

 6th Annual SAE Media Group
Future Armoured Vehicles
Weapon Systems
31 May 2022

Simulation & Training Perspectives for the Advancement of Armoured Vehicle Weapon System Technology

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BISim

THINKE



The Presenter

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Before



Ministry
of Defence



Now



Recently ...



2019



OPPORTUNITIES FOR MILITARY M&S TO CAPITALISE ON GAMING TECHNOLOGIES AND COMPETENCES

MSG-184- NATO Modelling & Simulation Group (NMSG) Symposium
21/22 October 2021

Mr Andy Fawkes, Vedette Consulting (UK)
Mr Matthew Hemsley, Vedette Consulting (UK)
Mr Douglas Henry, Dstl (UK)
Mr Brian Wardman, Dstl (UK)



Simulation Interoperability Standards Organization

"Simulation Interoperability & Reuse through Standards"

The Military's Metaverse

SIM-2021-Presentation-22 (SIMbrief)



Andy Fawkes, Think Company, UK

2021 SIMposium

21-22 September 2021



Serapis SSE28.1 – Innovation Call

"Military Metaverse CONOPS"

28 February 2022

Andy Fawkes & Nick Cheshire
Vedette Consulting



Amara's Law

"We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run."

Roy Amara (1925 – 2007); Head Stanford Institute for the Future

2021

2021

2022

THINKE

Presentation Overview

- Requirements
- Current Training
- (Shared) Situational Awareness
- XR – e**X**tended **R**eality
- Some Other Technologies
- Gaming and the Military Metaverse

Slides will be Published

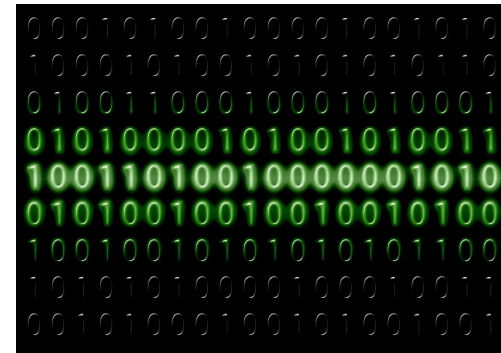
Adaptability



People



Digital



Metal



The Idea

Armoured vehicle crew
should be trained and
treated like air crew

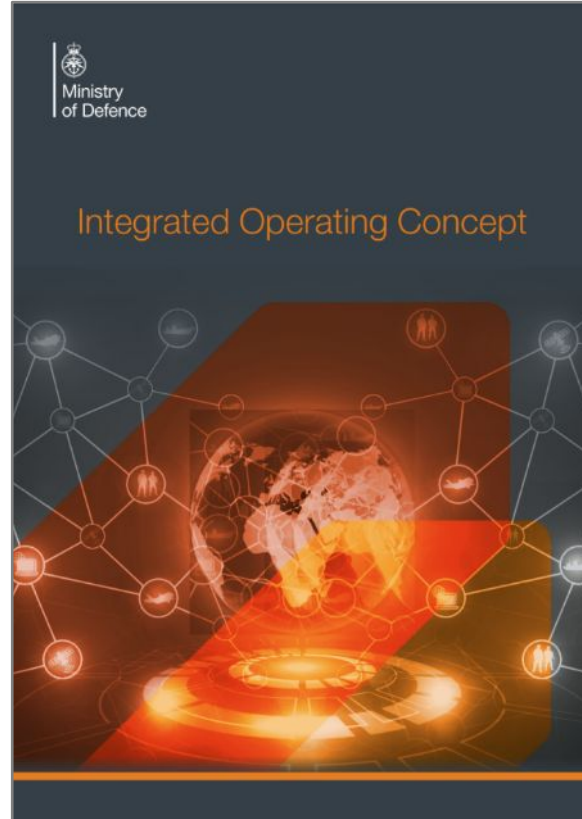
The need is greater and
the costs are getting lower

Requirements

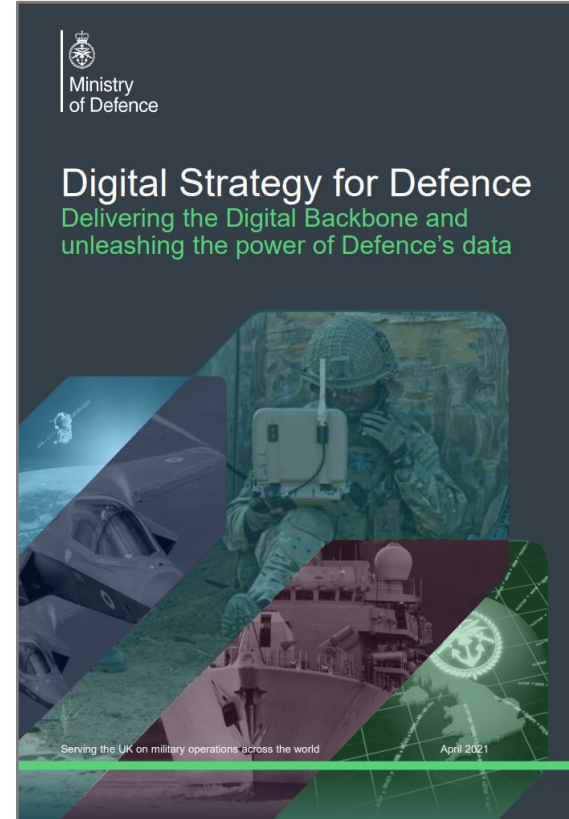
Direction of Travel? Some High Level Documents



March 2021



Sept 2021



May 2021



Nov 2021

The UK Strategic Command Strategy (22 Nov 21)



“We need to be better at responding to the unpredictable.

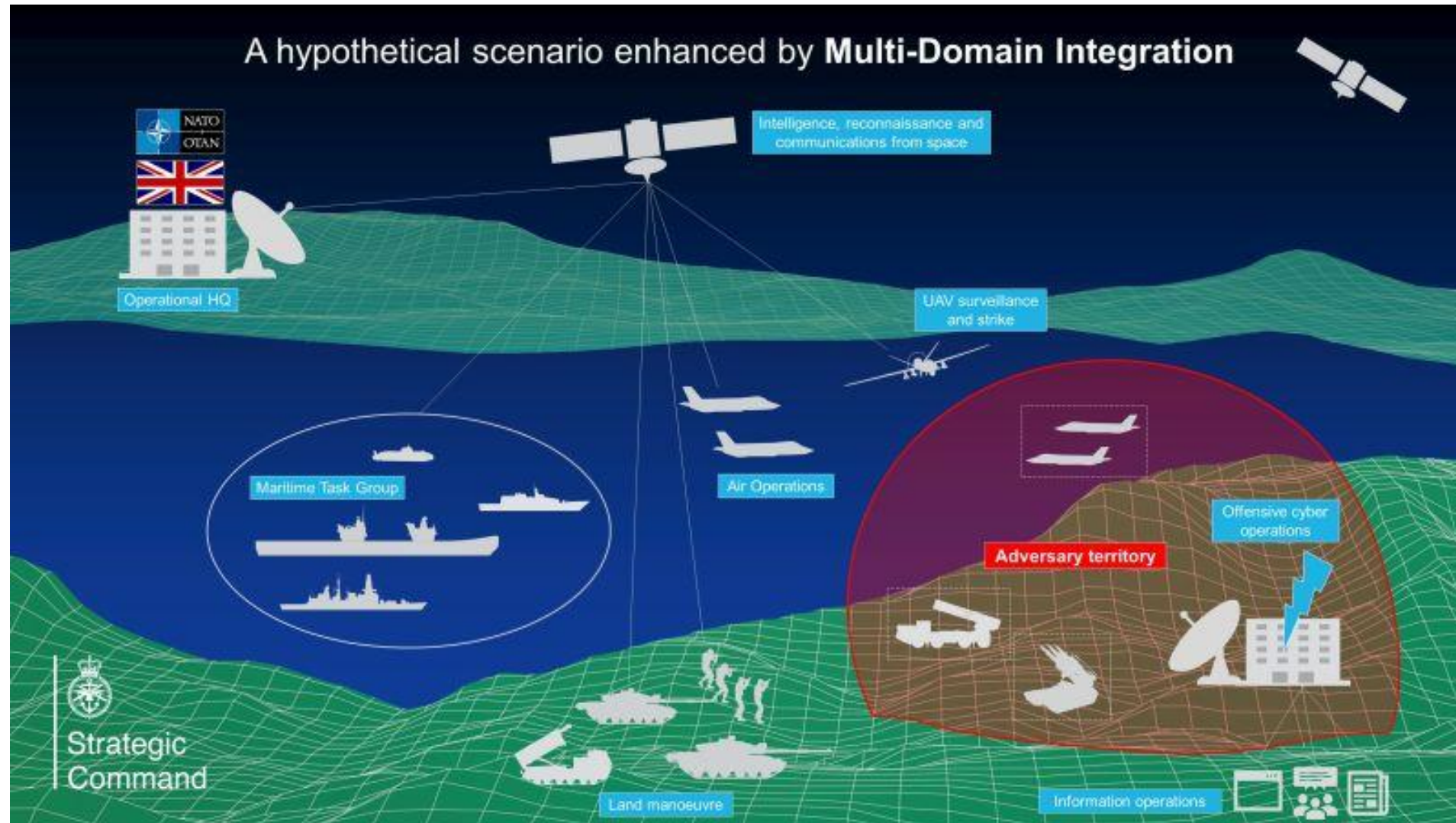
Defence must become agile, responsive and able to act in an integrated way.

It means experimenting with new technology and becoming experts in data exploitation.

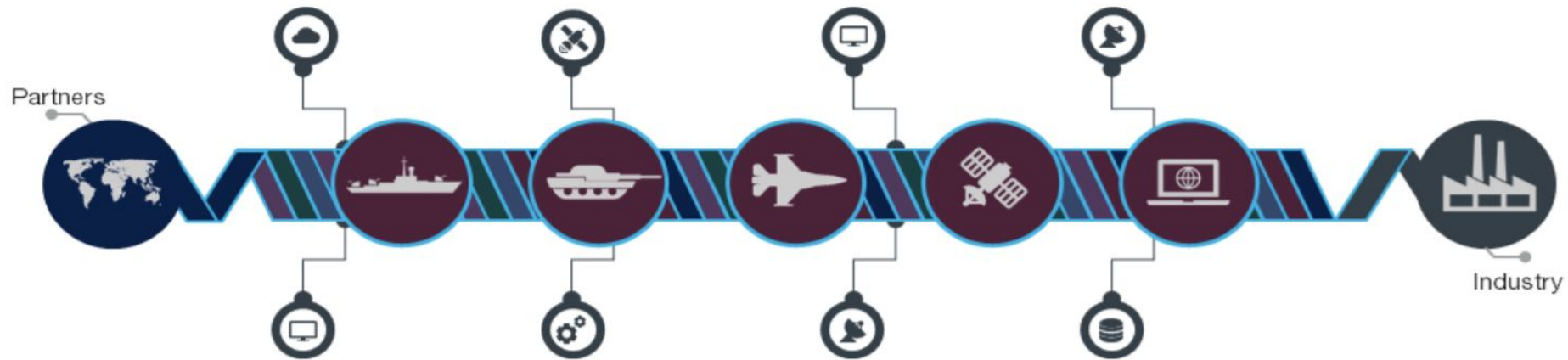
We need to join up our people, equipment and information through integration.

It’s through this integrated approach, which places the use of technology and data at its heart, that we will become more agile and more able to respond to the unknown.”

Multi-Domain Integration



The UK Defence Digital Backbone



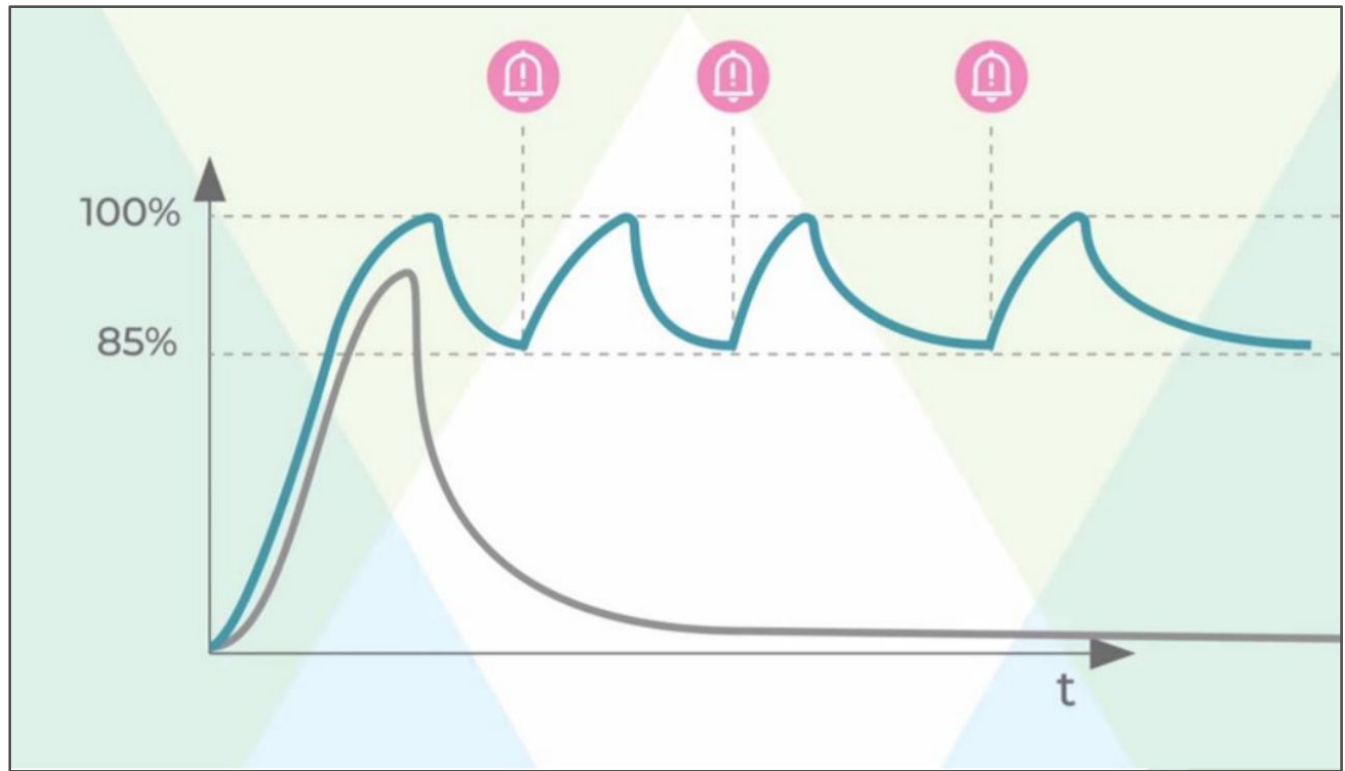
- **Defence's Digital Backbone will be an ecosystem** – a combination of people, process, data and technology; it will enable friction-free access to our data, connecting sensors in one domain to platforms in other domains, via decision makers at the relevant levels in real time.

- **Singular**
- **Secure**
- **Modern**
- **Data as a strategic asset**

COVID-19 Digital Acceleration



Skill Fade





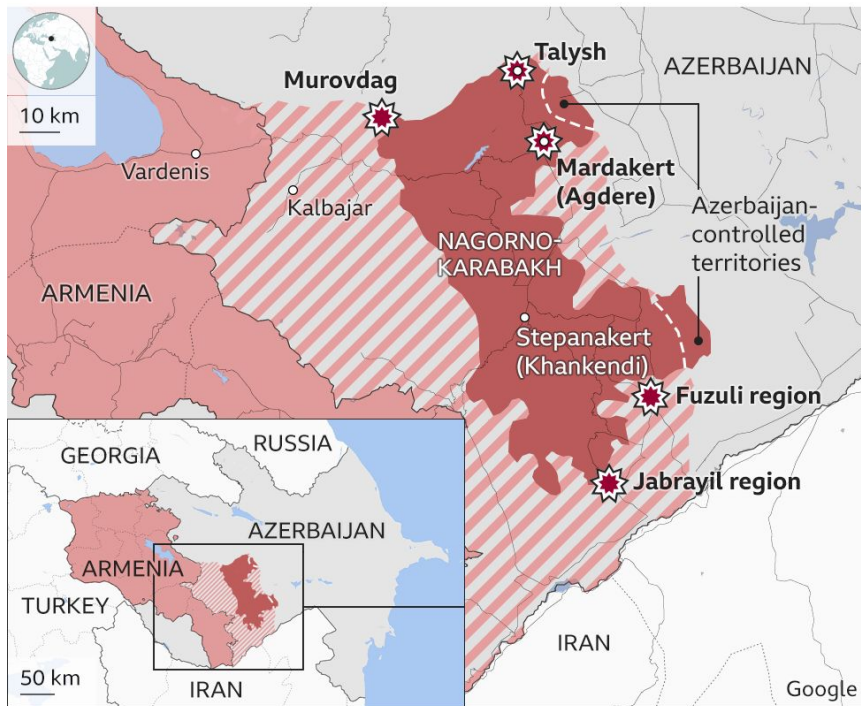
“Digital Native”

Over 2/3^{rds} of the Army are Digital Natives and 95% by 2030

The Crucible of War

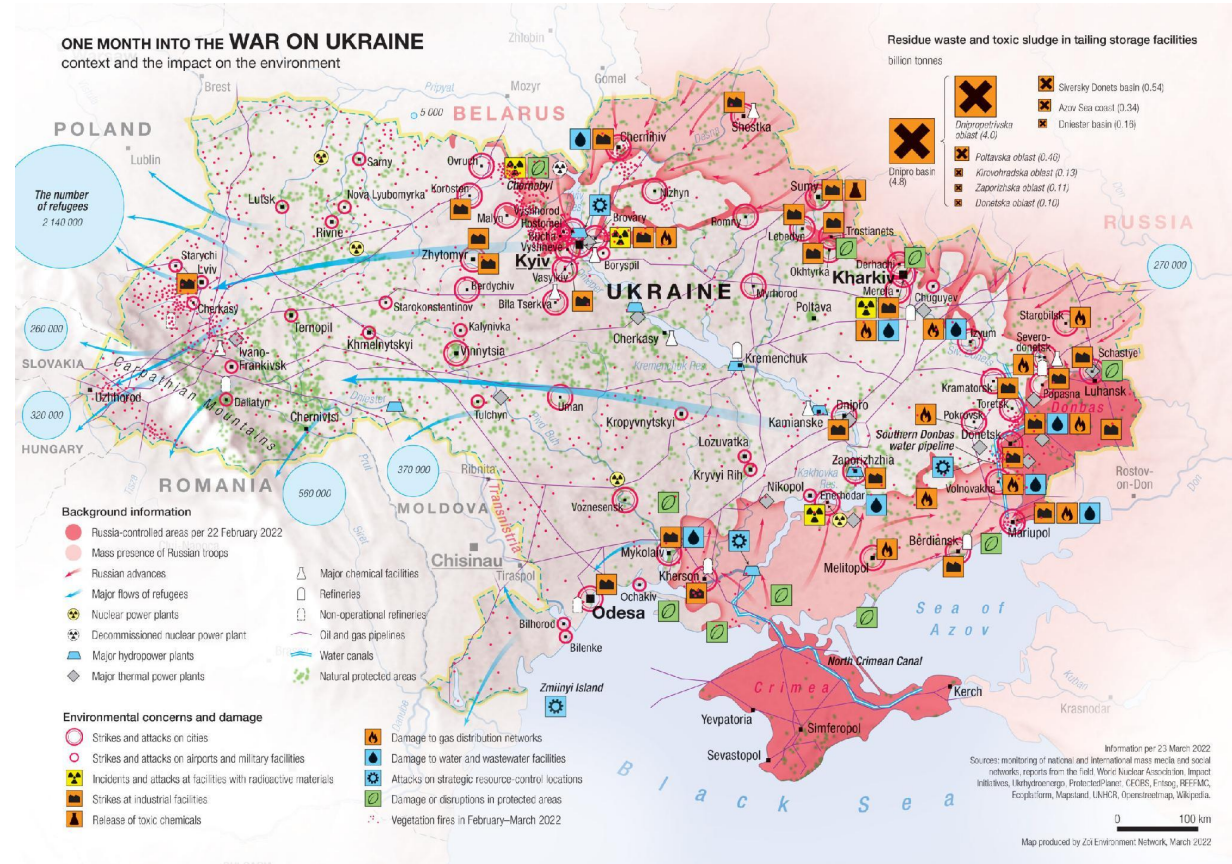
Conflict in Nagorno-Karabakh

 Approximate areas of battles, 27- 28 September 2020
  Armenian-controlled territories surrounding Nagorno-Karabakh



Source: BBC

BBC



**New
Realities?**

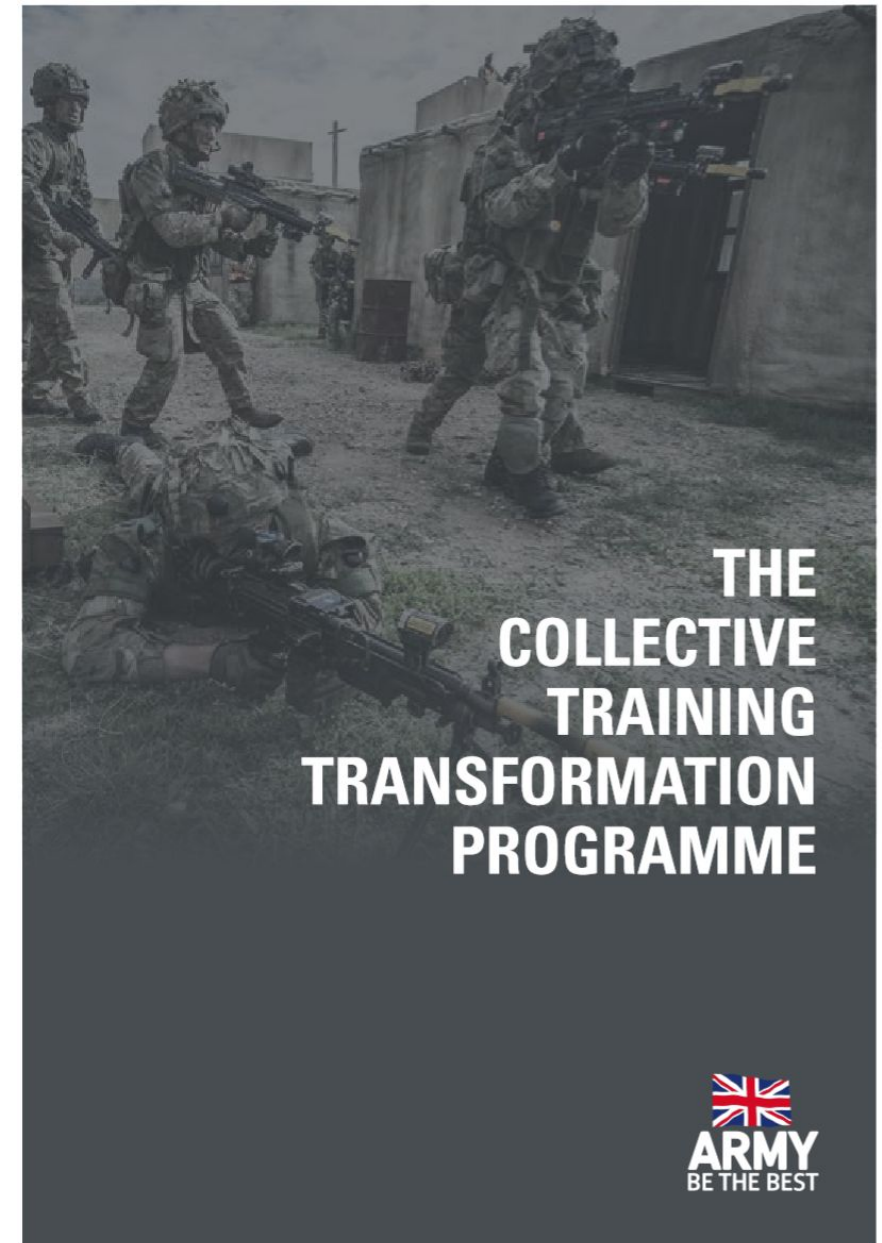


More Autonomous Systems?



British Army Collective Training Transformation Programme (CTTP)

- CTTP **seeks collective training that is more challenging and conducted in more dynamic and complex environments (physical, virtual and cognitive)**
- Collective Training will become **surrogate warfare**;
- It will be **measurable, enabled by simulation** and technology
- The British Army will **train in regions of the world** that cement our Joint and International partnerships



**No battle plan
withstands
contact with the
enemy**



What are We Seeking in Training?

Faster



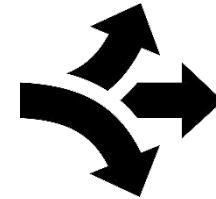
Cheaper



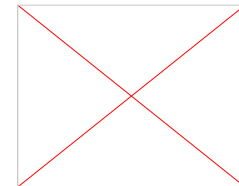
Better



Flexible



Multi-Domain

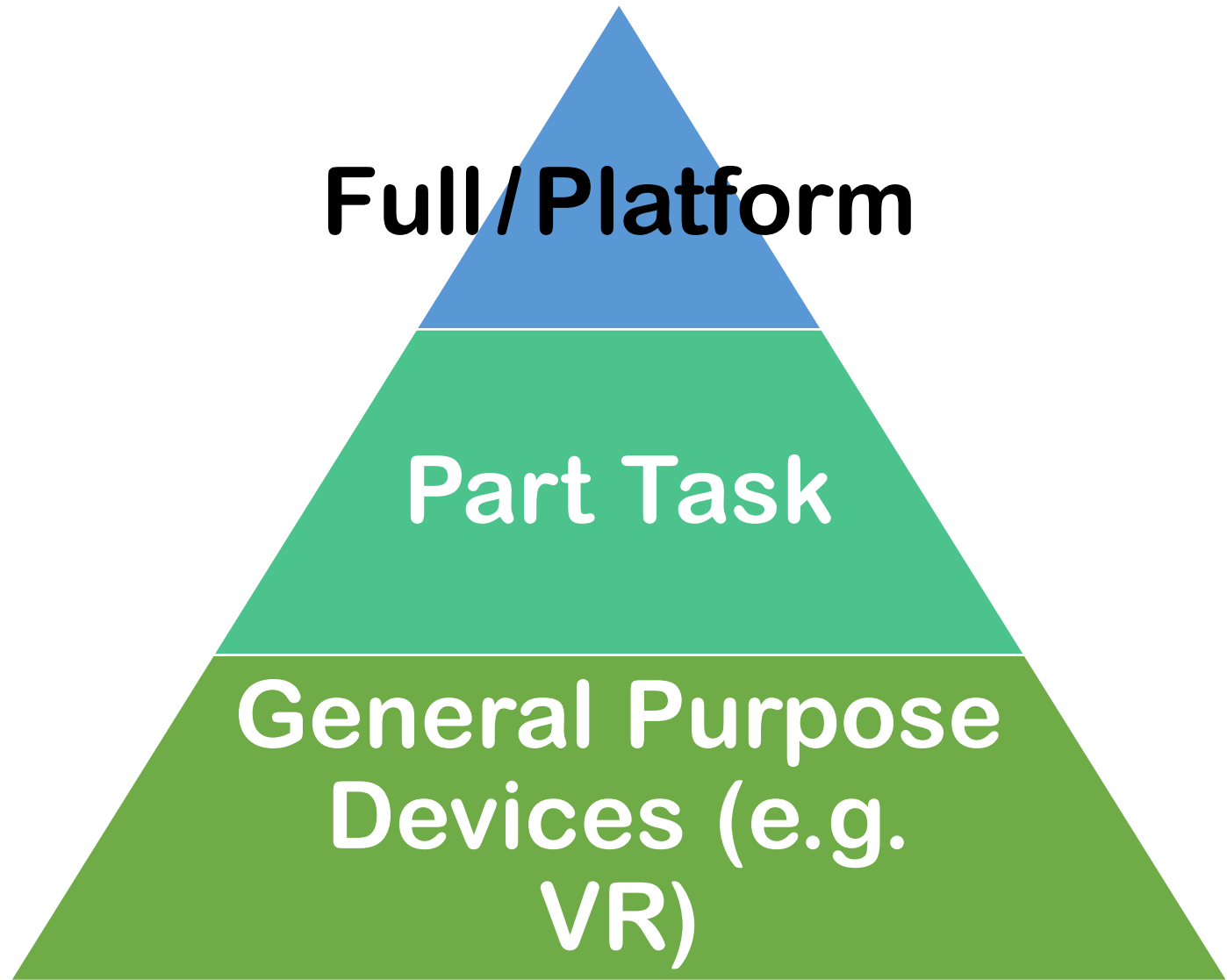


Greener



Current Training

**Training System
Availability**



Live Training



Times Photographer
Richard Pohle

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Embedded Training



Bradley AFV
Credit - Oasis Advanced Engineering

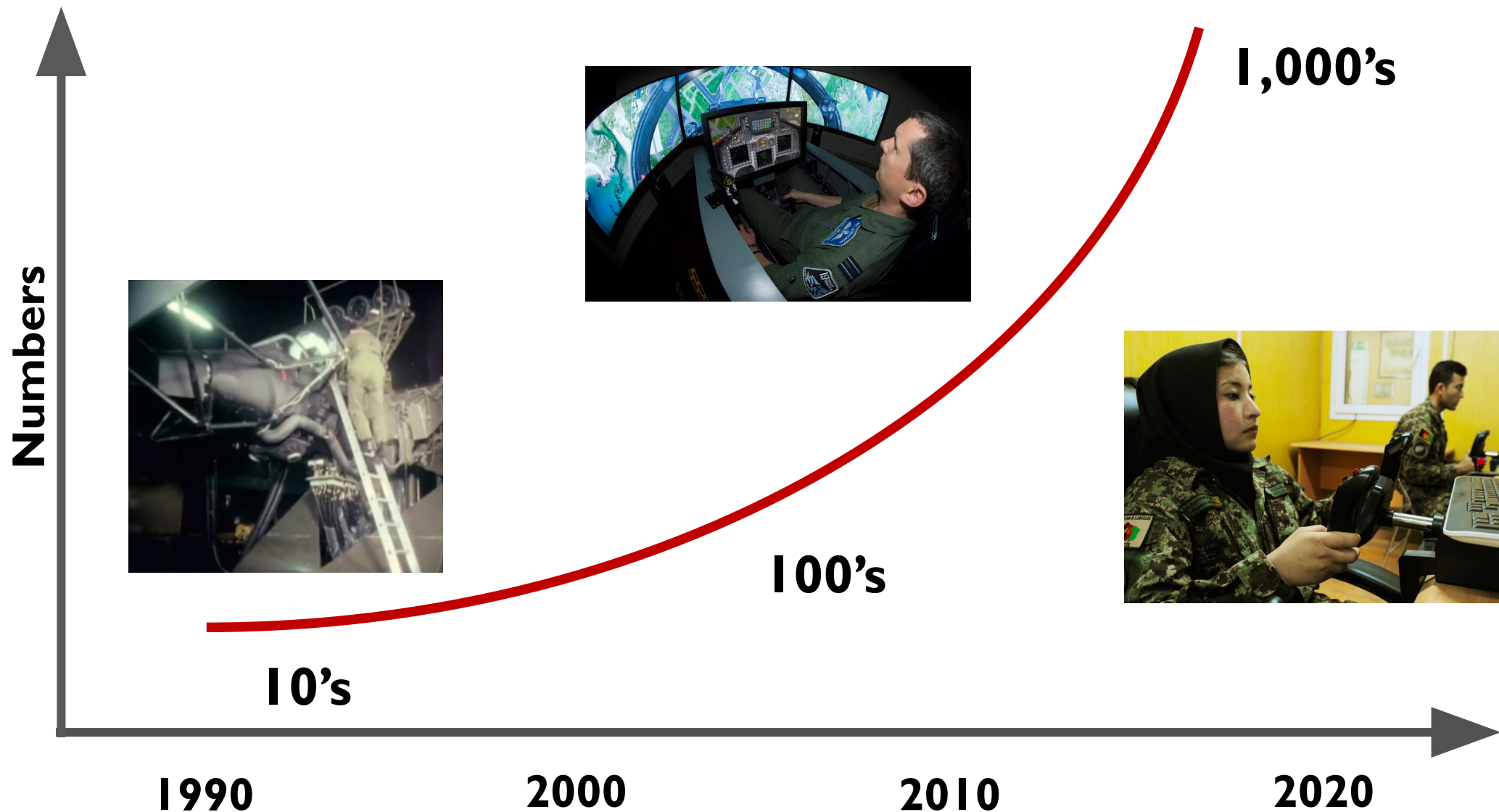
UK Combined Arms Tactical Trainer (CATT)



Simulation Everywhere



Military Access to Simulation

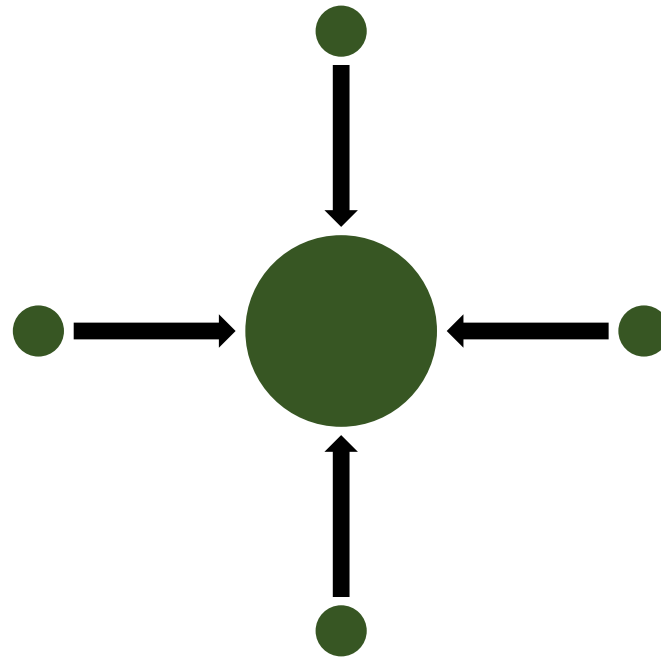


Why Use Simulation in Training?



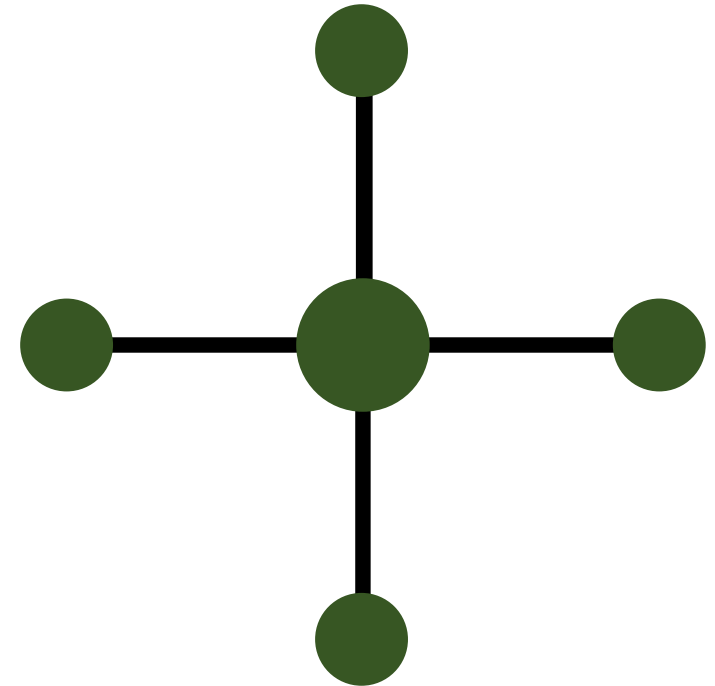
**Future
Emphasis?**

Now



Training Centres

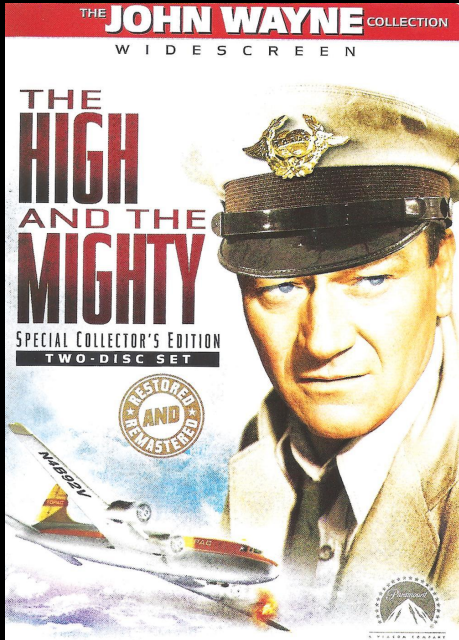
Future



Training Hubs

(Shared) Situational Awareness

The High and the Mighty (1954)

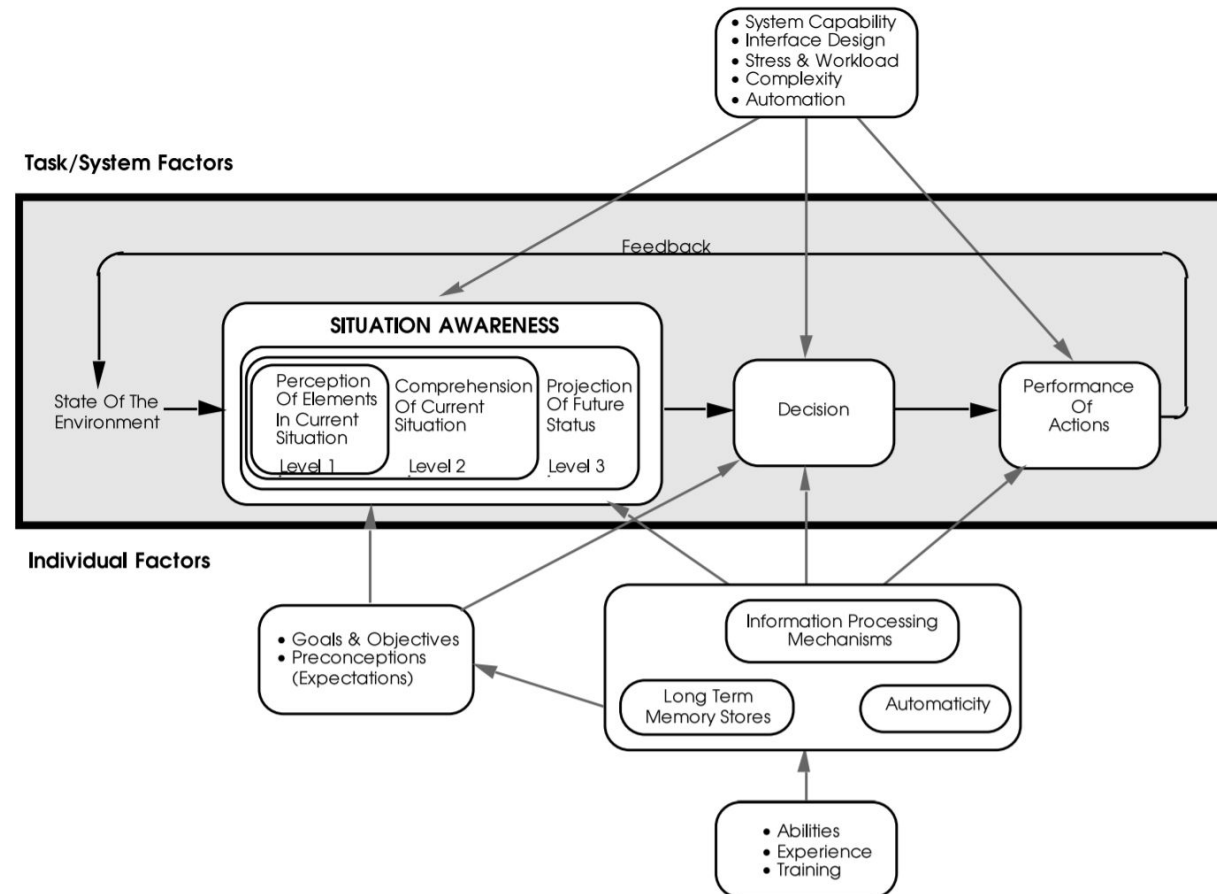


How not to work together?



The Three Level Model of Situation Awareness (Endsley 1995)

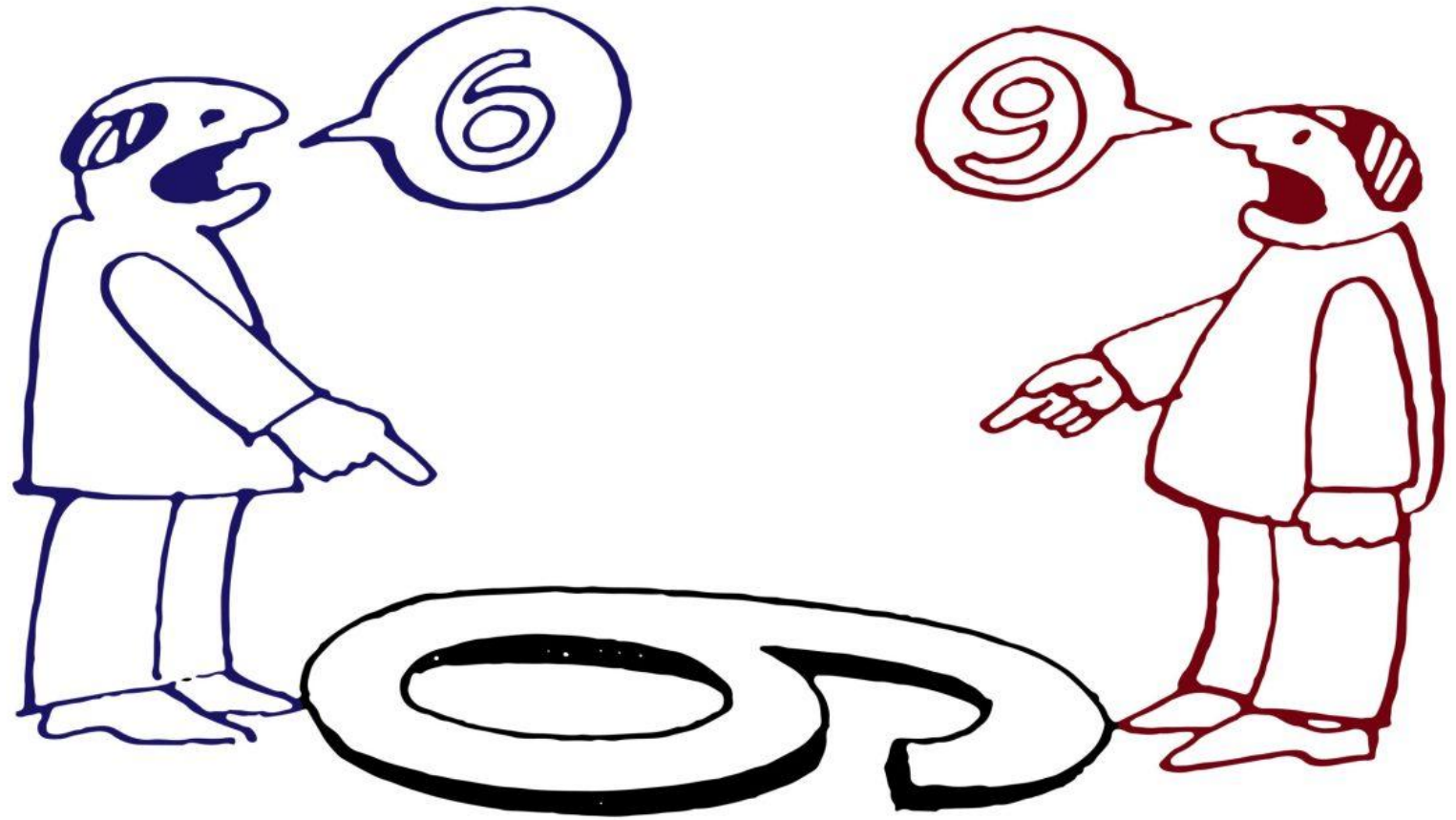
Situational awareness is the perception of environmental elements and events with respect to time and/or space, the comprehension of their meaning, and the projection of their future status.



Based on Endsley's SA Three Level Model



Differences of Perception



Language

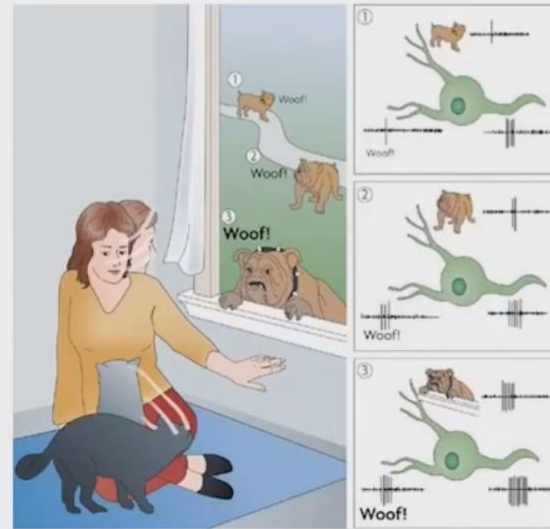


Airplane! (1980)

Practice, Practice, Practice!

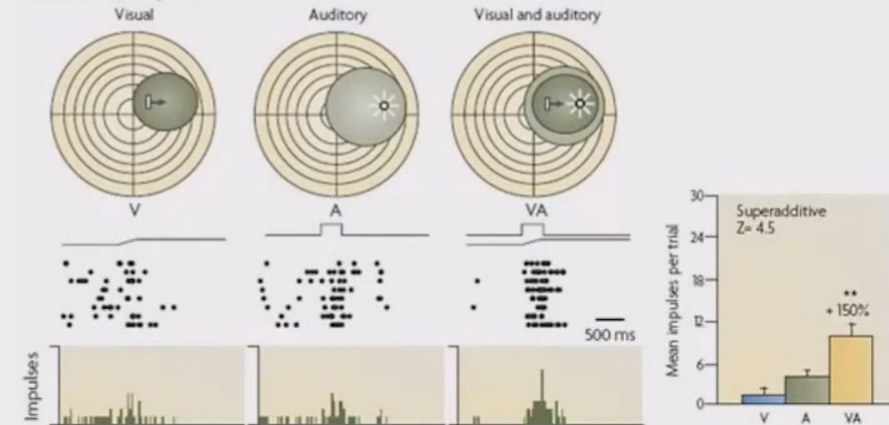
Individually and in Teams

Multisensory Integration



Nature Reviews | Neuroscience

a Multisensory integration



Stephanie L. Miller, R. Stanley. "Multisensory integration: current brain activation in the perspective of the single neuron." *Nature Reviews Neuroscience* 9.4 (2008): 255-266.

Avatars: Finding a sense of self and others in the virtual world

829 views • 29 Mar 2021

18 0 SHARE SAVE ...



Microsoft Research
195K subscribers

SUBSCRIBED



Multi-Sensory Perception



XR

XR

eXtended Reality (XR)

Reality	Augmented Reality	Mixed Reality	Virtual Reality
The real world	Information layered over vision	Blend of real & digital information to enhance reality	Fully virtual world
			

A Range of Options ...



Meta Quest 2



Varjo XR-3



?

UK VRLT

Battlesbury
Barracks,
Warminster
UK



The aim of the VRLT pilot was to identify the opportunities that Virtual Reality technology offers the Future Collective Training System

UK Virtual Reality in Land Training (VRLT) Pilot - 2019



VRLT's Principal Training Audience

Warrior
1

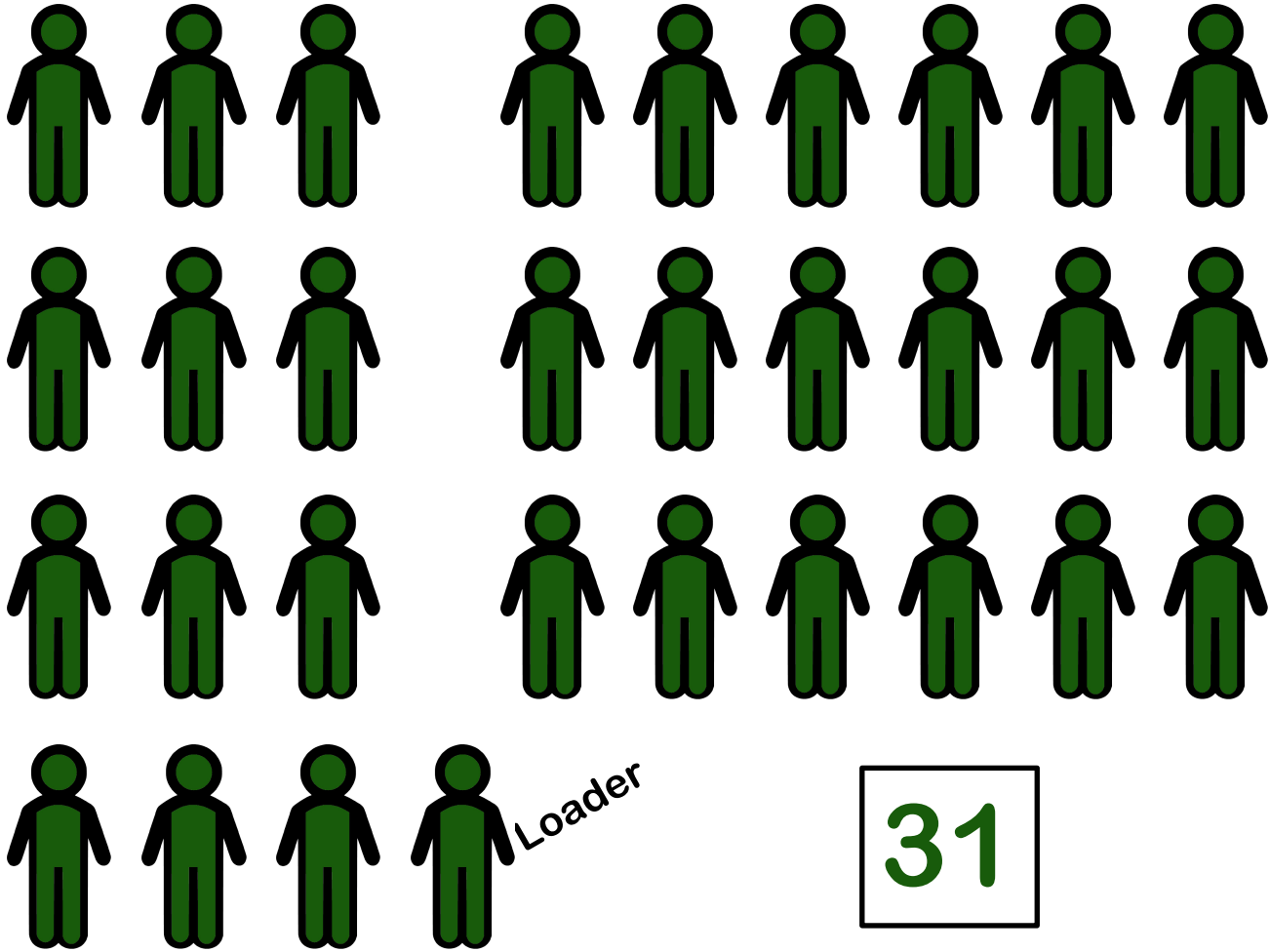
Warrior
2

Warrior
3

Challenger 2
Tank

Commander
Driver
Gunner

Dismounts



31



Collective Training Teamwork Taxonomy

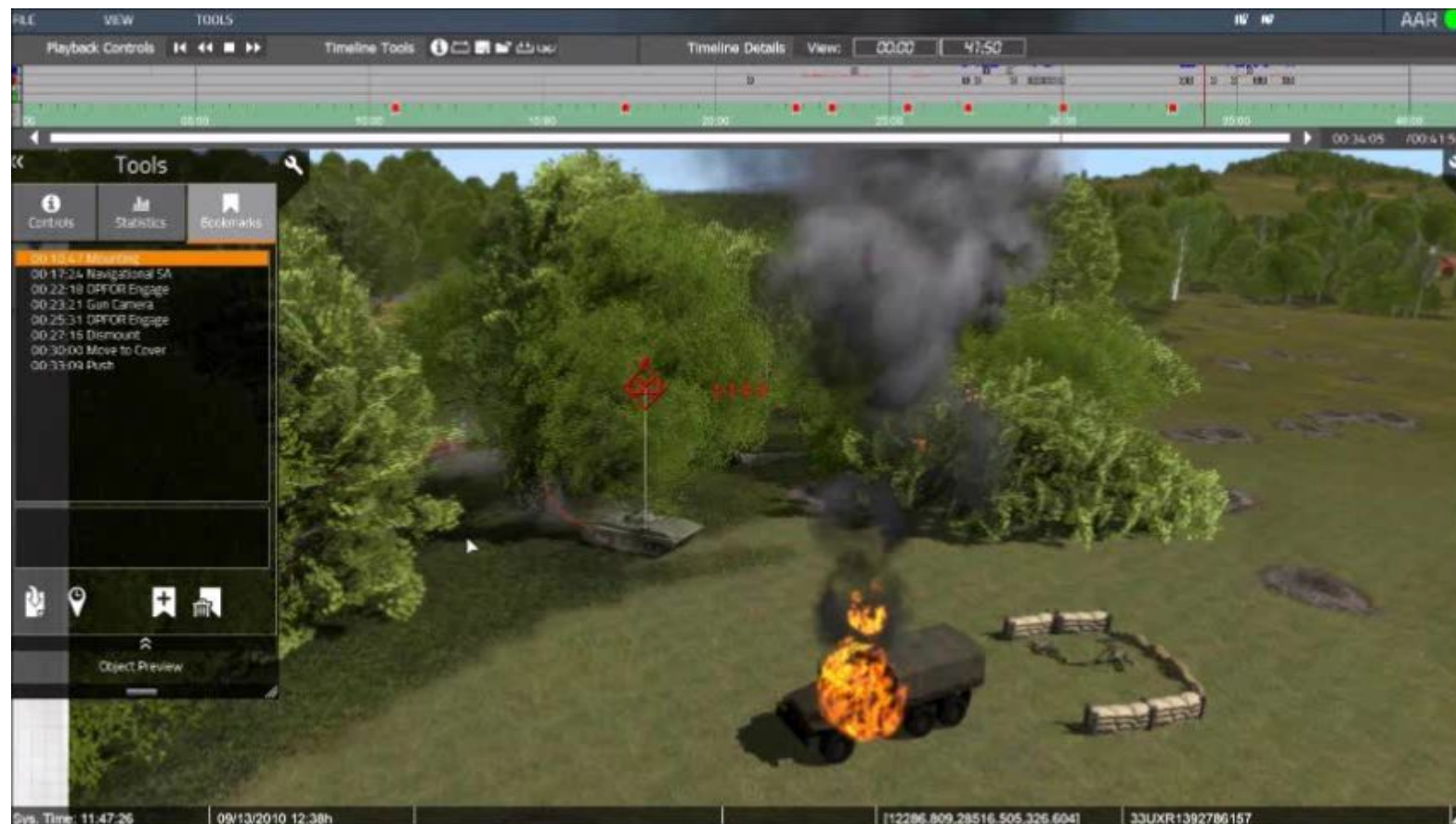
- Leadership – character, knowledge and action that inspires
- Situation Awareness – shared mental model of team situation
- Decision Making – team collectively makes a choice
- Communication – right information, right people, right time
- Co-operation – team goals over individual's

VRLT1

The Video



After Action Review





Why VR for Collective Training?

- Immersive environment creates a challenging environment
- Can rapidly rehearse and repeatedly practice in a variety of scenarios
- Flexible, scalable, deployable and cost effective
- “in desktop simulation you look at the virtual world, in VR, you are in it”



VRAI – Irish Defence Forces



Kongsberg RWS RS4



Mowag Piranha 3

VRAI

Customers include RAF

HEAT - SOLUTION OVERVIEW

DATA DRIVEN VR SIMULATION PLATFORM

TRAINEE MANAGEMENT

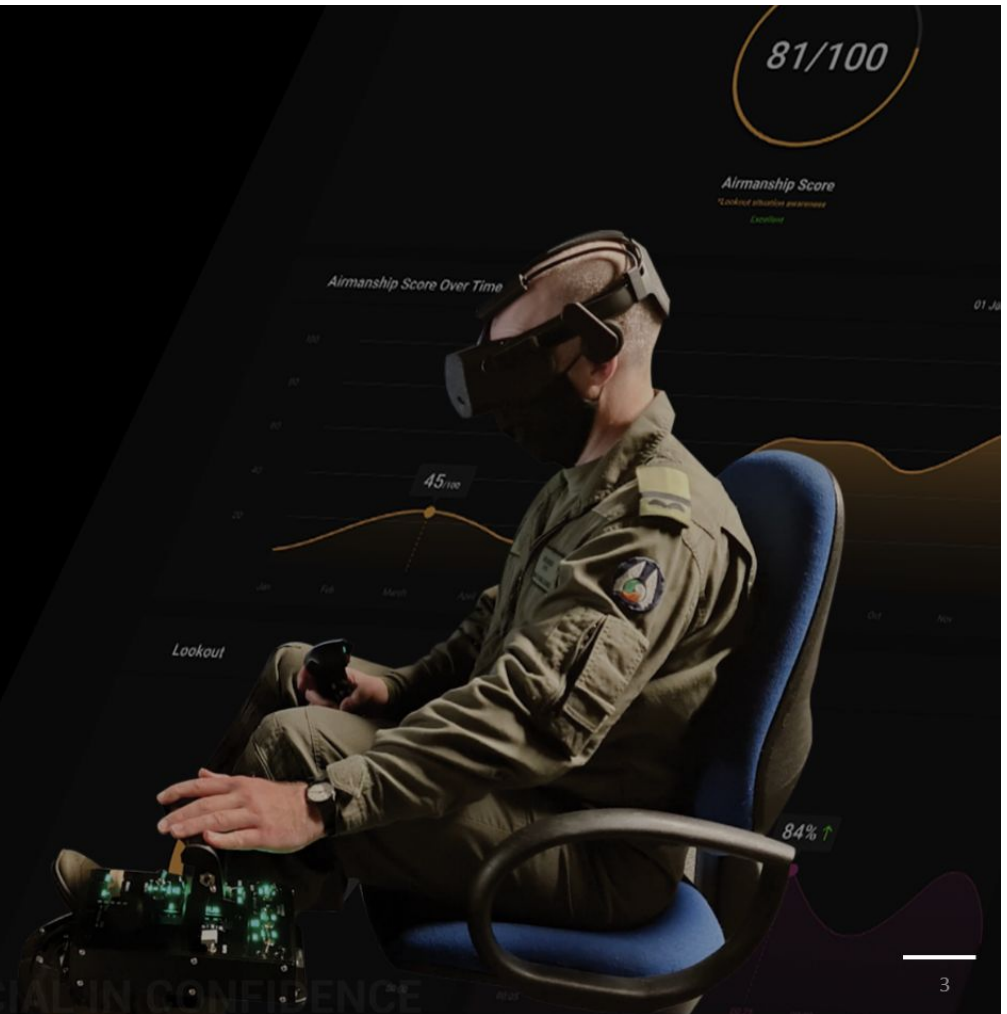
- Create trainee profiles to track performance
- Enables remote training

VR SIMULATION

- Hardware agnostic
- Integrate with 3rd party sims
- Or build for OEMs

DATA DRIVEN INSIGHTS

- HEAT's proprietary data pipeline
- Dashboard, reports & insights
- Large data sets for ML prediction



VRAI/Kongsberg & Irish Defence Forces



Some More Details

- This system is designed for up to platoon/troop level i.e. 4 x armoured vehicles operating together and also allows for individual gunners or drivers to train individually, as car crews, as a section (2 cars) or platoon (4 cars)
- Vehicles and weapons can be changed per customer
- Previously, all of this training was live on the vehicles with an instr to student ratio of 1:3, now 1:12
- The system is designed to be portable and each armoured car sim can be packed into a flight case for transportation
- The individual crews can be located in various locations and when they put on their headsets they are all on the same location virtually
- VRAI HEAT platform enables the ability to have cross training platform digital training profiles i.e. the training conducted in VRAI sim can be registered and integrated with other sims

Safety Critical VR-Based Training



EASA Qualifies World's First VR Flight Training Device



EASA calls the VRM Switzerland Virtual Reality FSTD qualification "a further step towards Agency and industry objectives to improve overall rotorcraft safety by 50% by 2028." Image credit: VRM Switzerland.

RICK ADAMS

APRIL 26, 2021

VRM Switzerland has received approval from the European Union Aviation Safety Agency (EASA) for pilot training credits in a type-specific Robinson R22 virtual reality flight simulation training device, the world's first VR-driven FSTD to receive approval from an aviation regulatory authority.

Mixed Reality in Operations

MICROSOFT TECH FEATURED STORIES

Microsoft is supplying 120,000 HoloLens-based headsets to the US Army

The contract could be worth up to \$21.88 billion over 10 years

By Tom Warren and Sean Hollister | Mar 31, 2021, 4:11pm EDT



Image: US Army

Microsoft has won a contract to supply the US Army with HoloLens-based headsets. The contract could be worth up to \$21.88 billion over 10 years, and [CNBC reports](#) that it will involve Microsoft supplying 120,000 headsets. The software maker has been working closely with the Army since 2018, and soldiers have been testing the Integrated Visual Augmentation System (IVAS) headsets over the past two years. These devices combine high-resolution night, thermal, and soldier-borne sensors into a heads-up display.

Report No. DODIG-2022-085



CU!
INSPECTOR GENERAL
U.S. Department of Defense

APRIL 20, 2022



(U) Audit of the Army's Integrated Visual Augmentation System

Controlled by: DoD-OIG
Controlled by: Audit
EUI Category: General Procurement and Acquisition
LDC: FED ONLY
POC: Deputy Assistant Inspector General for Audit, Acquisition, Sustainment, and Contracting: [REDACTED]

INTEGRITY ★ INDEPENDENCE ★ EXCELLENCE

Decision Support



RAAF Trials AR for Virtual Operations Room



Image credit: RAAF.

ATUL CHANDRA

APRIL 23, 2021

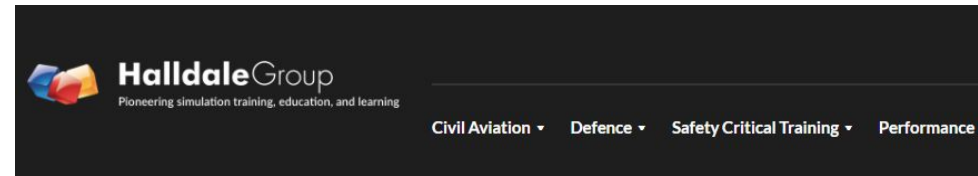
The Royal Australian Air Force (RAAF) is experimenting with Augmented Reality (AR) technology under its Plan Jericho innovation programme, resulting in the creation of a virtual operations room of the future.

Under Plan Jericho which aims to deliver rapid disruptive capability to the RAAF, its Disruptive Innovation team has been working towards a hybrid reality operations centre.

Support



Credit – Kognitiv Spark



RAAF Test Microsoft HoloLens



Image credit: RAAF.

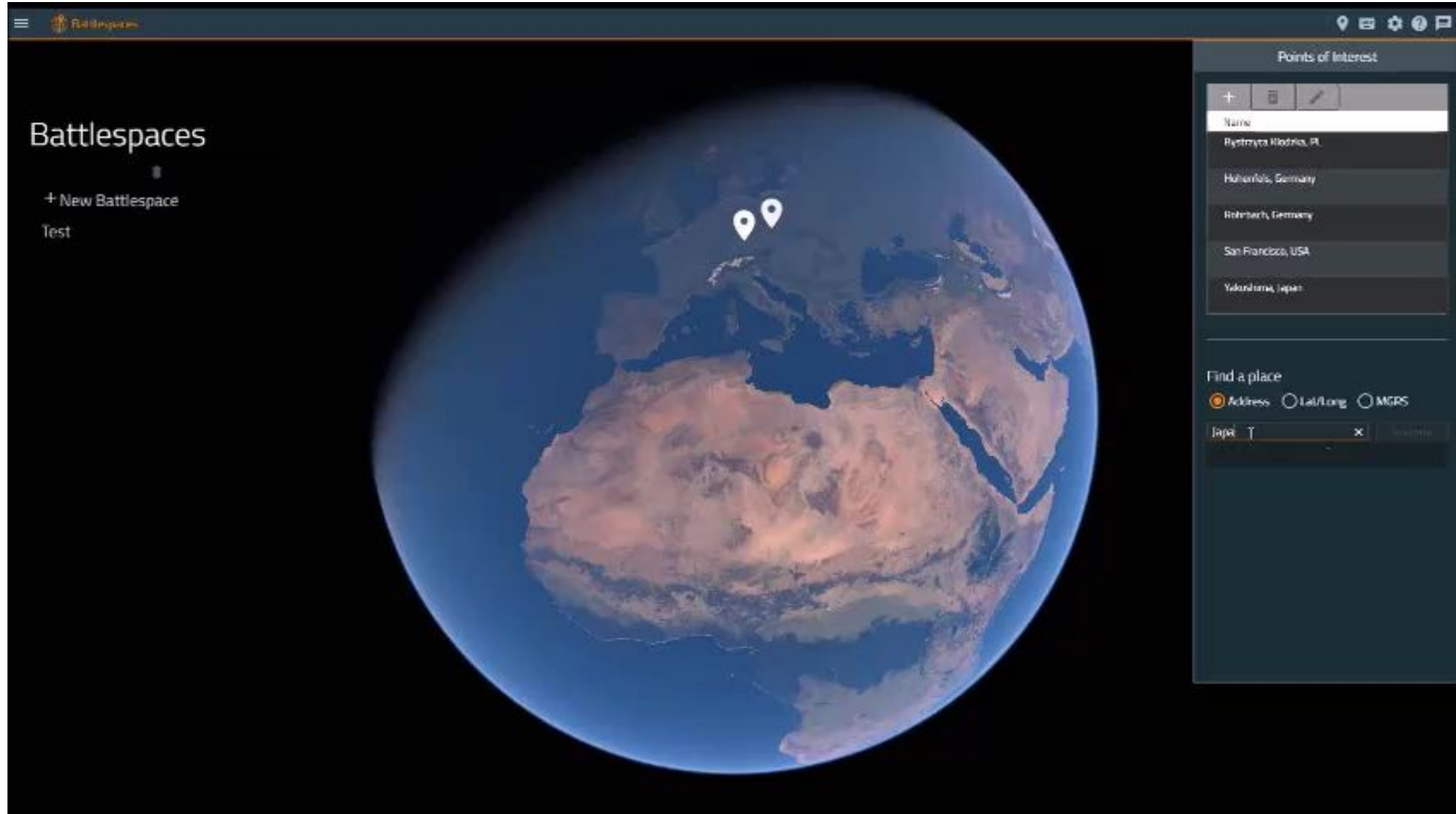
MIKE RAJKUMAR

SEPTEMBER 4, 2020

The Royal Australian Air Force (RAAF) recently commenced a trial initiative for maintenance of its C-17A Globemaster III transport aircraft using Microsoft HoloLens mixed-reality devices with software developed by Boeing. The trials commenced in July with aircraft technicians from No. 36 Squadron at RAAF Base Amberley, the service announced in a statement.

Some Other Technologies...

Whole Earth Simulation



Simulation (VBS3)

Experimentation

APS + Autonomous Systems



Eye Tracking

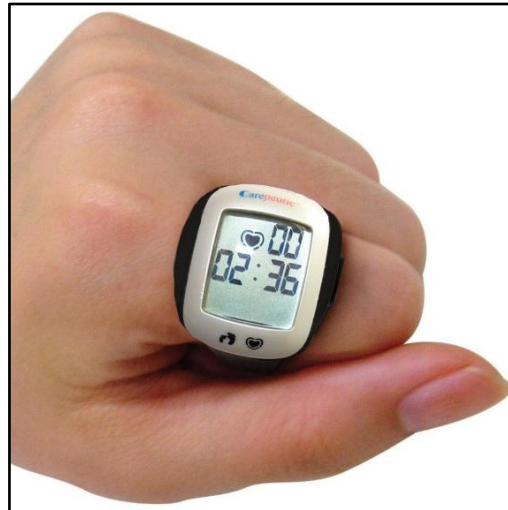


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Wearables



Notice

Telexistence Phase 2

DASA seeks innovations to develop a complete telexistence system, integrating telepresence, robotic and haptic technologies on to a single platform.

From: [Defence and Security Accelerator](#), [Defence Science and Technology Laboratory](#), and [Nuclear Decommissioning Authority](#)

Published 18 January 2022

Telexistence



A telexistence capability can be defined as a system, or a system of systems, which allows a human user to operate in an environment without physically being there.

Gaming and the Military Metaverse



Video Games

- The \$175bn video games ecosystem is vast and constantly evolving
- Serving 2.8bn gamers across the world

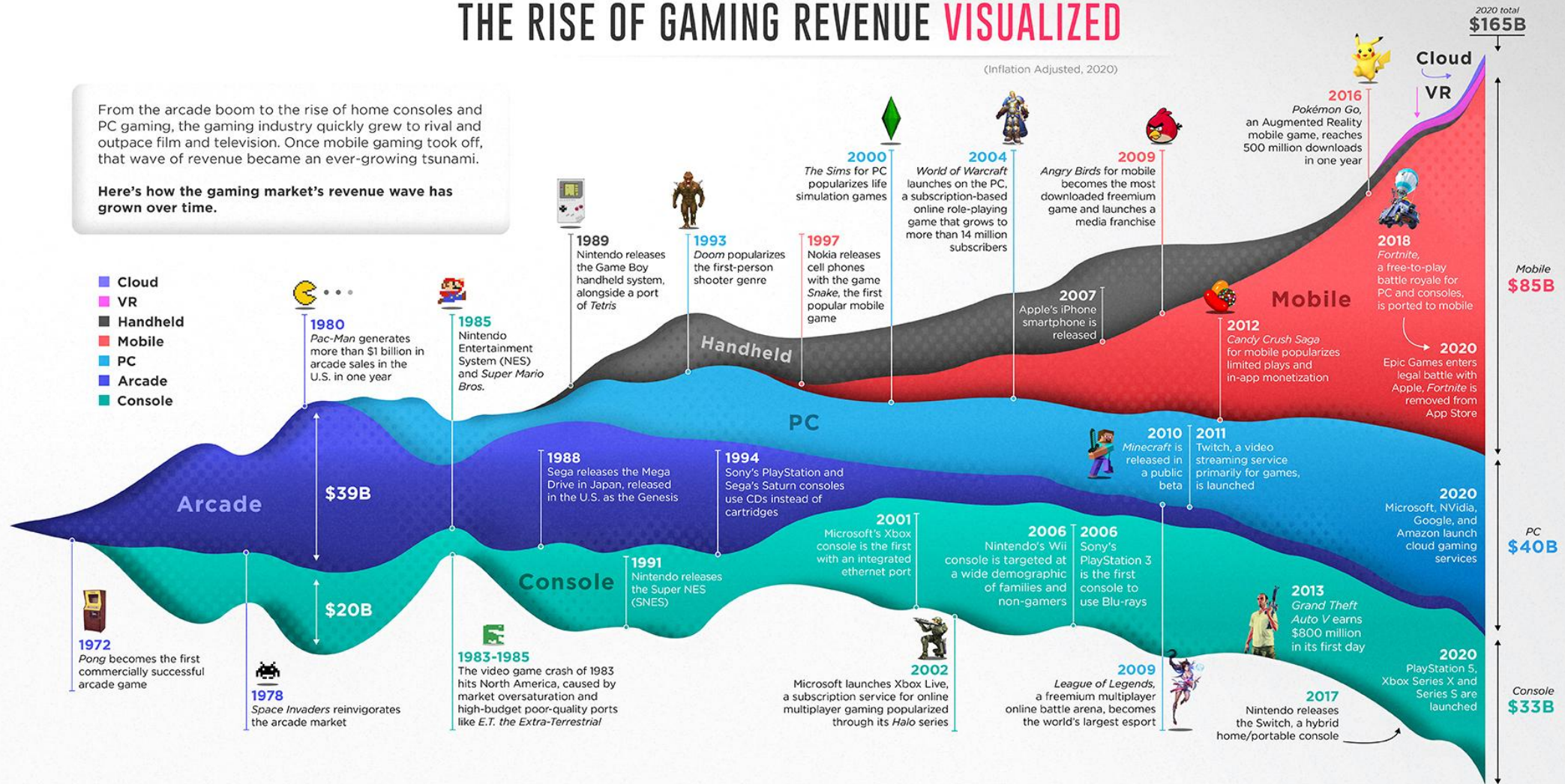
50 Years of Gaming History, by Revenue Stream (1970-2020)

THE RISE OF GAMING REVENUE VISUALIZED

(Inflation Adjusted, 2020)

From the arcade boom to the rise of home consoles and PC gaming, the gaming industry quickly grew to rival and outpace film and television. Once mobile gaming took off, that wave of revenue became an ever-growing tsunami.

Here's how the gaming market's revenue wave has grown over time.



SOURCE: Pelham Smithers
COLLABORATORS: RESEARCH • WRITING: Omni Wallach | DESIGN • ART DIRECTION: Clayton Widdoworth



Facebook icon /visualcapitalist Twitter icon @visualcap Instagram icon visualcapitalist.com

30 Years of Game Graphics



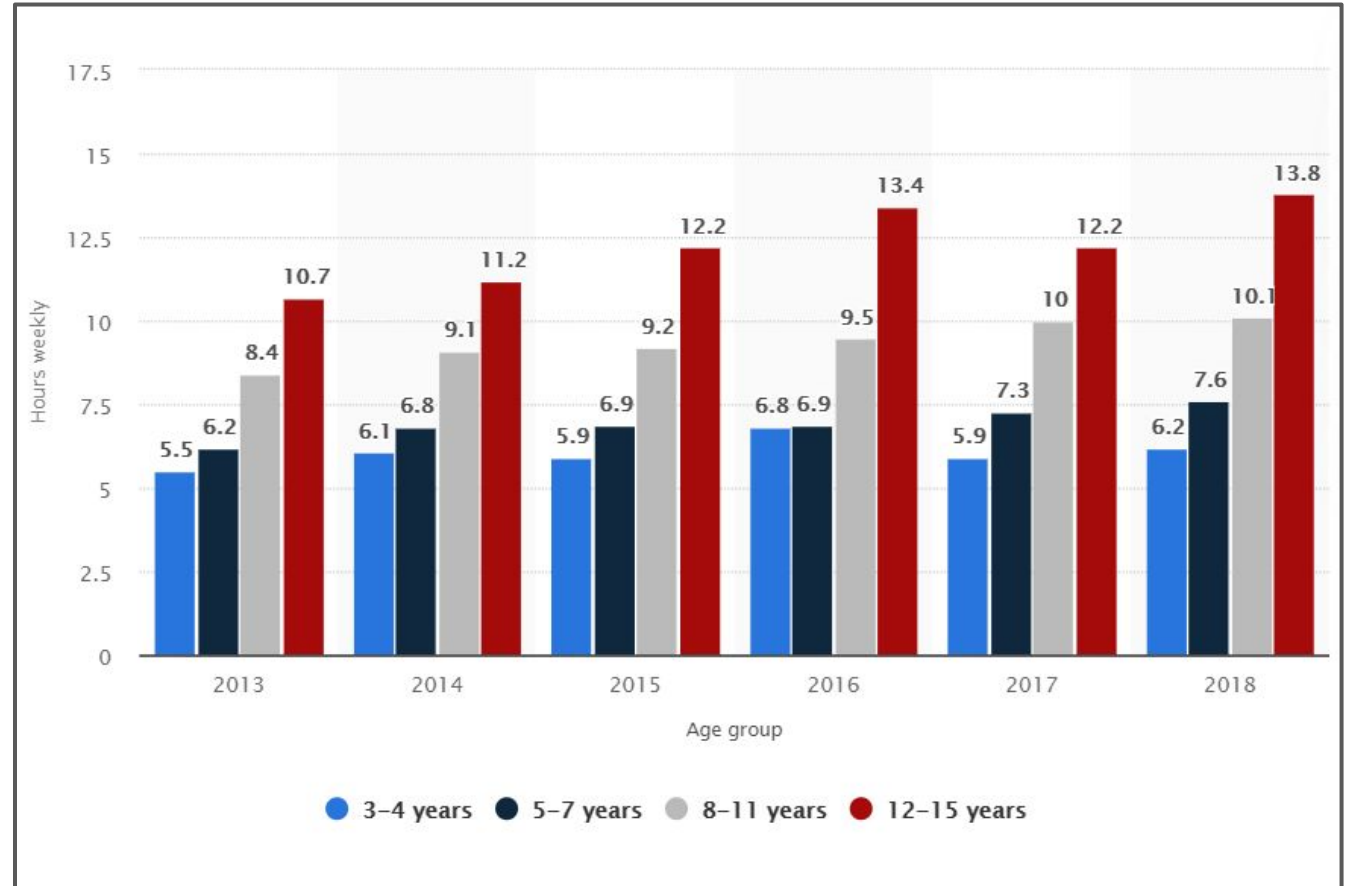
Unreal Games Engine Software in CAE Flight Simulator





93% of Children Play Video Games

Children's Commissioner for England (2019)



World of Tanks



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Military Esports

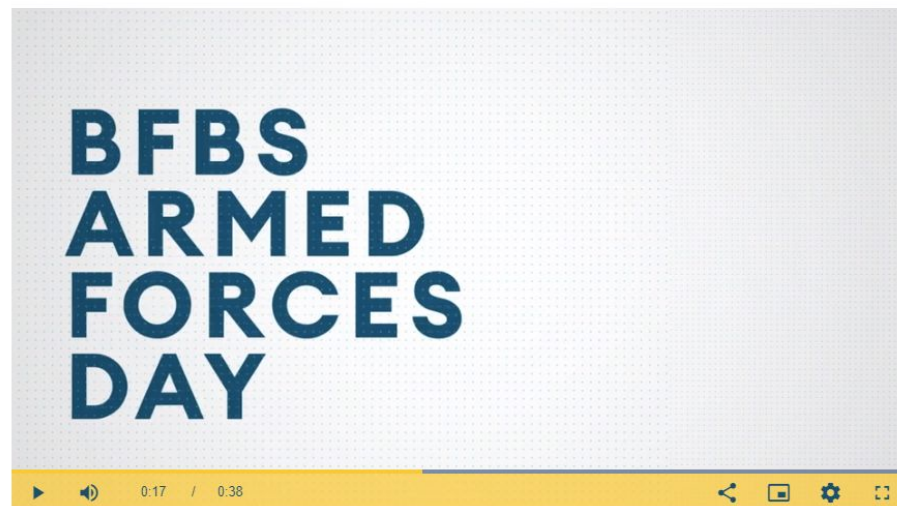


GAMING

Military esports showcased for first time on Armed Forces Day 2022

Produced by BFBS, the event will see military esports teams going up against civilians.

27th May 2022 at 3:08pm



Tip of the Spear Innovation



Combat Recce
@CombatRecce



WngO 2 for our Virtual Distributed Training event. Detail via our DC page and H Hr is 1900 on Wed 27 May 20 [#online](#) [#training](#) [#skills](#) [#distancelearning](#)



12:45 PM · May 26, 2020 from Tullibody, Scotland



45



See Combat Recce's other Tweets

THE SCOTTISH AND NORTH IRISH YEOMANRY



Towards the “Metaverse”



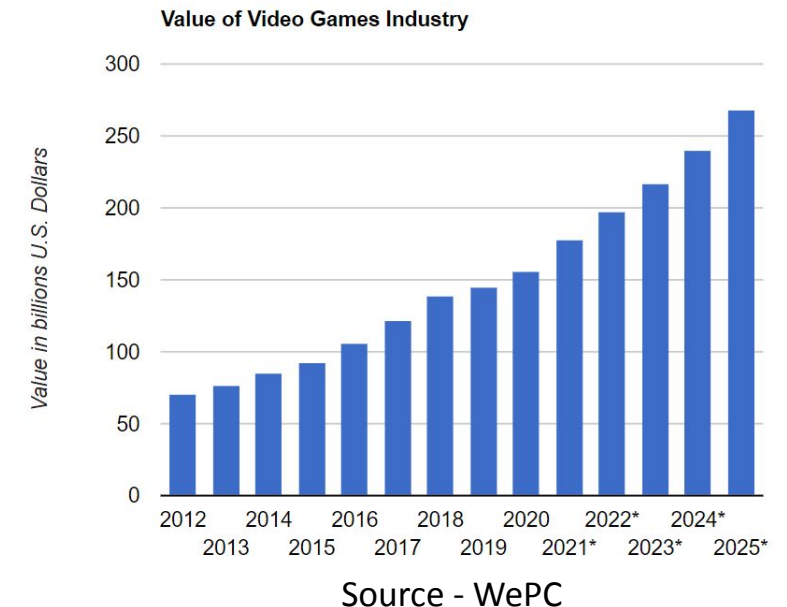
Metaverse is a term for the concept of a virtual shared space that converges with actual reality

“The metaverse enables us to embed computing into the real world and to embed the real world into computing ...”

Satya Nadella, CEO Microsoft

What is Different Now?

- **Computing Power and Availability**
- **Network Capacity and Reach**
- **Data Storage and Discoverability**
- **XR (VR/MR/AR)**
- **Ubiquitous Gaming**
- **Investment by Big Tech Companies, e.g.**
 - Microsoft
 - Nvidia
 - Meta/Facebook
- **The Pandemic**

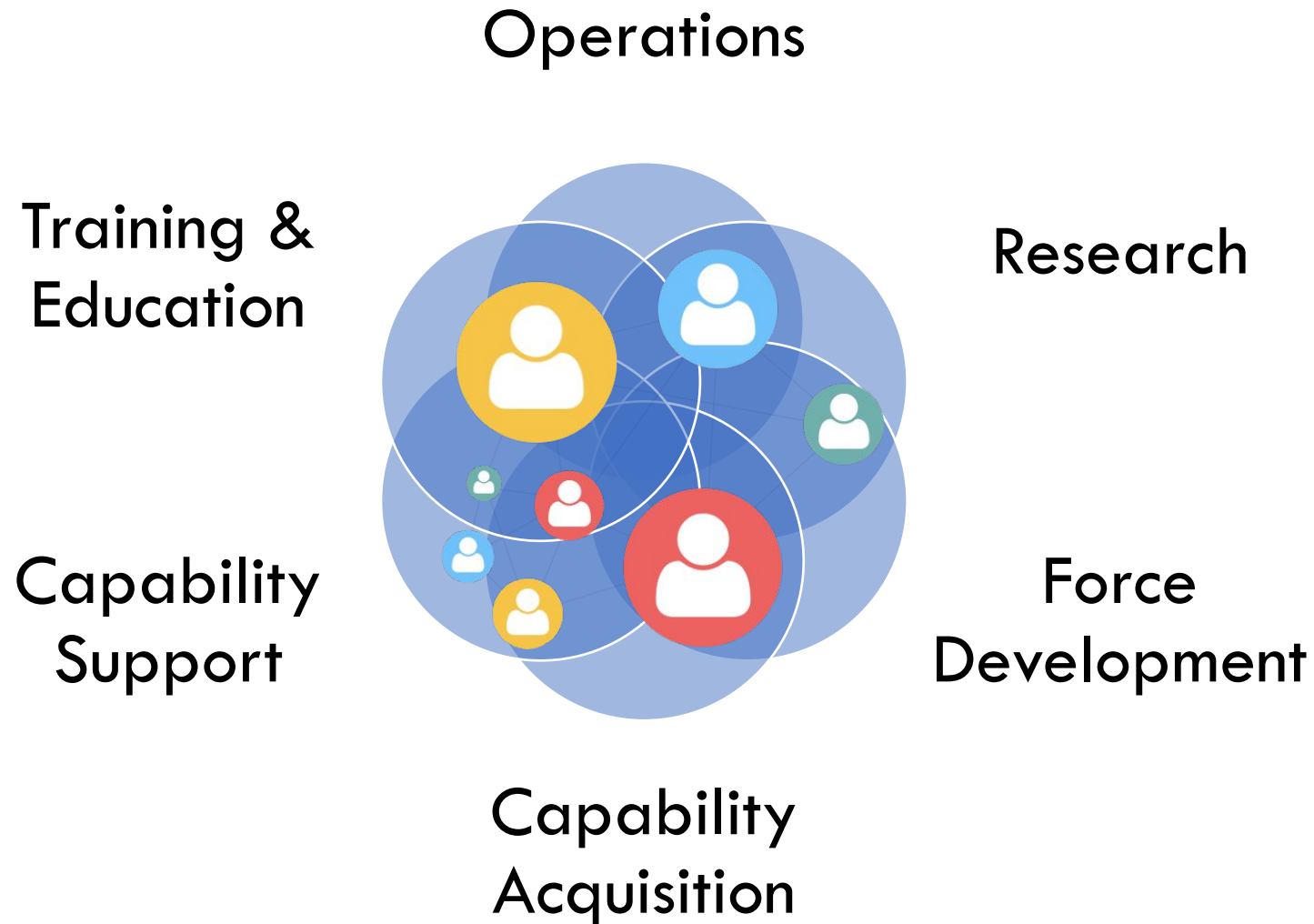


A Military Metaverse?



“Persistent secure networked interoperable live, virtual and constructive simulations, synchronized with multi-domain operational systems and enterprise-wide digital twins of equipments, platforms, infrastructure and personnel and the wider human and natural world.”

Military Metaverse Consumers/Users



The Idea

Armoured vehicle crew
should be trained and
treated like air crew

The need is greater and
the costs are getting lower

6th Annual SAE Media Group
Future Armoured Vehicles
Weapon Systems
31 May 2022

Questions?

Andy Fawkes



Credit - BISim

THINKE