

Topic: N171-030

Quad-M, Inc.

Dual Chaff Air Expendable Decoy Device

Chaff payload improvements have resulted in improved efficiency enabling the ability to provide 2 payloads per cartridge. The Navy's chaff cartridge has a volume of 6.6 cubic inches. The volume of a dual chaff payload is 3.0 cubic inches. Quad-M is in a unique position to develop and produce a dual chaff device. Their experience includes aircraft countermeasures/payloads, missile penetration aids, and satellite deployment systems. This experience in qualification of equipment and hardware integration is essential for success. A final design of the dual chaff system is complete. Small scale Hazard of Electromagnetic Radiation to Ordnance (HERO) testing and chaff dispensing testing will be performed. During Phase II.5, environmental qualification will be completed. Program and funding support from NAVAIR for the dual chaff capability is essential for transition to Phase II.5/III.

Technology Category Alignment:

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**SYSCOM:** NAVAIR

**Contract:** N68335-19-C-0214

**Booth:** 405

**Room:** FST at AIAA Aviation 2020

**WHO**

**SYSCOM:** NAVAIR

**Sponsoring Program:** NAVAIR

**Transition Target:** PMA 272

**TPOC:**

(301)744-2364

**Other transition opportunities:**  
Marine Corps Aircraft

**Notes:** In the concept shown, one squib is located on the casing center line and the other is offset. This does not require clocking of the cartridge. The impulse cartridge is also shown. The impulse cartridge includes a circuit board, two squibs, metallic enclosure, and a ceramic feed through.

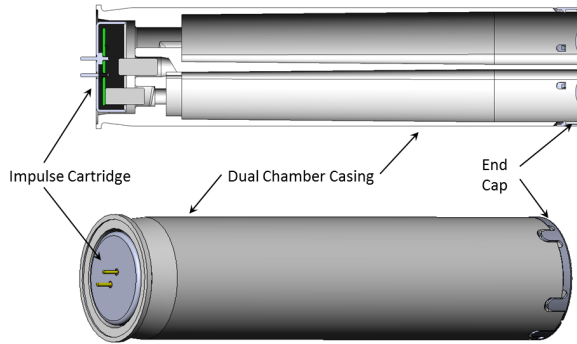


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**WHAT**

**Operational Need and Improvement:** A need exists to increase the number of expendable countermeasures dispense events without modifying the existing airframe structure thus increasing the aircraft survivability from Radio Frequency (RF) missile threats. The innovation of the design will be to integrate two separate firing pulses into a single point electronic firing system using a low and high voltage supply. The innovation of the design will expand the current chaff dipole design to a finer substrate material to provide the same aircraft cross-section coverage in half the volume.

**Specifications Required:** Utilize a single firing circuit; Provide two separate payload initiations sequentially at two different firing times; Fit in the Navy round chaff cartridge form factor; Meet the AN/ALE-47 CMDS programming capabilities; Combined unit cost of the dual casing and cartridge of \$20.00 or less on large production volume of 50,000 units per year; Short ignition delay (15ms) or less; Open circuit requirement after ignition (>500 Ohms); Low flash (less than 33 Foot-candles at 1-foot distance); Provide polling capable circuitry (250 mA); HERO (MIL-STD-464) rating; Compatibility with the existing AN/ALE-47 CMDS hardware and software

**Technology Developed:** During the Phase I program, two cartridge architecture concepts were considered. In concept 1, the squibs are equally spaced from the center line of the casing. This design approach is simple in nature but clocking of the casing is required to be within plus/minus 45 degrees when assembling the breech printed wiring board to the loaded chaff block. In concept 2, one squib is located on the casing center line and the other is offset. This solves the clocking problem but gas flow performance is a concern depending where the offset squib is placed. The impulse cartridge includes a circuit board, two squibs, metallic enclosure, and a ceramic feed through. At the end of the Phase I Option, tests were conducted on each design concept and concept 2 was selected.

**Warfighter Value:** This particular approach has the advantage of form, fit and functional capability with NAVAIR's ALE-47 system and provides improved efficiency of the Countermeasures Dispenser System (CMDS) by providing the same aircraft protection in half the volume and essentially doubling the number of onboard chaff payloads. This provides much improved aircraft protection over longer mission timelines and in areas of high threat density.

**WHEN**

**Contract Number:** N68335-19-C-0214 **Ending on:** March 11, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Final Design Updates	Low	Design Drawings Released	3	May 2019
Casing and Impulse Cartridge Manufacturing Complete	Low	Cartridge and Casing Delivey	3	November 2019
Cartridge Environmental and Small Scale HERO Test Complete	Low	Successful Test Completion	4	November 2019
Mass Model/Chaff Ejection Tetsing Complete	Low	Successful Test Completion	5	March 2020
System Level Qualification Test Complete (PhII Option)	Med	Successful Test Completion	6/7	December 2020
Mabnufacturing and Delivery of 200 Full Up Rounds For Navy Test and Eval (PhIII)	Med	Successful Test in an Operational Environment	9	September 2021

**HOW**

**Projected Business Model:** Quad-M's current Business Plan identifies the proposed Dual Chaff capability would result in revenue of \$6M over the next 5 years for NAVAIR opportunities, and we are confident additional opportunities will be identified. As discussed above this technology can also be applied to other potential uses for aerospace, automotive and transportation applications increasing reliability of actuation events without additional wiring changes or upgrades. Quad-M anticipates these opportunities could result in additional revenue of \$3M over the same 5 year period.

**Company Objectives:** Quad-M has filed provisional patent for the Dual Chaff Air Expendable Decoy Device, Titled "Multiple Payload Expendable Device", with Application Number: 62623724. Quad-M's business plan includes licensing this technology to existing and established impulse cartridge and chaff cartridge manufacturers for high rate production. Discussions are already underway regarding the licensing of the technology.

**Potential Commercial Applications:** There are a variety of other potential uses of this circuit for aerospace, automotive and transportation applications. For example, spacecraft separation systems typically require redundant actuation of two mechanisms, each mechanism capable of causing separation. It is advantageous to use serial commanding to reduce the electrical current consumption but still retain the redundant actuation capability. This commanding method also halves the amount of wiring harness needed to provide redundant actuation capability. Thus, using an existing wiring harness can double the amount of actuated devices or halve the mass of the wiring harness, which, especially in spacecraft and launch vehicle applications, is a critical design factor due to cost of mass to orbit.