Great expectations: The US Navy's first Ford-class aircraft carrier prepares for debut

Fitted with all-electric technologies, the future USS Gerald R Ford is poised to usher in a new era in US naval air power when it is delivered in mid-2016. However, the eponymous lead ship in the US Navy's new nuclear-powered aircraft carrier class has had its share of first-in-class challenges. Grace Jean reports

From a distance the US Navy's (USN's) newest nuclear-powered aircraft carrier, Gerald R Ford (CVN 78), bears a great resemblance to the deactivated USS Enterprise (CVN 65), the reactor of which is being dismantled by the Virginia-based shipyard that built and launched it in 1960 as the world's first nuclear-powered aircraft carrier.

However, the lead carrier of the Ford class that is replacing Enterprise boasts a host of advanced technologies that are not immediately apparent. The leap in flight deck technologies alone, from the preceding Nimitz class's legacy steam catapults and mechanised arresting gear to the Ford class's new electromagnetic aircraft launch and recovery systems, mark a generational change for naval air power - one intended to ensure that when Gerald R Ford is handed over in 2016 it can dominate the oceans just as its predecessor did when it debuted on the world's stage only a half-century ago.
On 17 November 2013 Huntington Ingalls Industries moved the US Navy's new construction aircraft carrier Gerald R Ford (CVN 78) to Newport News Shipbuilding’s Pier 3, where it is now completing outfitting and testing ahead of handover planned in 2016. (HII)

Yet with the advancements have come problems and challenges not unusual for first-in-class warships. Cost overruns and schedule delays because of those development-related issues have plagued the lead carrier, all of which have placed pressure upon the programme as a whole.

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**In demand**

Nuclear-powered aircraft carriers have remained the benchmark by which the world's navies are evaluated. For the USN in particular a formidable force of carriers has been its hallmark since the mid-20th century. In the post-Cold War period the USN's fleet of 11 carriers has remained the gold standard.
Leading the USN's forward presence posture in key areas of the globe, aircraft carriers have come to symbolise the United States' first-strike response. For example, Nimitz-class USS *Carl Vinson* (CVN 70) was the first coalition unit to spring into action in 2001 following the terrorist attacks of 11 September.

With an ability to generate around 120 sorties a day, Nimitz-class carriers are optimised for major combat operations but can also accommodate a modified air wing that is organised for lower-end missions, such as humanitarian aid and disaster relief (HADR).

To maintain the edge in power projection, the USN started planning in the mid-1990s for a successor to the Nimitz class. Officials in 2002 ultimately took the decision to acquire a replacement carrier laden with next-generation technologies, including a new nuclear reactor plant, a new electrical distribution system, an expanded flight deck fitted with an electromagnetic catapult system for launching aircraft and advanced arresting gear to recover them, and a new dual-band radar.

Pursuing all of the above in a concurrent development programme on the first-in-class *Gerald R Ford* appears audacious in hindsight. At the time, however, it seemed only an ambitious project with ample time on the horizon plus a reawakened defence industrial base bolstered by the then-unfolding post-9/11 mission in Afghanistan and eventually the counter-insurgency campaign in Iraq.

According to the USN, the Ford class is building upon the performance of the Nimitz carriers.
In testimony before US lawmakers serving on the House Seapower and Projection Forces Subcommittee in November, Assistant Secretary of the Navy Sean Stackley, who oversees research, development, and acquisition, said, “The Ford [class], the first newly designed aircraft [carrier] since the Nimitz [class] more than 40 years ago, will bring a significant increase in carrier capability to the fleet: [a] 33% increase in the rate at which we launch and recover aircraft; a propulsion plant three times the electrical generating capacity [of the Nimitz class]; increased service life allowance for power, weight, and stability to enable future modernisation; increased survivability; improved combat systems; vital warfighting systems, weapons, in the basic hull design.”

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Rising star

The USN originally awarded the Ford-class lead ship construction preparation contract in May 2004 to Northrop Grumman's shipbuilding division, which was spun off from the defence contractor in 2010, becoming Huntington Ingalls Industries (HII): a publicly traded company.

Under construction at HII’s Newport News Shipbuilding division, the Ford-class carriers are 101,605-tonne ships with a length of 332.8 m and a beam of 40.8 m. With a 78 m-wide flight deck, the Ford carriers can accommodate more than 75 aircraft: a mix of Lockheed Martin F-35C Lightning II Joint Strike Fighters, Boeing F/A-18E/F Super Hornet multirole fighters, Boeing EA-18G Growler electronic attack aircraft, Northrop Grumman E-2D Advanced Hawkeye airborne early warning aircraft, Lockheed Martin (Sikorsky) MH-60R/S multirole helicopters, and the future Unmanned Carrier-Launched Air Surveillance Strike (UCLASS) platform.

The Ford-class flight deck has been designed to increase the USN's sortie generation rate by 25% and to improve weapon movement below decks. With an island that has been moved further aft and only three aircraft elevators (instead of the four lifts found on the Nimitz class), the Ford design optimises naval aviation operations.
A 6,800-kg sled is launched from the flight deck of the US Navy's new Gerald R Ford (CVN 78) nuclear-powered aircraft carrier during tests of the next-generation Electromagnetic Aircraft Launch System on 5 June 2015. (HII)

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On deck
HII's Newport News Shipbuilding (NNS) cut the first steel for Gerald R Ford on 11 August 2005 and laid the keel on 14 November 2009, according to IHS Jane's Fighting Ships. The carrier was launched into the James River on 17 November 2013 from NNS's Dry Dock 12, where it had been under construction since keel laying. Six tug boats helped to move the carrier to the yard's Pier 3, where outfitting of the ship's berthing areas, mess areas, and work spaces is ongoing along with testing of the ship's electrical, mechanical, and combat systems, to include EMALS and DBR arrays.

USN officials on 15 May 2015 announced that 22 'no-load' test shots had been conducted on EMALS. Subsequent 'dead-load' test shots of 36,287-kg wheeled steel vessels simulating the weight of aircraft occurred in mid-2015, with EMALS launching the vessels into the James River.

In early November, Gerald R Ford was more than 95% complete, with less than 450 compartments out of 2,607 to be turned over to the USN, Rolf Bartschi, the vice-president of CVN 78, construction told IHS Jane's. With the ship's company having moved on board in August, the navy is making preparations to take the carrier to sea for the first time in early 2016 for trials ahead of handover, planned for the April-May timeframe.

One of the major challenges for programme managers on Gerald R Ford was with the AAG. A component of the system called the water twister, which consists of a paddle wheel sitting on the end of arresting gear engines beneath the flight deck, absorbs 70% of the load of a landing aircraft. The plates inside the water twister failed, forcing the USN and General Atomics to spend two years redesigning, manufacturing, and then testing the updated system.

In March 2015 Rear Admiral Thomas Moore, programme executive officer for aircraft carriers, told reporters at the Washington Navy Yard that the AAG was the critical path to Gerald R Ford's delivery.

Back to the future

HII has been steadily progressing on the second Ford-class carrier, John F Kennedy, since 15 January 2009 after the initial contract was signed for construction preparation work, including acquisition of material and components.
John F Kennedy is a replica of lead ship Gerald R Ford, but the second-in-class carrier is expected to be fitted with a different radar, the Enterprise Air Surveillance Radar (EASR), which will replace the DBR. The EASR is meant to help reduce costs on the new construction Ford-class carriers while providing a common system for future amphibious assault ships and for backfitting onto existing Nimitz-class carriers.

Senator John McCain, who chairs the Senate Armed Services Committee, has been a vocal critic of the Ford-class programme. At a October 2015 hearing he pointed out that cost overruns on Gerald R Ford are the result of incorporating too many new technologies onto the lead ship and he warned that the second carrier, too, could suffer from similar woes.

"The story of John F Kennedy, or CVN 79, could be worse because the Department of Defense began building it before proving the new systems on CVN 78 and while continuing to make major changes to the CVN 79, including a new radar," he said. "This has made CVN 79, in essence, a second lead ship with all the associated problems."

Congress has capped John F Kennedy's cost at USD11.5 billion.

Rear Adm Moore said in 2015 that he expects the second carrier to be built for USD1 billion less than lead carrier Gerald R Ford via 18% fewer man-hours of construction, made possible through HII's capital improvement investments in the yard. Gerald R Ford is expected to be fully constructed in 49 million man-hours; John F Kennedy will be built in 44 million man-hours. USN shipbuilding officials have said they are aiming for another 10% reduction in the production effort.
on the planned third carrier: Enterprise (CVN 80). Building CVN 80 in 40 million man-hours would help take USD500 million out of the ship's total cost, officials here said.

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