

# Synthetic Biology and Novel Augmentation for Enhanced Soldier Performance

## Panelists:

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# Outline

- Overview of DIRP and Defence Technology Management
- 4 Calls in this Track
  - **2016-17**: Novel Augmentation for Enhanced Soldier Performance
  - **2016-18**: Exploiting Synthetic Biology for Novel Defence Materials
  - **2016-19**: Countering Synthetic Biology for Defence Applications
  - **2016-20**: Enhanced Survivability of Responders in a Radiologically Contaminated Environment
- Tips for a Successful Grant Application



# Novel Augmentation for Enhanced Soldier Performance

POC: Ms Chen Kaizhen



# 2016-17: Novel Augmentation for Enhanced Soldier Performance

Declining  
Manpower

## Problem statement

- In view of our impending manpower decline, we require solutions *to enable our soldiers to do more with less* to maintain an edge over our adversaries.

## Areas of Interest

- Enhancing the survivability, sustainability, and lethality of soldiers, especially dismounted soldiers.
- Accelerating and sustaining operational readiness.
- Extending human cognitive performance and expanding workload capacity.

# 2016-17: Novel Augmentation for Enhanced Soldier Performance

## Aim 1: Enhancing Physical Performance

- To **accelerate** physical training outcomes and/or directly confer at least 30% increase in strength or endurance. Proposals to **shorten** physical training time should target to achieve 30% reduction in training time. The use of **performance trackers and wearable solutions** should enable real-time tracking and multi-marker/multi-parameter monitoring, in meeting the above outcomes.

## Aim 2: Enhancing Cognitive Performance

- To **enhance memory, attention, or workload** capacity of the individual soldier by at least 30%.
- To **induce efficient sleep or improve concentration or focus** by greater than 30% either in terms of quality, duration or both.



# 2016-17: Novel Augmentation for Enhanced Soldier Performance

## Aim 3: Enhancing Resilience and Motivation

- To develop solutions for **enhancing resilience against stress and fear, to improve motivation**, and to overcome the perception of pain from injury.

## Aim 4: Enhancing Sensory Abilities

- To **enrich human sense capacity** by several folds beyond intrinsic human limits, enhance battlefield situational awareness, and enable quick reactions to enemy threats.



# Synthetic Biology

POC: Dr Dawn Yeo



# 2016-18: Synthetic Biology for Specialty Materials

Wider spectrum of Ops

- **Aim 1.** To deliver a proof-of-concept design and production of a specialty material (novel/hybrid) using synthetic biology.
- Any specialty materials proposed must involve synthetic biology at some stage of their production and **have a military application identified.**
- Production of sufficient material to demonstrate its desired property (e.g. strength, density).
- Examples include (but not limited to): novel camouflage solutions; very lightweight and strong materials; protective materials; etc.



# 2016-19: Countering Synthetic Biology

Hybrid  
Warfare

- **Aim 1.** Assess if an organism has been genetically modified by genetic engineering tools and synthetic biology approaches, or emerged through natural means.
- We are looking for solutions to **characterize and establish the origin of such modifications.**
- Examples include (but not limited to): Biologically engineered organisms, where the DNA may be fabricated synthetically and propagated; organisms where the DNA was edited by genome editing tools.

# Overcoming Radioactivity in a Contaminated Environment

POC: Dr Alex Chin



# 2016-20: Enhanced Survivability of Responders in a Contaminated Environment

Hybrid Warfare

## Problem statement

- Operators are required to operate in a radiation contaminated while maintaining speed of operations, with minimal attrition, within a dangerous and hazardous zone.

## Rationale

- We would like to explore ways to protect operators so that they will be able to operate unencumbered in a radiation contaminated environment.
- There remain tasks that robots will not be able to address, without oversight and presence of human operators (including during war time scenarios).

# Aims

- Aim 1
  - Development of a protective device, to enable work in an environment with 200 mSv/hr (total 1Sv over 5h mission). This is intended to **bring down personnel exposure by at least 50%**, to an equivalent of 100mSv/hr (total 0.5Sv over 5h mission).
- Aim 2
  - Developing **prophylaxis measures** with compounds that are already approved/natural products, that can show at least a **50% protective efficiency**, over a range of 10 mSv/hr – 200mSv/hr.
- Aim 3
  - **Radiation-proof robots** for operating in a high radiation environment where human cannot go.

# Summary - A successful grant

- Will do the following:
  - Meet the intent of the call, in addressing at least one stated aim explicitly.
  - Outline how the ideas proposed will achieve the stated aim.
  - Demonstrate out-of-the box thinking in solutions that can be implemented in a defence context.

The grant call is open from 30 Aug 2016



# DIRP Timeline

Call Status	Date
Call for Proposal	30 Aug 2016
Close of Call	30 Sep 2016
Invitation to Submit Full Proposal for Selected Applicants	15 Dec 2016
Submission of Full Proposal by Applicants	31 Jan 2017
Applicants Informed of Outcome	30 Apr 2017

**Further Administrative Details to be Provided at the Launch at 3:30pm**



# Thank you

- Q&A

