A JOINT PROJECT OF THE UNITED STATES ATOMIC ENERGY COMMISSION AND THE MARITIME ADMINISTRATION OF THE UNITED STATES DEPARTMENT OF COMMERCE

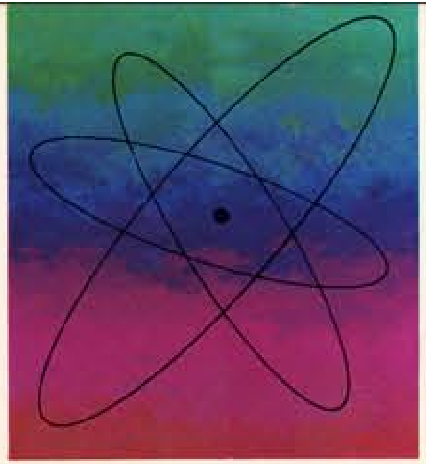
N.S. SAVANNAH

ILLUSTRATED WITH DECK PLANS

AMERICAN EXPORT ISBRANDTSEN LINES

GENERAL AGENT FOR N.S. SAVANNAH OPERATIONS

N.S. SAVANNAH



Touring the ports of the world as an exemplar of the peaceful uses of atomic energy is the N.S. SAVANNAH, the world's first nuclear-powered merchant ship. A product of American technological ingenuity, the SAVANNAH was built as a cargo-passenger ship suitable for commercial service. The N.S. SAVANNAH, a bold and imaginative concept now reality, is a floating messenger of peace, representing to the peoples of the world yet another step forward in the unceasing quest to harness the powers of nature for the betterment of mankind.

NUCLEAR POWER and the SAVANNAH

When the first Steamship SAVANNAH set out on her maiden voyage on May 22, 1819, her holds and even much of her cabin space were crammed with cordwood needed to fire her simple boiler. She was essentially a floating engine. Later steamships substituted more efficient but almost equally bulky coal for the SAVANNAH's cordwood, and their below-deck bunkers usurped much valuable cargo or living space. Modern steamships depend for their power upon vast quantities of fuel oil, stored in huge tanks and requiring complex pumping and piping systems.

The common denominator is a source of heat — wood, coal or oil — to change water to steam and to direct the energy of the steam into a turbine which turns the ship's propellers. The common drawbacks are the limitations of bulk and weight of this heat source and the relatively small proportion of the heat energy which is actually applied to the primary task of moving the ship.

Scientists and engineers have studied this problem unceasingly and have found in the complex field of nuclear physics a new source of energy. A single neutron, a sub-atomic particle of matter, propelled at high speed against the center, or nucleus, of an atom of uranium fuel will split the nucleus and release its energy in the form of heat. Bombarding a mass of uranium with neutrons in a nuclear furnace called a reactor causes a continuous splitting of the fuel nuclei in a chain reaction, with a consequent continuous production of heat energy. It is this energy which provides the motive power for the Nuclear Ship SAVANNAH.

The nuclear reactor aboard the SAVANNAH is charged with 682,000 thimble sized pellets of enriched uranium oxide, the fuel which replaces wood, coal or oil of earlier steamships. The total weight of these pellets of

In 1819, the 97 ft. Steamship SAVANNAH pioneered a revolutionary method of ship propulsion. The first vessel to use steam in an ocean voyage, the tiny American vessel crossed the Atlantic from Savannah, Georgia, to Liverpool, England, in 29 days. Because she could carry fuel for only 89 hours of steaming, most of SAVANNAH's journey was under sail.

fuel is only 17,000 pounds, yet they will provide energy enough for 16,000 hours of steaming at full power, or three and a half years of normal operations. At a cruising speed of 21 knots, SAVANNAH can travel 336,000 nautical miles on a single fuel load. More than 90,000 tons of fuel oil would be required for similar performance by a conventionally powered ship.

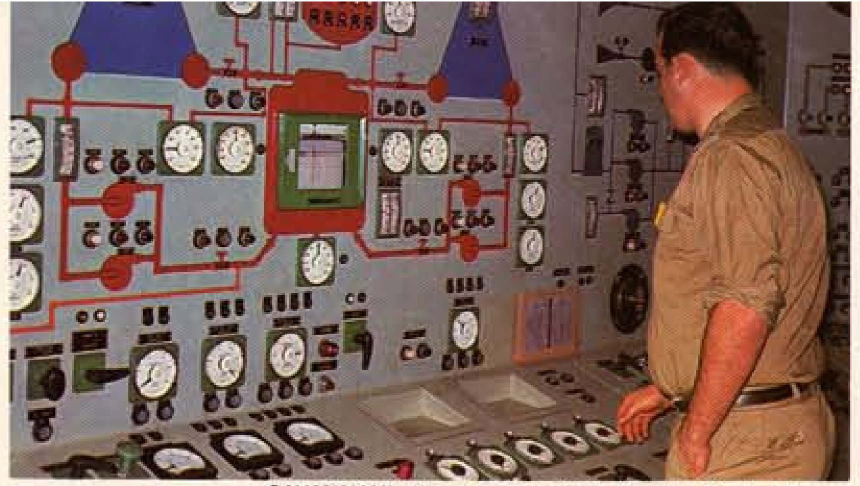
The SAVANNAH's nuclear reactor is located in a huge steel containment vessel deep amidships and immediately forward of the bridge. Within the reactor, boron steel control rods serve as "dampers" for the nuclear furnace. Fully inserted into the fuel core, the rods absorb the neutrons and shut down the reactor by interrupting the chain reaction. As the rods are withdrawn from the core, the chain reaction starts again and the amount of energy produced is governed by the distance the rods are withdrawn. Under operating conditions, the rods are adjusted by the reactor operator in the control room until the proper degree of heat is achieved.

Water, under the enormous pressure of 1,735 lbs. per square inch so that it will not boil, absorbs the reactor heat and transmits it at an average temperature of 508 degrees Fahrenheit to a heat exchanger where steam is produced in a secondary water system. It is this steam which drives the turbines and ultimately the propeller shaft of the ship. The spent steam is reconverted to water as it passes through a chamber surrounded by cold sea water and is ready to resume the cycle as it reenters the heat exchanger.

The SAVANNAH's nuclear power plant operates with a rigidly controlled chain reaction, thus releasing energy in the form of heat for conversion into steam, the conventional power for marine propulsion. If the reactor on the SAVANNAH should ever go out of control, which is highly unlikely, the principal nuclear damage would be a melting of its core, but the protective containment vessel would remain intact.

All components of the nuclear reactor, as well as the heat exchanger, pressurizer, steel drums and related valves and piping, are sealed off under strict conditions of sanitation within the heavy steel containment vessel which itself is shielded by 2,000 tons of lead, polyethylene, concrete and timber. The bottom half of the hemispherical vessel is encased in four feet of reinforced concrete, while the upper half is shielded by a 24-inch laminated steel and redwood collision mat. This massive shielding serves the multiple purpose of controlling the products of the fission process and preventing accidental damage to the reactor itself in the unlikely event of a collision at sea.

The operation, as well as the design and construction of nuclear reactors — whether for power, research or other purposes — is governed in the United States by the rigid control of Atomic Energy Commission and U.S. Coast Guard regulations. Public safety is the prime consideration.



SAVANNAH's "nerve center": the Reactor Control Room.

Technicians guide a reactor fuel element into position.

High Points in SAVANNAH'S History

Former President Eisenhower proposed in 1955 that the United States build the world's first atomic-powered merchant vessel to demonstrate to the world America's peaceful use of the atom, and in 1956 Congress authorized construction of the Nuclear Ship SAVANNAH as a joint project of the Maritime Administration of the U.S. Department of Commerce, and the Atomic Energy Commission.

On National Maritime Day in 1958, the SAVANNAH's keel was laid at Camden, New Jersey. Construction of the vessel and her powerful nuclear reactor advanced rapidly, and the trim white ship was launched with appropriate ceremonies on July 21, 1959.

Extensive outfitting, finishing and testing now proceeded, and by the end of 1961, SAVANNAH's reactor had been fueled and put into operation for the first time. The ship went to Yorktown, Virginia, for dockside and sea trials, which were completed satisfactorily by the end of April, with the ship operating at 100% of power and well in excess of the 20-knot designed cruising speed.

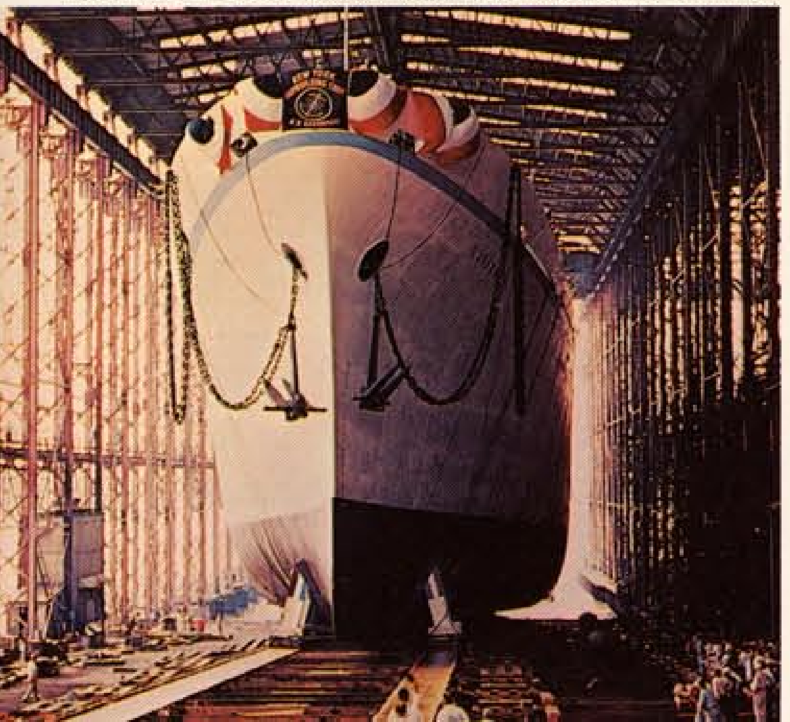
After the sea trials came SAVANNAH's eagerly-awaited maiden voyage. Sailing from her home port of Savannah, Georgia, in August 1962, the ship called at Norfolk, Virginia, and then steamed through the Panama Canal to visit ports along the West Coast and in Hawaii. This journey also marked the inauguration of commercial use of her spacious passenger services and modern cargo facilities. Afterward, in early 1963, the SAVANNAH sailed to Galveston, Texas, for maintenance at her special nuclear servicing pier.

Instead of resuming her scheduled port visits in May 1963, the ship was immobilized by labor troubles. As a result a new general agent (American Export Isbrandtsen Lines) was named and a new crew trained to operate the ship.

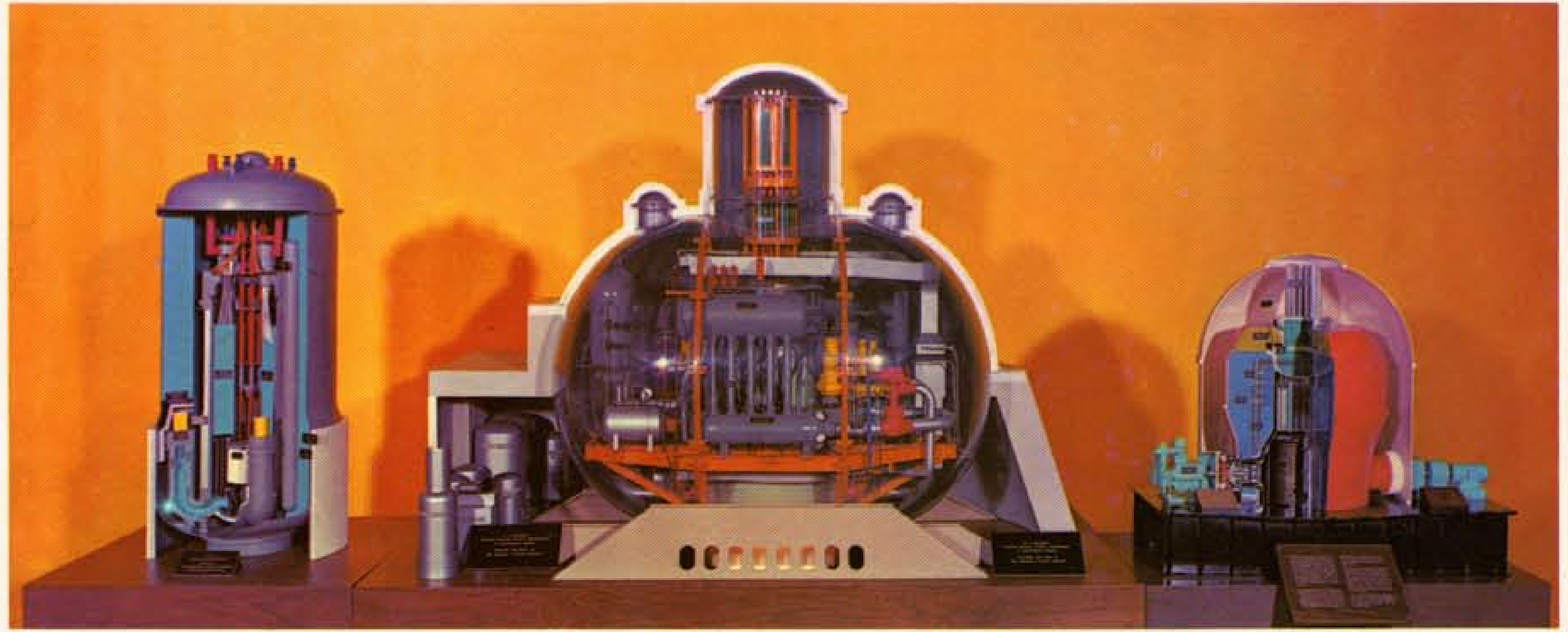
Completely spruced up for her maiden transatlantic crossing (summer 1964), the N.S. SAVANNAH began her second series of domestic visits — this time to Gulf Coast and Eastern seaports — in May of 1964.

In future years, after the SAVANNAH has welcomed those who wish to visit her and completed her demonstration voyages, the ship may enter into regularly scheduled commercial service.

The SAVANNAH slides majestically down the ways after her launching.



Fireboats and small craft welcome N.S. SAVANNAH into port.



Experience with SAVANNAH's reactor (center model) promoted development of smaller, more powerful maritime reactors (left, right).

The Future

The Nuclear Ship SAVANNAH represents only the first short step down a long road that may hold promise for the use of nuclear power in commercial ships of the future. By transforming the concept of nuclear power for merchant ships into a reality, SAVANNAH has secured a place in maritime history. The ultimate effect upon that history, however, awaits the decision of time.

Out of the technical experience derived from the design, construction and operation of N.S. SAVANNAH and the associated reactor development program have come designs for compact new reactor systems — the first nuclear power plant designs thought to be suitable for use in the maritime industry. SAVANNAH's operations to date have evolved a framework of regulations, procedures, standards and agreements that may lead to possible commercial use of nuclear-powered merchant ships in busy foreign and domestic ports. From SAVANNAH's training programs may flow personnel to meet the exacting demands of any future nuclear ship operations. From SAVANNAH's research and development requirements have come the first commercial marine nuclear servicing facilities available to private shipping customers from all countries of the world.

Nuclear propulsion may offer new promise for our merchant fleet. Higher sustained speeds and prolonged periods of uninterrupted operations could permit more trips per ship-year. Compact but more powerful reactors now in the design and testing stage and reduced operating spaces could mean more cargo per trip, more versatility per ship.

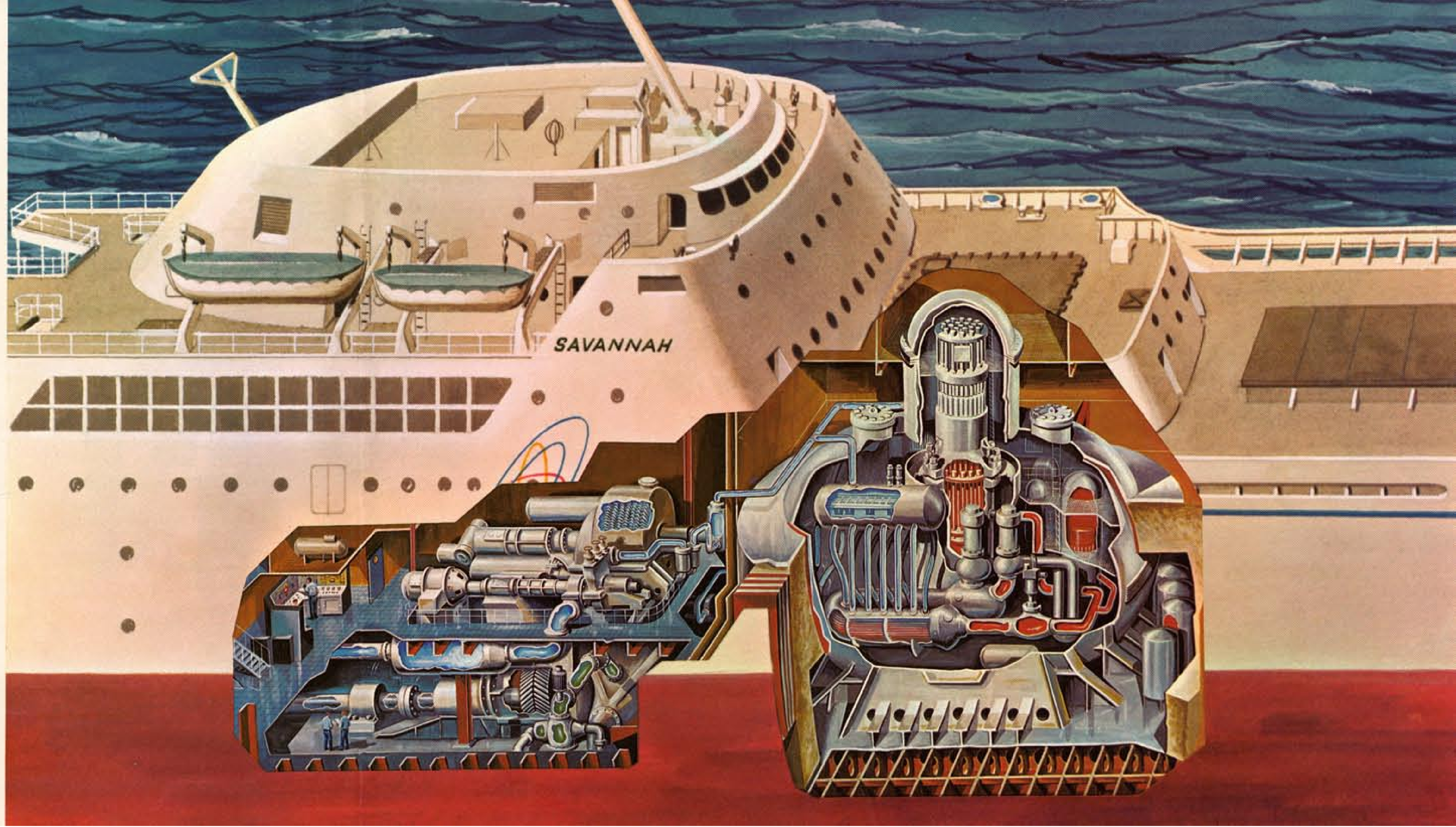
The Nuclear Ship SAVANNAH can provide potential commercial nuclear ship operators with results based upon its experience, not theory, and could lay the groundwork for the first privately owned nuclear ships in the American Merchant Marine.

N.S. SAVANNAH

From gracefully flared bow to modified cruiser stern, the streamlined N.S. SAVANNAH measures 595.5 feet overall. Her beam is 78 feet, her draft 29.5 feet. Capable of cruising at 21 knots, the 22,000 ton ship carries 60 passengers and 9,400 tons of cargo.

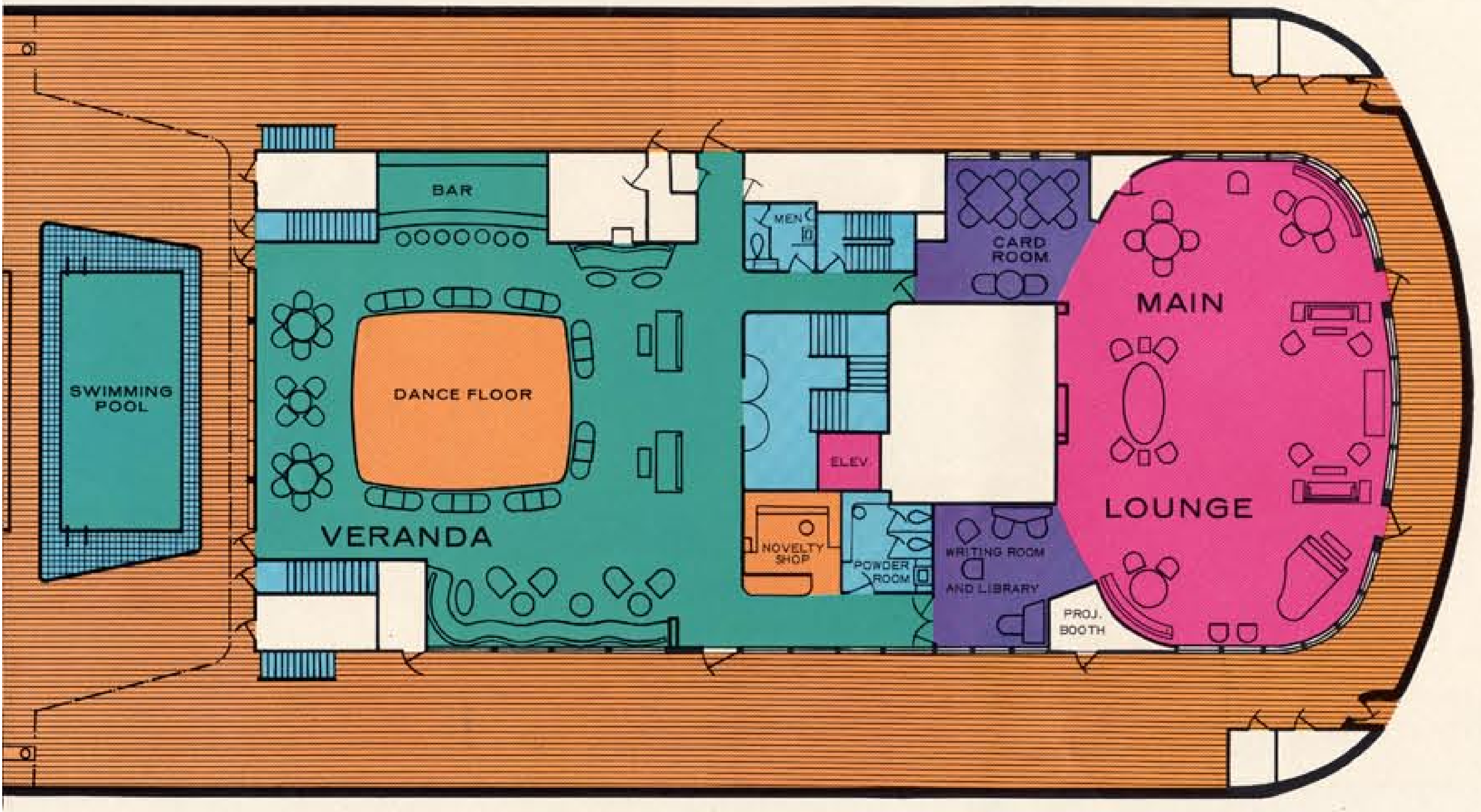
The drawing to the right and the color-keyed legend below provide a brief explanation of SAVANNAH's ultra-modern propulsion system.

- (red) Radioactive water in the **Primary System** circulates through the reactor. Fission-produced heat is captured by this water and carried to the Heat Exchanger.
- (light blue) Via the **Secondary System,** non-radioactive water enters the Heat Exchanger and is converted to steam. This steam drives a turbine which turns SAVANNAH's propeller shaft.
- (green) **Sea Water** is used to cool and condense spent steam, which is then returned to the Heat Exchanger for re-use.

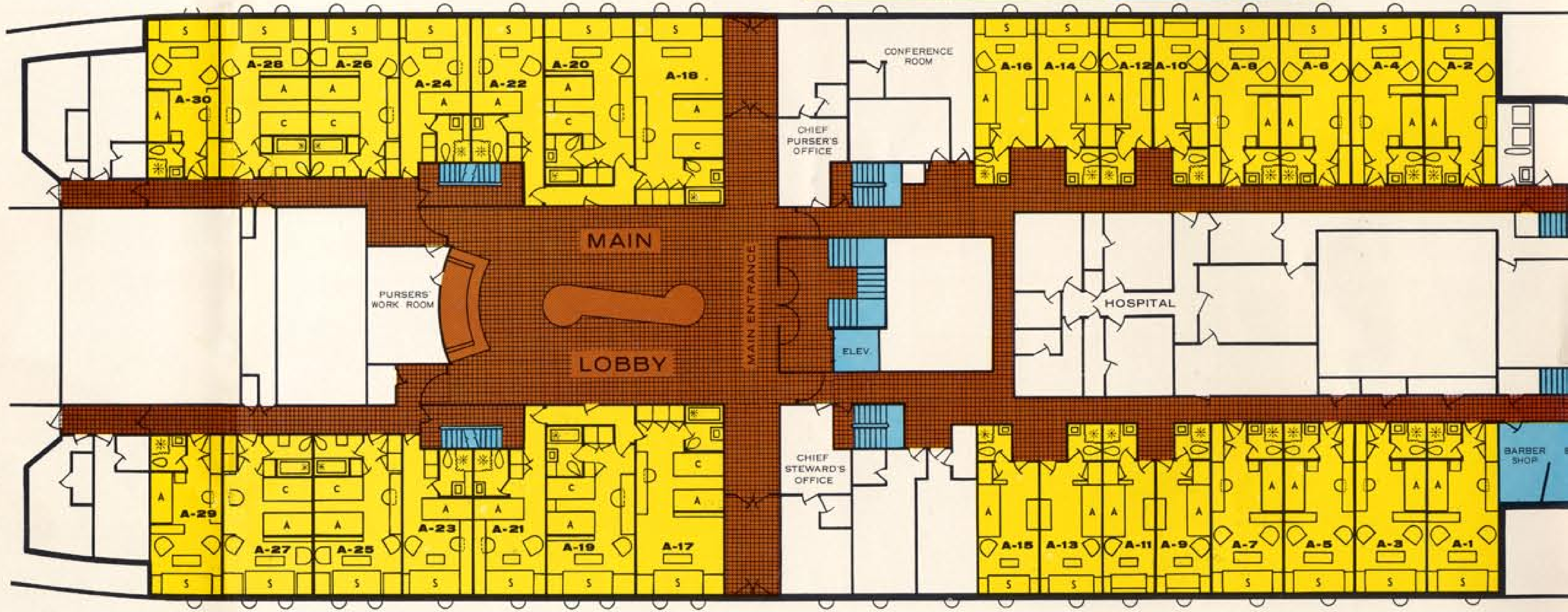


N.S. SAVANNAH

PROMENADE DECK



"A" 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.

LEGEND

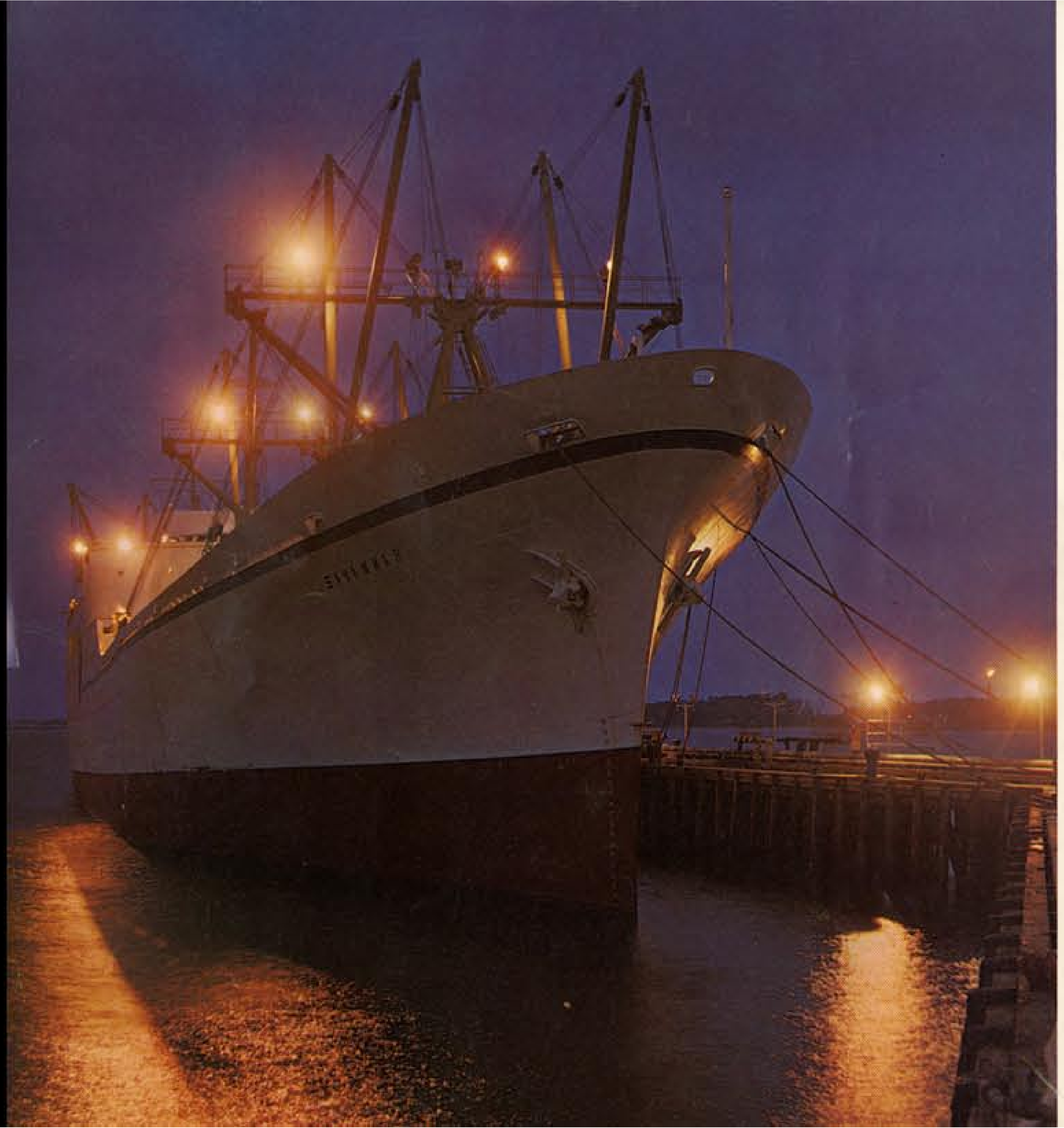
A C	Bed		Bath with Shower		Washbasin		Chair
S	Sofa Bed		Shower		Toilet		Wardrobes

The luxurious Lounge can double as a movie theater.

The Main Lobby, looking toward the Purser's Square.

The spacious Veranda opens onto the Swimming Pool.

A model of the Steamship SAVANNAH decorates the handsome Dining Room.



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