



Australian Government
Department of Defence

The Military Medicine Panel (TP 22) of the Five Eyes Science & Technology Organisation: opportunities for collaboration



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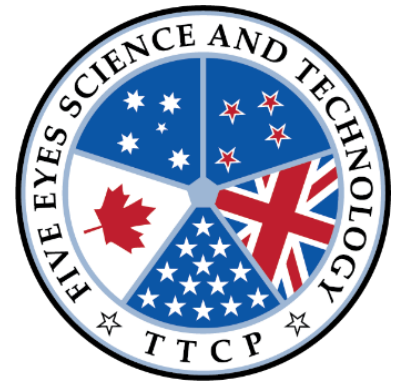




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BRIG Reade has no financial or other conflicts of interest

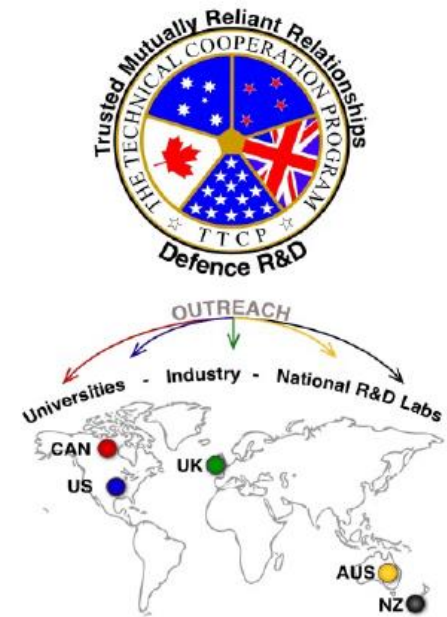
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To highlight opportunities for military medicine research collaboration between the five partner nations

- 1957: Bilateral Agreement between US & UK: *“the concept of national self sufficiency is now out of date. The countries of the free world are interdependent and only in genuine partnership, by combining their resources and sharing tasks in many fields, can progress and safety be found”*.
- Canada immediately partnered in 1957
- Australia joined in 1965; New Zealand joined in 1969
- Strategic intent: *“to effectively and affordably apply science and technology to provide the Five-eyes nations with a defence and national security operational edge”*
- Achieves this by:
 - foreshadowing potential future threats
 - collaborative research with transition pathways to future capability
 - Sharing science / technology information
 - testing to reduce the technical, operational and financial risk of technology transition to new capability





Protection of Intellectual Property:

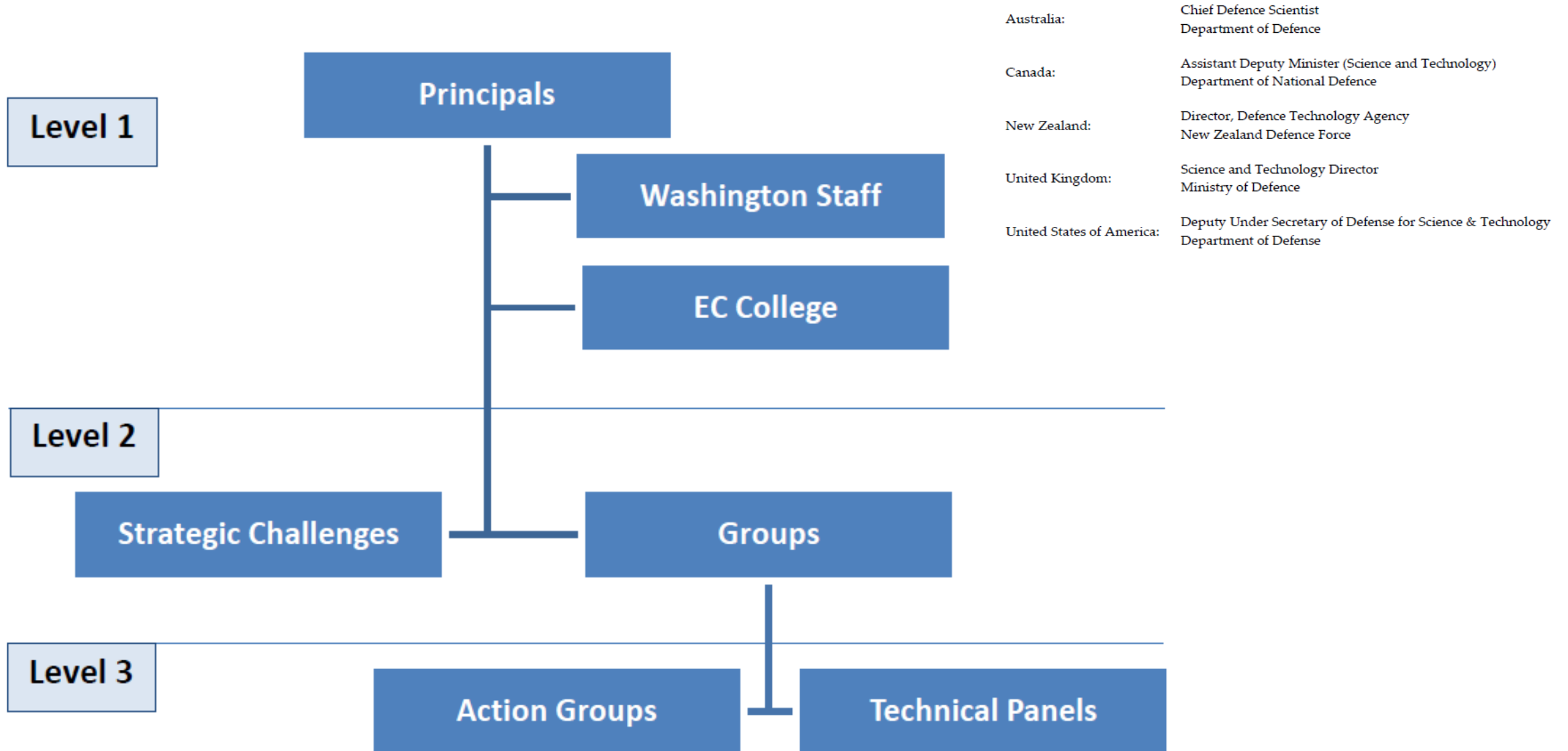
Disclosure: A Contributing Participant, upon request, will disclose promptly and without charge to the other Contributing Participants any relevant Project Background Information generated by its military or civilian employees (hereinafter referred to as “Government Project Background Information”), provided that:

- 9.9.1.1. Such Government Project Background Information is necessary to or useful in the Project, with the Contributing Participant in possession of the Information determining whether it is “necessary to” or “useful in” the Project;
- 9.9.1.2. The rights of holders of Intellectual Property are not infringed;

Agreed template for Material Transfer Agreements etc.

If the Contributing Participants mutually determine that the cooperative efforts under this PA require the transfer of Equipment and Material (E&M) to the other Contributing Participants, a list of such E&M will be developed in accordance with the following table and Section VIII (Equipment and Material) of the TTCP II MOU. In addition to the items listed in the table below, the POs will maintain a list of all Equipment and Material to be exchanged.*

Five Eyes S&T – structure



Five Eyes S&T – structure



AER	Aerospace Systems: Enhance the military capability of current and future aerospace systems through collaborative research and innovation.
C4I	Command, Control, Communications, Cyber and Information Systems: Advance current and future warfighter capabilities through collaborative innovative research in command, control, communications, cyber and information systems.
EWS	Electronic Warfare Systems: Seeks to shape future electronic warfare capabilities to address an increasingly complex and rapidly evolving threat landscape.
HUM	Human Resources and Performance: Enhance the war-fighter and the human systems that select, prepare, equip and sustain them to prevail in their mission and reset for the next.
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance: Conceive and deliver cooperative research and development for situation awareness and agile targeting capabilities that enhance our military advantage in all environments.
LND	Land Systems: Provide effective S&T for Army and Marine military capabilities for ground forces to: enhance soldier and combat system effectiveness, increase system survivability, reduce logistics cost drivers and improve interoperability.
MAR	Maritime Systems: Shapes future capabilities for maritime warfare, with special emphasis on coalition interoperability, enhancing autonomy in maritime operations, improving underwater sensing and improving warship survivability.
MAT	Materials and Process Technologies: Leads the R&D of advanced material solutions that improve the performance, durability and economic sustainability of legacy systems and emerging platforms with next generation materials science and expert advice.
WPN	Weapon Systems: Conducts research across the spectrum of weapons technologies in an evolving threat environment, to shape and enable future generations of weapon system capabilities and to safely sustain and enhance existing weapon systems.
ASC	Autonomy Strategic Challenge: Seeks to enhance, demonstrate and evaluate the military utility of autonomous systems for future littoral operations.
CUE	Contested Urban Environment Strategic Challenge: Will generate capabilities that will increase mission success while reducing risk to military forces in urban operations.



TP/AG/COI	KEY TOPICS/OUTCOMES
TP24 Training	Identify areas for FVEY collaboration in Training S&T, including live, simulated, virtual, and blended approaches to enhance warfighter capabilities and effectiveness.
ELSEI AG	Provide a methodology to evaluate Emerging and Disruptive technologies through a framework that assesses Ethical, Legal, Social and Environmental Impacts.
TP-23 – Human Resources	Core S&T areas, driven by the Strategic Objectives of the Senior Personnel Leaders, include Selection, Recruitment & Retention, Social Issues, and Individual Training & Education.
JP1 – Human Systems Performance (Land)	Human science research on land warfighter characteristics, capabilities and performance, ensuring their effective integration with technologies, platforms and socio-technical systems.
JP2 – Human Systems Performance (Maritime)	Scientific modelling, analysis and experimentation to inform maritime technology design, personnel roles, and effective use of technology to respond to current and emerging threats.
JP3 – Human Systems Performance (Air)	Support coalition Air Forces to deliver higher levels of operational efficiency and effectiveness with reduced costs and risk through evidence-based application of human factors S&T.
TP21 - Resilience	Identify opportunities and strategies to enhance or build resilience in serving personnel through a holistic and multidimensional approach that considers psychological and physiological factors, including nutrition, behavioural health leadership, and enhanced family support.
TP22 – Military Medicine	To improve operational readiness and mitigate the detrimental health effects of military service through collaborative research on prevention, diagnosis, and treatment in four Focus Areas: Combat Casualty Care, Rehabilitation Medicine, Military Operational Medicine, and Force Health Protection.



The Panel seeks to **improve operational readiness** and **mitigate** against the **detrimental health effects of military service** through collaborative research on prevention, diagnosis, and treatment in four **Focus Areas**:

Combat Casualty Care

Improve methods of treatment for wounded members immediately after injury with goal of reducing mortality and optimizing ultimate functional outcome

Rehabilitation Medicine

Better methods of returning survivors of trauma to greatest possible level of function

Military Operational Medicine

Develop countermeasures against stressors (e.g. austere environments; physical trauma)

Force Health Protection

Well-being of military members through epidemiological surveillance, communicable disease control and prevention, health promotion and occupational and environmental health

Under which currently sit 4 **Activity Plans** (blood, injury in training, military-specific occupational exposures, and regulatory impediments to data-sharing)



- **Logistic challenges** to provision of deployed healthcare (e.g. blood, oxygen supply)
- Inability to **evacuate** rapidly (thereby requiring prolonged field care)
- **Fitness to train / fight** of current & likely future combatants
- **Health effects of performance optimisation**
- Lack of **commercial incentive for industry** to develop products of particular military relevance (e.g. dried plasma)

(NB. Medical countermeasures to CBRN threats are out of scope for TP22)



Military medical research is unique within FVEYS S&T:

- Very high cost (approx. US\$4 billion / new drug), so usually unable to be funded fully from military resources
- Timeline for new drug development 10-15 years
- Preclinical research is valuable & more straightforward, hence more prevalent, BUT note high failure rate of transition from lab to patient
- Some research questions are military occupation – specific (e.g. those relevant to fast-jet pilots; recruit training) – but populations are small & might not be able to give free consent
- Most major clinical studies must be conducted in a civilian healthcare setting

SO: Collaboration is essential



National relative competitive advantages:



- US: size in clinical trials; early preclinical studies; occupational medicine



- AS/NZ: highly efficient clinical trials (approx. 1/10 the cost cf. US)



- UK: late preclinical lab studies (esp. haemorrhage); military to veteran cohort studies; efficient clinical trials



- CA: late preclinical lab studies (esp. blast); efficient clinical trials



Military blood transfusion

- **Key S&T Challenges:**

- **Dried plasma.** Generate sufficient evidence for regulatory approval, if appropriate.
- Define optimal low titre O **whole blood (LTOWB) antibody titre thresholds** in military populations.
- Define the **need for and benefit from using LTOWB** in comparison to standard care in major trauma resuscitation.
- **Cryopreserved platelets.** Generate evidence for regulatory approval.
- **Plasma resuscitation in burns.** Improve clinical practice in treatment of severe burns

- **Key partner and stakeholder interactions**

- As benefits will translate to civilian practice, many of the proposed research programs will seek competitive civilian grant funding (e.g. NIH, NHMRC)

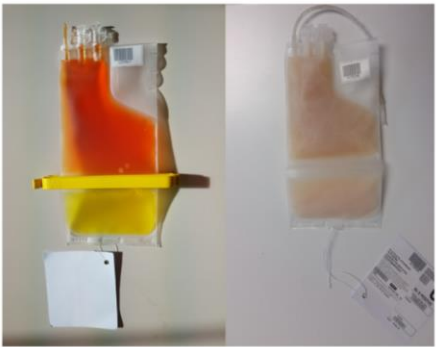
- **Outcomes achieved to date**

- CY2026: 3 x cryopreserved platelet trials (AS, NZ, US) have completed enrolment. Results known, AS study published, US and NZ pending. Applications for registration of cryopreserved platelets to progress
- CY2025: Following trials of cryoprecipitate and fibrinogen concentrate, recognition that early empiric clotting factor replacement should NO LONGER BE USED

- **Next steps**

- Regulatory approval for **cryopreserved platelets**
- AS, CA, UK and US have each acquired **spray-dried plasma** manufacturing equipment. UK protocol shared to compare in vitro characteristics of spray-dried plasma made using the different plasma components available
- Clinical trials of spray-dried plasma
- Integration of results of **whole blood** studies currently underway
- Agreement to compare **anti-A/B antibody levels in Emergency Donor Panels** (testing underway)
- Funding applications for trial of **plasma in burns**

Completed Project: Cryopreserved platelets



NZ method of freezing platelets and plasma separately in the same bag. From Reade *et al.* *BMJ Open*, 2023

Platelets are essential to stop death from trauma – haemorrhage.

Conventional 5-day shelf-life prevents military use.

The US Navy developed cryopreserved platelets (CPP) in the 1970s, extending shelf-life to 2 years.

CPP were used by Dutch, Australian and Czech military hospitals in Afghanistan, but clinical trial data is lacking so CPP are not FDA or TGA registered & not in widespread military or civilian use.

MILITARY OUTCOME: Platelets will be available in deployed Military Treatment Facilities, reducing potentially preventable deaths due to haemorrhage.

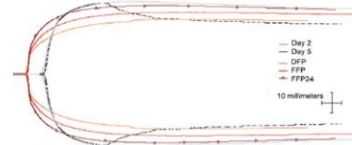
2012

Australian Defence Force & Red Cross Lifeblood commence TTCP-registered cryopreserved platelet research program

In vitro comparison of cryopreserved and liquid platelets: potential clinical implications

Lacey Johnson,¹ Michael C. Reade,² Ryan A. Hyland,¹ Shereen Tan,¹ and Denese C. Marks¹

TRANSFUSION 2015;55:838-847.



2019

Australia publishes successful pilot trial. Protocol shared with NZ and US under TTCP MOU

2026

3 harmonised phase III trials (AS, NZ, US) complete enrolment

Cryopreserved vs Liquid-Stored Platelets for the Treatment of Surgical Bleeding
The CLIP-II Randomized Noninferiority Clinical Trial

JAMA. 2026;335(7):600-608.

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Completed Project: Fibrinogen in Trauma



Challenge

2/3 of haemorrhage deaths could not have been controlled by tourniquets.

Objective

Reduce preventable combat casualty mortality from haemorrhage by supplementing fibrinogen:

1. Does early empiric fibrinogen (as cryoprecipitate) reduce bleeding and mortality?
2. Does early empiric fibrinogen (as purified fibrinogen concentrate) reduce bleeding and mortality?
3. Is fibrinogen concentrate superior to cryoprecipitate in major trauma patients demonstrated to have coagulopathy?

Accomplishments

- Three large phase III clinical trials with harmonised methodology:
 - CRYOSTAT-2 (1604 pts, JAMA 2023): no effect on transfusion or 28-day mortality (possibly worse in penetrating trauma) 
 - FiiRST-2 (217 pts, JAMA Open 2025): no effect on transfusion or 28-day mortality 
 - FIESTY-2 (850 pts; 95% completed): results pending 

MILITARY OUTCOME

- Early empiric clotting factor replacement should NO LONGER BE USED in military Clinical Practice Guidelines
- **Military CPGs should wait for trial evidence, not implement unapproved treatments that only make theoretical sense**
- Viscoelastic testing might identify patients who could benefit from one or both products – results pending

Activity Plan: Injury in Training



Reducing injury in training

- **Objective:** Reduce the currently high proportion of military recruits and trained personnel who suffer injury in training, delaying progress or requiring cessation of military service
- **Key S&T Challenges:**
 - What are the common injuries associated with military training?
 - How can injuries be reduced?
 - What populations are particularly prone to injury?
 - How can rehabilitation from injury be hastened?
 - Knowing expected rate of fitness improvement, how should recruiting standards be set?

• Potential future projects

- What are the acute and chronic effects of exposure to high-intensity vibration? An observational study using functional MRI, blood biomarkers and functional tests of cognition is underway.
- Effects of high-altitude decompression hypoxia
- Effect of requirement to wake from sleep to pilot aircraft immediately. How long does it take to “wake up”?
- Utility of wearables to detect pilot fatigue in long-duration flights

• Next steps

- **Muscle strength as a predictor of injury and speed of rehabilitation** – UK has agreed to share their protocol
- Impact of **arduous military training on immune and metabolic function** – UK has agreed to share their protocol
- **What is the maximum rate of acquisition of cardiovascular and strength fitness** (&hence how to set recruiting standards) – all 5 nations agreed this is relevant to their practice
- **Iron deficiency.** >50% of females complete recruit training with iron deficiency. What is the benefit of iron supplementation? Seeking collaborators.

Activity Plan: Health effects of military occupational exposures



Reducing health effects of military-specific occupational exposures

- **Objective:** Reduce the detrimental health effects of military training and operations
- **Key S&T Challenges:**
 - Identify gradations of exposure (e.g. by agreeing common definitions)
 - Understand physiological effects
 - Test strategies to reduce or mitigate effects of exposure
 - Develop treatments for people affected

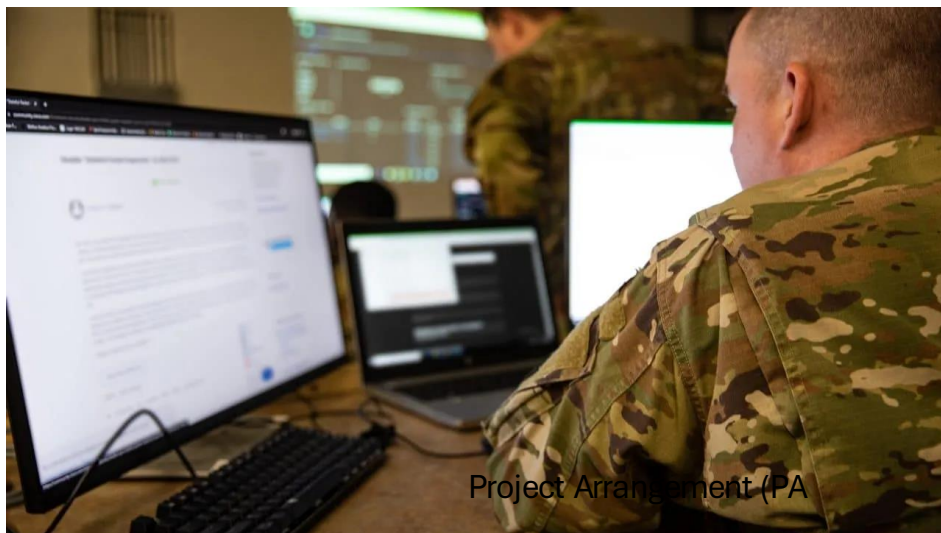
• Outcomes achieved to date

- Agreement to standardise data collected in each nation's research in **blast**, to facilitate comparisons:
 - Standardise measures for cognition, neurobehavioral outcomes, audiovestibular and balance testing, cognitive-motor integration, and other performance domains.
 - Harmonise methods for fluid biomarker collection and analysis (blood, plasma, saliva).
 - Define a set of common clinical data elements for (sub)concussive exposures.
 - Create a framework for international data sharing and bio-banking of human and animal specimens.

• Next steps

- **Hearing loss.** CA wishes to collaborate on this project if there is interest amongst the partner nations.
- **Heat stress management.** CA military work-rest tables updated, incl gender-specific guidance.
- **Extreme cold injury.** CA seeking risks and predictive factors for cold injury, incl. non-freezing cold injury.
- **Effects of extreme cold on the stability of medications.** AS agreed to share this protocol with CA.
- **Lifecourse studies.** UK, AS and NZ wish to harmonise their longitudinal health studies.
- **Intestinal microbiome.** How affected by deployments? Is prophylaxis effective? UK seeking collaborators

Activity Plan: Trauma Registry



Project Arrangement (PA)

- **Key partner and stakeholder interactions**

- Health data custodians in each FIVE EYES nation
- Potential collaboration with NATO Human Factors and Medicine (HFM) Panel

Overcoming barriers to accessing and sharing harmonised trauma registry data

- **Objective:**

- Quality Improvement
- Benchmarking and Performance Monitoring
- Injury Prevention
- Resource Allocation
- Clinical Research

- **Key S&T Challenges:**

- HIPPA (US), Data Protection Act (UK), PIPEDA (CA), Privacy Act (AS)) to allow sharing of personal healthcare data

- **Next steps**

- Agreement on the format of data recorded.
- Each nation will collect patient data by secure means
- Having satisfied defined data custodian criteria, data extraction will be available to each partner nation.
- CA has MOU with US to contribute to and share US DoD Trauma Registry data; this is likely to become the template for other nations



What can the Five Eyes S&T collaboration do for me?

- Facilitate **IP protection** for information exchange, protocol development, material transfer etc. between the 5 nations
- **Endorse projects** as relevant to the Five Eyes nations in support of military or civilian funding
- Provide an IP-protected forum for “**ideas pitches**” at meetings twice / year
- Highlight research proposals and results to **senior R&D officials**
- Assist in **translating research findings into policy**

What we can't do:

- Fund projects, staff or travel
- Endorse equipment for acquisition
- Write policy

TP22 Panel Leadership



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