel warfare concept. Whilst strikes on COGs are almost always necessary, a parallel approach simultaneously striking a wide array of targets chosen to cause maximum shock effect across an entire enemy system limits an adversary's ability to adapt and react and thus places the most stress on the system as a whole. This often offers the best opportunity to trigger system-wide shock, thus inducing paralysis or collapse.

The object is to effectively control the opponent's strategic activity through rapid decisive operations. Where parallel operations may not be possible due to resource or political constraints, then desired effects must be achieved sequentially with actions sequenced so that the resultant effects attain the objectives in priority order. However, this will dissipate the advantages of mass and shock effect that air excels in.

It is possible to combine parallel and sequential attack strategies in which high priority objectives are the focus of the initial air effort. At phase points, the campaign can be expanded to incorporate additional objectives, while continuing to ensure the previous requirements are met. For example, the first air objectives might be to isolate national leadership; destroy Weapons of Mass Destruction (WMD) and their means of delivery; achieve air, space and information superiority; and destroy certain C2 capabilities.

Once these objectives have been met, air operations could then expand to incorporate additional objectives, such as disruption of national fuel stocks, electric power and transportation systems or dislocation of enemy fielded forces.

COUNTER-LAND OPERATIONS

> *"An army can be defeated by one of two main alternative means not necessarily mutually exclusive. We can strike at the enemy's troops themselves, either by killing them or preventing them from being in the right place at the right time; or we can ruin their fighting efficiency by depriving them of their supplies of food and war material of all kinds on which they depend for existence as a fighting force."*
>
> *Wg Cdr J. C. Slessor*

The purpose of counter-land operations is to gain and maintain a desired degree of control of the battlefield by targeting fielded enemy ground forces and the infrastructure directly supporting them. Air and space power offers the advantage of finding, fixing and striking enemy surface forces across the full depth of the battlefield generally unconstrained by battlefield boundaries and many of the environmental limitations imposed on surface forces. However, the conduct of counter-land operations is dependent on overall campaign strategy and the specific circumstances of the conflict; such factors include enemy disposition, phase of the operation, whether ground combat is also occurring, our degree of control of the air and the need to support, or be supported by, surface forces.

Counter-land operations consist of two mission types:

- **Air Interdiction.** AI is action to destroy, disrupt, divert or delay the enemy's surface potential before it can be used effectively against friendly forces, or otherwise achieve its objectives, and is carried out at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required.
- **Close Air Support.** CAS is action by fixed- and rotary wing aircraft against hostile targets, which requires detailed integration of each air mission with the fire and movement of friendly forces for fratricide avoidance and targeting guidance.

Counter-land success generally requires sustained and concentrated efforts; AI, especially, demands sustained, persistent action to ensure a prolonged effect, whilst concentration of action against critical targets is essential due to the generally limited numbers of AI- and CAS-capable assets. Effective ISR is also essential to provide real- or near-real-time feedback on both initial actions and the subsequent effect(s) achieved over time, to inform decision making on if/when to re-attack or attack follow-on targets.

NOTE: Not all AI falls under counter-land operations; there are many examples of AI flown against air or sea LOCs.

Air Interdiction or Close Air Support?

The distinguishing characteristics between AI and CAS are the timing of when the effects will be felt and the level of coordination and/or control needed for success. CAS effects are felt almost immediately, whilst AI effects can take days or even weeks to be perceived or realized.

The risk of fratricide to troops in close contact requires more positive and restrictive control measures, plus some form of targeting guidance / terminal attack control, which generally precludes AI being tasked against targets that are, or will be, in close proximity by the time the mission is flown.

CAS is typically used for the direct destruction of local forces 'in close contact' rather than the disruption or neutralization of larger enemy formations by targeting critical enemy systems or nodes. As such, it tends to be a less efficient use of air power than AI, due to its localized effects, the tactical disposition of enemy targets and the added restrictions when attacking in close proximity to friendly ground forces. AI, on the other hand, allows air power to focus more directly on key portions of the enemy forces and associated support structure, generally producing more widespread and longer-lasting results.

AI has historically focused on operational-level effects such as isolating an entire front from access or reinforcement by enemy forces, destroying critical enemy war fighting capabilities or facilitating operational manoeuvre of friendly surface forces.

Counter-land Enablers

- **Air Ground Surveillance Systems.** AGS such as the JSTARS and ASTOR, build ground SA through surveillance to support operations and/or targeting. They allow for rapid updates on enemy force disposition, identify opportunities for rapid interdiction and retargeting of surface forces and may provide a limited battle management function. JSTARS battle managers provide direction based on wide area surveillance, ground moving target indicator and synthetic aperture radar information that detects and locates stationary ground targets, and tracks moving ground targets and rotating antennas. This data is used to build a common tactical picture to provide air and ground commanders with situation development, targeting, attack planning and limited post attack assessment information. Data is transmitted to airborne and ground elements of the TACCS capable of receiving data link messages. For Example, Joint Tactical Information Distribution System (JTIDS) Link 16 messages.
- **Space Ground Surveillance Systems.** Space ground surveillance systems complement AGS systems by providing detection capabilities beyond the range of most air sensors, albeit often at a reduced spatial or temporal resolution. However, space systems will usually have a field of regard many times larger than those of air sensor systems, making them well-suited to scan and cue functions leaving other sensors to focus appropriately. Space systems are also able to surveil deep targets without regard for conventional surface-to-air threats.

- **Precision Guided Munitions.** PGMs offer some significant advantages over other weapon systems in counter-land operations, particularly when adhering to the LOAC when considering collateral damage risk to civilians, civilian structures and properties associated with attack. Guided munitions can correct for many ballistic, release and targeting errors in flight and, because ordnance is generally predictable in effect, explosive loads can be more accurately tailored to the target. However, PGMs are not always the panacea. The use of such weapons places high demands on intelligence capabilities to identify key nodes and precise target locations. Furthermore, no PGM is guaranteed to hit its target every time and the non-ballistic nature of many PGMs means that, should they fail to guide, miss distances can be significantly greater than the expected miss distance of unguided munitions. This miss distance may be a consideration in high-risk collateral damage situations or when determining which weapons to employ for the support of troops in contact. Moreover, it is still true that in many circumstances the employment of massive firepower against area targets using large numbers of accurate, but not precise munitions, can ensure more uniform target coverage and maximize physical and morale effects on the enemy. Although technology has reduced the impact of weather and other environmental conditions, they can still adversely affect counter-land operations. Some forms of severe weather can interfere with the ability of air power assets to reach their targets, whilst many PGMs still rely on line-of-sight to the target for employment. Conditions such as fog, undercast or battlefield obscuration can prevent visual contact and disrupt weapons delivery. The adverse effects of weather can be reduced through a combination of weapons that do not require optical guidance, such as GPS guided munitions and the use of non-visual sensors such as radar to aid the weapons delivery process. Specific limitations can be summed as follows:

  - **Laser Systems.** Laser effectiveness can be seriously degraded by cloud cover and precipitation as well as battlefield conditions (smoke, dust, haze and other obscurants).
  - **Electro Optical and Infra-Red Systems.** Electro Optical (EO) and IR systems can be seriously degraded by cloud cover, humidity, precipitation and thermal crossover. Battlefield conditions (smoke, dust or other obscurants) may also degrade forward-looking infrared (FLIR) and low light level television effectiveness.
  - **Satellite Guided Systems.** Satellite guided munitions are susceptible to inaccurate coordinates from Target Location Error (TLE) or the use of different coordinate datums. In addition GPS accuracy is variable, while it can be optimized for a specific region, it is not globally at a consistent accuracy.

CONTROL AND COORDINATION MEASURES

Fire Support Coordination Line

The Fire Support Coordination Line (FSCL) is the FSCM with the potential to impact AI operations. It is established by a surface force commander within his AOO in coordination with other CCs. The FSCL

identifies the coordination requirements for fires by systems which are not organic to his force, but which might affect his operations:

- **Short of the FSCL.** Short of the FSCL (or within an enclosed FSCL) all air-to-surface and surface-to-surface attack operations are controlled by the surface force commander responsible for the AOO, who will specify the procedures required. The word control under these circumstances denotes aircraft control procedures; it does not imply that the surface force commander has OPCON [38] or TACON of the aircraft.
- **Beyond the FSCL.** Commanders of forces attacking surface targets beyond the FSCL (or outside an enclosed FSCL) must coordinate with all other commanders (air and surface) who might be affected, in sufficient time to avoid fratricide and in order to harmonize joint objectives. If the attacks are to take place within an AOO, this coordination is essential to ensure that they will not adversely affect the associated surface force commander's plan of operations or scheme of manoeuvre. This coordination is achieved through the targeting process and the component liaison elements.

Kill Boxes

Kill boxes offer a three-dimensional FSCM to facilitate the expeditious air-to-surface attack of targets, which may be augmented by or integrated with surface-to-surface indirect fires. The primary purpose of a kill box is to allow air assets to conduct interdiction against surface targets without further coordination with the establishing commander and without terminal attack control.

A kill box is not normally established specifically for CAS missions; however, this does not restrict the conduct of CAS inside established kill boxes if all CAS requirements are met. When used to integrate air-to-surface and surface-to-surface indirect fires, the kill box will have appropriate restrictions - the goal is to reduce the coordination required to fulfil support requirements with maximum flexibility, while preventing fratricide. Kill boxes are covered in greater detail in Chapter 11.

NOTE: The term 'kill box' should not be used interchangeably with a unit of area reference such as the 30 minute x 30 minute 'grid box' used in Common Geographic Reference System (CGRS) or Global Area Reference System (GARS). However, Grid boxes (or their subunits) can be used to define kill boxes. Kill boxes. CGRS and GARS are covered in greater detail in Chapter 11.

AIR INTERDICTION

AI targets enemy personnel, LOCs, C2 nodes, materiel, logistics and supporting systems at ranges beyond which an enemy can effectively engage friendly surface forces. The flexibility of AI allows it to be conducted in support of surface operations or as main effort against the enemy surface force without the presence of any friendly ground forces (or with discrete ground force elements providing target cueing); thus, it may offer the potential to reduce or even eliminate the requirement for ground combat.

[38] *OPCON is 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 TACON of those units.*

Interdiction and surface force manoeuvre can be mutually supporting. Surface force operations can support interdiction operations by forcing the enemy to consume supplies at an accelerated rate and to move forces to meet emerging threats. These movements and supply efforts then become targets or objectives for air capabilities or forces. Interdiction can also support surface operations by forcing the enemy to react to friendly attack and, in doing so, expose vulnerabilities to surface manoeuvre forces. Additionally, attacks on enemy C2 systems contribute to operations that interfere with an adversary's ability to mass, manoeuvre, withdraw, supply and reinforce surface forces.

Employment Methods and Factors

To guarantee the maximum chances of success AI should always be pre-planned, unless dynamic targeting requires otherwise, to allow for proper weapon-target combination, target area tactics planning, threat avoidance, weather study and other variables that maximize the probability of target destruction with minimum losses. Attacking mobile or short-notice targets may provide a more flexible response on the battlefield, but the chances of each specific attack being successful are reduced and higher friendly losses may be expected. Modern technology such as real-time data link and digital imagery in the cockpit may reduce, but not eliminate, this factor.

There are two types of AI missions that can be tasked, each influenced by a variety of factors.

Pre-planned AI

Pre-planned AI is the normal mode of operation flown against fixed targets or mobile targets not expected to move in the interval between planning and execution. The fact that such target sets are known in advance, supported by detailed intelligence information, allows aircrew more time to study target imagery, optimize weapons fuzing, align attack axes to optimize weapons effects and may reduce threat exposure by allowing better packaging of strike and support assets when required and available.

Non-pre-planned AI

There are several types of non-planned or flexible AI missions:

- **Armed Reconnaissance.** Armed reconnaissance is flown with the primary purpose of locating and attacking targets of opportunity (for example enemy materiel, personnel and facilities) in assigned general areas or along assigned ground communication routes, and not for the purpose of attacking specifically briefed targets.
- **Airborne Alert.** Placing AI assets on airborne alert allows real-time targeting, often relying on an off board sensor such as JSTARS to provide initial target detection and attack targeting information, with response times as short as a few minutes, depending on the distances and C2 arrangements involved. This option may work well for attacking enemy ground forces on the move in the enemy rear area, especially if pre-launch target coordinates or locations require updating. Real-time targeting of AI

missions, especially those flown short of the FSCL, provides a more responsive attack when supporting surface forces and allows airborne assets to quickly exploit enemy vulnerability that may be of limited duration. The downside of all non-pre-planned, dynamic targeting missions remains the overall reduction in probability of killing the target. The bottom line for dynamic targeting by airborne assets is that it should only be used in those cases when the need for a short reaction time outweighs the reduced effectiveness that is likely to result when compared with pre-planned operations.

NOTE: Airborne alert can be an inefficient use of resources unless there are an overwhelming number of assets available or an insufficient number of lucrative pre-planned AI targets available.

- **Kill Box Interdiction.** Kill box interdiction consists of AI conducted within an area defined as a kill box. Non-pre-planned missions will normally be given a target priority list or other guidance defining which targets to attack for greatest disruption of the enemy. This set of target priorities may be available prior to takeoff, or may be passed in-flight by an appropriate C2 agency such as an ASOC, CRC or AWACS.

Strike Coordination and Reconnaissance

Strike Coordination and Reconnaissance (SCAR) missions are flown for the purpose of detecting targets and coordinating or performing attack or reconnaissance on those targets. SCAR operations utilize combat aircraft to detect targets of opportunity in specific geographic areas, where potential targets are known or suspected to exist, or where mobile enemy surface units have relocated, for dedicated AI missions. Typical SCAR tasks include sequencing and deconflicting multiple attacking flights through the target area while providing prioritized targeting guidance and enemy AD updates to maximize the effectiveness of each sortie.

SCAR may be flown anywhere in the JOA where AI is used; however, unlike pre-planned interdiction, the tasked operational area for each SCAR mission has significant impact on the target priority for the assigned mission.

The target priority is established by a JFC or supported commander and, as there may be multiple supported commanders within a JOA, there may be more than one SCAR target priority. In addition, these SCAR priorities can change rapidly as the JFC transitions from one phase to the next (for example, deter, seize the initiative, dominate and/or stabilize).

SCAR aircrew follow the target priorities established by the JFC or supported commander as defined by the AOD, SPINS, ROE and appropriate OPORD. A SCAR mission allows the SCAR Commander (SCARC) to apply the dynamic targeting steps of find, fix, track, target, engage and assess in real time.

NOTE: The SCARC does not have to be a FAC(A); therefore SCAR sorties should not be tasked into CAS areas, due to the close proximity of friendly forces and the requirement for detailed integration.

Planning Air Interdiction

Experience has shown that certain key conditions tend to produce favourable AI results; a degree of control of the air; the existence of target sets critical to the enemy and vulnerable to attack; sustained pressure from ground combat; continued air attack or both; logistical constriction (due to both reduced supply and high consumption; and concentration of effort).

The most important aspect in planning AI is the effect desired; however, the stated effects themselves can also have different meanings in different contexts and therefore should be very precisely defined when used in broad guidance. Whilst flexibility is good, desired effects must be adequately defined to properly meet the commander's intent. Types of effects include:

- **Destruction.** Destruction is the most direct effect; however, the direct attack of mobile fielded forces has historically been limited due to the difficulty in finding and targeting individual guns or vehicles. Improvements in sensor and munitions technology now make direct attack a viable option; however, it is not the most efficient approach because it usually requires more assets to cover the larger number of individual targets. If the enemy was unable to replace key tanks and artillery pieces, then destroying them, instead of repairable targets such as bridges, might produce greater pay-offs. However, targeting critical LOC may cause concentration of enemy forces making them more vulnerable to direct attack.

NOTE: The term 'destroy' has a large number of different meanings to various parts of the military. Planning manuals, for example, have their own definitions for mobility (M), firepower (F) and catastrophic kill (K) of individual targets. At the higher levels of war, one usually associates the word 'destroy' with a certain reduction in combat power. Again, this should be specifically stated both in terms of how much combat power needs to be reduced and what the mechanism for destroying that combat power will be. A very specific example of this might be 'destroy 50% of the enemy XX battalion's combat power through the destruction of armoured vehicles, artillery batteries, and associated tactical munitions stockpiles' while a more flexible example might simply be 'reduce the combat power of the enemy XX battalion by 50%'.

- **Disruption.** Disruption can be achieved in a number of ways and a determination of an enemy's key vulnerabilities and our ability to attack them is central to planning. Traditional targets include ammunition, POL, LOCs and C2 systems. However, consideration must be given to what reserves or workarounds the enemy has available, what time delay can be afforded for the effects to be realized, what strategy and doctrine the enemy is likely to employ and what the actual battlefield situation is.
- **Diversion and Delay.** These are often the by-products of destruction or disruption where part of an enemy force is destroyed. Subsequent efforts to avoid having the rest of his force suffer the same fate will often result in long delays or an outright halt of movement to contact.

NOTE: The term 'delay' should always include a geographic and a chronological effect delineator, for example 'delay (specific forces) behind (phase line or feature) for (time period XX hours)'.

In deciding whether AI is directed against replaceable systems (vehicles, weapons, POL and CIS or repairable systems (bridges or railway lines), consideration must be given to the ability to maintain sufficient pressure to impede efforts to replace or repair affected targets and cause stress on the entire enemy operation. Often timely supply is critical and mobility denial will deny freedom of movement to execute tactical plans. This requirement applies particularly to operations of long duration, because time normally allows the enemy to restore losses; in which case, attacks on key repair and replacement assets may be advisable where they represent the weak link in the enemy's support infrastructure.

The effectiveness of AI remains largely dependent on a number of variables. Results against an enemy with minimal logistics requirements, a simple force structure and primitive logistics systems differ from AI against a highly mechanized force with intensive logistics requirements. In addition, the time for AI to achieve its effect, and the duration and depth of those effects depends on factors such as the distance between interdiction operations and the location of intended effect, the means and rate of enemy movement (sea, rail, road or air), the immediate target (forces, supplies, POL or infrastructure), the level of enemy activity and the resilience of the targeted force or system.

CLOSE AIR SUPPORT

CAS provides ground or amphibious forces with firepower in offensive and defensive operations, by day and night, to destroy, suppress, neutralize, disrupt, fix or delay enemy forces in close proximity to friendly ground forces. The firepower and mobility of aircraft can make an immediate and direct contribution to the surface battle, especially against targets that are either inaccessible or invulnerable to available surface weapons.

CAS directly supports manoeuvre, concentrating firepower in time and space, to help create breakthroughs, provide cover for withdrawals or helping to guard flanks. CAS is often crucial to the success or even survival of supported forces. The variety of targets likely to be encountered makes it important to be able to employ a variety of weapons and delivery systems, thus reliable and interoperable communications with the supported force are essential features in the CAS environment.

There are a number of methods of employing CAS assets:

Pre-planned

Pre-planned CAS is scheduled for a particular time or time period that normally coincides with the anticipated time that CAS will be needed by the supported component. It is conducted in two categories:

- **Scheduled.** Scheduled CAS puts aircraft over the area of the battlefield at a pre-planned TOT and where a need for CAS has been established in advance. It offers the likelihood for better weapon-to-target matching from prior intelligence.

- **On-Call.** On-call CAS places aircraft on ground or airborne alert during a period when the need for CAS is foreseen but not guaranteed. This may often be a less efficient use of CAS resources because assets involved may or may not actually be employed, unless a back up target is nominated.

Push

Push CAS proactively plans and 'pushes' aircraft, normally in a continuous flow, to a contact point at a specified time to provide constant CAS support to ground units identified as the main weight of effort. It is planned and flown before an actual request for CAS has been made. Post an in-flight check-in with an appropriate C2 agency, aircraft not needed for CAS are usually released to pre-planned backup AI targets.

Immediate

Immediate CAS usually results from unanticipated needs on the battlefield, often of an emergency nature, that requires diverting or rescheduling aircraft from other missions.

Emergency

Emergency CAS (ECAS) procedures may be used by non-FAC or JTAC qualified personnel 'in-extremis' where the risk of fratricide is less than the threat posed by the enemy.

Retasking

Aircraft already airborne on a CAS mission may be diverted by the ASOC to higher priority targets demanding immediate CAS. OCA or AI aircraft with appropriate ordnance on another mission (OCA/AI) may also be diverted to CAS by the CAOC. During the planning cycle lower prioritized sorties may be identified for potential re-tasking to immediate CAS missions if required. These aircraft can be on airborne or ground/deck CAS alert before executing their primary mission. Planning to meet re-tasking requirements can be included in the allocation plan. Warning of the possibility of re-tasking should be included in the ATO.

Planning and Requesting

The two key factors for successful CAS are the need to provide flexible, real-time targeting guidance to CAS aircraft and the need to avoid hitting friendly ground forces in close proximity to the target. To be most effective, CAS should normally be used at decisive points in a battle or operation and massed to apply concentrated combat power and saturate defences, whilst control of the air through SEAD, good weather and the availability of target marking all help to facilitate successful CAS.

In planning schemes of manoeuvre, surface forces should assess the capability and availability of organic assets and, if necessary, request pre-planned CAS through the BCD to augment their capabilities. These requests are considered in the JFACC apportionment recommendation. There are two types of CAS requests:

- **Pre-planned Requests.** CAS requirements foreseen early enough to be included in the ATO are submitted as pre-planned requests using Joint Tactical Air Request (JTAR) or Air Task Message (ATM) through the surface force C2 hierarchy with CAS planners at each ground force echelon approving or rejecting these requests. If accepted they are submitted to the next higher echelon, if refused they are sent back to the requesting unit with an explanation. Accepted requests are prioritized and eventually arriving with the BCD for action at the CAOC. Pre-planned requests may be filled with either scheduled or on-call air missions.
- **Immediate Requests.** Immediate requests arise from situations that develop outside the ATO planning cycle and are generally filled with on-call missions. Requests are broadcast directly from the FAC or JTAC to the appropriate tasking authority (CAOC or ASOC) by the quickest means available. This may be the Tactical Air Request Net (TARN), a JTAR or ATM, or a CAS briefing. The Fire Support Coordinator (FSC) and ALO or ASO at each intermediate HQ monitor the flow of requests. Based on the commander's intent, and after considering whether organic assets are available to fulfil the request, they accept or refuse the request. Silence by intermediate HQ implies consent to the request. The request will be filled by the ASOC redirecting pre-planned CAS missions or by requesting the CAOC to redirect other missions (not necessarily CAS) to cover immediate requests; in which case tailored ordnance loads may not be available for specified targets.

Resources and Planning

Both fixed- and rotary wing aircraft can conduct CAS; however, employment considerations differ, not least because army aviation units are organic to corps, divisions and regiments and conduct missions primarily as part of a combined arms team. Attack Helicopters (AH) and fixed-wing aircraft have capabilities that are complementary, especially when employed in combined attacks. Fixed-wing aircraft have a wide variety of CAS munitions and excellent capability to conduct CAS in diverse terrain, whilst AH offer the advantages of an increased loiter time on station and often have better SA on ground manoeuvre.

Planners should select combinations of munitions and aircraft that offer the required accuracy, fire power and flexibility for a particular request and ensure that sufficient guidance is given to weapons load, arming and fuze settings for the desired effects.

This requires the requesting commander to provide sufficient information outlining his desired effects, any external or self-initiated tactical restrictions or limitations, etc. General-purpose munitions are very effective against troops and stationary vehicles; however, hardened, mobile or pinpoint targets may require specialized weapons, such as laser-guided, EO or IR munitions, or aircraft with special equipment and / or capabilities.

Planners should task an appropriate mix of ordnance to best support the commander's intent while simultaneously giving him as much flexibility as possible. The rider is that immediate CAS requests might have to be filled by aircraft loaded with less-than-optimal munitions.

Digital Close Air Support

Digital CAS systems are great aids to reduce voice communications, save valuable time and reduce typing errors. The type of information exchanged between the FAC and aircraft remains the same, the difference being that much of the data from the FAC brief is generated automatically and inserted in the briefing format avoiding manual calculations. Digital CAS Systems are made up of specific hardware and software systems that give the FAC SA and enhance target-locating ability. This hardware may include Laser Range Finder (LRF) / Laser Target Designators (LTDs) coupled with computer/GPS that can utilize target location to build CAS briefs and digitally transmit them to the aircraft. These systems greatly aid CAS employment during night time and poor weather conditions.

Unmanned Aircraft

UA are uniquely capable CAS support and CAS platforms. Most UA offer extended loiter time and support precision targeting for ground manoeuvre elements. Armed UA can also provide precision fires against key targets. UA capabilities vary between different platforms and need to be well understood if they are to be effectively employed. Most new UA have the capability to be, or already are, armed and can provide extremely accurate fires with laser and GPS guided weapons as well as the ability to stream Full Motion Video (FMV). The current remote video terminals used by ground forces allow the FMV to be viewed directly from the UA real-time by ground forces.

Full Motion Video Operations

FMV is growing in its utility for CAS operations. However FMV provides a 'drinking straw' view of the target area through the aircraft's EO/IR sensors. Both aircrew and FACs still need to conduct adequate target study and mission preparation prior to the talk-on. FMV equipment normally comprises a receive-only terminal that provides the capability to receive real-time sensor-data (in the form of streaming video data) from suitably equipped airborne platforms.

Correctly used, FMV can reduce the risk of fratricide and reduce the engagement cycle time. However, to realize this capability, aircrew and ground forces must operate as a cohesive team. The requirement of the aircrew to understand the ground scheme of manoeuvre is therefore essential to success.

Conditions for Effective CAS

Experience has proven that effective CAS is reliant on certain conditions being met:

- **Effective Training and Proficiency.** Training should integrate all of the manoeuvre and fire support elements involved in the execution of CAS. Maintaining proficiency better prepares aircrews and controllers to adapt to rapidly changing battlefield dynamics.
- **Planning and Integration.** The ability to mass fire support at a decisive point relies on coherent planning and detailed integration between CAS and ground forces.
- **Command, Control and Communication.** An integrated, flexible and robust C2 and CIS structure is essential to identify requirements, request support, prioritize competing requirements, direct CAS forces to the target area, provide threat warning updates, coordinate ACM and FSCMs, and enhance combat identification procedures.
- **Appropriate Control of the Air.** Local or temporary control of the air permits CAS aircraft to operate without prohibitive interference from the enemy.
- **Target Marking and Acquisition.** Target marking builds SA, identifies specific targets in an array, reduces the possibility of fratricide and facilitates terminal attack control.
- **Streamlined and Flexible Procedures.** Procedures must be responsive enough to exploit fleeting opportunities and the CAS 'system' flexible enough to respond to dynamic target, tactic or weapon changes.
- **Appropriate Ordnance.** Weapons and fuzing must be tailored to the effect required.
- **Favourable Weather.** Favourable weather improves effectiveness regardless of the capability of the weapon or system being employed.

Terrain and Weather Effects on CAS

Terrain can affect communications and visual Line of Sight (LOS) for identifying the target and/or aircraft. Data link systems and GPS-guided weapons improve the ability to execute CAS in certain tactical situations despite weather limitations; however, favourable visibility normally improves CAS effectiveness but can decrease aircraft survivability.

Weather ceiling and visibility may affect the decision to employ low, medium or high altitude tactics. They will also determine the attack profile of the aircraft as well as affect the FAC or JTAC's ability to see the target. Visibility is more critical for long-range deliveries (free-fall bombs/rockets) than it is for short-range deliveries (retarded bombs and guns) whilst thick haze or smoke has a greater effect on low-level attacks than on steep-dive attacks because horizontal visibility is usually lower than oblique visibility. Reduced visibility and cloud layers restrict laser and EO guided ordnance. Specific issues include:

- **Target Masking.** A target screened by valleys or other natural cover may be difficult to see on low-level attacks necessitating an increase in altitude to find the target.
- **Thermal Significance.** Many variables can affect a target's vulnerability to detection and attack by thermal systems; recent operating conditions, time of day (thermal crossover), and target composition and background should all be considered.
- **Contrast and Brightness.** A major factor in target detection is the contrast of the target against its background. Camouflaged targets against a background of similar colour may be impossible to detect, whilst all targets, regardless of contrast differences, are more difficult to locate under poor light conditions. Target acquisition is usually easier when the sun is behind the aircraft.
- **Mountainous Environments.** Mountainous terrain may force the enemy to concentrate his forces along roads or valleys where CAS is very effective. However, the terrain also restricts the attack direction of the CAS strikes and may make aircraft vulnerable concentrated air defences along the most likely routes CAS aircraft will fly.
- **Desert Environment.** CAS aircraft may be more vulnerable in the desert because of the lack of covered approaches and the fact that both friendly and enemy units are often widely dispersed.
- **Target Acquisition.** In general if good contrast exists between the target and the background, target detection will be possible at extended ranges. Deserts that have vegetation will reduce target detection capabilities from stand-off ranges. Camouflage and decoys have proven to be effective countermeasures in the desert environment and will also delay target acquisition. Targets in revetted positions may only be visible from the air, and FACs or JTACs may have trouble designating these types of targets. In most cases the desert environment will allow weapons to be employed at maximum ranges and will provide increased weapons effects due to lack of obstructions. Greater communication ranges may be possible due to increased LOS ranges.

- **Jungle / Forested Environment.** In jungle terrain, most contact with the enemy is at extremely close range with the increased risk fratricide, which makes a detailed knowledge of the type of munitions best suited for that terrain of how to employ them vital.
- **Target Acquisition.** Due to limited LOS ranges, both vertical and horizontal, target acquisition will be difficult for both the attacking aircraft and the FAC or JTAC. Target marking techniques and attack profiles may have to be altered to engage targets.
- **Munitions Effects.** Ordnance and fuzing may have to be tailored to penetrate dense forest or jungle canopies.
- **Observation / Terminal Attack Control.** Dense vegetation will generally make observation beyond 25 to 50 metres very difficult, whilst navigation, self-location, target location and friendly unit location is also complicated.
- **Communications.** Communications may be severely degraded due to LOS, and it may be necessary to use a FAC(A), AbFAC or airborne C2 platforms as a relay station.
- **Limited Visibility / Adverse Weather.** The execution of limited visibility or night CAS is one of the most difficult missions on the battlefield. Limited visibility may occur due to fog, smoke or dust on the battlefield, but occurs most frequently due to operations extending into hours of darkness.
- **Advantages.** The most important advantage of night and adverse weather CAS is the limitation it imposes on enemy optically-directed AAA and EO/IR-guided SAMs, whilst friendly forces can take advantage of their night vision and navigational superiority to gain tactical and psychological advantages over the enemy. Selectively placed airborne and ground illumination may also further degrade enemy night vision capabilities while preserving or enhancing those of friendly forces.
- **Disadvantages.** Darkness and weather can impose several limitations on CAS employment. During periods of low illumination and reduced visibility, both CAS aircrews and ground forces may have difficulty in acquiring targets and accurately locating enemy and friendly forces. Low ceilings may require CAS aircraft to operate in the low to very low altitude environment with attendant considerations for enhanced SEAD, surface fires deconfliction and reduced target acquisition times.

- **Friendly Force Location and Combat Identification.** The challenges of identifying friendly and enemy locations, identifying targets and maintaining situational awareness become acute in the night or adverse weather CAS environment. Visual employment is a viable option for conducting night CAS though it will generally require more detailed prior planning and coordination, target area illumination and target marking to aid effectiveness. System-aided (laser, EO/IR, radar, radar beacon and GPS) target acquisition and weapons delivery methods are relied on more heavily during night and adverse weather, and whilst they can be used independently, combining the systems increases the probability of mission success.

Time Considerations

Time is a critical element in coordinating events and massing fires to achieve the combined arms effect of ground and air forces. Inadequate planning time will result in reduced effectiveness and increased risk to aircrews and surface forces alike. The joint ATO cycle is related to the joint targeting cycle and specific 'cut off' times for pre-planned CAS requests will have been established within the cycle.

CAS requirements that do not meet the established cut off times are submitted as a change to the ATO through the combat operations division of the CAOC or as an immediate request.

FRATRICIDE REDUCTION

The ever-increasing capability of combat aircraft and weapons systems has potential to maximize the effect of CAS attacks whilst mitigating the risk of fratricide. FACs or JTACs and aircrew must be careful when conducting CAS when friendly troops are close to targets.

Troops in Contact

The term Troops in Contact (TIC) is applied when friendly forces are within one kilometre of targeted forces and the supported commander must be advised of the increased probability of incapacitation (PI) of his own forces. Even friendly forces outside of one kilometre may still be subject to weapons effects and FACs or JTACs and aircrew must carefully weigh the choice of munitions and delivery profile against the risk of fratricide. Risk-estimate distances allow the supported commander to estimate the danger to friendly troops from the CAS attack. They are described in terms of 10% PI and 0.1% PI. Different surroundings such as terrain, buildings, trees, etc, can significantly reduce or increase PI.

Danger Close

The term danger close is used when ordnance is dropped inside the 0.1% PI distance and the supported commander must accept responsibility for the risk to friendly forces. When ordnance is a factor in the safety of friendly troops, the aircraft's axis of attack should be parallel to the friendly force's axis of orientation to preclude long and/or short deliveries from being a factor to friendlies.

Terminal Attack Control

Three types of control have been developed that follow a set of procedures with associated risk. The decision on which type to be used should lie with the lowest tactical supported commander and be broadcast by the FAC or JTAC on aircraft check-in.

The commander considers the situation and issues guidance to the FAC or JTAC based on recommendations from his staff and associated risks identified in the tactical risk assessment. The intent is to offer the commander, within the constraints established during risk assessment, the latitude to determine which

Example of Probability of Incapacitation (PI) Risk Estimate Distances (REDS) from US Open Source

Item	*10%*	*0.1%*
500 lb Unguided	275m	475m
500 lb Laser Guided	75m	200m
1000 lb Unguided	300m	500m
1000 lb Laser Guided	75m	200m
1000 lb Satellite Guided	100m	250m
2000 lb Unguided	325m	500m
2000lb Laser Guided	75m	225m
2000lb Satellite Guided	100m	225m
Cluster Bomb Unit	275m	425m
2.75" Rockets	100m	175m
5" Rockets	150m	200m
20, 25 and 30 mm Gatling Guns	100m	150m
Maverick (TV, IR, Laser Guided)	25m	75m
AC-I30 25 and 40mm	100m	125m
105 mm Canon	80m	200m

type of terminal attack control best accomplishes the mission. The three types of control are not ordnance specific.

- **Type 1.** Type 1 is the tightest form of control and is the default. It requires the FAC/JTAC to be able to see the aircraft and the target. This control is conducted when the commander decides that there is a high risk of fratricide, and as such the FAC/JTAC is required to visually acquire the attacking aircraft and the target under attack. In order to minimize fratricide the FAC/JTAC needs to consider attacking aircarft nose position and geometry. 'Cleared Hot' of each individual attack against each target is only given when the FAC/JTAC is certain the crew has positively identified the target and is heading towards it.

- **Type 2.** Type 2 controls individual attacks where the FAC/JTAC may not be able to see the aircraft or target on weapon release, or the aircraft is not able to acquire the target on weapon release. This control is conducted when the commander decides that there is a reduced risk of fratricide and requires the FAC/JTAC to control each individual attack. Examples of when Type 2 controls may be used include night, adverse weather, high threat tactics, high altitude or when stand-off weapons are employed. The FAC/JTAC maintains control of the attacks, making "Cleared Hot" or "Abort" calls based on the information provided by observers.
- **Type 3.** Type 3 provides clearance to release in the target area within prescribed conditions set by the FAC/JTAC when there is a low risk of fratricide. This control is conducted when the commander decides that there is a low risk of fratricide and, as with Type 2 control, the commander accepts the associated risks. When commanders authorize Type 3 control, the FAC/JTAC grant a weapons release clearance "Cleared To Engage" to an aircraft or flight attacking a target or targets, which meet the prescribed restrictions, set by the FAC/JTAC.

NOTE: The FAC/JTAC retains abort authority under all types of control: however, under Types 2 and 3 controls, FACs/JTACs may be required to coordinate attacks using targeting information from a 3rd party observer. The FAC/JTAC maintains control of the attacks, making clearance or abort calls based on the information provided by other observers or targeting sensors and must consider the timeliness and accuracy of targeting information when relying on any form of remote targeting.

Weapons Release Authority

The authority and responsibility for expenditure of any ordnance on the battlefield rests with the supported commander who usually delegates weapons release clearance authority to his FAC/JTAC to facilitate CAS attacks. Weapons release authority grants a FAC/JTAC the authority to provide the following orders / commands to attacking aircraft:

- "**Cleared Hot**" grants weapons release clearance to an aircraft attacking a specific target during Types 1 and 2 controls.
- "**Cleared to Engage**" grants a weapons release clearance to an aircraft or flight attacking a target or targets which meet the prescribed restrictions set by the FAC/JTAC during Type 3 control.

URBAN CLOSE AIR SUPPORT

The compressed battlespace in the urban environment creates unique considerations for planning and conducting CAS operations. These include operations in urban canyons, de-confliction in confined airspace, restrictive ROE, difficulty in threat analysis, the presence of non-combatants, the potential for collateral damage and the increased risk of fratricide. Some specific challenges are discussed below.

Threats

Threats are a particular issue because urban terrain provides excellent cover and concealment for a variety of weapon systems and also affects the employment of antiaircraft weapons, including AAA, MANPADS, and SAMs. Light to medium AAA may be employed from ground sites, from the tops of buildings or weapons mounted on civilian vehicles, whilst the terrain may limit suppression options and the cluttered environment with lights, fires and smoke will make threat and target acquisition difficult.

Command and Control

C2 suffers severe problems in urban terrain where manmade structures inhibit LOS and absorb or reflect transmitted signals making communications difficult, which in turn forces a higher degree of decentralization.

A detailed, flexible and redundant C2 plan is essential and must consider the use of aircraft as re-broadcast facilities and rooftop communicators to minimize ground-based LOS communication limitations.

Navigation

Navigation in urban areas is usually more difficult than over natural terrain as maps fail to show the vertical development of urban terrain and rapid movement from position to position can often create confusion between aerial and ground observers as to friendly and enemy locations.

The preparation of suitable, common-datum, maps and sketches is critical when considering action within urban areas and considerable effort will be required to ensure that maps and sketches are regularly updated and distributed to all relevant users. Detailed gridded maps, urban modelling or photos derived in planning will aid in target description and location.

Roads and buildings may be numbered to speed the target acquisition process from the air. Prior planning is required to ensure all units, both on the ground and in the air, have the correct charts or imagery.

Target Acquisition

Target acquisition is difficult with an increased need for marking and designating targets as well as the possibility that aerial firepower may be limited by the structural make up of the urban location. Tall buildings make it difficult for pilots to identify targets and may require specific attack headings to achieve LOS with the target. The use of FAC(A) or observers placed on upper floors of buildings may improve visibility.

Weapons Selection

Weapons selection must focus on rapid employment, minimum collateral damage, the ability to employ them in proximity to ground forces and high precision. Target sets may include troops in the open, armoured vehicles and enemy forces using buildings as firing positions or strong points.

A minimum collateral damage capability is essential to protect non-combatants, preserve whatever local and international support might exist and to reduce the cost of rebuilding the urban area upon conflict termination.

Weapons Effects

Weapons effects and the unexpected consequences of collateral damage in the form of fratricide, damage or destruction of unintended targets must be considered. Detailed planning of weapons and delivery tactics should minimize the risk to friendly forces, non-combatants and adjacent buildings / structures.

Suppression of Enemy Air Defences

SEAD support may be required against air defences both in and outside the urban area. Internal SEAD targets are generally more difficult to find and anticipate, so that an aggressive, proactive SEAD effort may be necessary during the early stages of urban operations.

COUNTER-LAND COMMAND AND CONTROL

Counter-land operations require an integrated, flexible and responsive C2 structure to process CAS requirements and dependable, interoperable and secure CIS architectures to exercise control. In addition to the TACCS structure already discussed, the following additional liaison personnel facilitate effective counter-land integration as part of a Theatre Air Ground System (TAGS).

Battlefield Coordination Detachment

The BCD is the ground force liaison element in the CAOC that provides the interface for exchanging current intelligence and operational data, supports requirements, and coordinates the integration of land forces requirements for ACMs, FSCMs and pre-planned CAS. It is typically organized into an HQ element and the following six sub-sections:

- **Plans.** The BCD Plans Section collocates with the Plans Division to relay and coordinate ground requests for air support and JFACC requests for support from ground units. It also provides the CAOC with the JFLCC's intent, guidance, objectives, priorities for air support, requested FSCMs and planned concept of operations and assists in planning, coordinating and synchronizing SEAD and EW as well as monitoring publication and distribution of the ATO.
- **Operations.** The BCD Operations Section collocates with the Current or Combat Operations Division to monitor the execution of the current ATO with particular focus on those missions planned against land component-nominated targets. It also coordinates all changes that affect the current ATO and liaises on changes to land forces current operations, objectives, priorities, nominated targets and FSCMs. Finally, it coordinates target attacks beyond a given FSCL.

- **Intelligence.** The BCD Intelligence Section provides intelligence personnel support to the BCD Plans and Operations Sections and liaises with the ISRD. More specifically, it provides information on enemy ground order of battle; assists in interpreting this information; processes, justifies and coordinates land component requests for reconnaissance and EW support; obtains land intelligence reports; facilitates the exchange of intelligence data; and coordinates intelligence data for unique targeting requirements. Finally it validates land component nominated targets before attack, ensures the timely processing of combat assessment to the JFLCC HQ, identifies new targets for attack, processes land requests for immediate air reconnaissance and EW support and provides the current land intelligence picture to the CAOC.
- **Air Defence.** The BCD AD Section works with the Operations and Plans Divisions to coordinate AD, TMD and airspace requirements with the JFLCC HQ during development of the ACO and ADP. It also coordinates JFLCC HQ changes in ROE, identification procedures, AD warning, employment, deployment and reporting requirements.
- **Airspace Management.** The BCD Airspace Management Section works with both the Operations and Plans Divisions of the CAOC to coordinate EW missions and deconflict airspace for Army long-range fire missions. In addition it informs and advises the JFLCC HQ ASC element of the impact of additions or conflicts on airspace activities and control measures and integrates planned army aviation missions into the ATO.
- **Airlift.** The BCD Airlift Section is collocated with the AMD to coordinate, advise and monitor airlift missions in support of land component operations. It also monitors the publication, distribution and execution of the theatre airlift portion of the ATO.

Divisional Air Integration Team

The Divisional Air Integration Team (DAIT) is established as a temporary measure specifically for Op HERRICK to augment the brigade ASOs and provide specialist air advice to brigades. A DAIT generally consists of a four man team to cover ISR, targeting and battlespace management.

COUNTERSEA OPERATIONS

"The argument has been advanced that the Air Force should be concerned with land objectives, and the Navy with objectives on and over the water. That distinction is to deny the peculiar quality of the air medium, the third dimension. The air is indivisible; it covers land and sea."

General Carl A. Spatz

Countersea operations effectively extend the application of air power into the high seas or the littoral and its adjacent waters. Air operations are typically flown in support of friendly naval forces; however, operations may also be conducted independently or when no friendly forces are in the area.

Such operations range from counter-air, AI, CAS and strategic attack through to specific maritime orientated sea surveillance and reconnaissance, surface warfare, underwater warfare and mine warfare operations. 'Standard' air operations are covered in greater detail within other sections of this chapter; however, specific maritime air operations include:

- **Anti-Surface Warfare.** Anti-Surface Warfare (ASuW) operations are conducted against enemy surface forces to destroy or neutralize enemy naval surface forces and merchant vessels. The area of attack and other factors that influence tactics, weapons mix and support requirements should be clearly identified. Primary targets should be specified, especially when surface combatants are escorting amphibious craft and supply ships.
- **Anti-Submarine Warfare.** Anti-Submarine Warfare (ASW) operations are conducted with the intention of denying the enemy the effective use of submarines. ASW includes searching, locating, classifying and attacking submarines and their support assets.
- **Aerial Mining.** Aerial mining operations support the broad task of establishing and maintaining control of vital sea areas by inflicting damage on an enemy's vessels or submarines to hinder his sea operations and impede the flow of traffic through a given area. Aircraft can penetrate to areas that are denied to surface vessels and submarines and are not endangered by previous mine lays when replenishing an area.

ELECTRONIC WARFARE

EW encompasses any military action that involves the use or control of the EM spectrum to reduce or prevent hostile use or to attack the enemy. It is subdivided into three main mission types:

- **Electronic Attack.** EA uses EM or DE to attack personnel, facilities or equipment with the intent of degrading, neutralizing or destroying combat capability. It includes actions taken to prevent or reduce an enemy's effective use of the EM spectrum, such as jamming and EM deception. EM employs weapons that use either EM or DE as their primary destructive mechanism (lasers, radio frequency weapons and particle beams).
- **Electronic Protection.** Electronic Protection (EP) involves all actions taken to protect personnel, facilities and equipment from any effects of friendly or enemy employment of EW that degrade, neutralize or destroy friendly combat capability.
- **Electronic Support Measures.** Electronic Support Measures (ESM) intercept, identify and locate sources of intentional and unintentional radiated EM energy for threat recognition. It provides information for immediate decisions involving Electronic Counter-Measures (ECM), Electronic Protective Measures (EPM) and other tactical actions such as threat avoidance, targeting and homing.

Electronic Counter-Measures

ECM encompasses actions taken to prevent or reduce an enemy's effective use of the EM spectrum and is further sub-divided as follows:

- **Jamming.** Electronic jamming is the deliberate radiation, re-radiation or reflection of EM energy with the object of impairing the effectiveness of electronic devices, equipment and systems.
- **Neutralization.** Electronic neutralization is the deliberate use of EM energy to either temporarily or permanently damage devices that rely exclusively on the EM spectrum.
- **Deception.** Electronic deception is the deliberate radiation, re-radiation, alteration, absorption or reflection of EM energy in a manner intended to confuse, distract or seduce an enemy or his electronic systems.

Electronic Protective Measures

EPM encompasses actions to ensure effective friendly use of the EM spectrum. This use can be degraded, neutralized or destroyed by both friendly and enemy EW.

- **Protection from Friendly EW.** Mutual interference and unintentional jamming can be avoided through the close coordination of intelligence, communications and operations that takes place in the EWCC. Spectrum management tools and procedures, that include both frequency management and EW frequency deconfliction, are used for this purpose.
- **Protection from an Enemy's EW Activity.** Protection can be achieved through a number of means.

    - **Emission Control.** Emission Control (EMCON) is the selective and controlled use of EM, acoustic or other emitters to optimize C2 capabilities whilst minimizing detection by an enemy's sensors for Operational Security (OPSEC), to minimize mutual interference among friendly systems, or to execute a military deception plan.
    - **Electronic Masking.** Electronic masking controls EM radiation on friendly frequencies to protect the emission characteristics of communications and electronic systems against an enemy's ESM.
    - **Wartime Reserve Modes.** Wartime reserve modes include the characteristics and operating procedures of sensors, communications, navigation aids, threat recognition, weapons and countermeasure systems that will contribute to military effectiveness should they remain 'unknown' to an enemy up until such time as they are used. They are held strictly in reserve for war or emergency use.
    - **Electronic Hardening.** Electronic hardening is achieved through design and production hardening techniques.

Airborne Electronic Warfare

Airborne EW is used to enhance the survivability of aircraft and ground assets and to improve mission effectiveness. ESM gives warning that radars are active in the area of operations and aircraft Defensive Aids Suites (DAS) are designed and programmed to identify the threats, warn the crew and, where appropriate, generate counter-measures. Active jamming or decoys used in association with tactical manoeuvring by aircraft may help disengage from the threat.

Avoidance should be the primary method of limiting engagement opportunities when the positions of the fixed SAM and AAA sites can be determined from intelligence sources and routing can be chosen to minimize exposure. Unavoidable penetration of threat areas may require profiles that use terrain masking as a primary means of avoiding or minimizing the acquisition by radar-laid SAM. Signature reduction technology may be used to reduce the range at which a threat system might be able to detect, track or target the aircraft.

Airborne Support Assets

Airborne support assets can be vital contributors to the EW battle and are always considered as critical assets. They take the form of either passive sensors or active jammers.

- **Passive Sensors.** Passive sensors normally provide strategic SIGINT information but can be used in the tactical Electronic Intelligence (ELINT) role to provide updated and accurate details of EW threats.
- **Active Jammers.** Active jammers work against radars, communications and navigation aids. Their main targets are the early-warning and long-range acquisition radars, C2, navigation and Identification Friend or Foe (IFF) systems.

CHAPTER 11

CONTROL AND COORDINATION MEASURES

CONTROL OF OPERATIONS [39]

When two or more FE operate in the same area of battlespace, whether physical or virtual, their activities should be coordinated. Where these activities are concurrent, and cannot be separated, they should be subject to some form of control. The degree of control required depends on the extent to which the elements are required to interact.

The types of control include:

- **Procedural Control.** Procedural controls provide a straightforward method of sharing battlespace between elements; they can, for example, be used to allocate a volume of battlespace to individual elements for a period of time [40]. Although currently defined in airspace doctrine, [41] procedural controls can be applied across all environments. Procedural airspace controls segment airspace by volume and time, in combination with appropriate weapons control status. On land, procedural controls include FSCM to coordinate land, air and maritime fires. While pre-planned procedural control

[39] *Control of operations is taken from JDP 3-70 Battlespace Management pp 2-3 to 2-5 Jun 08.*

[40] *AAP-6 'NATO Glossary of Terms and Definitions'.*

[41] *AJP-3.3.5(A) 'Doctrine for Joint Airspace Control'.*

is less susceptible to disruption, it is also less flexible than other forms of control and can curtail a commander's ability to exploit opportunities.

- **Positive Control.** Positive controls regulate identified force elements within designated volumes of battlespace, often using automated means such as IFF. Positive control does not necessarily mean overly-prescriptive management; it does, however, allow control of activities in real time and, thereby, mitigates risks and exploits opportunities as they arise. For examples blue force tracker can currently identify and track FE on the ground. Even where resolution of friendly forces is good, that of opponents and neutrals is seldom sufficiently timely or accurate to support positive control as the sole means of battlespace management.
- **Dynamic Procedural Control**. In the absence of positive control, a commander may impose or may choose to exercise, procedural controls that are adapted to suit his needs in a particular situation and for a particular period of time. Dynamic procedural control still requires a pre-established architecture of control measures but presupposes that these measures can be rapidly activated and deactivated. This enables activities to be synchronized from the outset, but also to be varied in response to a changing situation. For example, the use of 'walls' for the firing of ground or maritime missiles is an example of dynamic procedural control. A wall contains a three-dimensional volume of battlespace through which missiles can fly and from which other users are excluded. A wall can be established simply and quickly, and then refined as the missile trajectory is calculated more precisely to determine areas within the wall, both above and below the missile apogee, where aircraft can fly safely. Dynamic procedural control offers some of the benefits of agility, normally associated with positive control, but it also introduces risk of the 'dynamic' orders and procedures being misinterpreted or incorrectly applied. It also requires good SA and carries with it an additional bill in terms of staff effort, precluding its routine use over prolonged periods. A commander usually instigates dynamic procedural control to increase tempo for a finite period of time and in pursuit of a specific outcome.
- **Active De-Confliction.** Short of positive control, but exploiting similar degrees of shared SA across a joint force, a commander may choose to increase tempo further, beyond that attainable through dynamic procedural control. Given sufficient battlespace resolution, such that force elements can share with each other and force headquarters position, status and intention information in near-real-time, a joint force can be managed actively with less need for pre-planned de-confliction and greater opportunities to adjust plans in response to changes in the operational situation. Given sufficient shared SA, a commander can use active de-confliction to minimize separation of activity in both time and space [42].

COORDINATION MEASURES

Various measures are used for ASC and fire support coordination, in the planning and executing of air operations. The aim being to integrate air and surface manoeuvre, ensure deconfliction and identify which parts of the battlespace require specialized control procedures. FSCMs and ACMs are not complementary and in some cases may cause conflicts between airspace users and fire delivery systems.

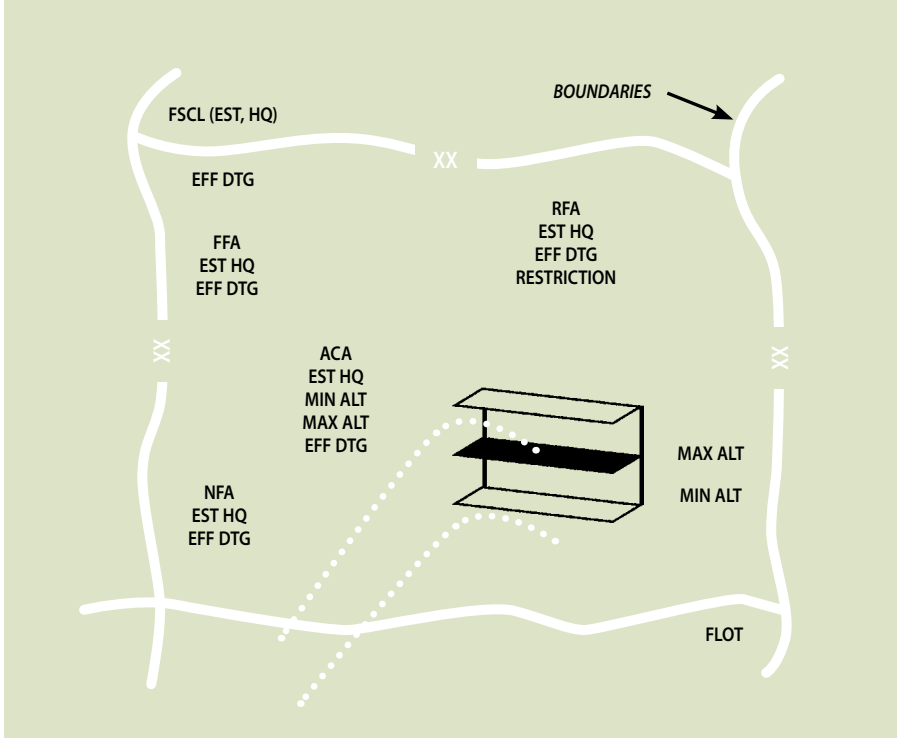
Component airspace, C2 elements, Fire Support Elements, LOs, TACPs and the CAOC should work together to ensure the appropriate ACMs are planned, requested and approved to support the planned establishment of FSCMs. Since FSCMs may be established at numerous levels and ACMs are normally established at a single level, the agencies at all levels must be aware of the impact of FSCMs and ACMs on future ground and air operations.

FIRE SUPPORT COORDINATION MEASURES

A FSCM is a form of procedural control employed by land, amphibious or SF commanders to facilitate the rapid engagement of targets and simultaneously provide safeguards for friendly forces.

Components position FSCMs within their respective AOOs consistent with the operational situation and in consultation with superior, subordinate, supporting and affected commanders. FSCMs may be either permissive or restrictive.

Fire Support Coordination Measures



[42] *Current systems in use are Joint Automated Deep Operations Coordination System (JADOCS) and Joint Effects Tactical Targeting System (JETTS).*

Permissive Measures

FSCM are designed to facilitate attack and include the following: [43]

- **Coordinated Fire Line.** The Coordinated Fire Line (CFL) is a line beyond which conventional, indirect, surface fire support means may fire at any time within the boundaries of the establishing HQ without additional coordination.
- **Fire Support Coordination Line.** The FSCL is used to expedite fires of air, ground or sea weapons systems using any type of ammunition against surface targets. It is established and adjusted by appropriate surface force commanders within their boundaries in consultation with superior, subordinate, supporting and affected commanders and applies to all fires of air-, land-, and sea-based weapon systems using any type of ammunition. The FSCL should follow well-defined terrain features, and there may be more than one FSCL at any time. Moreover a FSCL may define an enclosed area or be linear depending on the nature of the battle. There are several implications associated with the FSCL and its placement.

    - **Short of the FSCL.** Short of the FSCL the appropriate surface force commander controls all air-to-ground and surface-to-surface attack operations.
    - **Beyond the FSCL.** Coordination of attacks beyond the FSCL is especially critical to commanders of air, land and SF. Their forces may be operating beyond the FSCL or may plan to manoeuvre on that territory in the future. Forces attacking targets beyond a FSCL must therefore inform all affected commanders in sufficient time to allow necessary reaction to avoid fratricide. Supporting elements attacking targets beyond the FSCL must ensure that the attack will not produce adverse effects on, or to the rear of, the line. Such coordination is particularly important when attacking forces are employing wide-area munitions or munitions with delayed effects. This coordination also assists in avoiding conflicting or redundant attack operations.

NOTE: In exceptional circumstances, the inability to conduct this coordination will not preclude the attack of targets beyond the FSCL. However, failure to do so may increase the risk of fratricide and could waste limited resources.

    - **FSCL Placement.** By establishing the FSCL close in, yet at sufficient depth so as to not limit high tempo manoeuvre, land or amphibious force commanders ease the coordination requirements for attack operations within their AOOs by forces not under their control, such as NSFS or AI. The location of the FSCL should be readily apparent to forces engaged in high tempo operations. Normally, therefore, it should follow well-defined geographical features. However, the positioning of a FSCL will be based on estimates of the situation and concept of operations. Location of enemy forces, anticipated rates of movement, weapons capabilities and tempo of operations are considered in the commander's estimate, as well as other factors deemed appropriate such as his ability to control air operations short of the FSCL. Similar considerations will apply when an isolated FSCL is established, for example for airborne or amphibious operations. If there is any disagreement between CCs on the establishment of a FSCL, resolution by the JFC is required.
    - **High-Tempo Operations.** In high-tempo manoeuvre operations, the FSCL may change frequently, such as every few hours. In order to do so there must be robust and effective promulgation procedures in force in order that the establishing commander can quickly transmit the change to higher, lower, adjacent and supporting HQs to ensure controlling agencies appropriately coordinate attack operations.

- **Free Fire Area.** A Free Fire Area (FFA) is a specific area into which any weapon system may fire without additional coordination with the establishing HQ. It may also be used as an impact area when aircraft have to jettison weapons. Should a surface commander want to bypass an enemy force in strong fortifications, he may desire the establishment of a FFA to expedite fires. However, this action may also increase the amount of uncoordinated fires through the airspace in the vicinity of the FFA. The establishment of a ROZ in the airspace over the FFA may assist in airspace deconfliction.

Restrictive Measures:

Restrictive FSCM are designed to safeguard friendly forces and include the following: [44]

- **No Fire Area.** A No Fire Area (NFA) is an area into which fires or their effects are prohibited. Exceptions may be made on a mission-by-mission basis or when an enemy force within the NFA engages a friendly force; the commander may engage the enemy to defend his force. Should a ground commander wish to protect a vital industrial complex or religious site, he may designate the area a NFA. The establishment of an ACM restricting aircraft from flying over the site ensures no damage will occur due to misidentification of a target or that intentional provocation (fires from near the area) results in air-to-surface weapons release in response.
- **No Fire Line.** The No Fire Line (NFL) is established between converging elements of the friendly force and prohibits fires (or their effects) across that line.
- **Restricted Fire Area.** A Restricted Fire Area (RFA) imposes specific restrictions on fires (or the effects of fires) on an area such that fires exceeding those restrictions cannot be used without coordination with the establishing HQ.
- **Restricted Fire Line.** The Restricted Fire Line (RFL) is established between converging elements of the friendly force and prohibits fires (or their effects) across that line without prior coordination with the appropriate adjacent unit. By definition all boundaries are RFLs.

[43] *This is not an exhaustive list – see ATP-3.3.5.1 or the appropriate SUPPLAN for greater detail.*

[44] *This is not an exhaustive list – see ATP-3.3.5.1 or the appropriate SUPPLAN for greater detail.*

KILL BOXES

A kill box is a three-dimensional FSCM used to facilitate the expeditious air-to-surface attack of targets, which may be augmented by, or be integrated with, surface-to-surface indirect fires.

Kill boxes are permissive FSCMs in respect to the delivery of air-to-surface weapons; however, they are also restrictive in nature with the trajectories and effects of surface-to-surface indirect fires normally prohibited from passing through the kill box. There are two types of kill box:

- **Blue Kill Box.** A blue kill box permits air-to-surface fires in the kill box without further coordination with the establishing HQ.
- **Purple Kill Box.** A purple kill box is as above, plus it also permits the integration of surface-to-surface indirect fires with air-to-surface fires into the purple kill box without further coordination with the establishing HQ

NOTE: The kill box is a unique FSCM that may contain other measures within its boundaries (for example, NFAs, RFAs or ACM etc.). Restrictive FSCMs and ACMs will always have priority when established in a kill box.

Purpose

The primary purpose of a kill box is to allow aircraft to conduct AI against surface targets without further coordination with the establishing commander and without terminal attack control. A kill box is not generally established for CAS missions; however, this does not restrict the conduct of CAS inside established kill boxes if all CAS requirements are met.

When used to integrate air-to-surface and surface-to-surface indirect fires, the kill box will have appropriate restrictions - the goal being to reduce the coordination required to fulfil support requirements with maximum flexibility, whilst minimizing the risk of fratricide.

Ownership and Boundaries

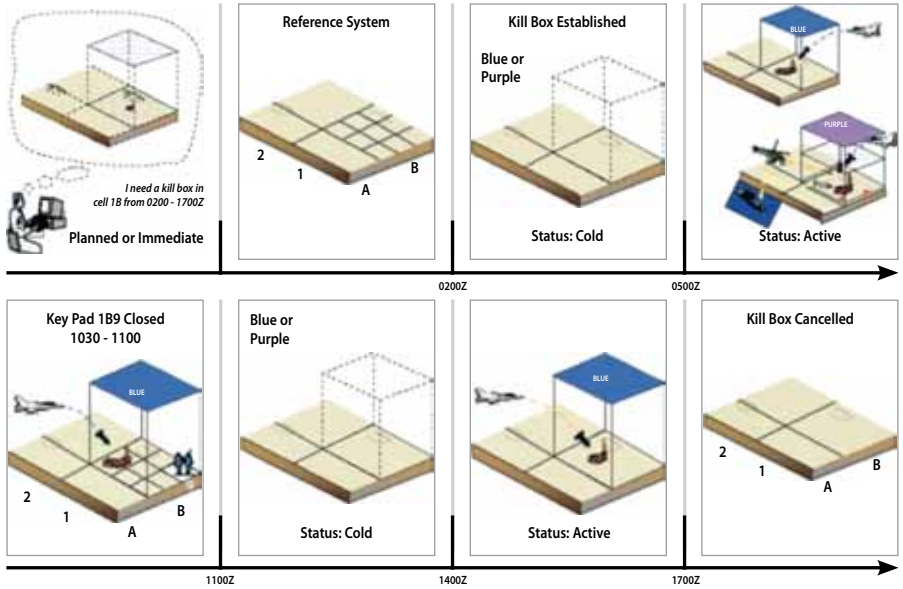
Kill boxes are established and adjusted by CCs in consultation with superior, subordinate, supporting and affected commanders as an extension of existing support relationship established by the JFC. Kill box boundaries are normally defined using an area reference system but could follow well defined terrain features, or may be located by grid coordinates or by a radius from a centre point.

Terminology

The terminology used during the life cycle of a kill box is defined below.

- **Kill Box Establishment.** The term "established" describes a kill box that may be pre-planned (via the joint targeting cycle) or immediate (during mission execution). Information about the time it becomes established, the duration and other attributes will be published and disseminated using existing voice, digital or fragmentary order from the establishing HQ.
- **Opening a Kill Box.** The term "open" describes a portion or portions of a kill box that are open to fires without further coordination or deconfliction. An established kill box is inherently open, until closed or cancelled.
- **Active Kill Boxes.** The term "active" indicates an established kill box that has aircraft flying, or the effects of air or other joint fires 'happening' within the boundaries of the kill box.
- **Inactive Kill Boxes.** The term "cold" indicates an established kill box that is not active. All portions of the kill box are open to fires unless identified as closed.
- **Closed Kill Box.** The term "closed" describes a portion or portions of an established kill box in which fires, or the effects of fires, are prohibited.
- **Cancelled Kill Box.** The term "cancelled" indicates that the kill box is no longer in effect.

Life Cycle of a Kill Box



NOTE: It is important to note that a kill box is an FSCM and not a reference system. Kill box boundaries are normally defined using an area reference system which provides the construct (a two-dimensional system) while a kill box (a three-dimensional system) is the application. Applicable ROE, collateral damage guidance and restrictions, positive identification (PID) and the SPINS must still be followed in a kill box. There should be no friendly ground forces within or manoeuvring into established kill boxes; however, should circumstances require otherwise (for example, long-range reconnaissance patrols, SF teams, etc), then NFAs must be established to cover those forces, or the kill box must be closed.

Aircraft that are used to conduct AI missions in kill boxes would normally come from the same mission set, ideally from an on-call AI mission that does not have any specific target sets. Alternately, kill boxes may be used as target locations for pre-planned requests for scheduled and on-call missions. The first FAC(A), SCARC, mission commander or mission lead on station is responsible for deconfliction and coordination, if required.

AIRSPACE COORDINATION AREAS

An airspace coordination area is a three-dimensional block of airspace in a target area, established by the appropriate ground commander, in which friendly aircraft are reasonably safe from friendly surface fires. There are two types of airspace coordination areas:

Formal Airspace Coordination Areas

The ACA establishes formal airspace coordination areas at the request of the appropriate ground commander. Formal airspace coordination areas require detailed planning. Because the vertical and lateral limits of the airspace coordination areas are designed to allow freedom of action for air and surface fire support for the greatest number of foreseeable targets. Since a fire direction centre can determine the trajectory for a specific ground or NSFS asset firing at a specific target, each target must be evaluated to ensure the trajectories of the rounds do not penetrate the airspace coordination area. The altitude of an airspace coordination area should allow for the majority of targets to be attacked without interference or problems. Formal airspace coordination areas are promulgated in the ACO and may also be included in the SPINS.

NOTE: Due to their restrictive nature, formal airspace coordination areas are not the preferred method of airspace deconfliction.

Informal Airspace Coordination Areas

Informal airspace coordination areas can be established using separation plans and may be established by any ground commander. Aircraft and surface fires may be separated by distance (laterally, in altitude or a combination thereof) or by time.

- **Lateral Separation.** Lateral separation is effective for coordinating fires against targets that are adequately separated from flight routes to ensure aircraft protection from the effects of friendly fires.
- **Altitude Separation.** Altitude separation is effective for coordinating fires when aircraft remain above or below indirect fire trajectories and their effects.
- **Altitude and Lateral Separation.** Altitude and lateral separation is the most restrictive technique for aircrews and may be required when aircraft must cross the firing unit's gun-target line.
- **Time Separation.** Time separation requires the most detailed coordination and may be required when altitude restrictions from indirect fire trajectories adversely impact aircraft ordnance delivery, for example, mortar trajectory.

AIRSPACE CONTROL MEANS

ACM are established by the ACA through the JACC. Each component maintains an airspace organization linked to the JACC, which coordinates the airspace C2 system, assigns responsibilities and develops procedures for planning, implementing and executing ASC using the ACP and ACO.

Some FSCMs also have applicability as ACMs, for example, the FSCL. FSCMs may be used within a procedural airspace control zone and will have primacy over ACMs. The most common ACMs include:

- **Coordination Level.** The Coordination Level (CL) is an advisory procedural method to separate slow and fast moving air traffic (normally fixed- and rotary wing aircraft) by determining a height above ground below which fast traffic normally will not fly and above which slow traffic will not normally fly.
- **High Density Airspace Control Zones.** High Density Airspace Control Zones (HIDACZs) consist of airspace in which there is a concentrated employment of numerous and varied weapons and airspace users. A HIDACZ has defined dimensions that usually coincide with geographical features or navigational aids. Access to a HIDACZ is normally controlled by the surface manoeuvre commander who can also direct a more restrictive weapons status within the HIDACZ.
- **Restricted Operations Areas / Zones.** Restricted Operations Areas or Zones (ROA / ROZ) consist of airspace of defined dimensions that is created in response to specific operational situations or requirements into which access by other airspace users is restricted.
- **Minimum-Risk Routes.** Minimum-Risk Routing (MRR) provides a temporary corridor of defined dimensions recommended for use by fixed-wing aircraft that presents the minimum known hazards to low-flying aircraft transiting the combat zone.
- **Standard Use Army Aircraft Flight Routes.** Standard Use Army Aircraft Flight Routes (SAFRR) are established below the CL to facilitate the movement of army aviation assets and are normally located in the corps through brigade rear areas of operations. These routes do not require approval of the ACA.
- **Low Level Transit Routes.** Low Level Transit Routes (LLTRs) are temporary, bidirectional corridors of defined dimensions that facilitate the low-level passage of friendly aircraft through friendly AD and controlled or restricted airspace.

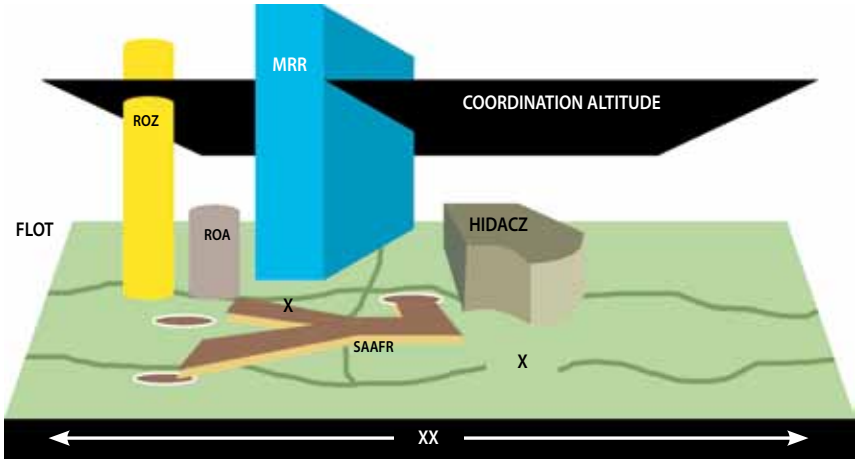
- **Base Defence Zones.** Base Defence Zones (BDZs) are AD engagement zones established around an air base with dimensions normally limited to the engagement envelope of Short-Range AD (SHORAD) weapon systems defending that base. BDZs have specific entry, exit and IFF procedures established.
- **Weapons Engagement Zones.** Weapons Engagement Zones (WEZs) consist of airspace of defined dimensions where the responsibility for engagement rests with a particular weapon system. WEZs are subdivided as follows:
    - **Fighter Engagement Zones.** FEZs consist of airspace of defined dimensions where the responsibility for engagement rests with AD fighter aircraft.
    - **High Altitude Missile Engagement Zones.** HIMEZs consist of airspace of defined dimensions where responsibility for engagement rests with the operators of high altitude SAMs.
    - **Joint Engagement Zones.** JEZs consist of airspace of specific dimensions where friendly SAMs and fighters are employed simultaneously.
    - **Low Altitude Missile Engagement Zones.** LOMEZs consist of airspace of defined dimensions where the responsibility for engagement rests with operators of low to medium altitude SAMs.
    - **Short Range Air Defence Engagement Zones.** SHORADEZs consist of airspace of defined dimensions where the responsibility for engagement rests with the operators of short-range AD weapons. SHORADEZs may be established within a LOMEZ or a HIMEZ.
- **Transit Corridor.** A transit corridor is a bi-directional corridor established to route aircraft through air defences with minimum risk.
- **Safe Lane.** A Safe lane is a bi-directional lane connecting an airbase, landing site and/or base defence zone to adjacent routes/corridors. Safe lanes may also be used to connect adjacent activated routes/corridors.
- **Air Route.** An air route is the navigable airspace between two points, identified to the extent necessary for the application of flight rules.

MARITIME AIRSPACE COORDINATION

Introduction

Maritime operations are intrinsically multi-dimensional and embrace the surface, sub-surface, air and land environments. They are also invariably joint, employing organic and non-organic air assets for AD, ISR, FP, power projection and logistic re-supply. The nature of maritime power can result in potentially large AOOs that may extend to considerable distances over water and land and may move, expand, contract and change shape as maritime units manoeuvre.

Typical Airspace Control Means



Within these there are normally small numbers of high value units which are usually large, rich in electronic and CIS and consequently difficult to conceal. This places an extremely high premium on effective AD. All these factors require highly responsive and flexible ASC that is optimized for FP and has distinctive maritime procedures and terminology. Whether a ship is optimized for area AD with an appropriate SAM or is fitted with short range self defence missiles/guns, the principle of airspace configuration around them is the same.

Airspace Organization

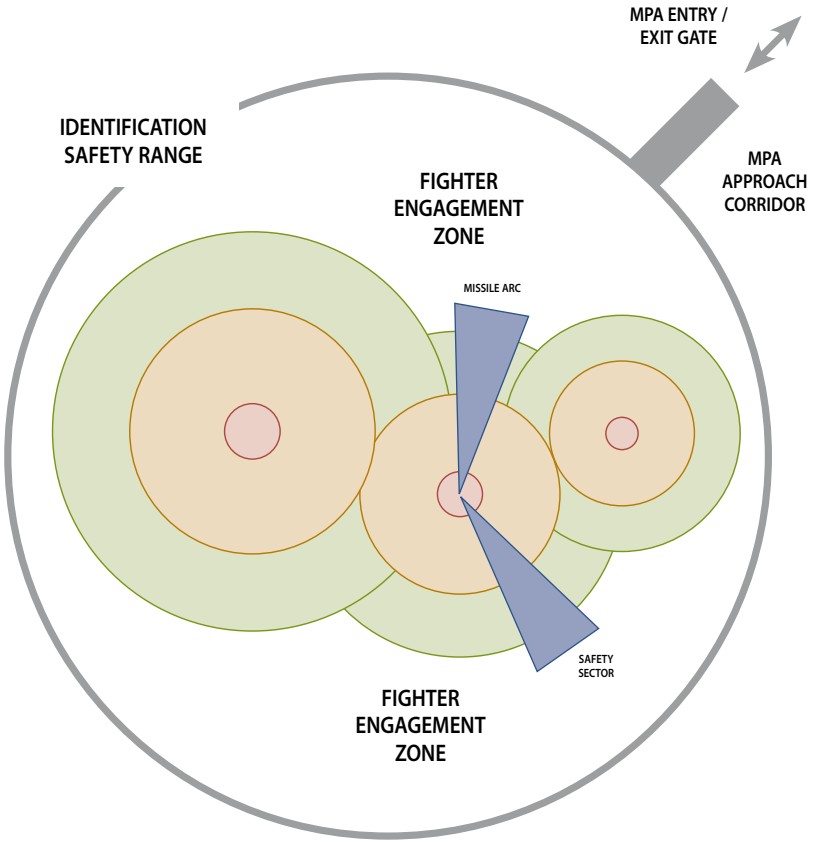
Each SAM fitted ship will have a MEZ established around it. Under weapons control status "Weapons Free" or the ship is automatically cleared to fire at any target penetrating the MEZ (not withstanding ROE unless known to be friendly or otherwise directed by the Air Warfare Commander (AWC). Specified procedures will exist to permit organic aircraft to operate within the MEZ and for aircraft to depart / join a ship. Beyond each MEZ is a Cross Over Zone (COZ) that normally extends to 15nm within which AD fighter aircraft can enter if in hot pursuit of a hostile aircraft. Beyond the COZ is a FEZ that extends to a range accounting for a fighter's combat radius and weapon range.

Within a maritime task force when ships are operating in close proximity, the MEZ would be centred on a nominated ship, usually the high value unit. Where ships are more widely dispersed but still operating as a composite task force, each MEZ may overlap with overall coordination resting with the AWC.

In order to protect friendly aircraft joining a maritime force, additional ACMs are implemented and promulgated in the operational tasking message Anti-Air Warfare (AAW).

A safety sector may be established in which joining/departing aircraft are safe from attack by friendly AD fighter aircraft or ship based weapons. In addition, an Identification Safety Point (ISP) is nominated, which is the point at which joining aircraft are to establish communications with the force and commence identification procedures.

Typical Maritime Airspace Division



Until identification is established, aircraft must not close within the identification safety range or they will be classified as "Hostile". From a Maritime Patrol Aircraft (MPA) perspective there are additional procedures for aircraft joining/departing a force. They join via a pre-nominated entry/exit gate and close the force along an approach corridor, the inner boundary of which is established at the identification safety range. They must remain within the corridor until identified and tasked to their ASW or ASuW mission. For deconfliction purposes, ships operating helicopters are protected by a Ship Control Zone (SCZ) that is usually 1.5nm radius whilst aircraft carriers have a 5nm radius Carrier Control Zone (CCZ).

AMPHIBIOUS OPERATIONS

Amphibious operations are complex, and unfamiliarity with the Amphibious Task Force (ATF) missions and capabilities complicate the planning and execution of tasking. ATF airspace includes any combination of ACM being utilized to define the area of amphibious operations.

Any air contact approaching the ATF must be rapidly and accurately identified to avoid fratricide or the engagement of non-combatants, and great care must be taken to ensure no enemy aircraft are able to close with the ATF under cover of returning own aircraft. The Commander Amphibious Task Force (CATF) is given specific command authority of all forces within the assigned area for amphibious operations.

Two options exist for providing battlespace for an amphibious operation; the provision of an Amphibious Operations Area (AOA) (encompassing air, land and sea space), or an amphibious AOO (providing land and sea space), with a HIDACZ to provide the airspace as and when required. Which option the CATF chooses will be situation dependent.

During amphibious operations, which may include an assault, CAS, NSFS, ISR and AD, the amount of airspace required and the complexity of the operation is likely to require the establishment of a Subordinate Airspace Control Authority (SACA). The level of responsibility of a SACA will increase whenever an AOA is established. A more flexible option would be to establish an AOO, utilizing a HIDACZ and allowing the ACA to maintain responsibility for ASM when the HIDACZ is not activated.

Organization

The CATF is responsible for airspace allocated for amphibious operations. The Tactical Air Control Centre (TACC) is the CATF's agency for exercising this authority. Close coordination between warfare commanders, the TACC, the Supporting Arms Coordination Centre (SACC) and the ADC is required to increase operational tempo, manage the ACO and reduce the risk of fratricide. Emphasis should be placed on simple, flexible ATC schemes and a combination of procedural and positive airspace control.

- **Tactical Air Control Centre.** The TACC is the amphibious airspace control agency, which coordinates with the ACA providing inputs to the overall ACO including the delineation procedures to be used by fixed- and rotary-wing aircraft within the amphibious airspace.

- **Supporting Arms Coordination Centre.** The SACC exercises overall coordination of supporting arms planning.

Whilst TACC and SACC are separate organizations, they work closely in planning, controlling and coordinating offensive air and assault support. The TACC supports the SACC by controlling all air support and promulgating AD measures. The Air Support Control Section (ASCS) of the TACC, headed by the air support coordinator, is an integral part of the SACC and is the primary interface between SACC and TACC. Since amphibious operations typically take place in a compressed battlespace within 25nm of land, rapid identification of air contacts is required to allow engagement of air threats while preventing fratricide. To achieve this, a portion of the TACC is co-located with the AWC to permit rapid identification of friendly aircraft while allowing the AWC to concentrate on identifying unknown air contacts. Collocation of the ASC and AD functions improves coordination of amphibious air operations, including deconfliction of transiting aircraft.

Amphibious Operations Airspace Control

Enemy forces will attempt to degrade ASC capabilities by direct attack and electronic measures directed against control nodes or other specific ATF elements. Methods of AOA ASC under these conditions will include a combination of positive and procedural airspace control although procedural control is usually used for executing air assaults and CAS missions. Airspace may be broken down into the same ACM as used overland with additional areas and considerations to allow coordination of ATF air assets within the ACA.

When a SACA is not established, the ACA may designate the airspace as a HIDACZ because of the concentrated employment of varied weapons and airspace users supporting the amphibious operation. This would restrict the airspace to users not involved with the amphibious operation. It is imperative that all aircraft operating in the HIDACZ check-in and remain in contact with TACC.

Return to Force Procedures

For aircraft originating or terminating inside the AOA Return to Force (RTF) procedures are controlled by the TACC's helicopter control section. Specific RTF check points, IFF procedures and routes will be promulgated as part of the ACO and be reflected in the SPINS of the ATF's daily OPTASK AIR message. For aircraft originating from or terminating outside the AOA the TACC will publish an ACO which details entry / exit points, check points, holding points, release points and altitude for aircraft depending on their mission.

UNMANNED AIRCRAFT OPERATIONS

UAs are remotely-operated or autonomous aircraft that provide commanders the capability to conduct ISR, BDA and attack missions. UAS include vehicles, ground control stations and support elements. UA may be launched from and recovered on improved airfields, ships or a forward launch and recovery site. UA mission profiles vary, depending on the type of vehicle; however, like other aircraft, UAs require airspace deconfliction.

The established principles of airspace management used in manned flight operations will normally apply to UA operations; however, UA are generally difficult to visually acquire and do not provide a clear radar signature, presenting a potential hazard to high performance aircraft. Operations involving these vehicles must be included in the ATO, catered for in the ACO and coordinated with all appropriate airspace control agencies to provide safe separation of unmanned and manned aircraft.

Deconfliction

Some UAs are equipped with UHF/VHF radio communications and can be deconflicted like other airspace users. For UAS not equipped with direct communication between the UA mission crew and other airspace users, procedural ACMs are a necessary part of operations. Considerations that should be reflected in the daily ATO, ACO or SPINS and disseminated to appropriate aviation and ground units or agencies. Information should include UA missions being conducted, changes in Launch & Recovery Site (LRS) locations, UA operating altitudes and areas, IFF squawks and check-in frequencies.

Restricted Operations Zones

To deconflict the UAs and manned aircraft in the operations area, a UAV ROZ may be established. A UA ROZ ('blanket' or 'blanket altitude') is a block of airspace with defined lateral boundaries. These boundaries are designed to cover the operating area as required to allow flexibility in mission changes by not restricting the UA and other aircraft that also must operate in the area, for example, CAS and ISR assets. To reduce potential conflicts with RW aircraft, the UA blanket altitude should be above the CL. Aircraft penetrating the UA ROZ to accomplish their missions fly under see-and-avoid principles and accept the risk.

Flight Routes

UA flight routes and transit altitudes may be established and approved by the ACA based on the UA's mission and in accordance with the ACP. Airspace control agencies should advise all affected aircraft of UA status.

SPACE COORDINATION MEASURES

The physical characteristics of the space domain, its laws of motion [45] and the vehicles that operate in space are fundamentally different than those of the air environment. As such, airspace coordination and control measures are impractical, if not impossible, to impose in the space environment. Nevertheless, a degree of space coordination is required to ensure deconfliction and to provide a common framework for those operating in space (including military, civilian and commercial entities).

Space coordination measures include the registration of all new satellite launches, limiting the number objects permitted to operate within certain orbital regimes (for example geosynchronous orbit) and

[45] *Aside from some very limited manoeuvre capability, the motion of a satellite is dictated by orbital dynamics.*

prohibiting the unnecessary creation of orbital debris. For the most part, these measures are enshrined in International Law, although our adversaries' interpretation of these laws may differ from ours. Just as a RAP enables the application of airspace coordination measures, a Recognized Space Picture is required to understanding the 'so what' of events in space.

This enables us to exploit and protect our space assets to the greatest extent possible whilst monitoring the activities of our potential adversaries and other parties that may, intentionally or unintentionally, impact upon our delivery of space power.

LONG-RANGE SURFACE-TO-SURFACE WEAPON DECONFLICTION

Cruise Missiles

Cruise Missiles (CM) are stand-off weapons fired from a launch point, to fly along a pre-programmed flight profile to a designated target. The flight profile is designed to avoid the enroute threats to the weapon, and some CM are capable of having both their flight profile and targets reprogrammed after launch. They invariably have a small radar cross section and are very difficult to accurately track with the normal radar units conducting airspace control.

For this reason, positive control is not an effective means to deconflict CM operations from other air operations, and it is imperative that procedural ACM be used. Whatever procedural ACM is used, it must be identified in the ATO, ACO or SPINS during the planning phase or be deconflicted on a real-time basis.

Long-Range Missile System

Long-range missile systems provide the JFC with a capability to strike deep targets. Such missiles can follow flight profiles that take them over 100 nm and up to altitudes in excess of 150,000 ft. Although there is no requirement to clear the full flight path unless these altitudes are being used by high-flying reconnaissance aircraft, these indirect fires can pose a potential hazard to other friendly airspace users at lower levels in the immediate vicinity of the firing unit and target location. The most usual method of ensuring deconfliction between long-range weapon systems and air platforms is to establish ROZs around the launch locations and target areas.

Loitering Munitions

Loitering munitions can come in many forms, but they are generally small, non re-useable platforms that are launched from ground platforms against surface targets. Typically, they fly at 100–250 kts with a likely radius of effect of 150–300 km and loitering time at maximum range of several hours. They can usually be re-directed in flight and may carry a sensor that can provide real-time imagery of the ground to a ground-based controller.

However, they are very unlikely to be able to detect and avoid airspace conflictions and, being small and 'disposable', are also very unlikely to carry transponders or any other equipment that could enable their position to be displayed on airspace control systems.

Consequently, deconfliction of loitering munitions from other airspace users will inevitably be based on procedural control methods and the allocation of appropriate ACM. As for other long-range weapon systems or UAV, these could involve a ROZ around the launcher position, a transit corridor of some sort to either a target or a holding area and, possibly, a further ROZ or HIDACZ covering the target area itself.

Alternatively, the holding/target areas could be integrated and delineated within a kill box construct if more appropriate. For pre-planned operations, all details and the ACM required should be published in the ATO/ACO/SPINS as appropriate, but for responsive use of these munitions, processes and procedures for real-time deconfliction must be developed and established within theatre.

COMMON GEOGRAPHIC REFERENCE SYSTEM

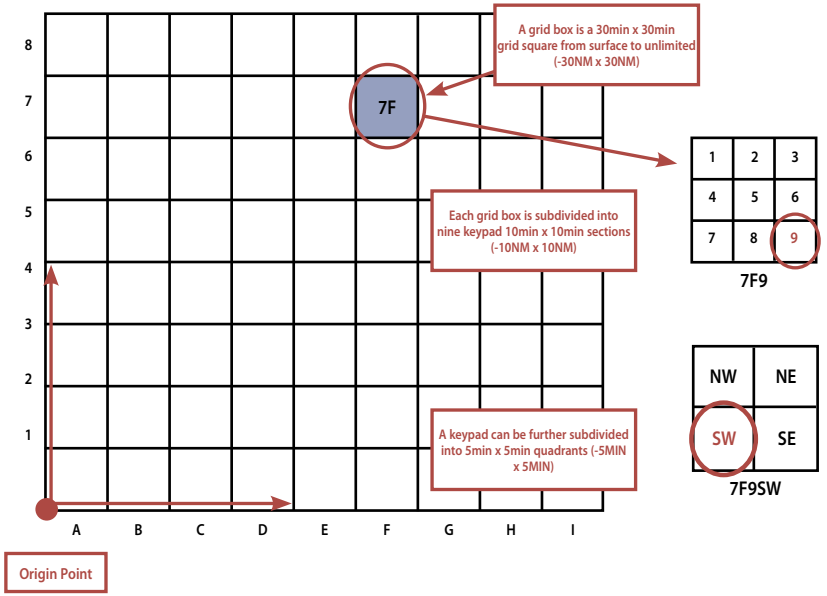
The CGRS is a procedural measure used to rapidly and clearly define geographical location for battlespace coordination, deconfliction and synchronization. It provides a common reference between components, and simplifies communications; it is not an FSCM. It is highly useful in facilitating rapid attacks on Time Sensitive Targeting (TST) and for expediting deconfliction of friendly force locations by allowing the JFC and CCs to clearly communicate information, establish a common frame of reference and enable rapid joint force prosecution of targets with multiple weapon systems.

A CGRS can be extremely useful in the area between the FSCL and the forward boundary, where it is possible more than one component may be conducting attacks. The CGRS is developed by the JFC, together with the CCs and should ideally mandate an alphanumeric, latitude and longitude-based CGRS for the entire combined operational area.

NOTE: The CGRS is not intended for defining points, describing natural terrain features, specifying the location of friendly forces and defining lines or boundaries that are angled or curved, and should not to be confused with a kill box though it is often used to define kill box boundaries.

The CGRS provides a tool for rapid deconfliction during non-contiguous battlefield operations (such as SF operating behind enemy lines) and may even be employed as a primary method to describe a contiguous battlefield. When properly employed it should facilitate informing all other affected commanders when targets are being prosecuted.

Moreover, areas of operation do not have to be linear or large when defined by a CGRS. The CGRS should be flexible enough to be used for a variety of purposes such as defining the general locations of friendly forces, land force manoeuvre boundaries, areas of intended attack, ACM boundaries, FSCM boundaries, ISR areas of interest, aircraft orbits and high threat areas (such as double digit SAM locations).



Example of Common Geographic Reference System

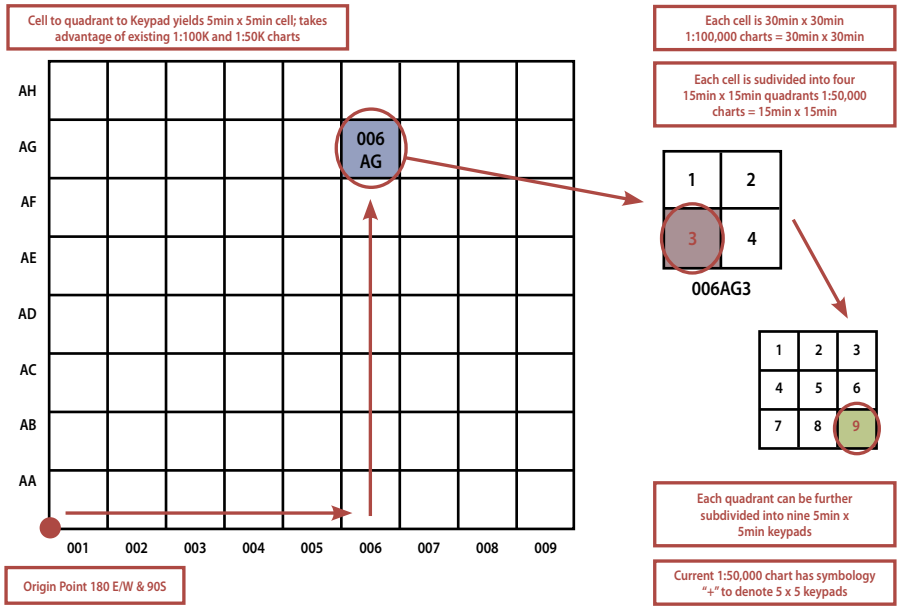
GLOBAL AREA REFERENCE SYSTEM

The GARS is a development of the CGRS that sees the CGRS established on a global scale. It is based on lines of longitude (LONG) and latitude (LAT), to provide an integrated common frame of reference for joint force SA to facilitate air-to-ground coordination, deconfliction, integration and synchronization.

The GARS aims to provide a common language between the components and simplify communications. It is important to note that GARS is primarily designed as a battlespace management tool and not intended to be used for navigation or targeting.

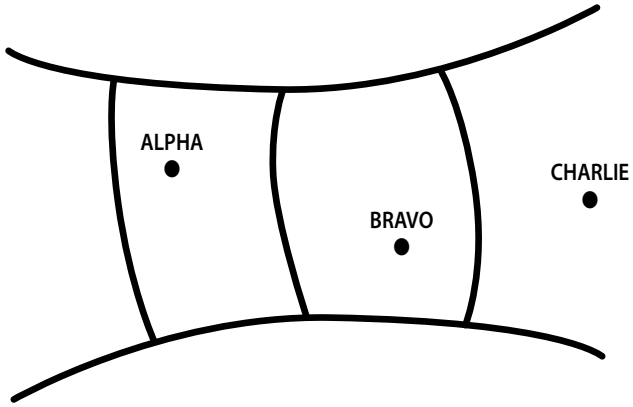
Design

GARS divides the surface of the earth into 30-minute by 30-minute cells. Each cell is identified by a five-character designation, for example, 006AG.



Example of Global Area Reference System

- The first three characters designate a 30-minute wide longitudinal band. Beginning with the 180-degree meridian and proceeding eastward, the bands are numbered from 001 to 720, so that 180 E to 179 30'W is band 001, 179 30'W to 179 00'W is band 002, and so on.
- The fourth and fifth characters designate a 30-minute wide latitudinal band. Beginning at the south pole and proceeding northward, the bands are lettered from AA to QZ (omitting I and O) so that 90 00'S to 89 30'S is band AA, 89 30'S to 89 00'S is band AB, and so on.
- Each 30-minute cell is divided into four 15-minute by 15-minute quadrants. The quadrants are numbered sequentially, from west to east, starting with the northernmost band. Specifically, the northwest quadrant is '1', the northeast quadrant is '2', the southwest quadrant is '3' and the southeast quadrant is '4'.
- Each quadrant is identified by a six-character designation, for example, 006AG3. The first five characters comprise the 30-minute cell designation. The sixth character is the quadrant number.



Typical Multiple Bulls-Eyes

- Each 15-minute quadrant is divided into nine 5-minute by 5-minute areas. The areas are numbered sequentially, from west to east, starting with the northernmost band. The graphical representation of a 15-minute quadrant with numbered 5-minute by 5-minute areas resembles a telephone keypad.
- Each 5-minute by 5-minute area or keypad 'key' is identified by a seven-character designation. The first six characters comprise the 15-minute quadrant designation. The seventh character is the keypad 'key' number, for example, 006AG39.

THE BULL'S-EYE REFERENCE SYSTEM

The Bull's-eye Reference System provides a common perspective of the battlespace and allows for common identification of mutually accessible attack areas. In addition, it can be used to identify the centre point for the establishment of an appropriate FSCM/ACM. It is normally used during counter-air engagements for SA on targeted and untargeted airborne threats; however, it has application in attacks against TSTs and is commonly used by aircraft as a means of relaying position and threat identification. Bull's-eye may be established throughout the operating area by selecting geographic points of reference and encoding them with code words or alphanumeric. If multiple bull's-eyes are required, each bull's-eye can be labelled with a specific code word.

NOTE: The utility of a bull's-eye system is greatly hampered when targets are identified a significant distance from the specified bull's-eye point. As distance from the point increases, the larger the surface area per degree occurs, and consequently, the higher probability of error. Therefore, it is best to use the bull's-eye technique in smaller areas.

CHAPTER 12

AIR OPERATIONS PLANNING AND EXECUTION

INTRODUCTION

A joint air tasking cycle is established once air operations commence, to provide for the efficient and effective employment of the joint air capabilities and forces that are made available. The ATO, combined with the ACO and SPINS, provides operational and tactical guidance for air operations. The JFACC's AOD provides guidance to ensure that planning effectively supports the joint force objectives while retaining enough flexibility to adjust to the dynamics of military operations.

CAMPAIGN AND TARGETING SYNCHRONIZATION

The joint coordination process synchronizes the campaign efforts of a joint force with the prime objective of providing the most efficient use of joint force assets to capitalize on their synergistic effect. The JFC establishes, or delegates a subordinate commander to establish, a JCB to accomplish campaign synchronization and joint coordination. The JCB and its subordinate working groups the Joint Target Working Group (JTWG), the Information Operations Working Group (IOWG), the Daily Asset

Reconnaissance Board (DARB), the Joint Defended Asset Working Group (JDAWG), the TST Cell, the Current Operations or the Combined Joint Operations Centre (CJOC) and the Joint Operations Planning Group (JOPG) all contribute specific inputs to, and shoulder specific responsibilities for, the campaign synchronization process. Effective communications and liaison are vital to its success.

Communications Systems

The JFACC is responsible for identifying all validated joint air CIS requirements that are necessary to support the JFC's mission and allow for the successful accomplishment of his directives. The ability to exchange information via reliable secure CIS with the JFC, joint force staff and CCs is key to the successful integration of the joint air effort.

Planning must address the promulgation of data exchange requirements as early as possible to ensure that each component can meet interoperable interface requirements, and every effort must be made to confirm data information exchange connectivity requirements during deliberate planning. Planning must consider all elements of Information Operations (Info Ops) and the best mix of computer-aided systems must be available for data transmission. The JFACC HQ, CAOC and LOs depend on secure, reliable, beyond LOS, communications and data exchange equipment in order to respond to joint force requirements.

Joint Coordination Board

The JCB seeks to accomplish campaign synchronization and joint coordination (approximately 3-10 days hence). This includes joint targeting guidance and balancing competing component requirements with the JFC's direction and guidance (D&G). The JCB should maintain a macro-level view of the theatre and JOA, and balance competing component requirements with the JFC's D&G for the next 3-10 day period. The JCB will issue a JCO as required on behalf of the JFC.

Joint Coordination Order

The JCO provides the overall operational focus of the campaign showing the total interaction of all forces and capabilities, lethal and non-lethal, that the JFC has available to complete his mission. The JCO states the JFC's intent, the point of main effort, and provides amplifying guidance and coordinating instructions. It includes annexes for the JPTL, TST, an Info Ops guidance matrix and any spins for restricted targets, joint fires and Info Ops.

CCs develop their own objectives and tasks based on the JCO and include requests and/or recommendations to the JFACC on the proposed apportionment of air assets for review and concurrence. The JCB will resolve any case of conflicting component objectives.

Joint Target Working Group

The JTWG manages the targeting process by coordinating the targeting inputs of the CCs with additional inputs received from other organizations. The JTWG determines desired effects to be generated, harmonizes and prioritizes targets, proposes the effect to be achieved, assigns an executing authority and develops a draft JPTL for JCB approval. Types of target list include the following:

- **Joint Target List.** The Joint Target List (JTL) is the primary target list supporting a particular operation and represents the compendium of all targets considered to have military significance in the theatre or JOA.
- **Target Nomination List.** The Target Nomination List (TNL) consists of those targets that are nominated by CCs or the JFC staff for inclusion in the JTL.
- **Joint Prioritized Target List.** The JPTL results from the prioritization of the JTL/TNL(s) and will include reference to all methods of attack being undertaken including SF as well as lethal and non-lethal techniques.
- **Restricted Target List.** The Restricted Target List (RTL) is a sub-set of the targets on the JPTL that require special consideration, usually where simple destruction is not sought. Special consideration may be warranted because of the particular sensitivity of the site, the need to de-conflict any proposed action with other activities, the site is assessed to have a significant intelligence value, the wish to use a unique weapon or the desire to exploit the target or post-conflict reconstruction considerations. A proposal to **attack a restricted target will need to be coordinated through the JTWG to the JFC.**
- **Prohibited Target List.** The Prohibited Target List (PTL) is comprised of an area, structure, object, person or organization, mindset, thought process, attitude or behavioural pattern which cannot be suitably and effectively influenced by a capability due to LOAC or humanitarian obligations. Actions which jeopardize the designation of a target as prohibited will require submission to the JTWG for consideration and approval by required command authority before redesignation of a prohibited target onto a JTL/JPTL, typically through the TST process.
- **No-strike List.** The No-strike List is a list of those objects or locations granted protection from attack under international law. These include religious and cultural sites, civilians, important food resources and nuclear power stations. To that end, an object listed therein cannot be targeted for attack or be removed from the list unless it has lost that protection under the relevant provisions of international law.

Apportionment

Apportionment is 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. Apportionment allows the JFC to ensure the priority of the joint air effort is consistent with campaign or operation phases and objectives.

Given the many functions that the joint air effort can perform, its theatre or JOA-wide application and its ability to rapidly shift from one function to another, JFCs pay particular attention to apportionment.

After consulting with the other CCs, the JFACC submits air apportionment recommendation for approval by the JFC before it becomes the guidance for upcoming targeting cycles. The methodology the JFACC uses to make the recommendation may include priority or percentage of effort against assigned mission-type orders and/or categories significant for the campaign.

Intelligence, Surveillance and Reconnaissance

ISR collection requires the JFC BS to develop an overall collection strategy and posture for the execution of the mission. The JFC HQ intelligence staff (J2) reviews, validates and prioritizes all outstanding intelligence requirements for the JFC. The JFACC provides integrated airborne ISR for the JFC and is responsible for planning, coordinating, allocating and tasking assigned airborne ISR assets to accomplish and fulfil JFC tasks and requirements.

The CAOC provides the joint force with integrated information from the JFACC's available airborne ISR support and may request additional ISR support, through the JFACC, from the JFC or another when assigned assets are unable to fulfil specific airborne ISR requirements. It is therefore imperative that the JFACC remains aware of all available surveillance and reconnaissance capabilities that can be integrated into joint air operations.

ISR personnel are usually part of the JFACC BS; however, that function may be devolved to and integrated into the CAOC, where the complexity of integrating airborne ISR normally determines whether a specialty team, cell or division within the CAOC handles the function. The JFACC's ISR collection managers and operations planners will work with the JFC BS and other components to effectively coordinate ISR objectives. The ISR collection elements will manage and satisfy the JFACC's information requirements.

AIR BATTLE RHYTHM AND AIR TASKING CYCLE

Introduction

The JFACC employs a joint air tasking cycle to provide for the efficient and effective employment of the joint air capabilities or forces made available to him. The cycle provides a repetitive process for the planning, coordination, allocation and tasking of joint air missions/sorties, within the D&G provided by the JFC.

This is achieved through an analytical and systematic approach that focuses targeting efforts on supporting operational requirements. The cycle is flexible and can accommodate changes driven by a changing tactical situation, requests from other CCs or a change in the JFC's D&G.

Much of the day-to-day cycle is conducted through an interrelated series of information exchanges and active involvement in plan development, target development and air execution (through designated component LOs). This provide a robust and flexible means of requesting and scheduling joint air missions.

Air Tasking Cycle

The air tasking cycle plans to match specific targets with the capabilities or forces made available to the JFACC for the given ATO day. Other component air missions that appear on the ATO may not be under the control of the JFACC, but still appear on the ATO to provide visibility and assist in overall coordination and deconfliction.

The ATO phases are interrelated to the air targeting cycle, and the approach is broadly similar in that it follows a systematic process that matches available capabilities / forces with targets to achieve operational objectives. Unlike the targeting cycle, the air tasking cycle is time dependent.

The air tasking cycle is built around a number of finite time phases set to plan, prepare for and conduct air operations. The full cycle from JFC guidance to the completion of the ATO execution period is dependent on the JFC's procedures; however, a 72-hour ATO cycle is fairly standard.

Detailed planning normally begins 48 hours in advance of the execution period in order to allow for the integration of all component requirements. Given that the ATO articulates tasking for a specific time period (normally 24 hours) there can be up to three ATOs in various stages of progress at any time. The ATO currently being executed, the ATO being developed, and the ATO in planning.

NOTE: Long-range combat air assets launching from outside the theatre/JOA may be airborne before ATO publication/execution, and these assets require the most current (draft) ATO information and updates as required. Inter-theatre airlift, combat, aerial support and UA missions may not necessarily operate within an established ATO cycle and are subject to foreign nation diplomatic clearance procedures. Careful consideration must be given to how these and intra-theatre air mobility and combat missions are integrated into the ATO.

THE DETAILED AIR TASKING CYCLE

The air tasking cycle consists of six phases:

Phase 1 - Joint Force Commander / Component Coordination

The JFC consults with CCs to assess ongoing operations and discuss strategic direction. The JFACC uses that consultation and the D&G provided by the JCO to direct his staff in the production of the AOD. That AOD provides the JFACC's D&G for the ATO development.

Phase 2 - Target Development

The Guidance, Apportionment and Targeting (GAT) process matches target development to tasking by collating target nominations from the components and screening them to ensure they meet the JFC's D&G and are relevant. GAT prioritizes the nominated targets to best achieve the JFC's and other CCs' priorities and timing requirements.

Phase 3 – Weaponeering and Allocation

Weaponeering is the quantification of available lethal and non-lethal weapons to create desired effects against prioritized targets by specialist targeting personnel. Approved targets are weaponeered to include recommended aim points, weapons systems and munitions, fuzing, target identification and description, target attack objectives, the probability of destruction and to identify any collateral damage concerns. The final prioritized targets are then provided to a MAP team. The MAP teams allocate air power by melding available capabilities with the GAT recommendations.

The resulting MAP is the plan of employment that forms the foundation of the ATO. Allocation translates the apportionment decision into total number of sorties by aircraft type available for each objective / task in response to CCs Allocation Request (ALLOREQ) messages The ALLOREQ details requests for air support and provides details of excess sorties not required by an air capable component that are made available for tasking by the JFACC.

Phase 4 - Master Air Planning and Air Tasking Order Production

The AOD, target worksheets, the ACP and component requirements are used to produce a MAP. The MAP is articulated in the form of the ATO, the SPINS and the ACO, which provide operational and tactical direction in appropriate levels of detail. The level of detail should be very explicit when forces operate from different bases and multi-component or COMAOs are tasked. By contrast, less detail is required when missions are tasked to a single component or base.

Phase 5 - Air Tasking Order Execution

During execution, the JFACC is responsible for retasking joint air operations assets to respond to moving targets or changing priorities. Ground or airborne C2 platform mission commanders may be delegated the authority from the JFACC to redirect sorties/missions to higher priority targets as necessary. The CAOC is the central agency for revising the tasking of joint air assets during the execution phase and is charged with coordinating and deconflicting those changes with appropriate control agencies or components, and it is essential that the CAOC be notified of all redirected missions.

The CAOC must be responsive to required changes during the execution of the ATO, particularly where In-Flight Reports (IFREPs), the discovery of TSTs or initial BDA may require that air assets be redirected either before or after launch.

Phase 6 - Combat Assessment

Combat assessment evaluates the effectiveness of combat operations in achieving command objectives and is performed at all levels within the joint force. The J3, assisted by the J2, is normally responsible for coordinating combat assessment. The JFACC continuously plans for and evaluates the results of joint air operations and provides assessments to the JFC for consolidation into the overall evaluation of the current campaign. Although combat assessment appears to mark the end of the air tasking cycle, it is an ongoing activity that provides important inputs to decision-making and supporting processes throughout that cycle.

TARGETING

Targets fall into the three general classes as follows:

- **Deliberate.** Deliberate targets are targets that are known to exist in an operational area and against which actions have been scheduled. Examples range from targets on the JTL, to targets that are detected in sufficient time to be catered for either in the ATO development cycle or within component fire support plans.
- **Dynamic.** Dynamic targets consist of those targets that have been identified too late to have been included in the normal targeting cycle and have therefore not been scheduled for prosecution.
- **Time Sensitive.** TSTs consist of those targets that require an immediate response either because they pose (or will soon pose) a danger to friendly forces or are highly lucrative, fleeting targets of opportunity. The JFC provides specific guidance and prioritization for TSTs within the theatre or JOA.

Joint Prioritised Target List Construction

The draft JPTL is formed from a prioritized listing of targets based on JFC and component target priorities. The draft JPTL should reflect which targets would most likely be attacked (barring technical problems with aircraft, weather, retasking for higher priority targets or other operational circumstances) with the projected apportionment of air assets assigned or made available to the JFACC.

Prioritization is important because it might dictate that lower priority targets be held over for prosecution in the next available targeting cycle. Component LOs should be ready to justify and prioritize target nominations against the priorities of the joint campaign. The JFACC may recommend to the JFC that other component assets be used against targets on the draft JPTL; however, only the JFC can approve this use of other components assets.

Joint Force Air Component Commander Targeting Responsibilities

The JFACC has the following targeting responsibilities to the JFC and subordinate formations / units:

- **Joint Force Commander.** The JFACC is responsible to the JFC for the development of the draft JPTL. He also provides representatives to the JFC's JCB, support to the JTWG, BDA support to the JTWG's Target Support Cell and combat assessment information to the JFC's staff. JFACC combat assessment is fused with other information sources by the JFC to direct targeting, weaponeering and the allocation of organic assets for assigned JPTL targets.
- **Formations/Units.** The JFACC is responsible for ensuring that all targets passed to formations or units for prosecution meets the legal requirements of the LOAC and comply with the ROE. However,

this does not relieve lower echelon commanders and operators from using sound judgement to ensure continued compliance with LOAC and ROE.

PLANNING GROUND-BASED AIR DEFENCE AND THEATRE MISSILE DEFENCE

GBAD and TMD planning is based on the Joint Prioritized Defended Asset List (JPDAL) produced by the JFC HQ. The JPDAL is used by the ADC to ensure that TMD planning is consistent with the JFC's D&G for each of the campaign phases and utilizes the most efficient employment of generally limited TMD resources. Subordinate units are tasked by a Coverage Mission Order (CMO) developed from the JPDAL.

The Critical Asset List (CAL) lists those assets that have been nominated by the ADC to be covered by a TMD capable unit. A Prioritized Critical Asset List (PCAL) is derived by each CC from the CAL. The PCAL lists critical military and civilian high value assets, which are significant from a strategic and operational perspective. The JFC compiles a joint PCAL from the individual CC PCALs. Military assets are prioritized by an objective means, political assets by subjective assessment of political authorities.

TIME SENSITIVE TARGETING

TSTs are normally prosecuted by the component that has responsibility for operations within their AOO using organic or direct support assets. However, a large proportion of TSTs can involve cross-boundary issues and multi-component or joint force assets to find, fix, track, target, engage and assess them. Where an individual component is not able to prosecute a TST he may request support from another component. Using a collaborative network, the JFC TST Cell and other component TST cells will usually have visibility of the processing of any specific TST. As such any TST Cell may offer other solutions / assets via the collaborative network and coordinate with the JFC TST Cell.

The JFC may designate a lead component for TST where a particular component has the best information or SA to prosecute a TST. When this is the case the JFC will normally embed his deployable TST Cell within the lead component's Current or Combat Operations Section.

Targeting and Engagement Capabilities and Limitations

Generally, the primary weapon systems suitable for surface joint TST attacks in an operational area are fixed-wing aircraft, AH, Multiple Launch Rocket System (MLRS), conventional artillery, CMs, NSFS or SF. Determination of the 'most capable' TST asset begins during the target step and continues through the engage step. Time permitting, each component provides recommendations highlighting the pros and cons of their available weapon systems based upon the current situation.

The JFC also provides D&G to CCs to allow them the flexibility to make the proper decision regarding the rapid selection of a 'best available' attack asset. Each of the different weapon systems has associated pros and cons regarding effectiveness against different target types, responsiveness, range, accuracy, vulnerably to adversary threat and associated risks of employment.

Find, Fix, Track and Assess

Various air and space sensors, both manned and unmanned, can detect, identify, track and assess TSTs. These sensors are very specific and generally require cross-cueing to each other or with other available intelligence to provide identification. In order to effectively employ ISR sensors and systems the TST cell must know what is available, what products are provided by the available systems, what the capabilities and limitations of each sensor and system are and where to access the information. Ideally multiple sensors and persistent ISR products need to be available for effective engagement of TSTs. Types of system include:

- **Manned Systems.** Manned airborne sensors are generally more flexible than other platforms as the 'man in the loop' allows for direct contact and re-tasking when required. Manned platforms require a high degree of security, such as local control of the air or protection in the form of a dedicated fighter CAP when operating in a potentially hostile environment. The TST cell must understand the capabilities, limitations and level of risk tolerance of each available ISR platform in order to re-task it.
- **Unmanned Aircraft Systems.** UA may be equipped with the same range of sensors as available on manned airborne sensors. UA that are remotely-piloted and have dedicated sensor operators, as opposed to being truly 'unmanned aircraft', generally offer the same degree of flexibility as manned aircraft. They are a very useful asset to provide surveillance of heavily defended areas or in areas that have an unknown level of threat. They may be redirected if required, may possess long loiter times and may provide real-time feedback (system dependent). It is critical that the TST cell know where to access the UA information (both real-time and analysed) and how to task the platform. Recent operations have also proven the viability of the armed UA as a 'one-stop-shop' for TST operations.
- **Space-Based Sensors.** Space-based sensors provide long-term, wide and narrow area surveillance with excellent resolution and with minimal vulnerability to enemy action. There are also no geographic boundaries in space and no legal restrictions that would prevent over-flight of even the most sensitive of target areas. Depending on both orbit and positioning, satellites may suffer gaps in surveillance periods and may be difficult to shift to a new surveillance area; however, over-flight of the entire globe twice a day by a single satellite is often achievable. By its nature, satellite coverage schedules are predictable and an adversary with space SA will be able to adjust activities to avoid detection.

    - The two primary problems associated with space-based sensors are releasability and timeliness. Because many of these systems are closely held national assets, releasability is a problem in the dissemination of real-time and 'non-sanitized' data and information. As a result, the TST cell may not get reports until long past the window for TST engagement. In many cases the raw imagery or data that precipitated intelligence may not be provided while the sanitized intelligence is made available. Responsiveness to tasking is not a feature of space-based systems. As a result, real-time data from space systems will probably not be available for TST operations, with the exception of those satellites that are configured to sense and warn (such as ballistic missile warning satellites). Research and development projects are underway to facilitate the timely dissemination of raw data products from space-based systems. In the interim, as a source of cross

cueing, intelligence and imagery (if available) from space-based sensors may be invaluable for cueing current ISR manned and UA systems operating in real time within the theatre or JOA.

- **Ground-Based Sensors.** Ground-based sensors such as acoustic, seismic, IR and EO sensors are part of an overall collection effort mostly managed within the land component. These systems serve tactical commanders and are virtually impossible to re-task. However, their data and information may be invaluable in the cueing of other ISR assets and in the identification of TSTs within the theatre or JOA.
- **Other Intelligence Sources.** Other intelligence sources, such as open source and Human Intelligence (HUMINT), may provide cueing and or identification for the TST process as well.

CHAPTER 13

TRAINING

"War is not an affair of chance. A great deal of knowledge, study and meditation is necessary to conduct it well."

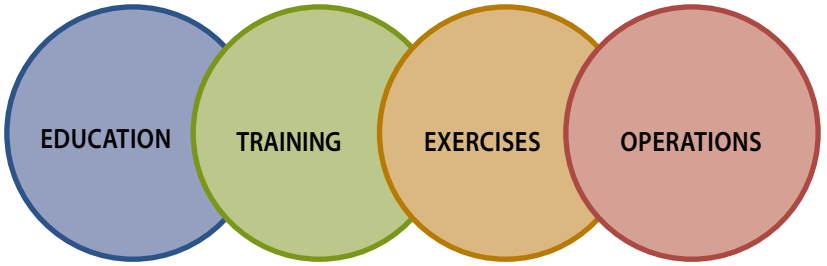
Frederick the Great

INTRODUCTION

Education, training and exercising are the fundamental building blocks that prepare airmen for the successful conduct of operations.

DOCTRINE

The key to good doctrine is to provide sufficient information to inform those involved in operations on what to do, without specifically stating how it should be done. Doctrine should not be dismissed out of hand through ignorance of its principles, nor should it be followed slavishly without regard to the mission and



The Key Elements

situation at hand. Doctrine must not consist of procedures to be applied in specific situations, but rather set forth general guidance that requires judgment in application. Thus, whilst authoritative, doctrine should not be prescriptive.

Doctrine of relevance to UK air and space warfare practitioners is primarily produced by the NATO Standardization Agency (NSA), the UK joint Development, Concepts and Doctrine Centre (DCDC), the US Air Force Doctrine Centre (AFDD) and the US Joint Forces Command (JFCOM). NATO documents are promulgated and distributed by the DCDC (hosted on the RLI, on CD and in hard copy).

EDUCATION AND TRAINING

There are a number of dedicated courses currently available, and applicable at various points in career development, designed to increase the professional knowledge of personnel involved in air warfare.

RAF Professional Military Development (Air), defined in AP 7000, seeks to ensure a coherent through-life education process for all ranks up to and including wg cdr, including significant investment in air power education across the board, and supplemented by force development activity on stations.

Generic Courses

There are two mandated residential generic air power and air warfare courses as well as a continuous system of education, administered by the Air Warfare Centre (AWC).

- **Basic Air Warfare Course.** The Basic Air Warfare Course (BAWC) aims to provide an introduction to air warfare for trainee officers by providing them with the knowledge and skills to enable them to contribute to the enhancement of the RAF's operational capability through the promotion and understanding of a war fighting culture. Courses last two weeks and are conducted at AWC Cranwell in Term 3 of Initial Officer Training (IOT). Those officers who graduated from IOT prior to the introduction of the BAWC are required to complete Air Power Study Packs 1-3, an e-learning package administered by 22 (Trg) Group Generic Education Training Centre and hosted on the Defence Learning Portal (DLP).
- **Higher Air Warfare Course.** The Higher Air Warfare Course (HAWC) aims to give all RAF officers promoted to wg cdr, or those sqn ldrs promoted in accordance with AP 7000 who have not completed the 8-week Intermediate Command and Staff Course (Air), the knowledge and skills to contribute effectively to the enhancement of the RAF's operational capability by promoting a war fighting culture supported by a competency based air power / air warfare strategy. The HAWC provides individuals with training across a spectrum of air power / air warfare issues preparing them for their primary role and enabling them to fill posts effectively within the joint arena.

Specialist Courses

There are a number of specialist residential courses run by the AWC based at RAF Cranwell.

- **Joint Air Weapons Employment Course.** The Joint Air Weapons Employment Course (JAWEC) aims to provide RAF Flying Branch and Operations Support Branch officers (up to wg cdr) with an understanding of UK and Allied current and future air weapons systems capabilities and limitations, to explain the integration and role of air and space power to achieve UK policy aims, to prepare students for joint and combined operations, and to provide air warfare and battlespace training. Courses are run periodically and last two weeks and three days, with up to 32 places per course. The syllabus includes:
  - *The study of offensive and defensive weapons (air, maritime and land), weapons characteristics and delivery techniques.*
  - *Target analysis, vulnerability assessment and damage probability calculations for weapon-to-target combinations.*
  - *Visits to service and civilian weapon development establishments.*
- **Combined Qualified Weapon Instructors.** The Combined Qualified Weapon Instructors Ground School (CQWIGS) provides students selected for the QWI course with grounding in current and future RAF weapons systems as well as lectures on avionics, space capabilities and targeting. Courses last two weeks and run twice per year.
- **Electronic Warfare.** The Air Electronic Warfare Course (AEWC) provides officers, selected NCOs and civilian equivalents from across Defence with an understanding of the basic theory of airborne EW and an overview of the EW systems applicable to UK military air forces. Course run five times per year, duration is two weeks and three days, with up to 30 places available. The syllabus includes:

- *Basic EW Theory.*
- *EW threats and counters.*
- *EW system performance analysis.*
- *Operational support and training assets.*
- *Maritime and Land EW procedures, equipment and tactics.*
- *EW procurement.*

- **Advanced Electronic Warfare.** The Advance Air Electronic Warfare Course (AAEWC) is open to graduates of the AEWC and is designed as a pre-cursor to the force specific EW Instructor Courses. It aims to build on the AEWC with the provision of an overview of modern and future EW trends. The course is run annually, lasts four days and offers up to 45 places. The syllabus includes:

  - *Modern EW technology theory and techniques.*
  - *Air applications under research and development.*
  - *Review of current EW trials and evaluation programmes.*
  - *EW procurement and management.*

- **Electronic Warfare Instructors.** The Combined Electronic Warfare Instructors Course (CEWIC) aims to train Electronic Warfare Instructor (EWI) students to a standard that will enable them to perform the duties of a EWI on a front-line squadron and provide EW subject matter expertise to commanders when operating out of area. The fast jet course is one week, multi-engine and rotary two weeks, with 40 places available on each course. The syllabus includes:

  - *DAS and EW fits to specific aircraft.*
  - *EW support to squadrons.*
  - *General principles of employment for EW equipment and DAS in operational and training environments, including coalition interoperability issues.*
  - *RF and IR threats systems and methods of threat mitigation from technical and tactical perspectives.*
  - *CIS and data links.*

- **Air Battle Staff Course.** The Air Battle Staff Course (ABSC) aims to prepare nominated officers from across Defence for operational planning appointments. The course looks at UK air-related doctrine, the JAE process, and the principles used in planning air operations and directing the employment of air assets during hostilities. The course is four weeks in duration, with 16 places and four courses per year. RAF students completing the ABSC are awarded the symbol 'qab'.

- **Targeting and Battle Damage.** The Targeting and Battle Damage Acquaint Course (TBAC) trains Defence personnel who have been selected to fill posts that will involve the support or management of targeting and BDA activities. The course lasts one week, with 18 places and runs three times per year. The syllabus includes:

  - *The targeting cycle and role of the targeteer.*
  - *National targeting organizations.*
  - *Intelligence sources and targeting materials.*
  - *Weaponeering.*
  - *BDA and combat assessment.*

- **Joint Targeting.** The Joint Targeting Course (JTC) is a 4 week course which aims to train tri-service and civilian personnel selected to fill specific targeting and BDA posts in the MOD, PJHQ, single-Service headquarters and targeting support agencies up to CDE-Tier Three analysis. The examinable course is lecture and practical exercise based and involves external visits to industrial and infrastructure sites.

- **Space.** The Military Applications of Space Seminar (MASS) is aimed at personnel who wish to develop their knowledge of the military effects provided by space-based systems. The seminar concentrates on force enhancement and space control issues which are relevant to military operations. CIS, satellite navigation, ISR from space, meteorology and SIGINT technologies and techniques are examined and then applied to aspects of space control. In addition the civilian and military policy on space is reviewed. The seminar lasts for one week and there are four seminars per year with 25 places available on each. No previous knowledge is assumed but candidates must have a UK Secret clearance.

TRAINING AND EXERCISING

The goal for any worthwhile training is to ensure personnel train with realism and intensity. Therefore, training, and management of training, should be formalized with a clearly articulated set of training objectives.

The Defence Systems Approach to Training Quality Standard (DSAT QS) is defined in JSP822, the MOD Policy Document for Individual Training Management and provides advice and guidance on how this process should be managed.

Joint, Collective Training and Exercising

In addition to individual training, there is also a requirement for operational units to conduct collective and, as required, joint training. MOD policy is contained in the Defence Exercise Management Policy (DEMP), [46] which defines an exercise management policy for UK Forces, to deliver a coherent, balanced and affordable Defence Exercise Programme (DXP). The DEMP includes military (UK and Overseas), political and logistic priorities as well as defining the tiers of exercising (Tiers 1-4) and detailing the exercise management process.

Defence Exercise Programme

The DXP is managed centrally by Joint Capability in the MOD and defines the priorities for UK joint, collective and multi-national exercising in a 12-18 month period. The management process provides a method for coordinating and prioritizing exercises as well as allocating supporting resources, such as airlift bids. HQ AIR provides its priorities in an annex to this document with A7 taking the lead. The DXP takes precedence over single-Service exercise plans.

Examples of major flying and air battle management exercises conducted in North America, mainland Europe and the UK include:

- **Red Flag.** Red Flag is a realistic combat training exercise that is focused on the first 10 days of a major tactical operation through large force employment and the vast bombing and gunnery ranges at Nellis AFB NV. The 'blue' forces use various tactics to attack range targets: mock airfields, vehicle convoys, tanks, parked aircraft, bunkered defensive positions, missile sites, etc. These targets are defended by a variety of simulated ground and air threats to give participating aircrews the most realistic combat training possible. 'US-only' RED FLAGS are reserved for US Special Access Programs.
- **Maple Flag.** Maple Flag is a combined US/Canadian Flag exercise held at Cold Lake, Canada. Units fly as a combined air package through the Primrose Lake range. This exercise provides a chance for units to exercise with a full mix of allied participants in a NATO atmosphere.
- **Blue Flag.** Blue Flag provides a large scale, force-on-force, computer-assisted, air power exercise for battle staff in a realistic environment. Training emphasizes the activities needed to plan and execute operations in accordance with current tasked theatre war plans.
- **Roving Sands.** Roving Sands is joint tactical air operations conducted in the White Sands Missile Range and Fort Bliss area that primarily exercises TMD.
- **Green Flag.** Green Flag provides realistic CAS, AI and FAC(A) training in a simulated brigade-level conflict at the US Army's National Training Centre. The ground war is fought at Ft Irwin CA and the air battle is flown from Nellis AFB NV.
- **Green Flag East.** Green Flag East is designed to provide realistic CAS, AI and FAC(A) training in a simulated low to mid intensity conflict at the US Army's Joint Readiness Training Centre. The ground war is fought at Ft Polk LA, and the air battle is flown from Barksdale AFB LA.
- **Internal Look.** Internal Look is a US Central Command directed BS exercise designed to train a Joint Task Force (JTF) commander/staff. The focus is on command and control training; standing up a JTF; crisis action planning procedures; joint doctrine; and tactics, techniques and procedures application.
- **Joint Task Force Exercise.** Joint Task Force Exercise (JTFEX) is a field training exercise employing Army, Air Force, Navy, Marine Corps and SF elements in a littoral environment off the east coast of the US, to support requirements-based joint interoperability training for USJFCOM forces and to certify the participating Carrier Battle Group (CVBG) and Amphibious Ready Group (ARG) / Marine Expeditionary Unit (MEU) for forward deployment.
- **Tactical Leadership Programme.** The Tactical Leadership Programme (TLP) is a NATO-run academic and a flying course. Academic courses include: AD Studies, EW, COMAO Planning, SAM operational support and intelligence. The flying course uses a building block approach to develop tactical leadership skills, progressing from basic combat missions to some of the most complex and challenging ones likely to be encountered. It comprises 15 sorties (three with AAR) and is open to aircrew with >500 hours on type / in role.
- **Tactical Leadership Training.** Tactical Leadership Training (TLT) is an AWC run exercise designed to develop the tactical leadership skills of participants. It involves forces from across Defence with objectives that may include planning and flying COMAOs with a land force element education, training and exercising key elements of air manoeuvre in support of air operations, practicing, developing and refining tactics and weaponry CAS and PR.
- **Combined Qualified Weapons Instructor.** CQWI Operations Phase is an AWC facilitated exercise that aims to consolidate CQWI student training in a live-fly tactical environment. It centres on COMAO planning and execution together with the integration of operations such as CAS, AI, CR and TST all exercised under realistic ROE.

[46] *D/DjtCap/JW/DEMP dated 10 Jul 08.*

ANNEX A

ACRONYMS AND ABBREVIATIONS

The Lexicon contains abbreviations relevant to AP 3002 and is not meant to be exhaustive. The definitive and more comprehensive list of abbreviations is in AAP-15.

AAA	Anti-Aircraft Artillery
AAEWC	Advanced Air Electronic Warfare Course
AAI	Attack-Attack Interface
AAR	Air-to-Air Refuelling
AbFAC	Airborne Forward Air Controller
ABSC	Air Battle Staff Course
ACA	Airspace Control Authority
ACC	Air Contingent Commander
ACCE	Air Component Coordination Element
ACM	Airspace Control Means
ACO	Airspace Control Order
ACP	Airspace Control Plan
ACS	Air Component Support
ACSU	Air Combat Support Unit
ACSSU	Air Combat Service Support Unit
AD	Air Defence
ADC	Air Defence Commander
ADP	Air Defence Plan
AE	Aeromedical Evacuation
AEW	Airborne Early Warning
AEWC	Air Electronic Warfare Course
AGS	Air-Ground Surveillance System
AH	Attack Helicopter
AI	Air Interdiction
AJP	Allied Joint Publication
ALCC	Airlift Coordination Centre
ALE	Air Liaison Element
ALE(M)	Air Liaison Element (Maritime)
ALLOREQ	Allocation Request
ALO	Air Liaison Officer
ALSA	Air, Land Sea Application Centre
AMC	Airborne Mission Commander
AMD	Air Mobility Division
AOA	Amphibious Operations Area
AOC	Air Operations Centre / Air Officer Commanding
AOCC	Air Operations Coordination Centre
AOCC(L / M)	Air Operations Coordination Centre (Land / Maritime)
AOD	Air Operations Directive
AODT	Air Operations Directive Team
AOO	Area of Operations
AOPG	Air Operations Planning Group
APOD	Airport of Debarkation
APOE	Airport of Embarkation
ARG	Amphibious Ready Group
ARM	Anti-radiation Missile
ASACS	Airspace Surveillance and Control System
ASC	Airspace Control
ASCS	Air Support Control Section
ASO	Air Staff Officer

ASOC	Air Support Operations Centre
ASSESSREP	Assessment Report
ASTOR	Airborne Stand-off Radar
ASuW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
ATACMS	Army Tactical Missile System
ATC	Air Traffic Control
ATF	Amphibious Task Force
ATM	Air Task Message
ATO	Air Tasking Order
ATP	Allied Tactical Publication
AWACS	Airborne Warning and Control System
AWC	Air Warfare Coordinator / Air Warfare Centre
BAWC	Basic Air Warfare Course
BCA	Border Crossing Authority
BCD	Battlefield Coordination Detachment
BCE	Battlefield Coordination Element
BDA	Battle Damage Assessment
BDE	Brigade
BDZ	Base Defence Zone
BS	Battle Staff
BUDFIN	Budget and Finance
BVR	Beyond Visual Range
C2	Command and Control
CA	Comprehensive Approach
CAC	Conduct After Capture
CAG	Contingency Action Group
CAL	Critical Asset List
CAN	Computer Network Attack
CAOC	Combined Air Operations Centre
CAP	Combat Air Patrol
CAR	Care After Recovery
CAS	Close Air Support
CATF	Commander Amphibious Task Force
CBRN	Chemical, Biological, Radiological and Nuclear
CC	Component Command
CC-AIR	Allied Air Component Command
CCD	Camouflage, Concealment and Deception
CCIR	Commander's Critical Information Requirement
CCT	Current Commitments Team
CCZ	Carrier Control Zone
CDS	Chief of Defence Staff
CEA	Campaign Effectiveness Assessment
CEWIC	Combined Electronic Warfare Instructors Course
CFL	Coordinated Fire Line
CGRS	Common Geographic Reference System
CID	Combat Identification
CIMIC	Civil Military Cooperation
CIS	Communication and Information Systems
CJRCC	Combined Joint Rescue Coordination Centre
CJO	Chief of Joint Operations
CJRCC	Combined Joint Rescue Coordination Centre
CJOC	Combined Operations Centre
CL	Coordination Centre
CM	Cruise Missile
CMO	Coverage Missile Order
CNO	Computer Network Operations
COA	Course of Action

COC	Current Operations Cell
COD	Combat Operations Division
COG	Centre of Gravity / Contingency Operations Group
COIN	Counterinsurgency
COMAO	Composite Air Operation
CONOPS	Concept of Operations
COORDO	Coordination Officer
COS	Chief Of Staff
COZ	Cross Over Zone
CPD	Combat Plans Division
CPT	Contingency Planning Team
CQWI	Combined Qualified Weapons Instructor Course
CR	Combat Recovery
CRC	Control and Reporting Centre
CSAR	Combat Search and Rescue
CT	Collective Training
CV	Critical Vulnerability
CVBG	Carrier Battle Group
DAIT	Divisional Air Integration Team
DARB	Daily Asset Reconnaissance Board
DAS	Defensive Aids Suite
DCA	Defensive Counter-Air
DCAOC	Deployable Combined Air Operations Centre
D&G	Direction and Guidance
DCDS(C)	Deputy Chief of Staff (Commitments)
DCMO	Defence Crisis Management Organization
DCS	Defensive Counter-Space
DE	Directed Energy
DEMP	Defence Exercise Management Policy
DIR	Director
DDIR	Deputy Director
DIRSPACEFOR	Director of Space Forces
DIS	Defence Intelligence Staff
DIV	Division
DJFACC	Deputy Joint Force Air Component Commander
DLP	Defence Learning Portal
DOB	Deployed Operating Base
DR	Divisional Representative
DSAR	Deployed Search and Rescue
DSCOM	Defence Supply Chain Operations and Movement
DSG	Defence Strategic Guidance
DXP	Defence Exercise Programme
DZ	Drop Zone
EA	Electronic Attack
E&E	Escape and Evasion
EAW	Expeditionary Air Wing
ECAS	Emergency Close Air Support
ECM	Electronic Countermeasures
EEI	Essential Elements of Information
EESA	Emergency Explosives Storage Area
ELS	Emergency Landing Strip
EM	Electromagnetic
EMCON	Emission Control
EMP	Electromagnetic Pulse
EO	Electro Optical
EP	Electronic Protection
EPM	Electronic Protection Measures
ESM	Electronic Support Measures
EW	Electronic Warfare

EWCC	Electronic Warfare Coordination Centre
EWI	Electronic Warfare Instructor
FAC	Forward Air Controller
FACA	Force Area Coordination Area
FAC(A)	Forward Air Controller (Airborne)
FAE	Forward Air Element
FARP	Forward Arming and Refuelling Point
FE	Force Elements
FE@R	Force Elements at Readiness
FEZ	Fighter Engagement Zone
FFA	Free Fire Area
FLC	Front Line Command
FLIR	Forward Looking Infra-Red
FLOT	Forward Line of Own Troops
FMB	Forward Mounting Base
FMV	Full Motion Video
FOL	Forward Operating Location
FP	Force Protection
FPCC	Force Protection Coordination Centre
FS	Flight Safety
FSC	Fire Support Coordinator
FSCL	Fire Support Coordination Line
FSCM	Fire Support Coordination Measure
FU	Formed Unit
FW	Fixed- Wing
GAT	Guidance, Apportionment and Targeting
GARS	Global Area Reference System
GBAD	Ground-Based Air Defence
GDA	Ground Defence Area
GLO	Ground Liaison Officer
GPS	Global Positioning System
HAWC	Higher Air Warfare Course
HF	High Frequency
HHQ	Higher Headquarters
HIDACZ	High Density Airspace Control Zone
HIMEZ	High-level Missile Engagement Zone
HN	Host Nation
HNS	Host Nation Support
HQ	Headquarters
HR	High Readiness
HUMINT	Human Intelligence
HVAA	High Value Airborne Asset
IADS	Integrated Air Defense System
ICC	International Criminal Court
ID	Identification
IFF	Identification Friend or Foe
IFREP	In-Flight Report
IM	Information Manager
IMC	Instrument Meteorological Conditions
Info Ops	Information Operations
IOT	Initial Officer Training
IOWG	Information Operations Working Group
IP	Initial Point
IPE	Individual Protection Equipment
IR	Infra-Red
ISOPREP	Isolated Personnel Report
ISP	Identification Safety Point
ISR	Intelligence, Surveillance and Reconnaissance
ISRD	Intelligence, Surveillance and Reconnaissance Division
IW	Information Warfare
JACC	Joint Airspace Coordination Centre
JADOCS	Joint Automated Deep Operations Coordination System
JAE	Joint Air Estimate
JAOP	Joint Air Operations Plan
JAWEC	Joint Air Weapons Employment Course
JCB	Joint Coordination Board
JCO	Joint Coordination Order
JCP	Joint Contingency Plan
JDAWG	Joint Defended Asset Working Group
JDP	Joint Doctrine Publication
JETTS	Joint Effects Tactical Targeting System
JEZ	Joint Engagement Zone
JFACC	Joint Force Air Component Commander
JFACHQ	Joint Force Component Command Headquarters
JFC	Joint Force Commander
JFHQ	Joint Force Headquarters
JFLCC	Joint Force Land Component Commander
JFMCC	Joint Force Maritime Component Command(er)
JFMS	Joint Force Movements Staff
JFSOCC	Joint Force Special Operations Component Command(er)
JIPE	Joint Intelligence Preparation of the Environment
JTAC	Joint Terminal Attack Controller
JOA	Joint Operations Area
JOP	Joint Operations Plan
JOPG	Joint Operations Planning Group
JPG	Joint Planning Guide
JPDAL	Joint Prioritized Defended Asset List
JPTL	Joint Prioritized Target List
JSTARS	Joint Surveillance and Target Attack Radar System
JTAC	Joint Terminal Attack Controller
JTAR	Joint Tactical Air Requeat
JTC	Joint Targeting Course
JTCB	Joint Targeting Coordination Board
JTF	Joint Task Force
JTFEX	Joint Task Force Exercise
JTFHQ	Joint Task Force Headquarters
JTIDS	Joint Tactical Information Distribution System
JTL	Joint Target List
JTWG	Joint Target Working Group
JIPE	Joint Intelligence Preparation of the Environment
JWP	Joint Warfare Publication
LEGAD	Legal Advisor
LLE	Land Liaison Element
LLTR	Low Level Transit Route
LO	Liaison Officer / Low Observable
LOAC	Law of Armed Conflict
LOC	Lines of Communication
LOMEZ	Low-level Missile Engagement Zone
LOS	Line of Sight
LRF	Laser Range Finder
LRS	Launch and Recovery Site
LSC	Logistics Support Cell
LZ	Landing Zone
MAP	Master Air Plan

MANPADS	Man-Portable Air Defence Systems
MAOC	Maritime Air Operations Centre
MARLO	Marine Liaison Officer
MCE	Maritime Coordination Element
METL	Mission Essential Task List
MISREP	Mission Report
MLE	Maritime Liaison Element
MOA	Measure of Activity
MOB	Main Operating Base
MOE	Measure of Effectivenes / Measurement of Effect
MOU	Memorandum of Understanding
MPA	Maritime Patrol Aircraft
MRR	Minimum Risk Routing
MS	Medium Scale
MT	Mechanical Transport
NATO	North Atlantic Treaty Organization
NCC	National Contingent Commander
NFA	No Fire Area
NFL	No Fire Line
NFU	Non-Formed Unit
NGO	Non-Governmental Organization
NRF	NATO Response Force
NM	Nautical Mile
NSFS	Naval Surface Fire Support
OA	Operational Analysis
OCA	Offensive Counter-Air
OCS	Offensive Counter-Space
OGD	Other Government Department
OPCOM	Operational Command
OPCON	Operational Control
OPINTEL	Operational Intelligence
OPLAN	Operations Plan
OPORD	Operations Order
OTC	Officer in Tactical Command
OTG	Operational Tasking Group
PCAL	Prioritized Critical Asset List
PGM	Precision Guided Munitions
PI	Probability of Incapacitation
PIO	Public Information Officer
PL	Package Leader
POL	Petrol, Oil and Lubricants
POLAD	Political Advisor
PR	Personnel Recovery
PTL	Prohibited Target List
QRA	Quick Reaction Alert
RAP	Recognized Air Picture
RE	Royal Engineers
RECCE	Reconnaissance
RFA	Restricted Fire Area
RFL	Restricted Fire Line
ROE	Rules of Engagement
RTL	Restricted Target List
RW	Rotary Wing
SA	Situational Awareness / Staging Airfield
SACA	Subordinate Airspace Control Authority
SADC	Sector Air Defence Commander
SAFRR	Standard Use Army Aircraft Flight Route
SAM	Surface-to-Air Missiles
SAR	Synthetic Aperture Radar
SCA	Space Coordinating Authority
SCAR	Strike Coordination and Reconnaissance
SCZ	Ship Control Zone
SEAD	Suppression of Enemy Air Defences
SERE	Survival, Evasion, Resistance and Extraction
SFA	Space Force Application
SFE	Space Force Enhancement
SI	Success Indicator
SIGINT	Signal Intelligence
SFF	Special Forces
SME	Subject Matter Expert
SOB	Support Operating Base
SOFA	Status of Forces Agreement
SOP	Standing Operating Procedures
SOLE	Special Operations Liaison Element
SPG	Strategic Planning Group
SPINS	Special Instructions
SpOCC	Space Operations Cooordination Centre
SQOC	Squadron Operations Centre
SS	Small Scale
STANAG	Standardization Agreement
StratAT	Strategic Air Transport
SUSTAT	Sustainability Statement
TacAT	Tactical Air Transport
TACCS	Theatre Air Command and Control System
TACON	Tactical Control
TACP	Tactical Air Control Party
TBM	Tactical Ballistic Missile / Theatre Ballistic Missile
TIC	Troops in Contact
TLE	Target Location Error
TLZ	Tactical Landing Zone
TMD	Theatre Missile Defence
TMDCC	Theatre Missile Defence Coordination Cell
TNL	Target Nomination List
TOT	Time on Target
TST	Time Sensitive Targeting
TTP	Tactics, Techniques, and Procedures
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
VHR	Very High Readiness
VMC	Visual Meteorological Conditions
WMD	Weapons of Mass Destruction
WOC	Wing Operations Centre

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