AMERICAN RACER
Suisun Bay Reserve Fleet
Benicia vicinity
Solano County
California

HAER CA-346
HAER CA-346

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

American Racer

HAER No. CA-346

Location:	Suisun Bay Reserve Fleet; Benicia vicinity; Solano County, California	
Type of Craft:	General cargo liner	
Trade:	Break-bulk cargo carrying in subsidized liner service	
MARAD Design No.:	C4-S-64a	
Hull No.:	629 (builder); MA-147 (MARAD)	
Official Registry No.:	297001	
IMO No.:	6414069	
Principal Measurements:	Length (bp):	507′-7″
	Length (oa):	544′
	Beam (molded):	75′
	Draft (molded):	27′
	Depth (molded, to Main Deck)	42′-6″
	Displacement:	20,809 long tons
	Deadweight:	13,264 long tons
	Gross registered tonnage:	11,250
	Net registered tonnage:	6,716
	Maximum continuous shaft horsepower:	18,750
	Service speed:	21 knots
	(The listed dimensions are as-built, but it should be noted that draft, displacement, and tonnages are subject to alteration over time as well as variations in measurement.)	
Propulsion:	Single-screw steam turbine	
Dates of Construction:	Keel laying:	June 18, 1963
	Launching:	May 13, 1964
	Delivery:	November 12, 1964
Designer:	Friede and Goldman, Inc., Naval Architects and Marine Engineers, New Orleans, Louisiana	
Builder:	Sun Shipbuilding and Dry Dock Co., Chester, Pennsylvania	
Original Owner:	United States Lines Company	
Present Owner:	Maritime Administration U.S. Department of Transportation	
Disposition:	Laid up in the National Defense Reserve Fleet	

Significance:

The *American Racer* is a cargo ship designed to carry general, refrigerated, and liquid freight in express ocean service. Propelled by steam turbines geared to a single screw, the ship features one of the earliest engine-automation systems installed aboard an America vessel. This system permits direct control of engine speed from the wheel house and centralized control and monitoring of the propulsion plant and other mechanical systems. It was designed to reduce the number of men needed to run the ship as well as to improve operational safety and efficiency.

The career of the *American Racer* demonstrates how rapidly the technology of international shipping changed in the mid 1960s as companies worldwide adopted intermodal, containerized freight handling. Although state-of-the-art when new in 1964, the ship was essentially a traditional break-bulk freighter, although its hatch and hold dimensions were calculated to accommodate shipping containers if needed. In February 1966—just fifteen months after the ship entered service—United States Lines, its owners, modified it to carry more than 200 containers but retained some break-bulk capacity. Twenty-eight months later, this mixed arrangement had proven uneconomical, so the company converted the ship back to full break-bulk stowage and chartered it to the U.S. government for use in the sealift of materiel to Vietnam. The movement of world shipping toward containers had rendered the *American Racer* obsolete for commercial liner service in less than four years.

United States Lines traded the ship in to the government in 1983, after more than a decade on charter, and the *American Racer* has remained ever since in the reserve fleet at Suisun Bay, California.

Author:

Michael R. Harrison, 2010

Project Information:

This recording project was cosponsored by the Historic American Engineering Record (HAER) and the U.S. Maritime Administration (MARAD). The vessel was documented under the direction of Todd A. Croteau, HAER Maritime Program Coordinator, and Barbara Voulgaris, MARAD Historian. Team members included architect Ashley T. Walker, photographer Jet Lowe, and historian Michael R. Harrison.

PART I. HISTORICAL INFORMATION

A. Physical History

1. Dates of construction: The United States Lines Company signed the contract for construction of the cargo ship *American Racer* and its four sisters on October 10, 1962. The builders laid the ship's keel on June 18, 1963, launched the ship on May 13, 1964, and delivered it on November 12, 1964.[1]

2. Designer: Friede and Goldman, Inc., Naval Architects and Marine Engineers, of New Orleans, Louisiana, won the contract for the design of the United States Lines' *Challenger II* class of express cargo ships, of which the *American Racer* is one. Friede and Goldman developed the final design of these ships in close collaboration with the technical division of United States Lines. The hull form was tested using a self-propelled model at the U.S. Navy's David Taylor Model Basin in Bethesda, Maryland.[2]

3. Builder: The Sun Shipbuilding and Dry Dock Company of Chester, Pennsylvania, built the *American Racer* and its four sister ships, the *American Rover*, *American Ranger*, *American Reliance*, and *American Resolute*. The *American Racer* was the second ship of the group laid down but the first launched and the first completed (see Appendix I). Suzanne Roosevelt (*née* Perrin), the wife of U.S. Under Secretary of Commerce Franklin D. Roosevelt, Jr., sponsored the ship at its launch.[3]

4. Original plans: United States Lines bought the *American Racer* to carry commercial freight in express ocean cargo service. Its design, called *Challenger II*, was an improvement on the company's previous flight of high-speed freighters, the *Challenger* class, with modifications incorporated to meet the needs of the company's service to Australia and New Zealand. The company's freight department determined that vessels for the Antipodes needed substantial capacity for refrigerated cargo—to handle "large lots of deep-frozen meats"—and a "large assortment of relatively small cargo-oil tanks to service the growing demand for liquid shipments." Furthermore, company officials decided these ships should have "maximum flexibility in compartmentation"; that is, their holds should be sufficiently subdivided to keep cargo for or from different ports separate and secure.[4] Despite the incorporation of these features, the five *Challenger II* ships, when completed, entered service on the North Atlantic, the United States Lines having, by that time, decided to sell its Australia/New Zealand service.

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[1] "The Maritime Administration Shipbuilding Program from 1950 to 1984," chart by Frank A. Gerhardt reproducing contract data found in the Records of the Maritime Administration (RG 357), National Archives and Records Administration, http://appendix.usmaritimecommission.de/documents /documents_main.htm.

[2] Nicholas Bachko, "SS American Racer: A Ship Designed for Shippers' Needs," *Marine Engineering/Log* 69, no. 11 (Nov. 1964): 56, 60.

[3] "American Racer launching," *New York Times* (hereafter cited as **NYT**), May 4, 1964, 58; Werner Bamberger, "Automated ship launched by Sun," NYT, May 14, 1964, 70.

[4] Bachko, "SS American Racer," 56.

The *American Racer* was the first of the five ships delivered. Its large-scale refrigerated holds made up 22 percent of its total cubic cargo capacity—a very high amount for a general-cargo ship. Designers carefully planned these spaces to be efficient to load and unload, economical to operate and maintain, and flexible enough to hold a variety of both frozen and dry cargoes. The reefer compartments were given hinged door sills; flush decks with no gratings; wide, light-weight access doors, and strong deck scantlings to permit the use of loaded forklifts in these spaces as well as in the standard cargo hold. To save space, designers selected 7″-thick rigid polyurethane insulation for the reefer compartments instead of the then-standard 14″-thick glass wool. To save weight, minimize maintenance, and maximize vapor impermeability, the reefer boxes were built with aluminum linings.[5]

As large and well-thought-out as these refrigerated spaces were, the *American Racer*'s most significant feature was its engine automation system, one of the first installed aboard an American ship. This system provided centralized control and monitoring of the propulsion plant and its auxiliaries, and it allowed remote control of engine speed from the wheel house. It was designed to reduce the number of engineers needed to run the ship as well as to improve operational safety and efficiency.

For simplicity and reliability, the automation system was explicitly designed to incorporate existing engine-room equipment and existing control technology. The designers worked out the ship's machinery layout—particularly the boiler and the turbogenerator locations—to allow the most convenient access to key systems by personnel stationed at a central engine-room control console. This 17′-long console contained controls for the turbines, boilers, turbogenerators, and auxiliary equipment, as well as a bell logger to record alterations to engine speed and direction and a data logger to record twenty specific temperatures and pressures across the engine plant. The throttle, numerous valves, and the various pump controls—traditionally hand operated and located at points throughout the engine room—were simplified and given motor or hydraulic actuation while their control was also brought to the console. Throttle control was duplicated at a second console in the wheel house, which also contained the ship's master digital clock (used to key all data logging), a telegraph, a steam gauge, and various alarms, including an "attendance alarm . . . to warn the bridge if the engineer fails to ring in a half hour from his last call."[6]

Centralized and remote control of the ship's speed was made possible by an advanced burner management system that allowed automatic adjustment of the flame intensity inside the boilers in response to steam demand. Conventionally, burners could be either on or off; here, by using steam pressure to atomize the fuel, the burners could be turned up or down to adjust boiler conditions. In addition, the *American Racer* was fitted with automatic flame scanners to extinguish the burners automatically in cases of "imperfect combustion."[7]

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[5] E. Scott Dillon, et al., "Forty Years of Ship Designs Under the Merchant Marine Act, 1936–1976," Society of Naval Architects and Marine Engineers *Transactions* 84 (1976): 185; Bachko, "SS American Racer," 59, 68.

[6] Bachko, "SS American Racer," 64–65; General Electric News Bureau, "Business Press" news release, n.d. [Nov. 1964], 2, in Hagley Museum and Library, Sun Shipbuilding and Dry Dock Co. Records (acc. 1718), series v: Records of Individual Ships, *American Racer* (hereafter **Sun Shipbuilding Records**).

[7] Robert P. Crossley, "The Ship You Drive with One Finger," *Popular Mechanics* (Aug. 1966), 188.

The *American Racer* contains the first single-plane engine installed on an American-built ship. This design, where the turbines, gearing, and shafting are all on one level within the ship, was adopted to provide additional foundation stiffness and better thrust absorption. It also gave the engine a low silhouette that allowed designers to place the main condenser ahead of the low-pressure turbine (instead of on another deck) and the boilers on the deck above (over the thrust bearing), where the burner aisle was readily accessible from the engine-room control console.[8]

The automation system cut the number of crew needed to safely operate the *American Racer* and its sisters, but this reduction required United States Lines to negotiate new manning scales with the unions representing its employees. In exchange for reduced engine- and deck-crew numbers, management agreed to provide individual staterooms of a minimum size with private or semi-private toilet facilities for all crew members aboard its automated ships. The company also agreed to installing improved vessel tie-up equipment and to aluminizing of rigging and "dimetcoting" of booms, kingposts, exposed decks, and machinery foundations to reduce maintenance. These new labor agreements were reached late in the development of the *Challenger II* design and required redesigning the ships' accommodation plans. Additional levels could not be added to the ships' deckhouses because of stability constraints, so extra space for staterooms was, in the words of United States Lines technical services manager Nicholas Bachko, "carved out of fan rooms and alleyways." The hospital was eliminated by designing the relief engineer's room to double as a hospital at sea, with space provided in a secure locker nearby for medicines and supplies.[9]

5. Original cost: The contract price for the construction of the *American Racer* was $10,590,000. Of this, the federal government paid $5,141,900 (48.6 percent) as a construction-differential subsidy and $18,100 for machinery improvements considered necessary to equip the ship for potential national-defense use, leaving United States Lines to pay $5,430,000 for the ship upon delivery.[10]

6. Modifications: The *American Racer* suffered from vibration problems when new, which United States Lines spent $24,000 to correct in early 1966.[11]

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[8] Bachko, "SS American Racer," 59, 63.

[9] As Bachko explained, "Since all members of the crew have single rooms, the hospital is necessary only to satisfy regulations as to accessibility to a berth when using a stretcher"; ibid., 59, 67. Dimetcote is an inorganic zinc coating used to protect steel from corrosion.

[10] Bamberger, "Automated ship launched by Sun," 70; "1964 Output of United States Shipyards," *Marine Engineering/Log* 70, no. 2 (Feb. 1965): 52–53; "Building subsidy paid to 13 of 28 ships in 1964–65 list," *Baltimore Sun* (hereafter **BS**), July 8, 1965, 36; Frank A. Gerhardt, "Title V New Construction Contracts, for period beginning July 1st 1957," chart by reproducing financial data from the National Archives and Records Administration, College Park, Md., Records of the Maritime Administration (RG 357), http://appendix.usmaritimecommission.de/documents/documents_main.htm.

[11] See the modification notations listed in the front cover of Friede and Goldman, Inc., *Specifications for a Single Screw Cargo Vessel, Turbine Propulsion, Maritime Administration Design C4-S-64a, United States Lines Company, New York, New York*, Apr. 5, 1962, with modifications to Mar. 10, 1966, National Archives and Records

In February 1966, just fifteen months after entering service, the ship was sent to the Maryland Shipbuilding and Drydock Company in Baltimore, where workers installed a steel cellular framework in Holds Nos. 3 and 4 to allow the loading of up to 150 standard 20′ shipping containers. With additional containers stowed in the non-converted holds and on deck, the modified ship could transport more than 200 containers, which took up about half of the vessel's hold capacity and left room for about 6,000 tons of break-bulk cargo. These modifications took two weeks to complete and cost $171,000. All four of the *Racer*'s sister ships were similarly modified round the same time.[12]

Twenty-eight months later, the ship was converted back to full break-bulk stowage in preparation for charter to the U.S. government, work that was again done at Maryland Shipbuilding's Fairfield yard. The *American Ranger* and *American Reliance* were similarly reconverted for charter, while sisters *American Rover* and *American Resolute* had recently been converted to full containerships.[13]

B. Historical Context

American subsidized liner shipping

The U.S.-flag merchant fleet, swelled by wartime shipbuilding and aided by the decimation of other nations' fleets, carried over 68 percent, by tonnage, of America's waterborne foreign trade in 1945. The return and growth of competition from lower-cost foreign-flag carriers, coupled with the high cost of building ships in U.S. yards and manning them with American sailors, reduced this amount to 39 percent by 1950 and 12 percent by 1960.[14] The dwindling number of American-registered ships on the high seas was widely seen by shipping executives, military planners, and government officials as a threat to the nation's economical vitality and emergency mobilization capacity; it also endangered the maintenance of a skilled shipbuilding industry.[15]

Shipping companies, however, faced two significant obstacles to greater market share: labor costs and construction costs. Ret. Adm. John M. Will, former commander of the Military Sea Transportation Service and president and chairman of the board of American Export Lines,

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Administration, College Park, Md., Records of the Maritime Administration (RG 357), Ship Specification Files 1936–2004, box 2.

[12] Edward A. Morrow, "U.S. Lines plans shipping service," NYT, Feb. 9, 1966, 78; Werner Bamberger, "U.S. Lines starts container route," NYT, Mar. 19, 1966, 58.

[13] "Port to add containers," BS, June 10, 1968, C14.

[14] The American merchant marine comprised 2,827 ocean-going ships of 1,000 gross tons and over as of June 30, 1960, including 571 ships in foreign trade (310 of which were subsidized), 372 ships in domestic trade (none subsidized), and 1,884 government-owned vessels in reserve; U.S. Department of Commerce, *Annual Report of the Federal Maritime Board and Maritime Administration*, *1960* (Washington, D.C.: G.P.O, 1960), 57, 62 (hereafter **MARAD Annual Report**); U.S. Bureau of the Census, *Statistical Abstract of the United States, 1965* (Washington, D.C.: G.P.O., 1965), 598.

[15] See John M. Will, "By Ship—The Salt of the Sea Not Withstanding," *Annals of the American Academy of Political and Social Science* 345 (Jan. 1963), *passim*.

Inc., wrote in 1961 that American "shipboard labor costs are four to five times as great as those of our foreign competitors. Recurring demands for increases in wages and fringe benefits, accompanied by more restrictive provisions in working conditions, resulting in diminished productivity, are responsible for this unfavorable situation." Echoing this point, *Time* magazine reported in 1964 that the average seaman's wage in America was $3.16 an hour, compared to $1.00 in Europe and $0.73 in Japan. Wages for both able seamen and officers on U.S. ships were 80 percent higher in 1959 than they had been in 1947. This was a boon for professional mariners, but a drain for operators. At the same time, construction costs in American shipyards were almost twice as high as those in foreign yards. Throughout the 1950s and 1960s, increasing numbers of American owners chose to register their ships abroad under "flags of convenience" to gain a freer hand in purchasing vessels overseas, hiring foreign crews, and avoiding many taxes and regulations. Not all companies could do this, however, as U.S. registration was required for a ship to engage in coastal trade, carry defense and government-aid cargoes, and qualify for various forms of lucrative federal financial support.[16]

The Merchant Marine Act of 1936 contained provisions designed to address these problems. To offset the difference between U.S. and foreign capital and labor costs, the law created the construction-differential subsidy and the operating-differential subsidy. Only liner operators engaged in foreign trade qualified for these subsidies, and the government required that they enter into contracts with the Maritime Administration (MARAD) to receive them.[17]

The liner or berth trade was the primary recipient of these subsidies. It comprised vessels operated on regular schedules over fixed routes in foreign trade. Liner companies tended to handle manufactured goods and general merchandise—things of value that warranted the expense of timely and predictable delivery—in contrast to tankers and tramp steamers, which carried bulk cargoes such as coal, ores, and petroleum. In 1956, liners transported 19.5 percent of all U.S. waterborne imports and exports by tonnage, which accounted for 72.2 percent of trade by value. Tankers and irregular carriers, on the other hand, transported 80.5 percent by tonnage, but only 27.7 percent by value. U.S.-flag liners moved 38.9 percent of all liner cargo that year, at a time when the overall U.S. share in waterborne foreign trade was just 20 percent. By 1960, these numbers had dropped to 30.2 percent and 12 percent.[18]

As Admiral Will explained in 1961,

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[16] Will, "By Ship," 84; "Shipping: At Low Tide," *Time*, Sept. 11, 1964, http://www.time.com/time/magazine/article/0,9171,830683,00.html; Curtis T. Clayton, "A Practical Approach to Ship Automation," *Naval Engineers Journal* 76, no. 1 (Feb. 1964): 110; "Defense planned of foreign flags," NYT, Mar. 23, 1958, S11; "'Flags of convenience,'" NYT, Apr. 20, 1958, E8.

[17] The operating-differential and construction-differential subsidies are explained in detail in chapter 2 of Allen R. Ferguson, et al., *The Economic Value of the United States Merchant Marine* (Evanston, Ill.: The Transportation Center at Northwestern University, 1961).

[18] Ferguson, *Economic Value*, 32, 484; Will, "By Ship," 84, 88.

> Companies receiving operating-differential subsidies . . . contract to maintain a stated number of regularly scheduled sailings, over specific world-wide trade routes, . . . on a win-or-lose basis. They contract to replace their fleets on an orderly schedule, to build these ships with American materials and in American yards, to crew their ships with American citizens, to purchase supplies and equipment and to make repairs in the United States, and to make their ships available to the government at depreciated book value in the event of a national emergency.[19]

In addition to being suitable for use as supply ships or transports in times of national emergency, vessels subsidized under the Merchant Marine Act could not exceed twenty-five years of age (so-called statutory obsolescence) without special approval from MARAD, which was frequently granted.[20]

As a result of federal subsidies, U.S.-flag liner companies faired better against global competition in the 1950s and 1960s than non-subsidized tanker and tramp operators did. "The strongest segment in our fleet is the liner segment," Admiral Will wrote, "most of which operates under subsidy contracts with the government."[21] By 1960, fifteen U.S. companies held operating-subsidy contracts with the government.[22]

During the 1950s, however, these companies' fleets consisted almost entirely of cargo ships built during World War II. Few needed to purchase new freighters during the decade, but competition from increasingly modern foreign ships and the impending statutory obsolescence of large numbers of their ships in the early- to mid-1960s led some to embark on fleet replacement programs supported by the construction-differential subsidy. Beginning in 1956, MARAD aggressively encouraged fleet replacement. As operating-subsidy contracts expired, federal officials negotiated new agreements that required operators to commit to phased, fifteen- to twenty-year replacement programs. "Four of the [subsidized] lines already have adopted programs which call for an estimated $1 1/2 billion shipbuilding program over the next 15 years," John Norris reported in the *Washington Post* in June 1956. "Others are being negotiated." By June 1959, MARAD had signed fifteen operating-subsidy contracts that committed U.S. shippers to "the collective replacement of 299 ships between the years 1958 and 1978, at a construction cost approximating $4.4 billion."[23]

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[19] Will, "By Ship," 86.

[20] The statutory maximum age for subsidized ships was changed to twenty-five years in 1960; previously, it had been twenty; Ferguson, *Economic Value*, 55 and 45 (note 37).

[21] Will, "By Ship," 85.

[22] MARAD Annual Report 1960, 57.

[23] Dillon, "Forty Years of Ship Designs," 183; MARAD Annual Report 1956, 1–3; John G. Norris, "U.S. merchant marine entering boom stage," *Washington Post*, June 17, 1956, B6; MARAD Annual Report 1959, 4.

United States Lines

The United States Lines Company, headquartered in New York City, was one of the shippers that committed to a fleet-replacement program in the late 1950s. In 1962, the year United States Lines ordered the *American Racer*, it was the largest American liner company, operating fifty-two cargo vessels and two passenger ships under subsidy on routes between U.S. Atlantic- and Gulf-coast ports and Europe, the Far East, Australia, and New Zealand.[24]

The U.S. Shipping Board had created the United States Lines in August 1921 as part of a broad post-World War I effort to strengthen America's commercial presence on the world's oceans by placing government-owned surplus tonnage under private management. It initially managed nine former German passenger ships running to Britain and northern Europe, but during its first decade it became prominent in the popular imagination as the operator of the liner *Leviathan*, the world's second largest ship. Its commercial success was hampered, however, by a mismatched fleet and by the enforcement of prohibition on its ships.[25]

In March 1929, the Shipping Board sold the assets and trade name of United States Lines to P. W. Chapman and Company of Chicago and New York, along with the American Merchant Lines, a combination cargo/passenger service created in 1924 from ships split off from the United States Lines. Only American Merchant's route to London prospered during the first years of the Depression, and the Chapman concern soon failed. A combination of American shipping companies led by the recently merged Roosevelt Steamship Company and the International Mercantile Marine Company (IMM) bought the lines in late 1931 and continued to operate them as a new subsidiary, the United States Lines Company (of Nevada). In 1937, IMM eliminated the American Merchant Lines as a separate brand and moved its freighters to the United States Lines. Two years later, on the eve of World War II, the United States Lines fleet counted four transatlantic passenger liners and seven combination cargo/passenger ships.[26]

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[24] MARAD Annual Report 1960, 57; House Committee on the Judiciary, *The Ocean Freight Industry*, H. Rpt. 1419, 87th Cong., 2d Sess., Mar. 12, 1962, 43. United States Lines' foreign-trade routes are listed as of July 1960 in Ferguson, *Economic Value*, 42–43.

[25] The U.S. Shipping Board had initially chartered its nine German liners to the United States Mail Steamship Company, established by shipping magnates Charles and Francis R. Mayer in 1920. Inadequately capitalized, U.S. Mail promptly collapsed, and the Shipping Board took back its ships and assigned them to the joint management of three established companies—United American Lines, the Roosevelt Steamship Company, and the Moore and McCormack Company—under the trade name United States Lines. N. R. P. Bonsor, *North Atlantic Seaway*, vol. 4 (Jersey, Channel Islands: Brookside Publications, 1979), 1523 *et seq.*; C. R. Vernon Gibbs, *Passenger Liners of the Western Ocean*, 2nd ed. (London: Staples Press Ltd., 1957), 272–76, 279–80; "Leases 13 ships to new mail line," NYT, May 30, 1920, 1; "Plans announced for new ship line," NYT, June 3, 1920, 8; "5 U.S. Mail ships seized by Lasker for failure to pay," NYT, July 23, 1921, 1; "Harriman to run seized Mail ships; four more taken," NYT, July 24, 1921, 1; "United States Lines will operate passenger vessels," *Wall Street Journal* (hereafter cited as **WSJ**), Aug. 30, 1921, 8; *Trade Routes and Shipping Services, United States Shipping Board* (U.S. Shipping Board, 1927), copy in Ralph E. Cropley Scrapbooks, Transportation Collections, National Museum of American History, Washington, D.C.

[26] Bonsor, *North Atlantic Seaway*, vol. 4, 1572; *Eighth Annual Report of the United States Shipping Board, Fiscal Year Ended June 30, 1924* (Washington, D.C.: G.P.O, 1924), 78; "Shipping Board to deliver steamers," NYT, Feb. 18, 1924, 6; "U.S. Lines begins freight service," NYT, Mar. 2, 1924, 24; "Consolidations cut ship board costs," NYT,

In May 1943, the United States Lines Company (Nevada) merged with its parent, IMM, and the two together became the United States Lines Company (New Jersey). During the war, the company acted as agent or charter operator for a varying number of War Shipping Administration vessels, but its core fleet remained modestly sized, comprising new tonnage built with subsidy aid under the Merchant Marine Act. The line grew considerably starting in 1946 with the acquisition of a substantial number of war-designed C2 cargo ships. In 1952, it took delivery of the superliner *United States*, the finest example of marine engineering in America at the time, which gave the company prominence in the public eye. Throughout the 1950s and 1960s, United States Lines was consistently one of the three largest American subsidized liner companies.[27]

In the second half of the 1960s, United States Lines managers worked to transform the line's core business from break-bulk to container shipping. Walter Kidde and Company bought the company in 1969 and allowed its operating-differential-subsidy contract to expire that year in order to free themselves from many government constraints. The line, subsequently bought by McLean Securities, Inc., in 1978, ordered twelve 4,458-TEU containerships from a South Korean yard in 1983. Designed to be fuel efficient, they were slow and lost the line business. In the largest bankruptcy in U.S. history to that point, the company collapsed in November 1986 and was liquidated.[28]

Automation

The strong position of United States Lines in the two decades after World War II was due in no small part to government subsidy aid. Under a revised operating-subsidy contract signed in 1959, the company embarked on a $395 million, forty-six-ship replacement program. The

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Sept. 15, 1924, 23; "Chapman acquires federal ship lines," NYT, Mar. 22 1929, 56; "Line to add two ships," NYT, Sept. 12, 1931, 35; "New owners get U.S. Lines today," NYT, Dec. 9, 1931, 51; "American Merchant fleet is abolished by I.M.M.," NYT, Feb. 7, 1937, 41.

In the 1931 purchase, United States Lines was given the house flag of the American Line (1893–24), a trade property of the International Mercantile Marine that had most recently flown over ships of the Panama Pacific Line's intercoastal service. Because of this flag transfer, United States Lines publicity sometimes claimed the line's roots extended back into the nineteenth century. "Leviathan raises a new house flag," NYT, Dec. 11, 1931, 55; Gibbs, *Passenger Liners*, 258–60, 272–73; James E. Pearce, "The Blue Spread Eagle," *Seabreezes* (Sept. 1951), 203.

[27] "U.S. Lines operates fifty vessels now," NYT, May 7, 1942, 29; "I.M.M. stockholders approve U.S. Lines merger proposal," WSJ, May 21, 1943, 5; "Stockholders of I.M.M. vote U.S. Lines merger," NYT, May 21, 1943, 30; "U.S. Lines Co. will have 19 new ships by year end," WSJ, Apr. 27, 1945, 13; "U.S. Lines resume sailing schedules," NYT, Jan. 28, 1946, 21.

The *New York Times* reported that United States Lines had "operated more than eighty ships" in 1943, but most of these were scows in the Baltimore-based Atlantic Transport Tug and Lighterage Co. fleet, a legacy subsidiary of the International Mercantile Marine. The company also "handl[ed] more than 1,200 ships as sub-agents," a reflection of its work for the War Shipping Administration; "U.S. Lines Company earned $1,518,882," NYT, May 15, 1944, 25.

[28] Marc Levinson, *The Box: How the Shipping Container Made the world Smaller and the World Economy Bigger* (Princeton: Princeton University Press, 2006), 241–44; Brian J. Cudahy, *Box Boats: How Container Ships Changed the World* (New York: Fordham University Press, 2006), 148–51; "McLean Securities' U.S. Lines places major ship order," WSJ, Apr. 25, 1983, 3; Susan F. Rasky, "Bankruptcy step taken by McLean," NYT, Nov. 25, 1986, D1; "McLean chief's gamble has failed to pay off," NYT, Nov. 27, 1986, D2.

first ships it ordered where eleven *Challenger*-class express freighters, delivered in 1962 and 1963. The *American Racer* and its sisters—the *Challenger II* class—came next in this ambitious modernization plan.[29]

The *Challenger II* vessels were the first in which United States Lines made an extensive investment in onboard automation, and they were delivered at the same time that other major shippers were embracing automation as well. The push for automation aboard American ships began in 1960, when the National Research Council's Maritime Research Advisory Committee recommended that Maritime Administration encourage the development and adoption of shipboard automation techniques as one way to strengthen the competitiveness of U.S. overseas shipping while simultaneously reducing its reliance on operating subsidies. The administration quickly commissioned a feasibility study from the Norden Division of United Aircraft Corporation, which had already begun its own private analysis of the subject. Published in April 1961, Norden's six-volume final report laid out a technological approach and economic justification for the automation of such key merchant-ship functions as navigation, communication, ship control, and propulsion-system operation. With MARAD's active encouragement, ship owners in the liner and tanker trades began to adopt automation systems over the next couple of years, both by building new ships and by retrofitting recently built ones. During 1962 and 1963, six of the fifteen subsidized lines ordered twenty-nine automated ships at an aggregate cost of $312.3 million, while Lykes Brothers Steamship Company of New Orleans, Louisiana, to take just one example, applied for subsidy funding in 1964 to retrofit its twenty-one newest conventional ships.[30]

Although costly to build and install, automation systems saved owners money in the long run by reducing the number of crew members needed to operate a ship. For example, fifty-two crewmen worked aboard United States Lines' conventional *American Challenger* when it was new in 1962, whereas thirty-nine sailed on the marginally larger *American Racer* two

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[29] The anticipated cost of the United States Lines replacement program was reported in the press as $395 million, but MARAD figures from 1962 give it as $679.6 million. Despite its publicized goal of forty-six new ships (sometimes reported in the press as forty-three or forty-four ships), the company ordered only twenty-four new ships using government aid between 1960 and 1969, when it let the operating-differential contract expire. These ships cost $276.5 million, of which the government paid $136.8 million. "U.S. Lines will launch automated cargo ship," WSJ, May 5, 1964, 23; "Merchant fleet gains confidence," NYT, May 22, 1964, 68; "American Racer due in port," BS, Nov. 12, 1964, 46; House Committee on the Judiciary, *The Ocean Freight Industry*, 36; George Horne, "U.S. Lines plans 16-ship charter," NYT, Oct. 4, 1969, 49; Warner Bamberger, "Line sets its course on time charters," NYT, Jan. 11, 1970, 194; Gerhardt, "The Maritime Administration Shipbuilding Program" and "Title V New Construction Contracts."

[30] MARAD Annual Report 1960, 11–13; Dillon, "Forty Years of Ship Designs," 194, 209; Clayton, "A Practical Approach to Ship Automation," 116; Gerhardt, "The Maritime Administration Shipbuilding Program" and "Title V New Construction Contracts"; Edward A. Morrow, "Lykes proposes ship automation," NYT, Apr. 28, 1964, 73. See also *Marine Engineering/Log* 70, no. 1 (Jan. 1965), which is devoted entirely to the subject of shipboard automation.

The Japanese motorship *Kinkasan Maru*, completed in November 1961, was the first ship equipped with wheel-house control of its propulsion plant. West German and Norwegian companies were also early adopters of shipboard automation; Donald H. Kern, "History and Current State of Shipboard Automation," in *Innovation in the Maritime Industry*, vol. 2, *Appendix* (Washington, D.C.: National Academy of Sciences, 1979), 136.

years later. United States Lines anticipated that the *Racer*'s engine-control features and improved cargo-handling gear would save the company $2 million in crew costs over the twenty-five-year life of the vessel. Similarly, Moore-McCormack Lines expected the six vessels it took delivery of in 1964 and 1965 to cut 15 percent from the $4,000 a day it spent to keep its largest conventional freighters at sea.[31]

Aboard the *American Racer*, automation reduced crew size in a number of ways. First, in the engine room, it simplified and centralized many routine tasks. One or two engineers stationed at the central console could, as John Williams described it in the *Wall Street Journal*, "turn valves, regulate pressures, start generators and burners and perform other intricate functions . . . at the push of a button" instead of many men operating the same equipment by hand at disparate locations throughout the engine room.[32] "On conventional ships," Robert Crossley told the readers of *Popular Mechanics*, "an oiler has to walk around and climb ladders to inspect each [engine] bearing every hour. Then the watch engineer does the same thing on the half hour." Aboard the *American Racer*, "a button lights up" on the console "if a bearing gets too hot, and the console takes steps to cool it off."[33] Similar labor reductions were achieved in many systems across the engine plant.

Furthermore, throttle control was duplicated on the navigating bridge. Heretofore, officers on the bridge could not directly control a ship's speed. They relayed engine orders below using a telegraph, and engineers in the engine room executed those orders. Now, through automation, "the officer on watch on the bridge has the option of operating the vessel by direct control of the main engine throttle or by telegraph relay."[34] By improving responsiveness, this system increased safety, as Crossley demonstrated to his readers through a story from the ship's first winter on the Atlantic:

> The 60-foot waves [the *Racer*] ran into off the Bay of Biscay were the highest her skipper, Capt. Richard O. Patterson, had seen in 43 years at sea. . . . Third Mate Richard Moody stood by the bridge console, one finger on a small wheel mounted on its top. The shaft rpms were down to 40—just enough to keep the ship's bow into the sea. The captain watched the angry waves. When he saw a really big one coming he'd call an order. Not "Slow ahead" or "Dead slow," but "Down five revolutions" or "Down 10 revolutions" or some other minutely calibrated decrease.
>
> The mate would flick the wheel, and instantly the ship would respond. No lag while engineers reacted to a telegraph signal. No feverish opening and closing of the throttle down below. Just a smooth, quick response like that of

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[31] Clayton, "Practical Approach to Ship Automation," 111; John D. Williams, "Push-button ships, U.S.-flag lines turn to automation in effort to become competitive," WSJ, Mar. 25, 1964, 1; "American Racer launching," 58; General Electric News Bureau, "Business Press" news release, n.d. [Nov. 1964], 2, in Sun Shipbuilding Records.

[32] Williams, "Push-button ships," 1.

[33] Crossley, "The Ship You Drive with One Finger," 95, 188.

[34] Quote from United States Lines News Service, press release for May 4, 1964, in Sun Shipbuilding Records.

> a finely tuned automobile. As soon as the wave passed, the revolutions were restored just as quickly, just as smoothly.
>
> Such delicate control of speed made a world of difference. The *American Racer* escaped much of the beating other ships took in the same storm. "On all previous ships," Capt. Patterson was telling me now, "by the time you notified the engine room and they could reduce speed for a big wave, it was too late. And when a thousand tons of water comes aboard, you know it."[35]

On deck, automation and increased mechanization of cargo handling reduced time and labor. "On conventional ships longshoremen have to rig booms to open the covers, and the job takes at least half an hour per hatch," Crossley wrote. "On the *Racer* each hatch cover, not only the top ones, but those for lower decks, are opened and closed by hydraulic rams. The covers ride on wheels running along tracks on the rim of each hatch." Furthermore, "On most ships there is only one winch for each boom. The vang guys, the lines that swing the booms in and out, often have to be hauled by hand, as does the schooner guy, which connects the booms at the top. The topping lift, which raises and lowers the boom, and the cargo hoist have to be connected to and disconnected from a single winch. On the *American Racer* each wire has its own winch," and one man at a dedicated console controlled all winches for a single boom.[36]

Trimming the deck and engine departments reduced the need for support crew as well, and the *American Racer* sailed with only seven members in its steward's department.

The *American Racer* was the sixth American ship fitted with engine-control automation. The first was the *Mormacargo*, delivered to Moore-McCormack Lines in August 1964.[37] The United States Lines publicity department, however, carefully claimed the *Racer* was "the first American dry-cargo vessel to be built from the keel up as a fully automated ship," which was true as far as it went.[38] Nicholas Bachko, the United States Lines technical services manager, explained in a 1964 *Marine Engineering/Log* article that his department's staff had worked with architects Friede and Goldman from the beginning of the *Challenger II* project to design "a practical system for automated controls in the engine room and bridge." This system was not specified during the construction bidding, however, because "the climate in labor circles was not conducive, at that time, to mutual negotiation of the reduced manning" that automation would allow. "Some six months after signing the contract," Bachko wrote,

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[35] Crossley, "The Ship You Drive with One Finger," 92.

[36] ibid., 188–89.

[37] The August 1964 delivery of the *Mormacargo* was followed the very next month by delivery of the first automated American tanker, the *Texaco Rhode Island*, as well as the second automated freighter, the Gulf and South American Steamship Company's *Gulf Trader*. The *Mormacvega* followed in October, then *Gulf Shipper*, *American Racer*, and *Mormaclynx* in November. Gerhardt, "The Maritime Administration Shipbuilding Program" and "Title V New Construction Contracts."

[38] Edward A. Morrow, "Automated ship due here Monday," NYT, Nov. 12, 1964, 73. The claim that *American Racer* was the first automated American cargo ship is repeated in many sources.

> this situation had not changed but United States Lines decided to venture into automation anyway, taking a gamble on securing the necessary support.
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> Accordingly, in May 1962, United States Lines instituted a change order to Sun Shipyard to provide a well-designed human engineered centralized control system including digital data and bell loggers, remote propulsion controls, steam atomization with sensitive combustion control, etc. For some months, this was the only contract in U.S. shipyards involving automation. When the maritime unions indicated their willingness to negotiate manning scales in automated vessels, some vessels being constructed in other yards and which were closer to delivery time were hurriedly outfitted with retrofit versions of automation. But the *American Racer* will be the first vessel built from the keel up as a full automated vessel.
>
> Naturally, having been developed as an automated vessel during the specification-writing stage, the engine room arrangements were oriented toward centralized control. The burner aisle was at the level of the space provided for the [engine-room control] console. Generators were conveniently located and had been specified to be of package type. . . . Group controls and engineers[′] alarm panel had been provided. A simplified bunkering system was already in the ship.[39]

As Bachko's story indicates, maritime unions resisted the adoption of automation because it threatened jobs already made scarce by foreign competition. Engineers, bridge officers, and deck crew (as well as stevedores and longshoremen) had the most to lose from labor-saving developments in ship control and cargo handling, and American shipping was beset in the late 1950s and early 1960s by numerous strikes as unions fought to preserve berths or negotiate pay and workplace concessions. Shipping lines made strenuous efforts to negotiate new manning scales and work agreements, with notable advances in 1963 and 1964, but only gradually were they able to reach lasting accords.[40]

A dispute between United States Lines and the National Marine Engineers Beneficial Association briefly delayed the *American Racer*'s departure from the shipyard in November 1964, and another involving deckhands threatened to tie up the ship before the start of its second roundtrip crossing in December. These actions followed closely on the heels of an engineers' strike that delayed the maiden voyage of the first automated freighter, the *Mormacargo*, in August and another by deck officers that affected the first sailing of the *Gulf Trader* in September.[41]

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[39] Bachko, "SS American Racer," 59

[40] Williams, "Push-button ships," 1; Morrow, "Lykes proposes ship automation," 73.

[41] "Walkout ties up automated ship," NYT, Aug. 21 1964, 54; "Dispute delays maiden voyage," NYT, Sept. 24. 1964, 80; Helen Delich Bentley, "Newest automated vessel has troubles in its debut," BS, Nov. 13, 1964, 31; "Strike tying up U.S. Lines fleet," NYT, Dec. 31, 1964, 1; "Ship dispute is resolved," BS, Jan. 1, 1965, 34; George Horne, "Unions to discuss crew-size issue," NYT, Jan. 2, 1965, 34.

Containerization

The *American Racer* was state of the art in 1964, but it was built just at the moment when shipping companies worldwide were starting to realize the profound cost savings achievable through containerization. With certain exceptions, general cargo vessels had always been loaded and unloaded by hand, a process referred to on the unloading end as "breaking bulk." The variety of sacks, boxes, crates, and barrels that enclosed commercial goods were brought aboard ship in small groups slung from booms and assembled like a three-dimensional puzzle into a "tight stow" in the holds. Goods were manhandled repeatedly on their way from freight shed to cargo hold and back in a process that required a great deal of physical labor and enormous amounts of time—turnarounds of a week were common. Cargo handling took skill and experience, but damage and pilferage were common and injuries to longshoremen frequent.

Container shipping, in contrast, was based on the concept that goods could be loaded into standard-sized steel boxes, each holding up to 20 or 25 long tons depending on length. The containers could then be lifted aboard ship and readily stacked into tiers. A container could be loaded aboard in a few minutes, where its contents piecemeal would previously have taken eighteen to twenty man-hours to stow.[42] Containers drastically reduced the amount of handling cargo received and the amount of time ships had to remain in port. They also allowed the creation of a complete intermodal transportation system, where goods could travel from maker to consignee inside a single container, no matter how many trucks, trains, or ships might be required to carry them along the way.

Trucking entrepreneur Malcom McLean developed intermodal container shipping in the mid 1950s for use in U.S. coastal trade. Its rapid adoption on transoceanic routes in the 1960s fundamentally transformed commercial shipping worldwide, with far reaching impacts to dockside and shipboard labor, naval architecture, and the culture and geography of the world's ports and waterfronts.[43]

The *American Racer* demonstrates the rapidity of containerization's adoption. When the ship was ordered in 1962, United States Lines followed a conservative course and specified a traditional break-bulk vessel with certain hold and hatch dimensions calculated to accommodate containers if needed. Other lines, notably Moore-McCormack, took this approach at the same time. In 1966, less than a year and a half after the ship's maiden voyage, United States Lines decided to inaugurate its first express container service, and the *Racer* and its sisters *Rover*, *Reliance*, and *Ranger* were modified into partial containerships

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[42] Alex Roland, W. Jeffrey Bolster, and Alexander Keyssar, *The Way of the Ship: America's Maritime History Reenvisioned, 1600–2000* (John Wiley & Sons, 2007), 363.

[43] The first containership was McLean's *Ideal X*, placed into U.S. coastal service in 1956. In 1958, Matson Navigation Company started container service between the west coast and Hawaii. The first container voyage in foreign trade was undertaken by Grace Line to South America in 1960, while the first services across the Atlantic were started by Moore-McCormack Lines, United States Lines, and McLean's Sea-Land Service in February, March, and April 1966. Matson started the first foreign-trade transpacific container service in 1967. Cudahy, *Box Boats*, 43, 68, 71–72, 86–87; Levinson, *The Box*, 65, 164, 217.

through the addition of support cells and guides in two of each ship's six holds. The remaining holds were kept in their original configuration. Unfortunately, this dual-hold arrangement meant that the company's substantial investment in containers and shoreside infrastructure could not pay off in substantially decreased turnaround times, as any non-containerized cargo the ships carried still had to be handled by traditional means.[44] Therefore, after only two years in container service, the company converted the *American Rover* and *American Resolute* to full container ships but converted *Racer*, *Ranger*, and *Reliance* back to full break-bulk for military charter. Containerization had rendered the entire class obsolete for commercial liner service in less than four years.[45]

2. Name: In the first half of 1924, the three-year-old United States Lines took delivery of five replacement vessels for its New York to London cargo and passenger service. These ships were converted for commercial use from Hog Island Type B troop transports and were renamed the *American Banker*, *American Farmer*, *American Merchant*, *American Shipper*, and *American Trader*. Although the U.S. Shipping Board transferred management of this route and these five ships to J. H. Winchester and Company under the new trade name American Merchant Lines the following September, the two lines came under joint ownership again in 1929. When United States Lines acquired two more ships for American Merchant in 1931, the "American" naming formula was retained. Even after American Merchant Lines ceased to be a separate brand in 1937, United States Lines continued to name new cargo ships in the established pattern, with the exception of vessels on the Australasian run operated under the company's American Pioneer Line banner.[46]

C. Operational History

The *American Racer* sailed from Sun Shipbuilding's yard at Chester, Pennsylvania, on November 12, 1964, under the command of Capt. Richard Patterson. This first departure was threatened by an unresolved dispute between the union representing the ship's engineers, the National Marine Engineers Beneficial Association, and United States Lines

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[44] Dillon, "Forty Years of Ship Designs," 185.

[45] The difficulties companies faced anticipating changes in the market and planning their new building accordingly are demonstrated by other actions taken by United States Lines management. In December 1964, just as the *American Racer* entered service, the company ordered another flight of five break-bulk cargo ships (MARAD design C4-S-68a, an adaptation of the *Challenger*-class design C4-S-57a). After construction began, the company reconsidered its needs and worked with builder Sun Shipbuilding to lengthen and redesign the vessels. The result was two ships completed with holds for mixed container and break-bulk cargoes (design C7-S-68c, *American Lancer* [delivered May 1968] and *American Legion* [July 1968]) and three completed as full container ships (design C7-S-68d, *American Liberty* [Sept. 1968], *American Lynx* [Dec. 1968], and *America Lark* [Mar. 1969]). Sun delivered three additional full container ships for United States Lines to the final design between 1969 and 1971. United States Lines also converted eight older C4-S-1a *Mariner*-class freighters to C6-S-1w containerships in 1969 and 1970 at a total cost of $66.6 million, 50 percent of which was subsidized by the government. Dillon, "Forty Years of Ship Designs," 185–86, 208; Horne, "U.S. Lines plans 16-ship charter," 49; Gerhardt "The Maritime Administration Shipbuilding Program" and "Title V New Conversion Contracts."

[46] The ships of the American Pioneer Line (owned by United States Lines 1940–65) tended to be named after historic clipper ships; those acquired after World War II followed the formula exemplified by such freighters as *Pioneer Bay* and *Pioneer Moon*. Bonsor, *North Atlantic Seaway*, vol. 4, 1572; "Shipping Board to deliver steamers," 6; "Consolidations cut ship board costs," 23; U.S. Shipping Board Annual Report 1924, 78; "New owners get U.S. Lines today," 51; "American Merchant fleet is abolished by I.M.M.," 41.

about whether relief-engineer training for the new class of ships would be paid for by the union or the company. United States Lines management "assigned two of its top staff engineers to serve as relief men" during the ship's coastal delivery voyage as an interim palliative measure, and the ship sailed only an hour late. Unfortunately, the bridge throttle control was malfunctioning at the time, and the ship traveled to Philadelphia, Norfolk, and Baltimore with the engines controlled conventionally from the engine room. A technician who joined the ship at Baltimore fixed the problem, and the *Racer* arrived in New York on the sixteenth under bridge control of the engines. "She behaved nicely," Captain Patterson told reporters, "far better than anyone had anticipated. The main thing is to get used to handling the throttle from the bridge."[47]

The ship docked in New York at the new Pier 76, a $9 million freighter terminal United States Lines had worked with the city of New York to build in place of old piers 75, 76, and 77 on the Hudson River between 35th and 37th streets. The 300'-wide pier was designed to separate and speed arriving and departing trucks and to allow container handling on its 92'-wide concrete apron. The *Racer* arrived, by design, on the day of the pier's dedication. In his remarks, United States Lines president William B. Rand declared that the ship and the pier represented the "ultimate in ocean transportation." The two promised, he said, in reporter Werner Bamberger's paraphrase, "virtually complete elimination of traffic congestion on land and speedy and safe overseas delivery of cargo—two to three days faster to European ports than by most competing vessels."[48]

The *American Racer* cleared New York for Le Havre, France, and London, England, three days later, beginning its career of monthly roundtrips in express cargo service.[49] At the end of its first roundtrip, the National Maritime Union, which represented much of the crew, complained that the ship's labor-saving features were not up to the promised standard. Constant-tension mooring winches had not been installed as originally planned and maintenance, "such as painting and chipping," was more than expected. According to the union, the ship had "very heavy rigging" and "a crew member lost two fingers on the initial

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[47] Bentley, "Newest automated vessel has troubles in its debut," 31; idem, "Newest cargoliner arrives today on maiden voyage," BS, Nov. 14, 1964, 23; Werner Bamberger, "New ship meets new berth here," NYT, Nov. 17, 1964, 81.

[48] United States Lines paid about $1.5 million a year in rent to the city of New York for pier facilities in the 1960s, making it the city's highest paying waterfront tenant. At the same time as it worked to modernize its cargo fleet, the company worked with the city's Department of Marine and Aviation to rehabilitate its Hudson River piers. Pier 62, rebuilt as a flat, open platform without a shed to accommodate container handling, opened in 1963, followed by a new Pier 76 in 1964. Piers 61, 60, and 59 opened in 1965, 1967, and 1968 respectively. The total cost for all was about $25 million. Although provision for containerized cargoes was made in the redesign of these facilities, they, like finger piers everywhere, proved inadequate for efficient intermodal use, and United States Lines, recently under new ownership, abandoned them in May 1969. As of 2010, Pier 76 still stands, serving as an automobile impoundment lot for the city of New York; piers 59–62 form the Chelsea Piers recreation complex. Edward A. Morrow, "U.S. Lines opening rebuilt Pier 62," NYT, Sept. 3, 1963, 65; "American Racer arriving for pier 76 dedication," NYT, Nov. 15, 1964, 88; Bamberger, "New ship meets new berth here," 81; "Mayor, union and industry hail Pier 60 rehabilitation," NYT, Apr. 14, 1967; Edward A. Morrow, "U.S. Lines to quit Chelsea district," NYT, May 1, 1969, 93.

[49] "Shipping—mails," NYT, Nov. 18, 1964, 93.

voyage because there were not enough people on hand to work the rigging." As a temporary measure, "unlicensed members of the engine department were brought up to assist in the deck work." Before the ship was to make its second departure from New York, the union struck United States Lines, calling for two more men to be added to the deck crew "for safety reasons." Management agreed to this increase, but only until the winches could be installed, work which was done the following summer.[50]

With a 21-knot service speed, the *American Racer* could sail from New York to Le Havre or Antwerp in 6-1/2 days. For a little over a year, the ship crossed the Atlantic about twice a month, regularly calling at Boston, New York, Philadelphia, Baltimore, Le Havre, Antwerp, Rotterdam, and London. Then, in early 1966, United States Lines announced it was starting an express container service between New York, Antwerp, and Rotterdam. To provide customers with "a sailing a week, departing every Friday night on a clocklike schedule," United States Lines needed to use fast ships, so management decided to convert *Racer*, *Rover*, *Reliance*, and *Ranger* for the purpose. In late February, the *Racer* was sent for two weeks to Maryland Shipbuilding and Drydock Company in Baltimore, where workers converted Holds Nos. 3 and 4 to stow sixty 20′ shipping containers in each hold. They also added additional tie-down points for containers atop the cargo hatches on the Main Deck. The other ships were similarly modified at the same yard over the course of the next month.[51]

Fresh from conversion, the *Racer* sailed to Philadelphia to load cargo before calling in New York. On Friday, March 18, 1966, the ship sailed from Pier 62 with forty containers aboard. Many companies, American and foreign alike, were making plans to start ocean container services in 1966, and there was some jockeying to be first out of the gate. United States Lines announced its service (and the *Racer*'s March 18 inaugural sailing) to the press on February 8. Competitor Moore-McCormack announced its new service to northern Europe and Scandinavia the next day, February 9, but actually started its service just two days later. Although Moore-McCormack committed its six newest cargo liners to the run, out of expediency it delayed installing container cells aboard them until later in 1966, a decision

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[50] Quotes from "Strike tying up U.S. Lines fleet," 1, and Horne, "Unions to discuss crew-size issue," 34. See also "N.M.U. ends threat to tie up U.S. Lines," NYT, Jan. 1, 1965, 38; "Ship dispute is resolved," 34.

The *Challenger II* ships were originally specified to have four labor-saving constant-tension mooring winches, two on the forecastle and two on the Main Deck aft. During construction, the decision was made to substitute a single capstan aft for these winches, although *American Racer* sailed before its capstan was ready for installation. When the National Maritime Union struck, claiming the missing equipment made a ten-man deck crew insufficient, United States Lines management abandoned the capstan plan and had the constant-tension winches installed on all five ships. Because the *Racer* had already been delivered, its winch work had to be competitively bid, which delayed installation until July 1965. "Bids to be asked on winch work," BS, Feb. 27, 1965, 21.

[51] United States Lines News Service, press release for Feb. 9, 1966, reproduced in House Committee on Merchant Marine and Fisheries, *Vietnam – Shipping Policy Review: Hearings before the Subcommittee on Merchant Marine*, part 1, 88th Cong., 2d sess. (Washington, D.C.: G.P.O., 1966), 233; "Container ship slated," BS, Feb. 9, 1966, C12; Morrow, "U.S. Lines plans shipping service," 78; Lloyd B. Dennis, "4 ships face conversion," BS, Feb. 11, 1966, C11. See also United States Lines' advertisement for its first Atlantic container service: NYT, Feb. 10, 1966, 38; WSJ, Feb. 11, 1966, 11; *Washington Post*, Feb. 14, 1966, A20.

that allowed United States Lines to claim, with some justification, that the *Racer* was the first ship to cross the Atlantic especially fitted to carry containers.[52]

On the return leg of its first container-service crossing, the *American Racer* transported twenty-four containers in addition to conventional break-bulk cargo. "Among the goods shipped in containers were hand tools, books, electrical appliances and other items packed in ordinary domestic distribution cardboard boxes," Werner Bamberger reported. "Dominic A. Calicchio, chief officer of the 21-knot steamship, said handling of the containers and the specialized unloading equipment posed no problems for longshoremen in Antwerp and Rotterdam. As for the future of this specialized service, he said, 'it will keep getting better with every try—the more containers you have over there, the more will come back.'"[53]

In January 1968, while eastbound to Europe from New York, the crew of the *American Racer* played a small part in the rescue of sixteen men from the 1,192-ton Dutch freighter *Ocean Sprinter*, which began sinking in a gale. The U.S. Coast Guard cutter *Absecon* could not arrive on the scene soon enough, and the Coast Guard asked the *Racer* and the Norwegian vessel *Black Falcon* to attend to the sinking vessel and render aid if possible. Neither could do anything in the 50-knot winds and 25′ seas, and conditions also prevented the *Ocean Sprinter*'s crew from abandoning ship. Once the *Absecon* arrived, the *Racer* and *Black Falcon* were released. The Coast Guard eventually rescued the Dutch crew.[54]

United States Lines began to take delivery of its first purpose-built containerships in 1968, and the *American Racer*, although only 3-1/2 years old, no longer had a competitive place in the company's containerized business model. United States Lines chartered the ship, along with *American Ranger* and *American Reliance*, to the U.S. Navy's Military Sea Transportation Service (MSTS) for $6,250 a day. The three were sent again to Maryland Shipbuilding and Drydock Company in June and July 1968 for removal of the container cells in Holds Nos. 3 and 4, not long after their remaining classmates, *American Rover* and *American Resolute*, were converted from partial to full containerships. The *Racer* arrived in Baltimore for reconversion on July 4, 1968.[55]

The MSTS charters formed part of the military's intensive sealift of materiel to southeast Asia in support of U.S. operations in Vietnam. The MSTS in-house magazine called the

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[52] Even without cellular holds, Moore-McCormack claimed *Mormacaltair*, the first ship to sail in its container service, could carry 350 20′ containers, or 175 40′ ones. "Containers to serve city," BS, Feb. 10, 1966, C10; "Moore-McCormack to start new container-hauling runs," WSJ, Feb. 10, 1966, 2; George Horne, "Mormac reveals container plans," NYT, Feb. 10, 1966, 74; Bamberger, "U.S. Lines starts container route," 58; Werner Bamberger, "A container trip is assessed here," NYT, Apr. 17, 1966, 84.

[53] Bamberger, "A container trip is assessed here," 84.

[54] Werner Bamberger, "Vessel is sinking in Atlantic gale," NYT, Jan. 18, 1968, 77; "Coast Guard cutter standing by Dutch vessel sinking in Atlantic," NYT, Jan. 19, 1968, 41. After the crew was rescued, Canadian trawlers successfully tried to claim and tow the disabled *Ocean Sprinter* to St. John's, Newfoundland, an effort summarized in "Prize of the sea," *Montreal Gazette*, Jan. 23, 1968, 6.

[55] "Navy to charter freighter from United States Lines," NYT, May 21, 1968, 93; "Port to add containers," C14; "Port shipping," BS, July 6, 1968, B8.

"'Racer' Class ships" "especially valuable on the Vietnam run because of [their] enormous reefer capability," which it said was more than three-and-a-half times that of other modern American cargo ships. But as the Nixon administration began to draw down U.S. troops in 1969 and 1970, the need to deal with surplus equipment and supplies arose. Most of the excess was redistributed or scrapped overseas, but some of it, about one percent according to news reports, was returned to the U.S. and donated by the General Services Administration (GSA) to various federal agencies. The *American Racer* brought the first full cargo of surplus back to the states from Okinawa in August 1970. A ceremony celebrating "Project Home Run," as GSA director Robert L. Kunzig dubbed the give-away, greeted the ship at the Naval Supply Center in Oakland, California. The *Racer*'s 2,333-ton, $6.5-million cargo included, among other things, engines, tires, medical equipment and supplies, shoes and boots, ice machines, and roasting ovens. About half went to the Department of Health, Education, and Welfare for distribution to private organizations, schools, and hospitals; the balance went to other federal agencies, such as the Forest Service.[56]

In early 1969, United States Lines tried to sell the *American Racer* and its four sisters to Farrell Lines, Inc., for the latter's service from U.S. east- and Gulf-coast ports to Australia and New Zealand, which Farrell had purchased from United States Lines in 1965. The purchase price was given variously in press reports as $22–$23 million up to about $30 million. "From the United States Lines point of view," one reporter wrote, "the disposal of the five American Racer–class vessels to Farrell represents a logical step toward exclusive operation of containerships in the North Atlantic. From Farrell's point of view the acquisition of the five ships means maintenance of the line's Australian and New Zealand services for the next two years [until completion of an order of new containerships] with superior tonnage." The sale did not go through, possibly because the Maritime Subsidy Board withheld its permission for the transfer.[57]

The ship remained on military charter, and in 1975 it assisted in the evacuation of refugees from South Vietnam after the fall of Saigon. It ferried refugees from the Philippines and to Orote Point (now Point Udall) on Guam.[58]

The government acquired the ship by trade-in and added it to the National Defense Reserve Fleet at Suisan Bay, California, in July 1983. Although the Department of Defense planned to

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[56] "New Reefer Chartered, American Reliance," *Sealift* 19, no. 1 (Jan. 1969): 13; Jeff Whitmore, "Military Equipment Returned for Use by Federal Agencies," *Sealift* 20, no. 12 (Dec. 1970): 16–17; "Supplies following troops home from Asia," *Pittsburgh Press*, Aug. 26, 1970, 35; Jack Anderson, "War surplus worth millions leaking through Pentagon net," *Pittsburgh Press*, May 28, 1972, A-20.

[57] "U.S. Lines plans sale of 5 ships," BS, Feb. 21, 1969, C11; "Farrell buys 5 U.S. Lines ships for cargo service to Australia," NYT, Feb. 21, 1969, 85; "Farrell asks ships' shift," BS, Apr. 22, 1969, C12.

[58] Paul L. Montgomery, "4 U.S. ships ready for evacuation role," NYT, Ap. 18, 1975, 14; Andrew H. Malcolm, "48,000 refugees jammed on Guam," NYT, May 10, 1975, 1.

place the ship in the Ready Reserve Fleet during fiscal year 1984, surviving documentation indicates this was not done. The ship remains at Suisun Bay to this day.[59]

PART II. STRUCTURAL / DESIGN INFORMATION

A. General Description

1. Overall: According to its designers' specifications, the *American Racer* is a steam-turbine propelled single-screw cargo ship "designed primarily for the carriage of general cargo, refrigerated cargo and liquid cargo."[60] It has a welded-steel hull with double bottom that is longitudinally framed below the tank top and transversely framed above. Only the Main Deck has camber and sheer. The ship has a raked clipper stem, high forward freeboard, and a cruiser stern. Its profile is defined by six pairs of kingposts rising from the forecastle, two small forward mast houses, the main superstructure, and a small mast house near the stern. The superstructure is moderately streamlined and surmounted by a short false funnel that supports a signal and radar mast. The boiler uptakes pass through kingposts abaft the funnel.

The ship's fore to aft arrangement is as follows:

- Forepeak with boatswain's stores and chain locker above tank for fuel oil or salt-water ballast
- Hold No. 1 (four compartments for dry-cargo) above two deep tanks for fuel oil or salt-water ballast
- Hold No. 2 (four compartments for reefer or dry cargo, one for dry cargo only)
- Deep Tank No. 3 (three compartments for liquid cargo, grain, or salt-water ballast)
- Hold No. 3 (nine compartments for dry break-bulk cargo or grain)
- Deep Tank No. 4 (four compartments for liquid cargo, grain, or salt-water ballast)
- Hold No. 4 (nine compartments for dry break-bulk cargo or grain)
- Ship's stores and machinery spaces with deckhouse above
- Hold No. 5 (two compartments for dry cargo; five for reefer or dry cargo) above four deep tanks for dry cargo, liquid cargo, or salt-water ballast
- Hold No. 6 (one compartment for dry cargo; one for reefer or dry cargo) above two deep tanks for fuel oil or salt-water ballast
- After peak, supporting the after deck house, containing the steering-gear room above tank for fuel oil or salt-water ballast

The double bottom is subdivided into additional deep tanks under the machinery spaces and holds.

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[59] Maritime Administration property management record and custody card for *American Racer,* https://pmars.marad .dot.gov/detail.asp?Ship=219; House Committee on Appropriations, *Department of Defense Appropriations for 1985: Hearings*, part 7, 98th Cong., 2d sess., 1984, 85, 117.

[60] Friede and Goldman, *Specifications*, section 1, p. 3.

2. Decks: The *American Racer*'s navigation spaces and crew quarters are located in a five-deck superstructure positioned somewhat aft of amidships. The Bridge Deck contains the wheel house. Just below, the Cabin Deck holds two two-berth passenger staterooms, the captain's stateroom and day room, the chief engineer's stateroom and day room, the radio officer's cabin, and the radio room. The Boat Deck encloses quarters for the licensed engineers and officers. The Upper Deck has the officers' and passengers' lounge, the purser's office and stateroom, and quarters for unlicensed deck- and engine-department crew and the cadets. In addition, this level holds laundry rooms, various lockers, and the emergency diesel generator room. The Main Deck within the deckhouse contains the galley, the officers' and passengers' mess, the crew mess, the crew recreation room, and quarters for crew in the steward's department. The aftermost section of the superstructure on the Main Deck encloses the upper level of Hold No. 5.

The forecastle and the three mast houses on the Main Deck contain mechanical rooms and various stowage lockers. The forecastle also contains the upper level of Hold No. 1. The tally office is located in the forwardmost house; the carpentry shop is in the aftermost. The remainder of the ship's decks below the Main Deck contains cargo holds, machinery spaces, and fuel-oil and ballast-water tanks.

3. Cargo holds: The *American Racer* has six cargo holds comprising thirty-four separate compartments spread across four decks. In addition, the ship contains eleven deep tanks for liquid cargo. The ship's total bale capacity is 688,184 cubic feet, of which 536,253 cu. ft. is dedicated to dry cargo and 151,931 cu. ft. is interchangeable between refrigerated and dry cargo. The ship's liquid-cargo capacity is 1,351 tons, and it can carry 3,380 tons of fuel oil.[61]

Holds Nos. 2, 5, and 6 contain eleven compartments specially designed to transport either refrigerated or dry break-bulk cargoes. For a general cargo ship, the *American Racer* was designed with an unusually high amount of reefer space (22 percent) in order to meet the needs of its owners' Australian service, although the ship was never used in this trade. The reefer compartments were designed to admit loaded forklifts and feature wide, light-weight access doors; hinged door sills; flush decks; and strong deck scantlings throughout. These spaces are insulated with 7'-thick rigid polyurethane insulation under aluminum linings; the battens are hollow aluminum, instead of wood, to reduce maintenance and discourage vermin. Five of the reefer compartments are accessible though overhead hatches. The remaining six are entered laterally through bulkhead doors.[62]

Holds Nos. 3 and 4, intended for dry cargo, are divided into three sections each by fore-and-aft steel bulkheads that rise from the Tank Top to the Main Deck. Each section is served by

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[61] Bachko, "SS American Racer," 57. Detailed designed capacities for the ship's individual holds and tanks, which do not agree exactly with the post-completion numbers quoted by Bachko, appear in "Tank & Hold Capacities," sheet no. 3 of 19 in Sun Shipbuilding and Dry Dock Company, *Booklet of General Plans, Maritime Administration Design C4-S-64a, Single Screw Cargo Vessel for United States Lines Company*, Sept. 23, 1964, with alterations to July 28, 1965, National Museum of American History, Washington, D.C., Maritime Collection, Maritime Administration Collection of Ship Plans (1939–1970), plans nos. MA39-1 and MA39-1.1.

[62] Dillon, "Forty Years of Ship Designs," 185; Bachko, "SS American Racer," 59, 68.

its own Main Deck hatch. These bulkheads were included to improve the ship's rigidity and to improve "port separation," that is, the segregation of cargoes intended for or loaded from different ports. These holds are also fitted with dust-proof light fixtures and powered equipment to allow the safe loading of grain if needed.[63]

The uppermost level of Hold No. 5, on the Main Deck, is accessible both through an overhead hatch as well as through large lateral cargo doors, port and starboard, opening through its after bulkhead. This arrangement was created to allow long items that would otherwise have had to be carried as deck cargo, such as missiles, to be stowed under cover.[64]

Eleven liquid cargo tanks are fitted with capacities between 40 and 250 tons. Some are lined with plastic, others with stainless steel, to allow flexibility in the types of liquids carried. All of these can also be used for dry cargo stowage as well, or for salt-water ballast.[65]

All hatch covers in the ship are hydraulically operated with the exception of the oil-tight ones opening through the Third Deck into the No. 5 deep tanks. All covers in the full-bodied portion of the ship are of sufficient scantling dimensions to support loaded forklifts.[66]

The ship is fitted with a humidity monitoring system in the non-reefer holds and a dehumidification system in Holds Nos. 3 and 4 to protect cargo from condensation damage. Cargocaire Engineering Corporation supplied the system.[67]

The ship was originally designed with tie-down points on the Main Deck to allow the loading of approximately sixty standard 20′ containers as deck cargo. Electrical connections allowed twenty-eight of these to be reefer containers. In February and March 1966, the owners converted Holds Nos. 3 and 4 for cellular stowage of 20′ containers and added additional tie-down points atop the Main Deck hatches. After this conversion, the ship was reportedly able to carry sixty containers in each converted hold, twenty-four 40′ containers (or forty-eight 20′ containers) on deck, and additional boxes in the non-converted holds, for a total capacity of up to about 200 containers. Even with a full load of containers, the ship retained capacity for about 6,000 tons of break-bulk cargo. United States Lines had the modifications to Holds Nos. 3 and 4 removed in June 1968 to prepare the ship for charter to the U.S. government.[68]

4. Crew accommodations: Because of its engine automation systems, the *American Racer* was built to accommodate a smaller crew than other comparably sized cargo liners of its time—thirty-nine men and cadets instead of fifty-two, plus four passengers (see Appendix II).

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[63] Bachko, "SS American Racer," 60–61.

[64] ibid., 61.

[65] ibid., 61.

[66] ibid., 61–62.

[67] ibid., 61.

[68] ibid., 61–62; Dennis, "4 ships face conversion," C11; Bamberger, "U.S. Lines starts container route," 58; "Port to add containers," C14.

Although the two passenger staterooms were designed for two persons each, all crew rooms were furnished for single occupancy with either private or semi-private toilet and shower facilities. Designers provided the ship with two mess rooms, one for crew and one for shared use by officers and passengers, plus two lounges, similarly separated. The crew accommodations are air conditioned.[69]

5. Safety: The ship carries two hand-propelled seventy-eight-person fiberglass lifeboats, outfitted and certified for forty-three persons, suspended from gravity davits. Welin Davit and Boat manufactured the boats, each 30′ x 10′ x 4′-4″, and the davits. In addition, the ship carries two fifteen-person inflatable life rafts manufactured by U. S. Rubber.[70]

The *American Racer* has two 10,340-lbs stockless bower anchors, plus an identical spare anchor stowed along the forward bulkhead of Hold No. 2 at the Tank Top level. Like all American ocean carriers of its time, the *American Racer* was equipped with Loran A and C receivers, radar, a steam whistle, and various radio and radio telephone systems for navigation and communication.[71]

B. Mechanical Features

1. Engine Plant: The ship is propelled by a single-plane cross-compound engine system comprising a high-pressure turbine, a low-pressure turbine (fitted with astern elements in the exhaust casing), and an in-line double-helical reduction gear. Normal engine power is 18,000 shaft horse power (shp), generating 99 rpm for a service speed of 20.6 knots. Maximum power is 18,750 shp, generating 101 rpm. The engine drives a single four-blade right-hand Nialite (aluminum bronze) propeller. This screw is 22′ in diameter, weighs 28 tons, and has four blades with an effective pitch of 23.87′.[72]

The low silhouette of the single-level engine allowed designers to place the *American Racer*'s main condenser directly ahead of the low-pressure turbine (where it might otherwise have been placed on the deck below or above).

General Electric manufactured the turbines and reduction gear, which were preassembled at the company's plant in Lynn, Massachusetts, and installed as a single unit directly onto the foundations in the engine room.[73]

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[69] Friede and Goldman, *Specifications*, section 1, p. 5; Bachko, "SS American Racer," 59, 67.

[70] Friede and Goldman, *Specifications*, section 16, pp. 1, 4; "General Dimensions and Data," sheet no. 2 of 19 in Sun Shipbuilding and Dry Dock Company, *Booklet of General Plans, Maritime Administration Design C4-S-64a*; Bachko, "SS American Racer," 69.

[71] Sun Shipbuilding, "General Dimensions and Data"; Bachko, "SS American Racer," 66.

[72] Machinery arrangement plans and additional technical notes about the boilers, turbines, reduction gearing, and pumps appear in Bachko, "SS American Racer," 59, 62–63, 68. See also Friede and Goldman, *Specifications*, section 50, p. 3, and section 51, p. 1; Sun Shipbuilding, "General Dimensions and Data"; Dillon, "Forty Years of Ship Designs," 185.

[73] General Electric News Bureau, "Business Press" news release, n.d. [Nov. 1964], 1, in Sun Shipbuilding Records.

2. Boilers: The ship has two marine-oil-fired boilers manufactured by the Babcock and Wilcox Company. Each boiler is fitted with two wide-angle steam-atomizing burners controlled automatically from the engine-room control console. The superheater outlet pressure is 870 pounds per square inch (psi) at 910 degrees Fahrenheit; throttle conditions are 840 pounds per square inch gauge (psig) and 900 degrees F.[74]

The boilers are placed on the deck above the engine so that the firing aisle is adjacent to the engine-room control console. The boilers exhaust to kingposts on deck.

3. Electrical system: Two steam-powered General Electric turbogenerators are installed for ship's-service electrical generation; each delivers 1,250 kW, 450-v, 3 phase, 60-cycle AC. The turbines receive 850 psi steam at 900 degrees F and produce 1,200 rpm on 2.2" Hg vacuum. General Electric manufactured the generators as complete units at the company's Fitchburg, Massachusetts, plant and shipped to Chester, Pennsylvania, for installation.[75]

A diesel-driven General Motors 100 kW emergency generator is installed on the Upper Deck. It is designed to start automatically (from nickel-cadmium batteries) in the event of a severe voltage drop on the main bus.[76]

4. Automation systems: The *American Racer* is fitted with one of the earliest shipboard automated control systems. In Sun Shipbuilding's description, this system

> includes digital data and bell loggers, remote propulsion controls in the engine room and remote throttle control on the bridge, steam atomization with sensitive combustion control, and remote control of motor operated valves for circulating water, bilge, overboard discharge, and feed systems. Automatic paralleling of generators, start and stop of all pumps and monitoring of important instrumentation including bearing temperatures can be accomplished at the [engine-room] console.

General Electric made the 17'-long engine-room console, the substantially smaller bridge console, and the automatic bell and data loggers; Bailey Meter Company, a subsidiary of Babcock and Wilcox, manufactured the automatic combustion controls.[77]

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[74] Friede and Goldman, *Specifications*, section 50, p. 3 [National Defense modification page]; Sun Shipbuilding, "General Dimensions and Data"; Bachko, "SS American Racer," 62–64; Dillon, "Forty Years of Ship Designs," 207.

[75] Friede and Goldman, *Specifications*, section 50, p. 3 [National Defense modification page]; Sun Shipbuilding, "General Dimensions and Data"; General Electric News Bureau, "Business Press" news release, 2.

[76] Bachko, "SS American Racer," 65.

[77] Quote from Sun Shipbuilding and Dry Dock Company, "S.S. American Racer Class" information booklet, [1964], n.p., in Sun Shipbuilding Records; Bachko, "SS American Racer," 65.

5. Cargo handling arrangements: The *American Racer* is fitted with six pairs of kingposts and twenty-three cargo booms. Most booms are 15-ton capacity except for those serving Hold No. 1, which are 10-ton, and No. 6, which are 10-ton forward and 5-ton aft. There is a single 70-ton heavy-lift boom between Holds Nos. 3 and 4, which is rigged to serve either hold. The after booms for Hold No. 4 are suspended from the forward bulkhead of the main superstructure instead of being rigged from kingposts. Only Hold No. 1 is not double rigged (i.e., served by two pairs of booms). All cargo, topping, vang and schooner-guy winches are electric-motor driven. All the ringing was aluminized when new to resist corrosion and reduce maintenance. The hatch covers are hydraulically operated; their controls are grouped with the winch controls in joint consoles located on platforms between the kingposts.[78]

The cargo-handling gear at Holds Nos. 3 and 4 were modified during the ship's 1965 conversion to containerization to better handle 20′ and 40′ shipping containers.[79]

The ship's refrigeration equipment comprises seven 14-ton units for cargo, two 5-ton units for ship's stores, and one 34-ton unit for air conditioning. The reefer units and the air-conditioning compressor were manufactured by Carrier; the two a/c chiller units were made by Heat-X, Inc. [80]

6. Steering gear: The Lidgerwood Manufacturing Company made the ship's electro-hydraulic double-ram steering gear. Suspended beneath the gear is a balanced streamlined spade-type rudder.[81]

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[78] Bachko, "SS American Racer," 61; Sun Shipbuilding, "General Dimensions and Data."

[79] Lloyd B. Dennis, "4 ships face conversion," BS, Feb. 11, 1966, C11.

[80] Bachko, "SS American Racer," 63, 69; Sun Shipbuilding, "General Dimensions and Data."

[81] Sun Shipbuilding, "General Dimensions and Data."

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Plans and voyage documentation left aboard the *American Racer* by its 1983 layup delivery crew. Suisun Bay Reserve Fleet, Benecia, California.

APPENDIX I: *Challenger II* vessels

Vessels built by the Sun Shipbuilding and Dry Dock Company for the United States Lines Company under Maritime Administration contract no. MA-MSB-11 (design C4-S-64a), signed Oct. 10, 1962

Name	MARAD hull no.	Builder's hull no.	Keel laid	Launched	Delivered
American Rover	146	628	May 15, 1963	July 7, 1964	Jan. 15, 1965
American Racer	147	629	June 18, 1963	May 13, 1964	Nov. 12, 1964
American Ranger	148	630	July 16, 1963	Oct. 19, 1964	Apr. 14, 1965
American Reliance	149	631	Feb. 19, 1964	Feb. 1, 1965	June 29, 1965
American Resolute	150	632	June 3, 1964	Apr. 15, 1965	Sept. 24, 1965

APPENDIX II: ORIGINAL COMPLEMENT OF THE *AMERICAN RACER*

From *Specifications for a Single-Screw Cargo Vessel, Turbine Propulsion, Maritime Administration Design C4-S-64a*

Deck Department		
Master	1	
Chief officer	1	
Second officer	1	
Third officers	2	
Radio officer	1	
Deck cadet	1	
Bosun	1	
Able seamen	6	
Ordinary seamen	3	
Purser	1	Total: 18
Engine Department		
Chief engineer	1	
First assistant engineer	1	
Second assistant engineer—watch	1	
Third assistant engineers—watch	2	
Third assistant engineer—reefer	1	
Engine cadet	1	
Electrician, unlicensed	1	
Reefer engineer, unlicensed	1	
Deck and engine mechanics—watch	3	
Engine day worker utility man	1	
Wiper	1	Total: 14
Steward's Department		
Chief steward	1	
Chief cook	1	
Cook and baker	1	
Messmen	4	Total: 7
		Total crew: 39
Passengers	4	
		Grand total: 43