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Report to the Ranking Minority Member, Subcommittee on Merchant Marine, Committee on Commerce, Science, and Transportation, U.S. Senate

September 1988

THE JONES ACT

Impact on Alaska Transportation and U.S. Military Sealift Capability

Released

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Resources, Community, and
Economic Development Division

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September 30, 1988

The Honorable Ted Stevens
Ranking Minority Member
Subcommittee on Merchant Marine
Committee on Commerce, Science,
and Transportation
United States Senate

Dear Senator Stevens:

As requested, we are providing you with our analysis of certain effects of the Jones Act (46 U.S.C. App. 883) as they pertain to Alaska. The Jones Act is enforced by the U.S. Customs Service in the Department of the Treasury. The act requires that, with a few exceptions, cargo transported by water between points in the United States be carried on U.S. built and registered vessels. Moreover, the act requires that the vessels be owned and primarily crewed by U.S. citizens. The Jones Act increases the cost of domestic waterborne commerce because U.S. vessels and crews are generally more expensive than foreign vessels and crews. Nevertheless, the act has been retained largely because it helps maintain the nation's capability for military shipbuilding and sealift[1] in time of war. The state of Alaska is disproportionately affected by the Jones Act because of its dependence on waterborne shipping.

As agreed with your office, we focused our analysis specifically on estimating the economic costs and the national defense effects of requiring that vessels used in the Alaska trade be built in the United States.

Results in Brief

Our major findings are as follows:

- Based on our estimates, the U.S.-built requirement increases costs of transportation in the Alaska trade by about $163 million annually. However, a change in the act now would not result in an immediate saving of this amount, because the major oil companies have invested heavily in U.S.-built ships and would be unlikely to replace these ships with foreign-built ships even if allowed to do so. This cost impact will likely decline in the future as the volume of oil shipped from the state decreases and as more of the oil is shipped by pipeline.

[1] "Sealift" is the overseas transport of military supplies.

- The Jones Act fleet[2] used in the Alaska trade comprises 21 percent of the militarily useful U.S.-flag fleet and provides positions for 22 percent of U.S.-citizen merchant mariners. In addition, since 1970, about 19 percent of the merchant ships built in U.S. shipyards have been built for the Alaska trade. The construction of these vessels has made a significant contribution to maintaining our military shipbuilding capacity.

Background

Alaska depends heavily on waterborne transportation. According to 1977 data (the most recent available), 63 percent of the tonnage shipped to Alaska was shipped primarily by water, compared with 9 percent of the tonnage shipped in the United States as a whole. The Alaska trade is dominated by the southbound shipment of crude oil, which amounted to 99 million tons in 1985. Northbound shipments of groceries, consumer goods, and other supplies, primarily from the Puget Sound area, amounted to less than 3 million tons. Most of the oil is shipped to the West Coast (59 percent), but 33 percent is shipped via Panama to the Gulf and East coasts. The rest is shipped to Hawaii or to the Virgin Islands.

The Jones Act generally requires that domestic cargoes be transported in U.S.-built, U.S.-flag, U.S.-owned, and U.S.-crewed ships. One exception is cargo shipped to and from the U.S. Virgin Islands, which are exempt from the Jones Act. Oil shipped between the Virgin Islands and other points in the United States may, and often does, move on foreign-built, foreign-flag tankers. The impact of the Jones Act is strengthened by the Export Administration Act of 1979, which generally prohibits the export of crude oil produced in Alaska's North Slope. The oil must therefore be shipped to points in the United States on Jones Act tankers. We used data from the Department of Transportation's Maritime Administration (MarAd) and from operators to develop estimates of the annual capital costs associated with the existing fleet of Alaska-trade Jones Act vessels, and calculated what these annual capital costs would have been had these vessels been built abroad. We also analyzed the possibility that building vessels in the United States increased operating costs because of the preponderance of steam-driven vessels in the U.S.-built fleet (as compared with more fuel-efficient diesel-driven vessels in the foreign-built fleet). MarAd officials and carriers, however, told us that, had U.S.-flag ships been built abroad in the 1970s, they probably would

[2]The "Jones Act fleet" consists of those vessels that qualify, under the Jones Act and other U.S. law, to offer transportation between points in the United States. This includes vessels that are U.S.-built, U.S.-flag, and U.S.-owned, and which do not receive construction or operating subsidies.

have been built with steam power, because U.S. crews were accustomed to steam power, and the cost savings associated with diesel power were not yet compelling. We concluded, therefore, that U.S.-flag vessels probably would have been built with steam power even if they had been built abroad, and that no operating cost saving would have resulted.

In analyzing the contributions of the Alaska-trade Jones Act fleet to meeting military sealift needs, we took as given the sealift needs identified by the Department of Defense (DOD), and analyzed the contribution of the Alaska-trade Jones Act fleet to meeting requirements for ships, crews, and shipyards.

Economic Costs

Previous studies have estimated the costs of the Jones Act on the Alaska trade to be between $269 million and $674 million per year. These studies, carried out in 1982, included costs of both the U.S.-built and the U.S.-flag requirements of the Jones Act. The U.S.-built portion of those cost estimates amounted to $134 million to $456 million per year.

Our cost estimate of $163.2 million per year for the U.S.-built requirement alone includes $15.2 million for dry cargo ships, $5.1 million for tug/barge combinations, and $142.9 million for tankers. This cost estimate represents the excess of annual capital costs in 1987 for the U.S.-built ships in the current Alaska-trade fleet over those of similar foreign-built ships. This estimate is sensitive to the assumptions that are made about the service lives of U.S.- and foreign-built ships. Using an alternative assumption about the service lives of foreign-built tankers, for example, lowers the Jones Act cost from $142.9 million for tankers to $99.4 million, reducing the total Jones Act cost to $119.7 million.

A new pipeline recently began operation between California and Texas, and a parallel pipeline of larger capacity is planned. These new pipelines will reduce the need for tanker transportation of Alaskan oil between California and the Gulf Coast, and thus reduce the costs of the Jones Act in the Alaska trade. Also, production of Alaska North Slope oil is expected to peak in 1989 and decline thereafter. To the extent that this decline actually occurs, the costs of the Jones Act will be reduced.

The extent to which the costs of the Jones Act are borne by Alaskans rather than oil companies, the federal government, and shippers in the lower 48 states cannot be estimated accurately. The increased transportation costs for Alaskan oil do, however, reduce royalties and severance

taxes received by the state of Alaska. We estimate this revenue loss at $37 million per year.

Effects on Military Sealift

The military strategy of the United States relies heavily on the use of U.S.-flag ships to move military supplies abroad in case of war. This military sealift requires adequate numbers of ships, crews, and shipyards. All three of these elements of military sealift have been declining. The U.S.-flag fleet declined from 1,050 ships in 1950 to 365 in 1987. The number of positions for U.S. merchant mariners declined from 56,629 in 1950 to 10,376 in 1987. The number of shipyards declined from 119 in 1982 to 102 in 1986, while the shipyard work force declined from 160,000 to 128,000. There are currently no merchant ships under construction in U.S. shipyards.

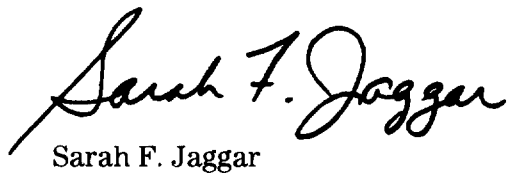
Admitting foreign-built ships to the Alaska trade would probably not change the number of U.S.-flag ships in that trade. However, it might reduce the number of positions for U.S.-citizen merchant mariners. This is because, while the foreign-built ships would be required to operate under the U.S. flag with U.S. crews, the foreign-built ships would be more likely to use diesel engines than the existing U.S.-built ships, so that the crew requirements would probably be somewhat reduced. Because our analysis indicates that existing capacity in the Alaska trade is adequate for anticipated traffic levels, we anticipate little construction of additional Jones Act vessels for the Alaska trade for the next 10 years. Allowing foreign-built ships into the Alaska trade would therefore probably have little short-term effect on the shipyard mobilization base. But in the long run, as existing ships are replaced, the effect would be to reduce the shipyard mobilization base.

The appendixes to this report present our analysis in greater detail. Appendix I provides background on the Jones Act and on the Alaska trade and presents in detail our objectives, scope, and methodology. Appendix II presents our analysis of how the Jones Act has affected Alaskan transportation costs. Appendix III presents information on the effects of the Alaska-trade Jones Act fleet on U.S. military sealift capability. Appendix IV summarizes the requirements of Jones Act provisos and related laws, appendix V details our methodology, and appendix VI lists the ships in the Alaska-trade Jones Act fleet in 1987.

We received oral comments on this report from program officials at the Department of Defense and the Maritime Administration in the Department of Transportation. In general, they concurred in the analysis presented in the report. They suggested several technical changes, which we incorporated as appropriate. In addition, the Department of Defense said that it supports the existing scope of the Jones Act and the importance of the tankers that operate in the Alaska trade.

As arranged with your office, we plan no further distribution of this report until 15 days after the date of this letter, unless you publicly announce its contents earlier. We will then send copies to the Chairman, House Committee on Merchant Marine and Fisheries; the Secretaries of Defense, Transportation, and the Treasury; the Director, Office of Management and Budget; and other interested parties. If we can be of further assistance, please contact Kenneth M. Mead, Associate Director, at (202) 275-1000 or me at (202) 275-5100. Major contributors to this report are listed in appendix VII.

Sincerely yours,



Sarah F. Jaggar
Associate Director

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Abbreviations

ANS	Alaskan North Slope
ANWR	Arctic National Wildlife Refuge
bpd	barrels per day
CDS	Construction Differential Subsidy
DOD	Department of Defense
dwt	deadweight tons
GAO	General Accounting Office
hp	horsepower
ICC	Interstate Commerce Commission
LASH	lighter aboard ship
MarAd	Maritime Administration
NADES	National Defense Shipyard Study
NDRF	National Defense Reserve Fleet
NPC	National Petroleum Council
OECD	Organization for Economic Cooperation and Development
RO/RO	roll on/roll off
RRF	Ready Reserve Force
SH&E	Simat, Helliesen & Eichner
SYMBA	Shipyard Mobilization Base Study
TOTE	Totem Ocean Trailer Express
VLCC	very large crude carrier

Introduction

The Jones Act, passed in 1920, requires that all shipments by water between points in the United States travel by U.S.-flag, U.S.-built, U.S.-crewed vessels. It has been supported primarily because a U.S.-flag, U.S.-built, U.S.-crewed merchant marine is considered important for national defense, despite its effect on raising the costs of U.S. domestic shipping.

The state of Alaska is disproportionately affected by the Jones Act because of its dependence on waterborne shipping. The Jones Act affects both supplies shipped north to Alaska and crude oil and fish products shipped south. Numerous provisions of the Jones Act and of other laws affect its scope. We were asked to examine the effects of the Jones Act on transportation with Alaska and on the nation's capacity to move war materiel.

Background

The "Jones Act" is the popular name for Section 27 of the Merchant Marine Act of 1920 (46 U.S.C. App. 883). It was inserted in the act as an amendment by the Senate Commerce Committee, under the chairmanship of Senator Wesley L. Jones of Washington State. It requires that, with certain exceptions, all cargo transported by water between points in the United States be carried on vessels built and registered in the United States, and owned by citizens of the United States.

The Jones Act strengthened existing law which had, since 1789, encouraged the use of U.S.-built, U.S.-owned ships in coastwise trade. It was originally motivated in part by the desire, as expressed by the Senate Commerce Committee's report, to build up the American merchant marine "commensurate with our wealth, power, and standing among the nations of the world." It was also motivated by the more practical desire to avoid a repetition of American experience during World War I, when the shortage of U.S.-flag shipping and the preemption of foreign-flag shipping by the demands of the war made it difficult for many American shippers to have their cargoes delivered.

Recently, the primary rationale of the act has been its effect in promoting a U.S. owned, built, and crewed merchant marine for wartime overseas transport of military supplies, or "military sealift." Supporters of the act acknowledge, however, that it increases the cost of domestic

waterborne transportation, because both U.S.-built ships and U.S. crews usually cost more than their foreign counterparts.[1]

The Jones Act does not cover passenger transportation or fishing, but other legislation enacted in 1886 and 1950 established similar requirements for the transportation of passengers and landing of fish, respectively (although vessels landing fish in the United States are required only to be U.S.-flag, not U.S.-built). The Jones Act also does not require that ships providing domestic service be repaired in U.S. shipyards, but the Tariff Act of 1922 requires that any repairs done abroad on U.S.-flag ships pay a 50- percent duty on the cost of the repairs. The Jones Act does not explicitly require the use of U.S. citizen crews. However, the Jones Act does require the use of U.S.-flag vessels, and the U.S. manning laws (46 U.S.C. 8103) require that all the licensed officers and 75 percent of the unlicensed crew on U.S.-flag vessels be U.S. citizens.

The Jones Act is enforced by the U.S. Customs Service in the Department of the Treasury. The cargoes of vessels violating the act are subject to seizure. The U.S. Coast Guard issues rules defining what a "U.S.-built vessel" is, and issues licenses authorizing vessels to engage in the coastwise trade. The Maritime Administration administers the construction subsidy program and can issue waivers allowing vessels receiving such subsidies to engage in the domestic trade. It also has an Office of Domestic Shipping that monitors the domestic shipping industry and assesses domestic shipping needs.

Alaska Depends Heavily on Water Transportation

Because of its geographical location, and the corresponding lack of rail access and poor quality of road access, Alaska has traditionally been forced to rely more heavily on water transportation than have the contiguous ("lower 48") states. According to the Census Bureau's 1977 Commodity Transportation Survey, 63 percent of the shipments to Alaska (by tonnage) from other states were shipped primarily by water.[2] By contrast, for the United States as a whole, only 8.8 percent of the tonnage shipped was primarily by water. As a result, Alaska is more affected by the Jones Act than are the lower 48 states. Alaskans have objected to the burdens of the Jones Act virtually from the date of its

[1] A 1984 report by the Congressional Budget Office, for example, cited U.S. shipbuilding costs of two to three times those of Japan, and U.S. crew costs of six times those of Singapore. See Congressional Budget Office, U.S. Shipping and Shipbuilding: Trends and Policy Choices, Aug. 1984, pp. 24-27.

[2] U.S. Bureau of the Census, 1977 Census of Transportation, Commodity Transportation Survey: Summary, June 1981, pp. 11, 66, and 77. While the Census of Transportation is conducted every 5 years, the Commodity Transportation Survey was not published for 1982, and was not conducted in 1987.

passage. In March 1921, for example, the Alaska Territorial Legislature approved a concurrent resolution directing the Alaska Attorney General to contest the Jones Act on the grounds that it was discriminatory and unconstitutional.

Northbound Cargo

Most waterborne dry cargo bound for Alaska is shipped from Puget Sound, from either Seattle or Tacoma, Washington. About 2 million tons of this cargo was shipped in 1985 (the latest year for which data are available) and was comprised of a wide variety of groceries, building supplies, consumer goods, and other supplies. (See table I.1.) Alaska also received in 1985 about 717,000 tons of refined petroleum products shipped from the West Coast. According to U.S. Army Corps of Engineers data, about 63 percent of the cargo is shipped to the Anchorage area.

While most of the cargo shipped to Alaska moves by water and is subject to Jones Act restrictions, there are some exceptions. Some time-sensitive cargo with high value per unit weight moves by air. Some truck traffic moves along the Alaska Highway. About 63,000 metric tons of bulk traffic (mostly chemicals and explosives) moved under Proviso 3 of the Jones Act in 1985 on foreign-flag vessels through the Canadian port of Prince Rupert. (See the discussion of the Jones Act provisos on p. 15.) This was about 3 percent of the 2.7 million short tons estimated by the U.S. Army Corps of Engineers to be shipped directly from U.S. ports. In the past, some Proviso 3 cargo bound for the arctic north slope has moved through Canada down the Mackenzie River. Finally, of course, cargo which is imported from Canada or other foreign countries directly to Alaska is not subject to the Jones Act. Some automobiles, for example, are imported directly from Japan to Alaska. We do not have complete data on the volume of traffic moving to Alaska by these various modes. Corps of Engineers data for 1985 show that cargo imported from foreign countries into Alaska was about 20 percent (633,340 out of 3.35 million tons) of total inbound foreign and interstate shipments. (See table I.1.)

Table I.1: Waterborne Freight Traffic to and From Alaska, 1985

Figures in short tons[a]

Commodity group	Foreign		Interstate[b]	
	Imports	Exports	Receipts	Shipments
Food and groceries (except seafood)	482	473	336,616	439
Seafood	10	151,872	1,001	132,610
Forest products	71,147	1,747,540	106,314	62,940
Mineral products (except petroleum)	280,285	603,184	178,352	2,004
Petroleum:				
Crude oil			122,303	99,478,196
Petroleum products	280,769	1,351,526	716,995	899,169
Chemicals	9,724	117,239	100,887	537,535
Manufactured products	17,881	654	95,241	56,233
Transportation equipment:				
Cars and trucks	2,302	177	11,485	12,572
Other trans. equip.	3	1	3,504	566
Miscellaneous commodities	737	66	1,011,906	180,306
Waste, scrap, and containers			3,271	20,574
Total	**663,340**	**3,972,732**	**2,687,875**	**101,383,144**

[a]A short ton is equal to 2,000 pounds.

[b]Except for crude oil, these data include only shipments to and from the West Coast. The crude oil data also include shipments via Panama to the Gulf Coast, via Cape Horn to the U.S. Virgin Islands, and to Hawaii.

Source: U.S. Army Corps of Engineers.

Dry-cargo service to Alaska is offered in containerships,[3] roll-on/roll-off (RO/RO) ships,[4] and barges. Containership and RO/RO service is offered twice a week, year-round, between Puget Sound and Anchorage. Barge service, which is slower but cheaper, is offered weekly, year-round, to the Anchorage area and less frequently in the summer months to other parts of Alaska.

[3]A containership is a dry cargo vessel which carries its cargo in standard shipping containers, usually 8'x8'x40'. These are lifted on and off the vessel by specialized container cranes. The containers can then be moved by land to their ultimate destination on railroad flatcars or truck trailer chassis.

[4]A RO/RO ship, as the name implies, carries truck trailers and/or railcars, which are loaded onto the ship by rolling them on and unloaded by rolling them off. They do not require the specialized cranes required by containerships—only a ramp which may be part of the ship's equipment. However, the integral chassis, which is part of each truck trailer, and the decking, which must be provided to support each trailer, make for less efficient use of space than is the case with a containership, in which the containers can be stacked one on top of another.

Southbound Cargo

While Alaskan concern about the burdens of the Jones Act has traditionally been focused on its effect on northbound cargo, the volume of northbound cargo has been dwarfed, since shipments of Alaskan North Slope (ANS) oil began in 1977, by the volume of southbound cargo. While the Corps of Engineers estimates the volume of interstate coastwise shipments received in Alaska at about 2.7 million tons in 1985, they estimate the volume of oil shipped south in that year at 99 million tons. (See table I.1.) There were also about 1 million tons of nonpetroleum products shipped interstate from Alaska in 1985, the most important of which were chemicals, seafood, and forest products. However, most of Alaska's seafood and forest products, as well as virtually all of its mineral shipments, were exported directly to foreign countries, thus avoiding the effects of the Jones Act.

Virtually all Alaskan oil which is not used in Alaska is shipped to other points in the United States, in accordance with the requirements of the Export Administration Act of 1979. However, crude oil produced in the Cook Inlet area (near Anchorage) is not covered by the 1979 act and can be exported. Also, refined petroleum products, whether from the North Slope or from Cook Inlet, can be exported. In 1985, exports of petroleum products from Alaska were 1.35 million tons (mostly liquified natural gas), about 1.3 percent of petroleum shipments to U.S. points.

Most Alaskan oil (about 51 million long tons in 1986[5]) is shipped directly to refineries on the West Coast. (See table I.2.) A substantial amount, however (about 29 million long tons in 1986), is shipped through the Panama Canal to the Gulf Coast. A little of this (355,000 long tons) is shipped directly through the Canal on small tankers. Most is unloaded at Panama, shipped across the Isthmus through the Panama Pipeline, and then reloaded onto tankers for shipment to the Gulf Coast. About 2 million long tons are shipped to Hawaii. Some crude oil is shipped to the U.S. Virgin Islands (5 million long tons) by way of Cape Horn.

[5]Note that these data are in long tons, which are more commonly used for maritime measurement. A long ton is 2,240 pounds. The Corps of Engineers data in table I.1 are in short tons of 2,000 pounds.

Table I.2: Alaska North Slope Interstate Shipments of Crude Oil From Valdez, 1986

Destination	Millions of tons[a] per year	Thousands of barrels per day	Percent of total
West Coast	50.9	1,005	58.5
Gulf/East Coasts:			
Via Panama Pipeline	28.8	569	33.1
Via Panama Canal	0.4	7	0.4
Hawaii	1.9	38	2.2
Virgin Islands			
(via Cape Horn)	5.0	99	5.8
Total	**87.1**	**1,718**	**100.0**

[a]These data are in long tons of 2,240 pounds.
Source: Maritime Administration.

Jones Act Provisos and Other Laws Affect Its Scope

The Jones Act contains 10 "provisos" which affect its scope, as do several other laws passed since it was enacted. The most important of these are the Export Administration Act of 1979 and the exception for shipments to the U.S. Virgin Islands.

The 10 provisos to the Jones Act are described more fully in appendix IV. The proviso with greatest significance for Alaska is Proviso 3, which states that merchandise transported from a point in the United States, by rail through Canada, and then by water from a Canadian port to Alaska, can move on the water leg via a foreign-flag ship if the through tariff for the movement is filed with the Interstate Commerce Commission (ICC).

The Export Administration Act of 1979 generally requires that all crude oil shipped through the Trans-Alaska Pipeline (i.e., all Alaska North Slope crude oil) be shipped to a point in the United States. This act strengthened a similar provision enacted with the Trans-Alaska Pipeline Authorization Act of 1973. In the absence of these restrictions, Alaskan oil shipped through the pipeline could be exported to Japan and other countries on foreign-flag tankers, thus avoiding the effects of the Jones Act. Since oil shipments from Alaska are by far the largest part of the Alaska trade, this requirement dramatically expands the scope of the Jones Act requirements.

One significant exception to this requirement is the Virgin Islands exception. The U.S. Virgin Islands are a territory of the United States, and therefore are a part of the United States for purposes of the Export

Administration Act. Hence, ANS crude oil can be shipped to the Virgin Islands. Under a provision enacted in 1936, however, the Virgin Islands are exempt from the Jones Act. (See app. IV.) Crude oil can therefore be carried from Alaska to the Virgin Islands on foreign-flag tankers, refined in the Virgin Islands, and then carried (as a refined product) to the continental United States on foreign-flag product tankers. (See table I.2.)

Alaskan oil and gas that are not shipped through the Trans-Alaskan Pipeline (such as oil and gas from Cook Inlet, near Anchorage) can be exported, thus escaping the Jones Act. Also, under current law, ANS oil that is refined in Alaska can be exported as a refined product.

There are also several minor exceptions. For example, Proviso 4 of the Jones Act allows foreign-flag or foreign-built vessels to operate on the Yukon River in the interior of Alaska. Section 18 of the Merchant Marine Act of 1920 allows foreign-built vessels which have come into the possession of the Secretary of Transportation (e.g., by being confiscated for drug-smuggling) to be sold to a U.S. operator and operated in the Jones Act trade. Vessels benefitting from both of these provisions are currently in operation.

One major law affecting the Jones Act is the 1936 Merchant Marine Act, which authorizes both operating and construction (shipbuilding) subsidies. These subsidies were intended to assist U.S.-flag carriers in competing with lower cost, foreign-flag carriers. As a result, the 1936 act generally prohibits a ship receiving either kind of subsidy from engaging in coastwise service. Since U.S.-flag carriers have higher costs than foreign-flag carriers, they can compete in the foreign trade only if they are either subsidized or have built their foreign-trade ships abroad. In either case, they are prohibited from engaging in the coastwise trade.

The economics of foreign-trade shipping, combined with the provisions of the 1936 act and of the Jones Act, thus separate the U.S.-flag fleet into two distinct groups: (1) foreign-trade ships, which are either subsidized or built abroad, and therefore are ineligible to engage in the domestic trade, and (2) Jones Act ships, which are built in the United States and are unsubsidized. The latter can engage in the domestic trade, but because of their high costs are economically excluded from the foreign trade. The only ships that can engage in both trades are ships that are eligible for the Jones Act but also carry foreign-trade "preference cargo," i.e., U.S. military cargoes and "government-impelled" cargoes

(such as Food for Peace), some or all of which by law must be carried in U.S.-flag ships.

The "Jones Act fleet" therefore consists of those vessels with "domestic trading privileges," i.e., those which are U.S.-flag, U.S.-owned, and U.S.-built (or which have acquired domestic trading privileges through some exception to the law, such as confiscated vessels), and which were not built with construction subsidy and are not receiving operating subsidies. Five tankers currently in the Jones Act fleet were built with construction subsidy but later repaid it; the legality of this repayment is currently under litigation. The active U.S.-flag fleet in 1987 comprised 365 ships. Of these, 156 were built abroad or receive subsidy and are therefore restricted to the foreign trades. The remainder, 209 ships, comprise the Jones Act fleet. Of the latter, 86 were active in the Alaska trade. Vessels in the Alaska-trade portion of the Jones Act fleet are listed in appendix VI.

Objectives, Scope, and Methodology

On July 13, 1986, Senator Ted Stevens, then Chairman of the Merchant Marine Subcommittee of the Senate Committee on Commerce, Science, and Transportation, asked us to examine the economic impact of the Jones Act. In subsequent discussions with his office, we agreed to limit our examination to the effects of the Jones Act on transportation in the Alaska trade, and to focus on the effects of the Jones Act requirement that vessels in domestic service be built in the United States. We also agreed to look at the role of the Jones Act in achieving national security objectives by providing military sealift capability.

Our two objectives were therefore to

- estimate the economic costs of the act's U.S.-built requirement on transportation to and from Alaska and
- analyze the impact of this requirement on achieving national defense objectives.

Our methodological approach to achieve the first objective was to identify all vessels active in the Alaska trade and estimate what their costs of construction were in U.S. shipyards. We calculated the annual costs of amortizing this capital investment, and then estimated what this annual capital amortization cost would have been had these vessels been built in foreign shipyards. We also examined possibly increased operating costs associated with building these ships in U.S. shipyards. These might result from higher fuel costs of using steam power (commonly used by

U.S.-built vessels) versus the lower costs of using diesel power (commonly used by foreign-built vessels). They could also include the costs of the larger crews required to operate steam power plants. A detailed discussion of our methodology appears in appendix V.

Our cost estimate is based on a retrospective analysis of how much transportation costs would have been reduced if the U.S.-built requirement had not been in effect at the time the existing Alaska-trade fleet was built. Because oil companies have already invested in more costly U.S.-built ships, a change in the U.S.-built requirement now would not necessarily reduce transportation costs by this amount in the immediate future.

As agreed with the requester's office, we did not attempt to measure the incidence of the costs of the Jones Act (i.e., the extent to which they are borne by Alaskans rather than oil companies or residents of other states). We also did not attempt to measure any multiplier or other secondary economic effects of the Jones Act, such as effects on employment. Further, we did not attempt to estimate what the future annual savings in transportation costs would be if the Jones Act were modified now. While we present some information on the significance of these effects, we did not attempt to estimate their magnitude.

Our approach to the second objective was to identify, based on data from MarAd and from individual carriers, the vessels active in the Alaska trade and to determine, using information from MarAd and from DOD, their military utility. We then analyzed the effects of building these ships in the United States on the three major requirements for sealift—ships, crews, and shipyards.

As agreed with the requester's office, we took as given DOD's estimates of how much sealift capacity and what shipyard mobilization base it would need in a military conflict. We did not attempt to estimate independently the importance of military sealift for national defense, the need for U.S.-flag vessels for military sealift, or the size of the shipyard mobilization base needed in the event of a military conflict.

Our review was carried out between November 1986 and February 1988 in accordance with generally accepted government auditing standards.

The Effects of the Jones Act on Costs of Transportation in the Alaska Trade

The Jones Act increases the costs of domestic waterborne transportation for two major reasons. First, U.S.-built ships have generally been, since the late 19th Century, more expensive to build than foreign-built ships. Second, U.S. citizen crews generally receive higher wages than foreign crews and are more expensive to insure. Previous studies estimated the cost of all Jones Act requirements on transportation in the Alaska trade at $269 million to $674 million per year. We estimate that the U.S.-built requirement of the Jones Act alone increases the costs of transportation in the Alaska trade by $163 million per year. This does not include the costs for higher wages for U.S.-citizen crews resulting from the Jones Act requirement that U.S.-flag vessels be used, nor does it include secondary market effects.

This Jones Act premium can be expected to decline in the future, both because of declining shipments of oil and because of expanded use of pipelines for shipments of oil to the Gulf Coast. Moreover, these costs would not be immediately eliminated by the elimination of the U.S.-built requirement. While much of this cost is probably borne by Alaskans, the exact incidence of the burden is uncertain.

Previous Studies Have Estimated the Costs of the Jones Act to Be $269 Million to $674 Million per Year

Previous studies have estimated the increased costs associated with both the U.S.-flag and the U.S.-built requirements of the Jones Act. In 1982, the consulting firm of Simat, Helliesen & Eichner, Inc. (SH&E) prepared an estimate of the economic costs of the Jones Act for the Alaska Statehood Commission. SH&E's estimate was that the increased transportation costs for northbound cargo were about $44 million per year, and the increased costs for southbound crude oil were $225 million per year, for a total of $269 million per year. This estimate included both the higher capital costs of the U.S.-built requirement and the higher operating costs of the U.S.-flag requirement. While SH&E did not calculate the costs of the U.S.-built requirement explicitly, the capital cost portion of their estimate, which corresponds to the U.S.-built requirement, was $134 million per year.

Later that year, the Alaska Statehood Commission asked another consultant, Arlon R. Tussing and Associates, Inc., to review SH&E's estimates. Tussing believed that SH&E's northbound estimate was about right, but estimated that the impact on the southbound oil shipments was much greater ($630 million per year), yielding a total of $674 million per year. Tussing's adjustment was based partly on the assumption that, because of the glut in foreign-built shipping, foreign-built vessels could be chartered for just enough to cover their operating costs

(whereas SH&E had assumed that charter fees would have to cover capital costs as well). His adjustment was also based on the benefits to Alaska resulting from secondary market adjustments to a reduction in shipping costs. (See pp. 23-24 for a more detailed discussion of these effects.) Tussing's estimate, like SH&E's, estimated the total costs of the Jones Act, including the cost both of the requirement to use vessels built in the U.S. and of the requirement to use vessels documented under the U.S. flag (and employing U.S. crews). The U.S.-built portion of Tussing's estimate would be about $455 million.

Building Vessels in the United States Increases the Cost of Transportation With Alaska by $163 Million per Year

We estimate that the cost of the U.S.-built requirement alone in 1987 was $163 million per year. We calculated the cost of building Alaska-trade Jones Act vessels in the United States separately for the three major types of vessels used in the trade—dry cargo vessels, tug/barge combinations, and oil tankers. The results are shown in table II.1. The estimated cost premium associated with using U.S.-built vessels in 1987 was $15.2 million for the dry cargo vessels in the Alaska trade, $5.1 million for the tug/barge combinations, and $142.9 million for the oil tankers. Under an alternative assumption about the useful lives of foreign-built tankers (discussed in more detail below), the cost premium for tankers would be only $99.4 million, and the total cost premium would be $119.7 million. Since the dry cargo vessels and the tug/barge combinations are primarily used for northbound cargo, while the tankers are primarily used for southbound cargo, these figures imply that the cost of the U.S.-built requirement for northbound cargo is roughly $20 million per year, while for southbound cargo it is roughly $143 million per year. This cost is about 2 percent of total personal income in Alaska, which in 1986 was $9.5 billion.

Analytic Procedure Used in Developing These Estimates

We first developed a list of Jones Act vessels active in the Alaska trade from MarAd and from ship operators. (Vessels of more than 1,000 tons active in the Alaska trade are listed in app. VI.) We then calculated the costs associated with building these vessels in the United States by estimating the increased capital costs of these vessels as compared with foreign-built vessels. We then "annualized" these capital costs by taking the original interest charges for 1987, using MarAd data on interest rates prevailing at the time the vessels were built. The sum of the annual depreciation charges and the annual interest charges is the annual capital cost shown in table II.1. The difference between the annual capital

cost for U.S.-built ships and the annual capital cost for comparable foreign-built ships is the cost premium attributable to the U.S.-built requirement of the Jones Act.

Table II.1: Aggregate Cost Premium Due to Building Alaska-Trade Vessels in the United States

Dollars in millions

Types of vessels	Aggregate annual capital costs		Jones Act premium
	U.S.-built vessels	Foreign-built vessels	
5 dry cargo ships	$26.2	$11.0	$15.2
46 tugs and 59 barges	25.3	20.2	5.1
54 tankers[a]	259.8	116.9[b]	142.9[b]
Total			**$163.2[b]**

[a]Of the 76 tankers used in the Alaska trade, 22 are over 20 years old (or, if rebuilt, more than 15 years old). These ships are fully amortized. We therefore considered them to have zero capital costs. The costs shown are for the remaining 54.

[b]These estimates assume that foreign-built tankers between 15 and 20 years old would continue to be used beyond the 15-year normal useful life used for depreciation purposes. If these vessels were replaced by new foreign-built vessels at the end of 15 years, the annual capital costs of the foreign-built tankers would increase to $160.4 million, the Jones Act premium for tankers would fall to $99.4 million, and the total Jones Act premium would be $119.7 million. The other data would not be affected. (See discussion on pp. 21-22.)

Source: GAO estimates. See appendix V for detailed methodology.

Our estimate for tankers is affected by a key assumption about the normal useful life of U.S.- and foreign-built ships. U.S.-built tankers are normally depreciated over 20 years, while foreign-built tankers are depreciated over 15 years. A tanker between 15 and 20 years old would thus still have positive annual capital costs if it were a U.S.-built tanker, but would have zero capital costs if it were a foreign-built tanker. If the foreign-built tanker were scrapped at the end of 15 years, and replaced with a new tanker, then the annual capital costs of the U.S.-built tanker should be compared with the annual capital costs of a relatively new replacement foreign-built tanker, not with the zero capital costs of a foreign-built tanker retained in service after the expiration of its depreciation life. We do not know whether these hypothetical foreign-built tankers would have been replaced at the end of 15 years, and if they were replaced, we do not know whether they would have been replaced with new or used tankers. These decisions would be based on the owners' perceptions about the future of the Alaskan oil market and on the costs of new and existing ships. To correct for any upward bias in our estimate of the Jones Act premium, however, we made an alternative calculation based on the assumption that all the foreign-built tankers in this 15-20 year old age category would have been replaced with new

foreign-built tankers. Under this assumption, the annual capital costs for foreign-built tankers would have risen to $160.4 million, the Jones Act premium for tankers would have fallen to $99.4 million, and the total Jones Act premium would have been $119.7 million. None of the other data would have been affected.

We did not make any estimate for possibly larger transportation volumes due to a reduced transportation cost. While such an increase in transportation volume is plausible, and would increase the total saving from using foreign-built ships, we have no basis for estimating how large it might be. We have also assumed that the increase in demand for foreign-built ships would not materially increase their price. In view of the current excess supply of foreign-built ships and foreign shipyard capacity, this assumption is plausible.

We did not include any differential operating costs among the costs of the U.S.-built requirement. Such costs were estimated by SH&E on the basis of the higher costs of operating U.S.-built steam propulsion systems rather than foreign-built diesel propulsion systems. After numerous discussions with MarAd and with carriers, we concluded that most of the steam-powered vessels built in the United States would have been built with steam power even if they had been built abroad. This is primarily because they would still have been operated under the U.S. flag with U.S. crews. U.S. crews were accustomed to operating and maintaining steam power plants, and, until 1979, the fuel savings from using diesel power were not sufficiently compelling for a U.S.-flag operator to justify switching to diesel. Very large crude carriers (VLCCs) were, until recently, generally built with steam power whether built in this country for U.S.-flag operation or abroad for foreign-flag operation.

We included all Jones Act vessels carrying goods to or from Alaska, including tankers carrying Alaskan crude oil from Panama to the Gulf and East Coasts of the United States. All non-Jones Act vessels, such as foreign-flag tankers carrying Alaskan crude oil to the Virgin Islands, were excluded.

Our approach was similar to the SH&E approach in that we calculated what the costs of the vessels in the current fleet would have been had they been built abroad. Like SH&E's, our estimates assume that shipping rates would reflect the full costs of building and operating the ships. Economists generally assume that, in the long run, prices fully reflect costs. In the short run, however, prices may not cover costs because of

an excess supply of ships. There is currently an excess supply of foreign-built shipping, so shipping prices do not fully reflect costs. Under these circumstances, as Tussing stated in his analysis for the Alaska Statehood Commission, the savings from allowing foreign-built ships into the trade will be greater, because they can be bought or chartered for less than their cost of construction. Since we view this effect as temporary, we have not included it in our estimates.

Secondary Market Effects May Increase the Impact of These Cost Reductions

Our cost estimate does not take into account possible reallocations of oil shipments that could occur if a change in the Jones Act reduced transportation costs. Transportation costs have the greatest impact on the cost of shipping oil via Panama to the Gulf Coast because this oil is shipped over a longer distance. The elimination of the U.S.-built requirement would reduce transportation costs per barrel more for oil shipped to the Gulf Coast than for oil shipped to California. The elimination of the U.S.-built requirement would thus make shipments to the Gulf Coast more attractive, and oil companies might be induced to shift some of their shipments to that destination. This would be particularly true if, as Tussing stated in 1982, the Gulf Coast price is set by Middle Eastern producers and is independent of the amount of oil shipped from Alaska. Increasing shipments to the Gulf Coast would reduce the supply of oil on the West Coast, and tend to raise the price for oil shipped there.

The "wellhead" price of oil is the selling price at the wellhead. It is determined by the market price at the ultimate destination minus the transportation charges from the wellhead to the ultimate destination. Arlon Tussing, in the analysis which he prepared for the Alaska Statehood Commission, stated that the reallocation of oil from California to the Gulf Coast would cause the wellhead price to rise by the same amount for shipments to both the Gulf Coast and the West Coast. Tussing stated that this would mean that the net revenue increase for oil companies shipping from Alaska would effectively be as great for California-bound oil as for Gulf Coast-bound oil. He estimated that this would approximately double the net revenue increase associated with eliminating Jones Act requirements.

Tussing's analysis of secondary market effects focuses on changes in the wellhead price, rather than changes in transportation costs. His analysis suggests that the wellhead price would rise by more than the reduction in transportation costs, because the reduction in transportation costs would cause a reallocation of supplies to the Gulf Coast, reducing the West Coast supply, and increasing its delivered price. We have not

included this effect, since our focus is on the effect of the Jones Act on transportation costs.

The Costs of the Jones Act Are Likely to Decline

The costs which the Jones Act imposes on transportation with Alaska are likely to decline in the future for several reasons. First, the output of oil from the Alaska North Slope is expected by the Alaska Department of Revenue to peak in 1989 and decline thereafter, falling from 733 million barrels per year in 1989 to 397 million barrels per year in the year 2000, and to 17 million barrels per year in 2015. (See table II.2.) The cost impact of the Jones Act may fall more than in proportion to the fall in oil shipments. This is because, as oil shipments fall, the first shipments to be eliminated will likely be the expensive shipments via Panama to the Gulf Coast. Because of the long distance over which these shipments are transported, these incur a greater transportation cost (and Jones Act premium) than the shipments to the West Coast, so that Jones Act costs will fall more than in proportion to the reduction in the number of barrels shipped.

Table II.2: Expected Decline in Alaska North Slope Oil Shipments

Figures in millions of barrels per year

Year	Expected shipments
1988	710
1989	733
1990	726
1991	692
1992	639
1993	635
1994	581
1995	565
2000	397
2005	238
2010	118
2015	17
2020	5
2025	6
2030	5
2035	6

Source: Alaska Department of Revenue, Dec. 1987 forecast.

These estimates of future production, however, do not include possible production from the Arctic National Wildlife Refuge (ANWR) or from

other undiscovered sources in Alaska. In 1981, the National Petroleum Council (NPC) estimated, on the basis of an industry survey, that undiscovered resources of 17.8 billion barrels existed, equivalent to about 25 years of current production. In 1984, the U.S. Department of the Interior's Minerals Management Service estimated these undiscovered resources to have a total of 3.3 billion barrels of oil, equivalent to about 5 years of current production. In 1986, the NPC conducted a more limited industry survey which indicated that estimates of future discoveries had fallen to 12.9 billion barrels, reflecting the lower price of petroleum (and hence reduced size of economically recoverable future discoveries) and disappointing exploratory results in the early 1980s. To the extent that these sources are actually developed, the decline in shipments of Alaskan oil would be delayed or slowed. The development of these new sources will depend partly on future prices for oil and partly on whether the ANWR (which the Department of Energy's Energy Information Administration estimates has reserves of 1.2 billion to 7.4 billion barrels) is opened for exploration.

Second, Jones Act costs are likely to decline because the construction of new pipelines from California to Texas may reduce or eliminate the shipment of oil by U.S.-built tankers from California to the Gulf Coast. The All American Pipeline, which was completed in December 1986 from Gaviota, California, to McCamey, Texas, links up in Texas with other pipelines connecting refineries in the Midwest, East, and South. The owners of the pipeline state that it will initially have a capacity of 100,000 to 150,000 barrels per day (bpd), with a likely expansion to 300,000 bpd in the 1990s. It will pump both California and Alaskan crude, and began pumping 30,000 bpd of Alaskan crude in June 1987. Construction of a second pipeline, the Pacific Texas Pipeline, began in September 1988 from the Port of Los Angeles to Midland, Texas. The Pacific Texas Pipeline Co., which is building the pipeline, says it is scheduled for completion in mid-1989 and is planned to have a capacity of 900,000 bpd. These new pipelines have the potential to transport all of the 576,000 bpd shipped to the Gulf Coast via Panama in 1986. If they do, this will substantially reduce the distance that the oil has to be shipped on Jones Act tankers, thus substantially reducing the Jones Act's impact.

Third, growth in refinery capacity in Alaska could reduce both Alaska's outbound shipments of crude oil and its inbound shipments of refined products. Because the product mix of Alaskan refineries does not match the product mix of Alaskan petroleum consumption, Alaska ships crude oil to refineries in California or Washington, and then ships refined

products back. In 1985, according to Corps of Engineers data, 716,995 tons of refined petroleum products were shipped to Alaska from the West Coast. If refinery capacity expands in Alaska, the need for these round-trip shipments would be reduced. Also, the restrictions on exports of oil to foreign countries apply only to crude oil. To the extent that the oil can be refined in Alaska, the refined products can then be shipped to foreign countries in lower cost, foreign-flag ships.

The first refinery in Alaska was built in 1962, with a capacity of 18,000 bpd. As of January 1, 1986, three additional refineries and a petro-chemical plant had been built, increasing capacity to 203,700 bpd. Alaska Pacific Refining, Inc., has proposed a new refinery with a capacity of 120,000 bpd at Valdez. The company estimates that about 60,000 bpd of the refinery's output would be exported, or about 3.5 percent of current shipments.

Savings From a Change in the Jones Act Would Not Result Immediately

While we have estimated that the cost of the U.S.-built requirement of the Jones Act in the Alaska trade is $163 million per year (see table II.1), this does not imply that there would be immediate savings of $163 million per year if this requirement were repealed. Many of the oil tankers in the Jones Act fleet are owned by or are on long-term charter to the oil companies that own and ship the oil. (See table II.3.) Since these companies have already paid for the capital costs of their U.S.-built ships, they would switch their oil to foreign-built ships only if the total costs of foreign-built ships (capital costs plus operating costs) were less than the operating costs alone of their U.S.-built ships. Moreover, a reduction in their transportation costs would increase the wellhead value of their oil, and hence increase their royalty and severance tax liability to the state of Alaska. This would weaken their incentive to switch to lower cost shipping even if, as Tussing states, foreign-built ships could be chartered at a price which reflects only their operating costs.

To the extent that existing tankers on short-term charters were displaced by foreign-built tankers, there would probably be a savings in operating costs, because the foreign-built tankers would generally be diesel-powered and would thus require less crew and use less fuel than the generally steam-powered U.S.-built ships. If all Alaska-trade tankers on short-term charter were displaced by foreign-built tankers, we estimate the savings in operating costs, based on MarAd data, would be about $11 million per year.

Table II.3: Alaska-Trade Tankers Owned by or on Long-Term Charter to Shippers, 1987

Shipper	Tonnage owned or on long-term charter[a] (deadweight tons)	Total tonnage employed[b]
Arco	1,494,500	1,139,800
Exxon	1,445,400	1,829,500
Sohio	939,600	3,747,100
Other oil companies	1,133,800	1,211,900
Total	**5,013,300**	**7,928,300**

[a]"Long-term" charter is defined for purposes of this table to be a charter of 10 years or longer.

[b]Tonnage employed includes ships actually used by each shipper to ship its oil, whether those ships are owned by the shipper or not. Three ships owned by Arco are chartered to and employed by Sohio. Sohio is foreign-owned, and therefore is prohibited from operating its own ships in the Jones Act trade. It has six ships on long-term charter, but most of the ships which it employs are on short-term charter from independent shipowners.

Source: MarAd and carrier data.

Who Pays the Costs of the Jones Act?

Analyzing who ultimately bears these Jones Act costs is complicated because there are plentiful opportunities for passing these costs on to others. The increased cost of transporting supplies to Alaska may be passed on to Alaskans, but these costs may in turn be passed on to others. Salaries in Alaska are generally higher than in the lower 48 states, in part to compensate for these higher costs. To the extent that these salaries are paid by those in the lower 48 states (such as salaries for employees of the federal government and national corporations), the costs of the Jones Act may be passed on to those living in the lower 48 states. To the extent that the costs of products produced in Alaska (such as seafood) which are shipped to the lower 48 states are increased by the Jones Act, these costs may again be passed back to the lower 48 states. We do not have sufficient data to disentangle these effects.

One effect which can be estimated is the effect of Jones Act oil transportation costs on Alaska state oil revenues. The state receives, as a royalty, 12.5 percent of the wellhead value of all oil produced in the state. In addition, the state receives a severance tax on the remaining 87.5 percent of the wellhead value. The severance tax rate varies from field to field, from 12.25 percent on the first 5 years' production at fields entering production after June 30, 1981, to 15 percent at all other fields, including Prudhoe Bay. Nearly all of the oil—98.76 percent—is produced in fields paying the 15-percent rate. According to a petroleum economist in the Alaska State Department of Natural Resources, every 1-dollar reduction in transportation costs increases the wellhead value by 1 dollar. The combined effect of the royalty and the severance tax is

that the state's revenues are increased by 25.6 percent of the increase in the wellhead value caused by the reduction in transportation costs. If the admission of foreign-built tankers into the Alaska trade led to a reduction in transportation costs of $142.9 million (our estimate of the Jones Act premium for tankers), and if this led to an equal increase in the aggregate wellhead value of the oil, the state of Alaska would gain 25.6 percent of this, or $36.6 million per year.

Impact of Alaska-Trade Jones Act Fleet on U.S. Military Sealift Capability

The Jones Act has been justified primarily on the basis of its contribution to maintaining a U.S.-flag merchant marine for providing military sealift. The decline of the U.S.-flag merchant marine over the past 40 years has raised concerns about its ability to meet its national defense mission. The Alaska-trade portion of the Jones Act fleet has made a significant contribution to providing capacity for military sealift in the past. Eliminating the U.S.-built requirement for the Alaska trade would probably not reduce the number of U.S.-flag vessels available for military sealift, and it would probably have little immediate effect on the nation's shipyard capacity. However, as replacement Jones Act vessels are eventually needed, elimination of the U.S.-built requirement would have a negative effect on U.S. shipyards. Also, the displacement of U.S.-built ships by existing foreign-built ships might reduce somewhat the number of positions for merchant mariners in the Alaska-trade Jones Act fleet.

The Need for Military Sealift

The Jones Act has always been justified in large part because of its contribution to national defense. The nation's strategy for defending itself in a conventional war is based on a wartime planning scenario which postulates a prolonged, global, conventional, three-theater war. Fighting such a war successfully would require that the United States be able to move large quantities of war materiel overseas quickly. The only way this can practically be done is by ship. Traditionally, DOD has relied on the U.S.-flag merchant marine to be available in time of war to provide this sealift capability.

Three elements are required for sealift: ships, crews, and shipyards. The ships must be readily available and of a type suitable for military needs. Some ships are needed immediately, during the "surge" stage of mobilization (the first 90 days); others are needed later, during the ensuing "sustaining" period. The crews must also be readily available and prepared to enter potentially hostile fire zones. Finally, shipyards are needed to prepare laid-up ships for service, to repair damaged vessels, and to build new ships to replace those lost in hostilities. All three of these elements of military sealift have been shrinking.

The U.S.-Flag Merchant Marine Has Been Shrinking

The number of ships in the U.S.-flag fleet has shrunk substantially since World War II. For use in World War II, U.S. shipyards built 4,976 merchant ships (2,000 gross tons and over) to meet wartime shipping needs. This number of ships was greatly in excess of peacetime needs, and after the war most of these ships were sold to foreign operators or

maintained in the newly created National Defense Reserve Fleet (NDRF). Since 1950, according to MarAd data, the number of privately owned oceangoing U.S.-flag ships of 1,000 gross tons or more has fallen from 1,050 in 1950 to 365 in 1987. (See table III.1.) This has occurred despite an increase in the volume of U.S. foreign trade from 117 million tons in 1950 to 641 million tons in 1985. (See table III.2.) The decrease in the number of ships is due partly to increases in the size of cargo ships and in the efficiency of their operation (due to such innovations as containerization) which have reduced the number of ships needed to move a given amount of cargo. It is also due, however, to a decline in the U.S.-flag share of U.S. foreign trade from 43 percent to 4 percent. (See table III.2.) The construction of pipelines and the introduction of ocean-going tug/barge combinations have also reduced the demand for ships in coastwise shipping. The increase in the average size of vessels is reflected in U.S.-flag deadweight tonnage,[1] which has actually increased, despite the fall in the number of ships, though this increase has been confined to the tanker segment of the industry. (See table III.1.)

As the number of ships in the U.S.-flag fleet has shrunk, DOD has placed increasing emphasis on maintaining a government-owned reserve fleet of merchant ships for use during war. This fleet is in two parts. The NDRF comprised, as of January 1, 1987, 141 militarily useful vessels, including 96 Victory ships built during World War II as well as some newer vessels. The Ready Reserve Force (RRF) is comprised of 86 generally newer vessels which are maintained in a more advanced state of preparedness so that they can be readied for sea within either 5, 10, or 20 days.

[1]The deadweight tonnage of a vessel is its cargo-carrying capacity in long tons of 2,240 pounds.

Table III.1: Active Privately Owned U.S.-Flag Merchant Fleet[a]

Deadweight tons in millions

	Number of ships			Deadweight tons		
Year	Dry cargo	Tankers	Total	Dry cargo	Tankers	Total
1950	618	432	1,050	6.4	6.6	13.0
1955	704	338	1,042	7.6	5.6	13.2
1960	631	282	913	6.9	5.7	12.6
1965	562	199	761	6.7	5.0	11.6
1970	546	246	792	7.1	6.8	13.8
1975	299	219	518	5.1	7.9	13.0
1980	268	263	531	5.0	14.2	19.2
1985	191	195	386	4.8	11.9	16.7
1987	173	192	365	4.2	12.0	16.2

[a]Oceangoing, 1,000 gross tons or over. Gross tons are a measure of the cargo capacity of a ship in volume, not weight. A gross ton is 100 cubic feet of volume. For comparison purposes, a standard 40-foot shipping container occupies about 2,560 cubic feet of volume, or 25.6 gross tons. A fully loaded 40-foot container would have a maximum gross weight of 30 long tons.

Note: Figures do not necessarily add to totals because of rounding.

Source: Maritime Administration.

Table III.2: U.S.-Flag Share of U.S. Foreign Trade

Year	U.S. foreign trade (millions of tons)	U.S.-flag share (percent)
1950	117	42.6
1955	200	23.6
1960	278	11.1
1965	371	7.5
1970	473	5.3
1975	616	5.1
1980	772	3.7
1985	641	4.3

Source: Maritime Administration.

Not All Ships Are Considered Militarily Useful

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DOD and MarAd staff consider most dry cargo vessels of more than 6,000 deadweight tons (dwt), except for bulk carriers, to be militarily useful. Oil tankers are considered most militarily useful if they are suitable for carrying refined products (i.e., they have coated tanks and other needed equipment) and if they are of moderate size (i.e., no larger than 100,000 dwt, which is the approximate upper limit for transiting the Panama Canal). Large crude carriers are considered of little military value because the military generally needs refined product carriers that are small enough to operate in shallower draft harbors than large crude carriers can navigate. Tug/barge combinations are generally considered of

lesser military value because of their slow speed relative to self-propelled vessels.

The criteria for "militarily useful" are somewhat elastic, however. DOD and MarAd staff told us that, as average vessel sizes have increased, larger and larger vessels have been accepted as being militarily useful. As containerships have displaced noncontainerized "breakbulk" vessels in the dry cargo trade, DOD has made technical adjustments so as to make use of containerships for sealift. Crude carriers might be militarily useful in some circumstances as floating storage tanks, and tug/barge combinations may have some military value if self-propelled vessels are not available.

The Commission on Merchant Marine and Defense[2] has concluded that the current U.S.-flag fleet, including the RRF, would be insufficient to meet surge sealift needs during the first 90 days of hostilities. While the NDRF would supply sufficient sealift to meet sustaining needs after the initial 90 days, these ships could not be prepared for sea soon enough to meet initial surge requirements.

The Number of U.S. Merchant Mariners Available to Crew Reserve Ships Has Fallen

None of the NDRF or RRF vessels have crews assigned to them. In the event of an emergency, MarAd, which is responsible for maintaining and crewing the vessels, would have to secure crews from the pool of merchant mariners not currently working on ships. Each position (or "billet") on an active merchant ship normally provides work for about two merchant mariners, since the ship is used almost continuously, while the crew requires time off for shore leave. In time of war, these off-duty merchant mariners would be called upon to crew the ships of the reserve fleet. The adequacy of this reserve pool of merchant mariners for operating the NDRF and RRF vessels becomes increasingly uncertain as the size of the merchant mariner pool shrinks. This pool has been shrinking as the U.S.-flag fleet becomes smaller, and as the number of crew needed on each vessel shrinks because of automation and other advanced technology. The number of billets on U.S.-flag merchant ships fell from 56,629 in 1950 to 10,376 in 1987. (See table III.3.) The older NDRF and RRF ships each generally need more crew than the newer ships in active service. Data from the report of the Commission on Merchant

[2]The Commission on Merchant Marine and Defense was created by P.L. 98-525, enacted on October 19, 1984. It was established to study the adequacy of the merchant marine and the shipyard mobilization base to meeting needs for military sealift. The members of the Commission were sworn in in December 1986. The Commission issued its first report in October 1987 and is scheduled to issue its final report in December 1988.

Marine and Defense indicate that mobilization of the RRF and NDRF in 1987 would have required more than 14,000 merchant mariners. As of December 31, 1986, 8,818 mariners were available in excess of those needed to crew active vessels.

Table III.3: Billets on U.S.-Flag Oceangoing Commercial Ships 1,000 Gross Tons and Over

Year	Billets
1950	56,629
1955	57,468
1960	49,153
1965	48,273
1970	37,580
1975	20,462
1980	19,814
1985	12,981
1987	10,376

Source: Maritime Administration.

The Shipyard Mobilization Base Has Shrunk

Shipyards are expected to play a series of changing roles during the various stages of military engagement. During the initial 90-day surge period, shipyards would be needed to activate RRF and NDRF ships and to complete militarily useful vessels which were under construction when hostilities began. During the later sustaining phase, shipyards would continue to be needed to repair vessels damaged in battle and to replace vessels that were lost. The scale of hostilities might also require an expansion of the naval and merchant fleets. The nation's shipyards capable of constructing or repairing vessels of 400 feet or longer comprise the "shipyard mobilization base," i.e., the shipyard capacity which would form the base from which mobilization would take place in the event of war.

Between 1982 and 1986, according to MarAd, the shipyard work force declined from 160,000 to 128,000 jobs, and the number of shipyards and ship repair facilities declined from 119 to 102. Since 1980, the number of merchant ships under construction or on order in U.S. shipyards has declined from 69 to zero. When one of the major U.S.-flag dry cargo carriers took delivery of its third containership for the Alaska trade on November 9, 1987, the U.S. shipyard industry found itself with no merchant ships under construction or on order for the first time in American history.

The Alaska-Trade Portion of the Jones Act Fleet Makes a Significant Contribution to Military Sealift

The Alaska-trade portion of the Jones Act fleet plays an important role in meeting potential military sealift needs for tankers. In 1987, there were 144 militarily useful Jones Act tankers, comprising about 79 percent of the militarily useful U.S.-flag tanker fleet. Fifty-six of these tankers were in the Alaska trade, comprising about 39 percent of the militarily useful U.S.-flag tanker fleet. The Alaska-trade fleet makes only a marginal contribution to meeting military sealift dry cargo needs, however. There were 33 militarily useful Jones Act dry cargo vessels, comprising about 8 percent of the deadweight tonnage of the militarily useful dry cargo U.S.-flag fleet. (See table III.4.) Only five of these dry cargo vessels were in the Alaska trade, comprising about 1 percent of the militarily useful U.S.-flag fleet.

Table III.4: U.S.-Flag Militarily Useful Ships, 1987

	Total U.S.- flag ships		Jones Act ships			Alaska-trade ships		
	Ships[a]	Dwt[a]	Ships[a]	Dwt[a]	Percent of total[b]	Ships[a]	Dwt[a]	Percent of total[b]
Tankers:								
Active[c]	168	7,601	144	6,325	83.2	56	3,108	40.9
RRF & NDRF	18	398	0	0	0.0	0	0	0.0
Total	**186**	**7,999**	**144**	**6,325**	**79.1**	**56**	**3,108**	**38.9**
Dry cargo vessels:								
Active[c]	199	4,537	33	621	13.7	5	82	1.8
RRF & NDRF[d]	212	2,957	0	0	0.0	0	0	0.0
Total	**411**	**7,494**	**33**	**621**	**8.3**	**5**	**82**	**1.1**
Total:								
Active[c]	367	12,138	177	6,946	57.2	61	3,190	26.3
RRF & NDRF[d]	230	3,355	0	0	0.0	0	0	0.0
Total	**597**	**15,493**	**177**	**6,946**	**44.8**	**61**	**3,190**	**20.6**

[a]In thousands.

[b]Percent of tonnage.

[c]Includes some privately owned vessels that are laid up or temporarily inactive.

[d]Also includes 10 Military Sealift Command ships on inactive Reduced Operating Status.
Source: Maritime Administration and Commission on Merchant Marine and Defense.

The Jones Act fleet plays a more significant role in providing billets for U.S. merchant mariners. Since Jones Act vessels are, on average, somewhat smaller than U.S.-flag vessels in the foreign-trade fleet, they require more crew members per deadweight ton of capacity. As shown in table III.5, Jones Act tankers provided 86 percent of the tanker billets in the U.S.-flag fleet (compared with 79 percent of the tanker tonnage),

and Jones Act dry cargo vessels provided 17 percent of the dry cargo billets (compared with 8 percent of the dry cargo tonnage). The Alaska-trade tanker fleet provides 45 percent of the tanker billets (compared with 39 percent of the tanker tonnage), while the Alaska-trade dry cargo fleet provides 3 percent of the dry cargo billets (compared with 1 percent of the dry cargo tonnage).

Table III.5: Billets on U.S.-Flag Ships, 1987

		Jones Act		Alaska trade	
	Total U.S.-flag billets	Billets	Percent of total	Billets	Percent of total
Tankers	4,705	4,036	85.8	2,108	44.8
Dry cargo ships	5,671	964	17.0	192	3.4
Total	**10,376**	**5,000**	**48.2**	**2,300**	**22.2**

Source: Maritime Administration.

The Alaska trade has also played a significant role in maintaining the shipyard mobilization base since 1970. During that time, 54 ships were built in U.S. yards for the Alaska trade. This represents about half of the 107 ships built for Jones Act use in that period, and almost one-fifth of the 287 merchant ships built by U.S. shipyards during this period. While we have no basis for quantifying the contribution that the orders for Alaska-trade ships had on the shipyard mobilization base, they certainly had a significant impact.

Eliminating the U.S.-Built Requirement Is Unlikely to Affect the Number of Vessels in the Jones Act Fleet, but Could Reduce the Number of Positions for U.S. Merchant Mariners

While admitting foreign-built vessels into the Alaska trade would probably cause some displacement of U.S.-built vessels by foreign-built vessels, this would probably not change the number of ships in the fleet. However, since the foreign-built vessels would probably require somewhat fewer crew members than the displaced U.S.-built vessels, admission of foreign-built vessels could reduce the number of billets for U.S. merchant mariners.

Eliminating the U.S.-built requirement would open the Jones Act trade to foreign-built vessels. To the extent that foreign-built vessels entered the trade, they would probably be newer vessels brought in to displace older U.S.-built vessels with higher operating costs. If the newer vessels were larger than the existing vessels in the trade, this displacement could reduce the total number of ships in the trade. However, the vessel operators in the Alaska trade with whom we spoke told us that the mix of vessel sizes now in the Alaska trade is well suited to the needs of the

trade. They therefore believed that any use of foreign-built vessels in the Jones Act fleet would not change the total number of ships in the Alaska trade.

The possible displacement of U.S.-built vessels by foreign-built ones could, however, reduce the number of billets in the domestic fleet. Foreign-built vessels would tend to require fewer crew members both because they would probably be newer and because they would be more likely to use diesel power (which requires less crew). The reduction in the number of billets could reduce both the number of actively working merchant mariners and the number of off-duty merchant mariners available to crew ships in the reserve fleets. We have no basis for estimating, however, how many U.S.-built vessels would be displaced and to what extent the number of billets would be reduced.

Revision of the Jones Act for Alaska-Trade Vessels Would Have Little Immediate Effect on the Shipyard Mobilization Base

The elimination of the requirement that vessels in the domestic trade be built in the United States would have its most obvious potential effects on U.S. shipyards. As noted above, these shipyards have substantially higher costs for building commercial ships than foreign shipyards. If the requirement to build in the United States were eliminated, the higher costs of U.S. shipyards would probably foreclose any commercial ship construction unless a construction subsidy program were created.[3] Several studies have assessed the adequacy of the shipyard mobilization base; they have found the base to be marginally adequate relative to DOD's assessments of initial "surge" shipyard mobilization needs, but suggest it may not be adequate to meet long-term "sustaining" requirements. The Alaska trade is unlikely to generate any new construction of merchant ships for the next 10 years, so elimination of the U.S.-built requirement for the Alaska trade would have little immediate effect on the shipyard mobilization base. However, to the extent that replacement Jones Act vessels are eventually needed, the lack of a U.S.-built requirement would have a negative effect on U.S. shipyards.

[3]Until 1981, construction of merchant ships in U.S. shipyards was subsidized by the Construction Differential Subsidy Program, authorized by Title V of the 1936 Merchant Marine Act. Under this program, up to half the cost of building a merchant ship in the United States could be paid by the federal government as a subsidy to cover the differential between the cost of construction in the United States and the cost of building abroad. Funding for this program was eliminated in 1981, and the program has been dormant since then.

Several Studies Have Assessed the Adequacy of the Shipyard Mobilization Base

There have been several analyses in the past few years of the adequacy of the shipyard mobilization base. In 1983, the Shipyard Mobilization Base Study (SYMBA), undertaken jointly by the Navy and MarAd, identified an inventory of 119 shipyards (110 private and 9 public) as of October 1, 1982, capable of working on vessels more than 400 feet long, with production employment of 165,000. On the basis of a war scenario assuming mobilization on October 1, 1988, SYMBA estimated a need for 112 shipyards and 165,000 employees. It estimated that production employment, in the absence of any further commercial new construction or repair work, would fall to 125,000, leading to a shortfall in available production workers. SYMBA did not estimate how much the inventory of shipyards would shrink by 1988.

The National Defense Shipyard Study (NADES), also undertaken by DOD and MarAd, was carried out in 1985 to assess the effects of a substantial shrinkage in the shipyard mobilization base. This study assumed that only 66 shipyards would be available in 1988 and examined the adequacy of such a base. It found that, assuming some partial mobilization prior to the beginning of hostilities, the 66-yard base would still be adequate. It forecast a larger employment base than SYMBA (142,000 workers) based on the assumption of continuing commercial repair work, and found that this would need to be augmented only moderately during the first 8 months of hostilities.

In October 1986, MarAd reported on the current inventory of shipyards and production workers. It found that the number of shipyards had fallen from 119 in 1982 to 102 in 1986, and that the number of production workers had fallen from 160,000 to 128,000.

In October 1987, the Commission on Merchant Marine and Defense issued its initial report. It identified an inventory of 117 shipyards employing 123,000 workers and projected a further decline in employment by the year 2000. The Commission concluded that, while the shipbuilding and repair industry would be able to meet the initial requirements for mobilization, they would not be able to meet the needs for construction of new vessels during the later phase of mobilization.

These studies of shipyard needs generally conclude that the mobilization base is adequate to meet short-term "surge" requirements. The adequacy of the base to meet long-term "sustaining" requirements, however, is more uncertain. It depends crucially on the assumptions made about how quickly the base can be expanded, in terms of facilities and workforce, to meet the new construction requirements of the sustaining

phase. All of the assessments of the adequacy of the mobilization base depend on assumptions about mobilization needs and shipyard base availability. Mobilization needs depend on assumptions about where the conflict develops (and hence the need for West Coast vs. East Coast yards) and what the damage and loss rates are. Shipyard base availability depends on assumptions concerning the volume of naval and commercial construction for the next several years and the speed with which the base can be expanded, by hiring new workers and building new capacity, in the event of hostilities.

The Alaska Trade Is Likely to Generate Little New Construction of Merchant Ships Over the Next 10 Years

Over the past 10 years, 24 ships have been built for the Alaska trade. Over the next 10 years, it is possible that none will be. With oil production expected to decline, and with existing production likely to be delivered increasingly by pipeline, it is unlikely that new oil tankers will be built for the trade. One dry cargo carrier has recently replaced its three containerships, substantially expanding its capacity. Another carrier's vessels are only 11 and 13 years old, and its representatives told us it does not expect to replace them before the year 2002. With the expansion in capacity and the likely lack of growth in the Alaskan market due to the uncertain prospects of the oil market, it is unlikely that new capacity will be needed for at least a decade.

Elimination of the U.S.-Built Requirement for the Alaska Trade Would Have Little Immediate Effect on the Shipyard Mobilization Base

As a result, while the Jones Act has made significant contributions to the shipyard mobilization base in the past, construction for the Alaska trade is likely to contribute little to the maintenance of the shipyard mobilization base for the next 10 years. Hence, elimination of the U.S.-built requirement for Alaska-trade ships would have little immediate negative effect on the shipyard mobilization base. Other Jones Act trades are also generating little demand for new ships. There are currently no large commercial vessels of any kind under construction or on order in U.S. shipyards. The leading carrier in the Hawaiian trade has recently announced plans to build two additional Jones Act vessels for that trade, but the ships have not yet been ordered. Eventually, of course, existing Jones Act dry cargo ships will need to be replaced, particularly for the domestic off-shore trades (Alaska, Hawaii, and Puerto Rico). If that replacement capacity were built abroad, the shipyard mobilization base would be adversely affected.

Summary of Jones Act Provisos and Related Laws

When the Jones Act (P.L. 66-261, Sec. 27) was enacted in 1920, it had two provisos which exempted certain traffic from its provisions. The act has been amended several times, so this original list of two provisos has since grown to ten. Other laws passed since 1920 have served either to limit or extend the Jones Act's reach.

The Jones Act Has Several Exceptions

The first two provisos of the Jones Act close potential loopholes in its requirements. The first proviso (enacted in 1935) states that no Jones Act vessel which comes under foreign ownership or a foreign flag may ever again qualify under the act to provide domestic service. The second proviso (enacted 1956, amended 1960 and 1988) states that a Jones Act vessel which is rebuilt can retain its Jones Act privileges only if it is rebuilt in a U.S. shipyard.

The other eight provisos, the 3rd through the 10th, provide exemptions from the Jones Act. The third proviso exempts merchandise transported from a point in the United States to a rail carrier in Canada, then to a Canadian port, and then by water to Alaska, if the through route is recognized by the ICC and the through tariff is filed with the ICC. While this was one of the original provisos in the Jones Act, it originally specifically excluded Alaska; Alaska was not covered until the Alaska Statehood Bill was passed in 1958. About 63,000 tons of cargo in 1986 were carried to Alaska on foreign-built vessels under this proviso, about 2 percent of total shipments from other points in the United States.

The fourth proviso, also included in the original act, exempted traffic on the Yukon River until the Alaska Railroad was completed and until the Secretary of Transportation (originally the United States Shipping Board) finds that proper transportation facilities for U.S. citizens have been furnished. Neither the Secretary nor the Board has ever made such a finding, so this exemption remains in effect, even though the Alaska Railroad was completed in 1923. Yukon River carriers have used Canadian-built barges to provide service on the Yukon within Alaska.

The fifth proviso, added in 1935, is a limited exemption for rail car ferries on the Great Lakes. The sixth proviso (1965, amended 1968) exempts movements of empty shipping containers and other similar shipping equipment. The seventh and eighth provisos (1971 and 1979) exempt cargo transported after consolidation on lighter-aboard-ship

(LASH) barges[1] and some U.S.-flag feeder service, but both exclude Alaska. The ninth proviso (1982) expanded the scope of the Jones Act to include transportation of hazardous waste for incineration at sea. The 10th proviso (1982) defined supplies aboard U.S. fishing vessels as not being covered by the Jones Act.

Other Legislation Affects the Jones Act's Scope

A number of laws which are not part of Section 27 affect the scope of the Jones Act restrictions. Section 21 of the Merchant Marine Act of 1920, for example, extended the scope of the coastwise laws (including the Jones Act) to the island territories and possessions of the United States, but provided an exemption for the Philippines, which was, at the time, a territory of the United States. A further exemption was added in 1936 for the U.S. Virgin Islands.[2] In 1947, an exemption was enacted for the town of Hyder, Alaska, which is located at the end of a long inlet which forms the border with Canada. Temporary exemptions have been passed for lumber shipments and use of foreign-built hovercraft. Also, under section 18 of the 1920 Merchant Marine Act, foreign-built vessels which come into the possession of the Secretary of Transportation (e.g., by being confiscated by the U.S. Coast Guard for drug-smuggling) may be sold to a U.S. operator and operated in the Jones Act trade. (At least two such vessels are currently operating in the Alaska trade.)

The Merchant Marine Act of 1936 created an operating subsidy program and a construction subsidy program for U.S.-flag vessels. Since these programs were created to help U.S.-flag vessels compete with foreign-flag vessels in the foreign trade, vessels receiving these subsidies were specifically prohibited from engaging in coastwise trade (with some exceptions). Most U.S.-flag vessels engaging in foreign trade are either subsidized under the 1936 act or are built abroad. In either case, they are disqualified from engaging in the coastwise trade. Most U.S.-flag vessels engaging in the foreign trade, therefore, for one of these reasons or the other, do not have "domestic trading privileges," i.e., they are not part of the "Jones Act fleet." This has a significant effect on service to Alaska, because ships operating between Puget Sound and Japan pass quite close to Alaska on the great circle route. But they are prohibited

[1]A LASH barge is a small barge, about the size of ten 40-foot containers, which serves as a floating container on vessels designed to service river ports and undeveloped harbors. The barge, or lighter, is filled with cargo, loaded aboard the ship, and then off-loaded into the water. It is then pushed by a tug to its ultimate destination.

[2]The President may, by proclamation, repeal this exemption, but has not done so.

from providing service between Puget Sound and Alaska either because they are subsidized or because they are foreign-built.

The Export Administration Act of 1979 had the most significant impact on the scope of the Jones Act by requiring that no crude oil shipped through the Trans-Alaska Pipeline be exported from the United States. This brought the crude oil shipments within the domain of the Jones Act, with one exception. The U.S. Virgin Islands are a territory of the United States, and thus shipments to the Virgin Islands are not exports from the United States, so they satisfy the Export Administration Act. But shipments to the Virgin Islands are not covered by the Jones Act, so Alaskan crude oil can be shipped to the Virgin Islands on foreign-flag tankers, refined there, and then shipped as refined products to the mainland United States. Also, both crude oil which is refined in Alaska and Alaskan crude oil which does not flow through the Trans-Alaska Pipeline (such as oil from Cook Inlet, near Anchorage) may be exported abroad using foreign-flag ships.

Detailed Methodology

Introduction

This appendix provides details on the methodology used to determine additional costs imposed by the Jones Act's U.S.-built requirement for the three components of the Pacific Northwest-Alaskan shipping industry: tug/barge combinations, oil tankers, and self-propelled dry cargo vessels.

Our cost data represent the excess of annual capital costs for U.S.-built ships over annual capital costs for comparable foreign-built ships. Vessels whose capital costs had been fully paid were treated as having zero capital costs. We considered operating cost differences only if they were directly related to whether the vessel was constructed in the United States or abroad. Since most foreign ships from the early 1970s were built with diesel rather than with less fuel-efficient steam turbine engines, we analyzed whether foreign-built ships equivalent to domestically built ships operating in the Alaska trade would have been built with diesels and enjoyed fuel economies as a result. As requested, we did not determine operating cost differences due to using foreign crews in the Alaska trade.

Our capital cost analysis includes all the interstate common carrier tug/barge operators and the larger contract and intrastate tug/barge operators in the Alaska trade. The analysis also includes all oil tankers active in the Alaska trade as of April 1987 and the five dry cargo ships used by Sea-Land Service, Inc., and Totem Ocean Trailer Express, Inc. (TOTE). In the case of Sea-Land, we analyzed the capital costs of the three new containerships delivered to Sea-Land for the Alaska trade in 1987, not the three old containerships in use in April 1987.

The cost analysis for all vessel costs is based on when the ships, tugs, and barges were actually built. An alternative approach would have been to assume that all vessels were built new in 1987. The latter approach would have the advantage of making cost comparisons between foreign- and U.S.-built ships easier, but it would overstate the actual capital cost premium attributable to the Jones Act.

For all classes of vessels, we estimated the actual construction costs of the U.S.-built vessels, and then estimated what these construction costs would have been had these vessels been built abroad to U.S. standards. We then calculated what the annual capital costs would be given these different construction costs. The annual capital costs are the sum of interest charges and depreciation.

Interest charges were based on the assumption that 80 percent of the cost would be financed using long-term financing and that 20 percent would be financed either through short-term loans or from equity. We used the interest rate from MarAd's Title XI Loan Guarantee program as the interest rate for the long-term financing of U.S.-built vessels. An official in MarAd's Office of Shipbuilding Costs and Production said that foreign interest rates in the shipbuilding industry, unlike those in the United States, have been established through agreement by the Organization for Economic Cooperation and Development (OECD). Most European nations, as well as Japan, are members. For nearly 10 years, the prevailing rate has been 8 percent. For most of this period, this rate has been substantially below the market interest rate and has represented part of the cost advantage in buying foreign-built ships. We used the 8-percent interest cost in our calculations. For simplicity, we assumed that the interest rate on the short-term financing for U.S.-built tankers owned by oil companies would be equivalent to the corporate prime rate. For independently owned tankers, and for tugs and barges, we assumed the prime rate plus 1 percent. For foreign-built ships, we assumed that the 8-percent rate would apply to both the short- and long-term financing.

On the basis of industry and MarAd suggestions, we assumed that the useful life over which the financing would be repaid for U.S.-built vessels was 25 years for tugs, barges, and dry cargo vessels, and 20 years for tankers. To compute foreign capital cost, we applied a different economic life. MarAd and industry sources and literature concerning foreign financing terms indicate that tankers and dry cargo ships built in East Asia are typically assumed to have a 15-year depreciation life. Industry sources indicated that foreign-built tankers are less likely to have coated tanks (which reduce corrosion) and therefore would have a shorter useful life than U.S.-built tankers. We therefore used this 15-year depreciation life as the useful life for foreign-built tankers. Foreign-built tugs and barges were assumed, like U.S.-built tugs and barges, to have a 25-year life. In accordance with MarAd and industry practices, principal was assumed to be paid in equal annual payments over the useful life of the vessel. Interest charges were based on the principal balance remaining in 1987, assuming this repayment schedule. Interest charges thus decline over the life of the ship.

Depreciation was calculated on a straight-line basis using the same useful life. Salvage value was deducted before calculating depreciation. The salvage value assumed also varied from one vessel class to another. On the basis of their minimal resale market, no salvage value was assumed

for either U.S.- or foreign-built tugs and barges. U.S.-built tankers and dry cargo ships were assumed to have a minimal salvage value of 2.5 percent. Foreign-built tankers and dry cargo ships, which enjoy a larger resale market in third-world countries, were assumed to have a salvage value of 10 percent.

Tugs and Barges

From various sources, we compiled a list of the seven major interstate tug and barge carriers active in 1987. Three of these carriers also had intra-Alaska operations. From these carriers, we obtained (1) a list of the 46 tugs and 59 barges actually in use (whether in inter- or intra-state use), (2) characteristics of that equipment (horsepower for tugs and dimensions for barges), and (3) the date of construction for each tug and barge. Tugs and barges operating part of the year in the Alaska trade and part in other trades were prorated to yield a list of full-time equivalents.

Annualized U.S. Costs

We obtained 1987 tug and barge construction cost estimates for several typical sizes of tugs and barges from two major tug/barge builders and from a large tug/barge carrier in the Alaska trade. Both builders have built tugs and barges typically used in the Alaska trade for many years. We then used the MarAd index of shipbuilding costs to convert these 1987 cost data into costs for the years in which the tugs and barges were actually built.

The 46 tugs and 59 barges were grouped into different classes based on horsepower rating for tugs and capacity (determined by volume) for barges. We established 6 classes for tugs and 10 for barges. The average cost and year built for each class was then calculated. The total number of tugs or barges in each group was multiplied by the individual cost to get the total group cost.

Annualized Foreign Costs

Since little information is available from either MarAd or tug/barge operators about foreign prices of tugs and barges, we relied on data from the two shipyards and from a major tug/barge operator. Both shipyards commented that the industry considered Japanese-built tugs as the price leader in Pacific markets in the mid-1970s. The price of foreign tugs takes into account the more favorable financing terms that foreign yards offer, as well as the yen-dollar exchange rate prevailing in the mid-1970s. Both tug builders estimated that these 1987 construction costs were up less than 10 percent compared with 1975 costs, and both

estimated that their 1975 construction costs were about 10 percent higher than the Japanese price in that year. The major operator we talked to estimated that these costs were about 10 percent too low. We attempted to get price estimates directly from foreign shipyards, but they were unresponsive. On the basis of these comments, we assumed foreign tug prices to be 20 percent lower than the typical U.S. price.

Concerning barge prices, less information about relative price differences in the mid-1970s is available. East Asian builders have dominated the world barge construction market for several years. One builder commented that the Japanese were the price leaders for barges in the mid-1970s. The builder estimated that Japanese prices for barges comparable to those in Alaskan service were 20 percent less than their own. We used the estimate of 20 percent in our cost comparison.

Tankers

We included in our study all active tankers in the Alaska trade as of April 1987. We have defined this trade to include tankers shipping oil from Valdez to West Coast points and to Panama, and from Panama to U.S. Gulf and East Coast destinations. We have also included the movement of refined petroleum products from the West Coast to Alaska. MarAd provided us with a listing of all tankers in the Alaska trade. From this basic listing, we have excluded tankers that were laid up as of April 1987, resulting in 76 active crude and product tankers. Of these, 22 ships were excluded from the financial analysis because they were more than 20 years old, and hence were assumed to have zero annual capital costs. The MarAd data define laid-up tankers as those out of service for more than 1 month. These vessels could be under repair or idle for lack of charter opportunities.

Capital costs for U.S.-built tankers came primarily from MarAd's Title XI program and a study done for ARCO Marine, Inc., by the consulting firm of Temple, Barker & Sloane.[1] The Title XI program and MarAd staff provided cost data on 25 tankers; data on another 15 ships were obtained from the Temple, Barker & Sloane study. These sources gave us data for 40 ships active in the Alaska trade. For those ships for which no construction cost data existed, a regression analysis was used to estimate capital costs. The regression analysis used data on 22 vessels for which we did have construction costs to analyze the relationship between construction costs and vessel size. (The regression analysis omitted data for

[1]Temple, Barker & Sloane, Inc., Assessment of U.S. Tanker Markets and Fleets, prepared for ARCO Marine, Inc., Apr. 1987.

14 ships whose costs differed significantly from the rest, either because they had been rebuilt or because they had been built specifically as product tankers with multiple tanks.) We then used this relationship to estimate construction costs for 14 vessels for which construction cost data were not directly available. The construction cost data for the 22 ships were converted to 1987 dollars using the MarAd index of shipbuilding costs for purposes of running the regression. The regression coefficients were then used to estimate the construction costs in 1987 dollars for the 14 vessels for which we did not have cost data. We then used the MarAd index of shipbuilding costs to convert these 1987 dollar costs back into dollar costs for the year in which the vessel was actually built. The regression equation used to estimate these construction costs was as follows:

COST = $18,277,000 + 509 (DWT)

where:

COST = Construction cost in 1987 dollars. Actual construction costs were converted to 1987 dollars using MarAd's index of shipbuilding costs in the United States.

DWT = Deadweight tonnage.

[Technical Note: The adjusted R^2 for the equation was 0.84. The coefficients (18,277,000 and 509) were both significantly different from zero at the 95-percent confidence level.]

Capital costs for foreign-built tankers were derived from the Construction Differential Subsidy (CDS) program (Title V of the 1936 Merchant Marine Act, as amended). Under Title V, MarAd obtained from representative foreign shipyards engineering cost estimates based on the specific construction standards of U.S.-built ships. The equivalent foreign ship costs were used to determine the amount of subsidy to be paid to U.S. shipowners. Historically, Coast Guard safety requirements for U.S.-built and U.S.-flag vessels in foreign or domestic service have been more stringent than those applied to foreign-flag ships. MarAd's Title V data are the only information available that directly establish a foreign price for U.S.-flag ships. Consequently, we used the Title V data to determine equivalent foreign ship costs.

There are difficulties with the Title V data, however. First, federal funds have not been appropriated for this program since 1981. As a

result, there have been no cost comparisons between U.S.- and foreign-built tankers since that time. Second, from the early 1970s to 1981, comparisons are available for only four sizes of tankers in the Alaska trade. Third, the relative price of U.S. and foreign tankers can vary considerably within a few years for similar-size tankers.

On the basis of the Title V data and discussions with MarAd staff, we believe that a foreign construction cost of 50 percent of the U.S. cost is a reasonable estimate; this rate was used in our calculations. However, the true figure could vary somewhat from this estimate.

Capital Costs

We assumed that tankers which had exceeded their 20-year useful life had an annual capital cost of zero. We determined that 54 tankers were 20 years old or less, and hence had positive capital costs as U.S.-built ships. We assumed that foreign-built tankers would have had a useful life of only 15 years, however. Fourteen of the 54 tankers were more than 15 years old, and we therefore assumed that they would have exceeded their useful lives had they been built abroad. These 14 vessels would have had positive capital costs if they had been built in the United States, but zero capital costs had they been built abroad. Of course, had they been built abroad, they might have been replaced at the end of their useful lives, so that there would be positive capital costs for the replacement vessel. Replacement is not at all certain, since the expected decline in north slope oil shipments might have discouraged investment in new capacity. We represented both of these possibilities by calculating one set of costs on the assumption that the foreign-built ships were replaced at the end of their 15-year useful lives, and another set on the assumption that they were not.

Operating Costs

Of the 76 active tankers in the Alaska trade, only 10 have diesel engines and 3 have gas turbine engines. The rest are steam turbine powered. A Senior Program Analyst in MarAd's Office of Advanced Ship Development and Technology said that most foreign-built tankers of the size used in the Alaska trade by the late 1970s had diesel engines.

To analyze whether the foreign-built ships would have been built with diesel engines for use in the Alaska trade, we grouped the 63 steam-turbine-powered tankers into several classes on the basis of deadweight tonnage and horsepower (hp). Of these 63 ships, 22 are above 100,000 dwt, and most were built in the late 1970s and intended primarily for the Alaskan oil trade. Officials from MarAd and some oil companies told us

that diesels were not installed for several reasons: their reliability had not been proven to the satisfaction of U.S. owners; U.S. ship crews were unfamiliar with operating diesels; and it would have been difficult to get union agreement to engine room manning reductions (which would have been made possible by diesels). We concluded that diesels would not have been used for tankers in this size class.

In the 60,000- to 100,000-dwt range, which includes 22 ships, whether diesels would have been used depends primarily on the horsepower and age of the ship. Most of these ships were built in the mid- to late-1960s and early 1970s. The MarAd Senior Program Analyst said that medium-speed diesel technology had been proven by the late 1960s, and most diesel-powered ships by 1972 used medium-speed diesels. By the early 1970s, medium speeds could be used for tankers of up to 24,000 hp, which would include most of the vessels in this category. Even though these tankers could use medium-speed diesels, however, oil prices were low, and medium-speed diesels required a higher grade of fuel and more maintenance than steam turbines. The benefits were thus considered questionable by the vessel operators for tankers in this range. We believe Alaska trade ships in this size range would not have had diesels.

The category below 60,000 dwt includes 19 ships. Most of these ships, built from the late 1950s to 1971, were designed to be used on relatively short runs such as from the U.S. Gulf Coast to the Atlantic Coast. Since horsepower ratings are less than 20,000 (except for three ships), they appear to be the vessels most likely to have been diesel powered. The MarAd Senior Program Analyst said, however, that in this type of service quick turnaround time is essential. The steam turbine engines are used to heat the oil for faster unloading. Diesel-powered tankers would require a separate engine to be used for this purpose. To determine which of these 19 tankers might have been built with diesels would have required a detailed analysis of the particular use intended for each ship. This task was beyond the scope of this study. On the basis of comments we received from tanker operators, we believe that most of these tankers would also likely have had steam turbine engines. Even if half of these ships had been built with diesels, the annual 1987 operating cost savings would only be about $2 million.

Dry Cargo Ships

Containerships

The three containerships active in the Alaska trade are operated by Sea-Land Service, Inc. These containerships were placed in service in 1987. Since these ships are diesel powered, no analysis of operating cost savings was needed.

To determine the annual capital cost of the new ships, we obtained information from a representative of Sea-Land on the cost of the new ships. We did not include the cost of new containers that will be used on these ships, since these costs would have been the same for a foreign-built ship. We used the rate of interest that prevailed in 1985 when construction began.

Determining the cost of an equivalent foreign ship required some approximations. As a result of the end of the CDS program in 1981, MarAd did not have data on containerships equivalent to Sea-Land's new ships that met U.S. standards. We obtained an estimate from Sea-Land about foreign ship costs, and also used data from Lloyd's Shipping Economist, a highly regarded industry periodical which tabulates data on ship costs from a wide range of sources. The Lloyd's estimate was adjusted to reflect the same cargo capacity as Sea-Land's new ships. We used the average of these two estimates—32.3 percent of the U.S.-built cost—as our estimate of the foreign-built capital cost.

RO/ROs

The two RO/ROs active in the Alaska trade are operated by TOTE. Capital costs of these two ships were obtained from TOTE directly. One ship was built in 1975 and the other in 1977. To determine the U.S.-built annual capital costs, we used the interest rate prevailing when the vessel was built.

MarAd had no data on costs for a directly equivalent foreign RO/RO ship even though the CDS program existed at the time. However, MarAd's Title V data on two RO/ROs of a size similar to TOTE's two ships put equivalent foreign-built ships at about 60 percent of U.S.-built costs. We used those data in our cost analysis.

Each ship is powered by two steam turbine engines producing a total of 30,000 hp, which exceeds what was available from medium-speed diesels in the mid-1970s. The low-speed technology suitable for larger ships had

not been proven to the satisfaction of U.S. ship operators. We were informed by a TOTE representative, moreover, that because of very tight ship schedules and higher maintenance requirements of slow-speed diesels, diesels were not considered practical when the ships were built.

Alaska-Trade Jones Act Fleet, April 1, 1987[a]

Vessel type, employer, and name	Year built/ rebuilt	Deadweight tons	Owner/Operator
Tankers			
Arco:			
Arco Alaska	1979	188,400	Arco
Arco Anchorage	1973	120,600	Arco
Arco California	1980	188,700	Arco
Arco Fairbanks	1974	120,600	Arco
Arco Juneau	1974	120,600	Arco
Arco Prudhoe Bay	1971	70,400	Arco
Arco Sag River	1972	70,400	Arco
Cove Leader	1959	67,400	Cove
Cove Liberty	1954/81	69,300	Cove
Prince Wm. Sound	1975	123,400	Trinidad
Total		**1,139,800**	
Exxon:			
Exxon Baltimore	1960	51,100	Exxon
Exxon Baton Rouge	1970	75,600	Exxon
Exxon Baytown	1984	57,700	Exxon
Exxon Benicia	1979	172,800	Exxon
Exxon Boston	1960	48,900	Exxon
Exxon Houston	1964	67,900	Exxon
Exxon Jamestown	1957	37,700	Exxon
Exxon Lexington	1958	39,000	Exxon
Exxon Long Beach	1987	209,200	Exxon
Exxon New Orleans	1965	67,800	Exxon
Exxon North Slope	1979	173,400	Exxon
Exxon Philadelphia	1970	75,600	Exxon
Exxon San Francisco	1969	75,600	Exxon
Exxon Valdez	1986	209,200	Exxon
Exxon Washington	1957	40,900	Exxon
Exxon Yorktown	1983	43,000	Exxon
OMI Wabash	1969	37,900	OMI
Overseas Juneau	1973	120,000	OSG Bulk Ships
Brooklyn	1973	226,200	Wilmington Trust
Total		**1,829,500**	

(continued)

Vessel type, employer, and name	Year built/ rebuilt	Deadweight tons	Owner/Operator
Sohio:			
Arco Independence	1977	262,400	Arco
Arco Spirit	1977	262,400	Arco
Arco Texas	1973/81	90,000	Arco
Chesapeake Trader	1982	50,100	Attransco
Potomac Trader	1983	50,100	Attransco
B.T. San Diego	1978	188,100	Bankers Trust/MTL
Cove Trader	1959	46,400	Cove
Adonis	1966/82	80,200	1st Pa. Bank
Brooks Range	1978	173,400	Interocean Management
Thompson Pass	1978	173,400	Interocean Management
Atigun Pass	1977	173,400	Keystone
Kenai	1979	123,100	Keystone
Keystone Canyon	1978	173,400	Keystone
Tonsina	1978	122,900	Keystone
Mobil Arctic	1972	129,000	Mobil
OMI Columbia	1974/83	136,200	OMI
OMI Hudson	1981	42,000	OMI
Overseas Alaska	1970	62,000	OSG Bulk Ships
Overseas Arctic	1971	62,000	OSG Bulk Ships
Overseas Boston	1974/81	123,700	OSG Bulk Ships
Overseas Chicago	1977	90,600	OSG Bulk Ships
Overseas Natalie	1961	120,000	OSG Bulk Ships
Overseas New York	1977	90,400	OSG Bulk Ships
Overseas Ohio	1977	90,600	OSG Bulk Ships
Overseas Wash.	1978	90,500	OSG Bulk Ships
Bay Ridge	1979	225,000	Seatrain
America Sun	1969	80,700	Sun Oil
Admiralty Bay	1971	80,600	Trinidad
Aspen	1971	80,600	Trinidad
Mount Vernon Victory	1961	49,200	Victory
Stuyvesant	1977	224,700	Wilmington Trust
Total		**3,747,100**	

(continued)

Vessel type, employer, and name	Year built/ rebuilt	Deadweight tons	Owner/Operator
Other:			
Baltimore Trader	1955/71	57,900	Attransco
Chevron California	1972	70,200	Chevron
Chevron Louisiana	1977	39,500	Chevron
Chevron Mississippi	1972	70,200	Chevron
Chevron Oregon	1975	40,100	Chevron
Chevron Washington	1976	39,600	Chevron
Pomerol	1958	30,300	Crest
Keystoner	1953	18,400	Keystone
Manhattan	1962	113,900	Manhattan
B.T. Alaska	1978	188,100	Bankers Trust/MTL
Petersburg	1963	50,100	Chas. Kurz/MTL
Mobil Meridian	1961	49,200	Mobil
OMI Dynachem	1981	49,500	OMI
Overseas Vivian	1969	37,800	OSG Bulk Ships
Delaware Star	1944/71	27,800	Sealift Tankship
Texaco Connecticut	1953/71	42,000	Texaco
Texaco Florida	1956/71	42,000	Texaco
Texaco Minnesota	1943/64	27,200	Texaco
Texaco Miss.	1944/64	26,600	Texaco
Glacier Bay	1970	81,000	Trinidad
Coast Range	1981	40,000	Union Oil Co.
Sansinena II	1971	70,500	Union Oil Co.
Total		**1,211,900**	
Total tanker tonnage		**7,928,300**	
Dry Cargo Vessels			
Sea-Land:[b]			
Sea-Land Anchorage	1987	16,000	Sea-Land
Sea-Land Kodiak	1987	16,000	Sea-Land
Sea-Land Tacoma	1987	16,000	Sea-Land
Total		**48,000**	
TOTE:			
Great Land	1975	16,100	Interocean Management
Westward Venture	1977	17,900	Interocean Management
Total		**34,000**	
Total dry cargo tonnage		**82,000**	

[a]The "Jones Act fleet" includes those vessels with unrestricted domestic trading privileges, i.e., vessels built in the United States, registered under the U.S. flag, not built with the CDS, and not receiving Operating Differential Subsidy. This list includes vessels of 1,000 gross tons and over and excludes tugs and barges.

[b]We have substituted Sea-Land's new vessels for the old vessels in service on April 1, 1987. The last of the new vessels was delivered on November 9, 1987.

Sources: MarAd, Sohio, and operators.

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