Explosive Weapons Use

The Use of Air-delivered Munitions in the Context of Humanitarian Action in Ethiopia, with a Focus on Drones

December 2022

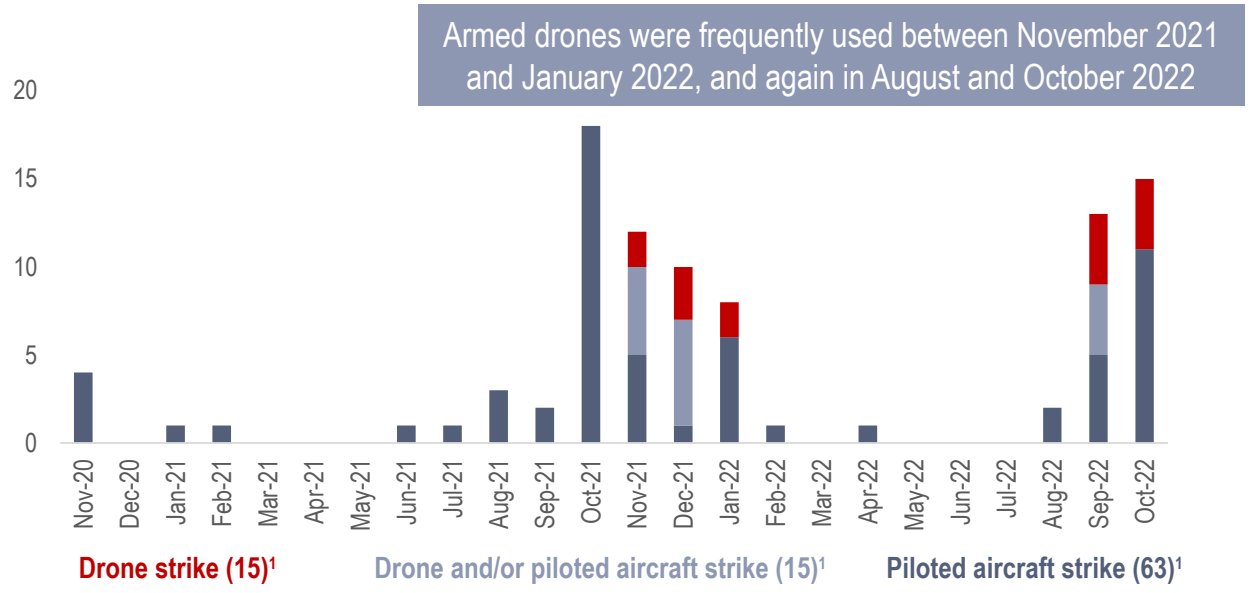
On 4 November 2021 an Ethiopian National Defence Force (ENDF) drone strike killed at least 38 people and injured over 40 in Chefa Robit town, Amhara. On 28 December 2021 another drone strike killed a UN High Commissioner for Refugees (UNHCR) aid worker while he was travelling in a car with his daughter between Alamata town and Mekelle city, Tigray region. On 14 October 2022 a drone strike killed an International Rescue Committee aid worker in Shire, Tigray who engaged in providing nutrition to vulnerable populations.

A total of 93 uses of air-delivered munitions have been reported in the Afar, Amhara, Oromia and Tigray regions in Ethiopia since the start of the intensified conflict in November 2020 and the end of October 2022.[1] At least 15 have been identified as drone strikes, while for others information on the delivery vehicle remains unclear.[2]

This brief discusses the general risk to civilians and aid delivery from the use of air-delivered munitions strikes, with a focus on how stakeholders in the aid sector can address the issue. It has a specific focus on drone-delivered munitions in the context of international humanitarian law (IHL).

The use of armed drones in the Ethiopian conflict was first reported in November 2021 after China, Iran and Turkey reportedly supplied Ethiopia with this this new technology. It is possible that the drones were delivered at cost price, or very cheaply, to demonstrate their capability. Armed drones are considerably cheaper to use than aircraft-delivered munitions.

Reported use of air-delivered munitions in Ethiopia, November 2020 to October 2022



Source: Insecurity Insight and Armed Conflict and Location Event Dataset (ACLED).

[1] Drone strikes: Air-strikes reportedly carried out with armed drones. Drone and/or piloted aircraft strike: The delivery platform could either not be identified and reports suggested that both drones and planes were used. Piloted aircraft strike: Air-strikes reportedly carried out using fixed-wing aircraft, helicopters but not with a drone.

The brief presents the available information on the civilian harm from nine of the 15 instances of the use of drone-delivered munitions where civilians were affected. IHL protects civilians and aid operations, yet there are no mechanisms to enforce this protection.

The brief also shows that these attacks have direct and reverberating effects that are foreseeable for conflict parties deciding to use such weapon systems. The destruction of civilian infrastructure has a devastating impact on access to health care, education and, most acutely, food. The death of aid workers from the use of explosive munitions only aggravates civilian suffering, because the use of air strikes affects humanitarian access. It is very difficult for aid agencies to mitigate effectively against the risks from drone attacks. It remains the responsibility of warring parties to prevent and mitigate these effects.

Events of air-delivered munitions by reported target, November 2020 to October 2022

Source: Insecurity Insight and Armed Conflict and Location Event Dataset (ACLED).

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The brief highlights a number of key concerns that require policy attention to protect civilians in Ethiopia and beyond. A key finding is that the presently available information around individual instances of armed-drone use remains unclear, making it impossible to determine to what extent civilian deaths and damage to and the destruction of civilian infrastructure were the result of the munitions' wide-area effects, inaccurate targeting, poor intelligence, or the deliberate targeting of civilians.

- The munitions' wide-area effects may have caused widespread unintended harm.
- Poor accuracy by drone-based unmanned delivery platforms that rely on technology and human skill to find their target may have resulted in them hitting civilian rather than military objects.
- Insufficient target verification or poor intelligence obtained from a distance may have contributed to civilian objects being inadvertently targeted and civilians being killed.
- Civilian objects or civilians may have been selected as intended targets.

Definitions of and terminology related to drones and explosive weapons

Explosive weapons generally use high explosives to project blast and/or fragmentation from the point of detonation. Explosive weapons can be classified by their principle means of delivery, whether they are: directly emplaced (such as a landmine or improvised explosive device); ground launched from a launch platform that can include vehicles or portable devices; or air-launched.

Air-launched explosive weapons

Air-launched explosive weapons can be delivered from fixed-wing aircraft, helicopters, other types of aerial systems and drones. They can be dropped or fired at an air or ground target. The munition used can be rockets, air-to-surface missiles, aerial bombs, glided bombs, cruise missiles, ballistic missiles and others. Air strikes are military operations that deliver air-launched explosive weapons.

Drones and drone strikes

Combat drones are unmanned combat aerial vehicles (UCAVs) that can be used for intelligence gathering, surveillance, target acquisition, and reconnaissance, as well as for delivering missiles and bombs in drone strikes. Drones are usually under real-time human control with varying levels of autonomy. The operator operates and controls the vehicle from a remote terminal. The terms air-launched and air strike are both used here to refer to the use of any type of air-delivered munitions. Drone strike refers only to a drone-delivered munition. The delivery platform cannot always be identified. In some instances, both drones and aircraft are used and it is not always clear whether the drone was used for reconnaissance or munition delivery.

Air strikes and IHL

IHL rules govern the conduct of hostilities and regulate the use of any weapon, means and method of warfare, including the use of armed drones. These rules include, notably, the principles of distinction, proportionality and precautions in attack, as well as the prohibition of indiscriminate and disproportionate attacks. IHL does not prohibit the use of explosive weapons in populated areas. However, the use of such weapons must comply with the rules governing the conduct of hostilities, notably the prohibition of indiscriminate and disproportionate attacks and the obligation to take all feasible precautions to protect civilians and civilian objects from harm.

Two linked characteristics of explosive weapons in particular are important when considering the feasibility of avoiding civilian harm:

- **Wide-area effects:** Certain types of explosive weapons have the capacity to injure and kill within a wide range around the place where an explosive device impacts.
- **Accuracy** is needed to ensure that explosive devices hit military objects and minimise civilian harm. This is defined as ensuring that the aim point (the intended target) is the impact point (where the explosive device hits and damage occurs).

A drone platform can be used for the delivery of some munitions that are known to have wide-area effects, in particular thermobaric and conventional high-explosive warheads. A strike's accuracy depends on the technology of both the drone and munition, as well as the way in which it is delivered. Avoiding civilian harm also depends on the intelligence that is used when distinguishing between civilian and military objects before aiming the munition.

Without clear information about the root causes of the damage inflicted by such attacks, solutions to ensure the protection of civilians remain ill defined. To prevent such incidents and to ensure the effective and practical application of IHL, it remains unclear to what extent the focus has to be on the munitions themselves, the delivery platforms, or the human skill or intelligence guiding the drones and selecting targets.

Moreover, there are no established mechanisms through which affected communities or NGOs can request clarification around the circumstances of instances of civilian harm in ways that would improve civilians' protection, safety and security.

There is a need for conflict parties who use such weapon systems to provide more and better information on the targeting objectives and to explain what measures have been taken to ensure application of IHL in their conduct of war.

Background to the Ethiopian conflict

The armed conflict between Tigray and its allies with the central government in Addis Ababa started in November 2020 and has resulted in a wide range of humanitarian concerns. So far, the conflict has seen six distinct phases.

- **Between November 2020 and June 2021 the Ethiopian National Defence Force (ENDF) with the support of the Eritrean Defence Forces (EDF) entered parts of Tigray primarily with ground troops.**
- **By March 2021 the EDF also entered the Oromia region. The Tigray Defence Forces (TDF; the armed forces of the TPLF) and Oromo Liberation Army (OLA; the armed forces of the OLF) carried out a joint offensive against the ENDF.**
- **After the withdrawal of the ENDF from Tigray at the end of June 2021, the TDF moved into Amhara and later Afar. At the same time the ENDF increased its use of air strikes, which peaked in October 2021. From November 2021 drones were among the platforms used to air-deliver explosive weapons.**
- **At the end of December the Tigrayan forces withdrew back to Tigray and a fragile ceasefire lasted until August 2022.**
- **In August 2022 the ceasefire fell apart after the Ethiopian Air Force shot down an aircraft it claimed was carrying weapons from Sudan to the Tigrayans. The ENDF then increased the use of air-delivered explosives.**
- **On 4 November 2022 a new ceasefire was signed**.

The humanitarian impact

An estimated 2.1 million people have been displaced by the conflict. Restrictions on access to Tigray via the Afar-Abala-Mekelle corridor prevented the entry of humanitarian and commercial goods by road, hindering people's access to adequate services and severely limiting the humanitarian response. The road was again closed following the 24 August breakdown in the ceasefire between Tigray and the Ethiopian government. Intermittently food aid has been allowed into Tigray.

The use of air-delivered explosive weapons and drone strikes resulting in civilian harm in Ethiopia

Until now, only the ENDF have used a variety of aerial platforms to launch munitions during the current conflict in Ethiopia. The TDF or their allies, such as the OLA, have used air-defence systems against government aircraft and have used ground troops when carrying out attacks.

The impact of military ground movements on civilians, civilian infrastructure and aid access have been examined elsewhere and is not the subject of this brief (see here).

Reported events of air-delivered munition, November 2020 to October 2022
At least 93 air strikes have been reported since the conflict began.

Source: Insecurity Insight and Armed Conflict and Location Event Dataset (ACLED).

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Nine cases of armed drone use that caused significant civilian harm were reported:

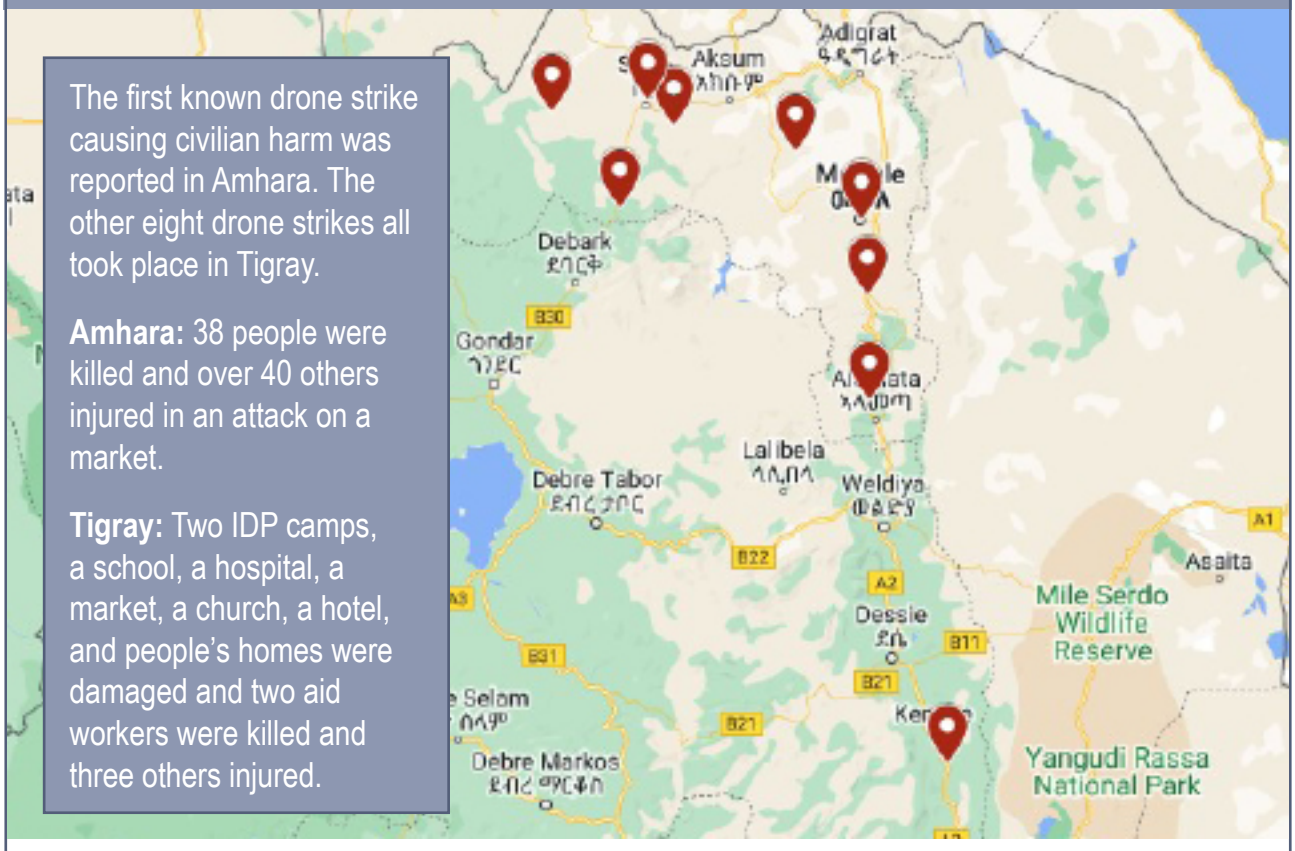
November 2021: At least 38 people were killed and over 40 injured in a drone strike on a market in Chefa Robit town, Amhara. Available information suggests that a Chinese-manufactured LJ-7 (or Blue Arrow) laser-guided air-to-surface anti-armour missile with "fire-and-forget" capabilities designed for the Chinese-manufactured CAIG Wing Loong II drone was used in this attack on the market. **Given the reported casualty numbers, this was likely a high-explosive warhead.[3] There is no information on why a busy market was attacked with what appears to have been a wide-area effect weapon.**

December 2021: Korem Hospital in Tigray was hit in a drone strike.

December 2021: A hospital that served more than 500,000 people, a busy market, a church and a hotel in Alamata town, Tigray were all destroyed in air and drone strikes. There is no clear evidence regarding the munitions used, but it is **very likely that this attack used classic dumb (unguided) bombs dropped by aircraft, although a combination of dumb bombs and some Chinese LJ-7 laser-guided missiles may have been delivered by drone. However, it is possible that the drones were only used to provide imagery to coordinate the wider attack. There is no information on the intended target.**

December 2021: A UNHCR employee was killed in a drone strike while he was travelling in a car with his daughter between Alamata town and Mekelle city, Tigray region. The fact that just one vehicle was targeted suggests that an **anti-armour munition was almost certainly used, despite the fact that the target vehicle was not armoured. It remains unclear who the intended target was and what intelligence contributed to the targeting planning.**

Nine documented cases of civilian harm from drone-delivered munitions, November 2021 and October 2022



Source: Insecurity Insight and Armed Conflict and Location Event Dataset (ACLED).

05 January 2022: Three Eritrean refugees, including two children, were killed and four others were injured when a drone strike hit the Mai-Aini Refugee Camp, Tigray region. **High-explosive munitions were probably used. There is no information who the intended target was.**

07 January 2022: A school in an IDP camp in Dedebit town, Tigray region was hit in a drone strike, killing 56 people and wounding at least 30 more. Further threats of drone attacks have forced humanitarian agencies to suspend their operations. Available information suggests that **high-explosive munitions were very likely used in this attack. There is no information on what the target was, nor why a wide-area effect weapon was used inside an IDP camp.**

September 2022: A health worker was injured in drone strikes while providing first aid to victims of a previous strike in Mekelle, Tigray. At least nine other civilians were killed and 13 others wounded.

September 2022: A World Food Programme driver was injured and his vehicle damaged by debris from a drone strike targeting TPLF military targets in Tigray. The Ethiopian government accused the TPLF of "using aid trucks for transporting its fighters" and advised aid agencies to limit their movements in areas of active fighting. See this report for more

October 2022: A drone strike hit an INGO nutrition programme in Shire town, Tigray region. One aid worker was killed and another wounded.

These strikes caused mass casualty events, destroyed key health infrastructure and affected food security in the area by targeting markets. The deaths of two aid workers affect the ability of aid agencies to provide affected populations with aid (see Horn of Africa Conflict, Hunger and Aid Security for more information)

Humanitarian flights in the context of air strikes and air-defence systems

The use of air strikes at the time when an authorised UN aircraft was approaching Mekelle endangered aid workers and aid operations through the risk of air-defence systems used to defend the city against air strikes inadvertently hitting the UN aircraft.

The UN suspended all flights into Mekelle, the regional capital of Tigray, on 22 October 2021, following instructions from the Mekelle airport control tower to abort the landing of a UN flight. The aircraft, from the UN Humanitarian Air Services, had received permission from officials in Addis Ababa to fly 11 aid workers into Mekelle. However, the control tower issued an "abort" alert when the government launched air strikes in the area. The Ethiopian Air Force had targeted the city for the previous four days as part of the ongoing government offensive against the TDF. The Ethiopian government stated that they were aware that the UN aircraft was in the area, but added that the UN and Ethiopian military aircraft had different flight patterns and timings in an attempt to deflect criticism. The TPLF have reported that their air-defence units knew that the UN aircraft was in the area and refrained from firing on aircraft in flight to prevent what it called "crossfire", implying that the Ethiopian government was setting up the UN aircraft to be hit by the TPLF anti-aircraft fire. The Ethiopian government has rejected this claim (see Ethiopia Flash Analysis and Prediction, 26 October 2021).

As the United Nations Secretary-General's 2013 report on the Protection of Civilians stated, kinetic measures used to destroy armed drones, such as missiles, rockets or another drone, **expose the civilian population to harm**. The deployment of radio-frequency and global-positioning-system (GPS) jammers to interfere with armed drones may interfere with everyday and often critical civilian applications of GPS, ranging from bank machines to air traffic control.

Drone and munition types reportedly used in Ethiopia

Ethiopia is known to use three different drone types: the Turkish-made Bayraktar TB2, Chinese-made CAIG Wing Loong II, and Iranian-made Mohajer-6 (see appendix for more information).

These drones can carry four different types of warheads with varying degrees of wide-area effects and technological designs to ensure accuracy.

Wide-area effects

High-explosive and thermobaric warheads are munition types with known wide-area effects, because the blast wave they create when thy explode extends over tens or even hundreds of metres rather than being tightly focused (e.g. to penetrate armour).

Armed drones can also carry anti-armour or multi-purpose warheads that are not designed as wide-area effect weapons, but can cause wide-area effects through secondary impacts.

- **Anti-armour warheads** are primarily designed to destroy or disable heavily armoured military vehicles. They use a shaped charge that generates a narrow jet of molten metal to penetrate conventional armour, which then ignites any flammable materials such as ammunition or fuel inside the target vehicle, as well as ricocheting inside the target causing kinetic and heat damage.

- **Multi-purpose warheads** combine a shaped charge to penetrate conventional armour with blast and fragmentation capabilities for use against light armour, other vehicles, buildings and personnel.

- **High-explosive warheads** are also intended to engage targets such as light armoured vehicles and personnel in the open, and are designed as wide-area effect weapons. High-explosive munitions pass the shock wave from the blast through the targeted material at supersonic speed (compared to low-explosive munitions, which deflagrate (detonate) at a subsonic speed).

  High-explosive munitions are intended to project a blast and/or primary and secondary fragmentation from the point of impact (either from the casing of the munition itself or from materials such as stones, metal items, etc. in the area surrounding the point of detonation).

- **Thermobaric warheads** are intended to engage personnel and equipment rather than damage or destroy built infrastructure. They are also designed as wide-area effect weapons by using oxygen from the surrounding air to generate a much higher-temperature explosion. They generally consist of a container of fuel and two separate explosive charges. After the munition is dropped, the first charge shatters the container and disperses the fuel in a cloud that mixes with atmospheric oxygen. The cloud of fuel flows around objects and into structures. The second charge then detonates the cloud, creating a massive blast wave. This means that the blast wave produced is of a significantly longer duration than that of conventional high explosives.

  The anti-personnel effect of the blast wave is more severe in enclosed spaces, such as shelters, bunkers and caves. The use of thermobaric weapons against those sheltering in enclosed spaces increases civilian harm.

Both large **high-explosive and thermobaric warheads are wide-area effect weapons**, but with a difference: thermobaric warheads are actually more effective when the fuel air mixture is detonated in enclosed spaces that channel and contain the blast wave, while high explosives create a stronger wide-area effect in the open.

The explosive weight in the various high explosive warheads used in Ethiopia is very similar to the US Hellfire missile (8 kg). This has an estimated "kill radius" of 50 feet (15 metres) and a "wounding radius" of 65 feet (20 metres). As a result, recommendations for more effective civilian sheltering from the use of explosive weapons differ: moving to bunkers provides protection from high explosives, but increases the risk when thermobaric warheads are used against bunkers.

Many drone munitions designed as **anti-armour and multi-purpose warheads are classified as point-area effect weapons** intended to destroy or disable a specific target, usually a vehicle or fixed point such as a bunker. However, the risk that the initial blast triggers secondary explosions by detonating ammunition or fuel in or around the intended target remains. In particular, when vehicles transporting containers of fuel are hit, even point-area effect munitions may turn into wide-area effect weapons through the interaction with the environment in which they are detonated, given the flammable nature of their loads and the kinetic impact allowing the release of flammable vapour into an oxygen-rich environment.

There is no evidence of the use of explosive sub-munitions (otherwise known as cluster bombs) in the current conflict in Ethiopia, although they were used in earlier conflicts in the country, and unexploded cluster bombs remain in place in many areas. None of the armed drones in use in Ethiopia is known to carry a bomb larger than 150 kg in explosive payload. High-explosive or thermobaric drone munitions include the MAM-C, MAM-L and MAM-T munitions developed for the Turkish-made Bayraktar TB2 drone.

Explosive weapons also have wider and longer-terms effects than the initial explosion. If markets are destroyed, food prices increase, because there are fewer markets. When aid agencies lose staff, they are forced to change the way in which they deliver support to the most vulnerable people in order to ensure the safety of their staff members. The impacts of the initial blast effect are therefore wide-ranging and long lasting far beyond the point of initial impact.

Avoiding civilian harm from armed drone use – what can be done?

Civilians and aid operations are protected by IHL. International law does not specifically regulate the use of armed drones, but their use is governed by the general rules of international law.

Rules governing the conduct of hostilities

The **principle of distinction** requires parties to a conflict to only engage military targets (either objects or individuals). The **principle of proportionality** demands that even when military targets are engaged, the expected collateral damage (i.e. adverse impacts on civilian bystanders and infrastructure, as well as on wounded combatants who can no longer participate in hostilities) is not excessive in relation to the concrete and direct military advantage anticipated from the attack.

The parties are also obliged, insofar as is feasible, to take a range of practical measures of **precaution in attack**, to ensure that the principles of distinction and proportionality are met and incidental civilian harm is minimised. This includes the duty to verify that the targets of planned and dynamic attacks are not civilian objects or civilians or wounded combatants not engaged in active combat.

Linked to the principles of distinction, proportionality and precautions in attack, broadly speaking, the **prohibition of indiscriminate attacks** covers two types of attacks:

1. attacks that are not directed at military objectives; and
2. attacks that are undertaken with means or methods of warfare that cannot be directed at military objectives or whose effects cannot be limited in the way in which IHL requires. See also Humanitarian Concerns raised by the Use of Armed Drones – Geneva Call and ICRC Casebook.

Does the technical capacities of drone delivery platforms allow drone operators to ensure that they do not unintentionally hit civilian objects?

Military users should make a distinction between civilian and military objects when using armed drones. Whether operators are able to do this depends on the technical capacity of armed drones in accurately hitting the intended target, the skills of the personnel operating them, and the intelligence available to guide the munition towards the correct military target.

The ENDF's varied drone fleet and the variety of possible munitions that it carries make a general assessment of their accuracy impossible. However, the characteristics of the different drone platforms suggest that all three types – the Bayraktar TB2, Wing Loong II and Mohajer-6 – should enable operators who have access to good intelligence and who have carried out a careful planning process the ability to avoid hitting civilian objects when using anti-armour, multi-purpose, high-explosive or thermobaric warheads, or conventional high-explosive bombs, whether they are using GPS- or laser-guided control methods.

While earlier generations of drone technology required uninterrupted input from an operator to manually guide the missile to its target or to keep their eye on the target until impact, the latest (or third generation) of munitions have a so-called "fire-and-forget" capability, which means that once the target is identified, the missile needs no further guidance during flight, because onboard guidance systems known as seekers such as infra-red receptors can adjust the trajectory automatically during the flight. The use of GPS guidance systems and laser designators has increased that level of accuracy.

However, the skill, and therefore the training, of the operating pilots is equally important. Evidence from Russian GPS- and GLONASS-equipped[4] strikes in Syria and Ukraine showed that the technological capacity of these guidance systems on its own does not guarantee accuracy. Adequate training of operators, maintenance of the guidance systems and the drones themselves, and access to any additional equipment that might be needed is equally important in ensuring accuracy.

What caused the civilian harm from the use of armed drones in Ethiopia?

- The available information suggests that the wide-area effects of some munitions that is believed to have been used may have caused some of the reported civilian harm.
- It is also possible that the accuracy of the delivery platforms may have been worse than expected and that civilian harm was caused by explosive munitions missing their intended targets by several metres. However, the relatively good accuracy of the latest generation of drones makes this less likely.
- In several instances the context strongly suggests that the civilian target was the intended target. It remains unclear whether this was due to poor intelligence, mistakes in target identification, or the intended targeting of civilians and civilian objects.

Key conclusions

- Better information is needed whether wide- or point-area effect munitions are used in a particular strike.
- The fact that in several instances munitions appear to have been targeted at civilian objects requires answers from IHL duty bearers.
- The operating method of guiding unmanned platforms from a distance highlights that better information on the methods and reliability of intelligence gathering and targeting should be available. Because these decisions are no longer taken under fire on the battlefield, but are planned from a safe distance, documentation describing the application of IHL principles should be possible and made available to affected communities and aid organisations.
- Conflict parities using explosive warheads need to provide better information on their intended target and approaches to ensure application of IHL.

The way forward

Armed drones are likely to be increasingly used in conflict. They are of considerably lower cost than aircraft- or helicopter-delivered munitions. They also reduce the risks faced by operating pilots. The technology is likely to improve accuracy. The remote method of control and the increase in accuracy highlight the need for better guidance on procedures for intelligence gathering and target identification to ensure compliance with IHL in relation to the principle of distinction between military and civilian objects in particular.

The conflicts in Ethiopia and Ukraine highlight the extent to which armed drones are being increasingly used by state actors. This highlights the need for shifts in mindsets among states using this technology, those monitoring compliance with IHL, and aid agencies seeking to protect their neutral and impartial aid operations on the ground.

- States need to review and develop policies, doctrine, and training adapted to the new technology, in particular in relation to the planning and execution of armed drone use, in order to respond to the complex challenges involved.

- Those seeking to ensure compliance with IHL need information on the root causes of civilian harm to formulate practical demands. It is important to understand the specific areas that require urgent change, whether they are related to the types of munitions carried or the nature of the intelligence and verification required when using remotely operated means of delivering explosive weapons.

- Aid agencies working on security risk management to ensure the safe delivery of neutral and impartial humanitarian aid need to adopt prevention and mitigation measures appropriate for such challenging contexts.

Overall, we need much better monitoring to enable the identification of the specific factors that lead to civilian harm to ensure that armed drones are used in compliance with the general rules of international law, including IHL.

Recommendations

States: internal

- Develop operational policies, procedures and training on the use of drones and the application of IHL when using them.
- Prior to military operations, ensure that the protection of civilians is explicitly identified as a strategic objective at the highest level and is integrated into all military orders.
- Ensure that doctrine specifically guiding armed drone use is in place, and adopt a policy that specifically avoids the use of drone-delivered explosive weapons with wide-area effects in populated areas.
- Ensure that drone-operating teams are equipped with and trained in the proper use of drones and related means and methods of warfare, and have adequate documentation guiding their decision-making when operating drones.
- Develop stronger international standards, including: (a) appropriate prohibitions and restrictions on the use of explosive weapons in populated areas; and (b) greater transparency in post-strike operations around intended targets.

States: international level

- Make the export of armed drones with munitions with wide-area effects conditional on recipients putting in place limits on the use of such weapons in populated areas, in accordance with the good practices recommended by the International Committee of the Red Cross.
- Provide leadership to ensure implementation of the Political Declaration on strengthening the protection of civilians from the humanitarian consequences arising from the use of explosive weapons in populated areas adopted in November 2022.
- Build the protection of civilians into all military and security partnerships and leverage these partnerships to strengthen the understanding of and adherence to IHL by security forces engaged in conflict (both state and non-state) to minimise civilian harm and the destruction of civilian infrastructure that drives displacement and humanitarian need.

The UN, states and international and civil society organisations

- **UN, states and strategic partners:** Engage with conflict parties on their responsibility under IHL.
- The Security Council should quickly and unequivocally condemn violations of IHL that result in harm to civilians and civilian infrastructure, and ensure accountability, as well as use its influence to engage with conflict parties to prevent, reduce, mitigate, and respond to civilian harm. Permanent members should commit to suspending the use of the veto to block measures aimed at preventing, ending, and remedying atrocity crimes.
- The Security Council should prioritize action to ensure implementation of relevant resolutions regarding the protection of civilians in armed conflict including but not limited to: UNSCR 2573 on attacks on civilian infrastructure in conflict; UNSCR 2417 on the link between armed conflict and food insecurity; UNSCR 2286 on the protection of healthcare workers in conflict; UNSCR 2601 on attacks on education in conflict. This should include supporting and pushing for more regular reporting to the Council on implementation, engaging civil society organizations on the impact of conflict on civilians; and prioritizing engagement with conflict parties on their responsibilities under relevant UNSC Resolutions.
- Call for the establishment of independent investigations mandated by international bodies such as the Human Rights Council (HRC), with findings reported to the HRC and UN Security Council, and call for those responsible for an attack to be held accountable through criminal investigations where appropriate.

- **States:** Put in place national mechanisms to collect data on incidents involving the use of drone-delivered munitions – including systems to track civilian casualties and the wider impact of drone strikes. Request and support more rigorous UN reporting on the risks, trends, and impacts of air-driven munitions on civilians.
- **States:** Ensure that policy decisions are informed by relevant data and case studies on how the use of weapons contributes to civilian harm.
- **International and civilian society organisations:** Request information from states on the quality and nature of intelligence in cases of civilian harm and the steps taken to avoid civilian harm and commitments to distinction as IHL requires. Gather and make available timely and relevant data and case studies to inform policy and practical responses.

Aid community

- Develop programming with in-built resilience that allows adaption to ensure an appropriate balance between ensuring staff safety and continuing to operate during periods when air-delivered explosive weapons systems are being used.
- Be aware that seeking protection in enclosed spaces (such as basements) can provide protection from high explosives, but that being in an enclosed space increases the risk when thermobaric warheads hit a place of shelter.
- Strengthen knowledge about effective practical mitigation measures that could be linked to programme practices such as chosen locations for aid operations and the number of people present at any time at such locations.
- Call jointly as an aid community for the establishment of independent investigations mandated by international bodies such as the HRC, with findings reported to the HRC and UN Security Council.
- Call jointly as an aid community for those responsible for an attack to be held accountable through criminal investigations where appropriate.

Methodology

Insecurity Insight monitors the way in which conflict directly impacts aid operations, health, education and food security, as reported in publicly available sources. Identified information is shared with the link to the original source via news briefs (see aid, health and education, protection). Information on incidents of explosive-weapons use affecting aid, health care or education is also available via the Explosive Weapons Monitor. All incidents, including those reported after the publication of news briefs, are collated in the Security in Numbers Database (SiND) of the Aid in Danger (AID) project to allow the analysis of patterns of harm.

Insecurity Insight also collaborates with ACLED (Armed Conflict Location & Event Data Project). For this brief, Insecurity Insight used incident information provided by ACLED on the use of air-delivered explosives and has carried out additional online research with the help of military experts on those events reported to have included the use of drones. ACLED data was accessed on 5 November 2022.

The analysis uses systematic and careful cross-referencing and triangulation.[5] It is based on geolocated imagery and images of munitions that are compared with those of known examples. Where available, the assessments include serial numbers and other markings to identify specific weapons systems. The information has not been independently verified through on-the-ground investigations. Disruptions to internet services in Ethiopia have made some of the work very challenging, and further work is required. In the future some assumptions may need to be revised should additional information become available. The accuracy of every reported detail cannot be guaranteed. Specific uncertainties are identified where relevant. The purpose of this brief is not to provide evidence, but to raise concerns and highlight areas that require further attention.

Arms Trade Treaty

The Arms Trade Treaty (ATT) is an international treaty that regulates the international trade in conventional arms and seeks to prevent and eradicate the illicit trade in and diversion of conventional arms by establishing international standards governing arms transfers. China is a party to the ATT and Turkey a signatory. Both countries supply drones to the Ethiopian government. The unique characteristics of drones present several challenges in regulating the transfer and use of conventional weapons. See: Stimson: The Arms Trade Treaty and Drones

Irrespective of their ATT status, all states must refrain from transferring weapons if there is an expectation based on facts or knowledge of past patterns that such weapons would be used to violate IHL. This follows from states' obligations to respect and ensure respect for IHL in all circumstances.

Commitments made by UN member states with drones in relation to explosive-weapons use:

China – has supplied armed drones to Ethiopia

China made a statement regarding the need to protect civilians in combat situations during the May 2019 Security Council open debate on the protection of civilians in armed conflict:

> *In situations where conflicts are unavoidable, the best possible efforts must be made to avoid injuring innocent civilians; prevent the abuse of force and actions taken in disregard of humanitarian consequences; and avoid the asymmetrical use of force and the use of high explosive weapons in densely populated areas.*

Ethiopia – has used armed drones in the conflict

Ethiopia has acknowledged the harm caused by the use of explosive weapons in populated areas (EWIPA), committed to action against it, and taken an active role in encouraging other states to do so.

Iran – has supplied armed drones to Ethiopia

Iran participated in the Joint Statement on Explosive Weapons in Populated Areas (EWIPA) made during the 73rd Session of the UN General Assembly's First Committee, October 2018:

> *In an unprecedented joint statement at the meeting of the UN General Assembly's First Committee, fifty states expressed grave concern over the humanitarian harm caused by the use of explosive weapons in populated areas.*
>
> *The statement, delivered by Ireland, noted the "overwhelming evidence" of the humanitarian impact and devastating harm to civilians caused by use of explosive weapons which "far outlasts the conflicts in which they are used", and highlighted in particular concerns over the use of explosive weapons with wide area effects in populated areas.*
>
> *States also emphasised that this devastation in turn "acts as a catalyst for the displacement of people within and across borders, rendering displaced persons and refugees vulnerable to exploitation and abuse.* The full joint statement is available here

Turkey – has supplied armed drones to Ethiopia

In May 2016 Turkey aligned with World Humanitarian Summit core commitments to "Uphold the Norms that Safeguard Humanity", including:

> *Commit[ting] to promote and enhance the protection of civilians and civilian objects, especially in the conduct of hostilities, for instance by working to prevent civilian harm resulting from the use of wide-area explosive weapons in populated areas, and by sparing civilian infrastructure from military use in the conduct of military operations."*

Annex: Known information on drone munitions

The **Turkish-made Bayraktar TB2** has four attachment points (known as racks or rails) where bombs or other weapons can be attached to the drone. It is known to carry combinations of the following armaments:

- MAM-C, MAM-L and MAM-T are a family of GPS- and laser-guided "smart" munitions developed by Turkish defence manufacturer ROKETSAN. They were specifically designed for use with drones and light attack aircraft and can engage both stationary and moving targets. A variety of warhead types are available including:
    - a multi-purpose warhead (armour-piercing, blast, fragmentation and incendiary)
    - a high-explosive, blast, fragmentation warhead
    - a tandem armour-piercing warhead
    - a thermobaric warhead.
- Cirit is an air-to-surface anti-armour missile with additional behind armour anti-personnel and incendiary effects, also developed by ROKETSAN. Cirit has been sold to the United Arab Emirates (UAE), so may also have been provided to the ENDF.
- L-UMTAS is a long-range air-to-surface anti-armour missile developed by ROKETSAN. It is not known to have been sold outside Turkey.
- It is also capable of carrying the BOZOK 120 mm laser-guided rocket and a number of unguided (so-called "dumb") munitions, including the TOGAN 81 mm mortar shell.

The **Chinese-made CAIG Wing Loong II** has attachment points for up to 12 air-to-surface missiles. It is known to carry combinations of the following armaments:

- TL-2 laser-guided air-to-ground missile. This is the only munition that the UAE's Wing Loong drones (the most likely source of those first seen in Ethiopia) are known to carry. The ENDF acquired 50 TL-2s on 2 November 2021. The missile has a smaller multi-purpose warhead and more limited accuracy compared to Western equivalents.
- The LJ-7 (or Blue Arrow) laser-guided air-to-surface anti-armour missile. Media reports suggest that this has a third-generation "fire-and-forget" capability. An LJ-7 was one of the munitions (although almost certainly not the only one) used in the 16 December 2021 attacks in Alamata, Tigray, that killed 28 civilians.
- The AKD-10. This is a wire-guided air-to-surface anti-armour missile that would be considered obsolete in most Western militaries, because it requires the operator to guide the missile throughout its flight to its target.
- The BRM1. This is a guided version of a now-obsolete 90 mm high-explosive rocket designed to be carried by attack helicopters.
- The Wing Loon II is also capable of carrying a variety of both dumb and GPS-guided bombs from the FT and LT ranges that vary in explosive payload from 13 kg to 15 kg.

The **Iranian Mohajer-6** has two attachment points, one under each wing. It is only known to carry the following armaments:

- The Qaem (also transliterated as Ghaem-5) infrared-guided missile. This is an unlicensed copy of the now-obsolete US BGM-71 TOW missile that was designed to target other drones or helicopters and so is unlikely to be used in Ethiopia.

- The Qaem bomb. There are several variants of this weapon: the Qaem is thought to be laser guided, the Qaem-1 is believed to have an infrared seeker, while the Qaem-5 has a TV camera for guidance. Credible but unconfirmed reports suggest that a Qaem-5 was used near the town of Gidami in Oromia on 6 January.

Anti-armour warheads: an explanation

As the name suggests, anti-armour warheads are primarily designed to destroy or disable heavily armoured military vehicles.

- **First-generation anti-armour missiles** require an operator to manually and continually guide the missile to its target. They are now virtually all obsolete.
- **Second-generation anti-armour missiles** only require the operator to keep their sights on the target until impact. Examples include the US Hellfire I, Russian 9M133 Kornet and Israeli LAHAT missiles.
- **Third-generation anti-armour missiles** have a "fire-and-forget" capability. Once the target is identified, the missile needs no further guidance during its flight, adjusting its trajectory using a variety of onboard seekers. Many have a tandem warhead designed to defeat modern reactive armour – where the first, smaller charge activates or destroys the reactive armour so that the second warhead can hit the main armour unimpeded. However, fire-and-forget missiles are more vulnerable to electronic countermeasures than earlier types. Examples include the US Javelin, the Turkish OMTAS and the Israeli Spike.
- The most modern **fourth-generation** anti-armour missiles also use "fire-and-forget" technology, but generally have a longer range and more sophisticated seeker for guidance. Examples include the US Hellfire II, Israeli Spike LR and Indian SANT.

Key resources

- Explosive Weapons with Wide Area Effects: A Deadly Choice in Populated Areas – International Committee of the Red Cross (ICRC)
- The Arms Trade Treaty and Drones – Stimson Center
- Explosive Weapon Effects – Geneva International Centre for Humanitarian Demining
- Protecting Civilians in Urban Areas: A Military Perspective on the Application of International Humanitarian Law – International Review of the Red Cross
- Customary IHL Database - ICRC
- Understanding the Reverberating Effects of Explosive Weapons: A Way Forward – UN Institute for Disarmament Research (UNIDIR)
- The Impact of Explosive Weapons on Urban Services: Direct and Reverberating Effects across Space and Time – International Review of the Red Cross (icrc.org)
- Menu of Indicators to Measure the Reverberating Effects on Civilians from the Use of Explosive Weapons in Populated Areas – UNIDIR
- Humanitarian Concerns Raised by the Use of Armed Drones – Geneva Call
- Outcome Report – Geneva Informal Roundtable Meeting on Military Drones in Africa

Footnotes

[1] Drone strikes: Air-strikes reportedly carried out with armed drones. Drone and/or piloted aircraft strike: The delivery platform could either not be identified or reports suggested that both drones and planes were used. Piloted aircraft strike: Air-strikes reportedly carried out using fixed-wing aircraft, helicopters but not with a drone.

[2] In 15 incidents it was not possible to identify the delivery platform (i.e. a drone or aircraft). These 15 incidents have been grouped in the category Drone and/or piloted aircraft strike.

[3] Because the attack occurred in open space, a thermobaric warhead would have needed a mechanism for atmospheric oxygen to be removed (e.g. it would have had to happen in a confined space like a bunker or building) to cause the same effects; see the section entitled “Drone and munition types reportedly used in Ethiopia” for further information on how particular munitions function.

[4] GLONASS is a Russian satellite navigation system.

[5] See also the detail information provided by PAX: Ethiopia now confirmed to fly Chinese armed drones - Peace Organization PAX and Turkish Drones Join Ethiopia’s war, Satellite Imagery Confirms - Peace Organization PAX.

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