

Casualty Evacuation in the Australian Defence Force

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Introduction

This article is the latest of a series regarding the role of occupational and environmental medicine in the ADF.^{1,2,3,4,5,6}

These articles, as well as a recent Productivity Commission inquiry,⁷ indicate that high workplace illness and injury rates confirm the need to improve the management of hazards associated with ADF workplaces, with better emphasis on prevention. To this end, a submission by the Royal Australasian College of Physicians to the aforementioned inquiry advocated this would best be achieved by basing the ADF's health services on a systems-based occupational health strategic model.⁸

Doing so would have to entail reassessing the fundamental inputs to capability⁹ for both Joint Health Command and Defence's Work Health and Safety Branch. The current state of the ADF's occupational and environmental health services, and the small number of specialist practitioners within the Australasian Faculty of Occupational and Environmental Medicine, suggests that a mature model would take 10–15 years' sustained effort.¹⁰

This article expands on these papers, with respect to the application of a strategic-level systems-based occupational health model to the ADF's casualty evacuation capabilities.

Definitional clarifications

The term 'casualty evacuation' (casevac) can be differentiated from 'medical evacuation' (medevac), in that unlike the former, medevacs use dedicated vehicles (whether road, sea or air),¹¹ and are protected by the Geneva Protocols.¹²

In addition, for the purpose of this article, the term 'dedicated' refers to purpose-built and -operated medevac platforms, while 'designated' refers to platforms with multimission capabilities that can include conducting casevacs when required.

ADF overseas operations and other deployments requiring ADF casevac support

Table 1 describes the ADF's current overseas operations as of 10 May 2019.

However, Table 1 does not include short-term recurrent operations such as GATEWAY (Australia's contribution to the preservation of regional security and stability in the northern Indian Ocean and South China Sea), SOLANIA (Australia's contribution to maritime surveillance within the Pacific Region), or RENDERSAFE (disposal of World War II-era explosive remnants from South Pacific island nations).¹³ It also does not include 'one-off' overseas operations in response to specific incidents, such as assisting

Table 1: Current ADF global operations as of 10 May 2019¹

Operation	Location	Personnel	Government Mandate
ACCORDION	Middle East Region	500	Ongoing
ASLAN	Sudan	25	Reviewed annually
MANITOU	Middle East Region	240	Ongoing
MAZURKA	Egypt	27	Ongoing
OKRA	Middle East Region and Iraq	600	Ongoing
PALADIN	Israel/Lebanon	12	Reviewed Annually
RESOLUTE	Australian Maritime Interests	600	Ongoing
HIGHROAD	Afghanistan	300	Ongoing
AUGURY - PHILIPPINES	Philippines	100	Reviewed annually
	Total	2404	

the response to the Fukushima nuclear accident in 2011,¹⁴ the Indian Ocean search for MH370 in 2014,¹⁵ or Operation FIJI ASSIST following Typhoon Winston in 2016.¹⁶

Table 1 also excludes ADF members who undertake overseas deployments without being force-assigned to any of these operations. For example, approximately one-third of Navy's 14 000 personnel are posted to ships at any one time for up to two years, of whom about a third (up to 1600 personnel), are at sea or visiting overseas ports. Only about 500 of these seagoing Navy personnel are force-assigned to the operations per Table 1.¹⁷ It is likely that Army and Air Force have significant numbers of their own personnel in similar circumstances.

It is therefore estimated that at present, strategic casevac support is routinely required for at least 3500 ADF personnel. However, even this figure does not include up to 1300 additional ADF members aboard each of Navy's two Landing Helicopter Dock (LHD) ships, which would increase the number of personnel requiring strategic casevac support to over 6000, or well over double that per Table 1.¹⁸

While there are no numbers available regarding forward or tactical casevac, there were approximately 70 ADF casevac back to Australia in 2017, 20 per cent of which were perhaps from *non*-Table 1 operations and other deployments.¹⁹ It is therefore estimated that the ADF currently conducts about 20 strategic AMEs per thousand deployed members per year.

In addition to its own personnel, the ADF has also deployed overseas to evacuate civilian casualties, notably the 2002²⁰ and 2005²¹ Bali bombings.

ADF operations and exercises within Australia requiring ADF casevac support

ADF personnel often undertake exercises and other activities within Australia that may require casevac support. For example, Exercise TALISMAN SABRE 2015²² resulted in 48 strategic casevac, while Exercise HAMEL 2016²³ had 54.²⁴ While these casevac were for routine conditions, the 1996 midair collision between two Army Blackhawks during a routine training exercise at the High Range Training Area near Townsville, led to 18 fatalities and 12 casevac.²⁵ In addition, a main machinery space fire aboard HMAS *Westralia* in 1998, at the beginning of an otherwise routine non-exercise deployment from HMAS *Stirling*, resulted in four deaths and five casevac ashore.²⁶

Exceptions aside,²⁷ ADF operations within Australia typically entail disaster relief tasks such as flood

relief in Queensland in 2012²⁸ and bushfire relief in NSW in 2013;²⁹ the largest such operation at present remains Operation NAVY HELP DARWIN after Cyclone Tracy in 1974.³⁰ Although casevac have usually not been required for participating ADF members during these operations, they have been conducted for assisted civilians,^{31,32,33,34} because unlike the ADF's casevac services, civilian medevac organisations are not intended, and are therefore generally unable, to move large numbers of patients simultaneously.

Finally, a routine requirement exists to return 'garrison' personnel to their home locations when they are ill or injured elsewhere (typically during courses). Virtually all intra- and interstate 'garrison' patient transfers use regular public transport aircraft (with or without a medical escort),³⁵ or civilian aeromedical providers such as the Royal Flying Doctor Service.³⁶



Stretcher fit, commercial passenger aircraft.³⁷ Note how one stretcher case uses the same space as six seats.

Casevac platforms

Casevac platforms can be characterised by the land, sea or air environments in which they operate.

Operational and exercise land ADF casevac within Australia and overseas generally use dedicated off-road-capable wheeled^{38,39,40} or tracked⁴¹ ambulances vehicles, while 'garrison' land casevac typically use dedicated Service or civilian road ambulances or patient transport vehicles.⁴²



Bushmaster ambulance, Urban Operations Training Facility, Shoalwater Bay Training Area, Exercise TALISMAN SABRE 2009.⁴³ Note the benign nature of the terrain in this instance.

Every RAN Fleet unit can conduct surface maritime casevacs using Rigid Hull Inflatable Boats (RHIBs)⁴⁴ or General Purpose Inflatable Boats (GPIBs),⁴⁵ while amphibious Fleet units also have organic landing craft.^{46,47} However, RHIBs and GPIBs are only marginally fit-for-purpose (especially for stretcher cases), while the scarcity and other high-priority demands on landing craft makes it is unlikely that they would ever be solely dedicated for casevac. Furthermore, the significant weather and sea state limitations of all these platforms, and alternative means of moving casualties between ships (such as light jackstay), usually mean that if possible, forward and tactical maritime casevacs are best conducted by air.



Launching a RHIB, Unit Readiness Evaluation, HMAS Toowoomba, 2019.⁴⁸ The difficulties, dangers and limitations associated with moving stretcher cases via this means should be apparent.

Ocean-going ships were used during both World Wars for strategic casevac from overseas, and to move casualties between Australian ports.⁴⁹ Extended transit times of up to three months meant they required comprehensive on-board treatment services. For example, although she was the smallest Australian hospital ship in WWII and was only intended to evacuate Army casualties from Port Moresby to Brisbane, MV *Centaur* still required 65 permanently embarked medical personnel, to staff 252 beds plus an operating theatre, dental surgery, laboratory and pharmacy for up to 18 days.⁵⁰

By comparison, 252 stretcher cases can be evacuated over the same route today in seven C-17 sorties of 3 hours 15 minutes flight duration, each carrying up to 36 stretcher patients and 8–10 health staff, plus additional medical and aircrew personnel for fatigue management purposes.^{51,52,53} Although additional sorties would be required to move intensive care cases (maximum six per C-17, medical and nursing staff permitting) it should be remembered that such cases from either World War would not have survived long enough to require evacuation.



Strategic aeromedical evacuation from Germany in a RAAF C-17 Globemaster III, 2011.⁵⁴ Note the amount of space required for one intensive care casualty.

The 1982 South Atlantic War led to the educational cruise liner SS *Uganda* being used as a hospital ship, and the Royal Navy's hydrographic survey vessels *Hecla*, *Herald* and *Hydra* as 'ambulance ships' for medevacs from the South Atlantic to Montevideo in Uruguay. This was necessary because of the short range of the UK Task Force rotary-wing aircraft within the South Atlantic area of operations, and the non-availability of airfields capable of accepting fixed-wing aircraft until the Port Stanley airport had been recaptured.⁵⁵ The mismatch between the huge distances within Australia's area of direct security interest (up to one tenth of the Earth's surface, or 51 million km²),⁵⁶ and the limited range of the ADF's rotary-wing casevac aircraft that cover this area, indicates that if no suitable fixed-wing airfields are available, this remains the case even in the 21st century.⁵⁷

All three Services have a range of rotary- (Navy^{58,59} and Army^{60,61,62}) and fixed-wing (Air Force^{63,64,65}) aircraft, most of which can be fitted with a comprehensive range of stretcher fits and other medical equipment.⁶⁶ However, other high-priority demands mean that they are rarely exclusively dedicated for casevac purposes.



Australian Army Special Forces tactical aeromedical evacuation using a US Army UH-60 Black Hawk, Task Force WOLFPACK, Tarin Kowt Afghanistan, 2010.⁶⁷ Note the Red Cross marking indicating its dedicated medevac status: the ADF is unlikely to employ its own such aircraft for combat operations.

The plethora of ADF platforms that can be used for casevac purposes (especially for amphibious operations, where combinations of some or all of these assets may be employed anywhere along the casevac chain), and their non-dedicated (and sometimes not even designated) status, supports basing casevac management on a systems-based occupational health model that premises *each* casevac mission as a discrete workplace.

Casevac hazards

The environments in which these casevac platforms operate have their own occupational and environmental hazards. Examples regarding land casevac include those associated with off-road terrain and on-road traffic,⁶⁸ while surface maritime casevac include the effects of weather and sea state among other seagoing hazards,⁶⁹ some of which are also shared with air casevac in addition to other aviation hazards.⁷⁰ Additionally, the lack of Geneva Protocol protection means casevac can also face operational hazards from enemy action that may threaten the mission, the platform, the personnel and the casualties.^{71,72}

In order to manage the risks posed by these hazards, the planning, conduct and monitoring of casevac missions is highly contingent on ADF health staff not only having the aforementioned high degree of clinical acumen (in particular advising when casevac is *not* required), but also a comprehensive understanding of each platform's capabilities and limitations, as well as the environments in which they operate. This requires dedicated training for the on-scene health staff who request casevac, the headquarters health staff who assess each request and plan, implement and otherwise control casevac missions, and the health staff who provide the en route clinical care. Furthermore, all these health staff need to work closely with the crews who operate these platforms, and the non-health headquarters staff who command and control them.

These considerations all support basing casevac management on a systems-based occupational health model that premises *each* casevac mission as a discrete workplace.

Casevac training

While no formal land casevac training is provided for ADF health officers, medics from all three Services undergo such instruction during the ADF Medic's Course, conducted via the Army Logistic Training Centre at Bandiana. Likewise, although there is no formal maritime casevac training, all Navy medics receive the same basic seamanship instruction as

other entrants at the RAN Recruit School at HMAS *Cerberus*. Selected Navy medics also receive maritime casualty regulation instruction (see below) during the Clinical Manager's Course at the RAN Medical School at HMAS *Penguin*. The RAN Medical School also provides instruction for selected non-health personnel on how to initiate casevac, during their two-week Minor War Vessel Health Care Provider's Course. Similar courses exist for Army special forces and other ADF personnel.

All Air Force and some Navy and Army medical officers undergo aviation medicine training at the Institute of Aviation Medicine, at RAAF Base Edinburgh. This training includes basic modules on the aviation medicine aspects of fixed- and rotary-wing aircraft casevac. Selected medical officers undergo further aviation medicine training in the UK.

All Air Force health officers and medics undergo additional fixed-wing casevac training at the Health Operational Conversion Unit (HOCU) at RAAF Base Richmond. HOCU also provides a Rotary-Wing Aeromedical Evacuation Course for Navy and Army health personnel, using Army (and sometimes Navy) aircraft. However, this course is primarily focused on ensuring personnel safety when working in and around helicopters, rather than actual in-flight clinical care.

The limitations of simulation aids such as mock-up or permanently grounded aircraft, with respect to aviation hazards such as noise, wind blast, and proximity to rotors, propellers and jet exhaust, mean that all these courses still need actual aircraft on which to conduct at least some of the training.

The hazards associated with working around all these platforms, and the environments in which they operate, demonstrate the extent to which even *clinical* casevac training requires at least *some* occupational health awareness.

Casevac regulation

A key misconception within the general ADF population and the wider Australian community, is that military casevac are only conducted for battle casualties and other medical emergencies. In fact, most ADF casevac are conducted for *non-urgent* patients who are either unlikely to resume their normal duties per their operational mission within an acceptable timeframe, or require treatment that may not be particularly urgent, but is simply not available in situ.

In support of this assertion, a previous paper notes that 81 per cent of the 62 087 US military medical

evacuations from the Middle East area of operations in the 10 years from October 2001 were for diseases and non-battle injuries, of which about half were musculoskeletal injuries, mental disorders and ill-defined conditions.⁷³

The highly variable degree of patient acuity (hence levels of care required) therefore mean that the primary aim of an efficient and effective casualty evacuation system, is to move the *right* casualties, at the *right* time, in the *right* order, by the *right* means, to the *right* destination medical facilities, with the *right* level of en route clinical care. Casualty regulation ensures that casualties are evacuated directly to health facilities that can not only deal with the numbers they receive, but can also provide the appropriate treatment. The intent is to balance the rate of effort of *both* the evacuation *and* treatment systems, while minimising the number of times that each casualty has to be handled.⁷⁴

These requirements further reinforce the extent to which a high degree of clinical acumen is required, not only by the ADF health staff who request and/or conduct casevac missions, but also the headquarters health staff who assess incoming casevac requests, and then plan, direct and otherwise control which patients move when, by what means, to which destination medical facility and with what level of en route care.

Hence, casualty regulation is far broader in scope than simply being an administrative function, particularly with respect to (again) clinical decision making as to when casevac are *not* required. Balancing these clinical requirements against the aforementioned occupational, environmental and operational hazards reinforces the extent to which the scope of casualty regulation remains entirely consistent with a strategic-level systems-based occupational health model.

Implications

This paper has already explained why the need to premise *each* casevac mission as a discrete workplace should be based on:

- the plethora of available ADF land- sea- and air-casevac platforms and their non-dedicated (and sometimes not even designated) status
- how the operational, environmental and operational hazards change with each casevac mission
- the extent to which casualty regulation is far broader in scope than simply being an administrative function

- the extent to which clinical staff require at least some awareness of the occupational hazards associated with working around or in their particular casevac platform.

Furthermore, as previously indicated, it is estimated that the ADF presently conducts about 20 strategic AMEs per thousand deployed ADF members per year. This rate will vary depending on factors such as:

- The standard of medical pre-deployment personnel preparation.
- The range of clinical services (capabilities) and capacities (numbers) of the supporting deployed health assets.
- The casualty holding policy, which dictates how long patients are to be retained by the support health assets before either returning them to duty, or evacuating them.

All of these factors depend on the occupational, environmental and operational health risks of each exercise, operation or deployment, the assessment of which is an occupational and environmental health function, irrespective of whether or not it is formally recognised as such.

Another factor affecting strategic AME rates pertains to the deployability status of members with known pre-existing medical conditions. The author has previously highlighted the importance of applying a risk management approach that balances the medical and operational risks posed by deploying such personnel in the first place, against the less-well-acknowledged yet still significant adverse effects of preventing such members from deploying who *can* in fact be deployed.⁷⁵ Applying this approach is likewise an occupational and environmental health function.

Conclusion

With ADF personnel arguably exposed to the most diverse range of occupational and environmental hazards of any Australian workforce, high rates of preventable workplace illness and injury indicate the need to improve the management of occupational and environmental health hazards, with better emphasis on prevention rather than treatment. This suggests the need for substantially revised fundamental inputs to ADF health capability, in order to base them on a genuinely holistic and sustainable systems-based occupational health strategic model.

Among other requirements, the ADF's ability to undertake forward, tactical and strategic casevac is dependent on platforms and deployable health

personnel with the relevant clinical skills and equipment, which can evacuate Service and/or civilian patients, in the right order, by the right means, to the right destination medical facilities, with the right levels of en route care, seamlessly by land, sea, and or / air. This requires a risk management approach by the on-scene health staff and other personnel who request casevac, the headquarters health staff who assess these requests and then plan, implement and otherwise control the responding mission(s), and the health staff who actually conduct them. All ADF health staff therefore require a comprehensive understanding of each platforms' capabilities and limitations and the environments in which the platforms operate.

Such an approach is therefore consistent with, and should be based on, the aforementioned model.

Author

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His seagoing service includes HMA Ships *Swan*, *Stalwart*, *Success*, *Sydney*, *Perth* and *Choules*. Deployments include DAMASK VII, RIMPAC 96, TANAGER, RELEX II, GEMSBOK, TALISMAN SABRE 07, RENDERSAFE 14, SEA RAIDER 15, KAKADU 16 and SEA HORIZON 17. His service ashore includes clinical roles at *Cerberus*, *Penguin*, *Kuttabul*, *Albatross* and *Stirling*, and staff positions as J07 (Director Health) at the then HQAST, Director Navy Occupational and Environmental Health, Director of Navy Health, Joint Health Command SO1 MEC Advisory and Review Services, and Fleet Medical Officer.

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Disclaimer

The views expressed in this article are the author's, and do not necessarily reflect those of the RAN, or any of the other organisations mentioned.

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References

- 1 Westphalen N. 'Occupational and environmental medicine in the Australian Defence Force', Australian Defence Force Journal. 2016 Nov/Dec;200:49–58, available from http://www.defence.gov.au/ADC/ADFJ/Documents/issue_200/Westphalen_Nov_2016.pdf.
- 2 Westphalen N, 'Primary health care in the Australian Defence Force', Australian Defence Force Journal, 2017 Jul/Aug;202:91–7, available from http://www.defence.gov.au/adc/adfj/Documents/issue_202/Westphalen_July_2017.pdf.
- 3 Westphalen N, 'Assessing medical suitability for employment and deployment in the Australian Defence Force', Australian Defence Force Journal. 2018 Jan;203:67–74, available from http://www.defence.gov.au/adc/adfj/Documents/issue_203/ADF_per_cent20Journal_per_cent20203_Article_Westphalen.pdf.
- 4 Heslop DJ, Westphalen N. 'Medical CBRN Defence in the Australian Defence Force', Journal of Military and Veteran's Health. 2019 Jan;27(1):66–73, available from <https://jmvh.org/wp-content/uploads/2019/01/Compensation-in-the-Australian-Defence-Force.pdf>.
- 5 Westphalen N. 'Compensation in the Australian Defence Force', Journal of Military and Veteran's Health. 2019 Jan;27(1):58–65, available from <https://jmvh.org/wp-content/uploads/2019/01/Compensation-in-the-Australian-Defence-Force.pdf>.
- 6 Westphalen N. 'Rehabilitation in the Australian Defence Force', Journal of Military and Veteran's Health, 2019 Oct;27(41):7–14, available from <https://jmvh.org/article/rehabilitation-in-the-australian-defence-force>.
- 7 Productivity Commission, 'Draft report: A better way to support veterans and their families'. 2018 Dec, available from <https://www.pc.gov.au/inquiries/current/veterans/draft/veterans-draft.pdf>. It is essential to note this report uses the term 'veteran' to refer to current as well as ex-serving ADF members.

- 8 Productivity Commission, 'RACP submission to the draft Productivity Commission report 'A Better Way to Support Veterans'. 2019 Feb, available from https://www.pc.gov.au/data/assets/pdf_file/0003/236811/subdr234-veterans.pdf.

Disclaimer: the author was requested to draft this submission, as a member of the AFOEM Policy and Advocacy Committee (PAC). It was cleared by both the Faculty and College PACs prior to submission.

- 9 Department of Defence, 'Defence Capability Development Handbook'. 2012, available from <http://www.defence.gov.au/publications/DefenceCapabilityDevelopmentHandbook2012.pdf>.

This reference describes the following Fundamental inputs to (in this case health) Capability (FiCs).

- Personnel
 - Organisation
 - Collective training
 - Facilities
 - Supplies
 - Major systems
 - Support
 - Command and management.
- 10 Royal Australasian College of Physicians, 'Occupational and Environmental Medicine', available from <https://www.racp.edu.au/trainees/advanced-training/advanced-training-programs/occupational-and-environmental-medicine>.
- 11 Global Security.org, 'Chapter 6: Casualty Evacuation Operations', available from <https://www.globalsecurity.org/military/library/policy/army/fm/1-113/CH6.HTM>.
- 12 International Committee of the Red Cross, 'The Geneva Conventions of 1949 and their Additional Protocols', available from <https://www.icrc.org/en/document/geneva-conventions-1949-additional-protocols>.
- 13 Department of Defence 'Global Operations', available from <http://www.defence.gov.au/operations>.
- 14 Perrett B. '[Royal Australian] Air Force C-17s Hauling Water Cannon To Fukushima', Aviation Week Network, 2011 March 23, available from <http://aviationweek.com/awin/raaf-c-17s-hauling-water-cannon-fukushima>.
- 15 Department of Defence, 'Defence involved in search for MH370', Annual Report 2013–14, available from <http://www.defence.gov.au/annualreports/13-14/features/feature-defence-involved-in-search-for-mh370.asp>.
- 16 Department of Defence, 'Operation Fiji Assist—first test of new Defence capabilities', available from <http://www.defence.gov.au/AnnualReports/15-16/Features/09-OperationFijiAssist.asp>.
- 17 This estimate is based on crew numbers for one Major Fleet Unit (MFU) undertaking Operation MANITOU in the Middle East (160–220 personnel); two MFUs and several Minor War Vessels (MWVs) undertaking Operation RESOLUTE (320–440 personnel), and at least one deployed submarine (58 personnel each).
- 18 [Royal Australian] Navy – Serving Australia with Pride, 'Amphibious Assault Ship (LHD)', available from <http://www.navy.gov.au/fleet/ships-boats-craft/lhd>.
- 19 HQJOC strategic AME database (only available on Defence intranet). 2017 figures were only for the period Jan–Aug. Strategic AMEs averaged 102.6 per year from 2013 to 2016.
- 20 The Bali bombing incident on 12 Oct 02 killed 202 (including 88 Australians) and injured 209 people. Five RAAF C-130 transport aircraft, 12 crews and five AME teams were deployed in response. This involved the triage, stabilisation and evacuation of 66 critically ill patients from Bali to Darwin over 21 hours. Following stabilisation in the Royal Darwin Hospital, four C-130s transferred 35 patients over 16 hours to various centres in Australia, under direction from Emergency Management Australia. See Hampson GV, Cook SP, Frederiksen SR. 'Operation Bali Assist', ADF Health. 2003 April;4(1).

- 21 The Bali bombing incident on 01 Oct 05 killed 20 people and wounded over 100 more. Two RAAF C-130s, with an aeromedical evacuation team, surgical team, medical staging facility and co-ordination element, evacuated 22 casualties and some of their family members to Darwin. See Australian Disaster Resilience Knowledge Hub, 'Criminal - Bali Bombings', available from <https://knowledge.aidr.org.au/resources/criminal-bali-bombings>; also Sydney Morning Herald, 'Deadly blasts rip through Bali', 2005 Oct 03, available from <https://www.smh.com.au/world/deadly-blasts-rip-through-bali-20051003-gdm66o.html>.
- 22 Department of Defence, 'Exercise Talisman Sabre 2017', available from <http://www.defence.gov.au/Exercises/TS17>.
- 23 [Australian] Army, 'What is Exercise HAMEL?', available from <https://www.army.gov.au/our-work/major-exercises/exercise-hamel-2016/what-is-exercise-hamel>.
- 24 HQJOC strategic AME database (only available on Defence intranet).
- 25 [Australian] Army, 'Blackhawk Board of Inquiry: Documents for Public Release'. 1997 March 03 [copy held by author].
- 26 Department of Defence, 'Report of the Board of Inquiry into the fire in HMAS Westralia on 5 May 1998: Report / Annexes', Volume 1, Canberra: Defence Publishing Services. 1998.
- 27 Exceptions include the ADF security operations in support of the Commonwealth Heads of Government Regional Meeting after the 1978 Hilton Hotel bombing, the 1982 Brisbane Commonwealth Games, and the 2000 Sydney Olympics. See Lewis D. 'Guarding Australians Against Terrorism: The Role of the Australian Defence Force's Special Operations Command', Australian Army Journal. 2003;1(2):45-52, available from https://www.army.gov.au/sites/g/files/net1846/f/aa_j_2003_2.pdf.
- 28 [Australian] Army, 'Emergency Support Force to South East Queensland 2012', available from <https://www.army.gov.au/our-work/community-engagement/disaster-relief-at-home/emergency-support-force-to-south-east-0>.
- 29 Department of Defence, 'NSW Bushfire Assist', available from <http://www.defence.gov.au/operations/nswbushfireassist/home.asp>.
- 30 Mitchell B. [Australian] Navy – Serving the Nation with Pride, 'Disaster Relief - Cyclone Tracy and Tasman Bridge', available from <http://www.navy.gov.au/history/feature-histories/disaster-relief-cyclone-tracy-and-tasman-bridge>.
- 31 Department of Defence, 'Remediation Force concludes recovery effort', available from <http://www.defence.gov.au/Operations/PastOperations/nswbushfireassist>;
- 32 Lahey K. 'Defence force helps Queensland on road to recovery', Australian Journal of Emergency Management. 2011;26(3), available from <https://ajem.infoservices.com.au/items/AJEM-26-03-05>.
- 33 Mitchell B. [Australian] Navy – Serving the Nation with Pride, 'Disaster Relief - Cyclone Tracy and Tasman Bridge', available from <http://www.navy.gov.au/history/feature-histories/disaster-relief-cyclone-tracy-and-tasman-bridge>.
- 34 Hamilton E. 'Airlifted to safety: As Bundaberg went under water, hospital patients were evacuated to drier ground in Brisbane', Air Force News, 2013 February 14;55(2):2-3, available from http://airforcenews.realviewdigital.com/?iid=73795&xml=defencenews_airforce.xml
- 35 Qantas, 'Medical Assistance', available from <http://www.qantas.com/travel/airlines/medical-assistance/global/en>.
- 36 Royal Flying Doctor Flying Service, 'Patient transfers', available from <https://www.flyingdoctor.org.au/what-we-do/patient-transfers>.
- 37 Bucher Aircraft Interior Systems, '**Stretchers:** Patient transport made easy', available from <https://bucher-group.com/products/medical-systems/stretchers>.
- 38 [Australian] Army, 'Australian Light Armoured Vehicle', available from <https://www.army.gov.au/our-work/equipment-and-clothing/vehicles/australian-light-armoured-vehicle>.
- 39 [Australian] Army, 'Bushmaster', available from <https://www.army.gov.au/our-work/equipment-and-clothing/vehicles/bushmaster>.
- 40 [Australian] Army, 'G-Wagon', available from <https://www.army.gov.au/our-work/equipment-and-clothing/vehicles/g-wagon>.

- 41 [Australian] Army, 'M113AS4 Armoured Personnel Carrier', available from <https://www.army.gov.au/our-work/equipment-and-clothing/vehicles/m113as4-armoured-personnel-carrier>.
- 42 Patient transport vehicles are differentiated from ambulances, in that the former are not suitable for responding to emergencies. See St John Ambulance, 'Patient Transport Service', available from <http://www.stjohnambulance.com.au/ambulance-and-health-services/patient-transfer-service>.
- 43 Department of Defence, '20090719adf8262658_472', available from <https://images.defence.gov.au/assets/archives/5003-All-Defence-Imagery/?q=AME>
- 44 [Royal Australian] Navy – Serving the Nation with Pride, 'Rigid-Hulled Inflatable Boat (RHIB)', available from <http://www.navy.gov.au/fleet/ships-boats-craft/other-vessels/rhib>. The RHIB website photos in particular demonstrate their marginal suitability for stretcher cases, particularly if operational requirements preclude removing the seats.
- 45 Some minor Fleet units and submarines only have General Purpose Inflatable Boats: see Navy – Serving the Nation with Pride, 'General Purpose Inflatable Boat (GPIB)', available from <http://www.navy.gov.au/fleet/ships-boats-craft/other-vessels/gpib>. It can be seen that similar issues with respect to using RHIBs for casualty evacuation also pertain to GPIBs.
- 46 [Royal Australian] Navy – Serving the Nation with Pride, 'LHD Landing Craft (LLC)', available from <http://www.navy.gov.au/fleet/ships-boats-craft/other-vessels/lcm1e>; and
- 47 [Royal Australian] Navy – Serving the Nation with Pride, 'Landing Craft, Vehicle and Personnel (LCVP)', available from <http://www.navy.gov.au/fleet/ships-boats-craft/other-vessels/lcvp>. It is noteworthy that neither the LLC nor the LCVP webpages refer to casualty evacuation.
- 48 Department of Defence, '20190320ran8604878_003', available from https://images.defence.gov.au/assets/archives/5003-All-Defence-Imagery/?q=20190320ran8604878_003
- 49 During WWI, 103 897 casualties were evacuated to Australia, consisting of 71 048 sick or injured, and 32 949 wounded. Two dedicated 'white' hospital ships moved 17 760 patients while the remaining 86 137 patients were moved in non-dedicated 'black' transports. In WWII, three hospital ships (a fourth being sunk) moved 50 167 patients from overseas and between Australian ports. See Butler AG. 'Official History of the Australian Army Medical Services', 1914–1918, Volume 3 Chapter 14. Australian War Memorial, 1943; Walker AS. 'Official History of Australia in the War of 1939–1945', Medical Services of the RAN and Air Force, Series 5, Part 4, Chapter 38, Australian War Memorial, Canberra, 1961; Goodman R. 'Hospital Ships', Boolarong Publications, Brisbane 1992.
- 50 See Foley JCH and Milligan CS, Australian Hospital Ship Centaur: the myth of immunity, Nairana Productions, Hendra QLD, 1993.
- 51 [Royal Australian] Air Force, 'C-17A Globemaster III', available from <https://www.airforce.gov.au/technology/aircraft/air-mobility/c-17a-globemaster-iii>.
- 52 US Air Force, 'C-17 Globemaster III', available from <https://www.af.mil/About-Us/Fact-Sheets/Display/Article/1529726/c-17-globemaster-iii>.
- 53 TravelMath, 'The flight time from Brisbane, Australia to Port Moresby, Papua New Guinea', available from <http://www.travelmath.com/flying-time/from/Brisbane,+Australia/to/Port+Moresby,+Papua+New+Guinea>
- 54 Department of Defence, '20111106adf8115142_537', available from https://images.defence.gov.au/assets/archives/5003-All-Defence-Imagery/?q=20190320ran8604878_003.
- 55 See Jolly R. The Red and Green Life Machine: A Diary of the Falkland Field Hospital. Century Publishing, London, 1983.
- 56 Australian Maritime Doctrine, available from <http://www.navy.gov.au/sites/default/files/documents/Amd2010.pdf>.
- 57 For example, HMAS Anzac (FFH-150) was conducting Operation DIRK off Heard Island in October 1997, when a crew member developed appendicitis. The patient was transferred to HMAS Westralia (AO-195), for landing ashore for treatment, in an operation that took six days.
- 58 [Royal Australian] Navy – Serving the Nation with Pride, 'MH-760R Seahawk' available from <http://www.navy.gov.au/aircraft/sikorsky-mh-60r-seahawk>.
- 59 [Royal Australian] Navy – Serving the Nation with Pride, 'MRH-90 Taipan' available from <http://www.navy.gov.au/aircraft/mrh-90-taipan>.

- 60 [Australian] Army, 'Boeing CH-47 Chinook', available from <https://www.army.gov.au/our-work/equipment-and-clothing/aviation/boeing-ch-47-chinook>.
- 61 [Australian] Army, 'Sikorsky Blackhawk', available from <https://www.army.gov.au/our-work/equipment-and-clothing/aviation/sikorsky-black-hawk>.
- 62 [Australian] Army, 'MRH-90', available from <https://www.army.gov.au/our-future/modernisation-projects/aviation-projects/mrh90>.
- 63 [Royal Australian] Air Force, 'C-17A Globemaster III', available from <https://www.airforce.gov.au/technology/aircraft/air-mobility/c-17a-globemaster-iii>.
- 64 [Royal Australian] Air Force, 'C-130J Hercules', available from <https://www.airforce.gov.au/technology/aircraft/air-mobility/c-130j-hercules>.
- 65 [Royal Australian] Air Force, 'C-27J Spartan', available from <https://www.airforce.gov.au/technology/aircraft/air-mobility/c-27j-spartan>.
- 66 As an example where this is not necessarily the case, Navy's MH-60R cannot be used for stretcher cases unless some of the mission equipment pertaining to its primary roles of anti-surface and anti-submarine warfare is removed. In practice, the MH-60R is usually therefore only suitable for sitting casualties.
- 67 Department of Defence, '20100216adf85371950000', available from <https://images.defence.gov.au/assets>.
- 68 For example of vehicular casevac hazards, see Keene N. 'Army Mog truck known for rollovers', Daily Telegraph, 2012 Oct 10, available from <http://www.dailytelegraph.com.au/news/nsw/army-mog-truck-known-for-rollovers/news-story/6761cd66198078216fa3437ab0394479>.
- 69 For an example of a RHIB accident where a calm sea state was deemed causative, see Silmalis L. 'Navy's bungle as boat is found to be going too slow', Daily Telegraph, 2012 Jun 03, available from <http://www.dailytelegraph.com.au/navys-bungle-as-boat-is-found-to-be-going-too-slow/news-story/45c4e1fadd76e38b19e66b29f5ca5865>.
- 70 For rotary wing casevac hazards, See Maag C. 'Unacceptable Risk: The Troubling Medical Helicopter Safety Record', available from <http://www.popularmechanics.com/flight/a5814/medical-helicopter-safety-crashes>.
- 71 Examples of operational hazards include small arms, grenades, mortar and artillery rounds, sea-, land- and air-launched missiles, sea and land mines, and torpedoes, all of which can cause death or injury secondary to penetrating wounds, blunt trauma, blast injuries and burns. See Westphalen N. 'Occupational and environmental medicine in the Australian Defence Force', Australian Defence Force Journal. 2016 Nov/Dec;200:49–58, available from http://www.defence.gov.au/ADC/ADFJ/Documents/issue_200/Westphalen_Nov_2016.pdf.
- 72 For a visually graphic demonstration of operational casevac hazards, see Kajaki: Kilo Two Bravo, Search Engine Films, 2014. This movie is based on the true story of a landmine incident near the Kajaki Dam, Helmand Province Afghanistan on 06 Sep 2006, which resulted in seven casualties (one fatal).
- 73 Jean-Paul Chretien, 'Protecting service members in war: non-battle morbidity and command responsibility', New England Journal of Medicine, 2012;366(8):677–9, available from <http://www.nejm.org/doi/pdf/10.1056/NEJMp1112981>.
- 74 See Hampson GV, Cook SP, Frederiksen SR. 'Operation Bali Assist', ADF Health. 2003 April;4(1).
- 75 Westphalen N. 'Assessing medical suitability for employment and deployment in the Australian Defence Force', Australian Defence Force Journal. 2018 Jan;203:67–74, available from http://www.defence.gov.au/adc/adfj/Documents/issue_203/ADF_per_cent20Journal_per_cent20203_Article_Westphalen.pdf.