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T E S T I M O N Y

July 16, 2014

STATEMENT BEFORE THE HOUSE ARMED SERVICES SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES ON THE UNMANNED CARRIER-LAUNCHED AIRBORNE SURVEILLANCE AND STRIKE (UCLASS) REQUIREMENTS ASSESSMENT

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Chairman Forbes, Ranking Member McIntyre, and members of this distinguished committee, thank you for the opportunity to share my views on UCLASS requirements. I'd like to commend the committee for taking an active interest in what is one of the most important force development issues facing DoD in general and the US Navy in particular. I've studied this issue for many years and from several different vantage points—first as an analyst at the Center for Strategic and Budgetary Assessments (CSBA), then as a senior civilian in both the Office of the Secretary of Defense (OSD) and the Navy Secretariat—and I consider it to be a harbinger of DoD's ability to transform how it projects power to meet emerging challenges.

Ironically, the ongoing debate over carrier-based unmanned air system (UAS) roles and missions is analogous to the debate during the interwar years over the role of the nascent aircraft carrier. At the time, the dominant view within the Navy was that carriers should provide airborne surveillance for battleships rather than serve as an independent striking arm of the fleet. The Chief of Naval Operations at the time, Admiral Benson, made the remark, "the Navy doesn't need airplanes. Aviation is just a lot of noise."[1] Reflecting this deeply ingrained cultural view, the program for the November 29, 1941 Army-Navy football game prominently featured a classic bow-on picture of the *USS Arizona* plunging through a huge ocean swell with the caption: "Despite the claims of air enthusiasts, no battleship has yet been sunk by bombs." Just one week later, Japanese carrier-based aircraft sank the *Arizona* pier-side in Pearl Harbor. In the years that followed, American aircraft carriers rapidly became the linchpin of the war in the Pacific.

Furthermore, the aircraft carrier has remained a crucial means of U.S. global power projection ever since, providing a mobile sea-base that can be positioned wherever needed. It has maintained its strategic effectiveness over the past 70 years because of the adaptability afforded by its embarked air wing—from torpedo- and dive-bombers at the Battle of the Coral Sea to F/A-18 strike fighters in Operation Enduring Freedom.

[1] William F. Trimble, *Admiral William A. Moffett: Architect of Naval Aviation* (Washington, DC: Smithsonian Institution Press, 1994), p. 71.

UCLASS should be the logical next step in the evolution of the carrier air wing. Near-term decisions on UCLASS' system performance requirements, however, will have a profound impact on its future operational utility. Poor decisions could eventually be reversed at higher cost—in terms of time, operational risk, and resources. However, given current budget constraints, it is likely that the nation would be saddled with these consequences for years to come. It is imperative to get the requirements right the first time, and this is accomplished in part by focusing on meeting emerging power projection challenges that the Intelligence Community anticipates will intensify and proliferate over the coming decades—not solely on meeting current operational demands.

An assessment of UCLASS requirements should begin with a very simple question: what core operational problem should the UCLASS be designed to solve? The dominant answer within the Navy, reflected in the UCLASS draft request for proposal (RFP), are the needs to maintain continuous maritime domain awareness (MDA) around the Carrier Strike Group (CSG) as well as identify targets for attack by relatively short-range, manned fighters. An alternative answer, one I espouse firmly, is that the more pressing problem is maintaining the Navy's ability to project power from the sea when: 1) carriers are compelled to standoff at considerable distance (e.g., in excess of 1,000 miles) from an adversary's territory due to emerging anti-access/area-denial (A2/AD) threats such as long-range anti-ship cruise missiles (ASCMs) and anti-ship ballistic missiles (ASBMs); and 2) it is necessary to find and destroy fixed and mobile/relocatable targets defended by modern integrated air defenses (IADS).

The Current Draft RFP: UCLASS as a "Spotter" for Manned Aircraft in Low-Mid Threat Environments

Driven by the perceived need to sustain continuous MDA around the CSG, including overnight while the deck is "closed," the draft RFP contains a derived threshold requirement for an unrefueled endurance of about 14 hours. The latter is required to sustain two continuous "24–7" intelligence, surveillance, and reconnaissance (ISR) orbits at a required radius of 600 nm from the carrier without violating the carrier's 12-hour "deck day" or requiring aerial tanking support.

The opportunity cost of 14 hours of unrefueled endurance, however, comes in the form of *permanent* design trades that significantly reduce the aircraft's survivability and payload carriage/flexibility—attributes needed to perform ISR *and* precision strike roles in A2/AD environments. These foregone capabilities cannot be "bought back" later or added to future UCLASS variants. Claims that "threshold growth" and "objective" requirements in the draft RFP will place competitive pressure on industry to enhance survivability and payload attributes are largely a chimera. As a matter of physics, absent a break-through in engine technology, it is impossible to achieve 14 hours of unrefueled endurance with an aircraft sized to operate from an aircraft carrier without making choices about its shape and propulsion path that constrain passive radar signature reduction (i.e., stealth) and potential and internal weapon carriage capacity (including both the numbers and types of weapons carried). While it is true that a few hours of endurance could be gained by installing internal fuel tanks in the UCLASS' bomb bay, it does not significantly expand the design trade space. Similarly, while additional payload could be carried externally with a significant reduction in endurance, it would also make the aircraft even less survivable in contested air space. Simply put, meeting the threshold requirement of 14 hours of unrefueled endurance necessarily results in sacrificing survivability, weapons carriage/flexibility, and growth margins for future mission

payloads (i.e., space, weight, power, and cooling allowances) and there is no technologically viable "growth path" for restoring them.

Perhaps this opportunity cost would be acceptable if there were a compelling operational justification for ~14 hours of unrefueled endurance—but there is not. It is worth noting that an aircraft with 8–10 hours of unrefueled endurance, flying at high subsonic speeds, would have roughly *three times* the combat radius of the F/A-18E/F or F-35C. To put this in operational perspective, that same 8–10 hour endurance aircraft could launch from a carrier positioned 1,000 miles away from an area of interest (the range of the Chinese DF-21D ASBM), loiter on-station for 3–4 hours, then recover onboard the carrier with reserve fuel as a safety margin.

When factoring in aerial refueling—an Air Force-supplied resource typically available to carrier-based aircraft in wartime—the 14-hour unrefueled endurance threshold requirement makes even less sense. The same 8–10 hour endurance aircraft could take off from a carrier positioned virtually any distance from a prospective adversary, refuel in transit and on ingress to the combat zone at a safe stand-off range for the tanker, remain on-station for 5–7 hours, cycle to the tanker and back to operational station *multiple times,* and eventually recover to either a carrier already in the region or its original home carrier. The marriage of unmanned operations and aerial refueling would enable the aircraft carrier to launch missions from intercontinental range in response to surprise aggression as well as to sustain persistent surveillance and strike operations from "access-insensitive" distances. For these reasons, automated aerial refueling (AAR) should be a threshold requirement for any carrier-based UAS program.

For survivability, it is important that UCLASS' level of radar cross section (RCS) reduction anticipates that future fire control radars will provide higher targeting resolution at lower frequencies by harnessing more powerful data processing techniques. It is also critical to address today's lower frequency acquisition and early warning radars, which have proliferated widely and are already integrated into the air defense networks of several prospective adversaries. Tracks generated by early warning radars will not only enable more efficient cued searches by fire control radars, but they could also be used to vector air defense fighters to intercept friendly aircraft. The technology required to achieve the level of RCS reduction required across the full threat radar frequency spectrum associated with 2025+ air defenses is both mature and affordable. Despite arguments to the contrary, "stealth" is not a primary driver of aircraft cost. While there are marginal costs associated with radar-absorbent edges and coatings, as well as sensor aperture integration, stealth is fundamentally a choice about the air vehicle's shape and propulsion path.

I am not aware of any mission- or campaign-level analysis showing that a threshold payload requirement of 1,000 lbs. is sufficient for a carrier-based UAS. Given the number of weapons required to both saturate an adversary's short-range air defenses and hit multiple aim points, 1,000 lbs. of payload (e.g., four small diameter bombs) is clearly inadequate to defeat most relevant targets such as coastal defense cruise missile sites, air defense radars, missile launchers, or enemy surface ships. In addition, the Navy has given scant consideration to the *types* of weapons that UCLASS should be able to accommodate. Since even a sufficiently stealthy UCLASS would be vulnerable if it approached too close to heavily defended targets, it should be able to carry stand-off weapons such as the Joint Standoff Weapon (JSOW), Long-Range Anti-Ship Missiles (LRASMs), and/or Joint Strike Missiles (JSMs). As adversary air defense radars become

more capable over time, as they inevitably will, UCLASS could maintain its overall survivability by employing stand-in electronic attack techniques, as well as by finding and engaging targets at greater stand-off distances. The latter, however, will require more capable sensors and longer range weapons, and that kind of adaptability must be designed in upfront with margins for space, weight, power, and cooling.

Finally, a carrier-based UAS optimized for ISR missions in relatively benign threat environments would be a redundant capability. The Navy is already procuring more than 60 MQ-4C *Tritons* designed specifically to provide broad-area maritime surveillance for deployed CSGs. The MQ-4C, augmented by the MQ-8B/C *Firescout*, which can operate from any air-capable ship in the fleet, could provide MDA around the CSG more effectively and affordably. For persistent ISR coverage over land in low-to-medium threat environments, the joint force has more than enough capacity with the currently projected fleet of RQ-4 *Global Hawks*, MQ-1C *Gray Eagles*, and MQ-9 *Reapers*. With 30–40 hours of unrefueled endurance, RQ-4s and extended-range MQ-9s could access any area of interest with a very high degree of basing flexibility.

A Balanced Design: Carrier-Based UAS as an Independent Striking Arm and Enabler of Manned Fighter Squadrons

A balanced carrier-based UAS design would, in this order of priority:

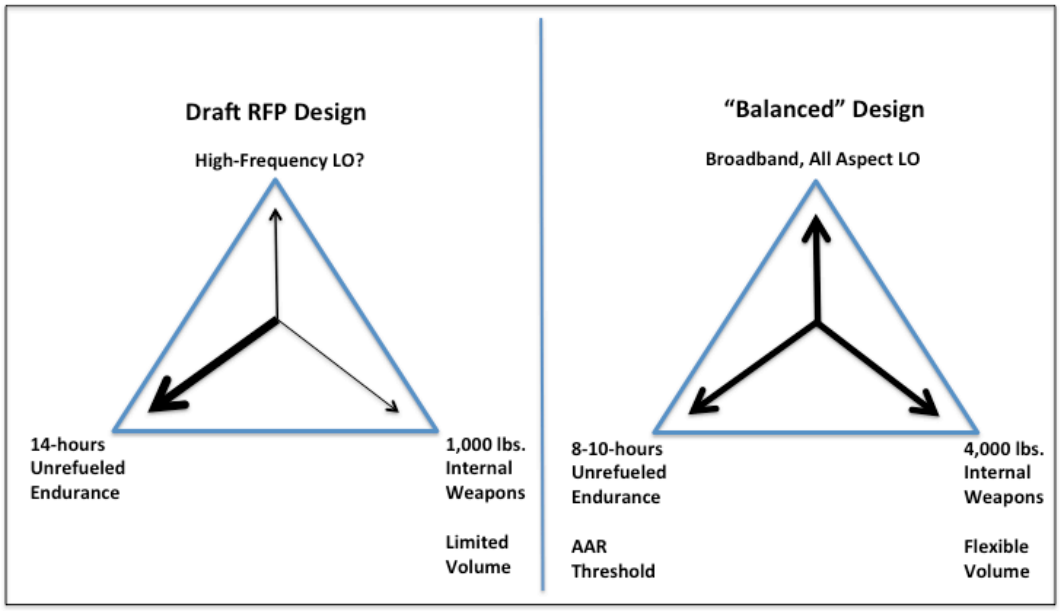
1) Achieve the minimum level of broadband, passive signature reduction required to locate priority targets with onboard sensors and engage them effectively with available weapons without being destroyed by modern air defenses;

2) Provide sufficient unrefueled endurance to reach target areas when the carrier is standing off at least 1,000 miles with allowances for indirect routing, maneuvering and loiter time; and

3) Once the above two conditions are satisfied, carry as much payload and as many types of weapons as possible while still conforming to carrier-deck size constraints.

A more balanced carrier-based UAS could have, for example, an unrefueled endurance of 8–10 hours (which translates to a combat radius of ~1,700–2,000 nm from the carrier or tanker); 24–48 hours of mission endurance with air-to-air refueling; broadband/all-aspect RCS reduction sufficient to find and engage defended targets; and the ability to carry 3,000–4,000 lbs. of strike payload internally (roughly what the F-35C can carry), including a variety of direct and stand-off weapons (see Figure 1).

Figure 1—Comparison of Draft RFP and "Balanced" UCLASS Designs



A "balanced" UCLASS could serve as an independent, long-range surveillance and striking arm of the aircraft carrier in A2/AD environments anticipated for 2025 and beyond. With aerial tanking support, it could respond globally to short notice aggression regardless of the carrier's initial location. Once the carrier was in position, outside of the densest A2/AD threats, it could contribute to a sustained precision strike campaign against an adversary's fixed and mobile targets. As part of the joint force, it could focus on coastal/shallow inland targets and naval targets such as surface action groups (SAGs). Taking advantage of its ultra-long mission endurance, it could be especially effective in hunting down and destroying mobile or relocatable targets over wide geographic areas.

A balanced UCLASS could also serve as a powerful enabler of manned carrier-based aircraft, in which the nation has invested billions of dollars, and do so in ways other than just finding targets in relatively permissive environments. With onboard fuel storage of about 20,000 lbs., it would be a very efficient aerial refueler for relatively short-range manned fighters. With its very low RCS, it could employ low-power, stand-in jamming techniques to improve the survivability of the F-35C—and to a lesser degree the F/A-18E/F—in higher-end threat environments.

Key Changes Required to the Draft UCLASS RFP

The opportunity cost of 4–6 hours of additional unrefueled endurance (14 vice 8–10 hours) as reportedly set forth in the draft UCLASS RFP would result in a dramatic reduction in strike capacity, a significant increase in air vehicle vulnerability, and reduced growth potential (i.e., lower margins for space, weight, power, and cooling).

To "fix" the draft RFP, five critical changes are needed to *threshold* requirements:

- Reduce unrefueled endurance from ~14 hours to 8–10 hours;
- Add automated aerial refueling (give and receive) and 24–48 hours refueled mission endurance as threshold requirements;
- Increase internal weapon payload from 1,000 lbs. to 3,000–4,000 lbs.;
- Establish weapon bay volume requirements to carry specified current and future standoff weapons (e.g., JSOW and JSM); and
- Require all-aspect, broadband RCS reduction at levels sufficient to address 2025–2035 air defense threats.

Looking Ahead to the Carrier Air Wing of 2025 and Beyond

The Navy intends to initiate development of another manned, supersonic fighter, the F/A-XX, to begin replacing older F/A-18s as they reach their end of service life in the late 2020s. The initial request for information from industry, which was clearly skewed toward a manned replacement, was released in 2012, and preparations are underway to initiate an Analysis of Alternatives (AoA). Putting aside the financial and political feasibility of concurrent fighter programs (F-35C and F/A-XX), especially given the cost and technical challenges still facing the F-35C, it is not at all clear that the future carrier air wing should be dominated by a mix of manned fighters with very limited mission endurance and combat radius.

The Navy's F/A-18 replacement plan and the draft UCLASS RFP both reflect a mindset that values unmanned aircraft as an appendage to the carrier air wing—not an integral part of it. Rather than thinking about 4–6 UAS per carrier, serious consideration should be given to fielding 1–2 squadrons per operational carrier in the 2020s, which would mean displacing manned aircraft, and thus, would prompt cultural and bureaucratic resistance within the naval aviation community. This would not only allow the carrier to serve as a flexible, global surveillance-strike platform, it would also result in significant lifecycle-cost avoidance. The Navy currently buys roughly enough of a specific type-model series of aircraft to outfit all 10 air wings so pilots can train year-round, whether they are deployed or stationed ashore. With UAS, there is no need to train pilots, so the Navy would only need to buy the number required to equip the maximum number of deployable carriers and generally fly those aircraft only when deployed. As a result, compared to manned aircraft, the Navy could buy about half as many carrier-based UAS and fly them less than half as often, generating significant savings in procurement, as well as operations and maintenance. As called for in the House version of the fiscal year 2015 National Defense Authorization Act, quantitative analysis at the campaign-level is needed across a wide-range of representative scenarios set in the 2025–2035 timeframe to determine the best composition of the future carrier air wing. Given its potential advantages in survivability, mission endurance, and life-cycle costs, a balanced UCLASS would likely perform very well.

Conclusion

There is no question that the nation needs a carrier-based unmanned aircraft. The relevant question is: *what kind* of aircraft? A system optimized for sustaining persistent ISR coverage in relatively benign threat environments is redundant and does not address the core operational problems facing naval aviation: the intensifying "anti-navy" threats that will push the carrier farther away from target areas and networked air defenses that will

make non-stealthy aircraft increasingly vulnerable to detection and attack. Unless these threats are addressed, carrier aviation, which has been the heart-and-soul of America's maritime power-projection capability since World War II, may be progressively relegated to the sidelines in future conflicts.

To preserve the aircraft carrier's strategic relevance over the next several decades, the Navy needs to develop and field a carrier-based UAS with:

- Ultra-long refueled mission endurance to respond rapidly to future contingencies and sustain persistent surveillance-strike operations from carriers positioned outside of A2/AD threat range;
- Survivability sufficient to find and engage, using onboard sensors and weapons, fixed and mobile/relocatable targets defended by modern air defenses;
- Unrefueled combat radius sufficient to range the depth and breadth of the battlespace from tankers standing off outside of enemy surface-to-air missile and fighter coverage; and
- As much payload carriage and flexibility as possible to neutralize adversary targets rapidly, minimize the need to return to the carrier to rearm, and hold at risk as many classes of targets as possible.

Unfortunately for the Navy and the nation, that air vehicle is not the one currently called for in the draft UCLASS RFP.

About the Center for Strategic and Budgetary Assessments

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