Next generation aeromedical evacuation: the C-17 Globemaster

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Abstract

- The introduction of the C-17 Globemaster is a major development in the capability of the Australian Defence Force, both in its role as a long-haul heavy airlifter, and in the improved responsiveness and range of aeromedical evacuation (AME) services it can provide.
- Coupled with the improvements initiated following responses to humanitarian disasters such as the Bali bombing, the C-17 will ensure that the Royal Australian Air Force remains a world leader in strategic AME.
- Development of the C-17 long-range strategic AME capability is a high priority for RAAF health services over the coming months.

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THE ROYAL AUSTRALIAN AIR FORCE strategic aeromedical evacuation (AME) capability has been shaped both by operational imperative and by developments in aircraft technology. With these developments, Australian Defence Force operational health support has itself been changed by an improved ability to reach forward and transport injured troops.

At the height of World War II, the large numbers of casualties and high altitude terrain of Papua New Guinea posed serious logistical problems for ADF health staff. The introduction of mass transport aircraft such as the Douglas C-47 Dakota, which was designed to carry 18 litters and three medical attendants, allowed the creation of specialist AME units. Each unit had integral health staff and equipment to move seriously ill patients back to Australian hospitals. This capability allowed rapid clearance of casualties from the front lines and significantly reduced the level of health support necessary at that level.[1] Just before the Vietnam conflict, which again saw Australian servicemen being injured in large numbers and requiring transport home from much greater distances, the C-130A, with its pressurisation and greater range and payload, was introduced and adopted as the AME platform of choice,[2] later followed by the C-130E. This led to the aeromedical system we know today, and turned the RAAF from amateurs into true AME professionals.

The Defence Health Service personnel of this century have again faced new challenges and changes to the operational environment. The Bali bombings of 2002 and subsequent humanitarian responses by the ADF have provided a huge catalyst for change in RAAF AME, with the development of an enhanced AME capability and a new approach to RAAF expeditionary health.[3] As a consequence of such responses, the Australian public expect the RAAF to rescue not only ADF troops, but any Australian injured away from our shores. With the acquisition of our newest airframe, the C-17 Globemaster, the ADF will be even better prepared to meet that challenge.

The RAAF C-17

On 3 March 2006, the Minister for Defence, Dr Brendan Nelson, announced the acquisition of up to four C-17 Globemaster aircraft for the ADF. The first of these arrived in Canberra to an official welcome on 4 December 2006, and is now stationed with 36 Squadron at RAAF Base Amberley. The second aircraft is due for delivery in mid 2007, and the final two aircraft by mid 2008. 36 Squadron was previously located at Richmond and equipped with C-130H aircraft, but

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The RAAF C-17 Globemaster lands at RAAF Base Amberley for the first time.

moved to Amberley on 17 November 2006 as the new C-17 squadron.

All initial training for the aircrew is being conducted with the United States Air Force (USAF) at Altus Air Force Base in Oklahoma. Likewise, the maintenance personnel are being trained by the USAF at McChord Air Force Base in Seattle or Charleston Air Force Base in South Carolina.

The USAF has operated the C-17 for more than 10 years, and its current areas of operations include the Middle East, Afghanistan and the Antarctic. It has been the platform of choice to carry severely injured troops out of Iraq for the past 4 years, and is a vital component of the USAF's highly successful global aeromedical system, which has revolutionised military medicine and saved many lives.[4] As of March 2006, the USAF had successfully transported 25 000 injured service personnel in the C-17, and the airframe had collectively logged more than a million flying hours.[5] Importantly, the C-17 mission completion success probability rate is an impressive 92%.[6] The Royal Air Force has been operating four of the aircraft via a leased arrangement for about 5 years, and is considering purchasing five aircraft. Canada and other NATO countries are also planning to acquire the C-17 in the very near future.

Aircraft specifications

The C-17 is a long-range, air-refuellable, heavy logistic transport aircraft, capable of operating into and out of short runways and austere airfields while carrying oversized payloads. The aircraft is capable of landing on semi-prepared runways as short as 900 m (3000 feet), and taking off from a 2300 m (7600 feet) airfield carrying a payload of 72 600 kg (160 000 pounds).[7] Its role as a responsive global airlifter significantly enhances and complements the existing airlift capability in the ADF. It can carry three to four times as much cargo as the C-130 aircraft over longer distances and in a shorter time. Additionally, it is equipped to conduct aerial delivery operations and support AME.

The C-17 allows the ADF to transport cargo that cannot be carried in the C-130. For example, many of the Australian Army vehicles and helicopters can now be transported and arrive at the destination in a ready-to-fight configuration. Additionally, when supporting human relief operations, equipment such as large generators and water purifying units or level 3 deployable health facilities can be carried.

The C-17 is manufactured by Boeing Corporation at their Long Beach facility in California. The aircraft has a minimum crew complement of two pilots and one loadmaster, and has passenger seating for 102 personnel. It can be fitted with a comfort pallet and/or palletised seating. The comfort pallet includes two flushable lavatories (airline style), three refrigerators, four ovens, hot water, and storage space.[8]

Aeromedical specifications

Three aeromedical stations, each designed to accommodate three litters, are stowed permanently in the cargo compartment. Complete installation includes these three litter

With its increased load-carrying capacity, the C-17 can carry both patients and cargo, providing improved flexibility to the ADF.

stations and an additional nine litter stations, for a total of 36 litter positions in the aircraft. Maximum seating in the cargo compartment with a full litter complement is still 102 seats.

The stations have a free-standing design. The litters are supported by horizontal arms attached to vertical stanchions. Each litter has a rated load capacity of 110 kg (250 pounds), which includes the weight of the patient and equipment.

The stations include a utility panel that provides each litter position with a nurse call button, general illumination light, and a dropdown passenger oxygen mask. Pressing the call button turns on a station indicator light on top of the utility panel and a nurse call light at the forward loadmaster station, and rings a chime over the public address system.

Provisions for each station include structural hardpoints and electrical and oxygen hookups. There are 12 emergency descent oxygen outlets to accommodate the aeromedical stations — six on each cargo compartment sidewall. There are also five therapeutic or respirator oxygen outlets located on the right cargo compartment sidewall, allowing oxygen hookup for patients requiring special treatment, but oxygen masks, hoses, regulators, and other equipment necessary to administer therapeutic oxygen are not provided with the aircraft. Six electrical accessory outlet panels supply 28 V DC and 115 V AC/60 Hz electrical power to the aeromedical stations.

The C-17 versus the C-130

Surprisingly, given its increased load-carrying capacity, the actual litter-carrying capacity of the C-17 (36 litter patients in the full configuration, less if ventilated patients are included) is far less than that of the C-130. A C-130J in full AME configuration can carry 97 litter patients. However, with only two seats left for health attendants, this would not be conducive to good clinical care. In practice, and particularly with seriously injured patients, the numbers carried are far less. For example, although missions of up to 52 patients occurred during the Vietnam War,[9] the largest load in recent RAAF history was the second flight from Bali after the bombings in 2002, which involved 22 patients.[10] Additional numbers of less severely injured patients (the "walking wounded") can be carried in the C-17 in more comfort than in the C-130. This limitation is therefore unlikely to be a major issue, but needs to be factored into operational health planning.

In all other aspects, the advantages of the C-17 far outweigh those of the C-130. This is because, although AME is a secondary mission, the C-17 is probably the first platform in the RAAF in which AME was considered in the aircraft design. It is faster, quieter, has less vibration and better temperature control, and is much more spacious, providing a better clinical environment for both patient and carer.[11] It provides greater flexibility in the operational scenario as, unlike the C-130, the full AME configuration does not completely fill the aircraft cargo bay, so non-medical cargo can also be carried. The integral oxygen and electrical supplies reduce the need to carry supplementary oxygen tanks and power supplies. The litter patient has much more room than in the C-130, and all the comforts of a hospital bed (with the exception of a mattress).

The basic aeromedical configuration in the C-17.

Nevertheless, the C-130 with the addition of the deployable aeromedical retrieval and transport system (DARTS) is still an excellent AME platform, and will supplement the C-17 AME capability in the foreseeable future, because of the small number and high projected workload of the C-17 aircraft.

Developing a RAAF C-17 AME capability

An AME capability consists of more than just the airframe and litter stations. It includes specialist medical and other equipment, trained personnel who are familiar with the airframe and its AME equipment, and a robust organisation and system to support it. Headquarters Health Services Wing (HQHSW) is undertaking several activities to ensure that a C-17 AME capability is in place when the aircraft becomes fully operational later this year.

The Australian C-17 has been not been greatly modified from its US counterparts, so any equipment used in the aircraft must meet the USAF airworthiness criteria. This includes all aeromedical equipment, and most current RAAF equipment has not been cleared for use. The HQHSW logistics cell is developing a list of equipment that has been cleared, so this can be purchased. At the same time, training staff at HQHSW and Operational Health Support and Training Flight are developing packages and plans to train and familiarise ADF health personnel on the C-17. It is also hoped that a small cadre of staff will be able to undertake training with the USAF.

Development of an enhanced AME capability in the C-17 is essential, as it is planned that each aircraft will carry up to six intensive care patients (plus 15 medium dependency litter patients in this configuration). Unfortunately the DARTS, which was designed and built for the C-130, is not immediately compatible with the C-17. Although some of the features of the DARTS, such as the aeromedical oxygen and electrical supply, are already integral to the C-17 litter stations, elements such as a framework to secure electrical equipment are not. Several options are being assessed to fulfil this role.

What the C-17 means to the ADF

The RAAF already has a world-class AME system, as has been proven repeatedly over the years. With the introduction of the C-17 and the enhancements initiated post-Bali,[3] the evolution that began with the Dakotas of World War II will continue, allowing the RAAF to remain world leaders in the field. Most significantly, it will allow the ADF to increase the global reach of its AME capability and the ability to respond quickly and decisively whenever disaster strikes, particularly when Australians are involved. Even more importantly, it provides reassurance to our troops, with the knowledge that high quality ADF health services can reach out to them from home, no matter where they are called to serve.

Competing interests

None identified.

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