Dr. Malcolm Davis

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Dr. Malcolm Davis joined ASPI as a Senior Analyst in Defence Strategy and Capability in January 2016. Prior to this he was a Post-Doctoral Research Fellow in China-Western Relations with the Faculty of Society and Design at Bond University from March 2012 to January 2016, and he currently retains an Honorary Assistant Professor position in the faculty.

He has worked with the Department of Defence, both in Navy Headquarters in the Strategy and Force Structure area, and with Strategic Policy Division in the Strategic Policy Guidance and Strategic External Relations and Education sections from November 2007 to March 2012. Prior to this appointment he was a lecturer in Defence Studies with Kings College London at the Joint Services Command and Staff College, in Shrivenham, UK, from 2000 to 2007.

He holds a PhD in Strategic Studies from the University of Hull as well as two Masters' degrees in Strategic Studies, from the Australian National University's Strategic and Defence Studies Centre. His main research focus is on Defence strategy and capability development, military technology, and the future of warfare.

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Robots at War – the role of autonomous systems in the future battlespace and the role of Counter-UAS

Dr. Malcolm Davis,
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Overview

- Recent operational experience – Ukraine and Azerbaijan – what are the lessons of the proliferation of autonomous systems? Cost vs Mass.

- Looking Forward:

  – Moving beyond ‘remotely piloted’ and getting the human ‘off the loop’. Why our adversaries will likely move faster to lethal autonomous weapons and what must we do to counter them?

  – Its not just about autonomous platforms – the role of systems and networked capability – and C-UAS systems to counter them.

    - AI in command and control, and space and ‘near space’ capabilities enable networked Intelligence, Surveillance and Reconnaissance (ISR) as part of Multi Domain Operations.
    - AUKUS, Autonomous Systems and Counter-UAS (C-UAS)

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Robots at war

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Future war and robots

- We must ask what does future war look like?

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The future of war

- Lessons learned from Ukraine will be studied for years – Ukraine (and Azerbaijan-Armenia in 2020) are unique conflicts – in many respects unlike probable scenarios for war in the Indo-Pacific.
  - Geographical and operational contexts will be different - but valuable lessons will remain.
  - The importance of Long Range Fires – superior ISR – exploiting a fast Decision Cycle (‘Observe, Orient, Decide, Act’ - the ‘OODA loop’) – intelligence and logistics matter – as does superior leadership and morale.
  - The motivation to fight plus better technology and better battlespace knowledge.

- But it is risky to see Ukraine as ‘the template’ – a very different contingency to other future conflicts (some examples)…

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The role of UAVs in Ukraine

A Game of Drones…

- Ukraine represents the first real war where UAVs have played a substantial role down at the tactical level.
- A broad mix of ‘milspec’ and commercially sourced UAVs – from short range infantry-controlled commercial DJI Mavic drones adapted for ‘over the hill’ intelligence, and military grade UAVs such as Switchblade 300/600, to advanced Turkish TB2 Bayraktar armed UAVs and US Phoenix Ghost UAVs.
- Key take-away has been to see UAVs at all levels as part of a ‘sensor to shooter’ kill chain, linked into long-range fires, and to coordinate manoeuvre elements on the ground.
  - UAVs are the forward eyes of M142 High Mobility Artillery Rocket System (HIMARS)

Drone Comparison In The Ukraine War

Switchblade 600
AeroVironment

- Endurance: 40+ minutes
- Operational Range: 40km (22nmi)
- Cruise Speed: 113km/h (61 knots)

ST-35 Silent Thunder
Athlon Avia

- Endurance: 60 minutes
- Operational Range: 30km (16 nmi)
- Cruise Speed: 120-140km/h (65-76 knots)

LUACC Swarm Launcher
KB Robotics

- Endurance: 40 minutes
- Maximum Payload: 2kg
- Operational Range: 50km (27 nmi)

Bayraktar TB2
Baykar Defense

- Endurance: 27 hours
- Wing Span: 12m (39 ft 4 in)
- Range: 4000 km (2,200 nmi)
- Cruise Speed: 130 km/h (70 knots)

Orlan 10
Special Technology Center

- Endurance: 10 hours
- Wing Span: 3.1m (10 ft)
- Communication Range: 100km (54 nmi)

Eleron-3SV
Enics

- Endurance: 2 hours
- Weight: 4.3 kg (7.49 pounds)
- Speed: 70-130 km/h (38-70 knots)
- Maximum Altitude: 5km (16,000 ft)

ZALA 421-08M
ZALA

- Endurance: 2 hours
- Maximum Payload: 300g (10.6 oz)
- Maximum Altitude: 2km (6,600 ft)

DRONESHIELD

www.droneshield.com

Source: Droneshield - https://www.droneshield.com/blog-posts/lessons-from-drones-in-ukraine-war

TB2 strike on Russian Logistics Convoy

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Drone Wars

- Ukraine has demonstrated the benefits of low-cost commercial drone tech in the hands of trained infantry at the squad or company level, together with more sophisticated ‘milspec’ systems to support actions at the battalion or even brigade level.
- Generating strategic effects – enabling rapid counteroffensives and striking deep into an adversary’s rear to attack critical combat support elements, inc. Logistics and C2.
- Cost-benefit ratios of killing expensive combat platforms (i.e. Infanty Fighting Vehicles and Main Battle Tanks) with cheap drones need further analysis.

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Looking Ahead

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Swarming

- Ukraine demonstrated the value of UAVs but the next step is to restore mass through swarming.
- Some challenges here for liberal democracies over authoritarian adversary states
  - Rules of Engagement (RoEs) and ‘trusted autonomy’ vs accelerating speed of warfare and the role of AI
  - Our need to stay ‘in the loop’ or ‘on the loop’ – to comply with Jus in Bello and International Humanitarian Law (IHL) - may constrain our ability to exploit swarming effectively.
  - Will our authoritarian adversary face the same constraint?

Swarming and AI

- The Ukraine war has demonstrated how essential UAS are for modern warfare – banning them and banning lethal autonomous weapons systems (LAWS) is now becoming less likely.
- But ethical and legal challenges remain:
  - UAS so far have had humans on the loop – with the autonomy constrained by human oversight.
  - The employment of swarming UAS tests the limits of human positive control, and even oversight. Humans become the bottleneck in the system.
- **China** is certainly examining the use of UAS by both sides in the Ukraine war, to inform their own development, including for swarming UAS integrated with AI in 'system destruction warfare'.
  - Key to success of swarming is low production cost and rapid mass production, allowing combat mass to be fully exploited, whilst minimising the implications of loss of platforms.

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Swarm vs Swarm

C-UAS

- Swarming UAS will demand much greater investment in sophisticated C-UAS for engaging large swarms – rather than shooting down individual drones.
- How do we provide rapid area defence against large numbers of loitering munitions, lethal autonomous weapons systems and UAS – perhaps, operating ‘off the loop’ – with AI integrated into a networked swarm?
- Implications of Directed Energy Weapons (DEW) – high energy solid-state lasers and high power microwave systems – a better bet than very-low altitude air defence (VLAAD) based around SAMs.
- Demands a resilient sensor to shooter ‘network’ – not just a link – which operates at high speed. AI management to counter large swarms, rather than humans ‘in the loop’.
- C-UAS in different operational domains – particularly at sea and ‘over the land’

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Human-Machine Teaming vs AI

AUKUS

- 2021 AUKUS Agreement promotes collaborative research by US, UK and Australia into advanced unmanned autonomous systems, including on and under the sea – the role of uncrewed surface vehicles (USVs) and uncrewed underwater vehicles (UUVs) – to enhance ASW and maritime awareness.
- Ocius Systems – 'Bluebottle' – USV undertaking advanced development – allow networked maritime surveillance across large oceanic regions for extended periods.
- Where might we take this technology? How might adversaries develop similar capability? Can we exploit 'Fourth Industrial Revolution' (4IR) technologies to maximise cost-benefit advantages through rapid mass

Source: Ocius Systems

Source: Ocius Systems

Implications for AUKUS

- Its time to get serious about accelerating UAS – and C-UAS – in the air, on and below the waves, and eventually over the land.
- Ukraine should generate new thinking in Defence on how AUKUS can develop technologies that enable us to best use UAS to support – and defend – ground forces.
  - Example: Think about UAS as 'part of the solution' for LAND-400 Phase 3
- An extension of air and naval capability – potential for UAS Aviation Support Vessel
- Entirely new approaches to naval operations and naval capability development… but…
- …our constraints on operational employment vs adversary lack of constraints – implications?
- RAN Remote Autonomous Systems – AI ('RAS-AI') Strategy needs greater urgency

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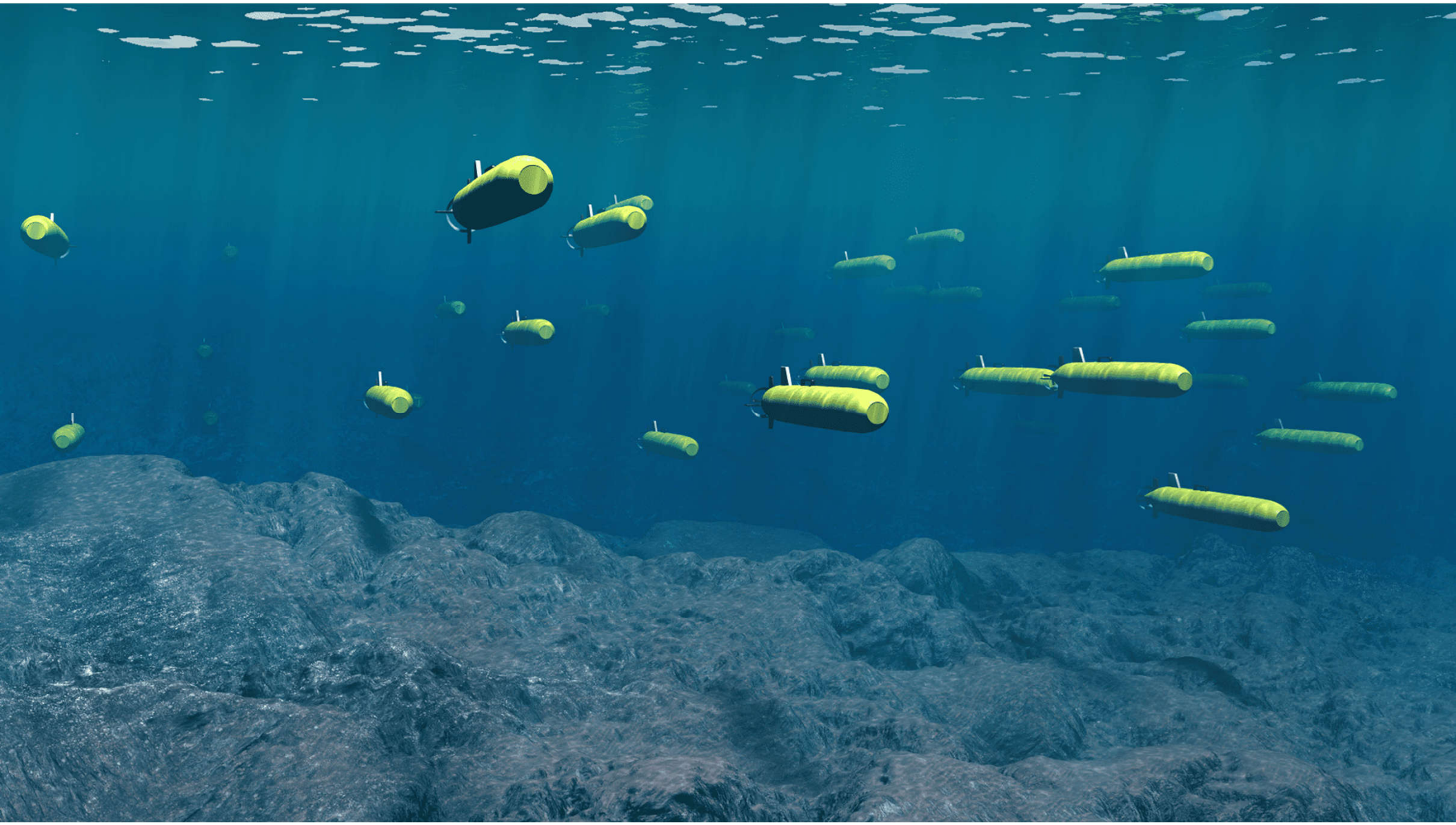
The return of mass in war is the key implication of UAS



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Questions and Discussion

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