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# Multi-role Electronically Scanned Array (MESA)

*Surveillance Radar*

The Multi-role Electronically Scanned Array (MESA) radar brings military airborne surveillance capabilities to the Boeing 737 Airborne Early Warning and Control (AEW&C) system.

Building on Northrop Grumman's 40-year heritage in airborne early warning (AEW) radars starting with the Airborne Warning and Control System radar, the MESA radar is the next-generation evolution leveraging electronically scanned radar technology. The MESA design concept enables an all-weather command, control and communications management capability on the Boeing 737 AEW&C aircraft, providing long-range surveillance radar, robust Identification Friend or Foe (IFF) detection to the radar instrumented range, and maritime surveillance instrumented to the horizon — all in a modern, integrated system.

The MESA radar provides a full 360-degree surveillance capability with sector emphasis and assignable higher update rate sectors to dynamically adjust to emerging tactical situations. Sector emphasis extends detection range without the need to fly closer to threat situations. Higher update rates bring battle management to the edge of the radar surveillance envelope with little or no latency in coordinating or directing forces to priority situations.

The 737 AEW&C system has been competitively selected by Australia, Turkey and South Korea as their front line AEW&C solution.

## Applications

MESA is designed for a midsize jet-powered aircraft, taking advantage of higher speeds and altitudes. Operating altitudes up to 40,000 feet (versus typical 20,000- to 25,000-foot altitudes of other AEW systems) provide a 20 to 50 percent range and line-of-sight advantage against low-flying missiles and aircraft in various terrains. Thus, early warning and reaction times are significantly enhanced when time is of the essence. MESA is operationally ready minutes after takeoff, beginning at 5,000 feet and with full power operation at 10,000 feet. Leveraging the interleaved electronic scanning features, a combined air and sea picture is rapidly developed. System operators and battle commanders now have the flexibility to orchestrate air operations and defensive measures with a radar/IFF system easily commanded via the system console.

## Advantages

Based on more than 60 years of airborne surveillance radar expertise, Northrop Grumman has designed a remarkable three-aperture active electronically scanned radar in a sleek dorsal mount, providing 360-degree operation with low aircraft drag. Legacy AEW systems have higher drag antenna configurations and are limited by mechanical scan

rates of 10 to 12 seconds. In contrast, the MESA radar has variable scan rates and instantaneous target revisit rates to satisfy diverse mission priorities. Battle managers can assign multiple emphasis sectors with extended range and update rates while maintaining a 360-degree background surveillance picture.

MESA's radar/IFF system is powered by 288 high-power T/R (transmit/receive) modules driving two side arrays and a "top hat" array. Each array has a large aperture for high gain and directivity of the radar and IFF beams. The "top hat" provides fore/aft coverage for full 360-degree surveillance coverage. This configuration provides radar target tracks through aircraft turns and maneuvers. MESA is designed to operate with graceful degradation, extending available operating hours for both radar and IFF. MESA's reliability is higher than AEW systems with separate IFF and radar systems due to fewer parts and shared system hardware between functions.

Operating at L-band enables long-range air and maritime search/track and IFF — all in one multifunction aperture system. IFF responses can exceed radar detections, providing cooperative target detections and situational assessments before targets penetrate radar surveillance coverage. Additionally, L-band provides better detection in rain than higher frequency AEW radars as well as longer range detection of smaller targets.

## Functionality

MESA provides wide area surveillance of greater than 340,000 square miles at rates exceeding 30,000 square miles per second for a typical 10-second scan rate. Since scan rates are variable and sectors selectable, other coverage rates, ranges and priorities are programmable by mission commanders. Four-dimensional processing, with monopulse angle processing, provides accurate range, azimuth and elevation locations. Doppler processing resolves closely spaced targets in formations.

Multiple pulse repetition frequencies are used for target detection/tracking optimization in high-clutter environments. The maritime detection mode is interleaved with air surveillance and IFF, providing surface ship detections to and beyond the horizon while maintaining the air picture.

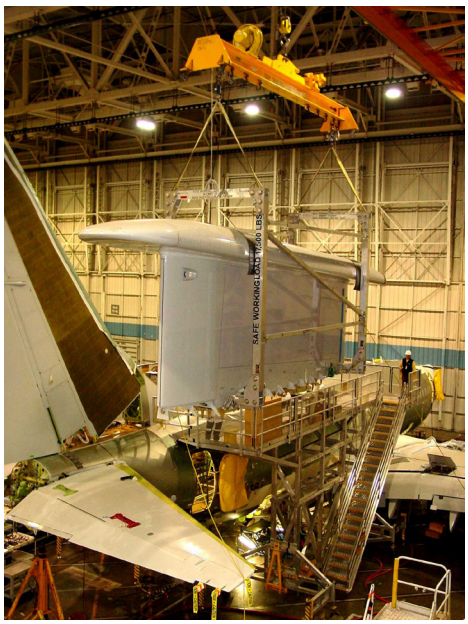
Advanced electronic protection (EP) capabilities mitigate radio frequency interference from various sources, ensuring continued operation. MESA EP capabilities use adaptive side-lobe cancellation and blanking. EP techniques mitigate deception and detection denial jamming.

MESA's active electronically scanned array allows operator-selected surveillance sectors with higher update rates, which can double detection range. Variable range and angle sectors are enabled while still maintaining a 360-degree background for situational awareness. Sector-selected modes provide three to four times higher target search rates and eight to 10 times higher track updates than legacy rotating AEW radars. Multiple emphasis sectors are operator selectable to focus on areas of interest in either fixed-to-ground or sectors moving with the platform.

## Growth

Future capabilities will continue to leverage the benefits of an AESA-based radar system and the additional prime power available on the 737. These include additional radar and IFF modes and advanced EP capabilities.



**For more information, please contact:**

Northrop Grumman
Electronic Systems
ISR& T Division
1745A West Nursery Road, MS 240
Linthicum, MD 21090
e-mail: surveillance@ngc.com

www.northropgrumman.com

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