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‘Groundhog’ or ‘Sitting Duck’? Why the Defence Forces need strong countermeasures against uncrewed and autonomous aerial vehicles

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Abstract: In five, 10, 15 years’ time we can expect Irish peacekeepers to find themselves in situations where they are pinned down not only by artillery crossfire, but also by combat drones and loitering munitions. Therefore, it is essential that the Defence Forces have the capabilities to detect, identify, counter and protect against such emerging threats. This article looks how peacekeepers are already being caught in the crossfire between parties, and how that danger is likely to increase due to proliferation of combat drones and loitering munitions. It then considers the use of UAV technology by violent non-state actors, drone countermeasures and what the Defence Forces need to do to avoid becoming ‘sitting ducks’.

Keywords: defence forces, peacekeepers, c-uas, uav, loitering munitions, capabilities

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Caught in the Crossfire

Defence Forces personnel on United Nations (UN) peacekeeping duties in southern Lebanon are no stranger to 'Groundhog', the codeword to take cover in designated bomb shelters. In May this year, while global attention was focused on the Gaza Strip, the UN 'Blue Line' border demarcation between Lebanon and Israel once again became a hot zone. Irish peacekeepers serving with the UN Interim Force in Lebanon (UNIFIL) received Groundhog alerts when Palestinian militants fired rockets toward northern Israel and the Israel Defense Forces (IDF) returned artillery fire.¹ A similar Groundhog incident took place on 1 September 2019, when a number of Israeli mortar rounds and artillery shells fell into the Irish peacekeepers' area of operations.²



It is, of course, not only Defence Forces personnel who are at risk in Southern Lebanon: UNIFIL's force currently consists of 10,243 peacekeepers from 46 countries.³ On 28 January 2015, as a result of IDF artillery fire, a Spanish peacekeeper at a UNIFIL position on the border of the Golan

¹ Niall O'Connor, "Irish troops took shelter as Israel traded rockets and artillery fire with Palestinian groups," *The Journal*, June 4, 2021, <https://www.thejournal.ie/irish-troops-unifil-117-infantry-irish-defence-forces-south-lebanon-5457082-Jun2021/>.

² Tom Brady, "Irish peacekeeping troops in Lebanon under protection after their operations hit by Israeli mortar fire," *Independent*, September 1, 2019, <https://www.independent.ie/irish-news/news/irish-peacekeeping-troops-in-lebanon-under-protection-after-their-operations-hit-by-israeli-mortar-fire-38456435.html>.

³ "UNIFIL Troop-Contributing Countries," UNIFIL, accessed July 16, 2021, <https://unifil.unmissions.org/unifil-troop-contributing-countries>.

Heights sustained serious injuries that resulted in his death.⁴ On 25 July 2006, four unarmed members of the UN Observer Group Lebanon (OGL), which supports UNIFIL, were killed when IDF artillery shells and aerial bombs struck their patrol base.⁵ The three-story building they were in was totally destroyed. The military observers were from Austria, Canada, Finland and China.⁶

This event took place during heavy exchanges of fire along the length of the Blue Line between 12 July and 14 August in what became known as the 2006 Lebanon War. Numerous incidents of firing by both sides took place close to UN positions. Several positions, including the UNIFIL headquarters itself, received multiple direct hits mainly from IDF artillery shells and mortar rounds, but also from tank rounds, and aerial bombs and rockets. This resulted in significant material damage to buildings, vehicles and supplies.

In addition to the four OGL observers killed, an Indian peacekeeper was seriously wounded by shrapnel from IDF tank fire (16 July). One unarmed OGL military observer was seriously wounded by small arms fire (23 July). Four members of the UNIFIL Ghanaian battalion were lightly wounded by an IDF tank round (24 July). An Israeli aerial rocket exploded above a UNIFIL position moderately wounding two Indian peacekeepers (29 July). Three Chinese peacekeepers were lightly wounded by a Hezbollah mortar round (6 August). A Hezbollah rocket impacted inside the UNIFIL headquarters in Naqoura lightly wounding one French peacekeeper (10 August). A Ghanaian peacekeeper was wounded when two Israeli artillery rounds impacted inside a UNIFIL position (12 August). On 12-13 August, 85 Israeli artillery shells impacted inside UNIFIL positions causing massive material damage to all of them; all UNIFIL personnel were forced into shelters for the entire period, preventing casualties.⁷

Step Change in Lethality

Peacekeepers from Ireland and elsewhere are already exposed to significant danger in southern Lebanon. However, such incidents could become more serious should Hezbollah and the IDF begin to engage each other across the Blue Line using armed drone technology. In particular, uncrewed combat aerial vehicles (UCAVs) and loitering munitions.

A UCAV is an uncrewed aerial vehicle (UAV) that serves as a platform for weapons such as guided air-to-surface missiles and smart bombs. We are all familiar with the American Predator and Reaper long-endurance UCAVs used in the 'War on Terror' in Afghanistan, Pakistan, Iraq and Syria.

⁴ "UN 'blue helmet' killed near site of Lebanon-Israel cross-fire; investigation under way," United Nations, January 28, 2015, <https://news.un.org/en/story/2015/01/489522-un-blue-helmet-killed-near-site-lebanon-israel-cross-fire-investigation-under>.

⁵ "Three peacekeepers dead, 1 missing – UNIFIL Press Release," UNIFIL, July 26, 2006, <https://www.un.org/unispal/document/auto-insert-208457/>.

⁶ Aoibheann O'Sullivan, "Ten years on: remembering fallen Peacekeepers," UNIFIL, July 26, 2016, <https://unifil.unmissions.org/ten-years-remembering-fallen-peacekeepers>.

⁷ Sources: UNIFIL, <https://unifil.unmissions.org/news> and Reliefweb, United Nations Office for the Coordination of Humanitarian Affairs (OCHA), <https://reliefweb.int/organization/unifil>.

A loitering munition (also known as a 'suicide drone' or 'kamikaze drones) is a type of expendable UAV with an integral explosive warhead. They are designed to loiter in the air, while gathering intelligence and tracking potential targets, before switching function to that of a guided missile: locked on to a target for a precision strike, mid-flight abort, potential recommit or ditch without detonation depending on the operator's decision — assuming that there is a 'human-in-the-loop' to retain control. A fully autonomous terminal guidance mode relies on artificial intelligence (AI) to make the rapid final decisions. Theoretically, loitering munitions have an increased capacity to discriminate between combatants and non-combatants compared to equivalent weapon systems such as mortars, rockets and missiles.⁸

As with unarmed UAVs used for intelligence-gathering, surveillance, target acquisition and reconnaissance (ISTAR), armed UCAVs and loitering munitions can be designed to act in swarms. In practical terms, a human operator directs the swarm to the mission area and then the largely autonomous swarm takes over and accomplishes the mission according to onboard AI computing and programmed rules governing swarming behaviour.

Swarms can consist of different types of UAV with specialised roles: unarmed information gatherers and communicators that inform UCAVs and loitering munitions about target locations, as well as decoy UAVs to draw air defence fire. Constant communication between elements of the swarm allows them to coordinate target selection and approach for maximum attack efficiency. Countering concurrently deployed drones on the battlefield is a difficult challenge. Countering swarming drones takes it to another level.⁹

Overall, the coordinated use of UCAVs and loitering munitions can generate a significant increase in lethality.¹⁰ The 2020 Nagorno-Karabakh war demonstrated that superiority on the battlefield can be achieved — in this case, by Azerbaijan's military — with the help of a combination of UAVs.¹¹ Azerbaijani forces used different types of unarmed ISTAR UAVs (supplied mainly by Israel) to identify Armenian air defence assets on the ground. This was followed by precision strikes by Turkish Bayraktar TB2 UCAVs armed with laser-guided smart bombs to suppress air defences. This then cleared the path for TB2 and Israeli Harop, Orbiter 1K and

⁸ Dan Gettinger and Arthur Holland Michel, *Loitering Munitions* (Annandale-on-Hudson, NY: Center for the Study of the Drone, Bard College, 2017), 1, <https://dronecenter.bard.edu/files/2017/02/CSD-Loitering-Munitions.pdf>.

⁹ David Hambling, "What Are Drone Swarms And Why Does Every Military Suddenly Want One?," *Forbes*, March 1, 2021, <https://www.forbes.com/sites/davidhambling/2021/03/01/what-are-drone-swarms-and-why-does-everyone-suddenly-want-one/?sh=28721c182f5c>.

¹⁰ John Antal, "The First War Won Primarily with Unmanned Systems: Ten Lessons from the Second Nagorno-Karabakh War," March 8, 2021, 7, https://www.socom.mil/JSOU/SpecialEventDocs/Croot_Lessons%20from%20the%202d%20Nagorno-Karabakh%20War%20by%20John%20Antal.pdf.

¹¹ Robyn Dixon, "Azerbaijan's drones owned the battlefield in Nagorno-Karabakh — and showed future of warfare," *Washington Post*, November 11, 2020, https://www.washingtonpost.com/world/europe/nagorno-karabakh-drones-azerbaijan-aremenia/2020/11/11/441bcbd2-193d-11eb-8bda-814ca56e138b_story.html.

SkyStriker loitering munition strikes on a wider range of Armenian ground targets, including tanks and other armoured vehicles, artillery systems, troop transports, command posts, bunkers, fuel and ammunition dumps, and exposed infantry.¹²

The videos of drone attacks on Armenian forces distributed by the Ministry of Defence of Azerbaijan are too visceral to include here. However, they clearly demonstrate the effectiveness of drone warfare; and, at the time, they had significant propaganda and psychological operations value against the Armenian side.¹³

Violent Non-State Actors

The Defence Forces on peace-support operations and other overseas deployments must contend with the proliferation of UAV technology from states to their proxies plus illegal armed groups, including violent extremist groups and terrorist organisations. In the Middle East, Iranian-sponsored Hezbollah, Hamas and Houthi insurgents are the main actors regarding proliferation. Hezbollah began using UAVs for reconnaissance in November 2004. By August 2006 Hezbollah was mounting operations against Israel using UAVs with 40-50 kg explosive warheads.¹⁴ Palestinian militants Hamas acquired UAVs in 2010. In 2012, the IDF claimed to have disrupted a Hamas UAV development programme in the Gaza Strip.¹⁵ In May 2020, Hamas launched locally produced Shebab loitering munitions against Israel from the Strip. The Shebab resembles the Iranian Ababil series and variants used by Iranian-backed Houthi insurgents.¹⁶ Iranian-supplied UAVs and UAV technology will almost certainly continue to arm Iran's proxies in Lebanon and elsewhere.¹⁷

It is unsurprising that illegal armed groups have weaponised commercially available UAVs to facilitate asymmetric attacks against state adversaries. In Syria in late 2015, the Islamic State in Iraq and Syria (ISIS) began using small fixed-wing UAVs packed with explosives as improvised loitering munitions.¹⁸ By January 2017 the group had formed its own UAV unit and increased its

¹² Uzi Rubin, "The Second Nagorno-Karabakh War: A Milestone in Military Affairs," *Mideast Security and Policy Studies* 184, December 16, 2020, 9-10, <https://besacenter.org/nagorno-karabakh-war-milestone/>.

¹³ Jack Davies, "Unmanned Aerial Systems in Nagorno-Karabakh: A Paradigm Shift in Warfare?," Human Security Centre, November 24, 2020, <http://www.hscentre.org/uncategorized/unmanned-aerial-systems-in-nagorno-karabakh-a-paradigm-shift-in-warfare/>.

¹⁴ Milton Hoenig, "Hezbollah and the Use of Drones as a Weapon of Terrorism," *Public Interest Report* 67, no. 2 (2014): 1-2, <https://fas.org/wp-content/uploads/2014/06/Hezbollah-Drones-Spring-2014.pdf>.

¹⁵ "Israel says it knocked out Hamas drone program," CBS, November 16, 2012, <https://www.cbsnews.com/news/israel-says-it-knocked-out-hamas-drone-program/>.

¹⁶ Joseph Trevithick, "Palestinian Militants Are Now Launching Suicide Drones At Israel," *The Warzone, The Drive*, May 13, 2021, <https://www.thedrive.com/the-war-zone/40601/palestinian-militants-are-now-launching-suicide-drones-at-israel>.

¹⁷ David Hambling, "U.S. And Israel Concerned Over Growing Drone Threat From Iran," *Forbes*, April 28, 2021, <https://www.forbes.com/sites/davidhambling/2021/04/28/us-and-israel-concerned-over-growing-drone-threat-from-iran/?sh=76f882b474b9>.

¹⁸ David Hambling, "ISIS Is Reportedly Packing Drones With Explosives Now," *Popular Mechanics*, December 16, 2015, <https://www.popularmechanics.com/military/weapons/a18577/isis-packing-drones-with-explosives/>.

rate of UAV attacks.¹⁹ ISIS also rely on small quadcopter and other multirotor UAVs to drop small munitions on targets, using UAVs and parts purchased from websites and other commercial sources.²⁰

In January 2018, an Islamist faction in Syria deployed a suite of 13 commercial UAVs modified to carry bombs in an attack against Russian military targets at Hmeimim air base and Tartus naval base in Latakia province.²¹ In Africa in November 2018, Islamist extremist group Boko Haram reportedly began using UAVs for surveillance of the Nigerian Army.²² Regardless of efforts by states to limit the sale, export and use of military-grade UAVs and associated operator control units, it is highly probable that UAV proliferation will continue to gather pace globally; especially given the ready availability, relatively low cost and simplicity of commercial platforms.²³

Violent non-state actors will almost certainly continue to develop increasingly sophisticated UAV systems capabilities based on technologies available on the white, grey and black markets; and on the reverse-engineering of downed and captured military-grade UAVs.

Countering the Inevitable

In the coming years, state militaries will become increasingly vulnerable as UAV technology continues to develop. Whether in Lebanon, elsewhere in the Middle East, Africa, the Western Balkans or on some future UN or EU mandated overseas deployment, Defence Forces personnel will likely encounter state and non-state actors armed with UAVs and loitering munitions. Regardless of whether Irish peacekeepers and observers are caught in crossfire or targeted directly, the Defence Forces require effective countermeasures protection against all types of UAV.

A comprehensive defence against UAVs involves a multilayered counter uncrewed aerial systems (C-UAS) architecture and system functionality to detect, identify and track a single target, multiple targets or even an entire drone swarm 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

¹⁹ Joby Warrick, "Use of weaponized drones by ISIS spurs terrorism fears," *Washington Post*, February 21, 2017, https://www.washingtonpost.com/world/national-security/use-of-weaponized-drones-by-isis-spurs-terrorism-fears/2017/02/21/9d83d51e-f382-11e6-8d72-263470bf0401_story.html.

²⁰ W.J. Hennigan, "Islamic State's deadly drone operation is faltering, but U.S. commanders see broader danger ahead," *Los Angeles Times*, September 28, 2017, <https://www.latimes.com/world/la-fg-isis-drones-20170928-story.html>.

²¹ Tamir Eshel, "Russian Forces in Syria Repelled Massive Drone Attack on Hmeimim and Tartus," *Defense Update*, January 8, 2018, https://defense-update.com/20180108_uav_attack.html.

²² Cara Anna, "Nigerian leader: Islamic extremists are now using drones," Associated Press, November 30, 2018, <https://apnews.com/article/766b4d71c21f43d496550a2eb16e64a9>.

²³ Kerry Chávez and Ori Swed, "The proliferation of drones to violent nonstate actors," *Defence Studies* 21, no. 1 (2021): 1, DOI: <https://doi.org/10.1080/14702436.2020.1848426>.

infrared cameras. Early detection and identification prepare the C-UAS system for an efficient response, including engagement of the target or targets by methods including:

- Electronic jamming to disrupt a UAV's global positioning system radio navigation or radio control signals, or signal 'spoofing' to take over navigation and control of the UAV.
- Cyber operations to interrupt communications links between a control centre and the UAV.
- Physically capturing a UAV midflight using a net either fired from a gun or deployed from an attack UAV to entangle the target's propellers and immobilise it.
- Physically disrupting or destroying a UAV using either directed energy (high-power microwave and laser) beams or a projectile such as a bullet, missile or smart airburst munition.²⁴

Numerous defence companies around the world are engaged in the development of C-UAS systems. It is a fast-moving and competitive field: there is already a race by companies to develop not only countermeasures, but also solutions that counter the countermeasures. In turn, drives efforts to further develop both C-UAS and UAV systems.²⁵

No Need to be 'Sitting Ducks'

The Defence Forces must keep pace with such developments and ensure that they have the necessary flexibility to adapt to future operating environments in which the lethality from UCAV and loitering munition use is exponentially greater than at present. Planning for force protection against such aerial threats is needed now. It cannot be put off until 2030. By then, Defence Forces personnel on peacekeeping and rapid response missions overseas will likely be 'Groundhog' in situations involving a mix of semi and fully autonomous UAVs.

Are bomb shelters, bunkers and command posts designed sufficiently to prevent a small loitering munition from flying through the entrance, into the interior, before detonating? Do Defence Forces armoured vehicles have sufficient armour and active protection systems to counter a top attack by precision guided munitions launched from a UCAV platform? What mobile C-UAS system do foot patrols need to protect them from a fully autonomous swarm of reconnaissance drones and loitering munitions?

These are just some of the questions that not only Irish military commanders, but also Irish politicians and civil servants will be faced with when making decisions regarding overseas deployments.

²⁴ "9 Counter-Drone Technologies To Detect And Stop Drones Today," Robin Radar Systems, accessed July 24, 2021, <https://www.robinradar.com/press/blog/9-counter-drone-technologies-to-detect-and-stop-drones-today>.

²⁵ Arthur Holland Michel, *Counter-Drone Systems, 2nd Edition* (Annandale-on-Hudson, NY: Center for the Study of the Drone, Bard College, 2019), <https://dronecenter.bard.edu/files/2019/12/CSD-CUAS-2nd-Edition-Web.pdf>.

When it comes to uncrewed and autonomous vehicles, we must acknowledge that force development will always require continuing adaptation and upgrading of capabilities in order to meet the challenges they pose. Defence planning and procurement must factor in the need for swift replacement of older C-UAS systems and acquisition of new capabilities in order to keep Defence Forces personnel protected. The onus is on government and policy makers is to implement a procurement system that not only keeps up with the rapid pace of UAV-related technology development, but also keeps ahead of it in terms of foresight. There is little point, after a long procurement process, in acquiring yesterday's outdated and ineffective C-UAS systems.

Therefore, the Defence Forces would benefit from establishing a specialised branch or office to address UAV and C-UAS development. Its role would be to continually monitor technological advances and uses, and make recommendations regarding planning and procurement. Such a branch or office would liaise closely with other militaries, the private sector and academia. Furthermore, it could more broadly be responsible for uncrewed and autonomous systems and other emerging and disruptive technologies in general.

