

Sentry-N2

A kinetic anti-drone shield for zones where conventional air-defence means are prohibited

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Executive summary

Critical infrastructure is largely defenceless against small drones. Refineries, fuel terminals, chemical plants, airports and ports face reconnaissance, sabotage and airborne attack, yet they cannot use most defensive means. In explosive atmospheres and near people, firearms, missiles and high-power lasers carry too much risk for the surroundings. Radio jamming fails against autonomous drones that do not depend on a radio link.

Sentry-N2 is designed to fill this gap. It is a kinetic counter-drone platform driven by compressed gas, with no flame, no spark and no hot muzzle blast. It fires a projectile that sheds its energy quickly in flight and breaks apart on impact instead of ricocheting. Its fire is corrected during the engagement, so it can hit a manoeuvring target that a single shot would miss. The civilian variant, HorizonMaster, is designed for the protection of critical infrastructure.

This document describes the problem, the operating principle of the system and the reasons for its design.

1. The problem

The small multirotor has become a real threat to industrial and energy facilities. It is cheap, it can fly autonomously, and it can observe, carry a payload or strike the sensitive points of an installation. The operator of a refinery or a port sees the threat but faces a difficulty that conventional defensive means do not solve.

Firearms are ruled out in such places. A muzzle flash and hot gases can ignite an explosive atmosphere, and a bullet that misses keeps flying far beyond the target. Radio jamming, long treated as the primary counter-drone tool, fails against drones that fly autonomously without satellite navigation or a radio link. A guard watching the sky is too slow, because a fast drone leaves no time to spot it, decide and shoot.

That leaves kinetic defence, in a form that solves two problems at once. It must be safe enough to be allowed in a sensitive zone. It must also hit an agile target that moves away from the aim point while the projectile is still in flight. Until now these two qualities pulled in opposite directions, because safe means were too weak and effective ones too dangerous. Sentry-N2 was designed around combining them.

2. Pneumatic drive for zones where shooting is forbidden

The system is built on a pneumatic drive, in which compressed gas expels the projectile without a powder charge. This single decision opens applications that are closed to firearms.

A pneumatic drive produces no flame, no spark and no hot muzzle blast, and the gas leaves the barrel cold. The system is therefore designed with operation in ATEX zones in mind, that is, in potentially explosive atmospheres. Refineries, gas terminals, chemical plants, paint shops and silos all rule out firearms, and Sentry-N2 is designed to bring neither fire nor spark into them.

3. The projectile

The second pillar of safety is the projectile. It is deliberately light for its size and deliberately brittle, and these two features give three safeguards at once.

The first is energy shedding in flight. High aerodynamic drag makes the projectile brake sharply, so its energy falls quickly with distance. The projectile is designed so that beyond the working zone its energy drops to a safe level, including after a miss.

The second is the absence of ricochet. On impact with a hard obstacle the projectile is designed to break apart into fragments and dust. It gives up its energy at the point of impact instead of bouncing off in an unpredictable direction. In built-up areas and next to industrial installations, this matters.

The third concerns explosive atmospheres. The projectile is designed to produce neither a mechanical spark nor an electrostatic discharge when it breaks apart. Together with the cold drive, this aims to keep ignition sources out of the zone from the muzzle to the point of impact. All three safeguards follow from one choice of projectile, so safety rests on physics rather than on electronics that could fail.

The platform can use different types of ammunition matched to the task and the surroundings. They include variants free of harmful heavy metals that break down into inert material after use.

4. Scalable effects

Sentry-N2 does not always fire with the same force. The energy of the shot is matched to the situation, which makes it a platform with scalable effects.

In its basic mode the system fires a subsonic shot of moderate energy, precise and with safe energy shedding beyond the working zone. When a target comes close, it can raise its rate of fire and cover the space in front of it. The operator does not have to choose between a means that is too weak and one that is too dangerous.

5. Correction during the engagement

A single shot at a manoeuvring drone often misses, because the target moves while the projectile is in flight. Sentry-N2 does not rely on one shot. It fires a short burst and corrects its fire during the engagement, so each shot lands closer than the one before.

This is the difference between chasing a target and closing in on it. A defence that fires at where the target was always stays one step behind. Sentry-N2 is designed to converge on a hit faster than the target can leave the engagement zone. It works in the immediate surroundings of the protected object, where a burst can be completed before the target escapes.

6. Situational awareness

The system combines cameras with an acoustic array, a set of microphones that listens all around. The array gives awareness of what happens beyond the cameras' field of view.

It determines the bearing of an approaching drone, so the cameras can be pointed there before the target enters their field of view. It warns of an approach from the flank or the rear, outside the cameras' sector. It can detect a target where sight fails, behind an obstacle, at night, in fog or in smoke. It also indicates the directions of several threats at once. The cameras look where the system needs to shoot, while the array watches everything around it. When a target is neutralised, the system ends the burst and turns to the next threat.

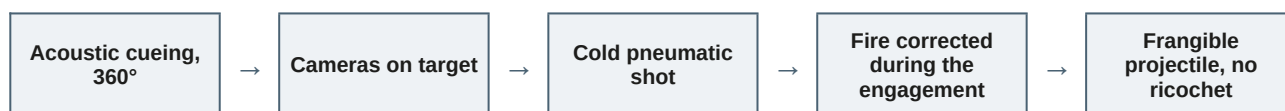


Figure 1. How the elements of Sentry-N2 work together. Schematic.

7. Why it works

The effectiveness of the system is a calculable race between two processes. On one side the error of the burst shrinks from shot to shot. On the other the target manoeuvres to escape the engagement zone. The design question is which process wins, and the answer can be computed.

Safety is computed just as carefully. The distance at which the projectile's energy falls to a safe level is designed to coincide with the boundary of the working zone. Effectiveness and safety are two sides of the same calculated physics. Full technical documentation, including ballistics, strength analysis and models, is available to partners under a confidentiality agreement.

8. Limits

No system answers everything, and Sentry-N2 has limits that are worth stating openly.

It defends a point and its immediate surroundings. It is not a shield over an arbitrarily large area from a single position, and it does not intercept at long range. Its effectiveness depends on the target being visible to its sensors and on enough time for a burst. Very large, very fast or armoured targets need other solutions. These limits mark out where Sentry-N2 is strong. That is the defence of critical infrastructure against small and medium drones in zones where other means are ruled out.

9. Responsible design

An effective kinetic effector can count as a weapon under the law. Sentry-N2 is developed with that in mind, and any configuration that the law treats as a weapon will be produced only under the required licence.

HorizonMaster, the civilian variant, is intended for refineries, fuel terminals, chemical plants, airports and ports. It is designed exclusively as a counter-drone system, with the safety of the surroundings and operation in ATEX and urban zones as design goals.

10. From point defence to area defence

A single position protects a point and its surroundings. Several positions working together can protect a larger site, such as a refinery, a port or a base. This direction is the subject of a separate study.

Conclusion

Sentry-N2 addresses a real and growing gap. Critical infrastructure needs defence against drones and cannot use means that are too dangerous for sensitive zones. The system is designed to combine two qualities that have so far excluded each other. One is safety that allows operation in an ATEX zone and in a city, the other effectiveness against an agile, manoeuvring target.

Its safety is designed into physics, through a cold pneumatic drive and a projectile that sheds its energy and breaks apart without ricochet. Its effectiveness comes from fire corrected during the engagement, which closes in on a target that a single shot would miss.

This document describes a system under development, and the properties described are design goals. Conformity with the applicable requirements, including ATEX, will be assessed under the relevant procedures. © 2026 Maciej M. Kasperek.

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