In the U.S., many people think nuclear power is dead because it proved to be too expensive and too unmanageable. In this view, the fuel melt at Three Mile Island March 28, 1979 ended nuclear power in this country.

This picture of nuclear power is incomplete. There is still one sector of the U.S. economy where new nuclear reactors are being built: the Navy.

Now the Navy is facing a crucial choice that may well determine the future of civilian nuclear power: will the next generation of aircraft carriers be powered by nuclear reactors, or by diesel engines?

Currently the Navy maintains 12 aircraft carriers -- three diesel-powered and 9 nuclear-powered.[1,pgs.2,123] The Navy plans to build two more nuclear Nimitz-class carriers, and then it will introduce a new generation of carriers, called CVX. (Nimitz-class carriers are named for the 100,000-ton U.S.S. Nimitz which entered service in 1975.)

Will CVX carriers employ nuclear propulsion? That is the question.

The Navy began planning for the new CVX class of aircraft carriers in 1996. CVX carriers will have many new features -- a new hull shape, better computer communications, and more killing power.[2]

The Navy intends to begin building the first CVX in 2006 for service starting in 2013. A carrier typically remains in service for 50 years. With construction costs of roughly $4.6 billion, an aircraft carrier is the nation's most expensive piece of military hardware.

Each aircraft carrier forms the centerpiece of a "battle group," which in turn provides the strategic basis for Navy operations worldwide. The battle group includes:

(1) the carrier itself (with crew numbering between 3200 and 3400) with its 80 aircraft (24 for support, 56 for attack, plus the 2500 people needed to maintain and fly them);[2,pg.24]

(2) six surface combat ships of which at least three are cruisers or destroyers with Aegis weapons systems, and at least four are equipped with vertical launching systems that can fire Tomahawk cruise missiles;

(3) a total of 10 anti-submarine warfare helicopters embarked on the six combat ships;

(3) two attack submarines (one of them equipped with a vertical launch system);

(4) and one multi-purpose fast combat support ship (known as an AOE), which resupplies the other ships in the group (with fuel, ammunition, food, etc.) from stocks maintained at 22 supply depots around the world.

These naval "battle groups" have three responsibilities:

(1) maintaining a "forward presence" during peacetime -- constantly reminding the world just how powerful and militarily-oriented the U.S. is;

(2) responding to crises;

(3) fighting wars.

Since the end of World War II, the Navy (or a combination of Navy and Marines) has participated in 205 out of 207 international crises, versus 53 for the Air Force and 38 for the Army.[2,pg.3] Thus for the past 50 years the Navy has participated in an international crisis every three months, on average.

From the perspective of the Navy and its private-sector industrial partners (which President Eisenhower in 1961 termed the "military-industrial complex"), there are good reasons why CVX carriers should be nuclear-powered:

1) If civilian nuclear power is ever to stage a come-back, the nation must maintain teams of scientists and engineers with up-to-date nuclear skills and expertise. Thus Navy reactors serve to "keep the nuclear design team together" against that future time when Three Mile Island has faded from memory, oil has become costly, solar photovoltaics have been scuttled by the oil companies that own the relevant patents, and nuclear energy is the only technology being offered to the public. From the viewpoint of the military-industrial complex, nuclear is far preferable to solar for generating electricity because nuclear plants require huge investment and are highly complex, thus demanding centralized control. Solar panels can be much smaller, simpler, and more widely dispersed, thus making centralized control impossible.

2) Nuclear power is modern; diesel is a 19th century technology. The Navy first embraced nuclear power in 1954. If the Navy had its way, every ship over 8000 tons would be nuclear powered today. Indeed, in 1974 Congress formally set the policy that all surface combat ships must be nuclear-powered. Between 1961 and 1975, nine nuclear-powered surface-combat ships were commissioned (in addition to the nuclear carriers), but it soon became clear that nuclear-powered surface combat ships were simply too expensive to maintain. Maintaining them would require cuts in other naval operations, and so the Navy capitulated to fiscal realities.[1,pgs.37] Since 1975, the only nuclear-powered surface ships built have been carriers. In fiscal year 1993, the Navy decided to scrap its last nuclear-powered non-carrier surface combat ships, rather than put them through an expensive nuclear refueling process. Thus after only 17 years of service, with more than half of their planned service life remaining, the Navy's non-carrier nuclear-powered combat ships were forced into retirement by excessive costs. Submarines are still being built with nuclear propulsion systems, but by their nature submarines are not highly visible. Thus aircraft carriers are the last highly-visible ships to carry the torch for nuclear modernity.

3) If the CVX is nuclear-powered, there is only one ship yard equipped to build it: the Newport News Shipbuilding Company (NNS). Thus the purchase of nuclear-powered combat ships were forced into retirement by excessive costs. Submarines are still being built with nuclear propulsion systems, but by their nature submarines are not highly visible. Thus aircraft carriers are the last highly-visible ships to carry the torch for nuclear modernity.

4) The Navy is silent on these first 3 reasons for preferring nuclear-powered carriers, but offers other arguments why they are superior:

(a) They can accelerate faster than diesel-powered carriers;

(b) They can travel indefinitely without refueling;

(c) Because they don't require refueling they can arrive at their destination earlier than diesel-powered carriers;

(d) Nuclear carriers can carry more jet fuel and ammunition than a diesel-powered carrier, thus making them less reliant on resupply ships.

In 1994, Congress ordered the U.S. General Accounting Office (GAO) to compare the cost-effectiveness of nuclear-powered vs. diesel-powered aircraft carriers. In August 1998 GAO issued its lengthy report,[1] in which it evaluated the Navy's claims of superiority for nuclear propulsion:

(a) It is true that nuclear carriers can accelerate faster because their steam boilers are always operating. A nuclear carrier can accelerate from 10 to 20 knots in 1.5 minutes and from 10 to 30 knots in 3 minutes. With only 4 of their 8 boilers operating, diesel carriers can accelerate from 10 to 20 knots in 2.5 minutes but they need all 8 boilers to achieve 30 knots. If they have to light the 4 additional
boilers, they can take 1.5 to 2 hours to reach 30 knots.

The Navy says rapid acceleration helps a carrier position itself for aircraft landings, especially in bad weather. However, when the GAO inquired, the Navy could not provide examples in which a plane crashed or was lost because of slow carrier acceleration. Navy staff told GAO that design of the flight deck is a more important factor in aircraft safety than is carrier acceleration.[1,pgs.71-72]

(b) It is true that nuclear-powered carriers can voyage indefinitely without refueling. In submarines this confers a military advantage but the situation with carriers is entirely different because their support ships and their airplanes require regular refueling. Therefore, carrier groups remain "tethered to the pump" despite the carrier's nuclear propulsion.

(c) Because nuclear carriers do not require refueling, it is true that they can arrive at their destinations earlier than diesel-powered carriers. On a 12000-mile voyage from San Diego to the Persian Gulf, a nuclear carrier would arrive in 17.9 days. A diesel carrier would arrive six hours later. On a 4800-mile voyage from Norfolk, Virginia to the eastern Mediterranean, a nuclear carrier would arrive in 7.1 days, 2 hours earlier than a diesel-powered carrier.[1,pg.49]

During long voyages, diesel-fueled carriers slow to 14 knots for refueling. However, GAO points out that this can be an advantage. Pilots are required to remain flight-qualified to engage in combat. This requires regular practice. While a carrier is steaming at full speed, planes cannot fly from its decks. Slowing down to refuel gives pilots a chance to fly and remain qualified for combat. Therefore, when a conventional carrier arrives at its destination, its pilots are ready to enter combat immediately. Pilots on a nuclear carrier must delay combat while they requalify.[1,pg.65]

(d) GAO says diesel-fueled carriers can be designed to carry the same quantities of jet fuel and ammunition as nuclear-powered carriers. The propulsion system isn't the determining factor, GAO says.[1,pg.8]

The GAO finds that diesel-powered carriers have several important advantages:

(a) Because they require much less maintenance, and therefore less down-time, diesel-powered carriers can provide a greater "forward presence" than nuclear powered carriers.

(b) Since 1973, the U.S. has maintained ("homeported," in Navy jargon) a carrier group at Yokosuka, Japan. The Japanese contribute Japanese maintenance personnel worth about $5 billion (U.S. dollars) each year to defray the annual costs of this group. For obvious reasons, the Japanese people won't tolerate U.S. military nuclear technology within their sovereign territory. If the CVX is nuclear-powered, then Japan must be persuaded to change its policy, or the U.S. will need to employ six U.S.-based carrier groups (on rotating duty) to achieve the same "forward presence" in the Pacific, GAO says.[1,pg.104] Even if the Japanese were willing to change their policy, permanently homeporting a nuclear carrier in Japan would require construction of nuclear maintenance facilities which by U.S. law would exclude Japanese personnel.

(c) One of the Navy's stated design goals for the CVX is to reduce carrier costs by 20%.[1,pg.30] GAO finds that this requires conventional propulsion because nuclear carriers are so costly to operate. GAO concludes that the 50-year lifetime cost of a nuclear-powered carrier ($22.2 billion) exceeds the lifetime cost of a conventional carrier ($14.09 billion) by $8.1 billion, or 58%. [1,pg.9]

GAO says wars of the future were prefigured in the Gulf War of 1991.[1,pgs.54-55] Examining the record of both conventional and nuclear-powered carrier groups in that war, the GAO found no difference in military effectiveness.

In sum, the GAO finds that nuclear-powered carriers provide no significant military advantage. The nation has a once-in-a-generation opportunity to stuff an important part of the nuclear genie back into the bottle from which it escaped at Hiroshima in 1945.

To get involved in this important decision, contact Laura Hunter, Environmental Health Coalition, San Diego, California: (619) 235-0281. Fax: (619) 232-3670. Email: laurah@environmentalhealth.org.

--Peter Montague(National Writers Union, UAW Local 1981/AFL-CIO)


Descriptor terms: