What is new in the *Ford*-class

Overall design

Gerald R. Ford (CVN 78) is the first new aircraft carrier design in 40 years, replacing the Nimitz class of carriers. The new design brings many performance improvements, including:

- 25 percent increase in sortie generation rate
- 2.5 times electrical generation capacity over the *Nimitz*-class
- Manpower reduction of 500 billets

The new carrier class was redesigned from the keel to the mast of the island house. Among the improvements:

- New reactor and propulsion plants
- Electromagnetic Aircraft Launch System (EMALS), an improvement over steam catapult system
- New island
- All electric ship
- Major space rearrangement
- Flight deck extensions
- Advanced arresting gear

Gerald R. Ford (CVN 78) is the Navy's first aircraft carrier to be completely designed using a 3-dimensional product model.

3-D modeling

For the *Ford*-class, Newport News Shipbuilding utilized the latest and most advanced computer tool capabilities and functionalities for visual integration in design, engineering, planning and construction.

Every piece part is created in a 3-D model at full scale which includes structure, various equipments, piping systems, machinery, electrical, wireways, gauges, pumps, berths, medical and galleys. At any given day hundreds of designers, engineers, planners and construction representatives were in the model designing, creating and planning every feature of the ship.

Part of the design build process is to validate requirements and ensure ship specifications are met, including access, passage, repair, take-downs, removals of components and safe working areas. For the *Ford*-class, Newport News Shipbuilding considered sailors with heights in the 95th percentile male to the 5th percentile female, ensuring all operations can be performed without restriction of human size.

Consideration of emergency crew wearing various apparatus and the capability of routing injured personnel through the ship also was considered. All these design challenges along with working to maintain the shortest and optimal routes for distributive systems tested the capabilities of the 3-D visualization tools.

Flight deck changes

Flight deck: The island is smaller and moved farther aft than on *Nimitz* class so there is more area for airplane maintenance and flight deck operations will be faster and safer due to better space utilization

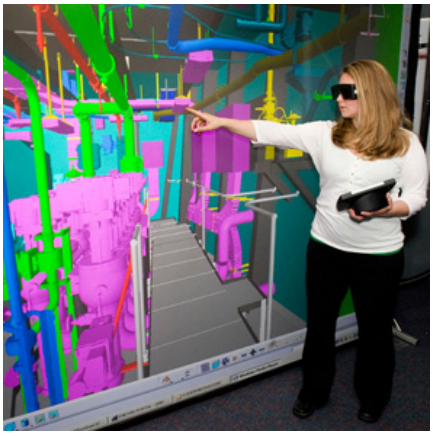
Weapons Elevator: Elevators use moving electromagnetic fields instead of cabling, which allows elevator shaft to use horizontal doors to close off magazines. This reduces manning and maintenance costs.

Flexible Infrastructure: Flexible infrastructure architecture that allows spaces to be adaptable to rapid changes without the use of “hot work.” It eases compartment reconfiguration to support changing missions, maximizes time for technology development prior to equipment installation, and eliminates cost and schedule impacts associated with the traditional conflicts from re-work.

Advanced Arresting Gear: Recovers current and future aircraft, is lighter than the legacy system, software controls, reduce manning.

Aircraft Carriers

- Design & Construction
- Refueling Complex Overhaul (RCOH)
- Fleet Services
- Inactivation
- The new *Ford*-Class
  - *Gerald R. Ford* (CVN 78)
  - *John F. Kennedy* (CVN 79)
  - New Technologies
- History of American Carriers



3-D modeling is playing a big role in designing the new class of carriers.

New technologies

Among the new technologies in the *Ford*-class are:

Dual Band Radar: Enables a smaller island structure on the deck of the carrier, facilitating the ship's increased sortie generation rate

Multifunction radar and volume search radar: integrates two radars operating on different frequency bands

EMALS: Replaces steam catapult. Uses electrically generated, moving magnetic field to propel aircraft to launch speed.

Flight deck improvements are a part of the initiative to increase sortie rates for the new class.

Improved efficiency

With the *Ford*-class, the Navy has made capital investments to reduce cost and maintenance over the carrier's life span — **that's $4B in total ownership cost savings over the 50-year life of the ship**. The improved design of the carrier allows for more efficient operations and requires fewer sailors to man. Among the efficiencies are:

Steam to electric transition: No catapult steam, no service steam and no steam turbine driven auxiliaries.

Fewer overall components: A third to a half as many valves, elimination of 70 sea chests, three vs. four aircraft elevators, two vs. three hangar bays.

Extended drydocking interval: the *Ford*-class is designed for 12 year intervals

Improved shipwide air conditioning: Provides lower moisture and dirt levels

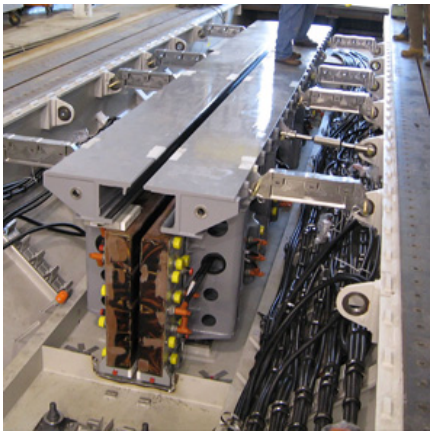
LED Battle Lanterns: The LED light source will be life of ship and the lower power demand will greatly extend lanterns run time per battery. In the *Nimitz* class, the current bulb has a 100-hour life.

Electric Water Heaters: Moving away from steam heating for hot potable water will lower the maintenance load and will reduce ships weight by eliminating a piping network that covered the entire ship.

Better shipboard lighting: High efficiency fluorescent T-8 lighting will be utilized throughout *Ford*-class ships. The T-8 light produces more light than the legacy T-12 with reduced energy consumption -- each bulb will last almost twice as long as the previous lighting system.

Weapons Elevator: Elevators use moving electromagnetic fields instead of cabling, which allows elevator shaft to use horizontal doors to close off magazines. This Reduces manning and maintenance costs.

Cargo Elevators: Cargo elevators will replace cargo conveyers allowing faster transport of palletized materials while eliminating the wasted time of unloading pallets and moving cans vice pallets of materials throughout the ship. Elevators are located so material is delivered directly to point of use locations like the Galley from the storage areas so cross ship transport is eliminated.



The electromagnetic catapult system increases efficiency by removing the old steam-powered catapults.

Five-year centers

Newport News Shipbuilding utilizes five year "centers" for building nuclear powered aircraft carriers. Building aircraft carriers on predictable and uninterrupted 5-year (maximum) centers is critical to enable cost-effective production.

Predictable and uninterrupted funding preserves the supplier base, which, once gone, cannot be recovered.

Maximizes efficiency in construction: keeps suppliers working from one product to the next, minimizing gaps between carrier work, and yields engineering and production benefit from lessons learned, series production, and enhanced learning curves across the entire shipbuilding base.

Maintaining the current plan of record allows for the most efficient resource planning and advantageous bulk purchasing — lowering costs for the taxpayer.