Executive Summary

Introduction

Foreign-flag Crewing Practices is a comprehensive review of the nationalities and size of the crews of non-U.S.-flag (foreign-flag) cargo vessels calling at the United States. Several factors influence the nationalities of crewmembers on vessels calling at U.S. ports – the laws of the vessel's flag country, overall crew competencies and training, ownership preferences, communications among crewmembers and costs. The report does not address all the variables affecting crew size, but centers on the impact of vessel type, size, age and flag on crew size.

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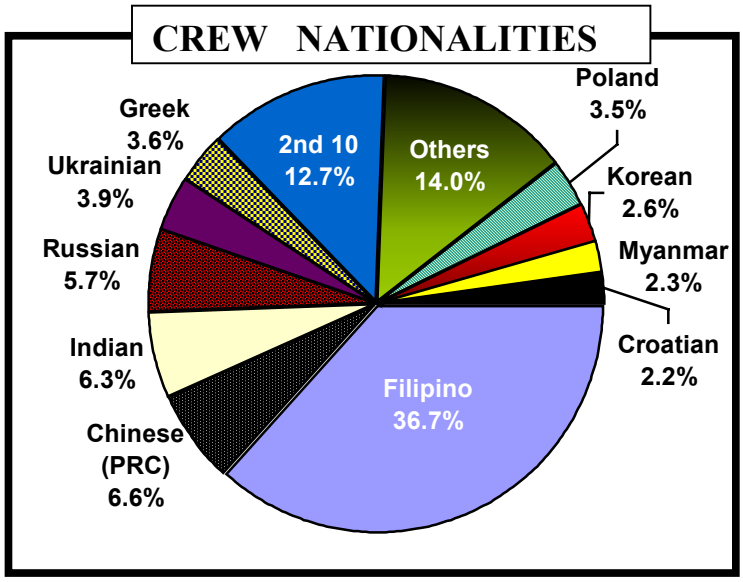
Data was derived from the "Crew List" form completed by the master of each vessel entering and exiting the U.S. and reported to the U.S. Department of Justice, Immigration and Naturalization Service (INS). The primary focus of this study is vessel entries during 2000. A total of 10,692 crew lists covering over 3,743 vessels and 222,865 individual crew entries from vessel visits to U.S. ports during 2000 were included in this study. To a lesser extent composite data from 1998 is also presented.

Major Findings

- Crewmembers from 143 different countries were found on foreign-flag vessels calling at U.S. ports.
- Only 10 nationalities made up the vast majority of crews, 73.4 percent, and all are considered moderate or low cost sources of crewing.



- There is little relationship between vessel flag and nationality of crewmembers employed on the vessel.
- Asia, led by the Philippines (the world's largest supplier of seafarers) with 36.7 percent of total crew entries, is the leading region of crew supply for the U.S.-foreign trade.
- Overall, Asian countries supplied 60.8 percent of total crewmembers on foreign-flag vessels.
- Eastern European nations were the second greatest source of crewmembers at 20.8 percent of the total.
- Western European nations were an important source of command officers (master & chief engineer).
- The workforce evident in the U.S.-foreign trade is more frequently from less developed nations and lower cost than the world supply data found in *BIMCO/ISF 2000 Manpower Update: The World Demand for and Supply of Seafarers*.
- Vessel Size, Age and Type are important variables affecting crew size.
- Newer and smaller vessels had lower crew complements.
- Average crew size did not vary significantly among the largest registries but variations were observed among registries not in the top 5.
- Tankers had a higher average crew complement across all age groups.

Conclusions

Once freed from legal restrictions, we believe costs become the vessel owner's primary determinant of the nationality of the crew complement. With few exceptions, only the lowest cost nationalities were employed as unlicensed seafarers in the competitive U.S. trades. Officers from developed countries still were well represented in the command positions of master and chief engineer in 2000 but decidedly less so in lower officer ranks where officers from developing countries filled most of the lower ranks. The crew

nationality data appears to portend the greater use of officers from low cost crewing centers as the supply of top officers from developed countries struggles to replace itself.[1]

While crew selection moves towards lower cost nationalities, improved vessel design has lowered the number of seafarers necessary to crew the newer vessels in the fleet. Average crew sizes will continue to decrease as newer vessels are added to meet growing demand and/or replace older vessels that are scrapped.

The dual observations of smaller crew complements and lower cost crewing sources will continue to assure that foreign-flag competitors in the U.S. trades will be minimizing crewing costs in the future[2]. Therefore it appears that U.S.-flag operators competing in the foreign trades will continue to be pressured by a large wage cost disadvantage.

[1] The BIMCO/ISF 2000 Manpower Update provides some data supporting this notion. The manpower update showed a rapidly accelerating age profile of OECD officers and a four-percentage point decline in the proportion of officer positions held by OECD nationals from 1995 to 2000.

[2] Revised IMO Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW 95) took effect in 2002. The new rigorous standards could reduce the supply of qualified seafarers and thereby increase crew costs in the future. We do not now speculate as to the impact of STCW 95 on the nationalities of crewmembers serving the U.S. foreign trade.

Foreign-Flag Crewing Practices

Purpose: This analysis of foreign-flag crewing practices was undertaken to assess the competitive environment for crews on foreign-flag cargo vessels calling at the United States. The study also provides a broad perspective of the myriad of different crews entering the United States on a regular basis. For most operators, the decisions concerning crew nationality and size represent the operators' largest significant controllable operating cost. The study of these costs and trends provide the U.S. Maritime Administration (MARAD) with insights into the difficulties facing U.S.-flag operators competing in a global marketplace. In the past, the U.S. Maritime Administration (MARAD) has made detailed studies of specific trades, trade routes and carriers for the specific purpose of calculating subsidy payments. This analysis is a broad and more complete look at the competitive crewing environment in which U.S.-flag vessel operators must compete.

Description of Data: The primary source of data was the "Crew List" form completed by the master of each vessel upon entering and exiting the U.S. and reported to the U.S. Department of Justice, Immigration and Naturalization Service. Crew lists for calendar year 1998 and 2000 were collected from the top four U.S. ports:

Houston, Texas
New Orleans, Louisiana
Los Angeles/Long Beach, California
Newark, New Jersey/ New York, New York

Three other major U.S. ports were also selected to provide a more even geographic distribution of U.S. deep-water ports. The three additional ports were:

Miami, Florida
Savannah, Georgia
Seattle, Washington

The focus of this study is cargo vessels – dry cargo, tanker, container and RORO/car carriers - entering the above U.S. ports during 2000, the latest year for which data is

available. Aggregate data from 1998 will also be displayed and more detailed data may be referred to other times. MARAD intends to develop the data into a time series but at this time does not believe it is adequate for the development of any trend analysis. Data from some ports was not available for the full year. (Adjacent or nearby ports may also have been included in the data received from the INS, and that data was also analyzed.) Appendix I displays a summary of the crew lists by port and month. From the crew lists, the following data for each vessel was extracted and entered into a relational database:

Vessel Name
Port Name
Date of Arrival

For each crewmember on the vessel, the following data was collected and entered:

Position
Nationality

In addition, the data was linked to a database of vessel characteristics provided by *Lloyd's Register of Ships*. The list of data elements available from Lloyd's is extensive; however, the following data elements were primarily used in this study:

Official Number
Vessel Type
Year Built
Deadweight tons
TEU capacity

Data was entered for each vessel entry that required the filing of a crew list and was available at the specified ports during 2000. A total of 10,692 crew lists covering over 3,743 different vessels were included in the study, resulting in a total number of individual crewmember entries of 222,865. A moderately smaller number of crew lists (9,760) were entered for 1998 port calls.

Data Limitations: Crew list data collected for this study did not include the full universe of vessels entering U.S. ports. Depending on vessel type, the seven ports included in this study recorded between 31 and 48 percent of U.S. port calls for the vessel type in 2000. Overall, over 40 percent of port calls recorded were at the seven study ports

(see Appendix II for more detailed information). Crew lists were not available for all months, slightly lowering data representation. Given the geographical distribution of the ports, the spacing of data over a year's normal market gyrations, and the substantial percentage, we feel the data fairly represents the market for crews in the U.S.-foreign trade during 2000. Since data presented is from 2000 and 1998 only, statements that assert a pattern or trend were primarily based on limited information from prior years not included in this report. As such, some caution should be exhibited when reading statements that speculate on a pattern or trend.

Crewing in the U.S.-Foreign Trades

Introduction

The analysis and discussion of crewing in the U.S.-foreign trades will be divided into three sections: 1. Nationalities, 2. Crew sizes, and 3. Actual crew complements. The first section will provide information concerning the predominant nationalities of seafarers serving the U.S. market. In the second section, data will be presented on the crewing levels of various vessel types and vessel ages. Finally, we will endeavor to tie the first two sections together by providing examples of actual crew complements.

Part 1. Crew Nationalities

Overview

Several factors influence the selection of crewmembers on vessels calling at U.S. ports – the laws of the vessel's flag of registry, overall crew competencies and training, ownership preferences, communications among crewmembers and costs. Once freed from legal restrictions[3], we believe costs become most vessel owner's primary determinant of crew complement. Command positions (master and chief engineer) appear to be the only positions where cost is not a primary determinant of the owner's crewing decisions.

Table 1

TOP 5 RANKINGS

FLAG	CREW
Panama	Philipines
Liberia	PRC
Cyprus	India
Bahamas	Russia
Malta	Ukraine

Source: Vessels calling selected U.S. ports during 2000 on foreign-flag vessels.

Competitive pressures have forced most developed countries to witness a decline of their national flag registries and ships in international trade. Various strategies have been employed to address the decline including forming substitute or "International" flags, such as the Norwegian International Shipping registry (NIS), changing crewing requirements, or

[3] Some flags of registry, like the United States, mandate or restrict seafarer nationality on vessels of its registry. In the U.S., only citizens can serve as master, chief engineer, radio officer, or officer in charge of

changing tax law. Open registries or "flags of convenience" (FOC) have long been havens for owners seeking lower taxes and operating costs. Table 1 displays the top 5 rankings for vessel flag and crew nationalities derived from the crew list data. The table clearly shows there is little connection between the top vessel flags and the nationalities of the crewmembers employed on the vessels. In this study, crewmembers from 143 different countries were found on foreign-flag vessels calling at U.S. ports. However as low cost sources of crews have displaced most national crewmembers, just 10 nationalities made up the vast majority of crews, 73.4 percent, and all are considered moderate or low cost sources of crewing. Of the 10 largest crew nationalities represented, only Greece has a major national flag presence in the U.S.-foreign trade. Table 2 contains the top 10 ranking of crew nationalities for foreign-flag vessels calling the U.S. during 2000. Exhibits I and II contain a more detailed presentation of the overall Top 20 Crew Nationalities for 2000 and 1998, respectively. It should be noted that the

Table 2

CREW NATIONALITIES (TOTAL CREWS)
ALL VESSEL TYPES (2000)

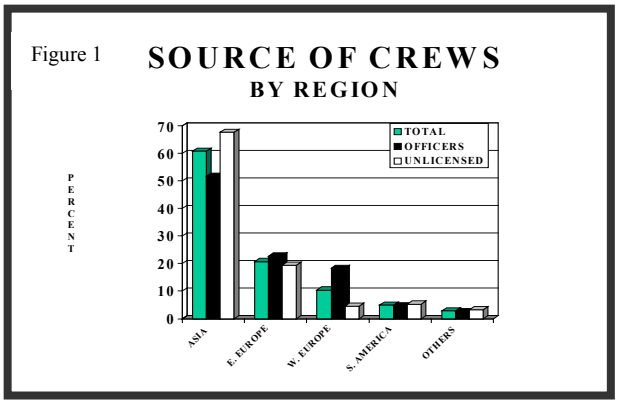
NATIONALITY	RANK	TOTAL CREWS		TOTAL OFFICERS		TOTAL UNLICENSED	
		Entries	Percent	Entries	Percent	Entries	Percent
FILIPINO	1	81,683	36.7%	22,914	24.4%	58,769	45.6%
CHINESE (PRC)	2	14,685	6.6%	6,435	6.8%	8,250	6.4%
INDIAN	3	14,092	6.3%	7,656	8.1%	6,436	5.0%
RUSSIAN	4	12,631	5.7%	6,071	6.5%	6,560	5.1%
UKRAINIAN	5	8,597	3.9%	3,568	3.8%	5,029	3.9%
GREEK	6	8,011	3.6%	5,991	6.4%	2,020	1.6%
POLISH	7	7,900	3.5%	3,361	3.6%	4,539	3.5%
KOREAN	8	5,847	2.6%	3,460	3.7%	2,387	1.9%
MYANMAR	9	5,088	2.3%	1,696	1.8%	3,392	2.6%
CROATIAN	10	4,941	2.2%	2,865	3.0%	2,076	1.6%
TOP 10		163,475	73.4%	64,017	68.1%	99,458	77.2%
2ND 10		28,258	12.7%	15,570	16.6%	12,688	9.8%
TOP 20		191,733	86.0%	79,587	84.7%	112,146	87.0%
TOTAL		222,865	100.0%	93,955	100.0%	128,910	100.0%

a deck or engine watch. In addition, each unlicensed seafarer must be a citizen or resident alien (no more than 25% may be resident aliens).

composition of the 10 most represented nationalities were unchanged from 1998 to 2000 with only the ninth and tenth most represented nationalities switching rank. Changes among the 2nd ten most represented nationalities, which represented 12.7 percent of crews, were more common. We believe that little should be drawn from these changes as the time period compared is short and the absolute numbers are relatively small. We found that because of the relatively small absolute numbers, 1.8 percent to 0.7 percent of crew entries, a possible reasonable explanation for the several changes could be variations in the composition of the sample between the two years[4].

By region[5], Asia, led by the Philippines with 36.7 percent of total crew entries, is the leading region of crew supply for the U.S.-foreign trade. Overall, Asian countries supplied 60.8 percent of total crewmembers on foreign-flag vessels calling the U.S. study ports in 2000. When broken down between unlicensed personnel and officers, Asian countries supplied an astounding 67.6 percent of unlicensed crewmembers and 51.6 percent of officers. Eastern European nations were the second greatest source of crewmembers at 20.8 percent of the total. By rank, Eastern Europeans represented 22.7 percent of officers and 19.4 percent of unlicensed seafarers. The other major geographic source of crews for the U.S.-foreign trade was Western Europe with 10.4 percent of crewmember entries. The breakdown of the Western Europe total is skewed towards officers with 18.4 percent, versus only 4.5 percent for unlicensed seafarers. All other regions were only minor suppliers of crew.

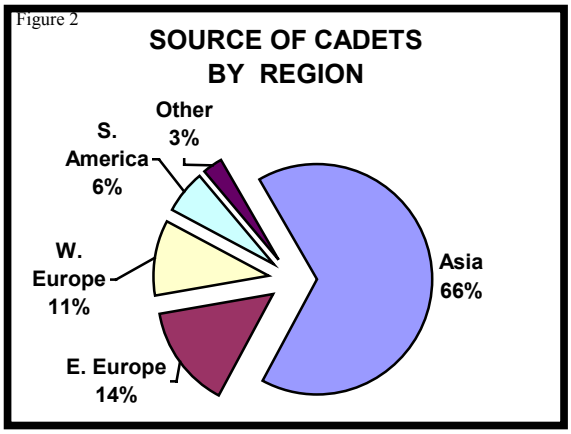
Figure 1



[4] Among the changes that may be meaningful if confirmed by future data was the drop off in the number of Japanese and Norwegian seafarers. However at this point, we can not determine if these changes are meaningful. Regarding the decline in participation of Japanese seafarers, our analysis found a modest decline (16%) in the total number of ship calls reporting a Japanese crewmember onboard and a large decline in the number of ships calls (from 54 to 4) reporting 10 or more Japanese crewmembers onboard. Norwegian seafarers were reported on 30% fewer ship calls and also experienced a decline (45 to 24) in the number of ship calls reporting 10 or more Norwegian crewmember onboard.

[5] The grouping are not entirely geographic, for example; Eastern Europe includes the former Eastern block including Russia and countries of the former Soviet Union some of which are in geographic Asia. A complete list of countries and region can be found as Appendix II.

Figure 2



An analysis of the nationalities of cadets entering the U.S. study ports may provide a barometer of future trends in the officer ranks. If that is true, we can expect growth in the number of Asian officers and a decline in the number of Western European officers (see Figure 2). Of course the trend is not uniform, some Western European countries have higher cadet participation rates than total officers participation rates while most do not. Participation rates for officer and cadet nationalities can be found for the top flags in Page 2 of Exhibits I and II.

Exhibits III - VI contain detailed distributions of the nationalities of seafarers by department, rank and vessel type.

Sources of Crewing – Asia

Summary of Region	
Total:	**60.8%**
Officers:	**51.6%**
Unlicensed:	**67.6%**

The top suppliers of seafarers from Asia are spread across the coastal and island regions of Asia with the greatest concentration in nations bordering the North Pacific Ocean and its coastal seas. The top seafarer nations of Asia were:

(1) Philippines 36.7%
(2) People's Republic of China (PRC) 6.6%
(3) India 6.3%
(8) Korea 2.6%
(5) Myanmar 2.3%
(11) Taiwan 1.8%
(15) Indonesia 1.3%
(19) Malaysia 0.7%

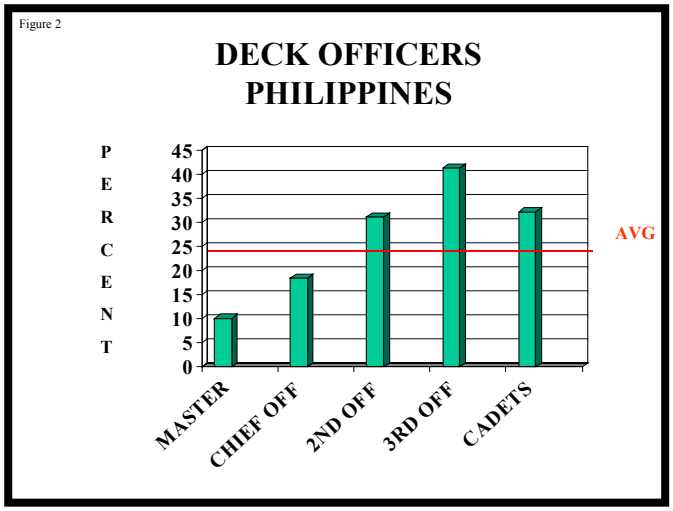
Asia is clearly the primary source for crews in the U.S.-foreign trade. The top 3, and 8 of the top 20 countries supplying crewmembers for vessels serving the U.S.-foreign trade, are all found in Asia.

(1) Philippines

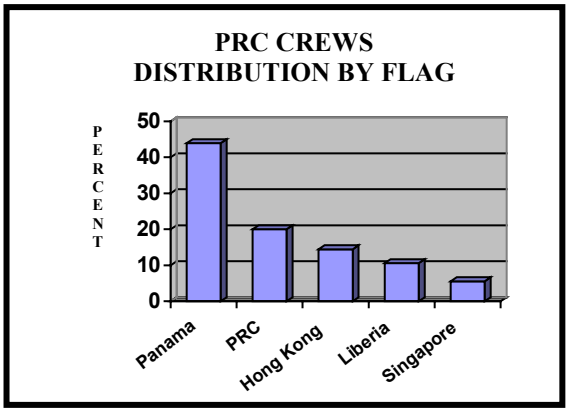
The Philippines is the dominant supplier of unlicensed crewmembers for the U.S.-foreign trades with 45.6 percent of the unlicensed crew entries. Unlicensed Filipino seafarers can be found sailing for nearly every major flag and most often are the largest national group on the vessel. Seafarers from the Philippines are reported to offer several advantages as contract crewmembers. On the whole, Filipino seafarers are low cost, there is a large supply and their English language skills make communication among all crewmembers easier.

Filipino officers were also widely used (24.4%) and made up the largest officer group. But as demonstrated in Figure 2, officers from the Philippines on average tended to be lower ranked. This was particularly true on vessels with a strong presence of national officers such as was found under the Greece, Japan, Germany and Norway (NIS) flags. Filipino officers found their greatest penetration of the higher officer ranks was when sailing on open registry vessels. For example, on Panamanian flag vessels, Filipino masters (15.9 %) and chief engineers (16.7 %) were among the largest nationality groups. But even on Panamanian flag vessels (and other open registry vessels as well), penetration of the command positions was relatively low when compared to the overall Filipino officer representation on Panamanian flag vessels of 27.8 percent.

Figure 2



(2) People's Republic of China (PRC)



The PRC differs from other low cost crewing sources in that Chinese were less likely to sail as part of a crew of diverse nationalities. The majority of Chinese crew entries were from vessels that were predominately crewed with Chinese. Crews from the PRC mostly worked for owners with direct or indirect connections with the PRC. As a result, most PRC crews sailed under a limited number of flags (see Figure 3). Crewing levels on PRC crewed vessels tended to be higher than most other vessels and ratings not found on other vessels, such as doctor.

(3) India

India was the second leading supplier of officers (8.1%) for vessels in the U.S.-foreign trades. Unlike the Philippines, Indian officers tended to be slightly over represented in the higher ranks – there were more entries for master and chief engineer than any other officer rating. Indian officers ranked highly (4^{th}) for both master and chief engineer. With a very small national flag presence in the U.S.-foreign trade, most Indian crewmembers sailed on ships under open registries and had a strong presence on vessels under the Bahamas, NIS and Singapore flags.

(8) Korea[6]

Over 70 percent of Korean crewmember entries during 2000 were from seafarers on vessels under the Panamanian flag and an additional 20 percent entered on South Korean flag vessels. Approximately 93 percent of seafarers recorded on South Korean flag vessels were national crewmembers. Containerships were the type of vessel most

[6] This section generally refers to South Korea. However, due to a data input error we can not definitively state that all entries were South Korean and did not include a small number of North Korean seafarers.

frequently crewed by Korean seafarers (61%). More Korean officers entered the U.S. study ports than Korean unlicensed crewmembers. Typically when a vessel was crewed by Korean seafarers, all the officers would be Korean and a majority of the unlicensed ratings were Korean as well.

(9) Myanmar (Burma)

As a source of crews, Myanmar seafarers played much the same role as those from the Philippines. Myanmar seafarers serve on a wide variety of vessels as lower ranking officers and unlicensed ratings. For the most part, the Myanmar seafarers arriving at the U.S. study ports were crewing on open registry vessels. Less than five percent arrived on a Myanmar flag vessel.

(11) Taiwan

Taiwan is a highly developed but often politically isolated country with a strong maritime community. This fact impacts Taiwan as a source of crews. For the most part, Taiwanese crews are employed on vessels owned or controlled by Taiwanese companies. Over 70 percent of Taiwanese seafarers sailed on Panamanian flag vessels – another 20 percent were on Taiwanese flag vessels. In both cases, Taiwanese make up a large majority of the crew onboard. Some higher-ranking officers are employed outside this model as command officers in a mixed crew environment.

(15) Indonesia

Of the national groups that comprise the Top 20, Indonesia had the lowest ratio of officers to total crew, 20 percent. The majority of Indonesian crewmembers entering the U.S. study ports were sailing on bulk carriers (52%). The most common flag on which Indonesian seafarers sailed was Malaysian (27%) followed by the Dutch (18%) and various open registries. Less than five percent of Indonesian crewmembers in this study were on an Indonesian flag vessel.

(19) Malaysia

Uncharacteristically, Malaysian seafarers calling at the U.S. study ports were nearly equally split between the licensed and unlicensed categories. Malaysian crewmembers were employed on variety of vessel types, although, tankers (55%) and containerships (30%) were the most common vessel types. Malaysian crews were predominately employed on vessels flying the Singaporean (64%) or Malaysian (22%) flags.

Sources of Crewing – Eastern Europe

For purposes of this study, Eastern Europe is defined as newly independent states of the former USSR and adjacent Warsaw Pact member countries in continental Europe. The top sources of crewing in Eastern Europe in 2000 were:

Summary of Region	
Total:	**20.8%**
Officers:	**22.7%**
Unlicensed:	**19.4%**

(4)	**Russia**	**5.7%**
(5)	**Ukraine**	**3.9%**
(7)	**Poland**	**3.5%**
(10)	**Croatia**	**2.2%**
(13)	**Latvia**	**1.7%**
(16)	**Bulgarian**	**1.2%**
(18)	**Romania**	**0.9%**

Economic change following the demise of the former Soviet Union resulted in sharp declines in the fleets of the Eastern Bloc. The declining opportunities for Eastern European seafarers with their national flag fleets corresponded with the rising need for low cost and adequately trained seafarers elsewhere. Eastern Europeans are now found throughout the fleets of the world. In our data, the officers and unlicensed ratings were found in relatively equal proportions to the total. There were not the great disparities evident in the rating distribution of other large suppliers of seafarers, such as the

Philippines, with a high bias towards the lower rating or the Western Europeans with a high bias towards the higher ranks.

(4) Russia

Russia continues to maintain a relatively large national-flag fleet crewed primarily with Russians. In our data, nearly 100 percent of crewmembers on Russian-flag vessels were Russian. These seafarers represented approximately 13 percent of the Russian crew entries. Russian seafarers also made up a significant fraction of the crews of vessels flying the flags of Liberia, Cyprus and Malta. Russian seafarers are found on all types of vessels – containerships were the most popular with 27 percent Russian seafarers arriving on this vessel type.

(5) Ukraine

Over 90 percent of Ukrainian seafarers entering the U.S. sailed on various dry cargo vessels – bulkers (34%), containerships (24%), freighters (21%) or ore carriers (11%). Ukrainian seafarers were found on vessels of various flags, the open registries of which Liberia (21%), Malta (13%) and Cyprus (11%) were the most common.

(7) Poland

Like Ukrainian seafarers, Polish crews are found in large numbers on dry cargo vessels (over 85 percent) under various flags. Where they differ is in the use of Polish seafarers by owners of RO/RO vessels. Approximately 16 percent of Polish entries were on RO/RO vessels where Polish officers are the 3rd most common nationality and unlicensed crewmembers are the 2nd most common. Additionally, Poland has a national flag presence in the U.S. foreign trade crewed by Polish seafarers. Overall, Polish flag vessels represented about 10 percent of Polish seafarer employment in the U.S.-foreign trade in 2000.

(8) Croatia

Seafarers from Croatia arrived in the U.S. on a wide variety of vessels under numerous flags. Liberian flag was the only standout with 32 percent of Croatians in this study

serving onboard vessels flying this flag. There were slightly more Croatian officer entries than unlicensed ratings making Croatia proportionately more important as an officer supply point. Only a few Croatian flag vessels called at the selected U.S. ports during 2000; those that did were crewed by an all-Croatian crew.

(14) Latvia

In contrast with other Eastern European seafarers, the Latvian seafarers in this study sailed predominantly on chemical (50%) and other types (26%) of tanker vessels. Latvian crews were also reported on a number of reefer vessels (17%) during 2000. Latvian seafarers sailed on vessels under a variety of flags with Liberia (42%) the only flag with a large number of crew entries. There were no Latvian flag vessels calling the U.S. study ports in 2000.

(16) Bulgaria

Bulgarian seafarers in this study were mostly found on bulk carriers (38%) and containerships (44%) under various open registries. A significant exception to open registry employment was the 17 percent sailing on Israeli flag vessels. There was also a small number of Bulgarian flag vessels that called at the U.S. ports during 2000 – these vessels were 100 percent crewed by Bulgarian seafarers.

(18) Romania

Romanian seafarers represented just 1 percent of crew entries in this study. The employment pattern for Romanian seafarers is very similar to that of Bulgarian crews, often sailing on the same vessel as Bulgarians. The Romanian crewmembers in this study served primarily on bulk carriers (26%) and containerships (47%) under several registries. Israel (25%) was the largest registry of employment for Romanian seafarers. There were no Romanian flag vessels calling at the U.S. study ports in 2000.

Sources of Crewing – Western Europe

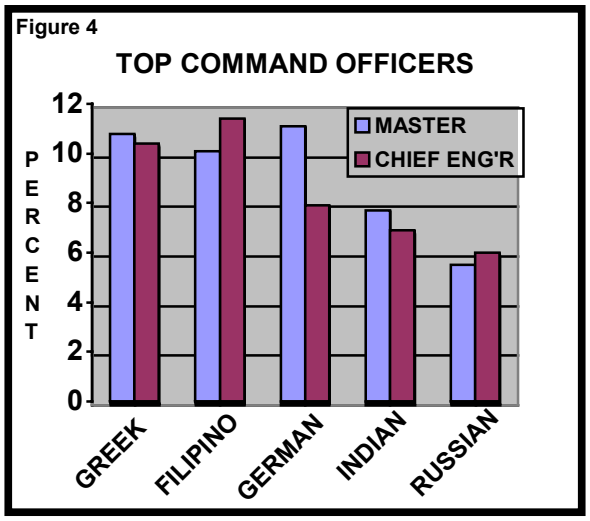
Western Europe as a source of crews in this study includes all of the countries of continental Europe not included in the previous section. The top sources of seafarers from this region were:

Summary of Region	
Total:	**10.4%**
Officers:	**18.4%**
Unlicensed:	**4.5%**

(6) Greece (3.6%)
(12) Germany (1.7%)
(14) Denmark (1.4%)
(17) Italy (1.0%)
(20) Sweden (0.7%)

The nations of Western Europe continue to own and control large fleets but Western European seafarers, for the most part, occupy only high-ranking positions on vessels trading with the United States. Greek seafarers are the only significant exception, as their relatively modest wage costs and national flag crewing requirements resulted in a modest level of unlicensed employment.

Figure 4



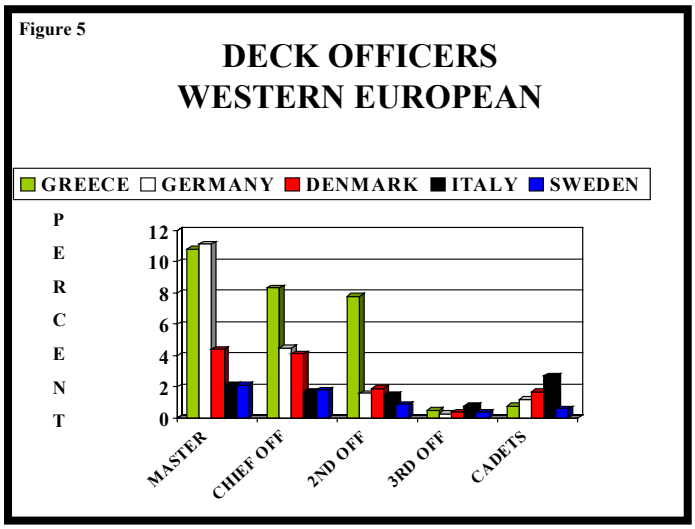
Western European nations are among the top suppliers of command positions (master and chief engineer). However after the command positions, participation rapidly drops-off. In 2000, 37 percent of all Master entries were from Western European countries, yet only 4 percent of 3rd Officer entries in our study were from these same countries. Additionally, the seafarers of Western European nations serve primarily on vessels under the national flag or the country's international registry (i.e., DIS, NIS). Specialization

was found among certain Western European seafarers. For example, German and Danish seafarers sailed primarily on containerships while Swedish seafarers are found in high numbers on RORO vessels and car carriers.

(6) Greece

Greek flag tankers and dry bulk vessels are still common sights in the oceans of the world as are Greek seafarers. As noted in Figure 4 above, we found that Greek masters and chief engineers were the 2nd most common nationality for each of these command positions. However, Greek officers were only the fifth most common overall nationality, as the lower the officer rank the lower the penetration (see figure 5). Other Western European nationalities have an even greater bias towards the higher officer ranks. This is nearly the inverse of the distribution of Filipino seafarers (Figure 2) in the officer ranks.

Figure 5



While common throughout the world fleets, 53 % of Greek officers and 70% of Greek unlicensed ratings in this study sailed on vessels under the Greek flag. When not sailing on a vessel under their national flag, Greek seafarers were primarily found crewing vessels under an open registry, primarily Cyprus (14%) and Panama (11%).

(12) Germany

While not a major source of seafarers, Germany is a leading source of masters and chief engineers on containerships. This could be expected since Germany is home to the world's largest owners of containerships. German masters and chief engineers represented 25.7 percent and 19.9 percent, respectively, of containership entries in this study – the largest of any nationality. Overall, 80 percent of German crewmembers were onboard containerships. Over 50 percent of German seafarers were at the rank of master

and chief engineer and over 83 percent were officers. Approximately 55 percent of German crewmembers in this study sailed on German flag vessels.

(13) Demark

The make-up and distribution of Danish seafarers in 1998 was very similar to their German neighbors but with a little greater distribution throughout the ranks. Danish crewmembers in our study were overwhelmingly officers (75%) with over 1/3 of officers at the rank of master and chief engineer. Danish seafarers also sailed predominantly on dry cargo vessels – containerships (75%) and freighters (16%). For the most part, Danish crewmembers entering the U.S. study ports were on vessels under the Danish International Shipping Registry (DIS). For vessels calling at the study ports in 2000, about 84 percent of Danish seafarers were onboard DIS flagged vessels with another 9 percent on Dutch vessels.

(17) Italy

Italian seafarers accounted for in this review were most frequently found on tankers (58%) and containerships (36%). Like their neighbors, most Italian seafarers sailed on their national flag vessels (65%) but were also occasionally found on vessels under an open registry – Panama (18%) and Bahamas (10%) were the largest.

(20) Sweden

While Swedish crews made up only 0.7 percent of total entries in this study, their concentration in the RORO and car carrier segment made Sweden a major source of seafarers in that sector. Swedish was the 2nd most common nationality of officers in the RORO segment and 3rd most common unlicensed nationality - 60 percent of Swedish crews sailed on a RORO or car carrier. Mirroring other Western European countries, the Swedish flag vessels were the primary employers of Swedish seafarers in this review at 66 percent.

Sources of Crewing – Central & South America and the Caribbean

Summary of Region	
Total:	**5.0%**
Officers:	**4.8%**
Unlicensed:	**5.3%**

The Central & South American and Caribbean region includes all of the countries in the Americas except the United States and Canada. While no single nationality ranked among the top 20 suppliers of crews in 2000, in total, this group of countries supplied approximately 5 percent of the crew entries. The largest sources of crews from the region were Chile, the British Virgin Islands, and Honduras. In 1998, Mexico was among the top 20 but Mexican crews were replaced by seafarers from Eastern Europe by an owner on several vessels and total participation by Mexican seafarers fell substantially.

Seafarers whose nationality was reported to the INS as British Virgin Islands (BVI) were among the top 20 suppliers of officers, most often high-ranking officers. It appears that the nationality of these seafarers was previously reported as British. The change to BVI occurred in early 1998, as it was observed that numerous slots previously reported as British suddenly changed to BVI. This would explain the low level of British seafarers found in the study. If taken together, seafarers with British and BVI nationalities would be among the top 20 supplier of crews.

Sources of Crewing - Other Regions

Summary of Region	
Total:	**2.9%**
Officers:	**2.6%**
Unlicensed:	**3.2%**

This category encompasses North America[7], Africa, Australia, the Middle East and Pacific Ocean Islands. The two areas where a significant number of crewmembers originated were the Middle East and Pacific Ocean Islands. The Republic of Kiribati and Tuvulu, both island groups were formerly part of the Gilberts of the British Gilberts and Ellice Islands Colony, were the largest nationalities from this group. The Pacific Islanders recorded in this study were almost

exclusively unlicensed seafarers comprising a little over one percent of unlicensed crewmembers.

The Middle Eastern countries of Israel, Egypt and Turkey were the largest suppliers of crews in this area. Israeli seafarers in this study served almost exclusively on containerships and under the Israeli flag – the majority were officers. The majority of both Egyptian and Turkish seafarers are employed on national flag vessels.

Other Crewing Studies

Two other recent studies on crewing addressed the maritime workforce from a global perspective. Both studies show a maritime workforce that is different than the workforce presented in this study of vessels in the U.S.-foreign trade. The Baltic and International Maritime Council (BIMCO) and the International Shipping Federation (ISF) completed a report *BIMCO/ISF 2000 Manpower Update: The World Demand for and Supply of Seafarers* in April 2000. The BIMCO/ISF study assesses the supply of seafarers based on questionnaires from major labor supply countries on the country's current supply of qualified seafarers. The apparent inconsistencies seem to be due entirely to the different perspectives of the two studies[8]. The BIMCO/ISF study addresses the worldwide supply of seafarers while this study is centered solely on the crews of foreign-flag vessels in the U.S.-foreign cargo trades[9]. The distinction is important; the workforce evident in the U.S.-foreign trade is more frequently from less developed nations and lower cost than indicated by the BIMCO/ISF worldwide supply data.

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[7] Since U.S.-flag vessels were not included in this study, only U.S. citizens on foreign-flag vessels were counted – this number was small. There also were few Canadian seafarers counted. Since no Great Lakes ports were included in the sample, Canadian seafarers may be underrepresented.

[8] The most obvious differences are: (1) no crews from U.S.-flag vessels are included in the MARAD study; (2) only actual working crewmembers are counted in the MARAD study; (3) the BIMCO/ISF study includes crews for ferries and numerous small vessels (over 100 GRT) in cabotage and short sea trades where more national crews can be expected to participate.

[9] The BIMCO/ISF report estimated the worldwide supply of seafarers in 2000 as 404,000 officers and 823,000 ratings. The largest apparent discrepancies occurred with the estimates for the Indian sub-continent and Far East (excluding Japan) with slightly less than half of all supply. The percentage for unlicensed and officers were 53 percent and 40 percent, respectively. Also in the BIMCO/ISF study, "OECD countries (North America, Western Europe, Japan, etc.)" comprised 28 percent of total supply with 36 percent of all officers and 23 percent of unlicensed.

The second crewing report, *Crewing the International Merchant Fleet*, was undertaken by the Seafarers International Research Centre (SIRC) at Cardiff University. The SIRC study uses the same basic source documents, crew lists, as in its analysis. Again the basic difference between this study and SIRC is perspective. SIRC was attempting to assess worldwide crewing while this study is centered solely on foreign-flag vessels entering U.S. ports. The primary difference in the sources of crews is the SIRC analysis had a higher population of Eastern Europeans and lower population of Asian seafarers[10].

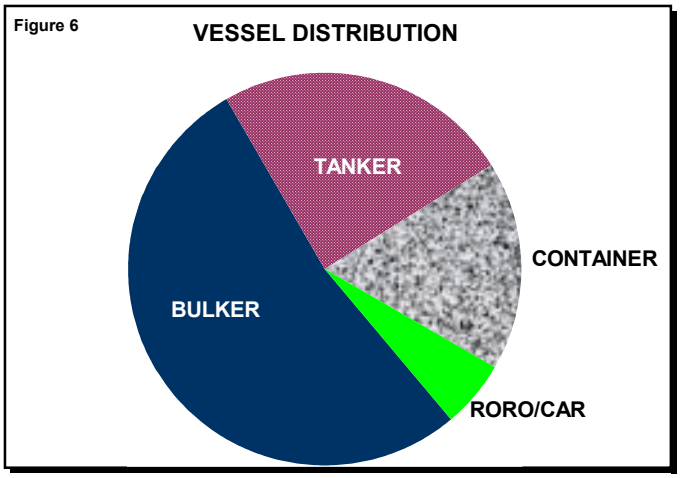
[10] The SIRC study also included U.S. flag crews in its seafarer population.

Part 2. Crew Sizes

Overview

Flag state regulations, IMO conventions, union agreements, vessel type, trading range, engineroom automation, vessel maintenance, cost of labor, vessel size and vessel age are among the many factors that have an impact on the size of the crew complement on any particular vessel. While we cannot address all the variables affecting crew size in this section, we will focus on vessel type, size, age and flag of registry and present cross-cutting averages that may shed light on their impact on crew size.

Figure 6



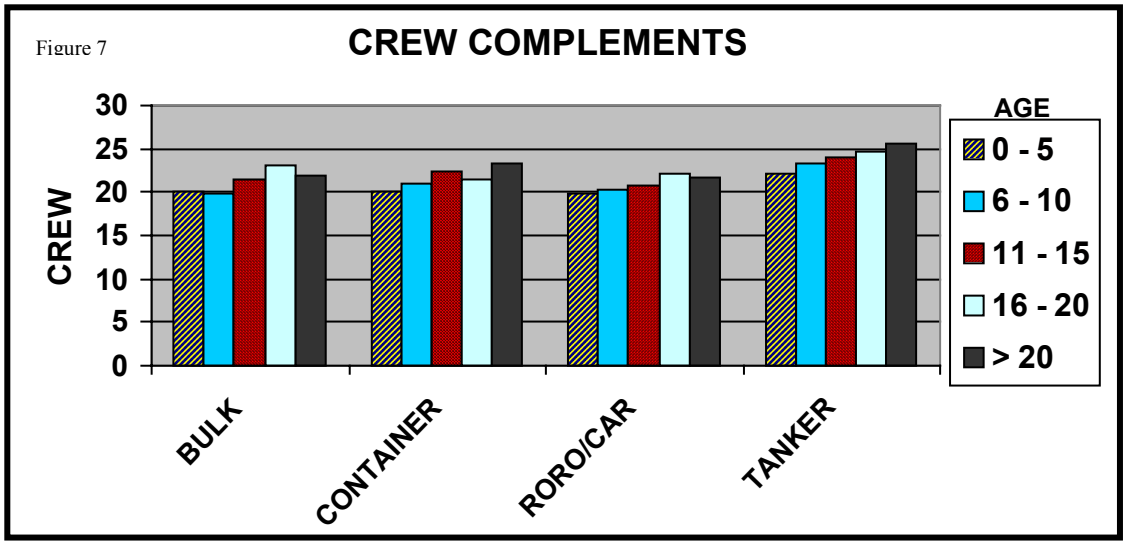
As was stated earlier, 10,692 crew lists for vessels filed at the seven study ports in 2000 were analyzed for this study. From the crew lists, total crew complements for 3,743 vessels were estimated[11]. Nearly 53 percent of the crew complements estimated were for dry cargo bulk vessels (bulk carriers, freighters, reefers and OBOs), 24 percent were tanker vessels, 17 percent were containerships and 5 ½ percent were RORO s or car carriers.

Generally, the data showed that newer vessels and smaller vessels have lower crew complements. Conversely, the older or larger vessels have higher crew complements. From the data analyzed, it appears that size matters the most at the extremes. The smallest vessels often had substantially smaller crew sizes. On closer review, the sharp reductions in crew size associated with the smallest size vessels may be more a reflection of a reduced crewing requirement for the coastal/near sea trading range than merely size. The largest vessels also tended to have slightly larger crew complements; this was

[11] Many vessels enter the U.S. several times during the year while many others only once. For some vessels the total crew complement could not be reasonably estimated because crew repatriation obscured the actual crewing level. The crews of these vessels were included in the nationality section but not this section.

particularly evident for tankers. Vessel age would appear to be a more important variable than vessel size. Newer vessels (10 years old and less) had obviously lower crew complements than older (11-20 years old) vessels and the oldest vessels (>20 years old) tended to have crewing levels that were even larger. Differences in automation would appear to be the primary reason newer vessels are able to operate at reduced crewing

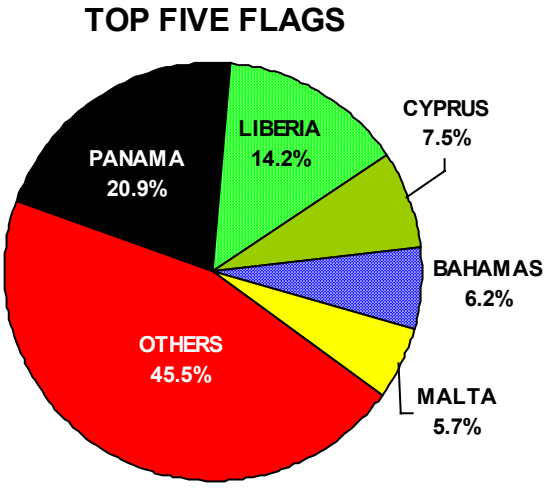
Figure 7



levels.

As is also evident in Figure 7, vessel type appears to have had an impact on crew levels as tankers had a higher crew complement across all age groups. Each vessel type will be discussed in more detail later in this section.

Figure 8



The flag of a vessel can also have an impact on the crew complement but it was not obvious in a review of the crewing levels of the top five flags. We observed that average crew complements did not vary significantly when the top flags were compared and, with limited exceptions, differences that did surface appear to be the result of other variables.

Since dry cargo bulk vessels represented over 50 percent of the vessel crew complements, it is not surprising that the top five flags[12] overall and the top five flags for dry cargo bulk vessels are the same, though slightly rearranged. As can be seen in Table 3, open registries dominate the list of the most common foreign flags on vessels that called U.S. ports in 2000. Only the Greek and German (with containerships) flags had significant national flag presence in the U.S. trades[13].

Table 3

TOP FIVE FLAGS
BY VESSEL TYPE

RANK	OVERALL	BULKER	TANKER	CONTAINER	RORO/CAR*
1	PANAMA	PANAMA	LIBERIA	PANAMA	PANAMA
2	LIBERIA	CYPRUS	PANAMA	LIBERIA	NIS**
3	CYPRUS	LIBERIA	NIS**	GERMANY	SINGAPORE
4	BAHAMAS	MALTA	BAHAMAS	DIS***	LIBERIA
5	MALTA	BAHAMAS	GREECE	CYPRUS	SWEDEN

* Combined, the top five in appendix XIII were determined seperately.

** NIS = Norwegian International Shipping registry *** DIS = Danish International Shipping registry

[12] The top five is based on the number of individual vessels (each vessel is counted once even if it entered several times), rather than the number of vessel entries.

[13] The non-open registry flags of the Sweden and Singapore also were in the Top five flags but with vessel types that did not include a large number of vessels.

Dry Cargo Bulk Vessel

The dry cargo bulk vessel category is comprised of four primary subgroups – bulk carrier, freighter, freighter/reefer, and OBO (Ore/Bulk/Oil).

Type	Median Age	Median DWT	Crew Complements[14] Median	Average
Bulk Carrier	16	40,181	22	22.7
Freighter	16.5	14,250	20	19.0
Freighter/reefer	11	9,867	20	19.2
OBO	13	78,570	25	25.3
All Bulk Vessels[15]	16	29,480	22	21.4

Exhibit VII presents a more detailed synopsis of average crew complements by vessel type, vessel size and vessel age. As discussed earlier, the data generally supports the notion that smaller-younger vessels have lower crew complements than older-larger vessels. There were certain key exceptions to this generality. The most notable was the relatively high average crew complement in the small sized freighter/reefer group. In the other vessel subgroups, many of the vessels in the less than 10,000 DWT size category had relatively low crew complements of 12 crewmembers and less. (Presumably the vessels with small crews have restricted trading ranges.) In the freighter/reefer group, which included large numbers of small vessels, few vessels had low crew complements. As a result, the freighter/reefer group, which was both smaller and newer than the freighter group, had a slightly larger average crew complement than the freighter group. Also, the relatively large number of vessels with low crew complements (12 or less) in the freighter group explains why the average crew complement for the freighter group was appreciably lower than its median crew complement. Exhibit VIII presents the synopsis of average crew complements by vessel type, vessel size and flag (only the top five flags overall).

[14] All median and average (mean) crew complements include cadets as crewmembers.
[15] Includes 50 vessels that were not categorized in one of the primary subgroups.

Tanker Vessel

The tanker vessel category is composed of three primary subgroups: tankers, chemical tankers and LPG tankers.

Type	Median Age	Median DWT	Crew Complements[12] Median	Average
Tanker	12	67,990	25	24.8
Chemical Tanker	10	29,974	23	23.5
LPG Tanker	15.5	13,289	20	20.9
All Tankers[16]	12	40,257	24	23.8

The synopsis of the average tanker crew complement by vessel type, vessel size and vessel age is found in Exhibit IX.

Tanker crew complements on average were higher across-the-board than the other vessel categories. This appears to be due to the requirements of the cargo for additional personnel such as tankermen and pumpmen. The differences in average crew complements between tanker subgroups appear to be mostly size related as the three subgroups had significantly different size characteristics.

Table 4

TANKER DISTRIBUTION BY FLAG
TOP 10 FLAGS

	CALLING U.S. NUMBER	CALLING U.S. PERCENT	WORLD FLEET*
LIBERIA	222	24.3%	8.5%
PANAMA	118	12.9%	15.2%
NIS	100	11.0%	4.3%
BAHAMAS	74	8.1%	3.8%
GREECE	66	7.2%	3.9%
SINGAPORE	50	5.5%	5.7%
MALTA	44	4.8%	5.4%
CYPRUS	38	4.2%	2.4%
MARSHALL ISLANDS	32	3.5%	1.1%
ITALY	27	3.0%	3.0%
OTHER FLAGS	141	15.5%	46.6%
TOP 5	580	63.6%	35.7%
TOP 10	771	84.5%	53.4%
ALL FLAGS	912	100.0%	100%

* Source: Merchant Fleets of the World, July 1, 2000

[12] All median and average (mean) crew complements include cadets as crewmembers.
[16] Includes nine (9) vessels that were not categorized in one of the primary subgroups.

By a wide margin, the Liberian flag was the most common flag of foreign tankers calling at U.S. ports. This was the only vessel type where the Panamanian flag was not the most common flag. As is evident from Table 4, the Liberian, NIS, Greek, Bahamian and Marshall Islands flags were considerably over-represented in the U.S. trades as compared to their proportion of the world fleet.

The average crew complements by vessel type, vessel size and top five flags can be found in Exhibit X. As with bulk vessels, there are no unexplainable differences in crew complements between flags. Panama's average crew complement is somewhat lower than the other top flags but this is a result of fleet composition. The Panamanian flag tanker fleet represented in this study was composed primarily of smaller chemical and LPG tankers. As a result, over 56 percent of the Panamanian tankers were less than 20,000 DWT compared to 20 percent for Liberian flag tankers. With this fleet composition, the average crew complement for Panamanian tankers would be expected to be lower than average.

Containerships

	Median	Median	Crew Complements[12]	
Type	Age	TEU	Median	Average
Containership	7	2,852	21	21.1

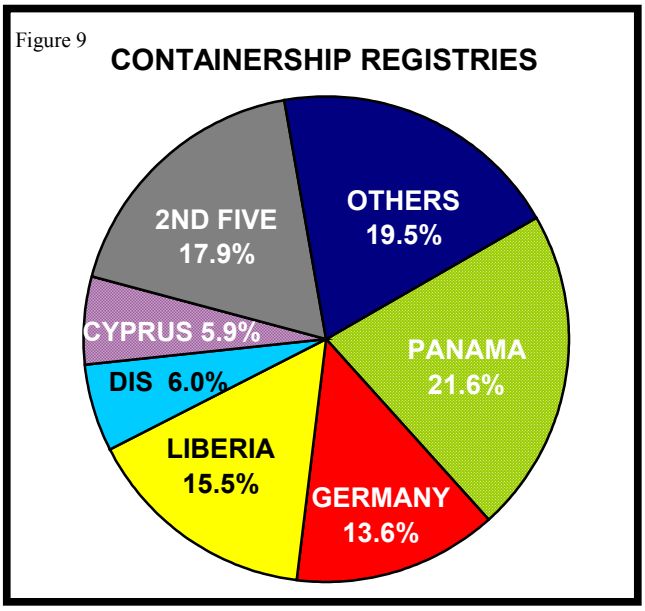
With the rapid expansion of the world container fleet during the 1990s, it is easy to understand that in 2000 containerships calling at U.S. ports would have the lowest median age and the lowest average and median crew complements of the four general vessel types. The impact of age is most evident for the largest (>4,000 TEU) containerships. With a median age of only four years, the average crew compliment of 20.7 is lower than the overall category average – the opposite of what would be expected when age is not a factor. While age may appear to be a better potential indicator of crew complements than size, crewing levels still show the tendency to increase with size

[12] All median and average (mean) crew complements include cadets as crewmembers.

within each age bracket. The synopsis of the average containership crew complements by vessel size (TEU) and vessel age as well as flag can be found in Exhibit XI.

The flags represented in the top five containership registries include not only three of the largest open registries, Panama (#1), Liberia (#2) and Cyprus (#5), but also two flags – Germany (#3), and DIS (#4) – that were not found among the Top 5 in any of the other vessel types. German interests are the world's largest owners of containerships and the national flag has retained sufficient numbers to be a strong participant in the U.S. trades. Overall, the flag distribution of containership vessels in this study (see Figure 9) showed a modest level of concentration (51%) in the top three flags. After the top three, participation was far less concentrated - the next ten flags (#'s 4 –13) had a reasonable proportion (2% or more) of the vessels calling the U.S. study ports.

Figure 9



The breakdown of average crew complements by flag shows that crewing levels were generally comparable among the different flags. The greatest contrasts occurred in the 1,000-1,500 TEU group where a small group of DIS flag vessels with an average crew complement of 12.7 seafarers contrasts with the group average of 19.6 crewmembers. German flag vessels had the lowest average age and the lowest overall average crew complement for containerships.

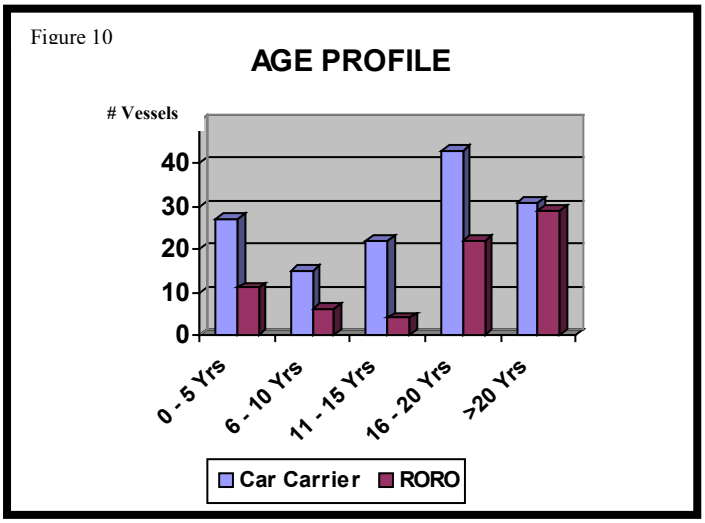
RORO and Car Carriers

While both RORO and car carriers have roll-on, roll-off vessel capabilities, they are dealt with separately since they service distinct markets. Car carriers offer a more specialized service of the bulk movement of new cars and light trucks to market. The RORO vessel generally carries a greater variety of cargoes that may include cars and light trucks but

also oversized vehicles, such as construction and farming equipment as well as other types of freight and containers.

Type	Median Age	Median Size	Crew Complements[12] Median	Average
RORO	18	10,404 DWT	21	20.7
Car Carrier	16	4,350 Cars	22	21.5

Figure 10



Older vessels populated the foreign-flag RORO and car carrier fleets serving the U.S. trades. The majority of the fleet (RORO 71%, Car Carrier 53%) were 16 years or older in 2000. Crew complements on average were about two persons larger in the older age groups as compared to the youngest. In the future, we would expect the average crew sizes to fall more quickly than in other sectors even as average vessel size increases.

The average crew complement information for both RORO vessels and car carriers can be found in Exhibits XII and XIII. RORO vessels had the smallest number of vessels of any vessel group, only 72. As is reflected in the median size, 10,404 DWT, RORO vessels were relatively small compared to other vessel types but most maintained a wide trading range. Because of the wide trading range, there were relatively few small crew complements (<12 seafarers) and the average crew size was higher than the other dry cargo vessel types of comparable size. Panama and NIS were the most common vessel flags (combined 47 %, 34 vessels) – the St. Vincent and the Grenadines, Philippines, Sweden and Malta rounded out the top five with 4 or 5 vessels each.

[12] All median and average (mean) crew complements include cadets as crewmembers.

Panama was by far the largest registry for car carriers included in this study with over 42 percent of the vessels in the group. Singapore was a distant second with slightly less than 14 percent of the vessels. Liberia, Sweden and NIS with a combined 28 percent gave the top five ranked flags 84 percent of the car carriers calling at the U.S. study ports. With the exception of Sweden (18.3 seafarers), crew complements were similar among the top five flags. With a median age of 5, age is the likely explanation for Sweden's much lower crewing levels.

Part 3. Actual Crew Complements

There is a myriad of possible crewing combinations for vessels working in the U.S.-foreign trades. To provide perspective to the statistics presented in the first two parts, we have compiled, in Exhibits XIV - XVII, actual crew complements for each of the major subgroups for the four vessel types highlighted. Three crew complements are displayed for each vessel type/subgroup – low, median and high. The median category generally reflects a crew on a vessel near the median age, size and crew complement previously presented. The low and high are not the lowest or highest crew complement but are representative of the lower and higher ranges. Also, no attempt was made to always display the most common crew nationality combinations for each vessel type, though many are represented. Instead, our intention is to present a perspective for the wide variety of crew sizes and compositions on vessels calling at U.S. ports and some of the major trends in vessel crewing.

Conclusions

Seafarers from low cost areas of the world filled the vast majority of billets on foreign-flag vessels in the U.S.-foreign trade during 2000. However, we have observed from our prior detailed crewing studies and confirmed by this study that there has been a transition in the U.S.- foreign cargo trades to low cost crewing providers. We believe that this transition is continuing. Among the unlicensed ratings, with few exceptions only the lowest cost nationalities were employed during 2000 in the competitive U.S. trades. Officers from developed countries were still well represented in the command positions of master and chief engineer in 2000 but decidedly less so in lesser officer ranks. At the same time, officers from developing countries were filling the lower officer ranks and pushing into the highest levels. The crew nationality data appears to portend the greater use of officers from low cost crewing centers even as the supply of top officers from developed countries struggles to replace itself.[17]

[17] The BIMCO/ISF manning study provides some data supporting this notion. The study showed a rapidly accelerating age profile of OECD member country officers and a four-percentage point decline in the proportion of officer positions held by OECD nationals from 1995 to 2000. However, the BIMCO/ISF study suggests that Officers from developing countries retire or move to shore based employment at earlier

While crew selection moves towards lower cost nationalities, vessel design has lowered the number of seafarers necessary to crew the newer vessels in the fleet. Average crew sizes will continue to decrease slightly as newer vessels are added to the fleet to meet growing demand and replace older vessels that are scrapped.

The dual observations of smaller crew complements and lower cost crewing sources will continue to assure that foreign-flag competitors in the U.S. trades will be minimizing crewing costs in the future[18]. As a result, U.S.-flag operators competing in the foreign trades will continue to be pressured by a wage cost disadvantage.

age (around 50) and this may challenge the notion that higher ranked officers will be replaced by officers from developing countries.

[18] Revised IMO Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW 95) took effect in 2002. The new more rigorous standards could reduce the supply of qualified seafarers and thereby increase crew costs in the future. We do not now speculate as to the impact of STCW 95 on the nationalities of crewmembers serving the U.S foreign trade but it will certainly be a subject of interest in the coming years.