

## Next Generation Jammer

### Executive Summary

- The Next Generation Jammer (NGJ) – Mid-Band (MB) Milestone C decision planned for September 2020 has been rescheduled to January 2021. Challenges due to late pod deliveries, the complexity of test equipment integration, initial manufacturing and quality issues, and the manpower and efficiency effects of the global coronavirus (COVID-19) pandemic have affected planned execution. The program is still on track to meet the March 2021 threshold for Milestone C.
- Early testing conducted in anechoic chambers has not yet verified that the NGJ-MB meets system-level radiated power requirements in every frequency region. Updated array calibration that improves radiated power has been tested at the subsystem level. System-level validation of radiated power is scheduled for later this year in the anechoic chamber.
- Delays to the NGJ-MB program have shifted the first phase of the Navy’s Capabilities Based Test and Evaluation (CBT&E) phase to Naval Air Station (NAS) Patuxent River, Maryland, from NAS China Lake, California.
- The NGJ – Low Band (LB) program completed two Demonstration of Existing Technologies (DET) contracts on August 31, 2020, to determine technical maturity of required technology to field the NGJ-LB capabilities.

### System

- The NGJ is being acquired in three separate acquisition programs: Increment 1 (MB), Increment 2 (LB), and Increment 3 (High-Band (HB)). These will eventually replace all of the legacy ALQ-99 Tactical Jammer System pods that have been developed and fielded since 1971 on the EA-6B and are currently flown on the EA-18G.
- The Navy is in the process of selecting NGJ-LB designs prior to its Milestone B scheduled in early FY21. The HB program is still very early in the acquisition and no proposed designs have been selected for review.
- The NGJ, and the ALQ-99 pods it is replacing, are used to conduct Airborne Electronic Attack (AEA) against Integrated Air Defense Systems. The NGJ-MB consists of a pair of pods that will be deployed on the EA-18G aircraft that work with the ALQ-218 receiver system and off-board assets. The NGJ-MB will be added to the EA-18G as part of its H16 Software Configuration Set Block Upgrade.
- The NGJ-MB is intended to engage multiple advanced threats at greater standoff ranges than the ALQ-99. It accomplishes



this with greater Effective Isotropic Radiated Power (EIRP) and four active electronically scanned arrays.

### Mission

- EA-18Gs equipped with NGJ will act as a component of future carrier air wings and expeditionary forces, providing AEA capabilities against a wider variety of radio frequency (RF) targets. The NGJ is designed to improve EA-18G capability against modern, advanced RF threats; communications; datalinks; and non-traditional RF targets.
- The Navy will use the NGJ to deny, degrade, or deceive the enemy’s use of the electromagnetic spectrum, employing both reactive and pre-emptive jamming techniques while enhancing the friendly force’s use of the electromagnetic spectrum.
- The Navy has four electronic attack mission profiles: standoff, modified escort, penetrating escort, and stand-in. The NGJ-MB will primarily fly the standoff and modified escort profiles.

### Major Contractors

- For the NGJ-MB:
  - Raytheon Intelligence and Space – El Segundo, California
  - The Boeing Company, Integrated Defense Systems – St. Louis, Missouri
- The NGJ-LB is still involved in a design selection process, with results expected later this calendar year.

### Activity

- COVID-19 delayed several NGJ-MB test events. The Navy reduced the number of personnel allowed access to test facilities in response to the pandemic. Additionally, other

entities responsible for producing and shipping system components needed for testing were hindered by the pandemic, adversely affecting the NGJ-MB’s timeline.

# FY20 NAVY PROGRAMS

- The Navy was originally scheduled to decide if the program was ready to proceed past Milestone C in September 2020. Program delays prevented the completion of the 10 development test flights required by the acquisition decision memorandum (ADM) to enter Milestone C. Delays were caused by a number of factors in addition to COVID-19, including late pod deliveries, complexity of test equipment integration, and initial manufacturing and quality issues discovered with the flight test deliveries. In response to these delays and to allow the program the time it needs to address entrance criteria, the Milestone C decision has been scheduled in January 2021, 2 months ahead of the threshold date of March 2021.
- Preliminary NGJ-MB chamber testing began at the end of 2019 and continued until summer 2020, taking place mostly at the Air Combat Environment Test and Evaluation Facility (ACETEF) and the High-power Electronic Attack Technique Radiation (HEATR) Chamber. In addition to the significant effort required to integrate the NGJ-MB pods to operate in the facilities, other tests completed include Hazard of Electromagnetic Radiation to Personnel, along with pod functionality and performance tests. Functionality demonstrated includes making jammer assignments with full, half, and quarter arrays; timing and beam commutation between assignments; and radiation from 2 full arrays.
- The Navy completed the chamber portion of the electromagnetic environmental effects (E3) testing, in support of airworthiness certification of the NGJ-MB in early summer 2020, and began the flight portions of the E3 testing in September 2020.
- The Navy began executing trial developmental runs for NGJ-MB in the ACETEF along with its jammer technique generation testing in the HEATR chamber, in August 2020. Developmental design of experiment runs for score are scheduled to begin in November 2020. The Navy plans to complete a representative set of jammer technique test points in the HEATR lab to support Milestone C, as well as preliminary EIRP testing in the ACETEF chamber.
- The Navy is in the process of verifying the tools planned for the modeling and simulation-based analysis of the NGJ-MB. Classification issues have so far prevented the program's receipt of the necessary EA-18G open air range reference data and delayed the start of tool validation.
- The Navy has not yet conducted operational testing on the NGJ-MB. Due to the delays described above, the operational test runs identified in the DOT&E-approved test plan have been rescheduled to occur at NAS Patuxent River, Maryland.
- In August 2020, the Navy concluded two DET contracts, one with Northrup Grumman Corporation and one with L3Harris, for the NGJ-LB program. The DET phase consisted of an assessment of industry technical maturity.

## Assessment

- More time and implementation of an updated array calibration process is required to assess system-level radiated power requirements. Early testing conducted in anechoic chambers

- has not yet verified that the NGJ-MB meets system-level radiated power requirements in every frequency region. The NGJ-MB program is implementing an updated array calibration process that improves radiated power across the array spectrum. This fix has been tested at the subsystem level with positive results and is scheduled to be verified with the entire system in the chamber this December.
- The Navy may have a solution to the design problem preventing the NGJ-MB's Ram Air Turbine Generator (RATG) from safely rotating at full speed. A redesigned RATG will be implemented in the delivery of the System Demonstration Test Articles (SDTA) in 2021 to support the completion of developmental and operational testing and demonstrate full power operation in flight.
  - Late NGJ-MB pod deliveries, manufacturing and quality issues, and test integration challenges have resulted in the first CBT&E period to be rescheduled and moved to occur at NAS Patuxent River, Maryland. Moving the test could lead to delays or even the elimination of some of the operationally representative test events prior to Milestone C.
  - The Navy originally planned to have at least 160 hours of flight time with the NGJ-MB from which it would calculate an early mean flight hours before operational mission failure value. The Navy will be unable to log that many flight hours with the system prior to the Milestone C decision if it only flies the E3 test flights and the 10 required developmental test flights.
  - Adequate ranges with advanced adversary integrated air defense systems will not be completed until calendar year 2022.

## Recommendations

The Navy should:

1. Complete all planned NGJ-MB chamber test points required by the ADM and the 10 required developmental test flights to inform the Milestone C decision.
2. Revise the current CBT&E implementation strategy to explore test mechanisms that mitigate the effects of NGJ-MB program delays and ensure that necessary operationally relevant testing will be conducted prior to IOT&E.
3. Establish a CBT&E working group within the Integrated Test Team for the NGJ-LB (Increment 2) program that is similar to the NGJ-MB program.
4. Verify the performance of the NGJ-MB arrays with the updated calibration technique in the chamber, continue the development program, and test for score to verify radiated power requirements are being met.
5. Ensure the NGJ-MB is tested at open air ranges against the most advanced threats, and utilize CBT&E to increase collaboration between Mission Engineering and Live Virtual Constructive distributed test environments to focus the limited live test resources on critical operational factors.