

Feature Article

New Navy Flattop Heralds Next Carrier Class

by **Harold Kennedy**

At the mouth of the historic Chesapeake Bay-near the site of the nation's first English-speaking colony and several battles of the Revolutionary and Civil Wars-plans are being laid for a major centerpiece of U.S. naval power for the 21st century.

The Newport News Shipbuilding company, of Newport News, Va., is under contract with the U.S. Navy to begin the design process for a new nuclear aircraft carrier-the last of the Nimitz class of ships, intended to last through the better part of the century ahead.

The new carrier, known only as CVN 77, has yet to be named. Construction will not even begin until fiscal year 2001, with completion scheduled for 2008. Both Newport News and the Navy view CVN 77 as the bridge between the current Nimitz class and a whole new generation of carriers, known as CVNX.



Thus, to a large extent, officials told National Defense, the fate of the 114-year-old Newport News shipyard and future U.S. naval clout may depend upon the success of this project.

It may seem unlikely that so much could depend upon a single ship, they said, but a nuclear aircraft carrier is no ordinary ship. The firepower of just one U.S. carrier-with 80 heavily armed aircraft-is equal to that of the entire air force of many countries.

"The first question any president asks during a crisis is: 'Where is the closest carrier?'" said Robert C. Klosterman, manager of the new Virginia Advanced Shipbuilding and Carrier Integration Center, a joint effort between the state of Virginia, the city of Newport News and Newport News Shipbuilding.

Each carrier is huge. The USS Nimitz (CVN 68), for example, is 1,095 feet in length-almost as long as the Empire State Building is high. It is 257 feet wide and towers some 20 stories above the waterline.

City at Sea

A carrier is virtually a self-contained city, home to as many as 6,000 men and women. Despite the austere environment of a warship, a carrier has all of the amenities of any metropolitan area of similar population. These include a daily newspaper, radio and television stations, fire department, library, hospital, general store, laundry, two barber shops, and even a post office with its own zip code.

A nuclear-powered carrier can go without refueling for as long as 25 years. It has an operational service life of an estimated 50 years. During that period, officials said, a single carrier can be expected to:

- Respond to approximately 20 major crises and possibly three major conflicts.
- Conduct more than 500,000 aircraft launches and recoveries.
- Spend approximately 6,000 days-more than 16 years-at sea.
- Steam a total of 3 million nautical miles, more than 10 times the distance from the Earth to the moon.
- House, during a half-century, more than 100,000 men and women.

Carriers have their limitations. Because of their size, they have difficulty navigating in the littorals-shallow and restricted waters close to shore, where many naval operations must take place.

Some officers do not support the Navy's heavy reliance on carriers. They argue that the Navy

should shift its emphasis away from large, "multi-mission" ships, such as carriers, and toward smaller, faster vessels able to operate close to shore.

Vice Adm. Arthur Cebrowski, president of the Naval War College, in Newport, R.I., advocates a new class of ship called "street fighter," which would be a light, heavily armed, high-speed surface vessel designed especially for littoral warfare.

Critics also point out that carriers, because of their size and importance in U.S. strategy, are prime targets for the nation's enemies. The loss of even one, they note, would have a profound impact upon Navy operations.

Carrier advocates, however, note that the United States has not lost a carrier to hostile fire since World War II. A carrier's aircraft provide significant protection against enemy aircraft, surface ships, submarines and even sea mines. A carrier itself has a phalanx of defensive weapons, including surface-to-air missiles, rapid-firing 20-mm guns to knock down incoming cruise missiles and electronic warfare systems.

In addition, each carrier usually is accompanied by a battle group of two cruisers, four destroyers, two attack submarines, eight helicopters and a fast combat support ship, assigned in large part to protect the flattop.

Aircraft have been flying from Navy ships since 1910. Aircraft carriers first proved their value in World War II. First, Japanese carrier-based aircraft surprised the U.S. Pacific fleet at Pearl Harbor. Later, U.S. carriers were credited with destroying Japanese naval power during the Battle of Midway.

Carriers most recently proved their worth in the 1999 air war against Yugoslavia. During that brief conflict, battle groups of the USS Enterprise and USS Theodore Roosevelt launched more than 3,000 combat sorties and coordinated multiple Tomahawk missile strikes against Serb targets.

The action against Yugoslavia, however, put strains on carrier assignments in the Persian Gulf and the Western Pacific Ocean. Said Navy Vice Adm. Daniel J. Murphy Jr., commander of the U.S. 6th Fleet:

"There are simply not enough carrier battle groups, amphibious ready groups (ARGs) with their Marine expeditionary units, and submarines in the Navy to meet global tasking." The Navy, Murphy said, needs 15 carrier battle groups, with their submarines, and a similar number of ARGs.

"We have 12, so we are shy three carrier battle groups and three amphibious ready groups," he told a group of defense writers.

Additional carriers, however, are years away from reality.

In fact, the 12th carrier—the USS Ronald Reagan (CVN 76)—still is under construction at Newport News, where its components now lie strewn on the dock like giant Lego pieces. A Nimitz-class vessel, the Reagan is scheduled to be completed in 2002.

Meanwhile, the USS Kitty Hawk (CV 63), commissioned in 1961, is due to retire in 2002.

On the Drawing Board

The 13th flattop, CVN 77, is in the planning stages at Newport News, which claims to be the only shipbuilder in the country capable of building nuclear-powered carriers.

Other U.S. shipyards have built carriers in past decades. The USS Constellation (CV 64), for example, was launched in 1961 by the New York Naval Yard. But that yard was decommissioned in 1966, part of a vast, long-term shrinkage of the U.S. shipbuilding industry.

But Newport News has survived, and it has plenty of experience in carrier construction, Irwin F. Edenzon, the company's director of Future Carrier Programs, told National Defense. "We built the first carrier from the keel up—the USS Ranger, which was launched in 1933. All previous carriers were conversions."

CVN 77, he added, will be the 30th carrier built by Newport News. For the first time in recent history, the company is working with Navy representatives to develop a design for the construction contract for a carrier. The contract design, once complete, will include items such as drawings, specifications and a list of equipment intended to go into the ship. The Navy and Newport News subsequently will use this information as the basis for the CVN 77 contract.

With an estimated price tag of \$4.5 billion for CVN 77, cost is certainly an issue, Richard W. Johnson, design manager for Newport News' Carrier Innovation Center, told National Defense. But he added: "For a 50-year defense acquisition, we think that's a bargain."

Newport News is the Navy's prime contractor for CVN 77. It is selecting subcontractors to build components of the ship.

In late January, for example, Lockheed Martin Corporation, headquartered in Bethesda, Md., was chosen to head the industry team to build CVN 77's \$500 million warfare system, which includes the ship's command and surveillance, armament, aircraft interface and information

systems.

Plans for CVN 77 include new sensor and communication system technology in an integrated warfare system, reducing total ownership cost and improving operational capabilities, according to Newport News officials.

All of the primary decision centers of CVN 77-the air-operations center where flights are controlled, the bridge where the captain manages the ship, the ready room where pilots plan their missions-are going to be connected with the latest local-area computer networks, officials said.

Smaller Crew

This will help reduce the number of personnel needed to run the ship. The Navy hopes to reduce the crew required for CVN 77 by 550, officials said. Ultimately, for future carriers, the Navy would like to reduce crews by as much as 1,500. This would be an important factor in holding down operating costs, since it will mean fewer meals, bunks and other supplies.

Smaller crews also would ease the Navy's current personnel shortage, caused by recruiting and retention shortfalls.

Additional plans are being made to accommodate all of the aircraft currently being envisioned for use on carriers, Klosterman said.

"The Joint Strike Fighter teams have been in talking to us. The F/A-18E/F folks have been here, too." The new V-22 tilt-rotor aircraft, with its vertical takeoff capability, should present little problems for CVN 77, he said.

The flight deck of even the largest carrier is just a fraction of the size of the smallest land-based runway. High-performance aircraft can operate from this tiny space only with catapults for takeoffs and arresting gear for landings.

Under such circumstances, pilots often say, takeoffs are a little like rocket launches. They call landing on a carrier-a relatively small, moving target in a huge, often turbulent sea-"a controlled crash."

To launch its aircraft, CVN 77 will use the decades-old technology, steam catapults. A steam catapult, in less than three seconds, can launch a 37-ton jet from a carrier deck to a safe flight speed of 160 miles per hour.

However, for the next generation of carrier-the CVNX class, which is already on the horizon-the Navy wants to develop a new system that will be lighter, more powerful and less visible to enemy forces.

At the Newport News Innovation Center, a team is developing a concept for an advanced internal combustion catapult aircraft launching system (ICCAL) and investigating electromagnetic aircraft launching system (EMALS).

The Newport team is investigating whether two new systems may be lighter, faster and less visible in the infrared spectrum than steam catapults, shipyard officials explained.

In December, the Naval Air Warfare Center Aircraft Division, in Lakehurst, N.J., awarded contracts worth about \$60 million each to Northrop Grumman, in Sunnyvale, Calif., and General Atomics, of San Diego, to develop full-scale prototypes of the electromagnetic system. The work is expected to be complete by September 2003.

To protect flight-deck personnel, waiting aircraft and other equipment from the hot exhaust gases of operating jet engines, carriers employ jet blast deflectors that lift up from the deck. Traditionally made of aluminum, these large shields-18 feet by 6 feet by 6 inches-are gradually worn down by the corrosion of salt water and the heat of engine exhausts.

To help the deflectors withstand such abuse, Newport News is investigating the use of advanced aerospace materials, such as the kinds of ceramic tiles and composite materials used in space shuttles.

Below deck, the shipbuilder is looking at new designs and equipment that will change the way that the crew's living and dining spaces are arranged and used. Under consideration:

- Commercial-off-the-shelf (COTS) food-preparation equipment, such as those on cruise ships and airliners.
- Efficient regrouping of dining and associated storage spaces.
- Modular spaces, decreasing construction costs, allowing more long-term design flexibility and lowering maintenance costs.
- An improved means of rapidly moving ship material.

Newport News is exploring the use of air-blown fiber optic cable to replace a carrier's hand-strung copper electrical wiring, making replacement easier and less expensive. A carrier contains thousands of feet of such wiring.

Use of fiber optic cable "reduces maintenance costs tremendously," said Newport News' Johnson. "When I need to change the wiring in a section of the ship, I can blow out the old fiber optic and blow in the new in a matter of seconds. The cost is just pennies, and it takes

just two or three people, not a whole team."

To do the heavy lifting of munitions and supplies alike, Newport News is investigating use of multi-purpose robots, each capable of lifting 5,000 pounds. Such machinery could replace a carrier's forklifts, the shipyard's Johnson said.

If the technology can be fine-tuned, he added, it could even replace the five to six seamen required to load bombs on to aircraft. However, he warned: "The pitch and roll of a ship at sea makes it difficult to load bombs. That won't be easy for robotic equipment to handle."

Nuclear Propulsion

Although CVN 77 will have the same nuclear propulsion system as previous Nimitz-class carriers, a new system-also nuclear-is planned for the first carrier of the next generation, CVNX 1.

At present, the Navy has no plans to build carriers with electric drive, the revolutionary propulsion system recently chosen for the DD21 destroyer. The reason given by officials: Electric drive currently does not produce the kind of tremendous power needed to allow huge carriers to travel at high speeds for long distances.

Nuclear propulsion, they said, does offer that kind of power. Nuclear-powered carriers can steam at 40 mph for days on end, arriving within 100 miles of 70 percent of the world's population, usually within 48 hours of notification.

They only have to be refueled every 15 to 25 years. When they go in for refueling, however, it is time-consuming and expensive.

The USS Nimitz-the first of the most recent class of carriers, launched in 1972-currently lies at dockside at Newport News for a 33-month, \$1.2 billion refueling and overhaul. During that period, more than 3,200 Newport News employees will work aboard the ship. The work includes:

- Refueling the ship's two nuclear reactors.
- Replacing the top two levels of the vessel's island house.
- Upgrading radar capabilities.
- Replacing nearly 3,000 valves and overhauling another 600.

As work on the Nimitz is completed in 2001, CVN 77 construction is scheduled to begin. The shipbuilder-located on 550 acres at the mouth of Virginia's James River, down river from colonial Jamestown, Williamsburg and Yorktown, near the battlefields of the Civil War's peninsula campaign, and across from the huge naval base at Norfolk-claims annual revenues of approximately \$1.7 billion and 18,000 employees.

Like its competitors, Newport News is struggling to stay afloat in an era when the U.S. defense budget has shrunk by nearly 40 percent in the past decade, spawning round after round of industry consolidations and mergers.

Since 1995, the U.S. shipbuilding industry has consolidated from six major builders to three today-Newport News; General Dynamics, of Falls Church, Va., and Los Angeles-based Litton Industries, which owns Ingalls Shipbuilding in Pascagoula, Miss.

In 1999, Litton merged with Avondale Industries, of New Orleans. Newport News, attempted a merger with Avondale, but was outbid by Litton. During that same year, Newport News survived takeover attempts from both Litton and General Dynamics.

Meanwhile, Newport News is receiving welcome assistance in bolstering its position in the industry. The Virginia state government has provided \$100 million to build a Virginia Advanced Shipbuilding and Carrier Integration Center (VASIC) in downtown Newport News.

Now under construction, the 230,000 square foot center ultimately will be occupied by more than 400 people from Newport News Shipbuilding, other Virginia shipbuilders, the Navy, state universities and other high-tech companies.

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