Commission on the Defence Forces: Public Consultation

Submission by Dr Andy Scollick

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Dear Members of the Commission,

Thank you for this opportunity to make a submission to the Commission on the Defence Forces. I offer the following points for your consideration.

1. Capabilities

1.1 Uncrewed and autonomous systems

The recent war between Azerbaijan and Armenia in the disputed Nagorno-Karabakh territory bore witness to the effectiveness of uncrewed aerial vehicle or UAV systems, including loitering munitions, which helped swing the war toward victory for Azerbaijan. State proxies and non-state actors continue to adopt the use of UAVs to facilitate asymmetric attacks and give advantage against state adversaries. Lebanese terrorist group Hezbollah first flew a UAV into Israeli airspace for reconnaissance purposes in November 2004. By August 2006, Hezbollah was mounting operations against Israel using UAVs with 40-50 kg explosive warheads. In January 2018, an Islamist faction deployed multiple retail UAVs modified to carry bombs in an attack against Russian military targets at Hmeimim air base and Tartus naval base in Latakia province, Syria. In November 2018, Islamist extremist group Boko Haram began using UAVs for surveillance of the Nigerian Army. In September 2019, Iranian-backed Houthi rebels attacked oil processing facilities in Saudi Arabia using UAVs launched from Yemen. As recently as 15 March 2021, explosive-laden Houthi UAVs targeted an air base and airport in south-western Saudi Arabia.

We are currently experiencing a technological explosion in the development of uncrewed aerial, ground, underwater and surface vehicle or 'drone' systems for military use by state actors and their proxies. Such robots have varying degrees of autonomy, from remote control by computer-assisted human pilots to fully-autonomous on-board programming involving ever more advanced artificial intelligence (AI) and machine learning. The rapid evolution of uncrewed and autonomous systems is driving transformation across the realm of security and defence.[1] This will likely be reinforced by military applications of emerging quantum technology-based computing, cloud connectivity and communication.

Regardless of efforts by states to limit the sale, export and use of armed drones, it is highly probable that drone proliferation will continue to gather pace globally. **The character of warfare is already changing due to the ready availability and relatively low cost of large numbers of drones.** Proxy and non-state actor adversaries, including extremist movements and illegal armed groups, will continue to develop increasingly sophisticated military robotic capabilities based on technology available on the white, grey and black markets, and on the

[1] This is acknowledged briefly in the White Paper on Defence Update 2019 (p. 19).

reverse-engineering of downed and captured drones. When combined with advances in loitering munitions, the result is a step change in lethality.

By 2030 Irish Defence Forces personnel will likely undertake overseas deployments on peacekeeping missions and other peace-support operations in operational environments where the risk of lethality from drone use by adversaries is exponentially greater than at present. Given the rate of technological advance, proliferation and decreasing unit cost of the small and medium scale drone systems, at some stage in the future and certainly by mid-century, overseas environments will become dominated by unarmed intelligence, surveillance, target acquisition and reconnaissance (ISTAR) and armed combat UAVs as well as advanced loitering munitions. First generation uncrewed ground vehicles (UGVs) are already on the verge of entering military service in logistics, tactical, medevac, counter-drone and other roles. By 2030 they will be in common usage. By mid-century we can expect a similar pattern of UGV proliferation to that of the UAV systems, giving non-state actors additional ground resources with which to carry out asymmetric warfare. Likewise, the development of uncrewed underwater vehicle (UUV) and uncrewed surface vehicle (USV) technologies continues to evolve, presenting a future threat to Naval Service operations and any future Army amphibious capabilities.

Ireland cannot afford to ignore these developments. International peacekeeping and humanitarian operations will in general increase their reliance upon uncrewed and autonomous systems for use across the spectrum of military and civil-humanitarian tasks undertaken by missions. However, the need by the Defence Forces for anti-drone **countermeasures** is a clearly the urgent priority. This is not something that can be put off until 2030.

The pace of development of **counter-drone technologies** is accelerating. There is little point in referring to specific proprietary systems for procurement here because by the time the Commission has published its recommendations in 2022, they will already be superseded by newer and more advanced systems – such is the rate of change.

A comprehensive and integrated drone defence involves a multilayered **counter-drone** system with the functionality to detect, identify or classify, and track a target UAV (including loitering munitions), UGV, UUV or USV, multiple targets or even a swarm[2] before mitigating or neutralising the potential threat through non-kinetic or kinetic solutions. Drone monitoring equipment enables 360 degree 'full-sky' coverage using four main types of equipment: radio frequency analysers, radar, acoustic sensors and optical, electro-optical or infrared cameras. Early detection and identification prepare the system for an efficient response, including engagement of the drone target or targets. Counter-drone engagement methods include:

- Electronic jamming to disrupt a drone's GPS radio navigation or radio control signals, or signal 'spoofing' to take over navigation and control of the drone.

[2] Drone swarms are multiple uncrewed platforms or weapons systems deployed to accomplish a shared objective based on swarm-level behaviour: each drone follows a simple set of rules, autonomously altering its behaviour based on communication with the other drones in the swarm, without any central controller. When a drone is disrupted or destroyed the swarm can adapt its behaviour and continue toward its objective.

- Cyber operations to interrupt communications links between a control centre and the drone.
- Physically capturing a drone midflight using a net either fired from a gun or deployed from an attack drone to entangle the target's propellers and immobilise it.
- Physically disrupting or destroying a drone using either directed energy (high-power microwave and laser) beams or a projectile such as a bullet, missile or smart 'airburst' munition.

The rapid co-evolution of drone and counter-drone technologies across the air, land and water domains results in a form of drone 'arms race'. Efforts are already underway by the security and defence industry to develop solutions that counter the countermeasures which, in turn, drives efforts to further develop countermeasures.

The Defence Forces have been operating unarmed UAVs since 2007. In May 2018, Paul Kehoe TD, then Minister of State at the Department of Defence stated:

> "Following a competitive tender process, four UAV systems were procured between 2007 and 2009 from Aeronautics Defence Systems Limited based in Israel, at a combined cost of €2.375 million exclusive of VAT. An upgrade of the Defence Forces UAV systems was carried out by the original equipment manufacturer in 2016 at a cost of €1.9 million exclusive of VAT. This involved the upgrade of four UAV systems with airframes in each system.
>
> These UAVs are, in effect, an information-gathering asset which have no offensive capability. They do not carry weapons. The UAV systems were acquired to enhance the capability of the Defence Forces to carry out surveillance, intelligence gathering and target acquisition for peace support operations and provide a low-cost, low-risk means to increase capabilities and enhance force protection by performing missions which do not demand the use of manned aircraft."[3]

These systems are the lightweight, person-portable, electrically-powered, fixed-wing 'Orbiter 2B'[4] (upgraded from 'Orbiter 1') mini UAV used for tactical-level ISTAR and operated by the Artillery Corps M-UAV Section. There are three airframes in each system giving a total of 12 Orbiter 2B UAVs. Furthermore, a number of additional simulators and pneumatic launchers have also been procured.[5] In addition, it is understood that the Engineer Corps operate DJI 'Matrice' industrial UAVs in inspection and other roles. The Army Ranger Wing operates a number of small and micro UAV systems, and the Naval Service operate quadcopter UAVs at sea. The primary function of all UAVs in the Defence Forces is surveillance .[6]

The Department of Defence's Equipment Development Plan for the Defence Forces 2020-2024 (published in June 2020[7]) lists under equipment programmes in planning an 'Unmanned Aerial Vehicle (UAV)/Drone Defence System' project (2021-2022) involving a new development of anti-drone capability against malign and nuisance drones (p. 9, 12). In

[3] https://www.oireachtas.ie/en/debates/question/2018-05-10/6/
[4] https://aeronautics-sys.com/home-page/page-systems/page-systems-orbiter-2-mini-uas/
[5] https://www.oireachtas.ie/en/debates/question/2017-11-15/232/
[6] http://digital.jmpublishing.ie/i/1227912-april-2020/23?
[7] https://www.gov.ie/en/publication/9bd58-equipment-development-plan/

addition, the Equipment Development Plan refers to planning for the replacement (2021-2022) of the current Ground Based Air Defence (GBAD) radar operated by the Artillery Corps, which is expected to have a UAV detection ability in conjunction with a counter rocket, artillery and mortar (C-RAM) function, which may overlap in some respects with counter-UAV solutions (p.12).

Planning and procurement must factor in the need both for periodic upgrades to adapt existing systems (as in the case of from Orbiter 1 to Orbiter 2B) and for replacement of systems in order to keep the Defence Forces 'in the game'. **Operating with outdated drone and counter-drone capabilities that are no longer effective is pointless.** Therefore, the Defence Forces require some form of branch or office within its divisional structure to address (internally or in concert with academia and the private sector) uncrewed and autonomous systems development: to monitor technological advances and uses, and make recommendations regarding planning and procurement. (In addition, there is undoubtedly an opportunity for collaboration regarding indigenous research and development, and production of drone and counter-drone systems in Ireland.) Such a branch or office could more broadly be responsible for focusing on emerging and disruptive technologies in general.[8]

The defence landscape of 2030 out to mid-century will see increasing degrees of sophistication, levels of use and, ultimately, dependence upon drones and dynamic robots. The threat spectrum already includes drone warfare. This can only broaden and deepen. This poses ethical dilemmas as well as practical problems: in future, can Defence Forces overseas missions proceed without armed drones and even loitering munitions? Will counter-drone capabilities be sufficient to provide force protection? It also poses opportunities for the Defence Forces. If the Defence Forces are to successfully cope with and adapt to the 'Drone Age', then they must keep abreast of developments and embrace the utility of drones and, eventually, dynamic robots.

1.2 Offshore renewable energy infrastructure

The increasing dependence of the Irish energy sector upon the development of offshore renewable energy (ORE) resources and infrastructure creates vulnerability. ORE infrastructure includes fixed and floating wind farms and, potentially, wave and tidal energy converters, integrated hydrogen fuel production facilities, and networks of undersea command and control cables and electricity interconnector cables. These interconnectors will link ORE production facilities to Ireland's electricity grid as well as link the national grid to grids in the UK and France. The development of ORE infrastructure presents a complex set of potential targets for state or non-state actors intent on some form of interference or disruptive sabotage. Regardless of the various scenarios involved in forecasting potential threats to Ireland's energy security, we must ask the question: **What capabilities are needed in 5, 10, 25 years time to provide for the effective security and defence of ORE infrastructure?** (There is much in common with the parallel issue of how to defend the undersea communications cables that cross through Ireland's exclusive economic zone and territorial waters.)

[8] Along the lines of NATO's Coherent Implementation Strategy on Emerging and Disruptive Technologies and Advisory Group. See https://www.nato.int/cps/en/natohq/news_181901.htm

It is a question that has received relatively little attention within Europe in general. Rather than suggesting answers here, I believe this requires a focussed discussion by some kind of task force involving members of the Defence Forces in conjunction with other stakeholders, for example, from the energy industry, other militaries, the European Commission and academia.

1.3 Improved capabilities for dealing with the Climate Emergency

> 'Due to more frequent and severe weather events EU Member States' armed forces may also be called upon more often to support disaster management and relief efforts, both within the EU and beyond its external borders' (EEAS Climate Change and Defence Roadmap p. 5).

Developing the capabilities of the Defence Forces to deal effectively with extreme weather events and the impacts of climate change is essential. Just a few examples: When procuring troop carrying and logistics vehicles (trucks and other load carriers) for the Transport Corps, thought should be given to fording capability (0.8m to 1.5m depth), 'high-water vehicle' characteristics and amphibious capability given the forecast increases in frequency and magnitude of flooding events. In addition to existing Engineer Corps fire-fighting capabilities, it would be prudent for the Defence Forces to develop fire-fighting support capabilities to assist county and city Fire Services in dealing with 'mega-fires' (extensive and devastating wildfires) during heatwaves. Likewise, during periods of drought, the Engineer Corps could be called upon to support the civil authorities in providing potable water to people and/or industry through logistics capabilities for water purification, high-pressure pumping and pipe-laying to supply water over long distances. Of course, such capabilities ought to be developed in concert with the Civil Defence component of the defence organisation.

Capability development is one of three interlinked areas of action of the 'Climate Change and Defence Roadmap' working document published by the European External Action Service (EEAS) in November 2020; the other two areas being the operational dimension and strengthening multilateralism and partnerships.[9] The Roadmap suggests a set of concrete short-, medium- and long-term actions at both the EU and member state level[10] that address the links between defence and climate change.

Climate change 'introduces new operational challenges, including the need to provide missions and operations with equipment that is effective under extreme weather conditions and technology that is more energy efficient' (Roadmap p. 6). While operational effectiveness remains the highest priority, in the context of the EU Common Security and Defence Policy (CSDP), 'reducing emissions and other environmental impacts of CSDP civilian and military missions and operations – in particular among military forces – offers several operational advantages, such as reduced logistical requirements and dependence on supply convoys in areas of high insecurity as well as budgetary aspects' (Roadmap p. 7).

[9] EEAS(2020)1251, https://data.consilium.europa.eu/doc/document/ST-12741-2020-INIT/en/pdf
[10] See Roadmap pages 5-9.

The Roadmap points out that the European Defence Fund (EDF) and Permanent Structured Cooperation (PESCO) mechanisms can be used to support energy-related capability development and technological innovation by member states. In this way, the defence sector can develop sustainable capabilities aimed at an energy transition in keeping with the EU Green Deal's objective of carbon neutrality by 2050.

The Defence Forces are already developing green technologies, including the installation of 11 solar photovoltaic (PV) systems at sites across the country.[11] There is potential for the Defence Forces to work with the EU, militaries from other member states, the UK and United States, as well as partners in academia and the private sector, to develop new technologies. Some examples include the self-contained sustainable 'smart base' concept developed by the Royal Netherlands Army that reduces the carbon and environmental footprints of overseas missions. The development of biofuel mixes for aviation fuel to supply the Air Corps, which is being pioneered by the Royal Air Force. The Defence Forces could be engaged as a partner in the R&D of renewables-based microgrid systems, (geothermal) heat storage and transfer systems, heat exchanger systems, battery systems, hybrid and electric vehicles, hydrogen fuel applications and more. The Defence Forces have a valuable role to play in developing field trials and proof of concept capabilities. **Capabilities and technologies developed under the aegis of the Defence Forces would be expected to have significant spillover effects in the wider economy through spin-off civil use.** This could have significant benefits for some of the world's most disadvantaged regions and populations affected by climate change, environmental degradation and the associated threat of conflict and displacement.

Needless to say, it is vital that the Irish defence organisation gives priority to green procurement and standardisation. Future EU and NATO interoperability standards will include green requirements aimed at achieving the high-level strategic objective of carbon neutrality. For example, we can anticipate that Air Corps aviation participating in an EU Battlegroup or NATO Partnership for Peace joint exercise will be required to operate using a biofuel mix aviation fuel. The UN Peacekeeping Office of Military Affairs may stipulate mandatory climate-proofed capabilities by national military components of UN peacekeeping missions. Furthermore, the Defence Forces may have to invest in armoured vehicles and other equipment that is better suited to extreme weather conditions (heat exceeding 50°C, prolonged drought, extensive riverine and coastal flooding, increased average significant wave heights at sea, etc.) if they are to retain the ability to participate in international peacekeeping missions and undertake the mandate assigned to them.

2. Structures

2.1 Systems approach

Although not directly within the Terms of Reference of the Commission, I believe, however, that this is an important point:

A whole system is greater than the sum of its parts. In Ireland the defence organisation is a triad consisting of three institutions: the Department of Defence (policy), Defence Forces

[11] https://www.seai.ie/case-studies/defence-forces-solar-pv/

(military) and Civil Defence (civil). Each component – de facto a set of structures and processes – functions as an interdependent subsystem of the defence organisation or integrated system.

It is noted that the *Feasibility Study: Establishment of a Research, Technology & Innovation Capability for the Defence Organisation, Final Report, September 2020* [12] by the Department of Defence, Defence Forces and Vedette Consulting states that 'Defence Organisation (DefOrg) refers to the Department of Defence and the Defence Forces' (p. 5). Yet 'Civil Defence operates at national level under the Department of Defence'.[13] I would argue that is essential that Civil Defence is considered not in isolation, but rather as an essential component of the defence organisation. This is especially important given the increasing probability of more extreme weather events and climate change-related impacts (floods, wildfires, droughts) affecting Ireland by 2030 and beyond. In relation to climate change alone, the defence organisation must function as an integrated system. Defence Forces' planning must necessarily include and increasingly rely upon the capabilities of the Civil Defence. The system cannot function seamlessly or effectively if one subsystem is excluded, out of balance or dysfunctional. **Any consideration of the Defence Forces must address the interface, interactions and coordination between the Defence Forces and Civil Defence.**

2.2 Adaptive defence planning architecture

The processes of defence planning necessarily take place within some kind of structure or framework that includes both the civil and military elements of the defence organisation. In the overall context of serving the political domain and defence policy, defence planning deals with not only the military domain but also the political–military interface. It may also (and I would argue should) address civil defence and other non-military policy considerations directly. In doing so, defence planning must consider the different nested levels of military (and broadly similar or equivalent levels of non-military) organisation and behaviour: technical, tactical, operational, strategic and cross-cutting institutional. However, the main focus of defence planning is on providing guidance to decision-makers and preparing strategies, plans and programmes at the political, institutional, strategic and operational level.

In most countries, defence planning is not without its problems. Not least of these is the predominant pattern of thinking, which tends to be linear, reductionist, fragmentary and deterministic: viewing real-world systems as largely predictable and controllable. Defence planning frameworks that are static, inflexible, siloed and unresponsive are mismatched with their *raison d'être*, which is to assist key decision-makers to make wise choices. To be effective, defence planning systems must somehow reflect the complexity, dynamics, scale, diversity and intrinsic deep uncertainty of the systems they deal with, as well as respond to rapid changes in those systems. Therefore, achieving effective defence planning requires a cultural paradigm shift toward a new pattern grounded in complex adaptive systems thinking.

[12] https://www.gov.ie/en/publication/d8cab-feasibility-study-for-the-establishment-of-a-research-technology-innovation-rti-capability-for-the-defence-organisation/
[13] https://www.civildefence.ie/about/faqs/

I have argued the case for an adaptive planning approach grounded in a complex adaptive systems perspective elsewhere: see 'A Strategic Adaptive Defence Planning Framework for State Polities in the 21st Century', pages 28-37 in *Defence Forces Review 2020*.[14] Twenty-first century challenges tend to emerge quickly and evolve fast. To meet them, the Defence Forces require an adaptive planning framework in order to avoid rigidities and vulnerability traps inherent in fixed term planning cycles. Parallel development and experimental implementation of adaptive processes and structures (frameworks) is, of course, preferable to the shock of rapid reorganisation of Defence Forces planning functions, including the Strategic Planning Branch. The introduction of adaptive planning can be accomplished using well-established principles of adaptive approaches (widely used in governance, management and planning); and based upon experience gained by other militaries, for example, the Adaptive Planning approach developed by the United States Department of Defense. Moves to develop adaptive planning are currently being made by NATO and the UK Armed Forces. An Irish approach would be proportionally smaller scale and, therefore, more feasible to accomplish. **In summary, I believe that the Defence Forces would benefit from the adoption of a strategic adaptive architecture for defence planning that complements rather than replaces existing defence planning structures and processes.**

2.3 Office of Emerging and Disruptive Technologies

As already outlined in section 1.1 regarding uncrewed and autonomous systems, the Defence Forces would benefit from establishing some form of branch or office within its divisional structure to address emerging and disruptive technologies in general, and uncrewed and autonomous systems in particular. Its role would be to monitor technological advances and uses, and make recommendations regarding planning and procurement. Such a branch or office would liaise closely with other militaries, industry and academia.

2.4 Office of Sustainability

From undertaking green procurement to overseeing development of renewable energy and other green technologies across the Defence Forces estate and missions, there is need for a dedicated office or branch to address sustainability and sustainable development. It would have responsibility for integrating and coordinating development activities, assessing best practice and liaising with other militaries, external (EU, NATO) agencies, industry and academic partners. A key role would be the promotion of spin-offs in the civil sector of green technology applications developed and demonstrated by the Defence Forces at home and abroad. Another key role would be to coordinate planning and management functions across the Defence Forces regarding adaptation of installations (bases, airfields, dockyards etc.) to take into account of the projected climate change impacts upon functions. Much experience has been gained in this regard by the U.S. Army Corps of Engineers, which could serve as a model for a scaled-down Defence Forces approach. This could involve extending the infrastructure remit of the Engineer Corps. **An Office of Sustainability would be central to climate-proofing and building resilience across the Defence Forces.**

3. Staffing

[14] https://www.military.ie/en/public-information/publications/defence-forces-review/review-2020.pdf

No comments.

4. Any other comments in relation to the Defence Forces having regard to the Commission's Terms of Reference

4.1 Defence Forces youth cadets

The establishment a youth cadet force for young people between 12 and 18 years old is a potential means of growing and sustaining societal support for the Defence Forces. The UK Armed Forces have a long-established youth cadet programme; see the following for details:

Army Cadet Force, https://www.army.mod.uk/who-we-are/the-armys-cadets/

Royal Air Force Air Cadets, https://www.raf.mod.uk/aircadets/

Royal Navy cadet organisations, https://www.royalnavy.mod.uk/our-organisation/cadets-and-youth

Naturally, an Irish equivalent would follow the Defence Forces ethos and could borrow some ideas from existing youth movements such as the GAA Youth Leadership programme, https://www.gaa.ie/my-gaa/community-and-health/youth-leadership/

4.2 Whole-of-society defence

My final point strays from the Terms of Reference. Plus I am also aware that certain members of the Commission will have a much better understanding of the Nordic concept of 'Total Defence' than I.

The world in 2030 and beyond will potentially be much more threatening to Ireland as a state and to Irish nationals both at home and abroad. There are no guarantees that future Presidents of the United States will be supportive of the transatlantic relationship and NATO. Regardless of whether Vladimir Putin remains President of the Russian Federation until 2036 or leaves office before then, his successor or successors could pursue even more aggressive policies against Europe. Ireland, its territory and extensive maritime exclusive economic zone and controlled airspace, is the strategic Atlantic flank of Europe. Under a number of scenarios, such as Russian operations to seize and occupy territory in the Arctic, Baltic Sea and Black Sea regions, there is potential for conventional war to break out in eastern Europe. It would be naïve to assume that Ireland's strategic position would not come into play regardless of our neutral status. It would be prudent, therefore, to begin a process of discussion regarding the 'Total Defence' concept and how to build a whole-of-society approach to defence that is appropriate to Ireland's unique circumstances.

I understand that it is probably beyond the Commission's Terms of Reference and capacity to investigate in any depth and detail. **However, I would strongly urge the Commission to consider recommending some form of follow-up process focused on discussing and developing an Irish Total Defence approach.** Such an approach will take years to build; it is not something that can be decided on and implemented at short notice in a looming crisis.

Declaration

I have no vested interests, financial or otherwise, in any of the companies or organisations or their products mentioned or implied in this submission.

Thank you.

Yours faithfully,

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