

# Evaluating Radar for Drone Detection



**Drone detection is one layer in a broader protection strategy—integrated with perimeter design, physical barriers, obscuration, and operator-driven procedures.**

Selecting the most effective drone detection radar is mission-critical. Data sheets alone don't reflect real-world performance. Only operational testing confirms reliable detection, accurate classification, and the consistency required to protect critical infrastructure.



**CAPTURE KEY INSIGHTS  
DURING TESTING**

# Recommended Drone Scenarios for Evaluating Radar

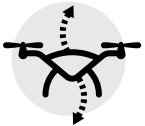
**Before testing begins**, align with your security and integration teams to assess detection geometry and coverage, validate camera placement, and confirm response timelines. This upfront alignment ensures testing reflects real risk, reduces operational gaps, and delivers consistent, reliable performance from day one.

## 1. HOVERING DRONE



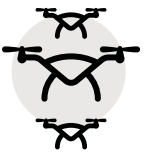
A radar should hold a track on a hovering drone at multiple ranges. To test this, hold the drone in a hover position for at least 60 seconds.

## 2. DRONE MOVING ERRATICALLY



The radar should be able to detect and hold a track on a drone that is rapidly changing direction. To test this, have the drone pilot move the drone up and down and in diamond and zig zag patterns.

## 3. DRONE ENTERING SCENE AT MULTIPLE ELEVATIONS



To verify comprehensive coverage and consistent radar detection and tracking of drones, have the drone approach from a few hundred meters out and just above horizon level then ascend before the final approach to the property.

## 4. RADAR INTEGRATED WITH CAMERA



For full zoom capability, pair a camera with a radar offering 1-5m range resolution. Lower angular accuracy requires targets to be closer for effective analytics and visual verification. Radar accuracy is just as critical as detection range, especially in sensor fusion.

## 5. EXTREMELY SLOW FLIGHT OPERATIONS



Drones carrying load have an unbalanced center of weight and become unstable during fast flight. It's critical that the system can detect slower moving drones at speeds from 1 to 4m/s.

## 6. DRONE FLYING AFTER SUNSET



You should expect a radar to be able to detect and track a drone in all lighting conditions. It is recommended to pair a radar system with a thermal PTZ camera for nighttime threat confirmation and false positive reduction.

## 7. DRONE FLYING DURING INCLEMENT WEATHER



High-performance radar will detect drones in extreme weather - rain, snow, wind storms, and more. While many drones will struggle in high wind, for example, others may not. It is prudent to test radar during common inclement weather events.

## 8. DARK DRONE (AKA SILENT OR NON-SIGNAL-EMITTING)



You should expect a radar to be able to detect and track a drone that does not have Remote ID and is not emitting a cataloged RF signal. Testing and verifying the radar will illuminate gaps in systems historically reliant on RF or Remote ID detection alone.

## 9. DRONE SWARM



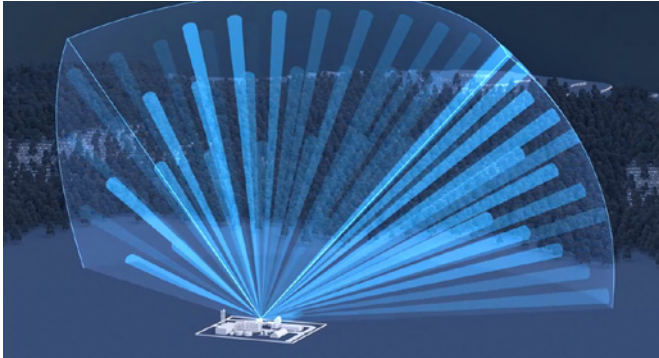
Radar should be able to detect and track multiple targets at the same time. To test this, have 3 or more drones fly within the field of view simultaneously.

**USE THE WORKSHEET  
ON PAGE 5**

# Observable Radar Performance Characteristics

## Vertical Field of View (FoV)

It is critical to detect drones flying simultaneously high and low. To see both, a radar's vertical FoV should be at least 60 degrees or more, split between airspace, horizon, and fence line. Anything less will leave gaps in coverage.



## Accuracy of Target Location

(aka range resolution, angular accuracy):

A 1-5 meter range resolution is necessary to:

- 1) Determine precise object(s) location in 3D space
- 2) Maximize zoom of a PTZ camera for visual verification,
- 3) Engage secondary camera analytics
- 4) Correlate radar targets with RF/RFID in a unified system.

*Note:* Avoid dual-tasking radar systems. Supporting both air and ground surveillance with a single sensor introduces trade-offs in detection accuracy, classification confidence, and effective range—limiting performance where it matters most. Dedicated monitoring ensures each domain is covered with the precision, reliability, and consistency required for mission-critical operations.

## Separation of Targets:

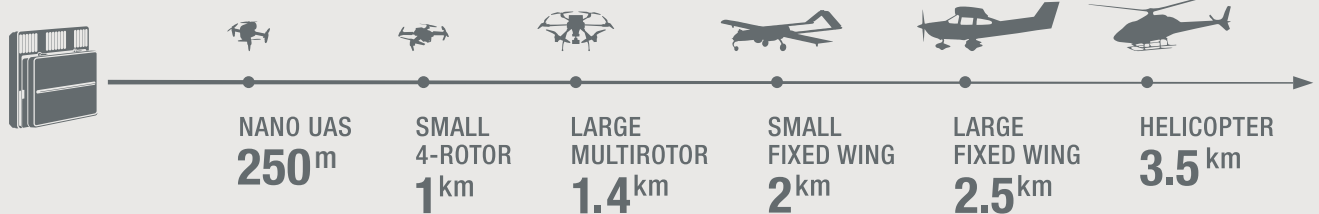
For most accurate and complete situational awareness, radar should have range resolution of 5 meters, or better. Commonly, small form factor radars have a range resolution between 10 and 20 meters and, as such, can NOT distinguish between multiple drones flying close together. Cameras slewed by imprecise radar will struggle to zoom into a target until it is too close to the facility for security to act.



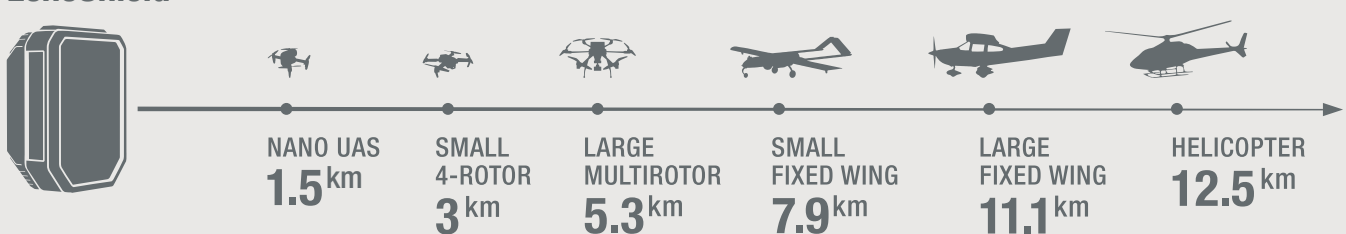
## Range of Detection & Classification:

Radar must deliver detection and classification at ranges that allow time to respond. Requirements should align to site-specific risk. For many critical infrastructure environments 800 m detection for common UAVs is a baseline, refined through formal risk assessment.

### EchoGuard



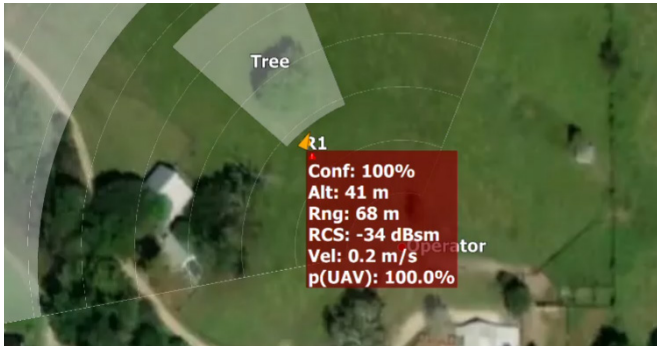
### EchoShield



# Observable Radar Performance Characteristics (continued)

## Object classification

Distinguishing between birds, drones and manned aircraft is essential for limiting false positives. The radar should have micro-Doppler capability and advanced algorithms to appropriately distinguish drones, other aircraft, and birds, for example.



## Track Update Rate

Holding an accurate track on a drone requires a high track update rate. Radar with a track update rate of less than 8 hertz will struggle to track both fast moving & hovering drones and may drop tracks on critical targets. Additionally, a high data update rate ensures smooth and consistent camera slewing for “eyes on confirmation.”



## FUTURE PROOFING

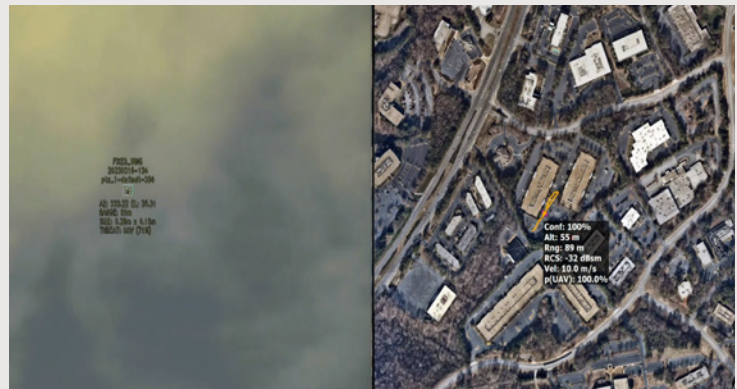
Choosing software defined radar ensures you receive regular performance updates (tuning, classification, range and accuracy) that keep pace with the evolution of threats. Choosing a solid-state, easy-to-set-up radar lowers operational burden and maintenance over the lifetime of use (true portability in radars should mean the radar can be up and running in less than twenty minutes.)

## FURTHER REDUCE FALSE ALARMS WITH CAMERA ANALYTICS:

When paired with a solid-state radar with excellent range resolution (aka angular accuracy), a PTZ camera with analytics provides an essential visual and data verification before an alarm sounds.

## SPINNING RADAR VS. SOLID STATE RADAR:

Due to the inherent motion, spinning radars are often limited to a 1-3hz track update rate (less than half of the recommended 10hz), which impairs track accuracy and smooth camera slewing. Spinning radars also have parts and pieces, making them prone to downtime and maintenance.



This guide is consistent with JIATF-401, CISA guidance, and other widely recognized federal frameworks for the physical protection of critical infrastructure, including considerations for drone detection and counter-UAS (C-UAS) solutions

# Radars Evaluation Worksheet

Use this page as a template or inspiration for creating your own evaluation form. Streamline scoring and data evaluation by establishing a simple rating system, such as 1-5, 1-10 or a ranked list. Ensure each evaluator has a copy of the worksheet during field testing and encourage them to capture their observations in real time for the most accurate and actionable insights.

	<b>ECHODYNE</b>	<b>RADAR B</b>	<b>RADAR C</b>
<b>1</b> HOVERING DRONE			
<b>2</b> DRONE MOVING ERRATICALLY			
<b>3</b> DRONE ENTERING SCENE AT MULTIPLE ELEVATIONS			
<b>4</b> RADAR INTEGRATED WITH CAMERA			
<b>5</b> EXTREMELY SLOW FLIGHT OPERATIONS			
<b>6</b> DRONE FLYING AFTER SUNSET			
<b>7</b> DRONE FLYING DURING INCLEMENT WEATHER			
<b>8</b> DARK DRONE (AKA SILENT OR NON-SIGNAL-EMITTING)			
<b>9</b> DRONE SWARM			