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NATO Air Transport Capability

An Assessment

Joint Air Power Competence Centre

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FROM:
The Executive Director of the Joint Air Power Competence Centre (JAPCC)

SUBJECT:
NATO Air Transport Capability – An Assessment

DISTRIBUTION:
All NATO Nations and Relevant Organisations – Releasable to the Public

"My logisticians are a humourless lot … They know if my campaign fails, they are the first ones I will slay."
Alexander the Great

To mount and sustain air operations at long range from home base requires considerable resources and integrated logistic support. For expeditionary operations, the sustainability element may prove critical to mission success. Sustainability, however, is more than logistics; it embraces equipment, personnel and training. Nevertheless, the movement of personnel and equipment remains of critical importance.

With the expansion in NATO member states, and operations conducted beyond the geographical North Atlantic domain, this JAPCC Assessment of NATO's Air Transport capability examines the increasing importance of Air Transport and addresses the key areas of Command, Control, Coordination, Interoperability and Standardisation.

It is also worth remembering that logistics, including Air Transport, plays a vital role in both the physical and moral component of any fighting force. Air Transport provides a means to deploy, sustain and recover the necessary fighting power in order to achieve the military objectives without which success is impossible.

As ever, the JAPCC encourages reader comments and feedback in order to improve the document's content. For further information, please contact the Assistant Director Capabilities at the JAPCC, Brigadier General Alessio Cecchetti, via e-mail at cecchetti@japcc.de, or through our Subject Matter Experts assigned to the Combat Support Branch – Air Transport Section, at@japcc.de.

Dieter Naskrent

Lieutenant General, DEU AF
Executive Director

JOINT AIR POWER COMPETENCE CENTRE

Joint Air Power Competence Centre | centre de compétence de la puissance aérienne interarmées
von-Seydlitz-Kaserne | Römerstraße 140 | 47546 Kalkar | Germany/Allemagne | Tel +49 (0) 2824 90 2209 | Fax +49 (0) 2824 90 2274 | www.japcc.org
NCN: +234 or 239 2200 | **E-Mail:** contact@japcc.de

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The C-130 fleet has formed the backbone of NATO's Tactical AT capability during the last four decades. This J model is the latest Hercules variant.

CHAPTER 1

Introduction

"Supply and Transport stand or fall together; history depends on both."
Winston Churchill

1.1 Objective

The Objective of Air Transport (AT) is best encapsulated in the Allied Tactical Publication (ATP) 3.3.4. Volume I[1], as follows:

1.1.1 AT enables the global, regional and local movement of personnel and materiel, both military and civilian. With acknowledged limitations in payload compared with other modes of transport, AT is a fast and versatile way to deploy, sustain and redeploy forces;

1.1.2 AT is a fundamental enabler of rapid movement of forces, especially when ground threats or terrain features/conditions hamper freedom of movement. Due to its responsiveness, speed of execution and global range, AT also offers the most effective means to enable and sustain the rapid, even decisive, projection of Air Power, in particular to distant theatres and to remote locations;

1.1.3 AT operations range from the low-key insertion of Special Forces, through the maintenance of routine inter- and intra-theatre airbridges and hub-and-spoke operations, to full spectrum airborne operations which enable concentration of combat power at high tempo. Moreover, a credible capability to conduct airborne operations will force an opponent to reserve and confine a number of forces in order to counter this potential threat to his vital assets. An airborne operations capability constitutes an important element of deterrence, coercion, diversion and surprise;

1.1.4 AT is vital for Aeromedical Evacuation (AE) from austere locations. Where risks to life in combat are high, intra- and inter-theatre AT underpin strongly the moral component of fighting power; it is often the only way to transport casualties to specialist medical support within the critical timeframe required.

1.2 Aim and Scope

This AT Assessment is a source document with the principal aim of underscoring the importance of Strategic and Tactical AT by raising awareness of current and emerging AT issues across the NATO community. This Assessment describes and analyses the current NATO military AT inventory and supporting multinational agencies, identifies problems and recommends possible solutions. Ultimately, this AT Assessment endeavours to contribute to standardisation and interoperability across the Alliance.

1.3 Assumptions

This AT Assessment is based upon the following assumptions:

1.3.1 NATO AT capability is formed from the contributions of the respective member nations. Whilst NATO has encouraged these nations to procure the necessary platforms to meet NATO's Level of Ambition, the reality is that the majority have, historically, procured equipment based on national (not Alliance) requirements and, for the purposes of this Assessment, it is assumed that this policy will not change in the short-to-medium term;

1.3.2 This Assessment considers the NATO AT inventory. It does not address the efforts of, or the linkage to, the European Union;

1.3.3 The delineation between Strategic and Tactical AT is not defined by range but by the Area of Operations. For the purposes of this assessment, Strategic AT refers to inter-theatre AT and Tactical AT refers to intra-theatre movements;

1.3.4 This Assessment considers only Fixed-Wing and Tilt-Rotor aircraft, Rotary-Wing platforms are not considered;

1.3.5 AT cannot be viewed in isolation. The deployment, sustainment and redeployment of forces can also be achieved through surface (land and sea) movements, or a combination of both surface and air transportation. It is not the intention of this document to cover surface movements;

1.3.6 In terms of the number of aircraft, and the overall capacity of NATO's AT capability, it is clear that 100% of the maximum potential AT requirement can never be satisfied. The requirement level will change during peacetime versus the various (inherently non-linear) phases of an operation with any capability gaps potentially served by (short-term) commercial means.

1.4 Classification

This Assessment has been compiled from open sources and previous studies. It therefore carries no security classification and is releasable to the public.

1. As at 1 July 2011, ATP 3.3.4.Vol I is a Study Draft.

A Portuguese C-130 departs on a routine transport mission. Many NATO C-130 aircraft are more than 30 years old and are in need of replacement.

© Miguel Nobrega

AT aircraft, such as this Italian Air Force C-27J, have taken on an increasingly important role in the post 9-11 security environment.

CHAPTER 11

The Modern Operational Context

"The first, the supreme, the most far-reaching act of judgment that the statesman and commander have to make is to establish … the kind of war on which they are embarking."
General Karl von Clausewitz

2.1 Background

2.1.1 Prior to the collapse of the Soviet Union and the cessation of the Cold War, there was a general assumption amongst politicians and militaries that NATO and the Warsaw Pact would meet upon the battlefield of North-Western Europe. The static geography of the Cold War was reflected in the priority afforded to Strategic and Tactical AT. With the exception of reinforcement from North America, AT was less critical to NATO's Strategic Concept. This is not to say that the respective NATO member countries possessed no AT assets, quite the reverse. The United States required AT to deploy and sustain forces in Korea and then subsequently in South-East Asia while some European countries retained a legacy of colonial outposts, all requiring logistical linkage.

2.1.2 The NATO requirement for AT was dramatically altered following the 11 September 2001 terrorist attacks on the United States. NATO took the decision, at the request of the US, to invoke Article V of the North Atlantic Treaty and to take measures to "meet the challenges to the security of our forces, populations and territory, from wherever they may come."[1] The subsequent US-led operation in Afghanistan required a massive logistical undertaking to support deployed forces in a landlocked country with no

Once fully into service, the new Airbus A400M will help meet the AT requirements of its 7 European launch customers, while also greatly increasing NATO's overall AT capability.

recognisable transport infrastructure. Surface forces faced the combined challenge of navigating surrounding countries and insurgents; stressing the criticality of both inter- and intra-theatre AT.

2.2 Current Operational Needs

2.2.1 The importance of AT to deploy robust military forces when and where required is included in NATO's Strategic Concept 2010. Within this concept, NATO Allies have agreed to engage in a continuous process of reform, modernisation and transformation in order to ensure that NATO possesses the full range of capabilities and resources to deter and defend against any threat. These resources must, however, be used in the most efficient and effective way possible to maximise the deployability of NATO forces and the capacity to sustain operations in the field.

2.2.2 The reality of NATO's current AT capability versus the requirement indicates a clear shortfall in committed assets. This shortfall was formally identified in the 2002 Prague Capabilities Commitment (PCC) document and, in spite of a small reduction in the overall shortfall, the Bi-SC Priorities Shortfalls Areas 2009 again listed AT (both inter-theatre airlift and intra-theatre airlift) and AE as capability gaps.

1. Prague Summit Declaration by North Atlantic Council 21 November 2002.

CHAPTER III

Strategic AT

"We have learned and must not forget that, from now on, air transport is an essential element of air-power, in fact, of all national power."
General H. H. "Hap" Arnold

3.1 The Strategic AT Requirement

The advent of asymmetric warfare has blurred the traditional delineation between Strategic and Tactical AT. Strategic airlift assets were previously flown, over longer distances, between areas of low-threat. Higher risk tasks were normally assigned to tactical platforms, operated over shorter distances and perhaps more limited by weight, altitude and temperature. In the modern operational context, Strategic AT provides the airbridge that links bases outside the theatre to the Joint Operations Area (JOA), or to other theatres, and often operates directly into a Forward Operating Base (FOB). The secondary effects of this subtle change have included an increase in the requirement for Force Protection (FP) measures at FOBs (against both direct and indirect threats) and in defensive aids for strategic platforms. These requirements will be discussed further below, in terms of the qualities/functional requirements/characteristics required of inter-theatre AT in addition to the number of AT Force Elements required to support NATO operations.

3.2 The Required Force Elements

3.2.1 In order to quantify the number of inter-theatre AT assets required, NATO's Level of Ambition (defined within the Strategic Concept[1]) has to be the point of reference. However, the Strategic Concept does not define, perhaps intentionally, the number of simultaneous operations but simply states "the ability to sustain concurrent major joint operations and several smaller operations for collective defence and crisis, including at strategic distance." The operational requirement is identified through the NATO Capability Requirements Review based upon planning scenarios derived from the Alliance's stated Level of Ambition. However, this requirement is classified and cannot be described further in this document.

3.2.2 Previous studies[2] have assumed the NATO Response Force (NRF) as their metric (approx. 22,000 personnel and 100,000 tonnes of air-portable equipment) when determining the required number of AT assets. However, these assumptions, and therefore the conclusions of these studies, are somewhat limited in scope when compared to the current NATO-led International Security Assistance Force (ISAF) in Afghanistan which totals 132,203 personnel (drawn from a coalition of nations in addition to NATO countries).[3] Given that its Level of Ambition demands the potential for two concurrent Major Joint Operations (MJO), it is clear that, without the Strategic AT resources of the United States military, NATO cannot currently meet its AT requirement. The 2005 review on the progress of the PCC anticipated that the Airbus A400M platform, procured to alleviate some of the AT shortfall and increase burden-sharing amongst the European nations, would not be introduced until at least 2010 and that an Interim Solution was required. The A400M programme and the Strategic Airlift Interim Solution (SALIS) are discussed further in Chapter VII.

3.2.3 The European shortfall in Strategic AT could be minimised by applying a number of measures rather than by simply procuring additional numbers of aircraft. Analysis (conducted at the Boeing Portal, Farnborough in the United Kingdom) of a scenario involving C-17 aircraft undertaking Non-Combatant Evacuation Operations (NEO) in Africa concluded, somewhat surprisingly, that the limiting factor was the aircrew-to-aircraft ratio and not the number of aircraft required. This Study would support the suggestion that efficient sortie generation of available assets could meet the required AT capability. Improved sortie generation will also rely on the availability and provision of sufficient aircraft spares, engineering and maintenance capability, operations and logistic capacity (both manpower and specialist ground support equipment) and in the subsequent reduction in turn-around times.

3.2.4 While it may seem logical, in terms of Strategic AT capacity and through-life costs, to assume that a relatively small fleet of larger aircraft is generally preferable to a larger fleet of smaller aircraft, one must consider two potential disadvantages; flexibility, and the political-military impact associated with the loss of a large aircraft. With a smaller fleet of larger aircraft, carrying greater overall capacity, one's freedom of manoeuvre is limited if large-scale concurrent tasking is required (i.e. NATO's Level of Ambition). The loss of a large aircraft, with resultant casualties, could be considered as a potential 'game-changer' in terms of public opinion, public support, political will and resilience. The implications for the military range from the obvious loss in combat power to the effect on morale, all of which could be mitigated (but never eliminated) through the use of smaller aircraft, FP and defensive aids. Therefore, taking into account the various arguments, a mixed fleet of different-sized aircraft with differing capabilities should be considered as the optimal requirement.

3.3 Strategic AT Platform Characteristics

3.3.1 In accordance with the current NATO Strategic Concept, the requirement for AT is for global range, assisted by Air-to-Air Refuelling (AAR) where required. This global reach, in combination with the generic characteristic of speed of response, ensures that Strategic AT maintains the advantage, at least in terms of rapidity if not capacity, over surface logistics movements.

3.3.2 The Supreme Allied Commanders Operations and Transformation (Bi-SC) Agreed Capability Statements[4] for Strategic AT are:

- Capable of strategic transportation of up to 300 fully equipped combat troops;
- Capable of automatic response to external electronic interrogation by military and civilian ground and airborne interrogators;
- Capable of bi-directional networked air-air and air-surface communications;
- Capable of secure, Electronic Warfare (EW) resistant voice and data communication;
- Capable of day/night and all weather operation, including at low-level;
- Capable of being refuelled in-flight;
- Capable of autonomous or mutual initiation of self-protection measures;
- Capable of passively detecting approaching surface-air missiles;
- Capable of passively detecting, analysing and identifying hostile radar emissions from airborne and ground threats in dense Electro-Magnetic (EM) environments.

3.3.3 The most significant omission in the above list is for any outsized cargo[5] requirement, which is a particular constraint as there are only a limited number of platforms (A400M, An-124, C-5, C-17, Il-76) capable of satisfying this requirement. Furthermore, none of these aircraft are capable of meeting the requirement to carry 300 fully equipped troops (except the C-5 using palletised seats installed on the main cargo floor). The C-5 normally carries only 73 troops, with the cargo compartment used for outsize cargo, whilst NATO only utilises the An-124 for cargo. Modern strategic platforms must be acquired within a comprehensive procurement strategy and be built (considering overall payload capacity and load bearing strength) to accommodate the weight (and volume) of modern fighting equipment, including personal equipment, required for expeditionary operations, much of which has been up-armoured against the current Improvised Explosive Device threat. Consultation with the user community (Land/Maritime/Air Components) is therefore essential to setting the lift requirement.

3.3.4 It is perhaps desirable, rather than essential, for strategic aircraft to meet the NATO requirements (Theatre Entry Standards are more applicable) for secure, networked communications. All commanders

have to prioritise their resources and, with longer exposure in the threat envelope, tactical platforms will have the greater need.

3.3.5 In performance terms, and dependent upon the assessed threat, the requirement to fly strategic aircraft in all weather and at low-level is minimal. Day/night operations do allow the commander flexibility, although with the proliferation of Night Vision Devices, the assumption that darkness offers greater safety than day has been largely dispelled. It would take a very brave commander to authorise large strategic aircraft to consistently operate at low-level with the dual dangers of being in close physical proximity to the ground and to the enemy surface threat.

3.3.6 The modern battlespace, with the rise of asymmetric warfare, is less constrained geographically with an ever-present threat reducing the number of clearly defined sanctuaries. With strategic platforms routinely flying direct into the theatre of operations, there is a clear requirement for a defensive capability to defeat the expected threat. The threat to the platform, in flight, can be countered with the installation of Defensive Aids Suites (DAS), and whilst on the ground, is countered by increased FP measures. However, the requirement for Radio Frequency (RF) DAS is perhaps secondary to Infra-Red (IR) DAS for strategic platforms; the threat to strategic aircraft in both Iraq and Afghanistan is from IR Man-Portable Air Defence Systems, after the RF threats were neutralised in both theatres.

3.4 The Current Inventory

3.4.1 NATO itself does not 'own' any Strategic or Tactical AT assets but is reliant upon contributing nations. It is acknowledged that these contributions are insufficient to meet the NATO requirement, due in large part to the delay in the delivery of the A400M. However, the requirement can be met by the United States, with minor contributions from the remainder. The US Department of Defense Mobility Capabilities and Requirements Study 2016 (MCRS 2016) concluded that the US strategic airlift fleet could satisfy their peak demand expected to support the most demanding projected requirements with an inventory of 111 C-5 aircraft and 223 C-17 aircraft by the end of 2016. However, the question of NATO's reliance upon

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NATO relies heavily on the Strategic AT resources of the United States military to fulfil its current Level of Ambition.

US Strategic AT assets remains unresolved with the potential that US national interests may take precedence over, or be invoked concurrently with, NATO priorities.

3.4.2 Annex B lists the major Strategic AT platforms operated by, or in support of, NATO nations. A cursory glance at this Annex underlines the limited number of platforms utilised and the disparity in numbers between the US and other NATO nations.

1. Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organisation 2010.
2. JAPCC Journal 2 Article NRF and NATO Strategic Airlift: Capability or Continued US Reliance by Maj J D Hood USAF.
3. www.ISAF.NATO.int – Key Facts and Figures 04 March 2011.
4. Bi-Sc Agreed Capability Codes and Capability Statements dated 16 April 2008.
5. The current ATP 3.3.4.3 (A) defines 'Outsized Aircraft Load' as "Cargo that exceeds 810 inches (2057.4 cm) long by 117 inches (297.18 cm) wide by 105 inches (266.7 cm) high in any dimension." However, the new ATP 3.3.4.3 (B), currently in review, will have the definition removed. Outsize cargo is generally accepted to mean cargo that exceeds the capabilities of a C-130J stretched aircraft in any dimension.

© U.S. Air Force, Staff Sgt. Mike Meares

With Air-to-Air Refuelling, AT aircraft have unlimited range, allowing missions to be flown directly into forward operating bases anywhere in the world.

CHAPTER IV

Tactical AT

"The first essential condition for an army to be able to stand the strain of battle is an adequate stock of weapons, petrol and ammunition. In fact, the battle is fought and decided by the quartermasters before the shooting begins. The bravest men can do nothing without guns, the guns nothing without plenty of ammunition, and neither guns nor ammunition are of much use in mobile warfare unless there are vehicles with sufficient petrol to haul them around."

Field Marshal Erwin Rommel

4.1 The Tactical AT Requirement

Tactical (intra-theatre) AT provides airlift within a specific theatre or JOA. It differs from Strategic AT: in its greater exposure to the enemy threat and therefore in its higher theatre entry standards; in localised command and control; in the coordination and synchronicity with the operational battle rhythm and scheme of manoeuvre; and in its capability to operate from performance-limiting, austere landing strips. For these reasons Tactical AT platforms are restricted in terms of outsized cargo capacity and range in comparison to Strategic AT platforms.

4.2 The Required Force Elements

The effectiveness of Alliance operations (in terms of deployment, mobility and sustainment) hinges upon the availability of intra-theatre airlift, especially in the case of expeditionary operations and/or when operating in areas with poor transport infrastructure. ISAF operations in Afghanistan have been constrained by a lack of intra-theatre airlift; however this is attributed more to a lack of Rotary-Wing lift rather than Fixed-Wing AT. The statistics, however, show that there are sufficient numbers amongst the Alliance members to fulfil this AT requirement. Where the failure lies is in the lack of standardisation in training and platform capabilities, and the consistent reluctance of nations to offer these capabilities to the Coalition. Quite often those nations who lack a Strategic AT capability mitigate this shortfall by utilising tactical assets instead.

4.3 Tactical AT Platform Characteristics

4.3.1 The NATO Bi-SC Agreed Capability Statements (dated 16 April 2008) for Tactical AT include the following criteria (with JAPCC highlighting in bold of certain capabilities discussed below):

- Capable of Aerial Fire Fighting;
- Capable of Air Ambulance Operations;
- **Capable of tactical transportation/Airlift of cargo up to six tonnes or up to 20 fully combat equipped soldiers;**
- Capable of performing reconnaissance (including: Maritime Patrol; Weather & Aerial Sampling);
- Capable of conducting Combat Search and Rescue (CSAR)[1] operations in no-to-low threat environments only, primarily to provide aerial refuelling to rescue helicopters;
- **Capable of automatic response to external electronic interrogation by military and civilian ground and airborne interrogators;**
- **Capable of bi-directional networked air-air and air-surface communications;**
- **Capable of secure, EW resistant voice and data communication;**
- **Capable of EW/Electronic Combat;**
- Capable of ice-strip operations (modified wheel-ski landing gear);
- **Capable of day/night and all weather operation, including at low-level;**

- Capable of airborne refuelling of Fixed- and Rotary-Wing aircraft;

- Capable of ground refuelling (both Fixed-Wing and Rotary-Wing & fuel caches whilst engines are still running with props feathered);

- **Capable of being refuelled in-flight;**

- **Capable of autonomous or mutual initiation of self-protection measures;**

- Capable of passively detecting approaching surface-air missiles;

- Capable of passively detecting, analysing and identifying hostile radar emissions from airborne and ground threats in dense EM environments;

- **Capable of airdrop operations of cargo and supplies;**

- Capable of airborne troop deployment.

4.3.2 A number of specialist roles are mentioned above, (fire-fighting, ambulance, Maritime Patrol, weather collection, CSAR, ice-landing, AAR and ground refuelling). However, the two primary roles for Tactical AT are Airland and Airdrop. The requirements (highlighted in bold) are considered by the JAPCC to be essential for Tactical AT operations; the anomaly being the requirement to carry six tonnes or up to 20 troops, which is presumably intended to incorporate Rotary-Wing AT.

4.3.3 Airland. Airland involves the landing of aircraft and the offload of its payload and can be conducted at a variety of landing destinations, from well-established airbases to unimproved Landing Zones (LZ). In a low threat environment, Airland minimises the risks of injury to personnel and damage to equipment, eliminates payload dispersal and offers increased availability of resources. Several variations of Airland operations exist including Tactical Airland Operations, Rapid Airland and Follow-on Airland in which combat power is rapidly reinforced at the airfield or LZ. The success of Airland operations is dependent upon proven operational Tactics, Techniques and Procedures (TTPs), Airfield FP measures and Engines Running Onload/Offload (ERO) techniques.

4.3.4 Airdrop. Airdrop is the delivery of personnel and/or materiel from an in-flight aircraft to a Drop Zone (DZ) when Airland is not possible or desirable. Airdrop allows commanders to project and sustain combat power where surface transportation is unavailable, when time is critical or when the enemy threat dictates. Advances in modern technology have improved both the precision of Airdrop and the ability to deliver effect at range, i.e. not from overhead the DZ but from a stand-off distance.

4.3.5 With Tactical AT operating within an increasingly complex modern battlespace comes the requirement

for theatre entry standards in secure voice and data communications, DAS, combat identification and day/night capability. In addition, aircraft design and modifications are required to the wings, engines, landing gear and the aircraft underbelly for operations from natural surface strips. Conventional thinking has to be reappraised with modern AT platforms increasingly referred to as Multi-Role Weapons Systems rather than the somewhat derogatory flying truck. The Multi-Role AT aspect is further discussed in Chapter V.

4.4 The Current Inventory

The C-130 Hercules (of numerous variants) has long provided the backbone of the NATO Tactical AT capability amongst Western members of the Alliance. However, the introduction of the A400M will add a medium-sized dimension to the Alliance inventory. The integration of Eastern European members added a plethora of former Soviet-built platforms, the majority of which are gradually being replaced with more modern systems. Annex C lists the major Tactical AT platforms currently operated in support of NATO operations.

1. The existing NATO definitions for Search and Rescue (SAR), Combat Recovery (CR) and CSAR were developed in isolation and at separate times. Since then, the term **Personnel Recovery (PR)** has been introduced and is defined as: "The sum of military, diplomatic and civil efforts to effect the recovery and reintegration of isolated personnel." Where **Isolated Personnel** is defined as: "Military or civilian personnel who are separated from their unit or organisation in a situation that may require them to survive, evade, resist exploitation, or escape while awaiting recovery." Ref. AJP-3.3.9 (SD-8). ***NATO Joint Doctrine for Personnel Recovery.*** MCASB, 2007.

U.S. Air Force, Airman 1st Class Samuel W. Goodman

Airdrop of personnel and/or equipment is a crucial capability that allows commanders to project and sustain combat power where surface transportation is unavailable, when time is critical or when the enemy threat dictates.

The Spanish CN-235 Maritime Patrol Aircraft (VIGMA version) is an AT platform modified for a specialised mission role.

CHAPTER V

Multi-Role AT

"I am looking for versatility; single-mission airplanes don't give that."
General Norton A. Schwartz

5.1 The Multi-Role Concept

5.1.1 There is a clear and current trend (for financial and practical purposes) for modern platforms to be designed and utilised as Multi-Role platforms. AT is by no means an exception, although one must distinguish between AT platforms used in multiple roles as opposed to AT platforms utilised in specialist roles. With advances in technology and modular concepts there is clear potential to convert, on the ground, the same AT airframe for different roles and missions. Future concepts and technologies will be discussed further in Chapter VIII and will no doubt influence future procurement strategies.

5.1.2 The Multi-Role concept enhances flexibility and versatility; however, one must caution against a potential lack of availability, dependent upon the allocation, prioritisation, planning and execution of the differing missions. Vital in the development of this Multi-Role capability is the additional training and associated costs to maintain aircrews at the requisite standard in addition to the time and resources required to physically re-role AT platforms.

5.2 Current Multi-Role Capability

5.2.1 AE, according to ATP 3.3.4, is the movement of patients under supervision to, and between, medical

A ski-equipped LC-130 Hercules aircraft from the New York Air National Guard's 109th Airlift Wing takes off during an Operation Deep Freeze mission in Antarctica, 2 February 2011.

treatment facilities by AT. AE may comprise up to three complementary phases; the initial evacuation to medical facilities from the (Forward) point of injury (usually undertaken by Rotary-Wing); tactical AE provided by intra-theatre AT; and Strategic AT providing AE for patients from theatre to the home nation or to a safe area.

5.2.2 A new breed of Multi-Role Tanker Transport (MRTT) aircraft has been, or is in the process of being, introduced to a number of NATO nations' inventories. The existing A310 MRTT aircraft of the Royal Canadian Air Force and the German Luftwaffe will be complemented by the recent acquisitions of the KC-46A (a Boeing 767 derivative) by the United States Air Force, the Italian Air Force KC-767A, the Royal Air Force A330 Voyager (a service provided by AirTanker) and the A400M (with AAR kits) for the German, French and Spanish Air Forces. These MRTT aircraft will operate alongside coalition partners: the Royal Australian Air Force KC-30A (an Airbus A330 derivative), the Royal Saudi Air Force A330 MRTT, the UAE A330 MRTT and the Japanese Air Self-Defense Force KC-767J.

5.3 Specialised Mission Roles

The true value of an AT aircraft is in its general utility. However, many platforms have been modified for specialist missions and thus cannot be classified as Multi-Role. These specialised roles include, but not limited to: support to Special Forces/Special Operations Forces; Airborne Command, Control and Communications; Intelligence, Surveillance and Reconnaissance (ISR); Close Air Support (CAS); Maritime Patrol Aircraft (MPA); CSAR; Search and Rescue (SAR); Aerial Fire Fighting; Weather Reconnaissance; Aerial Spray missions; Ice-strip; VIP; Electronic Warfare (EW) and Influence Activity/US Strategic Command/Information Operations.

A U.S. Air Force combat controller monitors pallets after an air delivery of humanitarian aid on 18 January 2010, in Port-au-Prince, Haiti. Seamless Command and Control is vital in ensuring that such AT missions are properly coordinated, planned, tasked and executed.

CHAPTER VI

Command, Control and Planning Considerations

"He who wishes to be obeyed must know how to command."
Niccolò Machiavell

6.1 Overall Logistics Effort

AT is not solely the preserve of Air Power but is just one part of the overall logistics effort with true Joint and Combined dimensions. Therefore AT has to be visible within, and have visibility of, a comprehensive Logistic Supply Chain. There is a requirement to track aircraft, aircrews, personnel and equipment across the strategic, tactical and forward domains in order to increase situation awareness when deploying, sustaining and redeploying forces.

6.2 Information Management

6.2.1 The existing systems and tools used to manage AT assets, capabilities and services are, perhaps unsurprisingly, distinctly unique to each AT organisation, with each organisation developing, controlling and modifying its own system.

6.2.2 The Logistic Functional Area Services (LOGFAS) system, developed by the NATO C3 Agency (NC3A), is used by NATO Allied Movement Coordination Centre (AMCC) to design their deployments and comprises several modules:

6.2.2.1 GeoMan, used in the planning and analysis of the logistic operation design through the management of Geographical Locations (GeoLocs), Routes and Movements/Logistics Areas;

6.2.2.2 LOGFAS Data Management Module (LDM), used for managing force profiles, organisation and in movement planning;

6.2.2.3 Allied Deployment and Movement System (ADAMS), used to design, deconflict and manage deployments, during which ADAMS monitors progress and disseminates information;

6.2.2.4 Effective Visibility Execution (EVE), used for modifying the movement plans originally defined in ADAMS and provides visibility of the execution;

6.2.2.5 Coalition Reception, Staging and Onwards Movement (CORSOM), used to support the control and visibility of the forces arriving at the destinations points.

6.2.3 The Management European Air Transport (MEAT) application is being developed by European Air Transport Command (EATC) and is intended to support AT activity during the complete operational cycle (from tasking to reporting).

6.2.4 In the case of exchanging AAR services (pertinent to MRTT platforms) between the different nations, the Movement Coordination Centre Europe (MCCE) uses the European Planning and Coordination System (EPACS) for coordination activities.

6.2.5 The Air Transport and Air-to-Air Refuelling Exchange of Services (ATARES) New Accounting and Invoicing System (ANAIS) is a web-based application which will be used by the MCCE to account for the services exchanged through LOGFAS (EVE) and EPACS. It is also intended that this system will be used by different organisations within its own respective application; MEAT will also utilise ANAIS for its accounting requirements.

6.2.6 NATO's Air Command and Control System (ACCS), to replace the existing Integrated Command and Control (ICC) system, is intended to combine and automate, at the tactical level, the planning, tasking and execution of all air operations. When operational, the ACCS will provide a unified air command and control system, enabling NATO's European nations (including new Alliance members) to seamlessly manage all types of air operations over their territory, and beyond. NATO members will be able to integrate their air traffic control, surveillance, air mission control, airspace management and force management functions.

6.3 Information Management Shortfalls

6.3.1 The European Defence Agency (EDA) commissioned an analysis (due in late 2011) of current systems in the Network Enabled Air Transportation (NEAT) Requirement Study with no conclusions, but with the observations set out below.

6.3.2 Many current shortfalls have been identified including:

6.3.2.1 Not all air services could be exchanged using the existing tools;

6.3.2.2 Not all systems cover the entire operational cycle from tasking to reporting;

6.3.2.3 Some systems are tailored for specific countries or different organisations with differing security classifications;

6.3.2.4 Systems utilise different databases (and formats), making the exchange of services, the update of information, and the translation of information between systems more problematic;

6.3.2.5 There is no regulation of standards and procedures between the current systems, thus hindering efforts toward interoperability;

6.3.2.6 Requests are often sent via e-mail or telephone, rather than using the existing Information Technology (IT) tools, creating additional manpower effort both at national levels and at the coordination

centres. Furthermore there are no decision-making tools within the existing IT systems, again requiring more manpower.

6.3.3 There is a requirement to manage the future structure of European airspace (under the Single European Skies projects) that requires significant change to existing systems, databases and working culture. An integrated information system, operating in real time and similar to social networking websites, is seen as a central requirement.

6.3.4 An Information and Knowledge Management (IKM) System-of-Systems is identified as a potential solution to integrate the capacities of the different existing systems, databases and tools in a Network Enabled Capability environment able to manage military AT assets, capabilities and services.

6.3.5 In addition to IKM, common procedures are necessary to enhance collaboration.

6.3.6 With the lack of centralised command and control of NATO's AT capability, it is hardly surprising that the Information Management (IM) systems and tools are neither standardised nor interoperable. However, even where IT systems are compatible, the lack of common procedures and protocols does not necessarily enable effective or efficient working practices. These deficiencies, and the differences in working cultures, appear to reduce the standard of cooperation and coordination to the lowest common denominator rather than encouraging the implementation of best practices.

6.4 Command and Control

6.4.1 The Air Power mantra 'Centralised Command and Decentralised Execution' does not appear to apply to Strategic AT. The responsibility to deploy and sustain forces in support of NATO operations is ceded to the respective member nations and not as a collective. The AMCC, as its title suggests, has the coordination authority to deconflict, advise and assist. However, it has no Command and Control functions.

6.4.2 Command and Control for intra-theatre AT sits at the regional or component level, with the coordination, tasking and execution of those tactical assets (after Transfer of Authority to NATO) assigned to the Air Operations Centre. Execution may be even more decentralised, as while Fixed-Wing AT assets may be assigned to the Joint Forces Air Component Commander, the Rotary-Wing AT assets in the JOA may be assigned to yet another component.

6.4.3 It may prove impossible to achieve unity of command with respect to AT assets across the 28 NATO Nations, across all operational levels and across all components. If this is truly unachievable then, as a minimum, NATO should have the capability, utilising a common interoperable IT system, to coordinate and track all logistics movements, again across the national, operational and component levels. There are obvious parallels with civilian logistics companies, where best practice and potential solutions may be identified.

6.4.4 A major consequence of NATO ceding the responsibility for Strategic AT to the individual nations is the difficulty encountered when dealing with diplomatic clearances and the transportation of third country nationals. Delays caused by diverse diplomatic procedural requirements, and attendant misunderstandings, effectively reduce the efficiency of the operational airlift capability. The current system based upon bilateral agreements lacks consistency at the Alliance (multilateral) level and ultimately denies the most efficient use of assets.

The introduction of the A400M will add a medium-sized dimension to the Alliance inventory and provide a unique opportunity to enhance cohesion, interoperability and standardisation.

CHAPTER VII

Enhancing AT Capability and Interoperability through Increased Multinational Cooperation

"The only thing that will redeem mankind is co-operation."
Bertrand Russell

7.1 AT Standardisation

7.1.1 The foundations of NATO standardisation and interoperability sit within the Standardization Agreement (STANAG[1]) Process. Annex D lists the NATO STANAGs relevant to AT. These STANAGs are key to building the NATO AT capability through a number of multinational initiatives and organisations. However, with more than 30 STANAGs and ATPs, many covering similar issues, it would appear that the volume of dispersed information does not necessarily aid co-operation amongst the interested parties.

7.1.2 Furthermore, it appears that there is no **permanent** central focal point for staffing NATO AT issues. The NATO AT Panel, which reports to the NATO Air Operations Support Working Group (AOSpWG), currently acts as a central focal point for coordinating the AT custodians and all AT-related issues; however, it meets only once a year. The establishment of a standing NATO AT Coordination Cell could rationalise the number of STANAGs, making IM and dissemination more effective. As an example of the potential benefits, the JAPCC AAR Cell acts as the Coordination Cell for all NATO AAR staff issues, and is the Custodian of ATP-56(B), AAR Refuelling (AJP 3.3.4.2), in addition to

being the Chair for the NATO AAR Panel coordinating the four AAR STANAGs. Such an arrangement may serve as an additional benefit to the AT staffing effort. Significantly the JAPCC is independent of the NATO chain of command and is thus able to act independently and impartially.

7.2 Enhancing AT Capability

7.2.1 In order to build an affordable AT capability, which is less reliant upon the United States and in the absence of NATO assuming responsibility, a number of Alliance and Partnership for Peace (PfP) nations have established and promoted several multinational initiatives (see Figure 1). These initiatives, programmes and associated organisations enable the smaller nations to share the burden with the larger contributors whilst informing procurement strategies and improving efficiency amongst existing Alliance inventories. Naturally the secondary effect of this multinational approach is to enhance cohesion, interoperability and standardisation across the Alliance.

7.2.2 The organisations and initiatives described within this chapter offer evidence of the relative successes of current collaborative efforts. The merits of future initiatives will be discussed further in Chapter VIII.

7.3 Multinational Initiatives

7.3.1 European Air Group (EAG), High Wycombe

Following close cooperation between the UK's Royal Air Force and France's Armée de l'Air during the 1991 Gulf War and over the Former Yugoslavia, the Franco-British European Air Group was formally established in June 1995 with the intention to improve inter-air force cooperation and interoperability. In 1998 the title was changed to the European Air Group (EAG) following invitations to Belgium, the Netherlands, Spain, Germany and Italy to become 'correspondent' members. In 1999 these 5 nations confirmed their wish for full membership and the EAG became a 7-nation organisation. In the current economic climate, the member Air Forces need to make certain that they are operating in the most cost-effective manner by seeking to improve interoperability. The EAG provides a forum in which to develop projects which can assist in maintaining overall capabilities whilst also ensuring value for money for the nations. Amongst the many projects undertaken by the EAG are the: Multinational Training Project and Standardisation of Aircrew Regulations (supporting the EATC – see below).

7.3.2 Allied Movement Coordination Centre (AMCC), Mons and AMCC-ISAF, Eindhoven

The AMCC has provided, since 2001, the planning, coordination and deconfliction of multi-modal transportation (including Strategic AT) to every NATO Area of Operations, on behalf of Supreme Headquarters Allied Powers Europe (SHAPE). In 2003 the AMCC-ISAF detachment (Eindhoven) was formed to provide the deconfliction of Strategic AT to and from Afghanistan for all (47) Troop Contributing Nations, dealing with approximately 100 military and civilian AT providers. However, although the AMCC-ISAF has had considerable experience in the past decade in managing the multinational effort in support of ISAF operations, their focus is primarily on effectiveness, rather than efficiency. Furthermore their remit does not extend to Command and Control levels of authority; AMCC is a coordination body only. The AMCC-ISAF (formal title the ISAF Strategic Flight Coordination Centre (ISFCC)) forms part of Headquarter ISAF's Crisis Establishment and the intention is to incorporate the current AMCC-ISAF in SHAPE's Peacetime Establishment post the ISAF mission.

7.3.3 Movement Coordination Centre Europe (MCCE), Eindhoven

7.3.3.1 The MCCE, independent of both NATO and the EU, was formed on 1 July 2007, after the European AT Centre and the Sealift Coordination Centre merged, with the aim of optimising the effectiveness and efficiency of all Air and Surface transportation resources of the 25 participating nations. The MCCE acts as an 'honest broker' in matching AT (and AAR) requests to available resources; however this concept is very much dependent upon the provision and flow of

	NATO	MCCE	ATARES	EATF	EAG	EATC	A400M	SALIS	SAC
ALBANIA	■								
AUSTRIA		■		■					
BELGIUM	■	■	■	■	■	■	■	■	
BULGARIA	■			■					■
CANADA	■	■							
CROATIA	■	■							
CZECH REPUBLIC	■	■		■				■	
DENMARK	■	■	■						
ESTONIA	■	■	■						■
FINLAND		■		■				■	■
FRANCE	■	■	■	■	■	■	■	■	
GERMANY	■	■	■	■	■	■	■	■	
GREECE	■			■				■	
HUNGARY	■	■	■					■	■
ICELAND	■								
ITALY	■	■	■	■	■				
LATVIA	■	■							
LITHUANIA	■			■					■
LUXEMBOURG	■	■		■			■	■	
MALAYSIA							■		
NETHERLANDS	■	■	■	■	■	■		■	■
NORWAY	■	■	■					■	■
POLAND	■	■	■	■				■	■
PORTUGAL	■	■		■				■	
ROMANIA	■	■		■					■
SLOVAKIA	■			■				■	
SLOVENIA	■	■						■	■
SPAIN	■	■	■	■	■		■		
SWEDEN		■	■	■				■	■
TURKEY	■	■	■				■		
UNITED KINGDOM	■	■	■		■		■	■	
UNITED STATES	■	■							■

Figure 1: Membership of Multi-National Organisations, Programmes and Initiatives by Country.

■ Member Nation (August 2011)

information from the contributing nations. As the information is provided on a voluntary national basis, it is not always a complete picture.

7.3.3.2 A major benefit of the MCCE's *modus operandi* is in the use of the ATARES Technical Arrangement[2] which enables the exchange of flight hours rather than incurring direct financial payments between differing nations. ATARES has not only enabled efficiencies in overall flying hours but in the reduction in bureaucracy amongst the respective participants.

7.3.4 European Air Transport Fleet (EATF) Concept, Brussels

The EATF Concept, an EDA initiative, was created on 17 November 2009, under a Letter of Intent by 14 European Ministers of Defence, to enhance efforts to increase the provision of military airlift within Europe. The aim of the EATF is to provide a forum to develop concrete solutions to better utilise existing and future airlift assets within a flexible and inclusive partnership between national and international military transport fleets and organisations. This will be achieved through the pooling, sharing, exchange and acquisition of various capabilities, including diplomatic clearances, aircraft platforms, training, logistics support, movements handling and maintenance. Their recently completed Landscaping Study for instance, provides a complete picture of the military transport system in Europe and is a comprehensive study that describes AT assets, their operating environments, roles and functions, interactions of the organisations and nations involved, various information systems involved and the myriad rules and regulations that encompass it all. The long term vision for the EATF is to establish a robust network linking the various European AT entities to effect the efficient employment of all current and future AT capabilities.

A Royal Norwegian Air Force C-130J crew on a routine training flight.

7.3.5 European Air Transport Command (EATC), Eindhoven

As the name suggests, the EATC is a Command. Four nations (Belgium, France, Germany and the Netherlands) established the EATC on 1 September 2010 (Initial Operational Capability 11 May 2011) in order to centralise the command functions for planning, tasking and controlling of those transferred assets/resources, currently 170 platforms. The establishment of the EATC also enabled those countries to disestablish the respective national level of commands, thus reducing the unnecessary duplication of staff effort and bureaucracy, and to strengthen the European pillar within NATO. The introduction of the Airbus A400M into service with three of four EATC nations (the Netherlands did not procure the A400M) may maximise the benefits of this new command and undoubtedly increase levels of interoperability and standardisation. Whilst sovereignty over assets and individual national caveats will continue, the EATC aims to consolidate training, regulation, fleet management, logistics, diplomatic clearances and legal issues amongst the four nation partnership.

7.3.6 US Department of Defense (DoD) Lift and Sustain Program

Since 2004, the US DoD Lift and Sustain Program has provided lift and sustain support (including airlift and sealift) to coalition forces in Iraq and Afghanistan. The Lift and Sustain Program may be provided to eligible nations so long as those forces are deployed in support of United States military and stability operations and those forces must be located where life support is provided, by the United States, under the Logistics Civil Augmentation Program. The types of allowable support include the movement of: personnel and equipment; fuel and lubricants; subsistence (food); sustainment (life support); battlefield medical care

Civil charter options, such as this Volga-Dnepr IL-76TD-90, continue to offer AT options for many NATO nations.

including AE; clothing and individual equipment; ammunition, spare parts and components; linguist support; and the maintenance of Host Nation equipment. The types of support that may not be provided include: formal training programmes; significant military equipment other than ammunition; and long-term medical care beyond stabilisation (other than at Landstuhl, Germany). There is also a fiscal limit to the Lift and Sustain Program. Expenditure in Fiscal Year (FY) 2009 was limited to US$100 million however rose to US$350 million in FY2010 and is expected to reach US$400 million in FY2011. To date, of the 45 eligible nations serving alongside US Forces in Afghanistan, 25 nations have received Lift and Sustain support.

7.4 Multinational Programmes

7.4.1 Airbus A400M

A European Staff Requirement for the Future Large Aircraft Project was drawn up in 1993 to replace ageing C-130 and C-160 fleets. The Airbus A400M was designed to meet the AT (and MRTT including AAR) requirements of a number of European countries. The final customers are Belgium (7), France (50), Germany (53), Luxembourg (1), Malaysia (4), Spain (27), Turkey (10) and the United Kingdom (22) with a total commitment of 174 aircraft; the first delivery to commence in early 2013 to France. However, full capability is not expected until much later, following 5 subsequent capability standards running from 2013–2018[3]. This delay in delivery, and operational capability, was

Soldiers of the 173rd Airborne Brigade Combat Team board a C-17 Globemaster III from the Heavy Airlift Wing, Papa Air Base, Hungary.

© U.S. Army

anticipated in the 2005 review on the progress of the PCC with the recommendation that an AT interim solution was required.

7.4.2 Strategic Airlift Interim Solution (SALIS), Leipzig and Strategic Airlift Coordination Cell (SALCC), Eindhoven

7.4.2.1 The SALIS programme, inaugurated in February 2005, was designed to fill the Strategic AT capability gap amongst NATO, PfP and EU nations prior to the introduction of the C-17 and A400M fleets. A high-level group, led by Germany, determined that the charter of Antonov AN124-100 aircraft was the most efficient solution, with the nations'[4] guaranteed access to a fleet of up to six aircraft[5]. The programme is contracted by the NATO Maintenance and Supply Agency (NAMSA), currently until 31 December 2011 (Memorandum of Understanding [MOU] in effect until 2015), with aircraft tasking coordinated by the SALCC, collocated in Eindhoven with the AMCC-ISAF, the MCCE and the EATC.

7.4.2.2 Whilst initially procured as an interim solution, SALIS has become the *de facto* Strategic AT solution for many countries but is not the sole solution. A number of NATO countries are still reliant upon civil charter, hired on a national (the spot market) rather than collaborative basis, to satisfy their AT requirements. However, these countries run the risk, in a highly competitive military and civil market, of outsized-lift aircraft being unavailable.

7.4.3 C-17 Strategic Airlift Capability (SAC) Consortium and Heavy Airlift Wing (HAW), Papa Airbase, Hungary

7.4.3.1 Twelve nations (ten NATO and two PfP) signed Letters of Intent, in September 2006, to establish the SAC Consortium and an MOU, on 24 September 2008, to acquire three Boeing C-17 Globemaster III aircraft to form the operational arm of the programme, the HAW. The MOU will remain in effect for a period of 30 years, with each participating nation paying for a portion of the aircraft, operating costs and supporting infrastructure.

7.4.3.2 Whilst the aircraft acquisition, management and support to the SAC is achieved through the NATO Airlift Management Organisation (NAMO), the authority to task the HAW lies with the participating nations and not with NATO or any other international organisation. This consortium has resolved significant shortfalls in AT for many of the 12 nations involved, with the potential for the HAW model of cooperation to be applied to other Force Elements.

7.5 Organisation Membership

7.5.1 Advantages. The potential advantages to be gained from the AT solutions, described above, allow nations to satisfy their individual requirement *á la carte* and, in collaboration with other nations, to realise potential efficiencies in procurement, operational, maintenance, support, management and through-life costs. Furthermore, the greater the degree to which nations coordinate and cooperate (assuming the political will exists) then the greater the potential for increases in functional levels of interoperability and standardisation in regulation, equipment, training, doctrine and concepts. Figures 2 and 3 (page 25) show the various Range/Payload and cargo hold capabilities of key Tactical and Strategic AT aircraft.

© U.S. Air Force, Master Sgt. Daniel Kacir

Cargo being loaded onto a civilian chartered Volga-Dnepr AN-124 long-range heavy transport aircraft.

Canada's second CC-177 Globemaster III delivers supplies and equipment to a forward operating base in Inuvik, Northwest Territories in October 2007.

7.5.2 Challenges. The challenges associated with these cooperative approaches lie in the complexity in coordination between the disparate organisations (in terms of culture, language and common IT and communications systems) and the prioritisation of the task between individual nations within the same organisation and/or versus the NATO priority whilst considering the interests of the civilian market. Furthermore, in all multinational organisations national caveats ('red cards') may potentially affect the overall cohesion of the force.

7.5.3 With the proliferation in the number of AT organisations (each satisfying a different but often similar need or customer) there is an implied criticism that the NATO Command Structure, in its present form, does not serve as a single Command and Coordinating Authority for AT to satisfy the political and military commitment of the 28 NATO Nations as a collective. Has NATO therefore become irrelevant in the AT arena? Or has the necessity for consensus across NATO become a barrier to the agreement to work together, inevitably leading to a two-tier NATO – those who commit and those who do not, cannot or will not?

1. AAP-03(J) with effect from 01 January 2011 separates STANAGs and Standardization Recommendations (STANRECs).
2. ATARES and Surface Exchange of Services (SEOS) will merge into Multi-modal Exchange of Services (MEOS) using the accounting tool ATARES New Accounting and Invoicing System (ANAIS).
3. Quote from Domingo Ureña, Cedric Gautier – Flight International dated 20 May 2011.
4. The original 15 nations expanded to 18 however reduced to 16 with the withdrawal of Canada and Denmark in 2010 and with the potential to reduce further to 14 with the withdrawal of Portugal and the Netherlands in 2011.
5. 2 aircraft on full-time charter; 2 aircraft within 6 days; 2 aircraft within 9 days.

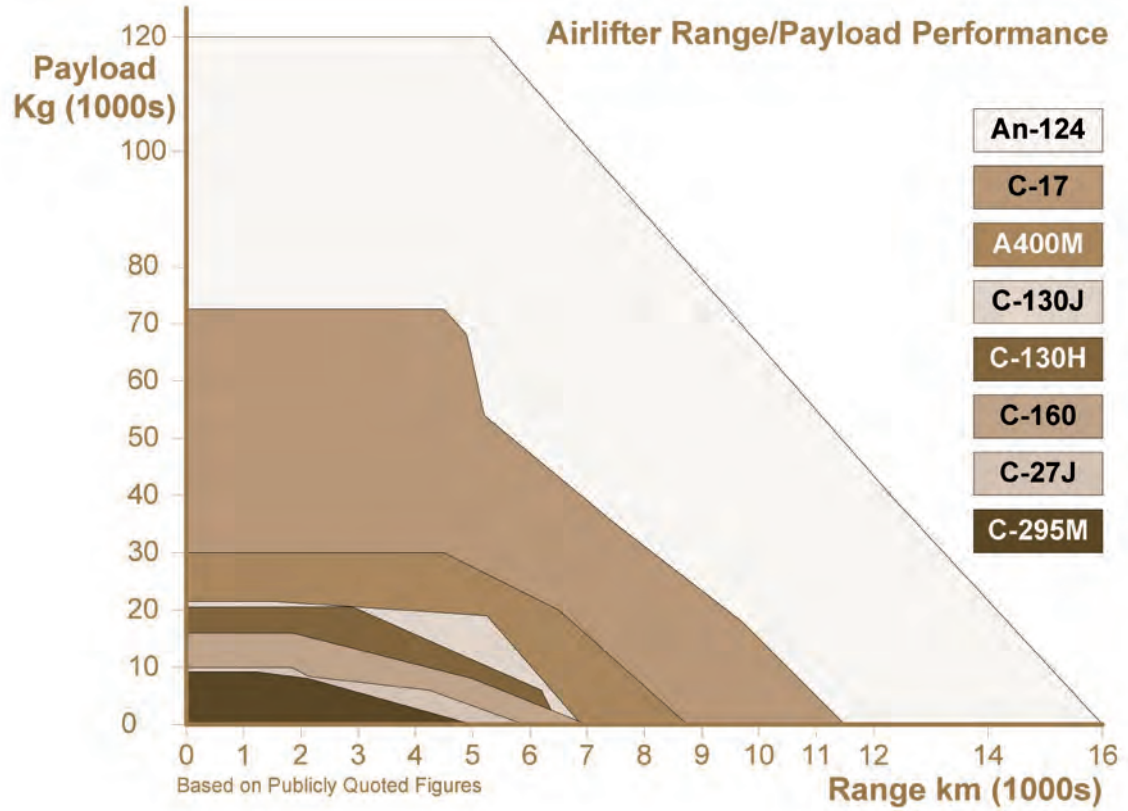


Figure 2: Range and Payload performance of key Tactical and Strategic AT aircraft.

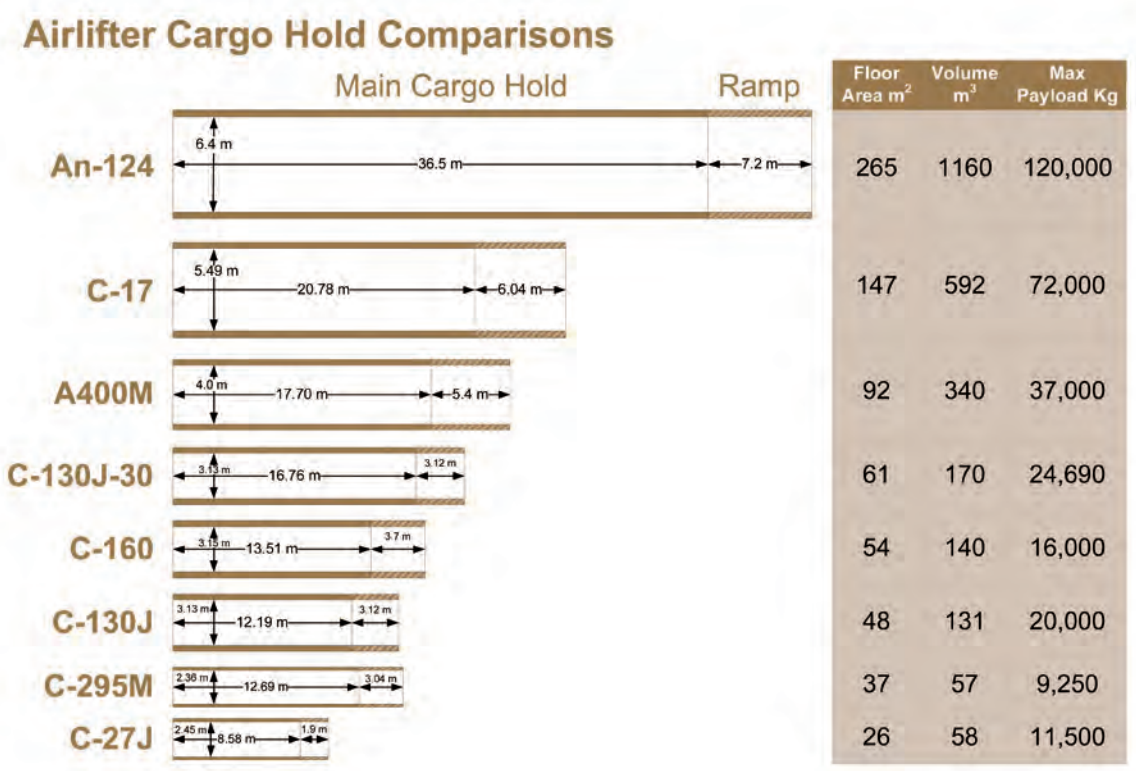


Figure 3: Comparison of cargo hold sizes of key Tactical and Strategic AT aircraft.

CHAPTER VIII

The Future for AT

"Neither a wise man nor a brave man lies down on the tracks of history to wait for the train of the future to run over him."
Dwight D. Eisenhower

8.1 Future Operational Context

8.1.1 It is difficult, and perhaps foolhardy, to attempt to predict the shape and nature of future conflicts. However, with respect to AT, there appears to be no significant shift in its overall concept, technology and use. There will be an enduring NATO requirement to transport personnel and materiel, together with the likelihood of an increase in concurrent operational activity,[1] and without geographical constraint. NATO has adopted a global remit which suggests the requirement for both a rapid and long-range logistic capability; AT providing (to date) the most rapid capability. The use of emerging technologies has not however influenced the next generation of transport (and MRTT) platforms, none of which seek to exploit the advantages of unmanned systems, hyperspeed propulsion or the Space domain.

8.1.2 What is certain is that, in the short term, defence expenditure among the majority of NATO nations will have to compete more vigorously for funding in an era of depressed economic performance and shrinking public purses. Whilst this will force ever greater levels of cooperation and efficiency between contributing nations, the greater impact upon the Alliance will be felt from any decline in the military capabilities of the United States.

8.2 Future Requirement

8.2.1 Level of Ambition. NATO's Level of Ambition, articulated through the Strategic Concept and subsequent Comprehensive Political Guidance, will drive the future AT requirement. The Alliance's experience in Afghanistan (2003 – present) has confirmed the increasing importance of non-kinetic air effects (including AT) over the more traditional effects of kinetic strike; there is, of course, a requirement for both, although a rebalancing of air forces and attitudes, especially amongst senior ranks and politicians, has finally dawned. Afghanistan has further proved that there is sufficient Tactical AT capability within the Alliance; what is currently lacking is the political will to commit these forces in support of NATO operations.

8.2.2 Burden Sharing. NATO will continue to rely upon the individual member states (and their respective national policies) to provide the Alliance's AT capability. Fortunately, in terms of interoperability, many nations cannot fund the development of platforms in isolation and are forced into similar or collaborative projects. With the increasing complexity of AT platforms comes a financial cost, thus the drive towards more capable but fewer numbers of MRTT aircraft. There is however a critical mass in numbers of physical aircraft required to conduct operations or indeed simultaneous operations (it is after all impossible to be in two places at the same time). As the only nation in NATO with the organic capability to satisfy its own national requirement, the United States also contributes the bulk of NATO's military AT capability with the remainder provided by some, but not all, Alliance members and civilian charter. There is an overwhelming military and political case for European nations to share a larger portion of NATO's AT burden, whether in terms of aircraft, aircrews and/or financial costs. If this issue of burden sharing is not addressed then the danger of a two-tier NATO comes closer and perhaps even questions the relevance (certainly in the interests of the United States) of a North Atlantic Alliance when global economic (and arguably military) power is shifting eastward to the Pacific Rim.

8.3 Organisational Reform

8.3.1 The delivery of an efficient and effective AT capability is subject to the nations' willingness to subordinate national issues of **sovereignty, politics, law and finance.** The requirement for consensus amongst NATO nations (evidently lacking by the continued responsibility for Strategic AT resting with individual

The MV/CV-22 Osprey tilt-rotor aircraft is an exceptionally flexible multi-role platform that will be modified to fulfil key specialised AT requirements well into the future.

nations and by the proliferation in coordinating bodies) suggests that **a truly efficient NATO-led solution is far from imminent** and that the real challenge is to ensure that these disparate organisations (NATO, EU, EATC, MCCE and so on) can **work collectively and at an appropriate operational tempo.** What is not required is yet another layer of expensive bureaucracy at the expense of actual capability.

8.3.2 The concept of **Centralised Command and Decentralised Execution** should be most evident at the tactical level with the Air Component Commander exercising (as a minimum) Operational Control of all in-theatre assets. However, the Afghan operation has again exposed an apparent disunity of effort, with individual nations retaining organic AT for national purposes, often at the expense of collective efficiency.

8.3.3 Recognising that it is neither realistic to expect the current NATO Command Structure to assume Command and Control of NATO's AT capability (perhaps modelled on the United States Transportation Command example) nor to expect any surrender of national sovereignty, the most pragmatic solution must lie within a multinational collaborative approach, an approach certainly favoured by the smaller European nations. The line to take (that of least resistance) would be to expand one or more of the existing models (SAC or EATC), once their effectiveness and efficiency have been demonstrated. The examples chosen, in addition to providing actual AT capability, also enhance interoperability since they are based on either a multinational model (SAC) or on common policies (EATC). However, concern remains that while these models are proven to work in the context of peacetime training and exercises,

The Lockheed P-791 hybrid airship on its first flight, 31 January 2006. Airships are already used for high-altitude surveillance and hybrid airship technology could one day provide a viable low-cost AT solution.

their utility in the face of the inherent risks of operations may be constrained by a lack of political leadership, will and consensus.

8.3.4 A brief analysis of the existing multinational AT organisations confirms the extent of collaborative efforts, which nonetheless fall short of an integrated strategy and solution; the collective approach being effective but less than efficient. The lack of transparency across the spectrum of organisations and visibility of the wider issues (procurement, regulation and legal) constrains these organisations to their individual remits and tasks. As a consequence, and when viewed as a collective, there is obvious duplication and inefficiency in some areas. A more robust stance by NATO (perhaps without the need for total consensus) could potentially increase coordination and collaboration, a concept clearly stated in the latest NATO Strategic Concept for increased coordination and collaboration between NATO and the EU, for example. For the concept to work, in practical terms, reform of the NATO Command Structure and national command and staff structures would need to be addressed.

8.4 Procurement Strategy

8.4.1 The United Kingdom's involvement in Afghanistan and Iraq over the past decade saw a vast increase in the number of Urgent Operational Requirements (UOR) being sought and delivered to equip the UK Armed Forces for the task at hand. This UOR method of procurement greatly reduced the time taken from initial requirement through evaluation to delivery and, although not successful in all cases, did highlight the inertia in the UK's Standard Equipment Programme. Organisational reform of military procurement staffs and processes was required, in addition to a more mature relationship with the civilian defence industry (and their shareholders).

8.4.2 What is required, therefore (and this is by no means unique to the UK), is a more responsive and agile procurement cycle that can exploit current and emerging technologies and which is both affordable and disposable. With all the advances in modern engineering technology and production methods, there can be no excuse in taking 20 years to develop a transport aircraft which, by the time it achieves Full Operational Capability (FOC), has either been superseded or is too expensive to procure in sufficient numbers to fulfil the original requirement. In comparison, the motor industry has seen a significant shift in the funding of vehicles with leasing replacing purchasing. This enables the user to keep pace with emerging technology whilst discarding antiquated and obsolete equipment and ensuring the project is affordable, in the short term. The UK's Future Strategic Tanker Aircraft (FSTA) is a clear example of a Civil Owned Military Operated programme delivering capability (in this case MRTT) quickly with the initial costs borne by the civil partner; what is not so clear is the final cost to the military.

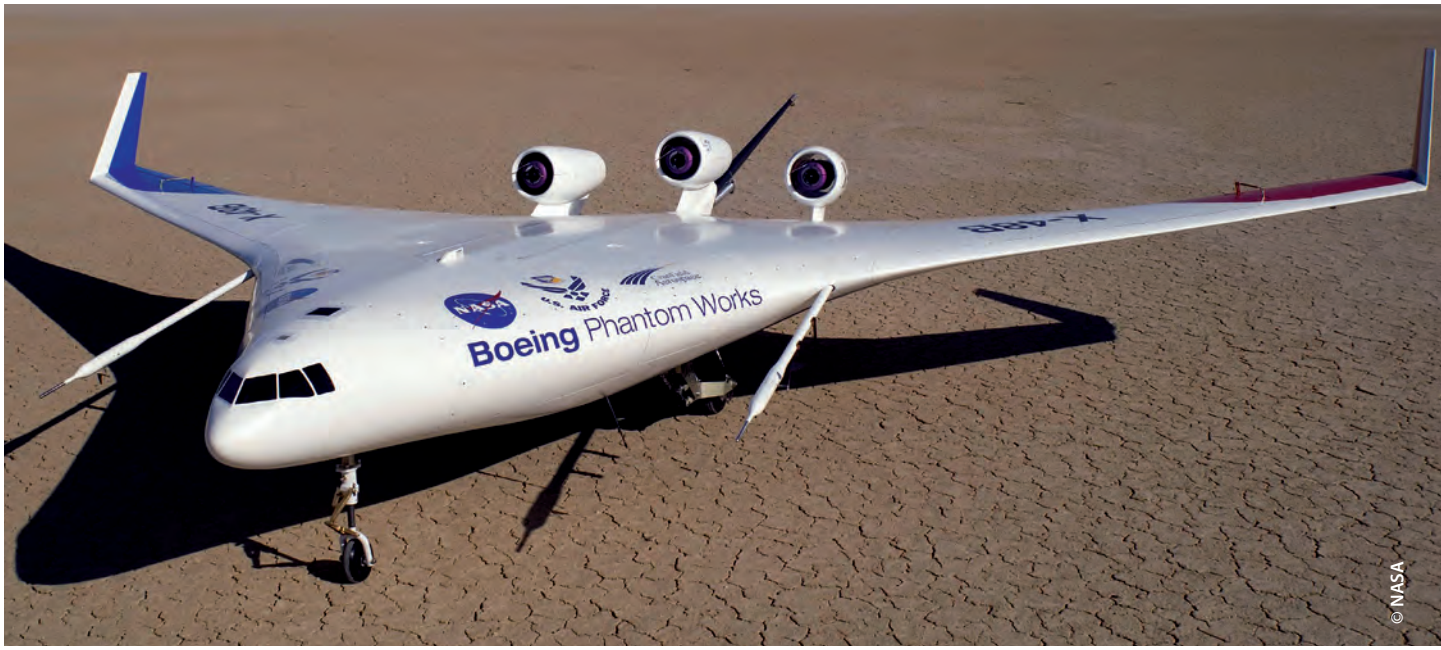
8.4.3 For the smaller nations within NATO, there remains a dearth of useful capability being contributed to the AT effort. The SAC Consortium, and associated

HAW, has demonstrated, albeit with only 3 aircraft, how collective acquisition and operation can be achieved. Only time will tell if the SAC/HAW will prove to be a long-term success and the example to follow, however the consortium has demonstrated a level of political intent to change the *status quo*. A further option is for smaller nations to procure, or lease, any excess in other nations' procurement programmes. For example, the German decision to utilise only 40 of the 53 procured A400M aircraft can be seen as an opportunity for other nations to access the AT market or to increase their own capability. Similarly the EATC has to demonstrate some 'teeth' to convince the sceptics that closer cooperation can be achieved in practice and not just on paper. The collective procurement of the A400M, and the intent to form a multinational unit, must surely aid the aspirational EATC although the organisation has taken 10 years to form and the A400M will not achieve FOC before 2018.

8.4.4 Whichever procurement strategy is followed and whatever commitments NATO assumes beyond the Afghan campaign, it appears likely that the requirement for outsized AT will endure for the majority of European air forces, with the capability being provided by civilian charter (the USAF C-5M upgrade and the C-17 fleet should satisfy the US requirement). Whether SALIS, in its present form, continues as the solution is questionable; Denmark and Canada both left the programme in 2010 in pursuit of national solutions. Fundamental to any civil charter solution is the guaranteed access to outsized AT when in competition with other nations and the civil market. If SALIS proves too expensive (as a guaranteed supplier) then nations will look elsewhere, especially if the US airlift fleet has excess capacity and is available at a more affordable price.

8.5 Future AT Technology

8.5.1 Technology has an important role to play in addressing the future AT requirement but has the power to emasculate man's thinking. Too often technology is mistaken as the solution, rather than as a contributing tool in the resolution of the problem, with an over-reliance on technology potentially resulting in an incorrect outcome. Whilst technology has enhanced other military capability areas, the potential benefits to AT capability appear small in comparison to other capabilities areas. A comprehensive, through-life, AT



The sub-scale X-48B Blended Body technology demonstrator first flew on 20 July 2007. Its designers see it as a manned multi-role, long range, high-capacity military transport aircraft.

capability must include investment in equipment in conjunction with other lines of development[2], with technology making the transition from potential improvement to fielded capability.

8.5.2 With respect to Strategic AT, the primary Air Power attributes of height, speed and reach could potentially be exploited by operating at the edge of the atmosphere or in near space[3] and in utilising emerging hyper-speed propulsion (and fuel) technologies. The use of advanced composite materials could alter the design and performance of AT platforms (for both Tactical and Strategic AT) to enable greater payload capacity, enhanced survivability and self-protection measures and improved aerodynamic performance. Changes to the fundamental design of AT platforms (typically perceived as a flying box with 4 engines) have been mooted before, with the Configurable AT (CAT) concept, a flying fuselage optimised to carry large centreline mounted modules in lieu of significant internal cargo (be it equipment, Command, Control, Communications and Computers, Intelligence Surveillance and Reconnaissance [C4ISR], fuel etc.) or passenger volume. The utility of airships has been revived in the form of aerostats (tethered balloons with ISR sensors for FP and point defence of installations) and the Long Endurance Multi-Intelligence Vehicle (LEMV) will provide high altitude surveillance for US troops in Afghanistan by 2012. Whilst these platforms are primarily designed for ISR, airship technology has been proven to be cost effective as a transport platform from as little as $1,500 per hour for fuel, maintenance and crew, based on a 50-ton payload vehicle.

8.5.3 UAS. The use of UAS is well established in the Combat Air and the ISR domains. However, its use in the AT domain has been restricted to the developmental and concept phases. The exception is in the development of Tactical Rotary-Wing AT platforms which is at a more advanced stage than that of Fixed-Wing concepts. Advances in unmanned Fixed-Wing AT will come once a number of major issues have been resolved; autonomous technical safety and emergency management; approval of unmanned navigation (including sense and avoid) through regulated airspace; and vulnerability from EM interference to the flight controls. However, the most significant step will only occur once public opinion has accepted the use of UAS for cargo and passenger freight. This is most likely to be driven by the civilian commercial market, due to potential economic advantages to the operators, prior to adoption by military air forces.

© NASA Dryden Flight Research Center, Carla Thomas

The Advanced Composite Cargo Aircraft (ACCA) on its first test flight 2 June 2009. The ACCA is a proof of concept technology demonstrator for advanced composite manufacturing processes in a full-scale, certified aircraft.

8.6 Training and Exercising

8.6.1 The title of ATP 3.3.4.3(A), Tactics, Techniques and Procedures (TTPs) for NATO AT Operations is somewhat misleading, the document consisting mainly of procedures only[4]. AT TTPs currently sit with the individual nations, with much of the information classified, from which national syllabuses are developed and trained to. The lack of a common standard for AT training across NATO (to serve as reference for the development of national syllabuses) has resulted in the lack of standardisation in the application of TTPs. This issue may not be as important to Strategic AT (still a national task) but may impact more upon Tactical AT, in which assets are more likely to be delegated to a local command or control level, and any lack in standardisation may prove more critical to interoperability and safety.

8.6.2 In the unlikely event that NATO agrees upon and publishes an AT Employment Manual (similar to Tactical Employment Manual Allied Command Operations [ACO] 80-6) the TTPs contained within it must be thoroughly exercised and evaluated prior to employment on operations. There are however two significant concerns: first, there is a distinct lack of dedicated AT training exercises at the NATO Alliance component level (in comparison to the Tactical Leadership Programme for Combat Air operations); second, there are increasing pressures leading to a reduction in live training activity.

8.6.3 Use of Simulators. The economic and environmental pressures to reduce live training activity has led to an increased appetite for the use of Synthetic Training Equipment (STE) and the Live Virtual Construct combining live and simulated activity. While the use of simulators may appear attractive, one must consider the minimum live activity required for both Flight Safety and for personnel to undergo the physical, psychological and emotional pressures experienced in a demanding operational environment. In addition, one has to consider the training of the supporting elements to the air activity; the Air Traffic Controllers, aircraft engineers, ground equipment handlers and perhaps specific to AT, the movements personnel and in-flight catering. Training exercises are not simply for benefit of the aircrews but to train the team in its entirety. However, in order to take advantage of modern STE there has to be a paradigm shift in attitudes towards simulators and simulator training. The current procedural training on aircraft-specific simulators has to be complemented with operational mission training conducted on a network of distributed Mission Training Devices linking AT platforms to the virtual war.

8.7 Evaluation

8.7.1 The evaluation, assessment and certification of the military combat readiness and capabilities of NRF air forces are conducted in accordance with the ACO Tactical Evaluation (TACEVAL) Programme. ACO Forces Standards Vol VI contains evaluation criteria, guidance and common procedures for scheduling, conducting and reporting evaluations and assessments.

8.7.2 However, in recent years the NATO TACEVAL Programme has concentrated mainly on fighter squadrons and occasionally on Rotary-Wing units. The main reason for NATO not evaluating Tactical AT units is the reluctance of nations to submit AT units for evaluation during the current period of enduring high-tempo operations. NATO has not evaluated any Tactical AT wing in the last 5 years. The number of evaluations and the priority afforded to Tactical AT units must be increased in order to ensure the requisite AT capability is available to in-theatre commanders. The TACEVAL Programme would serve as an assessment in the standardisation of aircraft equipment, aircrews and procedures which would ultimately lead toward greater levels of interoperability.

1. At the time of going to press, NATO is currently involved in seven different missions and operations: Unified Protector in Libya, ISAF in Afghanistan, KFOR in Kosovo, Active Endeavour in the Mediterranean, Ocean Shield in the Horn of Africa, NATO Training Mission in Iraq and supporting African Union peacekeeping efforts. (Source: NATO webpage)
2. United Kingdom MOD Defence Lines of Development (DLODs) are Training, Equipment, Personnel, Infrastructure, Doctrine and Concepts, Organisations, Information and Logistics.
3. There is no clear natural boundary between the atmosphere and space however 100 000 ft would be a practical limit for conventional aviation … The bottom limit of true space is sometime referred to as near space. Innovative platforms might be able to exploit this domain for military use. (Source – The UK Military Space Primer (DCDC) June 2010).
4. The future intent of the NATO Air Transport panel is to subdivide this ATP into three distinct ATPs; AT Operations, Air Movement Operations and Airborne Operations but again will neither address Tactics nor Techniques.

CHAPTER IX

Conclusion and Recommendations

"Please be good enough to put your conclusions and recommendations on one sheet of paper in the very beginning of your report, so I can even consider reading it."[1]
Winston Churchill

9.1 The NATO Requirement

9.1.1 In his final address to NATO in June 2011, the outgoing US Defense Secretary Robert Gates, criticised European governments for failing to reform their armed forces and to prepare them more effectively for operations. Despite having more than two million troops in uniform, non-US NATO states had not only struggled to sustain sufficient numbers of troops in Afghanistan but also "Not just in boots on the ground, but in crucial support assets such as helicopters, transport aircraft, maintenance, Intelligence, Surveillance and Reconnaissance".

9.1.2 In this AT Assessment the JAPCC has made the following observations with respect to AT:

- While on paper there appears to be sufficient AT assets within the Alliance's member nations to achieve NATO's Level of Ambition, the reality is that other factors prevent the fullest exploitation of these assets;

- The majority of European NATO nations have little or no Strategic AT and are reliant upon the US military or civilian charter, furthermore, many nations misuse Tactical AT as a stopgap for their lack of Strategic AT thus impacting on the Tactical AT requirement;

- Where there is Tactical AT capability, there is a lack of political will to surrender sovereignty and collectively commit forces to NATO operations;

- Despite a total of 30 STANAGs, there is a little commonality in equipping AT platforms to the required standards; essentially many are not Fit-For-Purpose for specific NATO operations. The procurement of C-17, C-130J, C-27 and A400M fleets should address this, although procurement remains a national responsibility and will reflect national, and not NATO, priorities.

9.1.3 NATO membership includes a commitment by each nation to contribute a minimum of 2% of their respective GDP to defence; on current trends, only 4 of the 28-nation Alliance will do so, with the United States indicating they are increasingly reluctant to commit US taxpayers' money to fill the gaps in international security left by their (mostly European) allies.

Recommendation: The problem lies in the defence of Europe and, with less reliance on the United States, European nations have to agree collectively on a broad spectrum of credible military capabilities; however, unless political consensus, and political will, support the NATO Level of Ambition, then either a two-tier NATO will emerge or NATO will become increasingly irrelevant. In practical terms, the AT capability can be achieved through a pan-Alliance, pan-European procurement strategy (including investment in technology), balanced air forces with greater emphasis on Combat Support assets, common regulation, increased efficiency of existing assets, a greater appetite to surrender sovereignty/command authority and a reduction in the use of national red cards.

9.2 Regulation

As already stated, there are currently in excess of 30 NATO STANAGs with respect to AT. Whilst the custodianship of each STANAG rest on individuals and nations within the Alliance, coordination of the AT Custodians and all AT related issues lies with the NATO AT Panel which reports to the NATO AOSpWG. However, the AT Panel has no permanent office and the role of Chair is secondary to core national business.

Recommendation: A dedicated AT Coordination Cell should be formed to shape Concepts and Doctrine, to manage and disseminate the various STANAGs/ Standardization Recommendations (STANRECs) and to act as a focal point for all NATO AT issues.

9.3 Training, Exercises and Evaluation

In order to produce the required operational AT output, a comprehensive training strategy must link training objectives to the desired strategic or tactical effect. Training remains, however, the responsibility of the respective nations with no common NATO training syllabus, no common TTPs or Tactics Manual. The training strategy should include exercises during which evaluation of the capability can be conducted noting that live flying activity appears to be in decline, due to economic and environmental pressures, whilst the use of the Synthetic Environment is on the increase. The use of simulators is welcomed; however a minimum level of live activity is required to ensure Flight Safety and to train the whole team and not just the aircrews.

Recommendation: NATO undertakes a comprehensive analysis of Joint and Combined Training, Exercises and Evaluation.

9.4 Increased Cooperation and Coordination

It is highly unlikely that all 28 NATO Nations will ever achieve consensus, surrender sovereignty of AT assets and collectively procure AT equipment. Therefore increased cooperation and coordination between nations to increase the efficiency and effectiveness of national AT assets is the only pragmatic solution. A number of organisations already exist (including the EAG and EATC) for these very functions but each of these organisations currently concentrates on their respective niche area and lacks visibility and information of the entire Alliance AT effort. Furthermore, without the inclusion of the US, this mainly European effort is somewhat meagre in scale with consensus only achieved amongst a handful of nations.

Recommendation: Cooperation and coordination can be maximised through common information, financial and legal agreements. The existing AT entities

A formation of C-130 Hercules aircraft fire off chaff and flare countermeasures over the Nevada Test and Training Range 17 November 2010 during a Mobility Air Forces Exercise.

© Royal Norwegian Air Force

A Royal Norwegian Air Force C-130J deploys soldiers to Souda Bay Air Base as part of the military intervention in Libya, 22 March 2011.

must have visibility of each other's work to minimise inefficiencies, make use of tools such as ATARES as a common currency and, through Technical Agreements/MOU, overhaul Dickensian working practices (Diplomatic Clearances, National Red Cards, NATO holidays, *per diem* payments and so on). Every effort to integrate or connect existing AT organisations will benefit collective efficiency.

9.5 Investment in Technology

AT has lagged behind other domains in the exploitation of current and emerging technologies. Whilst UAS are commonplace in the ISR and Combat Air domains they have yet to mature in the logistic world. Emerging hyperspeed propulsion and fuel technologies will soon become science fact (rather than fiction) yet are rarely mentioned in the context of AT; paradoxically they are mentioned in space transportation. Perhaps an evolution in Air and Space Power thinking is required. However, full exploitation will only be achieved if a radical overhaul of procurement strategies (whether national or collaborative) ensures procurement keeps pace with technology.

Recommendation: In order to maximise the effectiveness and efficiency of AT capability, investment in the application of current, and development of emerging, technologies is required in addition to a common military-industrial strategy.

9.6 Planning Considerations

The attraction of Multi-Role platforms is clear in financial terms and in the inherent flexibility of Air Power. The new generation of Multi-Role AT platforms will be more capable than their predecessors. However, one must caution that Multi-Role is not Swing-Role (i.e. its task cannot be changed once airborne) and that Multi-Role does not necessarily permit concurrent activity (it cannot be in two places at once or undertake different roles at the same time).

Recommendation: Force planners and defence planners should recognise that aircraft can only be allocated to one role during the declaration process. During the operational planning process, Joint Force Commanders will need to provide clear direction to operational planners on the prioritisation of Multi-Role aircraft.

1. It is assumed that experienced readers will turn initially to this Assessment's Conclusions and Recommendations, validating the accuracy of this quotation.

ANNEX A

Acronyms and Abbreviations

AAR	Air-to-Air Refuelling
ACCA	Advanced Composite Cargo Aircraft
ACCS	Air Command and Control System
ACO	Allied Command Operations
ADAMS	Allied Deployment and Movements System
AE	Aeromedical Evacuation
AEWC	Airborne Early Warning Command
AJP	Allied Joint Publication
AMCC	Allied Movement Coordination Centre
ANAIS	ATARES New Accounting and Invoicing System
AOSpWG	Air Operations Support Working Group
ASW	Anti Surface Warfare
AT	Air Transport
ATARES	Air Transport and Air-to-Air Refuelling Exchange of Services
ATP	Allied Tactical Publication
Bi-SC	Bi-Strategic Commands
CARP	Computed Air Release Point
CAT	Configurable Air Transport
CORSOM	Coalition Reception, Staging and Onwards Movement
CSAR	Combat Search And Rescue
DAS	Defensive Aids Suite
DIRCM	Directed Infrared Countermeasures
DLODs	Defence Lines of Development
DoD	Department of Defense
DZ	Drop Zone
EAG	European Air Group
EATC	European Air Transport Command
EATF	European Air Transport Fleet
EDA	European Defence Agency
EM	Electro-Magnetic
EPACS	European Planning And Coordination System
ERO	Engine Running Onload/Offload
EVE	Effective Visibility Execution
EW	Electronic Warfare
FY	Fiscal Year
FOB	Forward Operating Base
FOC	Full Operational Capability
FP	Force Protection
FSTA	Future Strategic Tanker Aircraft
GDP	Gross Domestic Product

GeoLocs	Geographical Locations
HAW	Heavy Airlift Wing
HUD	Head-Up Display
ICC	Integrated Command and Control
IKM	Information and Knowledge Management
IM	Information Management
IR	InfraRed
ISAF	International Security Assistance Force
ISFCC	ISAF Strategic Flight Coordination Centre
ISR	Intelligence, Surveillance and Reconnaissance
IT	Information Technology
JAPCC	Joint Air Power Competence Centre
JOA	Joint Operations Area
LAIRCM	Large Aircraft Infrared Countermeasure
LDM	LOGFAS Data Management Module
LEMV	Long Endurance Multi-Intelligence Vehicle
LOGFAS	Logistic Functional Area Services
LWR	Laser Warning Receiver
LWS	Laser Warning System
LZ	Landing Zone
MAWS	Missile Approach Warning System
MCCE	Movement Coordination Centre Europe
MCRS	Mobility Capabilities and Requirements Study
MEAT	Management European Air Transport
MOU	Memorandum Of Understanding
MPA	Maritime Patrol Aircraft
MRTT	Multi-Role Tanker Transport
MTOW	Maximum Take Off Weight
MWS	Missile Warning System
NAMO	NATO Airlift Management Organisation
NAMSA	NATO Maintenance and Supply Agency
NC3A	NATO C3 Agency
NEAT	Network Enabled Air Transportation
NEO	Non-Combatant Evacuation Operations
NRF	NATO Response Force
NVG	Night Vision Goggles
PCC	Prague Capabilities Commitment
PfP	Partnership for Peace
RF	Radio Frequency

RTD	Radar Towed Decoy
RWR	Radar Warning Receiver
SAC	Strategic Airlift Capability
SALCC	Strategic Airlift Coordination Cell
SALIS	Strategic Airlift Interim Solution
SAR	Search and Rescue
SHAPE	Supreme Headquarters Allied Powers Europe
STANAG	Standardization Agreement
STANREC	Standardization Recommendation
STE	Synthetic Training Equipment
STOL	Short Take-Off and Landing
TACEVAL	Tactical Evaluation
TTP	Tactics, Techniques and Procedures
UAS	Unmanned Air System
UOR	Urgent Operational Requirement
VTOL	Vertical Take-Off and Landing

ANNEX B

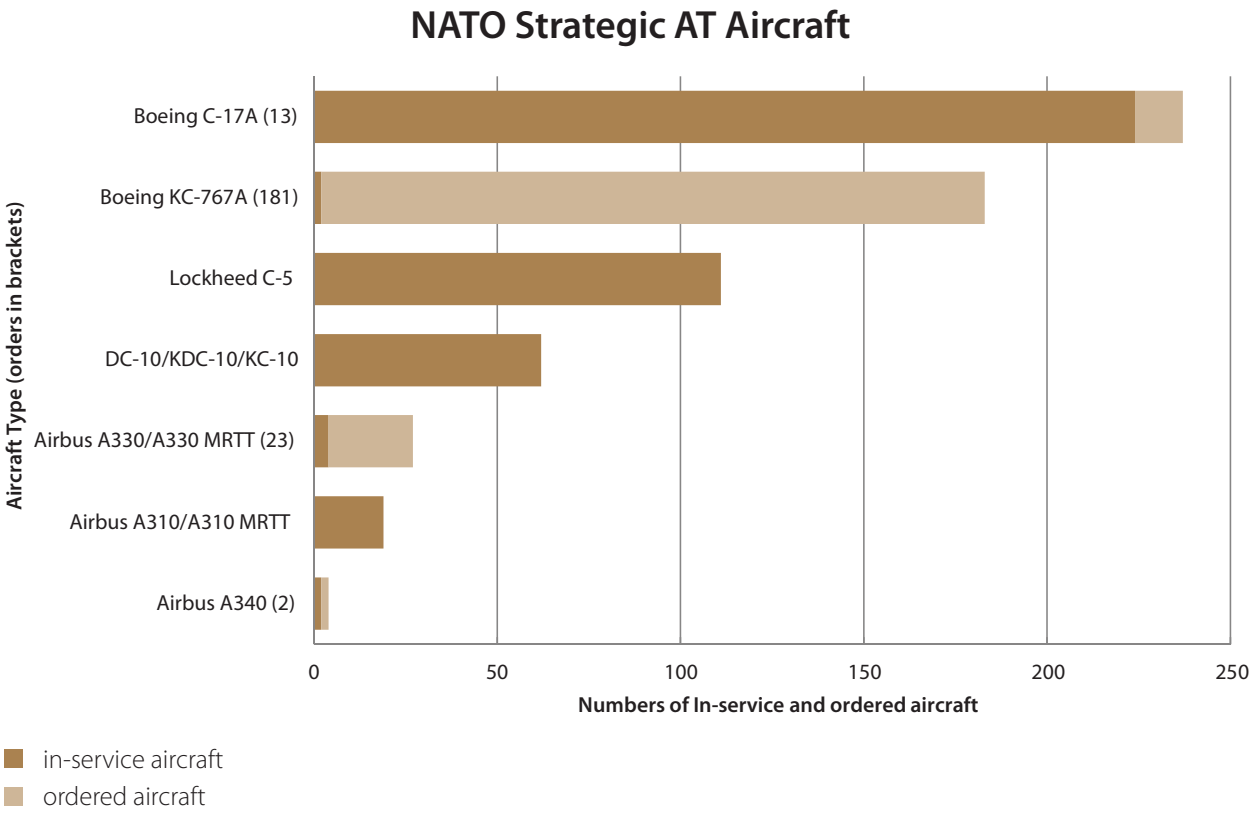
Strategic AT Aircraft

This Annex lists only the major Strategic AT aircraft in use by NATO nations today or in the near future. Included are the commercial An-124 and IL-76 aircraft, due to the important strategic lift capability they provide to NATO nations both today and in the future. It should also be noted that almost half of the aircraft listed in this Annex are MRTT aircraft. The planned orders for MRTT aircraft alone indicate how important it will be to integrate them into AT operations. Omitted from this Annex is the KC-135 aircraft which, though it has played an important role in AT, has primarily been used as a tanker platform. Also missing from this Annex are the numerous different charter aircraft used by many nations to move both personnel and equipment to fulfil national requirements.

Additionally, though the distinction between Strategic and Tactical AT has to do with the Area of Operations rather than aircraft range (as noted in paragraph 1.3.3), the primary characteristic of the aircraft included in this Annex is that they are **large in size and have long-range capabilities**. Many aircraft today are designed to fulfil both Strategic and Tactical AT missions and could fall into either this Annex or the Tactical Aircraft Annex. The final item to note is that roughly 89% of all the NATO Strategic AT aircraft listed in the graph below (including in-service and ordered aircraft) are from the US. If one factors in the A400M orders (certainly capable of strategic movements), the US portion falls to 70%. This reinforces both the importance of the A400M programme to Europe as well as the reliance of NATO upon US AT capability.

Note

The JAPCC has compiled the following information and aircraft data from various open sources and cannot verify the accuracy of the data. In many cases differing values for the same item were found. This Annex should therefore be used for information purposes only.



A310/ A310 MRTT

Manufacturer
Airbus Industries

Quantity in NATO Nations
Belgium (2), Canada (5: 2 MRTT, 3 AT/VIP), France (3), Germany (7: 4 MRTT, 1 AT, 2 VIP), Spain (2)

Airbus A310 MRTT of the German Luftwaffe.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
43.9 m (144 ft)	47.4 m (155.5 ft)	113,999 kg (251,324 lb)	163,998 kg (361,554 lb)

Powerplant

2 x GE CF6-80C2A2 turbofans

Performance

Range
4,350 NM

Take off run
7,700 ft

Cruise speed
529 Kts
Mach: 0.80

Max Ceiling
41,000 ft

Payload

Cargo
36,000 kg (79,366 lb)
or
Passengers
220
or
Aeromedical Evacuation
56 stretchers and 6 intensive care patients

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: Nil

AAR (Receiver) Capable

No

Natural Surface/Austere Airfield Capable

No

Relevant Information

MRTT in service with Royal Canadian Air Force (RCAF) and the German Luftwaffe.

A330-200 MRTT

Manufacturer
Airbus Industries

Quantity in NATO Nations
UK 14 (AirTanker Services Ltd)

RAF A330-200 Voyager MRTT arriving in the UK.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
60.30 m (198 ft)	58.80 m (193 ft)	120,500 kg (265,655 lb)	233,000 kg (514,000 lb)

Powerplant

2 x Rolls-Royce Trent 772B turbofans

Performance

Range
with 40 t payload 4,500 NM

Take off run
8,300 ft

Cruise speed
467 Kts
Mach: 0.82

Max Ceiling
41,500 ft

Payload

Cargo
45,000 kg (99,000 lb)
or
Passengers
390
or
Aeromedical Evacuation
40 NATO stretchers,
20 passengers seats for medical staff
and 100 passenger seats

Defence Systems: Dependent upon National Procurement

RF: TBD	IR: TBD

AAR (Receiver) Capable

Some aircraft

Natural Surface/Austere Airfield Capable

No

Relevant Information

The UK A330 Voyager MRTT will be able to refuel both probe and receptacle receiver aircraft.

A340-211

Manufacturer
Airbus Industries

Quantity in NATO Nations
France (2), Germany (2, planned)

A French Airbus A340 in flight.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
60.3 m (197 ft 10 in)	59.4 m (194 ft 10 in)	192,500 kg (285,500 lb)	253,500 kg (558,875 lb)

Powerplant	Performance	Payload
4 x CFM International 56C	**Range** 8,000 NM **Take off run** 9,900 ft **Cruise speed** 467 Kts Mach: 0.82 **Max Ceiling** 41,100 ft	**Cargo** 44,000 kg (97,005 lb) or **Passengers** 375 (single class)

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: Nil

AAR (Receiver) Capable

No

Natural Surface/Austere Airfield Capable

No

Relevant Information

–

AN 124-100

Manufacturer
Antonov

Nations participating in the SALIS programme
Belgium, Czech Republic, France, Germany, Greece, Hungary, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, the United Kingdom and two PfP nations (Finland and Sweden)

Volga-Dnepr Antonov An-124 Ruslan, Helsinki-Vantaa airport.

Concept
The basic requirement is to retain secured access to six aircraft within a certain time frame: Two aircraft based in Leipzig (Germany) on full time charter and four additional aircraft available based in Kiev and in Ulyanovsk (two in six days and two within nine days). A contract was signed between NAMSA and Ruslan SALIS GmbH, representing ANTONOV ASTC of Ukraine and Volga-Dnepr Airlines of Russia, the two largest operators of the civil An-124-100 aircraft.

General Aircraft Information

Wingspan	Length	Empty Weight	MTOW
73.3 m (240 ft 5 in)	69 m (226 ft 3 in)	181,000 kg (399,025 lb)	392,000 kg (864,200 lb)

Powerplant

4 x Lotarev D-18T turbofans

Performance

Range
2,591 NM
Take off run
8,270 ft
Cruise speed
432–459 Kts
Mach: 0.66–0.69
Max Ceiling
39,380 ft

Payload

Cargo
120,00 kg (264,550 lb) or
Passengers
88 (not available during commercial cargo operations) or
an additional 60 on a palletised seating system or
Aeromedical Evacuation
288 stretchers and 28 attendants

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: Nil

AAR (Receiver) Capable

No

Natural Surface/Austere Airfield Capable

No

Relevant Information

An-124 has two overhead travelling cranes with a combined capacity of 30 tons which operate the length of the fuselage. The aircraft is able to kneel to allow easier front loading.
Note: It has limited pressurisation (3.57 psi) in the main cargo compartment.
An-124-100M upgrade increases max payload to 150,000 kg (330,700 lb), max takeoff weight to 402,000 kg (886,250 lb), range with 120 t payload increased to 2,862 NM.

C-5A/B/C/M

Manufacturer
Lockheed

Quantity in NATO Nations
USA (111)

A USAF C-5 Galaxy on takeoff.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
67.9 m (222 ft 8 in)	75.5 m (247 ft 8 in)	172,370 kg (380,000 lb)	348,000 kg (769,000 lb)

Powerplant

C-5A/B
4 x GE TF39-GE-1C turbofan

C-5M
4 x GE CF6-80C2 turbofan

Performance

Range
2,400 NM

Take off run
8,300 ft

Cruise speed
469 Kts
Mach: 0.77

Max Ceiling
35,700 ft

Payload

Cargo
122,470 kg (270,000 lb)
or
Passengers
81 on upper deck (73 rear deck, 8 forward deck) can be carried simultaneously with cargo (an additional 267 palletised seats can be installed on the main cargo floor)

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: MWS, FLARES, LAIRCM

AAR (Receiver) Capable

Yes

Natural Surface/Austere Airfield Capable

No

Relevant Information

Wartime max takeoff weight: 381,000 kg (840,000 lb). The C-5M 'Super Galaxy' is the last update version as result of C-5 Avionics Modernisation Program (AMP) and Reliability Enhancement and Re-engining Program (RERP).

C-17A

Manufacturer
Boeing

Quantity in NATO Nations
Canada (4), UK (7), USA (210; 223 total ordered), SAC/HAW international unit, Papa, Hungary (3)

A USAF C-17A Globemaster III on a local training flight.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
51.7 m (169 ft 9 in)	53.1 m (174 ft)	128,140 kg (282,500 lb)	265,352 kg (585,000 lb)

Powerplant

4 x Pratt & Whitney F117-100 (PW2040)

Performance

Range
with 160,000 lbs payload 2,400 NM

Take off run
7,600 ft

Cruise speed
450 Kts
Mach: 0.77

Max Ceiling
45,000 ft

Payload

Cargo
77,519 kg (170,900 lb)
or
Passengers
102 paratroopers (using centre line seats), 164 passengers using palletised seating
or
Aeromedical Evacuation
36 Litters and 54 ambulatory patients/attendants

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: MWS, FLARES, LAIRCM

AAR (Receiver) Capable

Yes – Boom Receptacle System

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

C-17A 'ER': Extended range due to the addition of the center wing tank (9,600 gallons) incorporated in production beginning in 2001 with Block 13 aircraft (aircraft built after the 71st aircraft) which increases range to 2,800 NM. Can be used for reverse air-refuelling.

Il-76TD-90

Manufacturer
ILYUSHIN International Aviation Company, production in TAPO plant (Tashkent Office) in Uzbekistan.

Quantity in NATO Nations
Used mainly by different cargo airlines in Eastern Europe.

A TransAVIAexport Airlines Ilyushin Il-76TD in Frankfurt.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
50.5 m (165 ft 7 in)	46.6 m (152 ft 2 in)	72,000 kg (159,000 lb)	195,000 kg (429,901 lb)

Powerplant

4 x PS90A-76 turbofans

Performance

Range
2,322 NM

Take off run
5,906 ft

Cruise speed
420 Kts
Mach: 0.63

Max Ceiling
39,370 ft

Payload

Cargo
50,000 kg (110,231.05 lb)
or
Passengers
120

Defence Systems: Dependent upon National Procurement

RF: Nil for commercial variants	IR: Nil for commercial variants

AAR (Receiver) Capable

No

Natural Surface/Austere Airfield Capable

No

Relevant Information

The IL-76TD-90VD is an improved version of the IL-76TD with new Stage IV ICAO noise compliant engines and updated avionics.

KC/KDC/DC-10

Manufacturer
McDonnell Douglas

Quantity in NATO Nations
The Netherlands (3: 1 DC, 2 KDC), USA (59)

A USAF KC-10 Extender in flight.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
50 m (165 ft 4 in)	54.4 m (181 ft 7 in)	109,328 kg (241,027 lb)	267,600 kg (590,000 lb)

Powerplant	Performance	Payload
3 x F103/GE CF6-50C2	**Range** 4,400 NM **Take off run** 10,000 ft **Cruise speed** 490 Kts Mach: 0.82 **Ceiling** 42,000 ft	**Cargo** 76,560 kg (170,000 lb) or **Passengers** 75 or **Aeromedical Evacuation** 162 patients

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: Nil

AAR (Receiver) Capable

Yes – Boom Receptacle System (except KDC-10)

Natural Surface/Austere Airfield Capable

No

Relevant Information

The KC-10A Extender tanker can deliver 90,719 kg (200,000 pounds) of fuel to a receiver 2,200 statute miles (3539.8 km) from the home base and return.
Operates as MRTT.

KC-767A

Manufacturer
Boeing

Quantity in NATO Nations
Italy (4: 2 in-service, 2 under delivery),
USA (179 as the future KC-46A)

An Italian Air Force KC-767 Tanker aircrew transfers fuel to an F-15.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
47.6 m (156 ft 1 in)	48.5 m (159 ft 2 in)	82,377 kg (181,610 lb)	179,169 kg (395,000 lb)

Powerplant

2 x GE CF6-80C2 turbofan

Performance

Range
6,358 NM

Take off run
7,550 ft

Cruise speed
460 Kts
Mach: 0.80

Max Ceiling
40,100 ft

Payload

Cargo
30,000 kg (66,130 lb)
or
Passengers
200
or
Aeromedical Evacuation
TBD

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: TBD

AAR (Receiver) Capable

Yes – Boom Receptacle System

Natural Surface/Austere Airfield Capable

No

Relevant Information

As an MRTT this platform can refuel Boom Receptacle receivers on the Centreline Boom and probe receivers on the Wingpod Hoses.
Italy is expected to receive it's last two aircraft with DIRCM system and will upgrade the other two aircraft.

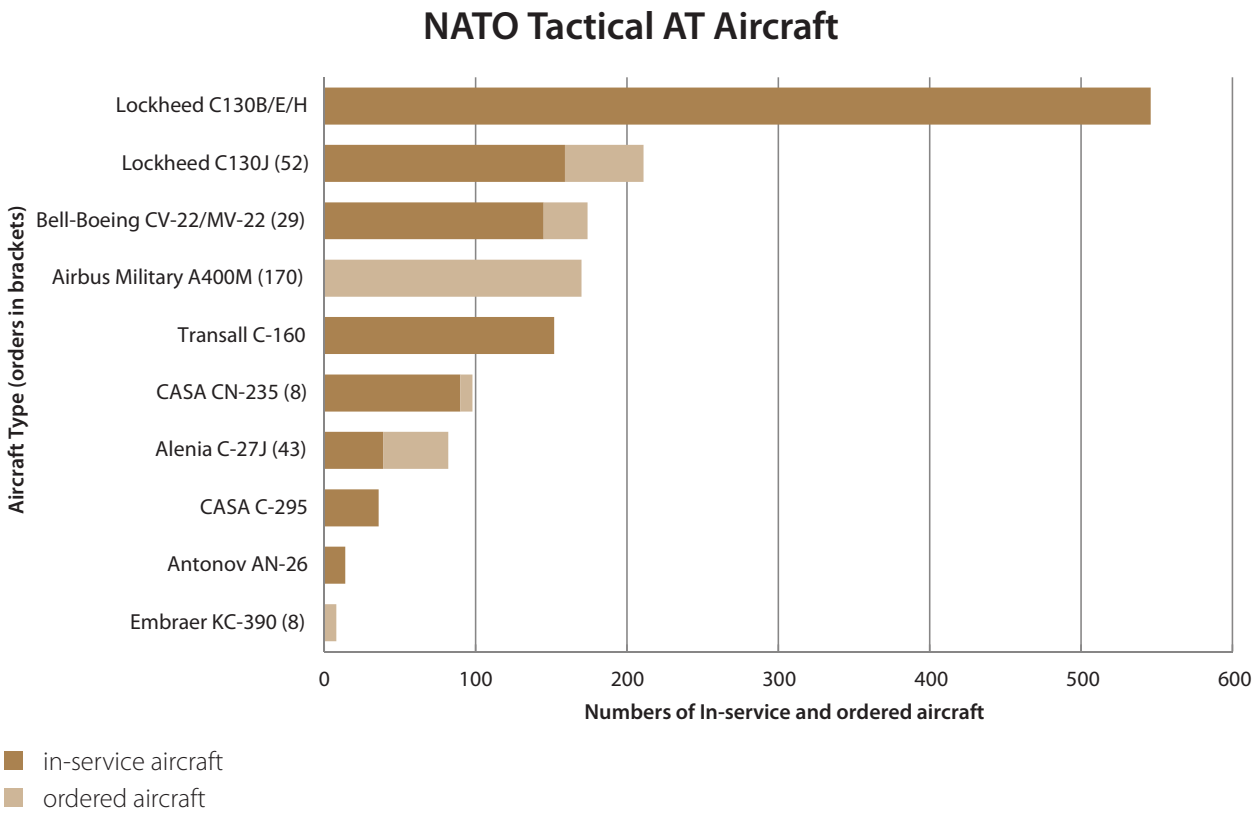
ANNEX C

Tactical AT Aircraft

This Annex lists only the major Tactical AT aircraft in use by NATO nations today or in the near future. The C-130 aircraft is clearly the most numerous Tactical AT aircraft in NATO. However, many of the older C-130 aircraft will have to be replaced soon. This is also true for the majority of the C-160 aircraft. The newer C-130J, C-27J, and CN235, as well as the A400M and even KC-390, will all play increasingly important roles in the Tactical AT arena for NATO.

Note

The JAPCC has compiled the following information and aircraft data from various open sources and cannot verify the accuracy of the data. In many cases differing values for the same item were found. This Annex should therefore be used for information purposes only.



A400M

Manufacturer
Airbus Military, EADS (European Aeronautic Defence and Space Company).

Quantity in NATO Nations
Orders from: Belgium (7), France (50), Germany (53), Luxembourg (1), Spain (27), Turkey (10), UK (22)

An Airbus A400M during a demo flight.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
42.4 m (139 ft 1 in)	45.1 m (148 ft)	76,500 kg (168,654 lb)	141,000 kg (310,850 lb)

Powerplant

4 x EuroProp International TP400-D6 turboprop

Performance

Range
1,781 NM

Take off run
3,048 ft

Cruise speed
420 Kts
Mach 0.68–0.72

Ceiling
37,000 ft

Payload

Cargo
37,000 kg (82,000 lb)
or
Passengers
116 fully equipped troops/paratroops
or
Aeromedical Evacuation
66 stretchers

Defence Systems: Dependent upon National Procurement

RF: RWR, CHAFF, TRD	IR: MWS, FLARES, DIRCM

AAR (Receiver) Capable

Yes-Probe and drogue

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

Can operate as MRTT with optional AAR Kits: A two-point trailing drogue system can be installed within two hours by fitting two standard Air-to-Air Refuelling pods (optional) to the multi-role attachment points on the wings. A centre-line pallet-mounted hose drum unit can be fitted in the rear cargo bay.

AN-26

Manufacturer
Oleg K. Antonov Design Bureau.

Quantity in NATO Nations
Bulgaria (2), Hungary (5), Romania (4), Slovakia (1), Croatia (2 An-32 variant)

Bulgarian Air Force AN26.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
29.2 m (95 ft 9 in)	23.8 m (78 ft 1 in)	15,020 kg (33,113 lb)	24,000 kg (52,911 lb)

Powerplant	Performance	Payload
2 x IvchenkoAI-24VT turboprop	**Range** 594 NM **Take off run** 2,330 ft **Cruise speed** 237 Kts **Max Ceiling** 24,600 ft	**Cargo** 5,500 kg (12,125 lb) or **Passengers** 40 or **Aeromedical Evacuation** 24 stretchers

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: Nil

AAR (Receiver) Capable

No

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

An-32 is a developed version of An-26 with some changes in the airframe and more powerful engines.
The payload capability is also improved: cargo 6,700 kg (14,770 lb).

C-27J

Manufacturer
Alenia Aeronautica, Italy
(A Finmeccanica Company).

Quantity in NATO Nations
Bulgaria (3), Greece (12; 4 on delivery), Italy (12), Lithuania (3), Romania (2; 5 on delivery), Slovakia (2 on order plus 1 optional), USA (7; 38 total ordered)

A C-27J Spartan in flight.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
28.7 m (94 ft 2 in)	22.7 m (74 ft 5 in)	17,000 kg (37,479 lb)	31,800 kg (70,107 lb)

Powerplant	Performance	Payload
2 x Rolls-Royce AE 2100-D2A turboprop	**Range** with 9,000 kg of payload 1,000 NM **Take off run** 1,9000 ft **Cruise speed** 318 Kts **Max Ceiling** 30,000 ft	**Cargo** 9,842 kg (21,700 lb) or **Passengers** 60 or 46 Para troops or **Aeromedical Evacuation** 36 Stretchers

Defence Systems: Dependent upon National Procurement

RF: RWR, CHAFF, RTD	IR: MAWS, LWS, DIRCM, FLARES

AAR (Receiver) Capable

Yes

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

Feasibility study underway by manufacturer to support national special forces operations.

C-130B/E/H

Manufacturer
Lockheed Martin

Quantity in NATO Nations
B model: Greece (5), Romania (4) and Turkey (6);
E model: Canada (10), Poland (5), Turkey (7);
H model: Belgium (11), Canada (13), France (14), Greece (10), Portugal (6), Romania (1), Spain (12), Netherlands (4), UK (9), USA (429 in total E and H variants)

Turkish Air Force C-130E flying over Hirfanli Dam Lake in November 2009.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
40.4 m (132 ft 6 in)	29.8 m (97 ft 9 in)	34,400 kg (75,800 lb)	69,750 kg (155,000 lb)

Powerplant	Performance	Payload
B 4 x T56-A-7 turboprob **E** 4 x T56-A-7 turboprob **H** 4 x Allison T56-A-15 turboprop	**Range** 2,046 NM (H model) **Take off run** 3,580 ft **Cruise speed** 325 Kts **Max Ceiling** 33,000 ft	**Cargo** 19,090 kg (42,000 lb) or **Passengers** 92 (64 para troops) or **Aeromedical Evacuation** 74 stretchers

Defence Systems: Dependent upon National Procurement

RF: RWR, CHAFF, JAMMER	IR: MAWS, FLARES

AAR (Receiver) Capable

Some USA and UK models. Canada and Spain have 5 aircraft with AAR tanker capability (drogue).

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

C-130H-30 model: stretched version of the C-130H; France (9), Netherlands (4), Portugal (3), Spain (1) and UK (5). Specialised variants: KC-130 (Tanker), EC-130H (Compass Call), HC-130H (Search and Rescue), MC-130H (Combat Talon), WC-130H (Weather Recon), LC-130 (Antarctic), AC-130H (Spectre Gunship), AC-130U (Spooky Gunship), other: firefighter.

C-130J

Manufacturer
Lockheed Martin

Quantity in NATO Nations
Canada (9; 17 total ordered), Denmark (4), Italy (21), Norway (4), UK (24), USA (133; 175 total ordered)

An Italian Air Force C-130J in flight.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
40.4 m (132 ft 6 in)	29.8 m (97 ft 9 in)	34,274 kg (75,562 lb)	79,378 kg (175,000 lb)

Powerplant

4 x Rolls-Royce
AE 2100D3 turboprop

Performance

Range
with 15,876 kg payload 2,835 NM

Take off run
3,050 ft

Cruise speed
348 Kts

Max Ceiling
36,560 ft

Payload

Cargo
18,995 kg (41,790 lb)
or
Passengers
92 (64 para troops)
or
Aeromedical Evacuation
74 stretchers

Defence Systems: Dependent upon National Procurement

RF: RWR, CHAFF	IR: MAWS, FLARES, LAIRCM

AAR (Receiver) Capable

Yes – USA (receptacle), UK and Italy (probe and drogue)

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

C-130J-30 is a stretched version of the C-130J with increased payload: Cargo: 21,770 kg (47,330 lb), passengers up to 128 (92 para troops) or AE configuration with 97 stretchers.

Specialised variants: KC-130 (Tanker), EC-130J (Commando Solo), HC-130J (Coast Guard), MC-130J (Combat Shadow), WC-130J (Weather Recon), AC-130J (Gunship) not yet in the USAF inventory, other: firefighter.

C-160

Manufacturer
Transall

Quantity in NATO Nations
France (51), Germany (81), Turkey (20)

French C-160 operating on a natural surface runway.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
40.0 m (131 ft 3 in)	21.4 m (106 ft 3 in)	29,000 kg (63,935 lb)	51,000 kg (112,435 lb)

Powerplant	Performance	Payload
2 x Rolls-Royce Tyne Rty.20 Mk 22 turboprop	**Range** with 16,000 kg of payload 1,000 NM **Take off run** 3,609 ft **Cruise speed** 268 Kts **Max Ceiling** 27,000 ft	**Cargo** 16,000 kg (35,275 lb) or **Passengers** 93 (61–88 Para troops) or **Aeromedical Evacuation** 62 stretchers

Defence Systems: Dependent upon National Procurement

RF: RWR, CHAFF	IR: MWS, FLARES

AAR (Receiver) Capable

Yes (some blocks only)

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

Specialised variants: The C-160G Gabriel is a Signals Intelligence variant. C-160H Astarte is a submarine communications relay aircraft utilised by the French Navy. The upgraded C-160NG features a fixed refuelling probe and can be converted to air refuelling tanker aircraft.

C295M

Manufacturer
Airbus Military, EADS. Originally: CASA (Construcciones Aeronáuticas SA)

Quantity in NATO Nations
Czech Republic (4), Poland (11), Portugal (12) (7 M and 5 Persuader), Spain (13)

Spanish Air Force C295M during a paratrooper launch.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
25.8 m (84 ft 8 in)	24.4 m (80 ft 2 in)	11,000 kg (24,251 lb)	23,200 kg (51,150 lb)

Powerplant

2 x Pratt & Whitney PW127G turboprop

Performance

Range
with 10,000 lb payload 2,300 NM

Take off run
2,200 ft

Cruise speed
260 Kts

Max Ceiling
25,000 ft

Payload

Cargo
9,250 kg (20,400 lb)
or
Passengers
71 troops or 48 para troops
or
Aeromedical Evacuation
27 stretchers (12 stretcher intensive care unit configuration)

Defence Systems: Dependent upon National Procurement

RF: RWR, CHAFF	IR: MAWS, FLARES

AAR (Receiver) Capable

Yes-probe and drogue

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

Specialised variants: MPA, ASW (Persuader), Search and Rescue (SAR), Airborne Early Warning and Command (AEWC).

CN235

Manufacturer
Airbus Military, EADS. Originally: Joint venture between CASA and Indonesian Manufacturer IPTN, which formed the Airtech company to manage the programme.

Quantity in NATO Nations
France (18), Spain (20), Turkey (52)

Two Turkish Air Force CN235 flying in formation.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
25.8 m (84 ft 8 in)	21.4 m (70 ft 2 in)	9,800 kg (21,605 lb)	16,502 kg (36,380 lb)

Powerplant	Performance	Payload
2 x GE CT7-9C3 turboprop	**Range** with 10,000 lb payload 1,230 NM **Take off run** 1,325 ft **Cruise speed** 245 Kts **Max Ceiling** 25,000 ft	**Cargo** 6,000 kg (13,200 lb) or **Passengers** 44 or 36 paratroopers or **Aeromedical Evacuation** 18 stretchers

Defence Systems: Dependent upon National Procurement

RF: Nil	IR: Nil

AAR (Receiver) Capable

No

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

The C-295 and CN-235 share the same basic airframe design with two different cabin lengths.
Specialised variants: MPA, Cartographic

KC-390

Manufacturer
Embraer, Brazil.

Quantity in NATO Nations
Orders from Portugal (6)
and Czech Republic (2)

Artist's impression of Embraer's KC-390 Tactical AT aircraft refuelling two AMX fighter-bomber aircraft.

General Aircraft Data (expected)

Wingspan	Length	Empty Weight	MTOW
35.1 m (115 ft)	33.9 m (111 ft 3 in)	TBD	81,000 kg (178,574 lb)

Powerplant

2 x International Aero Engines (IAE)
V2500-E5 turbofans

Performance

Range
1,320 NM

Take off run
TBD

Cruise speed
300 Kts

Max Ceiling
36,000 ft

Payload

Cargo
20,865 kg (46,000 lb)
or
Passengers
80

Defence Systems: Dependent upon National Procurement

RF: TBD	IR: TBD

AAR (Receiver) Capable

Yes-probe and drogue

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

Special variants: MRTT, Firefighting

MV/CV-22B OSPREY

Manufacturer
Bell-Boeing

Quantity in NATO Nations
USA (145; 174 total ordered)

A USAF CV-22 hovers in-flight.

General Aircraft Data

Wingspan	Length	Empty Weight	MTOW
15.5 m (50 ft 11 in) **with rotors** 25.8 m (84 ft 7 in)	17.5 m (57 ft 4 in) w/o AAR probe	15,177 kg (33,459 lb)	STOL 27,442 kg (60,500 lb) VTOL 21,545 kg (47,500 lb)

Powerplant	Performance	Payload
2 x Rolls-Royce Allison T406/AE 1107C-Liberty turboshafts	**Range** with STO and 4,536 kg payload 950 NM **Take off run** 0 ft **Cruise speed** 241 Kts at sea level **Max Ceiling** 24,700 ft	**Cargo** 9,072 kg (20,000 lb) of internal cargo, or up to 6,804 kg (15,000 lb) of external cargo (dual hook) or **Passengers** 24 troops (seated), 32 troops (floor loaded)

Defence Systems: Dependent upon National Procurement

RF: RWR, CHAFF, JAMMER	IR: LWR, MAWS, FLARES, DIRCM

AAR (Receiver) Capable

Yes-probe and drogue

Natural Surface/Austere Airfield Capable

Yes

Relevant Information

Multi-mission capability: amphibious assault, combat support, long-range special operations infiltration/exfiltration, transport, search and rescue, MEDEVAC, and, in the future, as a tanker.

ANNEX D

NATO AT Standardization Agreements (STANAGs)

1. **STANAG 2087 (Ed. 6)** *Medical Employment of Air Transport in the Forward Area.*

2. **STANAG 2471 (Ed. 3)** *Chemical Contamination Control for Airlift Operations.*

3. **STANAG 2506 (Ed. 2)** *Allied Joint Movement and Transportation Doctrine – AJP-4.4(A).*

4. **STANAG 3345 (Ed. 6)** *Data/Forms for Planning of Air Movements.*

5. **STANAG 3400 (Ed. 4)** *Restraint of Cargo in Fixed-Wing Aircraft.*

6. **STANAG 3465 (Ed. 6)** *Safety, Emergency and Signalling Procedures for Military Air Movement – Fixed-Wing Aircraft.*

7. **STANAG 3466 (Ed. 3)** *Responsibilities of Air Transport Units and User Units in the Loading and Unloading of Transport Aircraft in Tactical Air Transport Operations.*

8. **STANAG 3467 (Ed. 3)** *Characteristics of Air Transport (Air Landed) Pallets for Carriage Internally.*

9. **STANAG 3469 (Ed. 3)** *Parachute Extractor Assemblies and Aircraft Extractor Parachute Ejector Installation.*

10. **STANAG 3527 (Ed. 3)** *Aircrew Fatigue Management.*

11. **STANAG 3534 (Ed. 6)** *Airfield Lighting, Marking and Tone Down Systems For Non-Permanent/Deployed Operations.*

12. **STANAG 3543 (Ed. 5)** *Air Transport Cargo/Passenger Handling Systems – Request for Information.*

13. **STANAG 3548 (Ed. 3)** *Tie-down Fitting on Air Transported and Airdropped Equipment and Cargo Carried Internally by Fixed-Wing Aircraft.*

14. **STANAG 3570 (Ed. 5)** *Drop Zones and Extraction Zones – Criteria and Markings.*

15. **STANAG 3616 (Ed. 3)** *Responsibility for the Design and Provision of Adaptors necessary for the Compatibility of Air Cargo Loading, Securing, Unloading or Dropping Systems in Fixed-Wing Aircraft.*

16. **STANAG 3700 (Ed. 7)** *Allied Joint Doctrine for Air and Space Operations – AJP-3.3 (A).*

17. **STANAG 3739 (Ed. 4)** *Combined Air Terminal Operations.*

18. **STANAG 3767 (Ed. 2)** *Exchange of Data on Load Capabilities of Transport Aircraft.*

19. **STANAG 3771 (Ed. 4)** *Ground Security Measures against Aircraft Sabotage/Hijacking.*

20. **STANAG 3774 (Ed. 4)** *Control Procedures for Pallets and Associated Restraint Equipment used in Combined Air Transport Operations.*

21. **STANAG 3778 (Ed. 2)** *Performance Criteria for Honeycomb Paper used as Energy Dissipating Materiel.*

22. **STANAG 3854 (Ed. 3)** *Policies and Procedures Governing the Air Transportation of Dangerous Cargo.*

23. **STANAG 3922 (Ed. 3)** *Airdrop Systems for Personnel and Supply/Equipment – ATP-46(A).*

24. **STANAG 3998 (Ed. 4)** *Tactics, Techniques and Procedures for NATO Air Transport Operations – ATP-3.3.4.3(A).*

25. **STANAG 3998 (Study)** *Tactics, Techniques and Procedures for NATO Air Transport Operations – ATP-3.3.4.3(B).*

26. **STANAG 4441 (Ed. 1)** *Manual of Safety Principles for the Transport of Military Ammunition and Explosives – AASTP-2.*

27. **STANAG 7025 (Ed. 3)** *Air Traffic Management and Control of Minimum Operating Strips (MOS) Operations.*

28. **STANAG 7057 (Ed. 1)** *Exchange of Data on the Multi-Modal Documentation of Cargo.*

29. **STANAG 7109 (Ed. 3)** *High Altitude Aerial Delivery Systems (HAADS) and Procedures.*

30. **STANAG 7134 (Ed. 1)** *Control of Lighting at Airfields during NVG Operations.*

31. **STANAG 7147 (Ed. 1)** *Aeromedical Aspects of Night Vision Device (NVD) Training.*

32. **STANAG 7166 (Ed. 1)** *Air Forces Logistic Doctrine and Procedures – ALP-4.3 (ALP-13).*

33. **STANAG 7190 (Ed. 2)** *Procedures for Cross-Parachuting Authorisation.*

34. **STANAG 7197 (Ed. 1)** *The use Of Night Vision Goggles (NVG) during NATO Air Transport Operations.*

35. **STANAG 7207 (Study)** *Allied Doctrine for Air Transport – ATP 3.3.4. Vol I.*

36. **STANAG 7213 (Study)** *Air Transport Air Movement Operations.*

37. **STANAG 7214 (Study)** *Air Transport Airborne Operations.*

Joint Air Power Competence Centre

von-Seydlitz-Kaserne
Römerstraße 140 | 47546 Kalkar (Germany) | www.japcc.org