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Nuclear Ships

The age-old dependence of man upon wind and muscle to propel his ships began to come to an end nearly a century and a half ago when the *Savannah,* equipped with sails and an auxiliary 90-horsepower, one-cylinder steam engine and fueled by 75 tons of coal and 25 cords of wood, became the first American ship to use steam for an Atlantic crossing.

This notable accomplishment is celebrated yearly on National Maritime Day, 22 May. But the celebration this year was more than a commemoration. It was marked by an event that foreshadows another great change in marine transportation: the laying of the keel of the world's first nuclear-powered passenger-cargo vessel, which will be appropriately named the *N. S. Savannah* ("*N.S.*" for *nuclear ship*), after its pioneering predecessor.

The new *Savannah,* which is scheduled to be completed in 1960, will not be outstanding among modern vessels either in power or in speed: its shaft horsepower will be only 22,000, its running speed slightly more than 20 knots. Its significance lies rather in its use as an experimental commercial ship for the determination of the costs and the problems of nuclear propulsion.

So far as costs are concerned, no one expects the *Savannah* to be able to compete with conventional ships: the high initial expense of building—estimated at $40.25 million—will not be offset by its infrequent need for refueling. The *Savannah* is expected to run for some 300,000 miles or about three and one-half years on a single charge of 60 kilograms of enriched uranium oxide.

But in time costs will doubtless be reduced to the point at which nuclear ships will become competitive and more than competitive. Before that time comes, it is well to consider some of the special risks that are inherent in nuclear ships both for their crews and ports of call.

As P. T. Fletcher of the United Kingdom Atomic Energy Authority has recently pointed out [*Atom* **19**, 10 (May 1958)], one of the major problems of using a nuclear reactor in a ship will be to contain the fission products, especially in case of accident. Fire, collision, failure of the cooling system, or corrosion of the containing jacket could bring about release of the radioactive fission products with consequent danger to the crew and passengers if the ship were at sea or to a much larger number of people if the ship were in port.

The hazards can, as Mr. Fletcher notes, be reduced, but not eliminated, by engineering safeguards—the reactors can, for example, be designed for automatic flooding in emergencies—and by specially trained crews alert to all of the possibilities of mishap. In most emergencies the hazards to large numbers could be reduced by towing the ship out to sea.

If nuclear-powered ships are to become useful commercially, the governments of the ports that receive them will be obliged to undertake the new and demanding tasks of monitoring for radioactivity and warning the public in possible emergencies.

Cities that serve as ports will probably be the first to cope with the new problems of the atomic age, but as land-based nuclear reactors become more abundant and as the transportation of uranium fuel and radioactive wastes increases, inland cities will also need to make a suitable response. Perhaps "radiation departments" will become as standard in municipal governments as police and fire departments are now.—G.DuS.