

XENTA

SHORAD & C-UAS Radar

White Paper



This White Paper describes the Weibel Scientific A/S XENTA SHORAD & C-UAS radar. Our surveillance radars are available in versions optimized for Short Range Air Defense (SHORAD) applications, and versions optimized for detecting, tracking, and classifying Low, Slow, and Small (LSS) targets for C-UAS & Critical Infrastructure Protection (CIP).

1. WEIBEL SCIENTIFIC A/S

Weibel Scientific A/S is a family-owned and privately held Danish company that currently has more than 380 employees, of which more than a third work in research and development.

As the world's leading developer and manufacturer of Continuous Wave (CW) Doppler radars, Weibel has delivered superior high-technology products for civil and defense applications for more than 45 years. Currently, we have systems fielded in more than 45 countries worldwide for range instrumentation (test and qualification of weapon systems), space launch safety, space situational awareness, muzzle velocity measurement, and air surveillance. Today, Weibel has more than 5,500 radars in operation worldwide.

With a long heritage of highly accurate instrumentation radars provided to test ranges all over the world, the XENTA product line builds on Weibel's advances in Continuous Wave (CW) radar technology.

Weibel designs and builds all critical components in-house to ensure quality, and to minimize obsolescence issues. In-house design and manufacturing also mean that Weibel is independent of sub-suppliers for delivery of key components. This ensures better control of the product design, life-cycle costs, and customer support.

2. XENTA RADAR

The primary characteristics of XENTA are continuous target illumination within its field of view, an electronically controlled transmit beam, and 3D digital-array technology utilizing synthetic receiver beamforming. This technology gives an instant target update within all receive-beams in the field of view, removing the need for time-consuming beam scanning.

The increased illumination time (time-on-target), and flexibility of the synthetic beamforming, results in increased detection ranges in complex clutter environments. The technology ensures extremely high sensitivity in reception enabling XENTA to classify targets with very low Radar Cross Section (RCS), such as commercial nano-, and micro drones.

The SHORAD version of XENTA comes with advanced functions such as ECCM, IFF, Search on the Move (SOTM), and ruggedized components for harsh military environmental conditions.

The C-UAS version of XENTA is well suited for civilian counter-drone environments, such as airports, border control, critical infrastructure, event protection, and UTM/ATM.

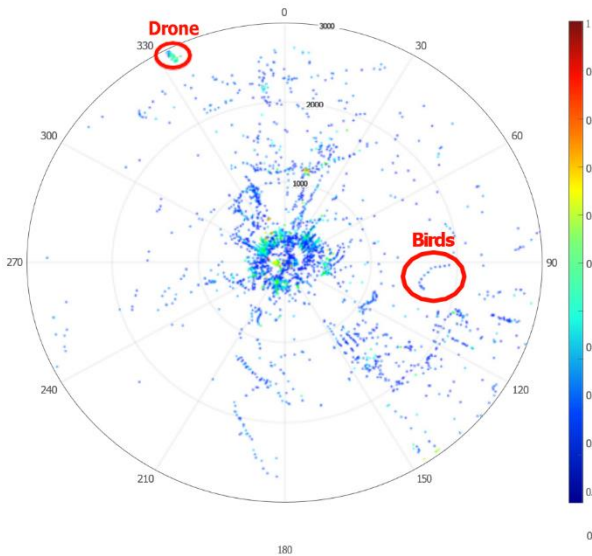
XENTA comes in various versions, ranging from low to high power output, as well as low and high elevation coverage. The radar has an instrumented range of 75 km and consistently detects a DJI-P4 drone beyond 7 km and classifies the same drone type beyond 5 km while separating true targets from surrounding birds.



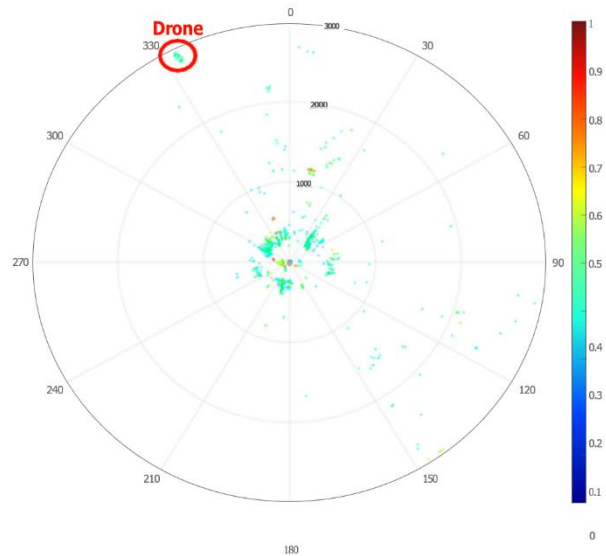
Responding to the growing drone threat, Weibel commenced development of a radar sensor system exploiting our proven technologies from the tracking market. The resulting XENTA radar uses FMCW with Range Doppler with a 3D digital array for effective air surveillance.

XENTA is designed to operate in complex clutter environments. As example, the following real-life recordings show a DJI-P4 drone tracked at 3km distance in central Oslo. This is a highly challenging clutter-rich environment with rooftop fans on buildings, nearby mountains, and vegetation.

No Clutter Filtering



Micro-Doppler Filtering



Weibel’s patented technology enables the selection of multiple beamforms to optimize detection and tracking performance.

XENTA is a rotating radar with 360 degrees azimuth coverage with a high-performance turning motor that permits high-speed rotation with high-precision pointing. The transmit beam is shaped in elevation to cover up to 60 degrees.

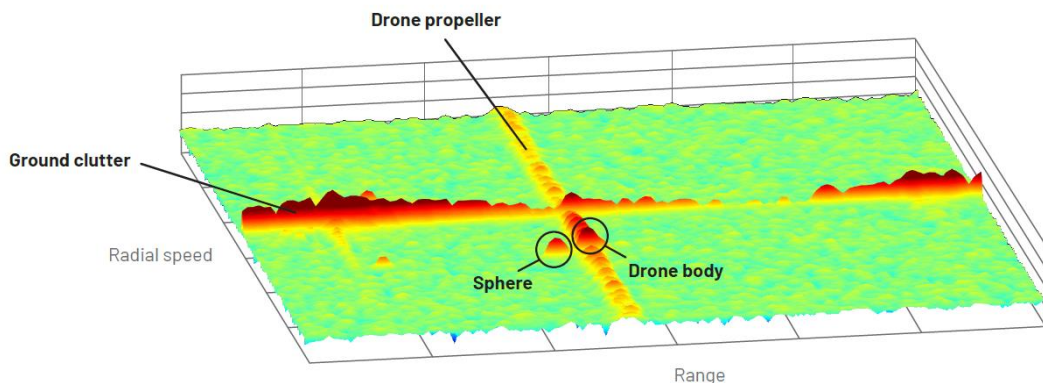
Combined with the 3D Digital-Array receiver technology, and synthetic beamforming, the radar provides multiple stacked beams for efficient target separation.

XENTA radars support the open EUROCONTROL ASTERIX interface that can easily be integrated into any Air Traffic Management (ATM), UAS Traffic Management (UTM) or Command & Control (C2) system.

The first and foremost advantage of the micro-Doppler technology is the ability to detect the propellers of the drone, thereby distinguishing drones from birds.

The Range-Doppler illustration below is depicting a measurement of a small drone and suspended sphere.

The picture shows the ability to clearly distinguish the propellers from the ground clutter, as well as separating the drone body from the sphere.



Based on internal tests and more than 50 demonstrations to potential customers, our data verify XENTA’s performance as follows:

Target Type	RCS	Typically observed max detection range in all weather	Typically observed max classification range in all weather	Max observed clear weather detection
DJI Spark/ DJI Mavic Mini	0.002m ²	2.5 – 3 km	1.5 – 2 km	> 4 km
DJI Phantom 4/ DJI Mavic	0.01m ²	5 – 7 km	4 – 5 km	> 7 km (flight limit at site)
DJI Matrice 300	0.04m ²	7 – 8 km	5 – 6 km	> 9 km (flight limit at site)
Alpha Piper 30 ft. WS		25 – 26 km	25 – 26 km	> 28 km
Helicopter Robinson		21 – 22 km	21 – 22 km	> 28 km
Wide-body Airliner		60 – 70 km	60 – 70 km	

*Performance is subject to clutter, multipath, glint, operator settings, propagation conditions, etc.

3. OPERATIONAL CONTEXT

In the military SHORAD configuration, XENTA is designed to be part of an integrated air defense system supplementing long-range and medium-range air defense sensors as a gap filling radar. XENTA detects and tracks rockets, artillery and mortars, cruise missiles, fighter jets, rotary wing aircraft and low, slow and small drones.

XENTA fits in a MOWAG EAGLE V 6x6 or JLTV type vehicle, thereby allowing the system to keep up with the pace in modern warfare. In a GBAD role, XENTA’s deployment time enables 2-3 leapfrogging systems to deliver a continuously updated local air picture while engaged in the maneuverable warfare. XENTA will be equipped with a Search on The Move function that enables the system to uphold a close-in-defense to V-SHORAD capacity while being on the move e.g. in the brigade’s high-mobile operations.

The XENTA surveillance radar is designed to be a key asset in an integrated counter UAS system, working seamlessly with already existing ATM or UTM systems. The radar will provide early warning through long-range surveillance, detection, and classification of non-cooperating targets for protection of critical infrastructure objects such as airports, and power plants, as well as sports venues, concerts and VIPs.

4. CLOSING REMARKS

Weibel’s new XENTA surveillance radar has, to our knowledge of the global radar market, second-to-none performance when it comes to detecting, classifying and tracking of drones.

Our long-lasting expertise with Doppler technology vouches for the quality and precision of our systems.

Weibel will be happy to conduct a virtual/remote demo for you to experience the performance first-hand, and in due time, Weibel would also look forward inviting you for a live demo!