

Naval Airborne EW: Northrop Grumman Builds on Strong Legacy to Deliver the Future



▶ Northrop Grumman is driving technological advancements in airborne electronic attack and countermeasures to keep naval airpower platforms like the EA-18G Growler ahead of evolving threats. *Photo source: U.S. Navy*

Naval Aviation is readying for a future threat environment that will require the most sophisticated tools that impose airborne electronic attack overmatch and superior jamming to protect its fleet and secure its assets. Keeping the service's electromagnetic maneuver warfare platforms, particularly the EA-18G Growler electronic attack aircraft, at the technological cutting edge will require a new way forward on multi-mission, multi-function capabilities. Northrop Grumman is prepared to meet the future, serving as the Navy's premiere airborne electronic attack systems integrator while meeting a new era of electronic warfare with software defined, hardware enabled capabilities built on open architecture that leverages model-based engineering.

For more than 55 years, Northrop Grumman has provided the Navy with critical end-to-end electromagnetic maneuver warfare solutions, to include multi-function radio frequency

electronics, passive precision targeting systems, cognition enabled jammers, advanced computers and processors, offensive and defensive cyber, next-generation radars and resilient, software-defined, all-domain network radios.

From building, maintaining and upgrading electronic sensing and jamming systems for the EA-6A Electric Intruder, EA-6B Prowler and EA-18G Growler electronic combat aircraft, to producing radar warning receivers and electronic support measures for the P-8A Poseidon, Northrop Grumman has paved the path as the Navy's airborne EW partner.

Tom Tack, director for EMW Systems in Surveillance and Electromagnetic Maneuver Warfare, calls Northrop Grumman's continued Navy airborne EW role the "lifblood of this part of the organization."

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▶ Northrop Grumman's Next Generation Jammer-Low Band demonstration unit for the EA-18G Growler successfully underwent testing at the U.S. Navy's Facility for Antenna and RCS Measurement and Air Combat Environmental Test and Evaluation Facility. *Photo source: U.S. Navy*

"We believe in the EMW mission and have it ingrained in everything we do; designing complex EW systems for carrier-based aircraft, is probably the most difficult and constrained environment that you can work in," Tack said.

Northrop Grumman is in the unique position of not only providing integral EW systems, but also serving as the manufacturer for the fuselage on the Growler aircraft where these capabilities are integrated.

"With that experience comes the unique understanding of the processes that are required, how we do aerodynamic design, how we handle everything from vibration and inertial loads to the management of the electronic environment and weapon system supportability. It cuts across the board in being able

to have people that understand both the aircraft design as well as the electronics design and how systems will work and be maintained in the harsh and unique Navy environment," Tack noted.

Northrop Grumman has been highly successful in fielding systems capable of simultaneously jamming enemy radars while enabling listening and direction finding. The company has also pioneered the use of long and short baseline interferometry for rapid, single aircraft precision geolocation, the adaption of radar Airborne Electronic Attack (AEA) suite technologies for EW targeting and survivability.

Buz Kalafos, vice president of Northrop Grumman Mission System's Surveillance and Electromagnetic Maneuver Warfare business unit, noted the extensive benefit in providing multi-function capabilities that integrate seamlessly.

"Northrop Grumman has really established its leadership role in supporting the Navy in the electronic warfare area with our ability to have these very powerful, electronically exquisite jamming systems work in close concert with those receiver systems. And now to be able to do that and network with other aircrafts' receivers is game-changing," Kalafos said.

Northrop Grumman's position as the AEA integrator for the Navy's Growlers is a strong foundation for providing critical capabilities for the Growler's Block II upgrade program and electronic attack pod upgrades under the Next Generation Jammer programs.

▶ Northrop Grumman's Bethpage, New York employees continue to work on next-generation systems to support the naval aviation community that they have served for decades. That work continued even through the recent coronavirus pandemic. *Photo source: Northrop Grumman*



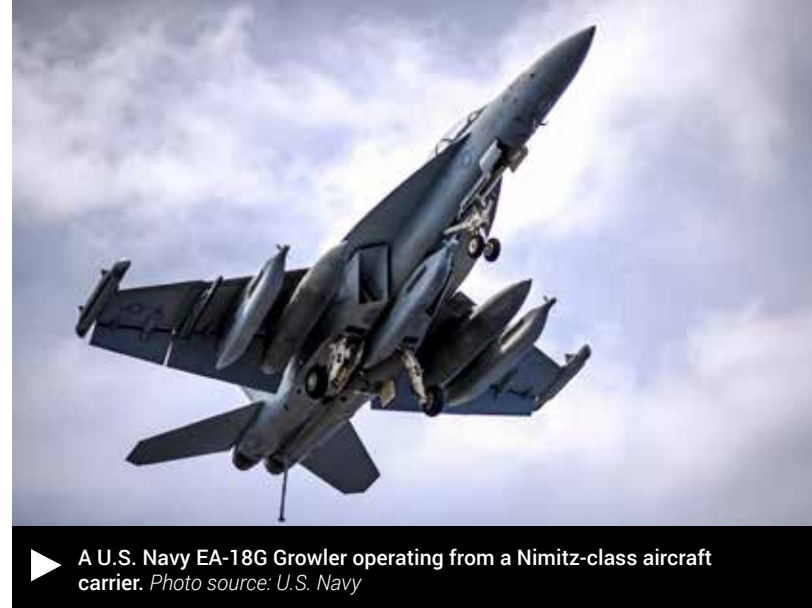
The backbone for Northrop Grumman's electronic warfare advancements is an innovative software enterprise approach that provides the Navy with maximum flexibility to adapt and evolve their airborne EW capabilities.

Using a Modular Open Systems Approach (MOSA) architecture, Northrop Grumman is creating common software blocks that can be iterated upon, rather than creating brand new software for each new system.

This approach has been leveraged, for example, on the company's proposed modular Controller/Receiver/Exciter for the Navy's Next Generation Jammer-Low Band solution as well as upgrades bringing advanced processing, AEA resource management, and advanced capabilities to the EA-18G in a modular, software upgradeable open systems architecture.

"The lines are blurring between Electronic Support Measures (ESM), Electronic Attack (EA), cyber attack and non-kinetic warfare capability needs. As a result of being able to have systems that are truly multi-function, multi-mission, we can respond to that need. It allows us to have less hardware on the aircraft resulting in less weight, less size/power/cooling needed, and a longer mission range," shares Eric Reinke, Northrop Grumman Mission Systems' vice president of Strategy and Program Development.

He added that Northrop Grumman understands the Navy's future Electromagnetic Maneuver Warfare (EMW) mission environment will require a software defined, hardware enabled design approach that allows for a rapid changing of systems capabilities pushed out to the fleet quickly.



▶ A U.S. Navy EA-18G Growler operating from a Nimitz-class aircraft carrier. *Photo source: U.S. Navy*

"The threats are becoming highly complex. The responses to those threats also becomes much more complex, which drives us to systems that have a high degree of flexibility. What that means to me is the need for being able to adapt the response, hence what we call the reactive electronic attack capability. The technology supports the ability to react to new and changing threats rapidly," Reinke said.

Designing the Navy's future airborne electronic warfare assets requires a cutting-edge approach, an area Northrop Grumman has championed with the use of digital and model-based engineering.

Northrop Grumman is proposing digital and model-based engineering for both Next Generation Jammer-Low Band and

▶ Northrop Grumman's Next Generation Jammer-Low Band Demonstration of Existing Technologies demonstration unit undergoes testing inside the Naval Air Systems Command Air Combat Environment Test and Evaluation Facility's (ACETEF) anechoic chamber. *Photo source: U.S. Navy*



Growler Block II as a key component driving down cost and mitigating risk for rapid development efforts.

“More mission capability in the same physical volume – this really adds to the agility of being able to change, adapt and rapidly develop new systems. We’ve made a lot of push and investment in this area,” Reinke said.

Northrop Grumman is in position to make the Navy’s next generation of airborne EW assets a reality, working in lock-step with the service through demonstrations and fleet experiments to showcase the future of electronic maneuver warfare for decades to come.

To date, Northrop Grumman has successfully flown its discriminating NGJ-Low Band Transmitter Group, to include its AESA antenna and power amplifiers, demonstrating an ability to provide full power over the 360 degree Field of Regard and showcasing an ability to support the Navy’s accelerated timeline for fleet introduction.

“It’s not just about knowing today’s and yesterday’s threats. It’s about knowing when the capability enters the fleet it’s able to handle today’s threats and those anticipated in the next decade,” Tack said. “We understand the timeline that NAVAIR is asking for, and because of our background and the merging of all our different groups, we’ll be able to make their timeline and deliver in a ‘speed-to-fleet’ mindset as quickly as they require.”

Having access to a company-owned fleet of test bed aircraft at its flight test center in Linthicum, Maryland at Baltimore/Washington International Thurgood Marshall Airport, has expanded the possibilities for developing, demonstrating and assessing new systems before sending them out to the fleet.

“We can demonstrate, in flight, the capabilities and solutions in the relevant environment for technology readiness. It allows us to rapidly integrate and test systems, and validate our MBSE models in the air,” Tack said.

Northrop Grumman’s extensive network of labs and indoor flight ranges, including the largest anechoic chamber on the East Coast and its low-speed wind tunnel in Hawthorne, California, allow the company to rapidly run end-to-end capabilities for electronic attack systems before integration.

The company’s team in Bethpage, New York is leading efforts for Naval electronic warfare work, including housing a state-of-the-art electronic attack system integration lab for complete system testing.



▶ A P-8A Poseidon flies over the Chesapeake Bay above the USS Zumwalt (DDG-1000) guided-missile destroyer. Photo source: U.S. Navy

“It’s run by the brightest minds, some having 40 or more years of experience in electronic warfare systems. A lot of them have been designing entire aircraft and the EW systems integrated on those aircrafts,” Tack said.

Realizing the Navy’s vision for continued airborne EMW dominance into the future cannot be accomplished alone; and Northrop Grumman has assembled a team of industry partners that share the same innovative approach required to realize this necessary technological advancement.

L3Harris Space and Airborne Systems segment serves as a partner on Northrop Grumman’s Next Generation Jammer-Low Band effort, providing electronic attack equipment for the pod system.

“Nobody does this alone. We have a lot of great partners across the board. The L3Harris group in Amityville, New York, just 15 minutes down the road from Bethpage, has a similarly lengthy heritage on the processing side of electronic warfare. They bring so much to this team in terms of background capability, long-term commitment to the mission, software that’s been out there, validated and verified, as well as mission-proven capabilities,” Kalafos said.

Northrop Grumman is also leveraging the support of small businesses for NGJ-LB.

For decades, Northrop Grumman has served as the Navy’s premier enabler for airborne electronic warfare assets, providing capabilities that protect the fleet in the most austere, challenging environments.

Northrop Grumman is making investments now that shape the future of the naval electronic maneuver warfare force for decades to come, providing the necessary experience and critical innovation needed to realize the Navy’s vision of next-generation electromagnetic spectrum dominance.