Australian Government
Bureau of Meteorology

Emerging Defence climate policy, processes, and procedures implementable as actionable measures

Background

The Bureau of Meteorology has identified broad ways in which it can advise and support Defence in building practical implementation measures to address climate change and adaptation through a Fundamental Inputs to Capability (FIC) framework across three time horizons of short, medium and long term.

Below is just an exemplar and not the only framework that could be used. Meteorological data may not affect all FIC elements equally and some cases may not affect individual FIC elements at all. Some of these examples are further explained in detail below.

Table 1: Exemplar of current and future meteorological data impacts for Defence

	Short (next 2 years)	Medium (2 to 10 years)	Long 10 years plus
Personnel	**Heat Stress Management Decision Support Tool – Land.** The Bureau is working with DSTG to support heat stress planning for Army training exercises and activities.	Evaluation of training areas and locations to provide the best location for soldiers to maximise training.	Developing capabilities to ensure personnel can operate in hostile environments into the future.
Organisation	Progressing climate maturity in the Defence community.		
Collective training			
Facilities and training areas	**Reduced Bushfire Risk – Army.** Post the October 2013 Marrangaroo Training Facility Fire, an on-site meteorological measuring capability was installed by the Directorate of Training Area Management (DOTAM) to ensure training is not conducted in dangerous fire conditions is installed on all high-risk ranges and bases.	**Heat Stress Management On-Site Equipment – Land.** As per left, the DOTAM system providing an onsite meteorological measuring capability could be easily replicated on an as required basis.	**Aviation basing.** Longer runways, air-conditioned hangers or de-icing systems may be required due to changing atmospheric conditions. **Maritime basing.** Increased sea level and associated storm surge when combined with more extreme weather events may need to be factored in to ensure maximum availability in the future.
Supplies	**Reduced Fuel Usage – Aviation.** Large aircraft such as C-17 and Multi-Role Tanker Transport (MRTT) can measurably decrease aviation fuel usage.	**Reduced Fuel Usage – Maritime.** Ships (Air Warfare Destroyers, Offshore Patrol Vessels etc.) can potentially decrease maritime fuel usage.	

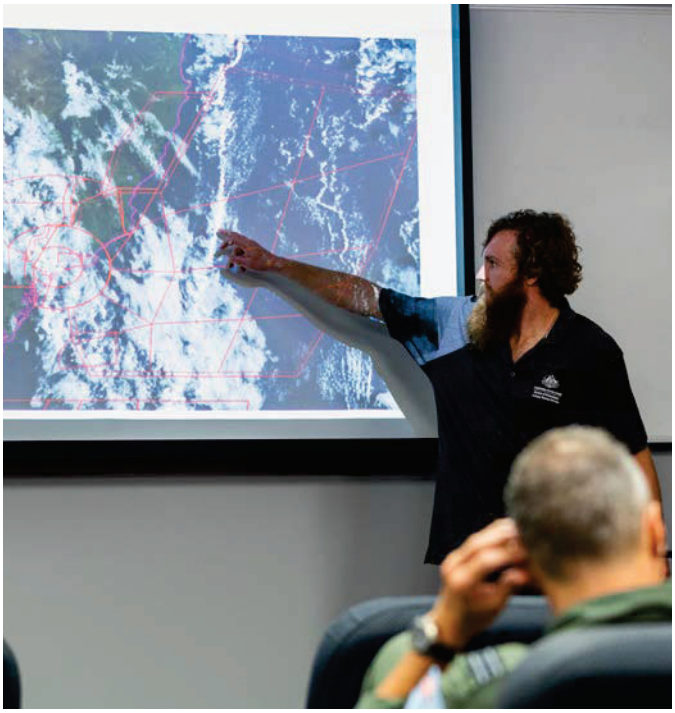
	Short (next 2 years)	Medium (2 to 10 years)	Long 10 years plus
Major systems	**Platform sensors.** Increasing sea water temperatures and salinity may need to be factored into the selection or development of a sensor. Gate Zero analysis of capability CONOPS for future climate constraints.		**Platform equipment and habitability.** Increasing air and sea water temperatures could impact platform equipment operation and habitability.
Command and management		**ADF preparedness.** Will more frequent weather extremes result in increased utilisation of the ADF to support both domestic and overseas HADR activities.	**New capability requirements.** Will climate change drive resource competition in new geographical areas?
Support		**Reduced Maintenance – Maritime.** As per above, Ships (Air Warfare Destroyers, Offshore Patrol Vessels etc) can potentially decrease impact/stress on vessel hulls, thus reducing maintenance demands.	
Defence industry		**Defence Estate and Fleet.** Carbon emission reductions for the Defence estate and commercial vehicle fleets will rely on Defence being a 'fast-follower' of industry.	**Synthetic jet fuel.** Sustainable production of synthetic jet fuel will rely on investment from commercial companies.

Short term

Personnel

Increasing temperature and humidity and/or more frequent weather extremes may impact ADF personnel exercising and conducting operations. Activities could be modified to reduce health risks whilst optimising human performance by including relevant meteorological data.

Heat Stress Management Decision Support Tool – Land. The Bureau is working to support the development of a DSTG concept demonstrator to support heat stress planning for Army training exercises and activities. To date historic climate data (air temperature and humidity) has been provided for 10 Defence locations. This data will be combined with physical exercise worktables to determine for example: could a Chemical Biological Radiological Nuclear exercise (soldiers in Chemical Biological Radiological Nuclear suits) be held in Cultana in the middle of summer, or should a different location be used for that time of year? The intent is to provide data for about 100 Defence sites and to include forecast data in the tool to support the actual conduct of the planned exercise/activity.



Meteorologist Aaron [redacted] briefs pilots operating from RAAF Williamtown on the local weather conditions prior to a training mission.

Facilities and training areas

The use of existing bases and training ranges could be impacted by more extreme weather events. Training activities can be adjusted and/or modified to reduce fire risks by including relevant meteorological data.

Reduced Bushfire Risk – Army. Post the Marrangaroo 16 October 2013 Marrangaroo Training Facility Fire, which spread quickly to towards the township of Lithgow in NSW, DOTAM established an on-site meteorological measuring capability to ensure that training was not conducted in conditions where temperatures, moisture and winds were optimal to fire conditions. The capability now protects facilities, and townships and is installed on all high-risk ranges and bases across Australia.

Supplies

Increasing temperature and humidity and more frequent weather extremes could result in a growing demand for critical supplies such as water, fuels and medicine as well as increased energy requirements to support habitability. The use of Defence assets could be modified and/or optimised to reduce climate related impacts.

Reduced Fuel Usage – Aviation. Currently, many commercial airlines, identify the best route, altitude, to conduct a transit based on meteorological conditions. The United States Air Force Meteorology Command has a measure to ensure the reduction of fuel by 1 per cent by supporting efficient transit.[1] *"Earlier last year, American [Airlines] also began optimizing weather reports with specialized software to provide crews optimal flight altitudes and speeds, a move the airline saved 1.1 million US gallons of fuel in 2020 alone."*

Medium term

Facilities and training areas

The use of existing bases and training ranges could be impacted by more extreme weather events. The use of existing bases and training ranges could be modified to reduce health risks whilst optimising use by including relevant meteorological data.[2]

Heat Stress Management On-Site Equipment – Land. In March 2021, a 20-year-old soldier died in Darwin potentially due to operating in excessive heat. Software and hardware systems similar to the DOTAM systems do not exist at training facilities and providing these systems may save lives but also raise the awareness of operational limitations of soldiers and increase climate literacy, awareness and maturity. The DOTAM system could be easily replicated on an as required basis.

Supplies

Reduced Fuel Usage – Maritime. Ventia, the company which established the ANZAC Class shipbuilding program based in Williamstown, and today builds and sustains ships and maritime assets around Australia's coastline (Air Warfare Destroyer and Offshore Patrol Vessel), has approached the Bureau of Meteorology to support development of software which would identify the best time and route for a vessel to transit from one location to another [Perth to Sydney for example] to create the least impact on vessel hulls, thus reducing maintenance demand on the vessel. This software could be extended to calculate fuel consumption thereby reducing fuel usage.

Command and management

The Force Design (i.e. capability planning and selection) could include and test a changing climate as part of the Defence Capability Assessment Process (DCAP). While climate change itself may not be a driving factor, it may be a tipping factor.

ADF preparedness. Will more frequent weather extremes result in increased utilisation of the ADF to support both domestic and overseas HADR activities. If direct by government, will this drive preparedness requirement resulting in force structure changes to enable the ADF to sustainably support such activities.

Support

Increasing temperature and humidity and more frequent weather extremes could result in a growing demand for maintenance. The use of Defence assets could be modified and/or optimised to reduce climate related impacts.

Reduced Maintenance – Maritime. As per above, Ventia has approached the Bureau of Meteorology to support development of software which would identify the best time and route for vessel transits to create the least impact/stress on the vessel hulls, thus reducing maintenance demand on the vessel.

1 https://www.flyingmag.com/usaf-seeks-to-slash-c-17-fuel-use-in-new-efficiency-program/
2 Army introduces strategy to combat climate change threats | Article | The United States Army

Defence industry

The carbon efficiency of Defence products is likely to soon draw greater scrutiny and increasingly become a differentiator in product selection.

Defence estate and fleet. There are opportunities for carbon emission reductions for the Defence estate and Defence commercial vehicle fleets but it will rely on Defence being a 'fast-follower' of industry when it comes to the technology.

Synthetic jet fuel. Sustainable production of synthetic jet fuel will rely on investment from commercial companies.

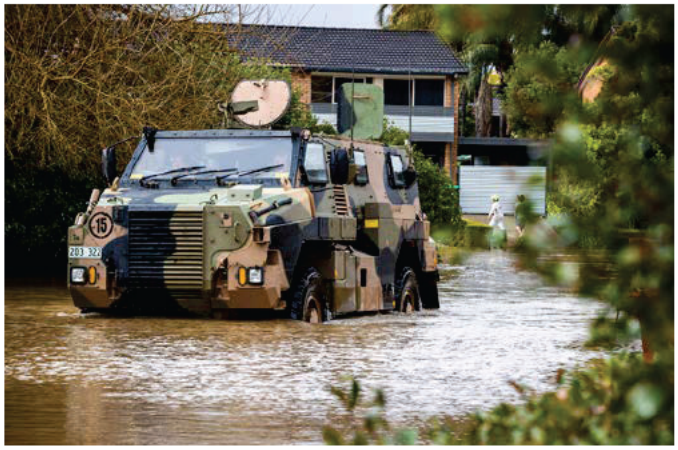
Long term

Facilities and training areas

The basing of aircraft and ships needs to be considered with respect to both current and emerging weather condition impacts on the platforms and how this may affect the ability of the platform to, launch, recover, berth and operate from that base, and whether an alternate base is preferred.

Aviation basing. Longer runways, air-conditioned hangers or de-icing systems may be required due to changing atmospheric conditions. Consideration may need to be given to other airbases which may be more favourable to the platform, thus requiring refuelling aircraft to support transit to an area of operations.

EA-18G Growlers from No. 6 Squadron, as seen from the ramp of the No. 36 Squadron C-17A Globemaster III, conduct Air-to-air formation flying off the coast of South East Queensland, 2021.



An Australian Army Bushmaster Protected Mobility Vehicle drives through a flooded street in McGrath Hills in New South Wales, 2022.

Maritime basing. HMAS CAIRNS is situated in Far North Queensland and is currently subject to flooding due to rainfall and storm surge. Increased sea level and associated storm surge when combined with more extreme weather events may need to be factored in to ensure maximum availability in the future.

Major systems

Climate changes and more extreme weather events could impact platform performance.

Platform sensors. In considering vessel sensors and the ability of crew to operate on the exterior of a vessel, heating water temperatures and increasing salinity could be factored into the selection or development of a platform. A conclusion may be that an autonomous vehicle is procured to ensure no gaps in coverage.

Platform equipment and habitability. When selecting a platform under foreign sales, ensuring the platform operates in Australian conditions where the expectation is for increasing air and sea water temperatures that could impact equipment operation.

Command and management

New capability requirements. Will climate change drive resource competition in geographical areas that the ADF has not had to operate in for extended periods (i.e. Antarctic and Southern Ocean)? Will this result in changes to capability requirements? For example: different platforms or even completely new capabilities to deliver the same effect.