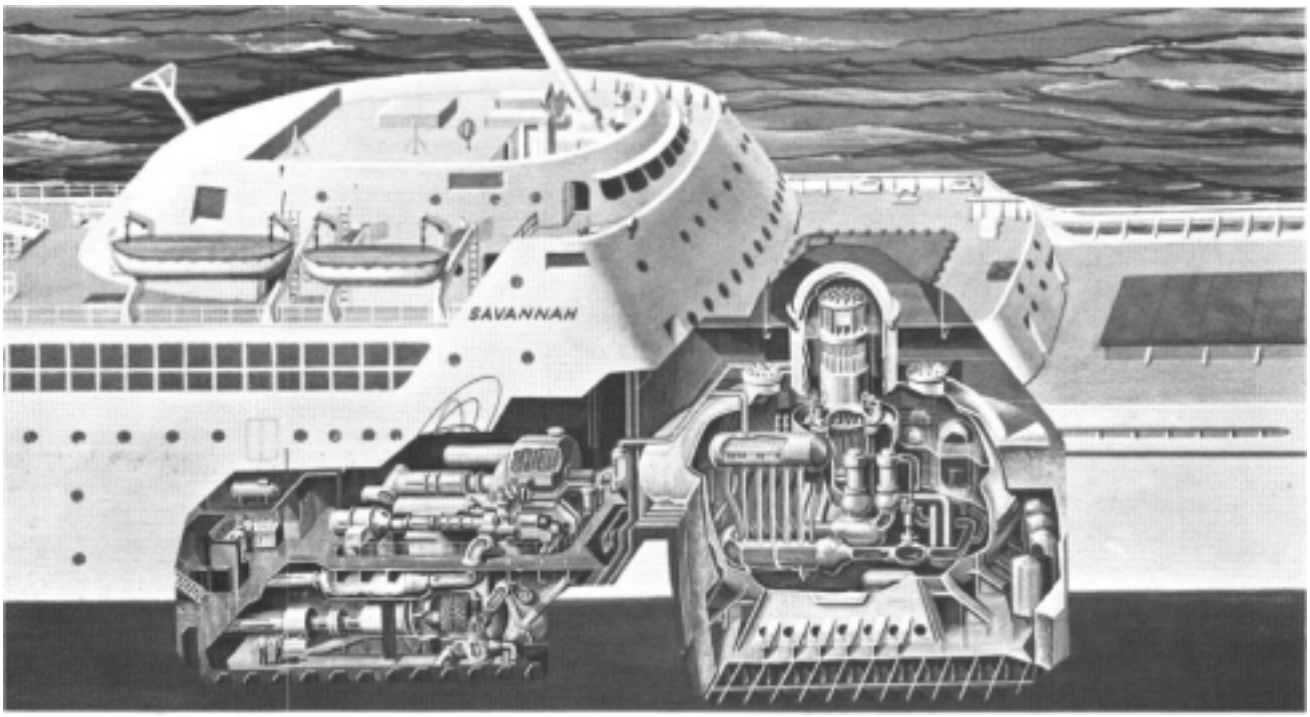
FIRST NUCLEAR-POWERED MERCHANT VESSEL

An International Historic Mechanical Engineering Landmark

The American Society of Mechanical Engineers * October 15, 1983

Patriots Point Naval & Maritime Museum, Mt. Pleasant, S.C.



PURPOSE OF THE SAVANNAH

A technological success, the N.S. SAVANNAH was never intended to be commercially competitive, and was not.

The N.S. SAVANNAH served as the trail blazer for future generations of nuclear-powered merchant vessels. It demonstrated to the world the interest of the United States in the peaceful application of nuclear power and provided a vehicle which would establish the procedures and precedents for the future operation of commercial nuclear ships.

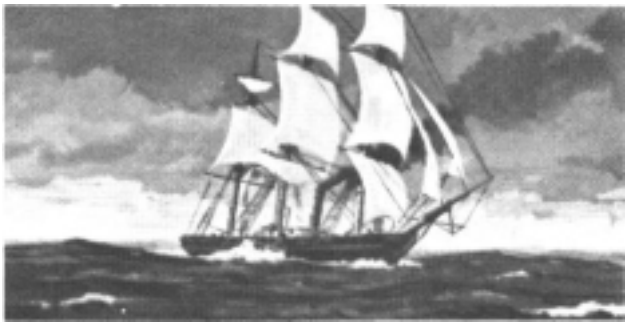
HISTORY OF THE SAVANNAH

On April 25, 1955 in a speech before the Associated Press in New York, President Dwight D. Eisenhower announced plans for a nuclear-powered merchant ship. The ship would be based on specifications developed by the Atomic Energy Commission and the Maritime Administration that he would submit to Congress.

Authorization to build the ship was given by Congress on July 30, 1956 through public law 848 Chapter 792.

The ship was designed by George G. Sharp, Inc. of New York and was built by the New York Shipbuilding Corporation of Camden, New Jersey. The Babcock and Wilcox Company as prime contractor for the power plant designed and built the 74 maximum power thermal megawatt pressurized water reactor.

In a ceremony on July 21, 1959, Mrs. Dwight D. Eisenhower christened the N.S. SAVANNAH which then slipped down the building ways into the Delaware River.



It was fitting that this ship, to usher in the Atomic Age of merchant ships, be christened “SAVANNAH”, for in May of 1819 a 320-ton ship started an epoch-making voyage from Savannah, Georgia to Liverpool, England. She was the S.S. SAVANNAH, the first vessel to use steam on a transatlantic voyage. Her 29-day, 11-hour voyage had ushered in the Steam Age in ocean travel.

Construction took longer than planned, but was essentially completed in the spring of 1961.

After public hearings on the safety of the ship's nuclear system and following extensive tests of the reactor and propulsion plant, the reactor was loaded with uranium oxide fuel in the fall of 1961. It took less than thirty hours to insert all thirty-two fuel bundles which would supply 3½ years' power for the historic ship.

During her sea trials, the captain showed that the SAVANNAH'S reactor could actually surpass its original operating objectives. Instead of delivering 20,000 shaft horsepower to a single propeller, the plant easily produced more than 22,300. Instead of being limited to about 20 knots, SAVANNAH surged along at 24.

Considered by some marine engineers the most beautiful ship ever built, the sleek white SAVANNAH was shown off to the crowds at the 1962 Seattle World's Fair.

Then, suddenly, in Galveston, Texas, the triumphant cruises were interrupted by an argument over salaries. The engineering officers on the SAVANNAH had been granted extra pay from the outset because of the needed nuclear training in addition to their other qualifications. However, the deck officers insisted that they should be paid more than the engineering officers because a deck officer's duties were traditionally more demanding. An arbitrator agreed with the deck officers, but the engineers refused to accept the ruling. In May 1963, the engineers shut down the ship's reactor in protest.

No one could persuade the engineers to return to work so long as they were being paid less than the deck officers. Finally, the Federal Maritime Administration cancelled its contract with States Marine Lines and picked American Export Isbrandtsen Lines to operate the ship. This meant that an entirely new crew (from a different union) would have to be trained. So, for almost a year, the world's first nuclear powered merchant ship sat at the dock in perfect condition but going nowhere.

When the crew was ready, the SAVANNAH steamed back into the spotlight. More than 150,000 visitors boarded her at the first four European ports she visited.

In mid-1965, the luxurious cabins were stripped out and the passenger spaces sealed off and 1,800 tons of solid ballast were removed in preparation for the ship to carry nothing but cargo.

In September, 1965, the SAVANNAH left New York for the first time with a capacity load of 10,000 tons of general cargo.

Even in her new role, the SAVANNAH continued to serve as a goodwill ambassador and a cruising exhibit for the peaceful use of nuclear power in visits to Africa, the Far East, the Mediterranean, and Northern Europe.

In the fall of 1968, the SAVANNAH spent two months at a Galveston shipyard for refueling and maintenance. The actual refueling took only two weeks. After nearly 350,000 miles, only four of the original thirty-two fuel bundles had to be replaced.

A second complete core was built for the SAVANNAH, but never installed. Since there were no plans for future ships, the Maritime Administration decided that little more research and development information could be gained from the $90 million-plus which had been invested in the entire SAVANNAH project.

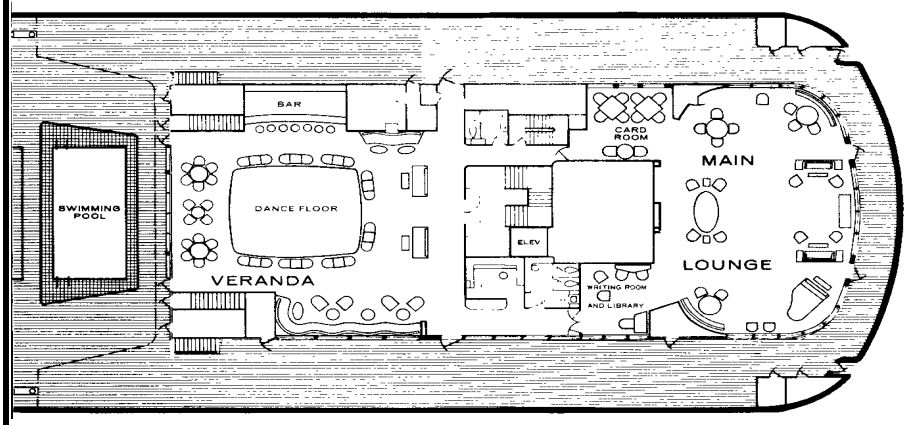
In the fall of 1971, the historic ship was retired.

In January of 1972, the deactivated ship was presented to the city of Savannah, Georgia as part of a proposed Eisenhower peace memorial located there. The city was unable to raise the $2 million required to develop the center and, after four years, the SAVANNAH was again retired.

On August 28, 1980, through public law 96-331, Congress authorized the Secretary of Commerce to charter the SAVANNAH to Patriots Point Development Authority, an agency of the State of South Carolina.

At Christmas time 1981, the SAVANNAH became a permanent exhibit at the Patriots Point Naval and Maritime Museum in Mt. Pleasant, South Carolina.

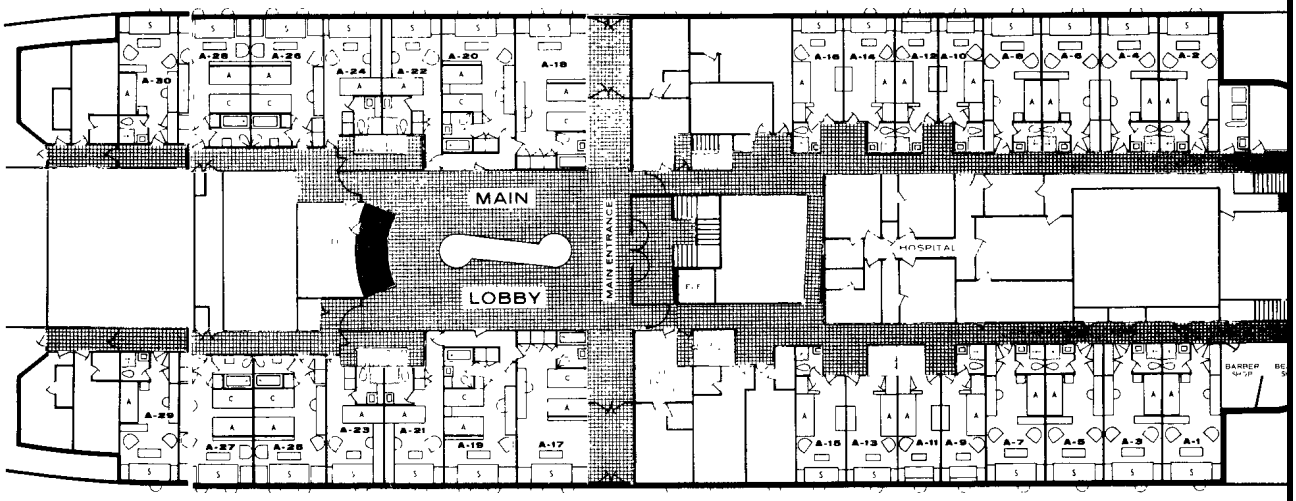
N.S. SAVANNAH



PROMENADE DECK

These Deck Plans show the attractive and ample spaces allocated to SAVANNAH's passengers. The public rooms, modern and colorful in design, are conveniently located on the Promenade Deck. "A" Deck provides air-conditioned accommodations for 60 passengers, with a private bath for each stateroom. The Dining Room is located on "B" Deck.

"A" DECK



LEGEND

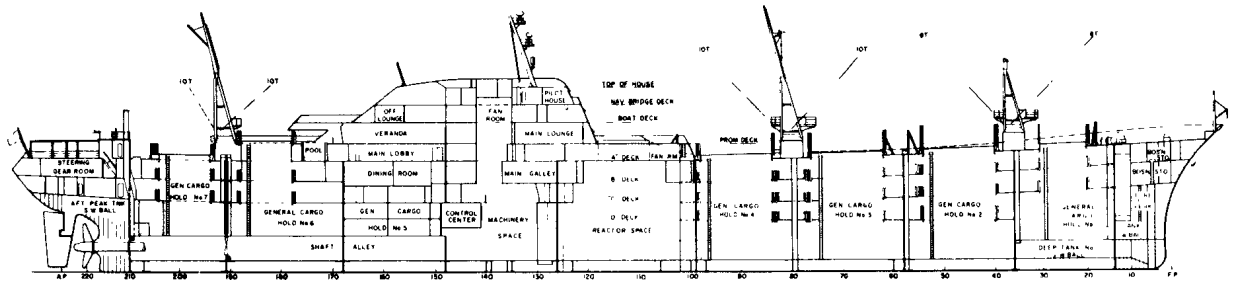
A C	Bed		Bath with Shower		Washbasin		Chair
S	Sofa Bed		Shower		Toilet		Wardrobes

PRINCIPAL CHARACTERISTICS OF THE SHIP

LENGTH, OVERALL APPROXIMATE	595'-6"
BEAM	78'-0"
DEPTH TO PROMENADE DECK	59'-0"
DISPLACEMENT AND TONNAGE	
Full Load Displacement	21,850 L.T.
Light Ship	11,850 L.T.
Total Deadweight	10,000 L.T.
Cargo Deadweight	9,250 L.T.
CAPACITIES	
General Cargo, Bale Cubic @ 80.6 Cu Ft/Ton	746,000 Cu Ft
Refrigerated Cargo	None
Cargo Oil	None
COMPLEMENT	
Passengers (One Class)	60
Officers	25
Crew	84
Other	15
Total	184
SPEED AND POWER	
Trial Speed at Normal Power	21 Knots
Normal Power to Shaft	20,000 SHP
Maximum Continuous Power to Shaft	22,000 SHP
Emergency Take-Home Speed	6.8 Knots
Emergency Take-Home Power	640 SHP
MACHINERY	
Main Power Plant:	Nuclear Steam Generator with Geared Steam Turbine
Emergency Propulsion Motor, Electric	750 HP
Number Propellers	1
Generators, Steam Turbine	2-1500 kw
Generators, Aux Diesel	2- 750 kw
Generators, Emergency Diesel	1- 300 kw
Evaporators	2-16,000 Gal/Day
Boiler, Aux Oil-Fired Package Type	1-7500 Lb/Hr
COMPARTMENTATION	
Nine Watertight Compartments, of Which Any Two May Be Flooded without Loss of the Ship	

PRINCIPAL PLANT PERFORMANCE DATA

OPERATING CONDITION	NORMAL POWER	MAXIMUM POWER
Shaft Power - SHP	20,000	22,000
Propeller Speed - RPM	107	110
Turbine Inlet Pressure - psia	460	445
Main Condenser Pressure - "Hg abs.	1.5	1.5
Boiler Drum Pressure - psia	485	472
Feedwater Temperature - °F	348	340
Total Electrical Load - kw	2,169	2,408
STEAM CONSUMPTION - LB/HR		
a. Main Turbines	187,400	204,500
b. Feed Pump Turbine	21,200	21,500
c. Turbogenerators	32,320	34,540
d. Low Press. Steam Generator	700	700
e. Air Ejectors, Sep'rs and Losses	4,300	4,610
f. Total Generation Required	245,920	265,850
HEAT TRANSPORT - MW		
a. Steam Generators	64.1	69.4
b. Purification System	1.2	1.2
c. Primary Pumps	-0.8	-0.8
d. Heat Losses	0.2	0.2
e. Reactor	64.7	70.0
Primary Loop Pressure - psia	1750	1750
Primary Loop Pressure Drop - psi	61.4	61.4
Primary Loop Flow - lb/hr	8,640,000	8,640,000
Primary Loop Temperature Rise -°F	21.6	23.4
Primary Loop Mean Temperature-°F	508	508
Blowdown - lb/hr	2,400	2,600



ABOUT THE LANDMARKS...

The N.S. SAVANNAH is the fourteenth International Historic Mechanical Engineering Landmark to be designated since the program began in 1973. Since then, sixty-five National and six Regional Landmarks have been recognized by the Society. Each represents a progressive step in the evolution of mechanical engineering and each reflects its influence on society.

The Landmarks program illuminates our technological heritage and serves to encourage the preservation of the physical remains of historically important works. It provides an annotated roster for engineers, students, educators, historians and travelers and helps establish persistent reminders of where we have been, where we are, and where we are going along the divergent paths of discovery.

The Charleston Section gratefully acknowledges the efforts of all who participated on the Landmark designation of the N.S. SAVANNAH, particularly the staff of Patriots Point Naval and Maritime Museum and the Babcock and Wilcox Company.

INTERNATIONAL LANDMARKS

* Cooperative Fuel Research Engine
  Waukesha, WI.
* Holt Caterpillar Track-Type Tractor
  Stockton, CA.
* 100-Inch Telescope, Mount Wilson
  Pasadena, CA.
* Edison Experimental Recording Phonograph
  West Orange, N.J.
* Le Creusot Steam Hammer
  Creusot, France
* Rotating-Arm Model - Test Facility
  Hoboken, N.J.
* Steam Turbine Yacht Turbinia
  Newcastle-upon-Tyne, England
* The Newcomen Steam-Atmospheric Engine
  Dartmouth, England
* FMC Continuous Rotary Pressure Sterilizer
  Santa Clara, CA.
* Corning Ribbon Machine
  Corning, N.Y.
* FMC Whole Juice Extractor
  Lakeland, FL.
* Shorside Container Handling Crane
  San Francisco, CA.
* Owens Automatic "AR" Bottle Machine
  Toledo, OH.
* N.S. SAVANNAH
  Mt. Pleasant, S.C.

INTERNATIONAL HISTORIC
MECHANICAL ENGINEERING LANDMARK

N.S. SAVANNAH
1962 — 1970

PATIOTS POINT NAVAL AND
MARITIME MUSEUM
MT. PLEASANT, SOUTH CAROLINA

The nearly 600-foot-long N.S. SAVANNAH of 22,000 tons displacement was the first nuclear-powered cargo passenger ship, being named after the historic paddle-steamer P.S. "SAVANNAH", the first ship to cross any ocean under auxiliary steam power (1819). Built by the New York Shipbuilding Corporation at Camden, N.J., the pressurized water reactor was supplied by the Babcock & Wilcox Company.

The single 5-bladed propeller accepted 20,000 shaft horsepower at 107 revolutions per minute from a cross-compound De Laval steam turbine set through double reduction gearing to attain speeds in excess of 20 knots. Her maiden trip in 1962 was to major U.S. ports, after which she made several global voyages.

A joint venture by the U.S. Maritime Administration and the Atomic Energy Commission, to the design of George G. Sharp, Inc. of N.Y., the ship demonstrated the technical feasibility of nuclear propulsion for merchant ships and was not expected to be commercially competitive.

THE AMERICAN SOCIETY OF
MECHANICAL ENGINEERS
1983