CHAPTER ONE

Welcome to the World – A New Star is Born

The End of an Era…

The aircraft carrier USS *Enterprise* (CV-6) was the star of the US Navy in World War II. From the outset, Big E was renowned for her greatness as a ship and the greatness of those who operated and flew from her. She also embodied some magic: she was a lucky ship, seemingly always where she needed to be and by good fortune always far from where things might have ended badly for her. A case in point was December 7, 1941, when she was not in port during the Pearl Harbor attack – where she would have had to take on the sizable Japanese armada alone. She operated successfully in almost every major Pacific fleet encounter from 1941 to 1945, and was to be the most decorated US Navy ship in World War II.

By the end of the war, however, the world had changed and naval aviation was at once in a period of retrenchment and in a technological growth spurt. It became clear that CV-6 could not be modernized to operate the heavier jets coming into service. On January 14, 1946 she was moved to the New York Naval Shipyard, where she was inactivated, and on January 18 was decommissioned. In spite of attempts to immortalize Big E, she was sold for scrap on July 1, 1958. Then, in 1959, the shipyard at Kearney, New Jersey, systematically deconstructed Big E. "Starved and stifled by the years long coma of inaction, the great spirit of *Enterprise* flickered and sank toward extinction. And yet the spirit did not die." Many opposed the inauspicious scrapping of CV-6, and many more hoped she would be immortalized as a museum. This was not to be. However, in a fortuitous twist, a new carrier was being built not far from where CV-6 was built a third of a century earlier. This carrier was to be bold, revolutionary, inspirational, and would bear the name *Enterprise* also. There would be an immortalization of the name in a new body. *Enterprise* was to be reborn.

Early in 1961 the dock was flooded and *Enterprise*, the first nuclear carrier in history, the biggest ship in the world, again the pride of her country and its Navy, first felt the touch of the sea.

The story of Big E had begun again.

…And the Start of a New Era

As early as 1949 the possibility was being explored of harnessing the

Opposite page: Big E tended by a gaggle of tugs during her first year of life.

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Big E leaves Norfolk and sails out to Chesapeake Bay on October 29, 1961 for sea trials, combining shipbuilder's and navy acceptance trials – the first time they had been done in unison. This was her first time at sea.

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new-found atomic energy and constructing an atomic power plant that could propel an aircraft carrier. In 1950 Chief of Naval Operations (CNO) Admiral Forrest Sherman initiated a feasibility study for carrier nuclear propulsion, however soon after his death in 1951 the Atomic Energy Commission (AEC) discontinued the aircraft carrier reactor project in favor of a civilian reactor. Naval development was actually ahead of civilian development, and the program was restarted in 1954. The AEC led the research at their laboratory at Bettis, Pittsburgh and in April 1956 construction of a prototype large-ship nuclear reactor was commenced at the National Reactor Testing Station (NRTS) in Idaho. The reactor prototype was designated A1W (indicating an atomic reactor for Aircraft Carrier Series 1 as built by Westinghouse). The plant consisted of two A1W reactors with steam generators and propulsion machinery for one shaft. This modeled one of four plants required to power the new *Enterprise*.

Actually the concept of developing nuclear power for ship propulsion was long thought of, even before the atomic bomb was conceived. Of course, the submarine reactor program was a little ahead of surface ships, with USS *Nautilus* (SSN-571) operating in 1955. These were smaller plants and the thought initially was that reactors were more suited to smaller surface ships. However, the benefits of nuclear power were becoming very evident, and with fuel-hungry jets operating off carriers the increased aviation fuel carrying capacity of a nuclear-powered carrier was attractive. In the 1950s the dawn of the supercarrier was upon us. With the hugeness of the new carriers directed by the high

performance jets – which required more deck area for faster launch and recovery and the newly designed angled landing area widening the deck, and much larger resultant displacement – these ships had themselves become hungry for fuel.

As well as having more fuel to operate a large air group of jets, the advantages of nuclear power included steaming unlimited by the frequent underway-refueling stops required of a conventional carrier. This was not only convenient but also tactically and strategically sound for such a highly valued asset as a carrier, which was at its most vulnerable to enemy whenever it had to slow down or steer a predictable course. Large reserves of steam were available for ship propulsion, electricity generation, and catapults for aircraft launch. The encapsulated reactors, with no need for intakes or smoke stacks, allowed for a stronger and potentially more compact construction, especially in the island superstructure where the fossil fuel carriers' smoke stacks were placed. The lack of toxic hot gasses vented from the smoke stacks had benefits for the ship and air wing – corrosive "soot", as well as making everything grimy, damaged sensitive electronics and radar competing for space up high on the superstructure, and, along with salt, contributed to corrosive damage to the aircraft. The hot gasses also contributed to turbulent airflow, or "burble", behind the ship, increasing the pilots' challenges during final approach on landing.

The ideas for nuclear propulsion were in part brought together by a man of great foresight, attention to detail, and stubbornness. A study of the USS *Enterprise* would be incomplete without acknowledging the significance of this US naval officer.

The Father of Big E's Atomic Engines

At the center of the nuclear program from its inception was engineering officer Capt. Hyman G. Rickover, a complex character who came to be known as the "Father of the Nuclear Navy."

Hyman Rickover was born on January 27, 1900 into a Jewish family in Poland. His father had moved to the United States and at the age of six Rickover, with his mother and sister, moved there to join him. He entered the US Naval Academy in 1918. Initially he struggled academically, but steadily worked his way up, graduating 107 out of 540 in the class of 1922. He was commissioned an officer and served on surface ships as an engineering officer, specializing as electrical officer. In 1925 he was stationed aboard the battleship USS *Nevada* (BB-36), until 1927 when he commenced a masters degree in electrical engineering, graduating in 1929. Following this he requested submarine duty, however these

The man responsible for developing the unique nuclear complex that powered *Enterprise* for 51 years. Adm. Hyman G. Rickover, a genius of sorts, personally oversaw the naval nuclear program at most levels. This is a rare photo of him wearing his admiral's uniform; he generally preferred civilian suits.

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were not easy times for him, and he did not easily fit in with the sub service. In 1933 he spent two years in the Office of the Inspector of Naval Material, followed by assignment to battleship USS *New Mexico* (BB-40) as assistant engineering officer. Here Rickover quickly became a star, reducing fuel consumption in operation, increasing peak efficiency and contributing to the *New Mexico* becoming number one in the fleet competition for two consecutive years. As a young officer Rickover displayed fastidiousness and leadership in training and operation. In 1937 he applied for the position of Engineering Duty Only (EDO) – a newly formed elite within the navy, the officers of which were not eligible for afloat commands – and facilitated work on design, construction and maintenance of ships. Following the outbreak of World War II he became involved in examining battle damage and systems vulnerabilities and during the war he remained involved in this area of work and was promoted to captain.

At war's end the navy was looking to downsize and Rickover became involved in the oversight of ship deactivation. He was then assigned to Oak Ridge, Tennessee, in 1946, to the National Laboratory, where the "Manhattan Project" involving early atomic research was conducted. This was to be a significant point in time. He was tasked with studying the basics of reactor technology and the viability of reactors for powering naval vessels. He made himself the charge officer of a small team of naval officers and so started the naval nuclear program by heading the team and working tirelessly to understand and then design and promote the reactor program. The construction of the world's first nuclear-propelled vessel, USS *Nautilus* (SSN-571), in 1952 was a result of this six years' work. The *Nautilus* led on directly to the reactor type and design used in *Enterprise*. She had a pressurized water reactor (PWR) design, as opposed to the sodium-cooled reactor used in the navy's second nuclear submarine, USS *Seawolf* (SSN-575). The sodium reactor was not pursued beyond *Seawolf* after the PWR was found to be a better naval reactor. In fact *Seawolf* was eventually overhauled to install a PWR.

Through the 1950s Capt. Rickover projected himself favorably to Congress and the government, and was seen as a man who got the job done. The naval propulsion plant was so successful in operation and safety that Rickover was able to secure the program. At the time of building, and now vice admiral, Rickover also held the role of assistant director in three areas: for Naval Reactors, the Atomic Energy Commission, and for the Bureau of Ships for Nuclear Propulsion. The success of *Nautilus*'s reactor, both in safety and the power produced, garnered the interest of Charles E. Wilson, Secretary of Defense, who advised the AEC that now was the time to look toward placing reactors in large naval ships. Further, the Chief of Naval Operations, Adm. Arleigh Burke, proposed that nuclear power be used in aircraft carriers. As a consequence of the proposals put forward, the navy's fiscal year 1958 budget made provision for reactors for an aircraft carrier, and this was duly ordered from Newport News Shipbuilding and Drydock Company in November 1957.

Rickover's vision to harness the energy from controlled nuclear fission, and his attention to detail, secured his position with the armed services committees and the AEC, as well as with numerous congressmen. Although he did strike resistance from some quarters

in the navy and the government in the face of shrinking funding, he was seen as a smart and wise naval engineer and strategist. But he was a complex and difficult man. He had a menacing side and he could be acerbic and downright mean to anyone he felt to be incompetent or in his way. Even when he selected officers for training in nuclear operation, including each prospective skipper of USS *Enterprise*, he could be very unpleasant to deal with (see Chapter 8.) Much of his approach was undoubtedly due to his work ethic – a humble attitude, working hard, serving, and aspiring to excellence. Dealing with nuclear fission safely was a huge responsibility and he took it seriously, while pushing it to fruition. In this job there was no room for failure. An error could mean loss of life and could jeopardize the entire program. Famously it is reported he said, "It is necessary for us to learn from others' mistakes. You will not live long enough to make them all yourself." He could strike fear into people and he would fight his enemy vociferously. He was not restrained by the rank of the person he addressed – because of his unique position, knowledge, and standing, he was seemingly immune from censure. No one could fire him.

And so it was that as Big E was being constructed, her new "boilers" were being driven in concept, development, and manufacture by a single-minded, bloody-minded perfectionist who did not take no for an answer and *would* get the job done.

The Design and Construction of USS *Enterprise* – The First Atomic-powered Carrier

USS *Enterprise* owed much in its design to the first US Fleet supercarriers. The four carriers of the Forrestal class had designed into them from the start an angled landing area flight deck with capacity for a large jet-based air group. They were a development of the prototype USS *United States* (CVB-58), which although never completed paved the way for USS *Forrestal* (CVA-59). There were later misgivings with *Forrestal*'s design, however: the island superstructure and the deck-edge aircraft elevator placements contributed to a more congested flight deck during flight operations, when generally aircraft flow forward to the bow. There was one elevator forward of the island, two aft on the starboard side and one portside on forward end of the angle, which so positioned became less usable. This was changed subsequently in USS *Kitty Hawk* (CVA-63), which, although considered a modified *Forrestal*, was in a class of her own. Hull design and deck layout were attributed to *Enterprise*'s design, with her island set further aft, allowing for two aircraft elevators (larger than *Forrestal*'s) forward of the island and one aft on the starboard side. The portside elevator was moved aft, well clear of the angled deck. The *Enterprise* deck plan was successfully applied retroactively to *Kitty Hawk* and her sister ship USS *Constellation* (CVA-64).

This was the era of the Cold War. The U.S. Navy was not only using fast jets, but also larger, heavier jets, as the country moved toward nuclear deterrence, relying on larger nuclear bombers. This called for big, wide, steel flight decks, which made the ship top heavy. To accommodate this, the carriers' hulls needed to be wider and therefore longer – creating a heavier ship that required a massive propulsion plant to drive it. In addition jets needed additional wind over the deck to launch and recover at higher speeds than their prop-driven predecessors. All this amounted to the need for more power in the plant

below. It was decided the necessary amount was 280,000 shaft horsepower (shp), which all carrier propulsion plants subsequent to *Forrestal* provided. The layout of the machinery was eight steam boilers driving four geared turbines, spinning four shafts. This arrangement was employed in *Enterprise*, however the two boilers for each shaft were replaced by two steam-producing nuclear reactors. So in design terms *Enterprise*'s propulsion system machinery layout was not much different from that of *Kitty Hawk* and *Forrestal*.

There were two facets to *Enterprise*'s development. Firstly the design, construction, testing, operation, and installation of this new propulsion technology, of which there had been no prior experience in a large surface ship. Secondly there was the design and construction of the ship to accommodate the nuclear plant. The whole project was on a tight schedule because the reactor plant was being developed in tandem to the shipbuilding, with only a little lead-in time.

Big E's Core – The Reactors

The supplier of the reactors was Westinghouse. In *Enterprise* they were to be designated A2W. I have touched on the A1W land-based prototype plant in Idaho. Although the program commenced in 1950 with the first land-based prototype large-ship reactor to be completed by 1953, the cost of $150 million to build a new carrier led to cancellation in 1953. Rickover then, defiantly, proposed a five-reactor prototype program, from submarine to destroyer, frigate, cruiser, and carrier, which was accepted. By 1955 the A1W project was up and running, as well as the frigate F1W and cruiser C1W. (These were to be installed as D2W in the "frigates" USS *Bainbridge* (DLG(N)-25) and USS *Truxtun* (DLG(N)-35), and C2W in the cruiser USS *Long Beach* (CG(N)-9), which were later to be loyal episodic team mates of *Enterprise*.) Each A1W was able to produce 35,000 shp, which was just right for the 280,000 shp required for the full eight-reactor, four-shaft system. The building and operation of A1W was instrumental in the success of *Enterprise*'s reactor plant construction. The keel for the test bed "land ship" at the Naval Reactors Facility in the NRTS at Idaho was laid on June 26, 1956. The first of the two reactors went critical on October 21, 1958, and the second on July 10, 1959. The prototype reactor plant, one quarter *Enterprise*'s complete installation, was a huge success. All that had to be done now was to build four of these plants and install them deep in the hull of the new carrier.

The Ship – Design and Concept

The plans drawn for the first nuclear carrier, authorized by the Chief of the Bureau assigned to the Bureau of Ships in Washington, DC, were known as SCB-160. The preliminary SCB-160 design was completed in September 1956. Initially it was thought that the ship would be too large, however reducing her size would be at the expense of side protection in the hull. The design incorporated a radical new radar set that led to the block-shaped island superstructure, which incorporated the eight panels of the extremely-long-range, electronically-scanning, fixed-array antennas of the Hughes SCANFAR system (AN/SPS-32 and AN/SPS-33). To support this radar the newly conceived Naval Tactical Data System (NTDS) was to be installed to facilitate rapid data processing and automatic data-link with other units. SCB-160 was also to incorporate two terrier defensive guided

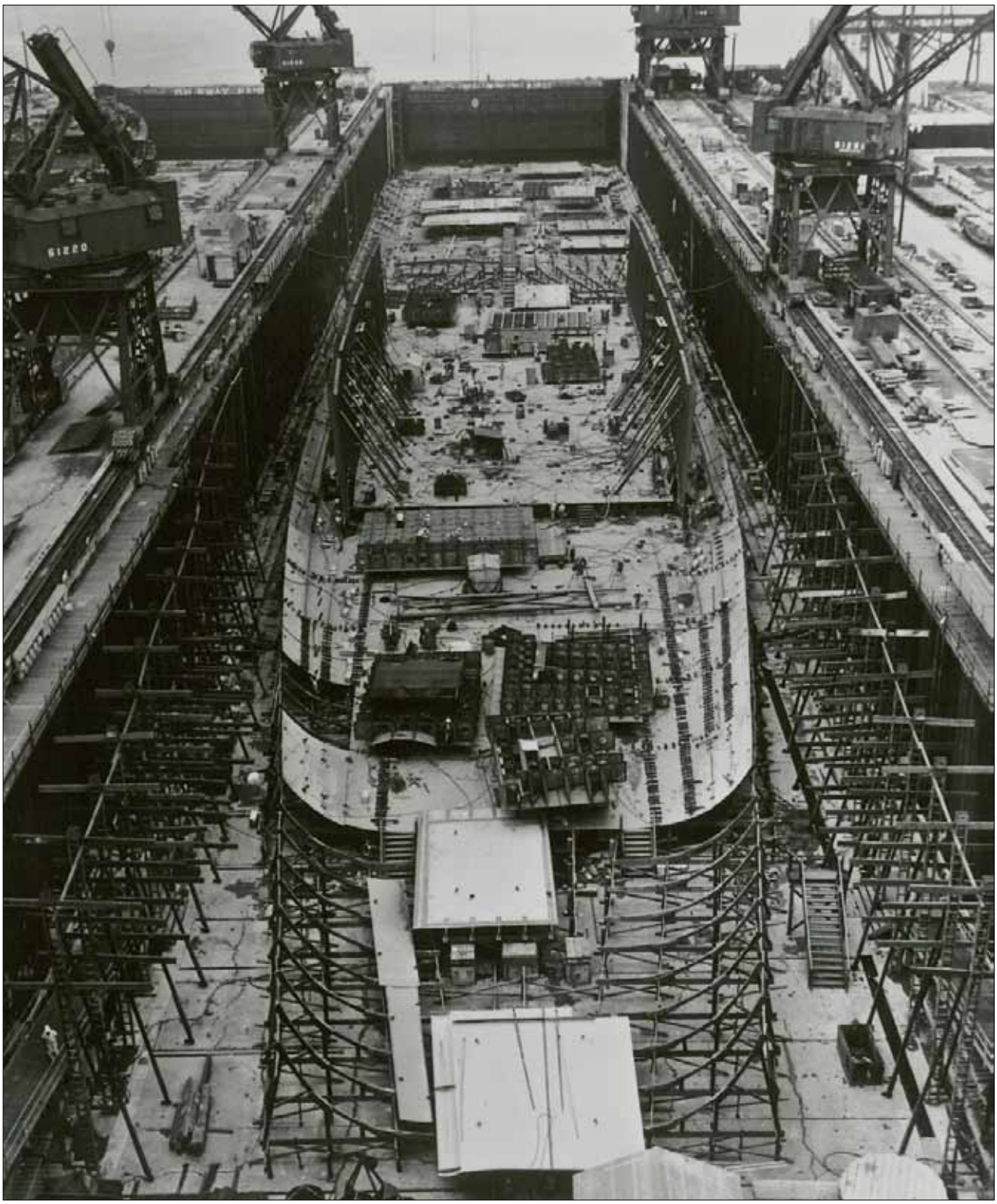
The first activity in building USS *Enterprise* CVA(N)-65, hull no. 546, was the laying of the keel plate of the hull, in Graving Dock No. 11, on February 4, 1958. This was at Newport News Shipbuilding and Dry Dock Company, Virginia. Five of these bottom shell plates were placed in the centre of the dock.

USN (from Naval Aviation News, April 1958)

missile systems, however these were not added due to cost.

It was initially felt that the reactors would not be capable of producing superheated steam for the now fleet-standard catapults and it was argued that her catapults should be an internal combustion type, the C-14, instead of the steam type introduced in the 1950s. Rickover had the insight to argue against this, suggesting *Enterprise* should not be jeopardized by experimental technology. He insisted that the reactors would supply plenty of steam at correct pressure and supply to simultaneously propel Big E and provide her with all necessary electricity and enough steam for safe and effective on-demand operation of four steam catapults. He redesigned the reactors to provide the required steam for flight operations simultaneous with full steam ahead in the propulsion plant. Really only one valve needed to be altered to bleed steam off for the catapult operation. As it was, the internal combustion catapult proved unreliable, the prototype exploding. The navy's Bureau of Weapons overseeing catapult installation nonetheless insisted on the combustion catapult and it was not until September 26, 1961, two days after launching, that both Bureau of Weapons and Bureau of Ships agreed to install the steam catapult system on *Enterprise*. Rickover was right – *Enterprise*'s reactors were more than capable of powering conventional C-13 catapults, and they were duly fitted.

The 915 designers who worked on SCB-160 produced some 16,000 individual drawings. Authorization for the construction of the ship was given in the 1958 fiscal year "new construction program" and the contract was signed to Newport News Shipbuilding and Drydock Company on August 16, 1957, whereupon the project was designated "Newport's Hull Number 546." The projected cost for the carrier was $451 million. The keel was laid in dry dock no. 11 on February 4, 1958, and was ceremonially officiated by Secretary of the Navy William B. Franke, who announced that



Construction proceeded quickly on hull no. 546. This photo was taken on June 23, 1958.

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the world's first nuclear-powered aircraft carrier would be named USS *Enterprise* (CVA(N)-65).

At the outset this was going to be a big ship. Her dimensions were 1,123 feet length overall, with a beam of 133 feet (this is maximum hull width at the main, or hangar, deck). At the widest point on her flight deck she measured 252 feet. Her depth at the centerline from keel to flight deck was 99 feet 4 inches and height from keel to masthead was quoted as the height of a 23-storey building – 230 feet. Her initial full load displacement was quoted as 85,350 tons. Determinants of Big E's massive size were, as discussed, the heavy reactor complex, and the need for a ship with capacity to operate fast and large jet aircraft. The landing area minimum length had been calculated on *Forrestal* as 740 feet, allowing for a plane on a 3-degree guide slope at 150 knots indicated air speed (IAS) to land on the deck 250 feet down the landing area, with a 350-foot run-out and 100 feet to turn off. The angled landing area and flight deck extending over the hull width make a ship inherently unstable, thus the ship grew in beam and so too in length. Big E had a streamlined hull and was the only carrier at the time to sport a modest bulbous bow protruding forward of her stem (where her bow cuts into the sea at the waterline), which improved her hydrodynamics and ultimately increased her speed.

The initial budget for *Enterprise* was estimated at $314 million but the atomic furnaces were costly and the budget rose to $472 million. This was a massive jump in price over the conventional carriers – *Forrestal* had cost $218 million and USS *Independence* (CVA-62) $189 million. The intention was to build six more Enterprise-class ships, but these costs caused controversy enough to end plans for another nuclear carrier in the near future. Secretary of Defense Robert McNamara was a fierce opponent of any further carriers in the class.

The Construction

The Newport News shipyard was familiar with carrier construction, and much of the hull work was similar to the *Forrestal* and USS *Ranger* (CVA-61) previously built there. However, due to the increased length of *Enterprise* (1,040 feet at perpendiculars – stem to stern) the largest dry dock had to have a notch cut into it to accommodate the bow of this new carrier, longer than any ship built to that date. At the outset of construction procuring materials and equipment from suppliers was coordinated by the yard. A total of 60,000 tons of steel and 1,500 tons of aluminium were ordered.

The first milestone of construction was February 4, 1958, the laying of the first keel plate. This was laid transversely over the keel blocks that would support Big E during her build, until dry dock no. 11 was flooded two and a half years later at her christening and launching. Five more keel plates were placed shortly thereafter. The steel parts were pieced together and shaped, then moved to an assembly area where they were joined together to form subassemblies. These were then moved by crane to the building dock for assembly. There were a staggering number of subassemblies to be lifted into place by shipfitters and many box structures went into making up the 3,200 compartments. Some subassemblies proved too large – for example, the aircraft elevators had to be cut in two to fit through the doors of the shed they were made in. Fitting the elevators to the ship was also made difficult due to the overhang of the flight

While building of the starboard flight deck sponson proceeded, construction of the island occurred in the middle of the flight deck. Upon completion, the island was moved on tracks laterally to the starboard side of the flight deck.

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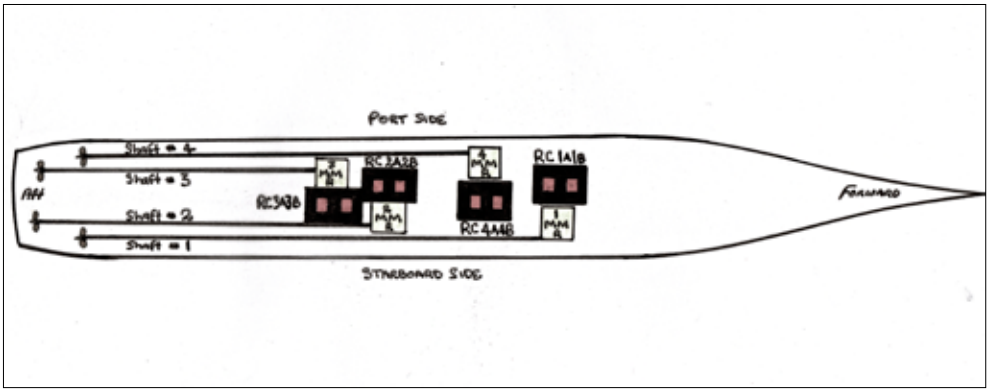
deck, which hampered access by dockyard cranes. A floating crane was used in the adjacent dock to position them.

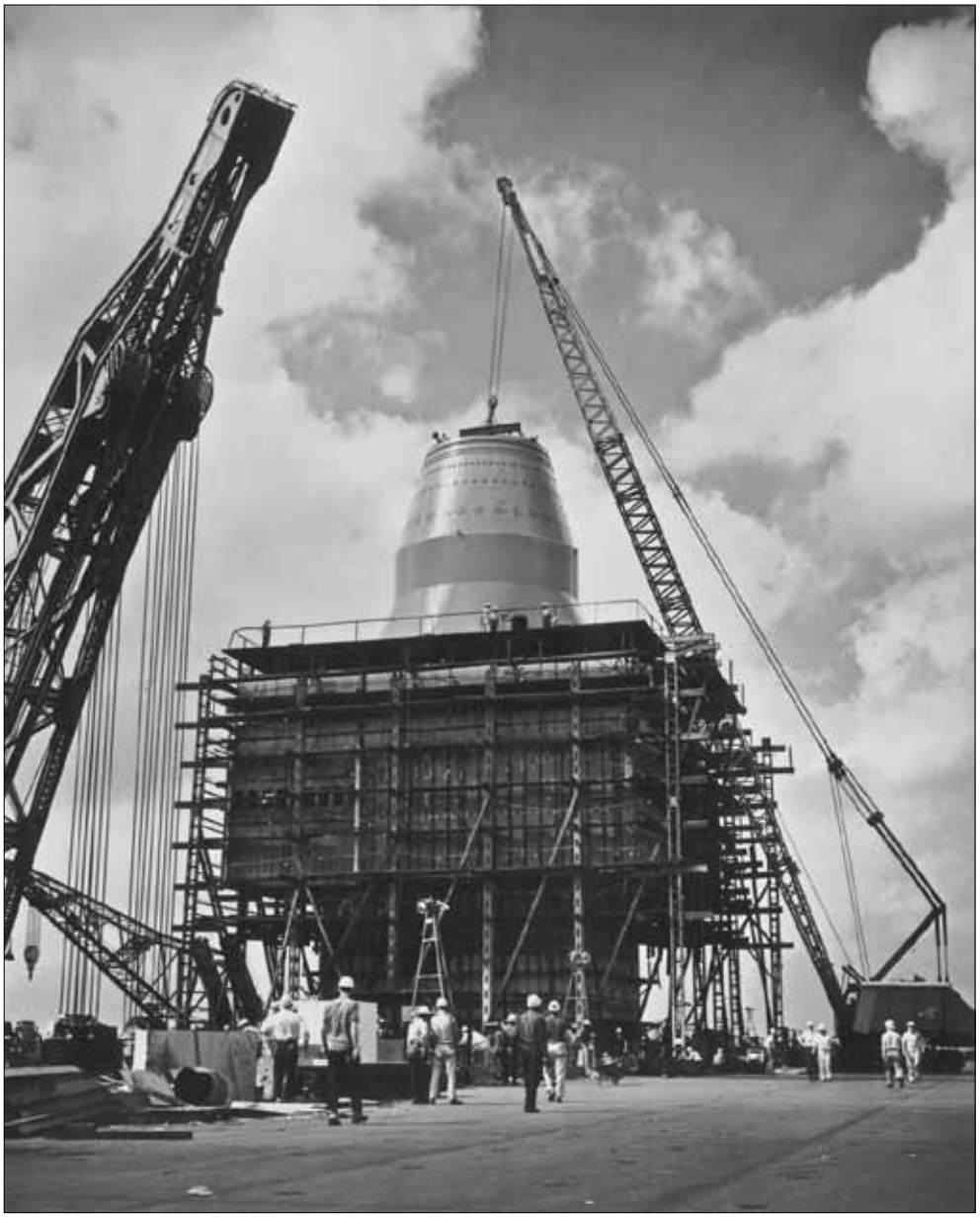
The island was constructed up on the flight deck in the midline. When the large starboard sponson was complete, the entire island was moved laterally on rails to its position outboard on the sponson overhang. Placement of the 30-foot aluminium "beehive" tower and the mast on top of the island posed another difficulty, as being 160 feet above the keel the cranes could not extend high enough. In order to lift the beehive and mast an entire caterpillar crawler crane had to be disassembled, itself craned up onto the flight deck, and reassembled to complete the task.

The point of difference from *Enterprise*'s conventional cousins was the propulsion plant construction and installation. Installation of the eight reactors in four dual plants was more challenging than the usual boiler plants, although helped by valuable experience gained from the construction of the prototype A1W in Idaho. The reactors required sensitive shipyard skills and the crane operators had to apply extreme care and accuracy. To prepare them, special test loads were made to represent the reactors in weight and size. Despite the various challenges the construction proceeded briskly. The four dual reactor compartments were placed deep in the ship, below the 3rd deck. Being very heavy they had to be



The layout of *Enterprise*'s reactor compartments (RC) and associated main machinery rooms (MMR). The four dual reactor plants are numbered in association with the drive shaft supplied, RC 1A1B forward, next RC4A4B, then RC2A2B and the very aft plant is RC3A3B.

Source Knott, J. A. and Allen, J. R.



With the island in its final resting place on the starboard side of the flight deck, Big E's aluminium "beehive" was lifted in one piece to 011 level, in September 1960. The ship's height was too great for the shipyard gantry cranes so a mobile crane was moved to the flight deck to complete the job.

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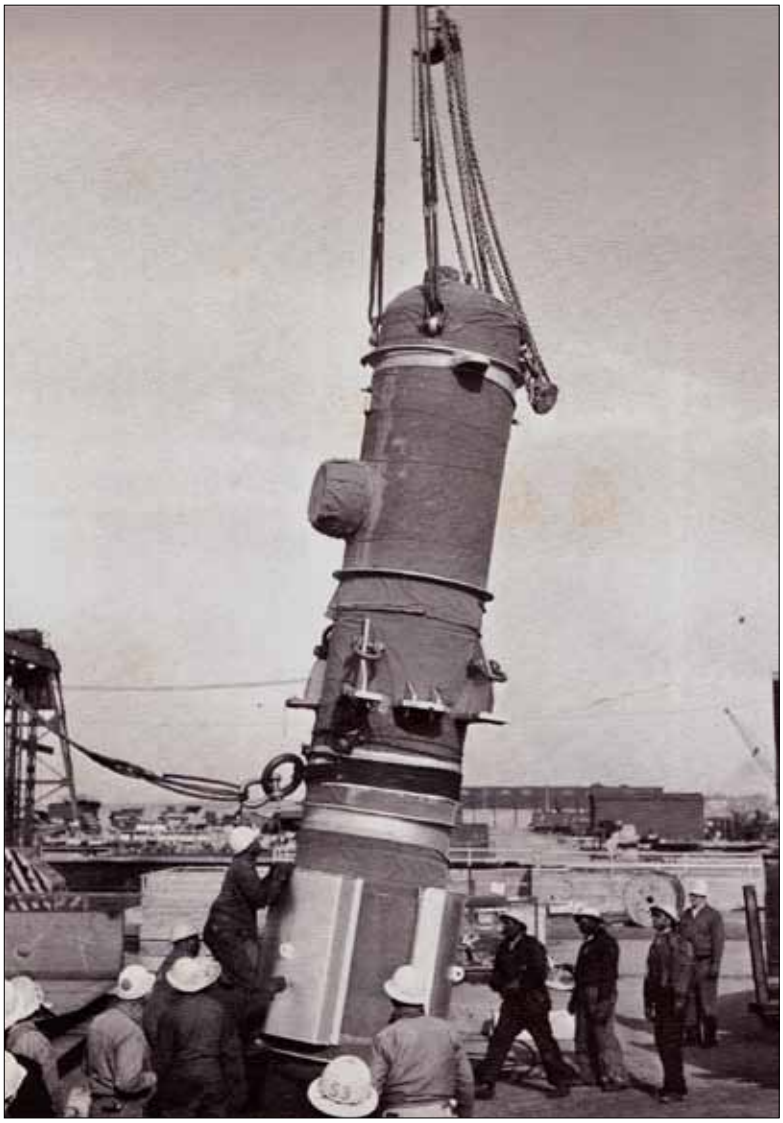

Propulsion plant elements are carefully lifted in to Big E's hull for installation and connection with the engineering, electrical, and machinery systems that will power and propel the ship for half a century.

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placed near the keel, and were arranged in a staggered formation, either side if the midline axis of her hull, close to the center of the ship (between bow and astern). From bow moving aft the reactor plants were arranged as follows: Reactor Compartment (RC) 1A and 1B, supplying main propulsion plant 1 and shaft 1 (the shafts were numbered 1 to 4 from starboard to port), were offset to the port side most forward. Associated propulsion plant was offset to starboard and the number 1 propulsion shaft was therefore the longest one of the four. Aft of RC 1A1B was RC 4A4B offset to the starboard side with its propulsion plant on its port side with the second longest traversing shaft. Aft of reactor plant 4 and now again offset to port side was RC 2A2B. The aft most plant was RC 3A3B, offset to starboard, with the shortest propulsion shaft out of the four plants.

Enterprise was to be the most electronically sophisticated ship ever built. She would embody contemporary systems but would incorporate very advanced, never-tried-before electronics and sensors. Firstly the new computerized data and communications system, the NTDS, was designed into the ship from new, the first carrier to utilize this from the start. NTDS was also installed on USS *Long Beach* (CG(N)-9). This system, yet to be tested at sea, was installed on the Pacific Fleet carrier USS *Oriskany* (CVA-34) from March to August 1961, and on *Enterprise* was to be the first operational-carrier NTDS installation (see the section on electronics and sensors in Chapter 4, p. X). The system was developed to assist with the huge amount of information required to be processed and passed on quickly when dealing with high-speed threats. The electronics on board would require 625 miles of wire and cable and there were more than 1,500 pieces of equipment installed. Electronics technology was still relatively primitive and there were over a million tubes, transistors, and diodes making up the components. They were so sensitive that they required a constant cool temperature, making air conditioning essential in the compartments where they were installed. Radar and navigation systems were supported by over 500 antennas. At the time, the communications equipment was the largest suite ever installed on one ship. It included

1,800 telephones and many radio circuits, teletypes, loudspeakers, and pneumatic tube messaging for sending documents between offices and workspaces. There were also the old voice tubes for verbal communication. Other vital equipment requiring electricity included lighting, pumps, and motors for air-conditioning the elevators. To support all of her electronics Big E was built with an extensive power grid, the electricity supplied by steam from her reactors.[1]

At her completion Big E's dimensions and vastness leant an air of power and invulnerability to her. She was the biggest ship in the world at that time. Her 4.47-acre deck was large enough to comfortably and safely operate up to 100 aircraft of varying types and sizes. Her 3,200 compartments housed all the required workspaces, command centers, storage holds, and equipment rooms, as well as staterooms and bunkrooms for a projected total crew of 4,600, including the air wing. This was the largest number of crew ever assigned to one ship at that time. Although not yet complete, *Enterprise* was ready for christening and launching in September 1960.

The Launch, Christening, Sea Trials and Commissioning of CVA(N)-65

Ceremonies commenced at 0945 on September 24, 1960. The carrier still sat on keel blocks and a multitude of guests gathered around the dock, ranging from naval personnel and governmental officials to shipyard workers and their families. At 1030 an over-flight of 16 navy jets initiated proceedings and Mrs Bertha Franke, wife of Secretary of Navy William B. Franke, who had presided over the keel laying ceremony, broke the champagne over the bow. At the same time flooding of the dry dock occurred, eventually floating *Enterprise* free of her keel blocks, breaking the bonds to terra firma. As she launched, circuits inlaid in her keel automatically activated lights on her bow outlining her name. Shortly thereafter the newly built submarine USS *Robert E. Lee* (SSB(N)-601) in the adjacent dock fired a blank salute from one of her missile tubes.

USS *Enterprise* (CVA(N)-65) is christened and launched on September 24, 1960 by Mrs Bertha I. R. Franke, the wife of the Secretary of Navy.

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And so it was: the christening and launching of the first nuclear-powered attack aircraft carrier, the first carrier displacing over 85,000 tons, the first ship with more than two nuclear reactors, the longest and largest ship in the world. Following the ceremony *Enterprise* was

The launching of USS *Enterprise* (CVA(N)-65) on September 24, 1961. Just prior to flooding the graving dock, 16 aircraft from Air Task Group 8 flew over in salute. Non-essential cribbing and blocking beneath the ship were removed and the dry dock was flooded. As the ship floated, lights automatically came on spelling her name. The submarine adjacent, USS *Robert E. Lee* (SSB(N)-601) fired a test salvo from one of her Polaris tubes in salute.

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Opposite page: Launched and afloat, CVA(N)-65 was moved from dry dock to pier for ongoing construction and systems fitting. The flight deck was bare, with visible welds between the armoured deck plates. The island was structurally complete, but the "SCANFAR" panels and Andrew Alford dipoles were yet to be added.

USN, USNI collection

floated out of dry dock no. 11 and towed to a pier for ongoing on-board construction and installation of vital systems, which would take a further year.

During 1961 the *Enterprise*'s first captain, Vincent de Poix, and his plankowner crew witnessed the completion of Big E's construction and fitting-out and commenced vital systems boot-ups and checks, well ahead of ever going to sea. In the future *Enterprise* would be a participant in many similar preparatory "in-port cruises", also known as "fast cruises." Before this grand ship was to taste the briny deep, the designers, builders, engineers, and the navy had to be 100 % sure that she was in shape, with safe and effective propulsion system operation, and that the crew could competently operate the reactor plants. Capt. de Poix, himself nuclear trained by Rickover, had never operated a nuclear ship, and was to go aboard USS *Long Beach* in July 1961 for her sea trials. At this stage *Enterprise* had successfully undergone reactor plant testing, with criticality achieved in all eight reactors and dockside testing of all propulsion systems. Ironically what was potentially holding up the proceedings was the catapult conversion from combustion to steam.

On October 29, 1961 *Enterprise* went to sea for the first time, completing pre-acceptance sea trials. Normally a new ship would embark first on a shipbuilder's trial, going through a series of runs and maneuvers so as to ensure the engineering was seated in and operating smoothly, and the ship as a whole was in shape to hand over to the navy. Following successful shipbuilder's trials a ship would then run through a set of pre-commissioning navy sea trials. The first to do so in U.S.

Sea trials begin. At 0915 hours on October 29, 1961 Big E left port for shipbuilder's and navy acceptance sea trials. Note the three C-1A Traders from VRC-40 aboard, to fly off the "guests." These were the first planes to launch from Big E's flight deck, and used a traditional take-off without catapults.

USN, USNI collection

The large slabs of the Hughes "SCANFAR" long-range, electronically scanned, phased array or agile beam "billboard" air search radar included four horizontal "billboards" – AN/SPS-32, measuring 40 feet wide x 20 feet high, providing 2D long-range search – and four vertical AN/SPS-33, providing the 3D elevation, or height finding search. The beehive on 011 level contained Big E's unique electronic warfare suite, consisting of AA 8200 ESM dipole antennas. Apart from the AN/SPN-6 aircraft marshal radar used for air traffic control, just visible on the right of the beehive, and the surface search AN/SPS-10 on the roof of the beehive, there were no conventional radars aboard at this time.

USN, USNI collection

Navy shipbuilding history, *Enterprise* conducted combined shipbuilder's and navy pre-acceptance trials.

At 0914 on this day deck crew on *Enterprise* and docksiders on the pier prepared to cast off the huge mooring lines that bonded the carrier to the land. As was the normal practice, the harbor pilot in the navigation bridge gave orders to Big E's engine room prior to casting the lines, so that there would be time for the engines to respond and reverse the ship out of her berth; conventionally powered ships need time to build up enough energy in their propulsion systems. Apparently Rickover had warned that there would be immediate propulsion-plant response, unlike the usual lag of oil-fired ships, but there had been no experience of this previously and *Enterprise*'s reactor-driven propulsion plant did indeed respond immediately, almost snapping one of the large hawser lines. It was considered an auspicious start. With a number of Newport News and navy distinguished visitors on board to witness the first at-sea period, *Enterprise* left Norfolk, sailing via the James River into Chesapeake Bay, many people lining the shore to witness the spectacle.

The flight deck was bare apart from three C-1A Traders from fixed wing fleet logistics Squadron 40 (VRC-40). This was not to be a flight deck qualification, but a focus on the ship's readiness for acceptance into the fleet. Nevertheless these were the first aircraft aboard, present to fly VIPs back to Norfolk during the sea trials. The three Traders made deck runs and were not assisted by the new steam catapults on this occasion. Lt. Cmdr. Oscar Folsom Jr. from VRC-40 took the honors as the first naval aviator to fly off Big E, on October 30, 1961.

Out at sea *Enterprise* rendezvoused with the 1944 veteran oil-fired escort USS *Laffey* (DD-724). Big E was greeted by her escort with the message "Welcome to the Briney Deep." During the initial phase of the sea trials she steamed slowly as the navy command observers, including Bureau of Ships and Naval Reactors, as well as civilian contractors, experts, and specialists, observed, measured, calculated, and tested all of Big E's propulsion system components, with special interest in the reactor performance. As the sea trials proceeded Capt. de Poix ordered incremental revolution increases, bringing *Enterprise* to speeds above 35 knots (40 miles per hour). High-speed turns were then thrown in to test her maneuverability, causing her to heel sharply out of turns – using the rudder behind each of her four propellers. *Laffey* was outperformed by *Enterprise*. In a further message, this time with a humble tone, *Laffey* passed on: "Fuel gone, topside salted, crew wet and engines tired. Nevertheless honored to be the first small boy with world's newest and greatest."[2]

The C-1As from VRC-40 preparing for take-off in October 1961. VRC-40 had the honor of being the first squadron to fly off *Enterprise*, with Lt. Cmdr. Oscar Folsom Jr. becoming the first naval aviator to launch from Big E. They did so under their own power, unassisted. The large radar aft of the beehive on its own mast was CATCC-65's aircraft marshal AN/SPN-6.

USN, USNI collection

Big E returned from extremely successful sea trials on November 3, 1961.

USN photo

After six days of sea trials Big E returned to Norfolk, steaming down the James River with a huge broom hoisted up and lashed to the mast, indicating a "clean sweep" and very successful trials. In fact, although only lightly loaded, the ship had exceeded all the expectations of her builders and the navy. She had achieved 35 knots on speed runs and CNO Adm. George W. Anderson Jr. declared: "Her maneuverability is reported as nothing less than spectacular, for any ship, regardless of tonnage. Her quick reverse from ahead and vice versa must be seen to be believed." He added: "ENTERPRISE has exceeded 40 miles per hour in her initial trials. I think we hit the jackpot." Vice Adm. Rickover was very impressed. All the reactor plant operators successfully passed their underway examinations during the trials, and he noted that during a 30-hour period *Enterprise* had steamed 629 miles (at an average speed of 20 knots).[3]

With successful trials behind her, *Enterprise* went back to the shipbuilder's yards for the completion of outfitting and adjustments prior to her commissioning, a little under a month later. Commissioning of USS *Enterprise* (CVA(N)-65) took place on November 25, 1961, just three months shy of four years after the keel was laid. Thirteen thousand people, including 3,000 crew – Big E's first crew, the "plankowners" – crammed into the hangar bay of the ship and observed Capt. Vincent de Poix formally take command as Big E's first skipper. The last national ensign and jack flags to fly on her predecessor, USS *Enterprise* (CV-6) – from which Capt. de Poix had flown in VF-6 during World War II – were flown from CVA(N)-65 during the ceremony, and Secretary of the Navy, Hon. John B. Conelly Jr. declared in a speech that the carrier would be a worthy successor to CV-6 and that: "She will reign a long, long time as the Queen of the Seas."[4] In Capt. de Poix's commissioning address to the crew and guests he linked the prestigious name *Enterprise* with a prestigious ship and a prestigious crew with much to live up to:

> We have inherited probably the most illustrious name in the history of our country's Navy, that of ENTERPRISE. This name carries with it glory and prestige…it also carries with it responsibility to keep the name untarnished. It must be our

After 30 hours underway for the sea trials, having traveled 629 miles, Big E steamed up the James River with a large broom lashed to her mast, indicating a "clean sweep."

USN

Back in the yards for further systems additions. In the adjacent dock is the cruise liner SS *United States*, which at the time rivaled *Enterprise* as the fastest surface ship afloat. The buildings in the background give a sense of scale to the massive presence of the two ships.

USN

Capt. Vincent de Poix, Big E's first skipper, in the captain's chair on the portside navigation bridge, 010 level, on November 25, 1961, Big E's commissioning day. Capt. de Poix ran a well organized ship that worked at a high operational tempo. She was a showboat, an incubator of new technologies, and an operational unit of the US Atlantic Fleet (2nd Fleet) and Mediterranean Fleet (6th Fleet). Capt. de Poix led the plankowner crew with class through busy trials, cruises, and deployments, winning all imaginable awards for excellence.

Capt. William H. Cracknell collection, source WWHAM

intention to do this and more… to add to its lustre… this latest ENTERPRISE has the potential to make its own great name in naval history. But we are the ones who must bring it to life. We must control the reactors… operate the radars, run the flight deck, man the lines and handle the wheel. Only through our skill, our intelligence, and our dedication will this ship become a worthy successor to her famous namesakes.

> We have every means with our air group, to be a significant instrument of national policy… a strong force for peace or mighty implement of war. I would like it known to all that we, the first crew of ENTERPRISE, realize and assume these responsibilities with all our minds and hearts.[5]

So began the life of USS *Enterpris*e (CVA(N)-65) – the Big E.