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FROM: Mr. Gary R. Bliss, Director, Performance Assessments and Root Cause Analyses  
(D, PARCA) *GRB 28 May 2014*

SUBJECT: Root Cause Analysis of the MQ-8 Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle Fire Scout (VTUAV) Program

**Purpose.** This memorandum summarizes PARCA's root cause analysis of the VTUAV program's cost growth which triggered a critical Nunn-McCurdy breach as described in the program's December, 2013 Selected Acquisition Report (SAR). That SAR reported a 55.2 percent increase in program acquisition unit cost (PAUC) and 71.5 percent increase in average procurement unit cost (APUC) compared to the original baseline and a 53.5 percent increase in PAUC and 49.2 percent increase in APUC compared to the current baseline. This memo describes causes for the larger of these figures, the 71.5% increase in APUC compared to the original baseline.

- The SAR attributed the cost growth to an "increase in warfighter capability and reduction in total air vehicle quantity."

**Contributors to cost growth.** The Navy reported<sup>1</sup> that prior year cost growth led to a 19% increase in the APUC, with the remaining 52% increase attributable to the proposed program restructure to procure the more capable MQ-8C air vehicle and reduce quantities from 168 to 119. However, the Navy's analysis is based on cost growth through December, 2012. PARCA assesses that existing APUC growth through December, 2013 was approximately 30%, roughly two-thirds of which is attributable to the seventeen year stretch of the production schedule compared to the original baseline, and one-third of which is attributable to cost growth associated with the MQ-8B air vehicle. The remaining APUC growth of approximately 40% is attributable to the Navy's proposal to reduce quantities and purchase the more capable MQ-8C, with roughly two-thirds of that increase due to quantity change and one-third due to the cost delta between the MQ-8C and MQ-8B.

**Root causes of cost growth.** To ascertain the root causes of VTUAV's cost growth one must ask *why the production schedule was stretched and why the Navy proposes to substitute the MQ-8C for the MQ-8B?* PARCA has identified two primary root causes that led to these decisions:

- Limited growth potential inherent in the MQ-8B airframe and performance limitations encountered in developmental testing of that system; and
- Low priority of the VTUAV program compared with other Navy funding requirements during the period leading up to the breach.

<sup>1</sup> March 10, 2014 VTUAV Program Deviation Report.

The MQ-8B is based on a commercial airframe, the Schweizer S-330, which was used on the predecessor RQ-8A program. However, to achieve the VTUAV program's requirements the S-330 airframe was extensively modified, including extending and improving the tail rotor, upgrading transmission components and the main rotor from 3 to 4 blades, and adding fuel capacity and stub wings for added payload and improved aerodynamics. These modifications took advantage of most of the growth potential of the S-330 aircraft, leaving little opportunity to enhance the system's endurance or incorporate additional sub-systems and payloads.

The Navy declared Initial Operating Capability of the MQ-8B in March, 2014, affirming it had attained performance requirements as defined in the Capability Production Document. Like many systems however, VTUAV encountered challenges during developmental testing that led to program delays. For example, the estimated date for completion of Operational Evaluation slipped repeatedly from August, 2008 to December, 2013, and Operational Testing was ultimately discontinued because of the Navy's decision not to purchase any additional MQ-8B air vehicles. Challenges encountered during developmental testing included: reliability; availability; supportability; communications relay; software development delays; shipboard compatibility problems; hot weather operations;<sup>2</sup> and restrictive ship wind envelopes.<sup>3</sup> While the MQ-8B attained stated performance requirements, the Navy's decision to discontinue its procurement indicates it did not meet their overall performance needs, especially compared to the more capable MQ-8C air vehicle.

The slip in the VTUAV's production schedule by seventeen years (from 12 to 29 years) is due to multiple factors, one of which—slip to maintain alignment with the LCS schedule—is exogenous to the program. Other factors include an unrealistic baseline procurement profile (ramping in four years from 20 to 35 units per year and then ceasing production) and slips to accommodate MQ-8C development. However, a significant portion of the production slip is not attributable to these factors but instead results from an eight year production break followed by production at rates below economic order quantities. The Navy has cited funding constraints as an explanation for these slips. However, with an estimated APUC of \$22.4M (TY), the cost to avoid a production break would be relatively modest, indicating that the VTUAV's priority is low compared with competing programs.

**Risks for future cost growth.** Although PARCA's root cause analyses are primarily retrospective, we note that certain attributes of almost any MQ-8C-based VTUAV program could lead to future cost growth. Given the difficulties the MQ-8B encountered on the road towards IOT&E, MQ-8C may encounter similar issues during its three years of additional development effort (FY15-17). A separate factor that could lengthen future development efforts is that the extra margin afforded by the more capable MQ-8C makes incorporating additional capabilities much more attractive (and feasible) than was the case for the MQ-8B. Finally, the continuing low priority of the program is evidenced by the Navy's plan to procure six air vehicles per year over a 16 year period, beginning in FY2020 and ending in FY2035. Like the unrealistic profile in the original baseline, PARCA regards the proposed production profile as highly unlikely, considering the technological advancements that are rapidly occurring in this commodity class.

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<sup>2</sup> DOT&E Annual Reports, FY2009 – 2013 and Early Fielding Report, 24 Jun 2011.

<sup>3</sup> DON, Commander Operational Test and Evaluation Force, Military Utility Assessment of MQ-8B VTUAV, 14 Mar 2014.