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Swarmed States

The Impact of Small Loitering Munitions on Weak Regimes

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Small loitering munitions are armed, autonomous drones that provide easily transportable, rapid, and precise air power for individual users. In the hands of malign actors, small loitering munitions will be used to advance their political goals. Autocrats will use loitering munitions to entrench their power while non-state groups will have a new tool to challenge and destabilize weak regimes. Fragile states lack the funds and technical capacity to effectively combat the use of small loitering munitions. But there is an opportunity to limit the proliferation of these weapons. The United States can curtail proliferation by expanding the Department of State's weapons removal and abatement programs and incorporating small loitering munitions into regional conventional arms treaties such as the 1996 Wassenaar Agreement.

Introduction

In the middle of the desert, an unmanned aerial vehicle (UAV) launches out of a tube small enough to fit inside of a rucksack. The UAV flies several miles, identifies its pre-set target, dives onto a truck, and explodes.[1] This demonstration was part of a presentation by the U.S. Department of Defense of the Switchblade 300, a drone that is part of a newly developed class of armed UAVs—small loitering munitions. Four months later in March 2022, these small loitering munitions were part of a long list of man-portable weapons sent to help Ukrainians fight Russian forces.

Advancements in small arms and light weapons, such as the AK-47 and man-portable air defense systems (MANPADS), have empowered individual soldiers with increasing destructive capability. Small loitering munitions are the latest evolution of light weapons, providing individuals with the ability to precisely identify and attack targets miles away. The proliferation of small loitering munitions, much like the AK-47 and MANPADS before, will provide state and non-state actors with a powerful new tool to advance their military and political goals.

The policy community has paid little attention to the political threat that the proliferation of small loitering munitions poses to fragile states in the hands of malign actors. Small loitering munitions can empower embattled autocrats to cheaply repress domestic unrest and attack neighboring states. At the same time, small loitering munitions can also empower violent non-state actors, seeking to destabilize weak regimes and commit acts of terror.

The United States has an opportunity to control the spread of small loitering munitions by working with regional and multilateral organizations to increase export transparency and regulations—similar to past efforts to prevent the proliferation of other light weapons like MANPADS through the Wassenaar Agreement.

Small Loitering Munitions: Mini-Cruise Missiles for the Individual Soldier

Loitering missiles operate from a simple premise: What if a missile could become more accurate by slowing down?

—Kelsey Atherton, 2021[2]

Small loitering munitions are an emerging class of loitering munition that allow individual soldiers to identify targets and project power with greater precision and range than current man portable weapons, such as light and medium mortars.

Loitering and Small Loitering Munitions (also known as 'suicide' or 'kamikaze' drones) are autonomous UAVs armed with a small warhead that uses electro-optical cameras and artificial intelligence (AI) to identify and strike targets, destroying the UAV in the process.[3] Most autonomous loitering munitions currently operate under *supervised* autonomy (human-in-the-loop), where the pilot of the system may intervene to recall the drone or change targets after launch.[4] Electro-optical targeting allows loitering munitions to be programmed with the features of an intended target or target-class. These small UAVs can then loiter in the air from minutes to hours as they search for targets up to 25 miles away.

A small loitering munition is a compact system carrying a warhead less than 2 kg meant to target personnel or small vehicles and artillery. These tactical weapons are portable (ranging between 5 to 15 lbs. and 30 cm to 1.5 meters in length) and can be launched by a single person. Small loitering munitions typically have a range of 6 to 25 miles with a flight time between 15 and 45 minutes, and can reach speeds of up to 120 mph.[5] They also have a lower radar signature than other combat drones because of their small size and low flight profile, making them harder to detect and counter.[6] Small loitering munitions are sometimes grouped with weaponized hobbyist drones because of their equivalent size and kamikaze style of attack.[7] However, weaponized hobbyist drones are do-it-yourself attempts to make a small loitering munition. The ability to independently hover and guide itself to a target using electro-optical targeting separates loitering munitions from hobbyist drones.[8]

Small loitering munitions can be divided into two categories: loitering missiles and loitering rotary wing drones.

- **Small Loitering Missile.** These UAVs have wings and are generally launched from a canister. A loitering missile is the more common type of small loitering munition.[9] Current small loitering missiles include the American Switchblade 300, Israeli Hero-30, and the Turkish ALPAGU.

- **Loitering Rotary Wing Drone (L-RWD).** L-RWDs are autonomous UAVs that use rotary wings for vertical takeoff and flight. These UAVs are the most advanced type of small loitering munition available because they have a greater level of autonomy than loitering missiles and do not need to be canister launched.[10] L-RWDs have the appearance of non-lethal, commercial drones, but are armed with a warhead for military use. Current L-RWDs include the Turkish Kargu-2, Israeli Rotem L, and the Russian ZALA 421-22.

A New Weapon for Malign Actors

Small loitering munitions are a revolutionary advancement in conventional warfare, providing individual soldiers with lethal aerial weapons.[11] Other man-portable weapons, like MANPADS and the 60 mm mortar, require a soldier to see their target for successful use. Small loitering munitions, with their AI-enabled guidance and targeting are easy to deploy, placing the precision of a cruise missile in a small and highly mobile package. Once a target category is set, the pilot can "fire and forget" as the loitering munition executes its mission.[12] These drones are thus favored by small squads that can move quickly and remain hidden. Together, these capabilities make small loitering munitions an attractive weapon to malign actors.

The greatest threat from small loitering munitions will be their proliferation in fragile states where the government lacks the funding and capacity to secure these weapons or is complicit in their spread. Malign actors in these fragile states will seek to acquire these cheap weapons because of their ease of use and power projection capabilities.[13] The potential impact that small loitering munitions can have on conflict has already led new producers to enter the market and prepare for high-volume sales.[14] Yet there is no mechanism in place to regulate the actors that purchase these weapons and verify their intentions for use.

The Expanding Market for Small Loitering Munitions

Small loitering munitions are cheap alternatives to larger drones and missiles. Increased demand for small loitering munitions has led to the expansion of the market for these munitions and a subsequent drop in prices (see Table 1). In 2012, 75 Switchblade small loitering munitions were fielded by the United States in Afghanistan for $10 million, which gave each drone a price of about $133,333.[15] Today, one Switchblade costs just $6,000.[16] The cost for small loitering munitions will only further decline as the market for these weapons expands.

Small loitering munitions are easily transported and more versatile than larger loitering munitions. These advantages, along with their flight range, have led to increased interest from great and middle power states in acquiring small loitering munitions. High demand will lead to more states entering the market to produce and purchase small loitering munitions. A 2020 study of drone production revealed that 90 countries had Class I military drone programs (drones weighing less than 150 kg), and 102 with drone programs of any size.[17] By contrast, there were only 60 military drone programs in 2010. The United States, Turkey, and Israel are currently the leading producers of small loitering munitions.[18]

Many small loitering munitions are sold to fragile states in active conflicts because they are cheap, lightweight, and lethal. Despite their appearance in conflict zones, there is no mechanism to monitor the sale of small loitering munitions. There are also no regulations on how recipient states may use small loitering munitions once delivered. The lack of arms control measures will allow them to proliferate quickly in unstable states.

Table 1: Producers of Loitering Munitions

Country of Origin	Companies	Drones*	Conflicts
United States	AeroVironment, Raytheon	**Switchblade 300, Coyote**	Ukraine (2022)
Israel	UVision, Israel Aerospace Industries	HAROP**, Hero-30, ROTEM L**	Nagorno-Karabakh (2020)
Turkey	STM[19]	**ALPAGU, Kargu-2, Boyga**[20]	Libya (2020)
China	China Aerospace	**CH-901**	
Russia	ZALA	Kyb, **421-22**	Ukraine (2022)
Ukraine	Athlon Avia	**ST-35**	
Iran	Unknown	Samad-2, Khatif, **Rujum,**	Lebanon, Yemen

*Drones in **bold** are small loitering munitions.

Deployment of Small Loitering Munitions in Fragile States

Small loitering munitions are a double-edged sword for weak regimes. These weapons can increase their ability to project power internally and externally. However, small loitering munitions will also significantly increase the power projection capability of insurgents, terrorists, and criminal organizations. Small loitering munitions are difficult to detect and intercept with traditional air defense systems, making them a significant threat in fragile states.

Uses by Weak Regimes

Small loitering munitions provide leaders of weak states with the aerial power they need to advance their political goals—namely to eliminate domestic threats to regime survival—and win stagnant conflicts with regional rivals.

- **Cheap Repression.** Small loitering munitions allow weak regimes to reduce the number of soldiers needed to control populations, decreasing the cost of repression. Autocratic regimes are exposed to the risk of military defections to opposition groups if they fail to pay and support military and state security forces.[21] However, small loitering munitions reduce the need to deploy soldiers to repress uprisings. Only a few soldiers are needed to operate small loitering munitions. Autocrats can thus rely on the most trusted members of their security forces to repress the population, and these soldiers would never have to come face to face with the populations they target.

  In 2020, a UN panel on Libya arms sanctions found that Government of National Accord forces used Turkish-made STM Kargu-2 UAVs (a L-RWD[22]) to hunt and attack Libyan National Army militia units loyal to Libyan Field Marshall Khalifa Haftar.[23] The success of the Kargu-2 in Libya has caught the attention of Malaysia, which is itself embroiled in a political crisis due to Prime Minster Ismail Sabri Yaakob's suspension of the legislature and elections.[24] The usefulness of small loitering munitions in protecting a regime is not lost on the Malaysian prime minister. Autocratic leaders are likely to take advantage of small loitering munitions to maintain their grip on power.

- **Targeted Assassinations.** Small loitering munitions can be used to target political opponents. In 2020, Israel is suspected of using an AI-controlled machine gun kill Iran's top nuclear Mohsen Fakhrizadeh. The attack took eight months to plan and required smuggling in parts of the gun that weighed about one ton.[25] Small loitering munitions, such as the Kargu-2 used in Libya, would have made this assassination easier to conduct because of their compactness, ease of transport, ability to take off vertically, and range. As AI advances, more regimes will seek to use self-guided small loitering munitions to eliminate political rivals.

- **Regional Power Projection.** Small loitering munitions provide weak regimes with a new tool for regional power projection. In 2020, Azerbaijan used Israeli and Turkish loitering munitions in its campaign to retake Nagorno-Karabakh, a long-disputed region between Armenia and Azerbaijan.[26] Azerbaijan's loitering munitions were difficult to detect and counter during the war. By the end of the conflict, Azerbaijan controlled most of Nagorno-Karabakh and some Armenian territory.[27]

  The success of loitering munitions in Nagorno Karabakh has reverberated globally. For example, the Harop's developer, Israeli Aerospace Industries (IAI), stated that "some small Asian states" have indicated interest in arming their navies with loitering munitions to protect their territorial claims. South Korea and India also are partnering with Israeli defense companies to build their own loitering munitions.[28]

Small Loitering Munitions and Violent Non-State Actors

Violent nonstate actors can use small loitering munitions to increase their power projection capabilities. For example, drug cartels have recently weaponized commercial drones—typically Chinese-made DJI drones—for use against Mexican authorities.[29] They are particularly popular with large, well-funded cartels such as the Cártel Jalisco Nueva Generación and the Cártel de Santa

Rosa de Lima. Most DJI drones used by these cartels have a market price between $1,000 to $2,500, but there are reports of more sophisticated and expensive drones, like the DJI Inspire 2 (~$7,000), being used as well.[30] In comparison, the American-made Switchblade 300 is $6,000.[31]

The success of cartels in Mexico is not an anomaly. Other violent non-state groups also will employ small loitering munitions against weak states. For example, anti-government groups in Venezuela in 2018 used a makeshift small loitering munition in an attempted assassination of President Nicolas Maduro.[32]

Combating the use of small loitering munitions is difficult. If the government is not complicit in using small loitering munitions, then the state usually lacks the capacity to respond to attacks. However, in each conflict where small loitering munitions appear, the actor that uses them has acquired the munition from another state. The trade of small loitering munitions is the opening needed to address the proliferation of these weapons.

Revitalizing Light Weapons Policies to Combat Small Loitering Munitions

The best method to limit the proliferation of small loitering munitions is to reclassify them as light weapons and add them to regional conventional arms treaties. Every conflict in which small loitering munitions have appeared, they were acquired from known drone manufacturing countries like Israel, Turkey, and China. Because we know more about the sellers of small loitering munitions than when and where they will be used, the United States can limit proliferation by better targeting the sale of these weapons. The United States can address the proliferation of small loitering munitions through regional arms agreements, in addition to providing weapons security and destruction training to fragile states.

Increase Foreign Assistance to At-Risk States

Providing counter-small unmanned aircraft technology (C-sUAS) to fragile states is the most direct way to increase the ability of states to defend against small loitering munitions. C-sUAS are the set of technologies and strategies used to detect, disrupt and/or disable small UAVs.[33] Handheld, ground-based, and UAV-based weapons provide states with the ability to protect citizens and fortify vulnerable buildings. The United States can supply its allies and partners with C-sUAS technology and train them in its use. However, providing C-sUAS technology alone will not prevent every successful use of small loitering munitions.

The United States can provide more comprehensive assistance to fragile states by including small loitering munitions under the list of weapons targeted by the Department of State's weapons removal and abatement programs. The mission of the Department of State's Office of Weapons Removal and Abatement is to reduce "the harmful effects of at-risk, illicitly proliferated, and indiscriminately used conventional weapons of war."[34] As such, it is one of the primary tools the United States uses to help states locate and secure small arms and light weapons.[35]

Expand the MANPADS Task Force

Man-portable air defense systems (MANPADS) were once considered too sophisticated to be a conventional light weapon due to features like infrared targeting but are now included in all lists of light weapons. MANPADS are shoulder-launched anti-aircraft weapons that typically use infrared tracking of the aircraft engine to acquire their target.[36] The U.S. Stinger and British Javelin are both models of MANPADS. These systems were given to proxy states to fight in conflicts during the Cold War.

After the Cold War, thousands of MANPADS were at risk of falling into the hands of terrorists who could target commercial airlines. Yet in the 1990s, these weapons were not widely considered conventional light weapons. The United States eventually classified MANPADS as conventional weapons because of the threat they posed to commercial airlines.[37] The United States set up weapons removal and stockpile security programs in fragile states, and in 2006, these efforts were put under one group, the MANPADS Task Force.[38] The United States can expand this program or create a sister task force to address the proliferation of small loitering munitions. Small loitering munitions are simply the latest advancement in the technology of light weapons, building on features such as infrared targeting in MANPADS to with more accurate electro-optical cameras for targeting. These advancements have made them more lethal and easier to use than weapons like MANPADS or light mortars—making the need to limit their spread urgent.

Expand Regional Conventional Arms Treaties

The most comprehensive action the United States can take is to push for small loitering munitions to be included in regional and multilateral conventional arms agreements. There are numerous treaties that address transparency in the trade of light weapons and include mechanisms for adding new weapons to the list of covered arms.

In the late 1990s, the United States pushed to include MANPADS in the Wassenaar Arrangement. The 1996 Wassenaar Arrangement is a commitment by major arms exporting states (including Russia) to provide information on their export of conventional arms and dual-use goods. The 2003 Elements for Export Controls of Man-Portable Air Defense Systems ("The Elements") added guidance on MANPADS to the Wassenaar Arrangement.[39] Following its adoption, other regional organizations used "The Elements" as an example for their own addition of MANPADS into regional arms treaties.[40] What started as a small push in one multilateral treaty ended up becoming a norm in international law. The process of including MANPADS into the Wassenaar Arrangement is a model for how the United States can advocate for the addition of small loitering munitions to other regional arms trade agreements.

Conclusion

The proliferation of small loitering munitions poses a significant security threat to fragile states. Weak regimes can use small loitering munitions to entrench their power, while violent non-state actors can challenge weak regimes. Regions with higher numbers of fragile states are at risk of becoming violently contested spaces. The United States should use current weapons removal programs and conventional arms treaties to address the proliferation of small loitering munitions.

To limit the proliferation of the small loitering munitions, the United States can follow the example of its past advocacy to limit the spread of MANPADS. At one point, MANPADS were considered too sophisticated to be a conventional weapon. However, as it did with MANPADS, the United States can push the world to recognize that the conventional weapons of the future are getting smarter. The United States can expand the weapons covered under the Department of State's Office of Weapons Removal and Abatement as well as in regional agreements to include small loitering munitions.

Armed drones are no longer a weapon only a state can wield. Non-state actors are using makeshift versions to attack weak regimes and possess the capacity to attack and capture poorly secured stockpiles of weapons. Small loitering munitions will eventually be fully autonomous and able to choose targets and execute them without human intervention. They will be faster and nearly impossible to stop. There is a small window of opportunity now to curtail the spread of these weapons. The United States should lead efforts to shift international norms regarding the sale of drones before they proliferate to malign actors.

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