



APHNAS, attack submarine of the mid-1970s, armed with torpedoes (four tubes) and 20 cruise missiles. As in a strategic submarine, the reactor was abaft the missile tubes. Arrows indicate the positions of the three elements of the wide aperture array (WAA) sonar on each side; a BQQ-5 DNA sphere is in the bow. Dimensions: 472×40 ft (13,000 tons).

implied, as might have been expected, that the new submarine would be powered by the big D1W. That, in turn, set hull diameter at 40 ft, compared with 33 ft for *Los Angeles*. As the ad hoc committee had recommended, the new submarine would carry 20 STAMs (in tubes abaft the sail), as well as more torpedoes than *Los Angeles*.

The new submarine was the first one designed for an entirely passive operation, that is, detecting targets passively at long range and then obtaining an entirely passive fire-control solution. She was therefore designed from the outset to have a towed array. The active bow sphere had to be retained as a hedge against Soviet silencing.

The passive alternative to a single ranging ping was rapid (virtually instantaneous) localization (RAPLOC) by triangulation. Limited by its high frequency and limited gain, the existing PUFFS could not reach STAM range. The new design substituted much larger, lower-frequency planar (rather than line) arrays exploiting the same propagation modes previously available only from the bow sphere (bottom and surface bounce and convergence zone). This WAA made the anti-submarine version of STAM a practicable proposition. It could also detect quite distant surface ships, perhaps out to extreme STAM range. A single array panel was demonstrated on a simulated submarine on Lake Seneca in 1967. WAA was successfully tested aboard *Baya* during FY 71. A developmental prototype was tested at sea on board *Barb* between January and April 1980. Beginning in July 1987, *Augusta* tested the prototype array. WAA is part of the current *Seawolf* sonar; a stand-alone version is designated BQQ-5.

Table 10-2 shows the baseline design of the new submarine, compared with *Los Angeles*, as of 16 April 1971. The missiles were accommodated in a wasp-waist section abaft the sail (four rows of five missiles each) between the operations compartment and the reactor. The new submarine was soon designated APHNAS (advanced performance high-speed nuclear attack submarine) to distinguish it from HSNAS (high-speed nuclear attack submarine, or *Los Angeles*). Among the variations considered at this stage were using a new HY-100 steel, using bow rather

Table 10-2. The Big Submarine, 16 April 1971

	Baseline	<i>Los Angeles</i>
LOA (ft)	472	366
Diameter (ft)	40	33
Surfaced displacement (tons)	12,075	6,105
Submerged displacement (tons)	13,649	6,927
Mean draft (ft)	32.8	27.2
Officers	12	12
Chief petty officers	15	12
Enlisted	84	84
Reserve buoyancy	13%	13.5%

than sail planes, omitting WAA, and varying the missile load.

Chief of Naval Materiel released the APHNAS report to CNO on 26 June 1971, and the project was presented to the CNO Executive Board on 3 August. The CNO formally requested a preliminary design on 18 August. It seemed that at least a few such submarines would be built; however, they would be extremely expensive. The new CNO, Adm. Elmo Zumwalt, feared that a few APHNASs soon would become a large number of standard production submarines, just as the single prototype *Los Angeles* had turned into the new standard attack submarine.

In September 1971, Zumwalt ordered his systems analysis arm, Op-96, to supervise a new overall study of future submarine employment over the next two decades. APHNAS was clearly in trouble. To those who had survived (and fought) CONFORM, a new trade-off study must have seemed eerily familiar. Moreover, the terms of the study, a comparison of *Sturgeon*, *Los Angeles*, and APHNAS, hinted at Zumwalt's likely intention of cutting *Los Angeles* production short (never mind APHNAS) in favor of a return to the less expensive *Sturgeon*. To have abandoned APHNAS altogether late in 1971 would have