TRAMP SHIPPING

BY

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Signature Redacted

Signature of Author

Signature of Professor
in Charge of Thesis
Foreword

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TRAMP SHIPPING

Sumner Adam Long
The Need for Tramp Shipping

During the best of the pre-war years from a quarter to a third of the foreign trade of the United States was carried in tramp ships, the remainder being carried in liners or industrial carriers. However, the cargoes carried by the tramps were limited to a comparatively small number of commodities on certain general routes.

Defining the separation between tramps, liners and industrial carriers is not always simple, for their cargoes sometimes overlap. Perhaps the easiest distinction to make is that of industrial carriers, the commonest example of these being the large tanker fleets of the American oil companies. Tramp tankers are, however, not always distinguishable, for the tramps are often taken on time charter to serve as industrial carriers. The differentiation between tramps and liners is more difficult, and competition is keener.

Strictly speaking, a liner is a ship which sails on a regular schedule between specified ports, and is a common carrier, while a tramp vessel is one which is available for hire for any voyage, and is classified as a private carrier. Tramps also prefer to carry full-load cargoes, whereas a liner is more likely to carry a mixed cargo. However, in times of poor trade, like the pre-war period, the liner will very often carry cargoes which would normally be shipped by tramp rather than sail with empty holds. Similarly, in good times, a tramp may be placed on time charter to a liner operating company to serve as a liner. Or a tramp may be put "on the berth" by its agents, by which is meant that the agent announces that he has a ship which will sail at a given time for a
specified place from a certain berth, and will receive general cargo until departure time. In this case the tramp competes with the liner, as does the liner with the tramp in poor times.

In 1938, the United States Maritime Commission issued a report on tramp shipping which it had been ordered to prepare under the Merchant Marine Act of 1936. In this report it was recommended that "no effort be made to develop tramp shipping under the American flag at this time."¹ This recommendation was made because the Commission felt that development would require subsidies which it could not justify paying in view of: 1) the decline in tramp shipping; 2) the inability of Great Britain to maintain her tramp ships during the depression; 3) the indications that it would be wiser to subsidize liners; 4) the increasing competition between tramps and liners; 5) the fact that national defense would warrant faster ships than tramps.² To support its reasoning, the Commission gives figures showing the increasingly large portions of bulk cargo being handled by tramps.

In addition to the conclusion reached, the Maritime Commission report noted that with the single exception of Japan all countries had been forced to cut down their tramp fleets.³ It especially emphasized the decreasing tramp tonnage of countries with high standards of living, and considered this an indication that American-flag tramp shipping would be unsuccessful.⁴ It appears that the trend away from tramp

²Ibid., pp. 20-21.
³Ibid., p. 12 et seq.
⁴Ibid., p. 20.
shipping has been reversed, and that tramp shipping is again resuming its pre-depression importance.

In view of the change in conditions during the decade since the Maritime Commission Report was issued, it seems that the report can be disregarded as irrelevant at this time.

While realizing that conditions in the post-war years are as abnormal as were conditions in the thirties, it nevertheless seems possible to make some predictions of the future on the basis of past experience. The shipping business is now a flourishing one, and shows signs of improvement in all countries except the U. S., where no progress is being made because of the fluctuating course of the government, the large surplus of obsolete ships, and the inexperience of operators in certain fields.

The tramp has two reasons for existing. The first is the shipment of large amounts of cargoes whose value is not sufficient to warrant the expense for the faster service given by the liner. Examples of such cargoes are coal, grain and scrap iron, which are primarily tramp cargoes. However, such cargoes will be carried by liners when trade is slack, and it pays them to carry such cargo at a loss rather than to sail with empty holds. Tramps are also used to carry full-load shipments of almost all bulk cargoes, but tramps do not commonly carry cargoes which require a great deal of special equipment for ventilating or handling.

The tramp's second reason for existence is that trade between two areas may be one-sided. A good example of one-sided trade is the historic triangle trade by which New England prospered. Salt fish was carried from New England south to the West Indies, where the ships sold the
cargo and loaded sugar for England and the Continent. On the return voyage from England, the ships carried manufactured goods, and emigrants.

In modern times, a good example of the unbalance of trade is the existence during the pre-war years of a number of westbound round-the-world services, seven in 1936, and only one eastbound round-the-world line. The service on these lines was, generally subsidized, and the frequency was determined by the overall picture, thus leaving tramps a lucrative field of operations in certain areas.

Tramp services, in general, connect areas of high civilization with each other and with areas which are primarily either markets or sources of supply. Thus it is not surprising to find that the United Kingdom and adjacent North Europe is one of the main trading areas for tramp vessels. From North Europe tramp ships sail to almost all corners of the earth. Some tramping was done in pre-war years between Japan and the East Indies, but now, the only other area which employs large numbers of tramps is the United States and Canada.

North America - Europe Trade

The first tramp service to consider is that between the eastern part of North America and North Europe. A large part of the trade is seasonal, owing to the closing of the Lakes, St. Lawrence and Hudson's Bay ports during the winter. The eastbound cargoes, in normal times, consist of such items as lumber, grain and newsprint from the Canadian ports, cotton, sulfur, and lumber from the Gulf ports. The westbound cargoes are mostly ores, especially iron from Spain and paper pulp from Sweden. The normal balance of trade is eastbound.
During the present abnormal conditions, the balance of trade is still eastbound, but the accent is on grain and coal. The trade in this service has not stabilized sufficiently since the war to be a good field for new tramp service. The abnormal relief trade will soon die out, and it does not seem likely that the European economy will have revived sufficiently to permit profitable American-flag service in competition with the subsidized tramps of the European countries themselves. The lower standards of living in most European countries, and the use of Indian (Hindu) sailors on British tramps makes competition keener, and does much to eliminate American competition which is without benefit of the subsidies that are paid to enable competition between the various European countries.

Furthermore, the cargoes now being carried are not the easiest to handle. The hauling of grain requires special cargo battens, feeder trunks, and shifting boards which make for extra expense, while the carrying of coal precludes the subsequent hauling of any other cargo without an expensive cleaning out of the holds.

Trade with South America

The trade between Europe and South America is almost entirely eastbound. Grain is shipped from the River Plate at certain seasons of the year, March and April. Bauxite is shipped from the Guianas (Paramaribo in Surinam, and Georgetown, British Guiana), to Scandinavia. In normal times, the return trade is coal from the British and German coal mines to Argentina and Brazil. At the present time, the trade is all eastbound.
The service between South America and eastern North America is handled to a large extent by liners. In the case of American-flag vessels, subsidies are used to enable them to better compete with foreign ships. The cargoes which are suitable for tramping on the North-South America run are very few: Ore is shipped in large quantities, bauxite is sent from the Guianas to the Newport News-Newfoundland range, iron ore is shipped from Cruz Grande, Chile to Chesapeake Bay, and copper ores and concentrates are shipped from the west coast of South America to eastern North America. Coffee is the only other cargo of importance suitable for tramping which is shipped out of South America to North America. The tendency in recent times has been to use liners almost exclusively in the coffee trade, and it seems that tramps will be shunted from that trade in the future. The only return cargo in normal times is newsprint, which is shipped from eastern Canada to Buenos Aires and Rio de Janeiro. At the present time, coal is handled between Hampton Roads and South American ports, but this trade is only of a temporary nature, for it is expected that European coal will drive the American coal from the market as it did after the first World War.

The serious condition of the ports of South America discourages any attempts to try operating a new service to these ports. Even the liners serving in these areas are unable to clear through the ports of Brazil; Argentina, Venezuela and Columbia except after long delays; the ports of the countries trying to handle cargo far in excess of their capacities. In addition, the port authorities and governments of these countries are so notoriously inefficient and corrupt as to make a
solution improbable as long as the volume of business remains at the present high level. In one week at Buenos Aires, an average of fourteen ships a day arrived, but only six a day cleared. To be able to meet expenses caused by the long wait in the stream (two weeks at Santos is average), the subsidized liner services, both American and British companies, have found it necessary to add a surcharge as high as 35 percent on goods going into the ports of South America.¹

A quite profitable trade might be built up in the North-South American trade carrying ore northbound and coal southbound. In the ore trade, however, much competition would be met from the industrial carriers, and it is doubtful whether a tramp service could survive. Carrying coffee northbound instead of ore would necessitate an extensive cleaning of the holds every voyage, and the same objectionable conditions would exist here as on the American-European trade.

It appears that, even if the volume of cargo moving were large enough to warrant more ships in the North-South American trade, other conditions are sufficiently important to make this trade hazardous for a new operator in that field.

Trade to the Mediterranean Sea

The trade between the United States and the Mediterranean ports is mostly in cargoes suitable for liners, American-flag service to this area being handled almost entirely by liners. Some American tramps do compete in this region while British tramps, and those of smaller

nations, such as Greece and Italy, handle the greater part of the tramp business. Westbound cargoes predominate in the Mediterranean-North American Service: Bauxite is shipped from the Balkans, and at the present time a large volume of iron ore is moving out of the French ports of Algiers, Bone and Bougie. Eastbound trade to the Mediterranean ports from North America is very light, although, at one time, a steady trade was done in cotton-seed oil to Marseilles.

Commerce between the United Kingdom and the Mediterranean is the most important part of the Mediterranean's trade if the near East is included. The United Kingdom imports sugar from her African colonies; cotton is imported from Egypt and from India. Tramps carry a large amount of jute from India to England, and are also employed carrying fruit from Spain to England, the run being short enough, even for a slow ship, to avoid having to refrigerate the cargo. However, there is no important return trade, and while the volume one way is satisfactory, it is seasonal; in addition, it is questionable how the changing Indian political situation will affect trade with India. The chief obstacle to American-flag tramping in this area would be the difficulty of maintaining American ships in operation between exclusively foreign ports. While it is common for foreign ships to leave their home ports for several years, and in the case of some Scandinavian ships, several decades, American ships have rarely ever been successfully operated in this manner.

**The Europe-Far East Trade**

Between Europe and the United Kingdom and the Far East, a large volume of trade takes place. Eastbound cargoes normally include large
amounts of coal (in pre-war days even the Australian railways burned British or German coal). Salt for China, Japan, and the Indies from Spain is an important eastbound cargo. Full cargoes of manufactured goods, however, make up the bulk of the outward bound trade on this route. The return cargoes are the raw materials which Europe is completely dependent upon. Large quantities of tin are shipped from the Straits Settlements and the Netherlands Indies, as are large amounts of rubber. Phosphates are shipped from certain of the Australian possessions. Copra is shipped from many of the tropical and semi-tropical islands to Northern Europe; the Philippines, the Netherlands Indies and Australia export large quantities of sugar. Australia and New Zealand export wheat and wool in large volume to Europe and the United Kingdom; Australia also exports wheat to China. The tea trade is of some consequence but it is not usually handled by tramps. There is a considerable trade in case oil between the East Indies and China, and the trade in rice, both in the Far Eastern area and to Europe is also quite important.

The volume of trade between Europe and the Far East is sufficient to make tramping in this service quite satisfactory, from the owner's point of view. Another factor is that the cargoes are of such a nature that it is possible to make round voyages without having to resort to the expensive cleaning out of holds.

The chief obstacles to service in this trade for American-flag ships would be the competition of foreign tramps, which would be operating, to a large extent out of their home ports, and with natives in the crews, and the difficulty, as explained above, of maintaining American-flag ships on runs between foreign ports.
The Trans-Pacific Trade

The trans-Pacific trade has a large volume of cargoes suitable for tramping. The greater part of these cargoes either are exported from, or imported into the Pacific Coast of North America. Many of these cargoes pass through the Panama Canal to the Gulf-Caribbean area. Sulfur and case oil and case gasoline pass westbound through the Panama Canal to China and Australia. Australian flour passes eastbound through the Canal to Trinidad and the British West Indies in the Carribean Sea. Rubber from Malaya and the Indies and tin from Malaya also pass through the Panama Canal to the ports of northeastern North America. Copra passes eastbound across the Pacific to Mexico; while the remainder of the large-quantity cargoes in the trans-Pacific trade originate or terminate in one of two areas: California or the Puget Sound-Vancouver area.

The chief export from California suitable for tramping is case oil and case gasoline. The chief imports into the area are sugar from the Philippines, and copra from the Philippines and the other islands of the East Indies. Chrome ore is also imported into San Francisco from the Philippines, Island of Zambales. Rubber and tin are imported from Malaya and the Indies also. The Puget Sound-Vancouver area's trade with the Orient is limited to exporting. Lumber is the chief cargo exported from the area to Japan, China and Australia. The British Columbian ports of Vancouver and Prince Rupert also export flour to Japan and China.

While the trade across the Pacific is now swollen by war relief and reconstruction goods and supplies for the American armies in the Orient, it appears to be more stable than that across the Atlantic. The only
serious dislocation in the trans-Pacific resulting from the war is
the almost complete stoppage of the sugar trade because of the
destruction of the mills and cane fields. On the other hand, the
trade in rubber and in tin is increased by the accumulated production
of the later war years which was not exported at all. This increase
should serve to stabilize the trade until sugar production can again
be resumed.

Conclusions

It is believed that a satisfactory tramp service could be maint-
tained across the Pacific on a sounder economic basis than could be
done in any of the other areas.

The Pacific trade has not been so seriously disrupted by the war
as has trade in certain other areas, notably the Atlantic. An
American-flag vessel in the trans-Pacific trade would also have the
advantages of returning to home ports on every voyage, and would not
therefore suffer from the difficulties of maintaining a ship in
foreign waters; furthermore, in the Pacific, the ship's maintenance
can better be taken care of at sea due to the normally good weather.
This cuts port time and expense, as compared with the North Atlantic
where nearly all maintenance must be done in port, and is proportionately
more expensive.

The author has, therefore, chosen to limit himself to a detailed
study of the trans-Pacific trade and of those cargoes in that trade
route which provide the most profitable operation.
Transpacific Trade 1920-1938

1922--American vessels carried 30% of Pacific dry-cargo exports from U. S.
1925--37% of this trade.
1930--28%.
1936--15%.

During this period, the English carried about 20% of the export trade from 1922-1930, and maintained this until 1936. In 1937 they increased their share to 29% but dropped to 24% in 1938. These figures show the ability of the British to maintain and to even improve its position in a trade between outlying areas in competition with the heavily subsidized shipping of the U. S. and Japan. The share of the total export trade handled by vessels other than American and British averaged nearly 50% for 1922-1930, and then jumped to 64% for 1937 and to 68% for 1938. Japanese shipping accounted for the major portion of this trade.

Trades and Services--1936

A. Exports (1,920,000 tons):

1. Japan took 65% of the volume of exports from the Pacific Coast, China 20%, and the Philippines 6%. The trade to the Dutch East Indies and the Straits Settlements was negligible.
2. American vessels carried only 8% of the total exports; Japanese liners handled 36%, other foreign liners 33%, and tramps 23%. Of total exports in American vessels, 92% was for South China and the Philippine Islands.
3. Tramp vessels carried exports only to Japan. They handle 32% of the exports to Japan.

4. Three commodity groups—scrap metal, iron and steel manufactures, and fertilizers accounted for 69% of total exports.

5. Only in the carriage of iron and steel manufactures, the second most important commodity, did American vessels handle as much as 30% of the exports.

B. Imports (1,053,048 tons):

1. The Philippine Islands were the principal source of trans-Pacific imports, supplying 54% of the total, with Japan accounting for 26%, North and South China 13%, the Straits Settlements 7%, and the Dutch East Indies 3%.

2. American vessels carried only 10% of the imports; Japanese liners handled 58%, other foreign liners 16%, and tramps 16%. Of imports carried in American vessels, 96% came from South China and the Philippines.

3. Tramp vessels were important only in the carriage of sugar from the Philippines. They handled 28% of the total imports from that country, or nearly twice the volume carried in American vessels.

4. Three commodity groups accounted for 67% of the total imports over the trans-Pacific route—sugar; vegetable oils, including coconut oil and wood oil; and rubber, gutta, and jelutong.

5. Sugar accounted for 74% of the import cargoes carried by American vessels from the entire Far East, but this was only 15% of the total movement of this commodity, and less than half that
carried by tramp vessels.

6. 50% of the silk and rayon—by far the most valuable cargo from the Far East—was carried in American vessels to the Pacific coast.

**Effect of the War**

During the period between wars, the trade across the Pacific was artificially stimulated by the Japanese armament campaign. From the beginning of the Manchurian Aggression in 1931, this stimulus was even more noticeable. In 1936, scrap metal was the largest single American export to the Orient. Japanese ships comprised the largest single national block engaged in the trans-Pacific trade, handling approximately half the export trade of the United States and roughly a third of the import trade.

Because of the war, the Japanese competition in the Pacific has been completely eliminated for some time to come. It is doubtful that the Japanese will be able to compete in the carrying of goods until long after economic conditions have improved sufficiently to restore the normal trade in the Pacific to its pre-war level.

The artificial removal of such a large portion of the ships which had been engaged in the trans-Pacific trade creates tremendous possibilities for a tramp trade which could be carried on efficiently and with great economic success. Tramp ships are the only type of vessel which can meet the demands of a trade so irregular as is the trade in the Pacific. A two-way liner service can handle an unbalanced trade only if the operator or the government is willing to pay for the
return trip empty. This need is partially filled by westbound round-the-world services, but the use of such services is governed by trade conditions on other portions of the route as well as by those in the Pacific.

Present Far East Conference

New York Freight Bureau
1. American & Manchurian Line
2. American Pioneer Line
3. American President Line
4. Bank Line
5. Barber Wilhelmsen Line
6. Blue Funnel Line
7. De la Rama Steamship Co., Inc.
8. Dodwell-Castle Line
9. Prince Line
10. Silver Line, Ltd.

Trans-Pacific Freight Bureau
1. American Mail Line
2. American President Lines
3. Barber-Wilhelmsen Line
4. Canadian Pacific Steamships
5. De la Rama Transpacific Service
6. Swedish East Asiatic Co., Ltd., Owners
7. Ivaran Lines—Far East Service
8. Fearnley & Eget
   Fern Line
   Klaveness Line
9. Madrigal Line
10. Maersk Line
11. Salen Line
### Independent

1. Ellerman & Bucknall Steamship Company
2. Lykes Bros.
3. American Gulf Orient Line
4. Waterman
5. Isthmian
6. Kerr Steamship Company
8. Lancashire Shipping Company

#### Westbound Cargoes

Exports from United States Pacific Northwest to Far East.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Volume Carried (Tons)</th>
<th>Percentage of Total Exports</th>
<th>Type of Carrier Tramp</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumber</td>
<td>1,021,947</td>
<td>76.7</td>
<td>368,993</td>
<td>36.1</td>
</tr>
<tr>
<td>Woodpulp</td>
<td>123,495</td>
<td>9.2</td>
<td>26,224</td>
<td>21.2</td>
</tr>
<tr>
<td>Scrap metal</td>
<td>70,964</td>
<td>5.3</td>
<td>39,966</td>
<td>56.4</td>
</tr>
<tr>
<td>Wheat flour</td>
<td>30,654</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisions</td>
<td>16,048</td>
<td>1.2</td>
<td>1,154</td>
<td>7.2</td>
</tr>
<tr>
<td>Copper and products</td>
<td>15,693</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper and products</td>
<td>15,555</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron and steel products</td>
<td>11,146</td>
<td>0.8</td>
<td>4,659</td>
<td>41.8</td>
</tr>
<tr>
<td>Petroleum products</td>
<td>5,383</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reefer&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4,939</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autos, trucks</td>
<td>2,286</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machinery</td>
<td>1,004</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>13,324</td>
<td>1.0</td>
<td>48</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Total exports</strong></td>
<td><strong>1,332,438</strong></td>
<td><strong>100.0</strong></td>
<td><strong>441,044</strong></td>
<td><strong>33.1</strong></td>
</tr>
</tbody>
</table>

<sup>a</sup> Refrigerated cargo

---

1. Radius, W. A., Table 37, p. 91, *U. S. Shipping in Transpacific Trade, 1922-1938; Stanford University, 1944.*
Exports from California District to Far East.\(^1\)

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Volume Carried (Tons)</th>
<th>Percentage of Total Exports</th>
<th>Type of Carrier Tramp</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum, products(^a)</td>
<td>161,541</td>
<td>27.0</td>
<td>1,594</td>
<td>1.0</td>
</tr>
<tr>
<td>Scrap metal.</td>
<td>121,630</td>
<td>20.4</td>
<td>24,980</td>
<td>20.6</td>
</tr>
<tr>
<td>Asphalt.</td>
<td>46,980</td>
<td>7.9</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>41,637</td>
<td>7.0</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Cotton</td>
<td>40,332</td>
<td>6.8</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Paper, manufactures</td>
<td>33,998</td>
<td>5.7</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Drugs, chemicals</td>
<td>16,387</td>
<td>2.7</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Salt</td>
<td>14,460</td>
<td>2.4</td>
<td>6,860</td>
<td>47.5</td>
</tr>
<tr>
<td>Canned goods</td>
<td>10,866</td>
<td>1.8</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Other provisions</td>
<td>10,164</td>
<td>1.7</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Other metals, products</td>
<td>9,905</td>
<td>1.7</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Reefer</td>
<td>9,668</td>
<td>1.6</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Iron, steel products</td>
<td>8,353</td>
<td>1.4</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Lumber</td>
<td>7,274</td>
<td>1.2</td>
<td>359</td>
<td>4.9</td>
</tr>
<tr>
<td>Rubber products</td>
<td>5,219</td>
<td>0.9</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Machin’y, locomotives</td>
<td>3,502</td>
<td>0.6</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Copper, manufactures</td>
<td>2,084</td>
<td>0.3</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Autos, trucks</td>
<td>2,080</td>
<td>0.3</td>
<td>..</td>
<td>...</td>
</tr>
<tr>
<td>Miscellaneous.</td>
<td>51,585</td>
<td>8.6</td>
<td>2,014</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>597,766</td>
<td>100.0</td>
<td>35,307</td>
<td>6.0</td>
</tr>
</tbody>
</table>

\(^a\)Excluding tanker shipments.

\(^1\)Ratis, W. A., Table 42, p. 101, U. S. Shipping in Transpacific Trade, 1922-1938; Stanford University, 1944.
The Conference Rates on the Most Important Westbound Cargoes From the Pacific Coast are as Follows:

<table>
<thead>
<tr>
<th>Cargo</th>
<th>to Shanghai</th>
<th>to Manila</th>
<th>to Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt, per ton</td>
<td>$22.75</td>
<td>$21.00</td>
<td>$21.00</td>
</tr>
<tr>
<td>Case oil, per ton</td>
<td>23.20</td>
<td>21.80</td>
<td>21.80</td>
</tr>
<tr>
<td>Flour, per ton</td>
<td>28.50</td>
<td>27.75</td>
<td>27.75</td>
</tr>
<tr>
<td>Potassium Nitrate, per ton</td>
<td>55.25</td>
<td>54.00</td>
<td>54.00</td>
</tr>
<tr>
<td>Lumber, per 1000 bd. ft.</td>
<td>50.50</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Lumber, per ton, approx.</td>
<td>30.50</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Because it is the largest single export from the Pacific Coast, and because it is easily handled, and because it had the highest freight rate, except for Potassium Nitrate, which is not readily handled or stowed and can only be taken as a part cargo, lumber, from Seattle to Shanghai was decided upon as the most suitable westbound cargo.
### Eastbound Cargoes

Imports to United States Pacific Northwest from Far East.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Volume Carried (Tons)</th>
<th>Percentage of Total Exports</th>
<th>Type of Carrier Tramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar</td>
<td>27,237</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>Copra and products</td>
<td>25,135</td>
<td>14.8</td>
<td></td>
</tr>
<tr>
<td>Other oil cakes</td>
<td>16,621</td>
<td>9.8</td>
<td>3,914</td>
</tr>
<tr>
<td>Glass, earthenware</td>
<td>12,629</td>
<td>7.4</td>
<td>1,155</td>
</tr>
<tr>
<td>Burlap and bagging</td>
<td>12,194</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>Seeds and beans</td>
<td>7,997</td>
<td>4.7</td>
<td>2,137</td>
</tr>
<tr>
<td>Toys, etc.</td>
<td>6,678</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>Wood oil</td>
<td>5,624</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Chemicals, fertilizers</td>
<td>4,523</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Cotton products</td>
<td>3,255</td>
<td>1.9</td>
<td>610</td>
</tr>
<tr>
<td>Lumber</td>
<td>3,206</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>Ores, pig iron, etc</td>
<td>2,967</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Gold and silver</td>
<td>2,776</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Tea</td>
<td>2,655</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Reefer</td>
<td>2,075</td>
<td>1.2</td>
<td>960</td>
</tr>
<tr>
<td>Provisions, n.e.s.</td>
<td>2,072</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Coconuts</td>
<td>1,785</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Silk and rayon</td>
<td>1,337</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Hemp, sisal</td>
<td>1,017</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>28,237</td>
<td>16.6</td>
<td>959</td>
</tr>
<tr>
<td>Total</td>
<td>170,020</td>
<td>100.0</td>
<td>9,735</td>
</tr>
</tbody>
</table>

---

1. Radius, W. A., Table 39, p. 93, U. S. Shipping in Transpacific Trade, 1922-1938; Stanford University, 1944.

2. No figures available.
## Imports to California District from the Far East

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Volume Carried (Tons)</th>
<th>Percentage of Total Imports</th>
<th>Type of Carrier Tramp Tons Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copra and products</td>
<td>128,664</td>
<td>16.1</td>
<td></td>
</tr>
<tr>
<td>Vegetable, other oils</td>
<td>107,551</td>
<td>13.5</td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td>88,631</td>
<td>11.1</td>
<td>9,233</td>
</tr>
<tr>
<td>Seeds and beans</td>
<td>66,182</td>
<td>8.3</td>
<td>2,837</td>
</tr>
<tr>
<td>Rubber, gutta, jelutong</td>
<td>52,283</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Lumber</td>
<td>38,806</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>Chemicals, fertilizers</td>
<td>36,891</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Burlap and bagging</td>
<td>32,924</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>Cotton products</td>
<td>27,335</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Coconuts</td>
<td>22,144</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Provisions, n.e.s.</td>
<td>20,485</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Ores, pig iron, etc.</td>
<td>12,344</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Glass, earthenware, etc.</td>
<td>11,495</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Other oil cakes</td>
<td>11,186</td>
<td>1.4</td>
<td>160</td>
</tr>
<tr>
<td>Paper stock</td>
<td>10,819</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Hemp, sisal</td>
<td>10,112</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Canned goods</td>
<td>7,394</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Silk and rayon</td>
<td>5,421</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Tea</td>
<td>4,965</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>4,933</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Coffee</td>
<td>4,240</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Toys, etc.</td>
<td>3,347</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Tapioca, sago, flours</td>
<td>2,866</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Reefer</td>
<td>2,525</td>
<td>0.3</td>
<td>1</td>
</tr>
<tr>
<td>Tin</td>
<td>1,707</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Gold and silver</td>
<td>1,628</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Raw cotton</td>
<td>1,557</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>79,036</td>
<td>9.9</td>
<td>378</td>
</tr>
<tr>
<td>Total</td>
<td>797,575</td>
<td>100.0</td>
<td>12,609</td>
</tr>
</tbody>
</table>

---

1Radius, W. A., Table 44, p. 103, U. S. Shipping in Transpacific Trade, 1922-1928; Stanford University, 1944.
From the above tables it may be seen that copra was the largest single import into the Pacific coast. Vegetable oils were second, and sugar was third. In considering suitable eastbound cargo, however, it should be remembered that war damage has eliminated sugar from consideration for several years. Vegetable oil is not a possible cargo for dry cargo ship, as it is generally shipped in bulk in deep tanks.

The conference rates on copra and sugar to the Pacific coast of the United States are:

<table>
<thead>
<tr>
<th>Cargo</th>
<th>from Manila</th>
<th>from Hong Kong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar</td>
<td>$17.50</td>
<td>$19.50</td>
</tr>
<tr>
<td>Copra</td>
<td>24.00</td>
<td></td>
</tr>
</tbody>
</table>

The eastbound cargo will be, therefore, copra from Manila to San Francisco, which has the best facilities for handling the cargo.

For lack of suitable cargo, it is found necessary to run the ship light between Shanghai and Manila and between San Francisco and Seattle.

Based on 1947 conference rates
Statement of Purpose

The purpose of this thesis is to determine the most profitable areas and trade routes for tramp shipping operations, and then to calculate the return on investment by operating on the chosen trade route.

1. A chartered EC2-S-C1 (Liberty)
2. A bought EC2-S-C1 - American manned
3. A bought EC2-S-C1 - Norwegian manned
4. A chartered C1-B
5. A bought C1-B - American manned
6. A bought C1-B - Norwegian manned.

This problem also contains an analysis of what cargoes to carry on the determined trade route.

The author chose to investigate the Liberty and the C1-B only because of the unavailability (due to demand exceeding supply) of C2's and C3's.
Statement of Trade Route and Cargoes

From the previous information, the author has established his trade route and the cargoes to be carried.

Lumber will be loaded at Seattle, Washington, for Shanghai, China. At Shanghai the vessel will discharge the lumber and run light to Manila, Philippine Islands. At Manila, a cargo of copra will be loaded for San Francisco, and after discharge at San Francisco the ship will run light to Seattle.
Statement of Results

The annual returns on investment calculated before federal income taxes are:

1. 90.3% for chartered EC2-S-C1
2. 232% for bought EC2-S-C1 with American crew
3. 254% for bought EC2-S-C1 with Norwegian crew
4. 104.25% for chartered Cl-B
5. 180% for bought Cl-B with American crew
6. 191.5% for bought Cl-B with Norwegian crew.

Federal income taxes have been omitted as the results are intended to be only comparable.

The above data is also based on the following:

1. Cargoes carried computed on 100% capacity
2. Excessive deck loads of lumber are carried on each voyage westward.
3. There was no lost time in turn-around between voyages.
4. Return cargoes were carried on every voyage.
5. The cargoes assumed for this analysis move free in and out.
6. The cargo rates used were taken from the extremely high 1947 conference rates.
7. Broken stowage for lumber was computed at 24%.
Chartered ECL-S-G1 (Liberty)

Profit and Loss Statement:

Gross revenue: $1,430,000
Less deductions: 28,600
Net revenue: $1,401,400

Operating Expenses:

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed charges</td>
<td>$134,125</td>
<td>28.8%</td>
</tr>
<tr>
<td>Repairs and Maint.</td>
<td>41,130</td>
<td>7.0</td>
</tr>
<tr>
<td>and Res.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>82,050</td>
<td>13.6</td>
</tr>
<tr>
<td>Supplies (incl. L.O. &amp; MUF)</td>
<td>37,009</td>
<td>6.6</td>
</tr>
<tr>
<td>Crew Expense</td>
<td>147,130</td>
<td>25.0</td>
</tr>
<tr>
<td>Port charges</td>
<td>16,061</td>
<td>2.7</td>
</tr>
<tr>
<td>Management</td>
<td>40,000</td>
<td>6.8</td>
</tr>
<tr>
<td>Cargo expenses</td>
<td>91,585</td>
<td>15.8</td>
</tr>
<tr>
<td>Total</td>
<td>$589,090</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Profit before U.S.M.C. excess profits deduction $812,510
Less U.S.M.C. excess profit deduction $722,000
Profit after U.S.M.C. deduction and before Federal income tax deductions $90,510

Return on Investment:

$100,000 - necessary capital

\[
\frac{90,510}{100,000} = 90.5\%
\]

1 Based on operating and pre-operating capital for 60 days as defined in the "Ship Sales Act."
Bought EC2-S-01 (Liberty) Manned by American Crew

Profit and Loss Statement:

Gross revenue: $1,430,000
Less deductions: $28,600
Net revenue: $1,401,400

Operating Expenses:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed charges</td>
<td>$83,642</td>
<td>15.5%</td>
</tr>
<tr>
<td>Repairs, Maint. &amp; Res.</td>
<td>41,150</td>
<td>7.7%</td>
</tr>
<tr>
<td>Fuel</td>
<td>82,050</td>
<td>14.9%</td>
</tr>
<tr>
<td>Supplies (incl. L.O. &amp; MUF)</td>
<td>57,009</td>
<td>6.9%</td>
</tr>
<tr>
<td>Crew expense</td>
<td>147,130</td>
<td>27.4%</td>
</tr>
<tr>
<td>Port charges</td>
<td>16,061</td>
<td>2.9%</td>
</tr>
<tr>
<td>Management</td>
<td>40,000</td>
<td>7.5%</td>
</tr>
<tr>
<td>Cargo expense</td>
<td>91,585</td>
<td>17.2%</td>
</tr>
<tr>
<td>Total</td>
<td>$558,607</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Profit before Federal Taxes:

$862,795

Return on Investment:

\[
\frac{862,795}{(50\%)(558,607) + 100,000} \times 100 = 234\%
\]

1 50% required as defined in "Ship Sales Act" - 25% of value of ship for net worth and 25% as down payment plus operating and pre-operating capital for 60 days of $100,000.
Bought ECE-S-01 (Liberty) Manned by Norwegian Crew

Profit and Loss Statement:

Gross revenue: $1,430,000
Less deductions: 28,600
Net revenue: $1,401,400

Operating Expenses:

<table>
<thead>
<tr>
<th>Expense</th>
<th>Amount</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed charges</td>
<td>$85,642</td>
<td>18.4%</td>
</tr>
<tr>
<td>Repairs &amp; Maint. &amp; Res.</td>
<td>$41,120</td>
<td>9.0%</td>
</tr>
<tr>
<td>Fuel</td>
<td>$82,050</td>
<td>17.7%</td>
</tr>
<tr>
<td>Supplies (incl.L.O.&amp;MUF)</td>
<td>$37,009</td>
<td>8.1%</td>
</tr>
<tr>
<td>Crew expense</td>
<td>$65,983</td>
<td>14.1%</td>
</tr>
<tr>
<td>Port charges</td>
<td>$16,061</td>
<td>3.5%</td>
</tr>
<tr>
<td>Management</td>
<td>$40,000</td>
<td>8.8%</td>
</tr>
<tr>
<td>Cargo expenses</td>
<td>$91,585</td>
<td>20.4%</td>
</tr>
</tbody>
</table>

Total $455,460 100.0%

Profit before Federal Taxes:

$945,940

Return on Investment:

\[
\frac{945,940}{(0.50 \times 544,506) + 100,000} = 254\%
\]

1 50% required as defined in the "Ship Sales Act" - 25% of value of ship for net worth and 25% as down payment plus operating and pre-operating capital for 60 days of $100,000.
Chartered C 1 - B

Profit and Loss Statement:

Gross Revenue: 1,629,500
Less Deductions: 32,590
Net Revenue: $1,596,910

Operating Expenses:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Charges</td>
<td>184,395</td>
<td>28.2%</td>
</tr>
<tr>
<td>Repairs and Maint. &amp; Reserve</td>
<td>44,900</td>
<td>6.7%</td>
</tr>
<tr>
<td>Fuel</td>
<td>76,600</td>
<td>11.7%</td>
</tr>
<tr>
<td>Supplies (incl. L. O.)</td>
<td>39,340</td>
<td>6.0%</td>
</tr>
<tr>
<td>Crew Expense</td>
<td>152,652</td>
<td>23.2%</td>
</tr>
<tr>
<td>Port Charges</td>
<td>17,873</td>
<td>2.7%</td>
</tr>
<tr>
<td>Management</td>
<td>40,000</td>
<td>6.1%</td>
</tr>
<tr>
<td>Cargo Expenses</td>
<td>101,708</td>
<td>15.4%</td>
</tr>
</tbody>
</table>

Total $656,568 100%

Profit Before U. S. M. C. Excess

Profits Deduction $940,252
Less U. S. M. C. Excess Profits
Deduction $36,000
Profit After U. S. M. C. $104,252

Deduction and Before Federal Income Tax Deductions

Return On Investment:

$100,000 - necessary capital 1

\[ \frac{104,252}{100,000} = 104.25\% \]

1 Based on operating and preoperating capital for 60 days as defined in the "Ship Sales Act"
**Bought Cl-B - Manned by American Crew**

**Profit and Loss Statement:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross revenue:</td>
<td>$1,629,500</td>
<td></td>
</tr>
<tr>
<td>Less deductions:</td>
<td>32,590</td>
<td></td>
</tr>
<tr>
<td>Net revenue:</td>
<td>$1,596,910</td>
<td></td>
</tr>
</tbody>
</table>

**Operating expenses:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed charges</td>
<td>$120,225</td>
<td>20.8%</td>
</tr>
<tr>
<td>Repairs, Maint.&amp; Reserve</td>
<td>44,000</td>
<td>7.5%</td>
</tr>
<tr>
<td>Fuel</td>
<td>76,600</td>
<td>12.8%</td>
</tr>
<tr>
<td>Supplies (incl. L.O.)</td>
<td>39,340</td>
<td>6.5%</td>
</tr>
<tr>
<td>Crew expense</td>
<td>152,652</td>
<td>25.7%</td>
</tr>
<tr>
<td>Port charges</td>
<td>17,873</td>
<td>3.0%</td>
</tr>
<tr>
<td>Management</td>
<td>40,000</td>
<td>6.7%</td>
</tr>
<tr>
<td>Cargo expenses</td>
<td>101,708</td>
<td>17.0%</td>
</tr>
<tr>
<td><strong>Total Operating Expenses:</strong></td>
<td><strong>592,398</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Profit before Federal Taxes:**

$1,004,512

**Return on Investment:**

\[
\frac{\frac{1,004,512}{[(50\%)(912,589) + 100,000]}}{1} = 180\%
\]

1 50% required as defined in Ship Sales Act. 25% of value of ship for net worth and 25% as down payment plus operating and preoperating capital for 60 days of $100,000.
Bought Cl-B - Manned by Norwegian Crew

Profit and Loss Statement:

Gross revenue: $1,629,500
Less deductions: $32,590
Net revenue: $1,596,910

Operating expenses:

Fixed charges $120,225
Repairs, Maint. & Res. 44,000
Fuel 76,600
Supplies (incl. L.O.) 39,340
Crew expense 64,119
Port charges 17,873
Management 40,000
Cargo expenses 101,708
$ 505,365

Profit before Federal Taxes:

$1,066,045

Return on Investment:

\[
\frac{1,066,045}{[(50\%)(912,359) + 100,000]} = 191.5\%
\]

1 50% required as defined in Ship Sales Act. 25% of value of ship for net worth and 25% as down payment plus operating and preoperating capital for 60 days of $100,000.
Discussion of Results

The results indicate that there is a greater return on capital investment by chartering a Cl-B than a Liberty on this particular trade route. The Cl-B makes a sufficiently greater number of trips per year to produce a gross cargo revenue which more than compensates for its increased fixed charges, crew expense, cargo expense, supply expense, and repairs and maintenance expense over the Liberty. It is also noteworthy that the Cl-B makes \( \text{a more voyages per year than the Liberty, due to its increased speed,}
\) and yet the fuel costs of the Cl-B for the year are about \( \$4,000 \) less than for the Liberty.

The return on capital investment when the vessels are bought greatly favors the Liberty over the Cl-B. The reason for the above is that the selling price of the Liberty is 59.7% of the Cl-B, and this also means that the capital investment in the Liberty is 59% of that on a Cl-B. Thus the return on capital investment is greater for the Liberty.

Because of the crew expenses on the Norwegian ship being less than half that on an American manned vessel, both the Cl-B and the Liberty will show a greater return on capital investment with Norwegian crews. This
reduction in operating expenses applies almost equally to the Cl-B and the Liberty, and will not alter the advantage indicated in the preceding paragraph.

These results also show that a much greater return on capital investment can be had by buying a vessel under the present U.S. Maritime Commission "Ship Sales Act" than by chartering a vessel, and the vessels that are bought show enough profit in one year to more than pay for themselves (the Cl-B pays for itself and has about $32,000 left for profit after one year, and the Liberty pays for itself and has about $325,000 left for profit after one year of operations).

The final conclusion is to operate on this trade route a Liberty ship bought from the U.S. Maritime Commission and to place on it a Norwegian crew.

¹ These profits based on vessel manned with an American crew.
Operating Data
EC2-S-C1

( Liberty )
<table>
<thead>
<tr>
<th><strong>Type of ship</strong></th>
<th>EC 2-S-Cl (Liberty)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOA</strong></td>
<td>441.5'</td>
</tr>
<tr>
<td><strong>LBP</strong></td>
<td>417'</td>
</tr>
<tr>
<td><strong>Beam</strong></td>
<td>57'</td>
</tr>
<tr>
<td><strong>Depth</strong></td>
<td>27.74'</td>
</tr>
<tr>
<td><strong>Load displacement</strong></td>
<td>14,254 tons</td>
</tr>
<tr>
<td><strong>Gross DW</strong></td>
<td>10,863 tons</td>
</tr>
<tr>
<td><strong>Light displacement</strong></td>
<td>3,391 tons</td>
</tr>
<tr>
<td><strong>Bale capacity</strong></td>
<td>499,573 cu.ft.</td>
</tr>
<tr>
<td><strong>RPM</strong></td>
<td>66.5</td>
</tr>
<tr>
<td><strong>No. of hatches</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>Service sea speed</strong></td>
<td>11 knots</td>
</tr>
<tr>
<td><strong>$V/\sqrt{L}$</strong></td>
<td>.54 at 11.0 kts.</td>
</tr>
<tr>
<td><strong>Gross tonnage</strong></td>
<td>7176</td>
</tr>
<tr>
<td><strong>Net tonnage</strong></td>
<td>4379</td>
</tr>
<tr>
<td><strong>Bunker capacity</strong></td>
<td>2419 tons (including cargo deep tanks)</td>
</tr>
<tr>
<td><strong>Type of machinery</strong></td>
<td>triple expansion reciprocating</td>
</tr>
<tr>
<td><strong>Single or Twin Screw</strong></td>
<td>Single</td>
</tr>
<tr>
<td><strong>Propeller diameter</strong></td>
<td>18.55'</td>
</tr>
<tr>
<td><strong>Trade route</strong></td>
<td>Seattle - Shanghai - Manila - San Francisco</td>
</tr>
</tbody>
</table>

1 Much of data taken from MESR April '47, from data presented in Course in Ship Operation, MIT, and from capacity plans received from Prof. Evers Burtner, M.I.T.
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross D.W.</td>
<td>10,863 tons</td>
</tr>
<tr>
<td>Cargo D.W. (round voyage)</td>
<td>16,920.19 tons</td>
</tr>
<tr>
<td>Average cargo (tons) carried per voyage - outward</td>
<td>9,770.19 tons</td>
</tr>
<tr>
<td>Average cargo (tons) carried per voygean - homeward</td>
<td>7,150 tons</td>
</tr>
<tr>
<td>Average cargo carried (% DW cap.)</td>
<td>83.5%</td>
</tr>
<tr>
<td>Average measurement cargo per voyage - outward</td>
<td>6,500,000 bd.ft. of lumber or 9,770.19 tons</td>
</tr>
<tr>
<td>Average measurement cargo per voyage - homeward</td>
<td>7,150 tons of copra</td>
</tr>
<tr>
<td>Passengers carried per voyage</td>
<td>None</td>
</tr>
<tr>
<td>Number of hatches worked</td>
<td>5</td>
</tr>
<tr>
<td>Tons of cargo handled per day:</td>
<td></td>
</tr>
<tr>
<td>Seattle</td>
<td>560</td>
</tr>
<tr>
<td>Shanghai</td>
<td>254</td>
</tr>
<tr>
<td>Manila</td>
<td>1190</td>
</tr>
<tr>
<td>San Francisco</td>
<td>1525</td>
</tr>
<tr>
<td>Days in port per round voyage (incl. 18% margin)</td>
<td>66.05</td>
</tr>
<tr>
<td>Round voyages per year</td>
<td>3.06</td>
</tr>
<tr>
<td>Average cargo rate per ton - $27.10</td>
<td>Copra - $24/ton (2240#)</td>
</tr>
<tr>
<td></td>
<td>Lumber - $30.20/ton (2240#)</td>
</tr>
<tr>
<td>Cost of fuel per ton: outward</td>
<td>$9.75</td>
</tr>
<tr>
<td></td>
<td>Homeward</td>
</tr>
<tr>
<td></td>
<td>$21.80</td>
</tr>
<tr>
<td>Percentage of year at sea</td>
<td>43.6%</td>
</tr>
</tbody>
</table>
Weights

Hull wt.+equipment wt.+outfit wt. 2840 tons
Machinery weight 420 tons
Margin weight 131 tons
Total built weight 3391.0 tons
Fuel oil/voyage (incl. 10% reserve) for one way 1412.4 tons
Lube oil 2.42 tons
Crew and stores 415.00 tons
MUF 408.80
Total 5629.62

Distances between ports:
Seattle-Shanghai 5067 miles
Shanghai-Manila 1156 miles
Manila-San Francisco 6221 miles
San Francisco-Seattle 791 miles

Total length of voyage (inc. 2% var.) - 13,500 miles

Bunkering ports
Cubic or D.W. cargo - D.W. outbound; cubic, homeward
Charter rate - $95,600 / year

Crew: Deck dept. 16, engine dept. 13, steward dept. 10

Displacement at beginning of voyage, 14,254 tons
Calculated EHP, 1240
Propulsive coef. 67.5%

IHP installed \( (m = 1.20) = 2500 \) (2500 H.P. installed but due to speed length ratio not practical to use)

Average service IHP for 14,254 tons \( \text{Displ.} = 2150 \)

Fuel consumption per IHP/hr - 1.1#/IHP
Characteristics

LBP = 417’

Beam = 57’

Depth = 37.33

b = .76

Speed Length Ratio and Displacement:

\[
\frac{V}{L} = \frac{11}{415} = .54
\]

Displ. = \frac{(L)(B)(H)(b)}{35} = (417)(57)(27.74)(.76)

Displ. = 14,254 tons

To Compute EHP - Taylor's Method:

\[
\left(\frac{L}{100}\right)^3 = \frac{14,254}{(4.17)^3} = 197.0
\]

\[
\frac{B}{H} = \frac{57}{27.74} = 2.06
\]

\[
\sqrt{C} = 16.8
\]

\[
\sqrt{S} = C\sqrt{\Delta L}
\]

\[
S = (16.8)\sqrt{(14254)(417)} = 41500
\]

\[
2R_f = fSV1.525 = (.009)(41500)(11.825)
\]

\[
R_f = 29,900 \text{ lbs.}
\]

\[
2R_t = (.45)(14254) = 6420 \text{ lbs.}
\]

\[
R_t = 36,320 \text{ lbs.}
\]

\[
3_{EHP} = \frac{(R_t)(V)}{325.5} = \frac{(36320)(11)}{325.5}
\]

1 Taken from page 96 "Principles of N.A." Vol. II
2 " pages 109,110,111,115, "
3 " page 112 "Principles of N.A." Vol. II
EHP = 1240

To Compute IHP from EHP:

\[ \text{IHP} = \frac{(EHP)(m)}{(e_p)(e_r)(e_t)(e_h)} \]

\[ ktd = \frac{(58.913)(EHP)}{(1.024)(1-t)(1-w)^2(V)(D_{prop})^2} \]

1 \[ e_h = \frac{1 - t}{1 - w} = \frac{.837}{.766} = 1.08 \]

2 \[ ktd = \frac{(58.913)(1240)}{(1.024)(.837)(.766)^2(11)^2(18.55)^2} \]

\[ ktd = .315 \]

<table>
<thead>
<tr>
<th>( J )</th>
<th>( J^2 )</th>
<th>( Kt )</th>
</tr>
</thead>
<tbody>
<tr>
<td>.60</td>
<td>.3600</td>
<td>.117</td>
</tr>
<tr>
<td>.65</td>
<td>.4225</td>
<td>.133</td>
</tr>
<tr>
<td>.70</td>
<td>.4900</td>
<td>.155</td>
</tr>
<tr>
<td>.75</td>
<td>.5625</td>
<td>.177</td>
</tr>
</tbody>
</table>

Above values of Kt based on: \[ Kt = (Ktd)(J^2) \]

MWR = .30

3 bladed prop., BTF = .005

3 \[ e_p = .675, J = .70 \]

2 \[ \text{RPM} = \frac{(101.33)(V)(11-w)}{(J)(D_{prop})} = \frac{(101.33)(11)(.766)}{(1.70)(18.55)} \]

\[ \text{IHP} = \frac{(1240)(1.2)}{(.675)(.97)(.97)(1.08)} = 2150 ' \]

1 Taken from pp.148,149,"Princ. of N.A." Vol. II
2 Taken from pp.167&163 " " "
3 Taken from p.164 " " "
4 Checks with Sheedy's Paper
To Compute Weights:

Cubic No. = \( \frac{(417)(57)(37.33)}{100} = 8875 \) tons

\[ H + E + 0 = (8875)(.32 \text{ wt. coef.}) = 2840 \text{ tons} \]

Machinery:

\[ \frac{(2500)(375)}{2240} = 420 \text{ tons} \]

Margin:

\[ (.04) 2840 + 420 = 131 \text{ tons} \]

Light displ. = 2840 + 420 + 131 = 3391 tons

Load displ. = 14254 tons

Gross D.W. = 10,863 tons

Fuel Rate:

\[ \frac{25.1 \text{ tons}}{\text{day}} \]

\[ f = \frac{(25.1)(2240)}{(24)(2150)} = \]

\[ f = 1.1 \frac{\#}{\text{SHP}} \]

Time at Sea for Round Voyage

\[ 51.1 \text{ days} \]

Distance - Seattle to Shanghai

(via Soya Kaikyo & No. of Aleutians) 5067 miles

Shanghai to Manila (via E. of Taiwan) 1156 miles

Manila to Frisco (via Balintang Channel) 6221 miles

San Francisco to Seattle 791 miles

\[ + 2\% \text{ variation in steering} \]

\[ 13,235 \text{ miles} \]

\[ 265 \text{ miles} \]

\[ 13,500 \text{ miles} \]

\( \frac{13,500}{(11)(24)} = 51.1 \text{ days} \)

1 Data taken from MIEAR Apr. '47 and confirmed by Isbrandtsen S/S Co.

2 Checks with Sheedy's paper for Soc. NA & ME

3 Distances taken from Dept. of Commerce "Table of Distance Between Ports."
Fuel Weight for Round Voyage:
\[ (25.1)(51.1) = 1284 \text{ tons} \]

Lube Oil Weight for Round Voyage:
15 gallons/day and 7.5 barrels/ton and 42 gallons/barrel.
\[ (15)(51.1) = 767 \text{ gals.} \]
\[ \frac{767}{(42)(7.5)} = 2.42 \text{ tons} \]

Weight of Fuel (+10% Allowance), L.O., Stores, and MUF for Round Voyage

Fuel

<table>
<thead>
<tr>
<th>Description</th>
<th>Weight (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% allowance</td>
<td>128.4</td>
</tr>
<tr>
<td>Total fuel</td>
<td>1412.4 (fuel oil cap' y. is 2419 tons)</td>
</tr>
</tbody>
</table>

Lube oil

2.42 tons

Stores (including crew, potable water and consumables)

Formula - 10 tons + 30 tons per 1000 miles

\[ 10 + 30(13.5) = 415 \text{ tons} \]

MUF at 8 tons/day

\[ (8)(51.1) = 408.8 \text{ tons} \]

Total 2823.62 tons

1 Data reported by Chief Engineer of the "William J. Bryan" of Waterman SS. Co.

2 Data taken from course in Ship Operation by Prof. L.B. Chapman, M.I.T.

3 10% Allowance for round voyage = 20% for one way
Cargo Deadweight - Bunkering and Supplying Ship for
Round Voyage:

Cargo D.W. = gross DW (fuel, L.O., stores, water, etc.)
= 10863 - 2823.62 = 8039.38 tons

Check on Service Displacement:

| Cargo DW = | 8039.38 |
| F.O. L.O., stores, etc. = | 2823.62 |
| Light displ. = | 3391.00 |
| Load displ. = | 14254.00 tons |

Weight of Fuel for Voyage from San Francisco to
Shanghai (Stopping at Seattle):

Total distance = 791 + 5067 = 5858 miles
Steaming time = \( \frac{5858}{11(24)} \) = 22.2 days

\[
\text{Total fuel weight} = \frac{(2150)(24)(22.2)(1.10)}{2240} + 10\% \text{ fuel allowance} = 56.5 + 5.65 = 621.5 \text{ tons}
\]

Weight of Lube Oil for Voyage from San Francisco to
Shanghai (Stopping at Seattle):

\[
\text{Weight of Lube Oil} = \frac{(2.42)(5858)}{13,500} = 1.05 \text{ tons}
\]

Weight of Stores for Round Voyage (All Stores Taken
on at San Francisco):

Stores: (including crew, potable water, and consumables)

Formula: \( 10 + 30(13.5) = 415 \text{ tons} \)

' Also allowed: 10% for return voyage, so actually
this figure takes into consideration a 20% allowance
for one way.
Weight of MUF for Voyage from San Francisco to Shanghai (Stopping at Seattle):

\[
\frac{(408.8)(5858)}{13,500} = 177 \text{ tons}
\]

Total Weight of Fuel, Lube Oil and Stores Leaving San Francisco (Note that vessel is bunkered for voyage to Shanghai only, but is stored for round voyage):

Total weight = 621.5 + 1.05 + 415 + 177 = 1214.55 tons

Fuel Costs - May 1947

<table>
<thead>
<tr>
<th></th>
<th>San Francisco</th>
<th></th>
<th>New York</th>
<th></th>
<th>Shanghai</th>
<th></th>
<th>Manila</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bunker C</td>
<td>$1.50 bbl.</td>
<td></td>
<td>2.22 bbl.</td>
<td></td>
<td>3.36 bbl.</td>
<td></td>
<td>3.56 bbl.</td>
</tr>
<tr>
<td>Diesel oil</td>
<td>2.65 bbl.</td>
<td></td>
<td>2.74 bbl.</td>
<td></td>
<td>3.77 bbl.</td>
<td></td>
<td>3.88 bbl.</td>
</tr>
</tbody>
</table>

1 Data received from Standard Oil of New Jersey
41.

Cargo D.W. at San Francisco Bunkering for Voyage to Shanghai and Storing for Round Voyage:

Cargo D.W. = Gross D.W. - (fuel, L.O., stoves, etc. for voyage to Shanghai)

\[ = 10863 - 1214.55 = 9648.45 \text{ tons} \]

Fuel Consumed between San Francisco and Seattle (791 Miles):

Steaming time = \( \frac{791}{(11)(24)} \) = 2.9 days

Fuel wt. = \( \frac{(2150)(24)(2.9)(1.1)}{2240} \) = 73.5 tons

Lube Oil Consumed between San Francisco and Seattle:

\( \frac{(2.42)(791)}{13,500} = .14 \text{ tons} \)

Stores Consumed between San Francisco and Seattle (Including Potable Water):

\( \frac{(415)(791)}{13,500} = 24.3 \text{ tons} \)

MUF Used between San Francisco and Seattle:

\( \frac{(408.8)(791)}{13,500} = 23.8 \text{ tons} \)

Total Weight of Fuel, Lube Oil, Stores, and MUF Used between San Francisco and Seattle:

Total wt. = 73.5 + .14 + 24.3 + 23.8 = 121.74 tons

Cargo Deadweight at Seattle:

\[ \text{Cargo DW} = \text{cargo DW at San Francisco} + \text{fuel, L.O., stores, MUF for voyage from S.F. to Seattle} \]

\[ = 9648.45 + 121.74 = 9770.19 \text{ tons} \]

Check on Service Displacement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo DW</td>
<td>9770.19</td>
</tr>
<tr>
<td>F.O., L.O., stores, MUF (remaining)</td>
<td>1092.81</td>
</tr>
<tr>
<td>Light displ.</td>
<td>3391.00</td>
</tr>
<tr>
<td>Load displ.</td>
<td>14254.00</td>
</tr>
</tbody>
</table>

1 Note that vessel was bunkered for voyage to Shanghai and is stored for round voyage.
Determination of Amount of Lumber Vessel Can Carry

Bale capacity: 499,573 cu. ft.

Stowage factor of Douglas Fir: 89

Broken stowage: 24%

Underdeck capacity:

\[ \frac{499,573}{(89)(1.24)} = 4555 \text{ thousand board feet} \]

Deck Load capacity:

\[ (4555)(42.7\%) = 1945 \text{ thousand board feet} \]

Total capacity:

4,555,000 board feet

1,945,000 board feet

6,500,000 board feet

To Compute Height of Deck Load of 1,950,000 Board Feet of Lumber:

Cubic Vol. Required:

\[ (1950)(89)(1.24) = 213,950 \]

Effective deck area of vessel:

\[ (417)(57)(.90)^{\frac{3}{2}} = 21,392 \text{ sq. ft.} \]

\[ (21,392)(.75)^{\frac{3}{2}} = 16,044 \text{ sq. ft.} \]

Height of deck lumber:

\[ \frac{213,950}{16,044} = 13.3 \text{ feet} \]

Total cargo D.W.:

6,500,000 ÷ 1000 bd. ft. = 1.5 D.W. tons

of 2240 lbs. = 9770.19 tons

Note: Net cargo revenue based on approximately 90% of 6,500,000 or 5,850,000 board feet.

1 See page 508 of Leeming's "Modern Ship Stowage."
2 Data provided by Wiggins Lumber Co. Boston
3 Ratio of area of deck of ship to area of circumscribed rectangle.
4 Factor used to account for midship housing, winches, and masts house areas.
5 This is an excessive height and it is questionable whether the stability characteristics of the ship will permit such loading.
6 See page 283 of Leeming's "Modern Ship Stowage."
Computation to Determine Advisability of Bunkering in both San Francisco and Shanghai:

Difference in cargo D.W. between fueling in San Francisco for round voyage and fueling in San Francisco for Shanghai:

\[ 1412.4 - 621.5 = 790.9 \text{ tons} \]

Gross cargo revenue on 5,850,000 board feet at $50.50 \text{ per 1000 board feet}:

\[ \text{Revenue} = 296,000 \]

Average cargo rate per ton:

\[ \frac{296,000}{9770.19} = 30.20 \]

Increased Cargo Revenue by Fueling at San Francisco and Shanghai:

\[ (30.20)(790.9) = 23,900 \]

Loss in Cargo Revenue due to Increased Cost of Bunkering in Shanghai as Opposed to San Francisco:

\[
\begin{align*}
\text{Shanghai} & \quad 3.36 \text{ bbl.} \quad 2 \\
\text{San Francisco} & \quad 1.50 \text{ bbl.} \quad 2 \\
\text{Difference} & \quad 1.86 \text{ bbl.} \\
\end{align*}
\]

\[ 1.86 \text{ at } 6.5 \text{ bbls. per ton} = 12.10 \text{ per ton} \]

Total Difference in Bunkering Costs:

\[ (12.10)(790.9) = 9,550 \]

---

1 Conference rate supplied by J.J. Murphy - Am. Pres. Lines - Boston
2 Prices supplied by Standard Oil of New Jersey
Net Increase in Cargo Revenue by Bunkering in San Francisco and Shanghai as Opposed to Bunkering in San Francisco for Round Voyage:

\[ \$23,900 - 9,550 = \$14,350 \]
Days in Port - Seattle - Round Voyage:

Hatch Rate $\sqrt[3]{11,000}$ board feet / hr.

No. of hatches = 5

Amount of lumber = 6,500,000 board feet

Cargo worked 8 hours / day

$$\frac{6,500,000}{(11,000)(8)(5)} = 14.80 \text{ days}$$

18% allowance for Sundays, holidays and bad weather

$$2.67 \text{ days}$$

Total days 17.47 days

Days in Port - Shanghai - Round Voyage:

Cargo worked 8 hours / day

Hatch rate = 5,000 board feet / hr.

$$\frac{6,500,000}{(5,000)(8)(5)} = 32.50 \text{ days}$$

18% allowance for Sundays, holidays and bad weather

$$5.85 \text{ days}$$

Total days 38.35 days

Days in Port - Manila - Round Voyage:

Hatch rate for Copra $\sqrt[3]{35}$ tons / hr.

Stowage factor - 70 $\sqrt[3]{\text{cu. ft.}}$ - No. of hatches = 5

Bale capacity - 499,573 cu. ft.

Tons of copra handled = \frac{499,573}{70} = 7,150

1 See page 282 Leeming's "Modern Ship Stowage."

2 As reported by J.J. Murphy, Genl. Mgr. Am. Pres. Lines, Boston

3 See page 593, Leeming's "Modern Ship Stowage"
Cargo worked 8 hours / day

\[
\frac{7150}{(35)(8)(5)} \quad 5.12 \text{ days}
\]

+ 18% allowance for Sundays, holidays and bad weather

\[
\frac{392}{(35)(8)(5)} \quad 6.04 \text{ days}
\]

**Days in Port - San Francisco - Round Voyage**

Hatch rate for copra - 45 tons / hr.

Tons of copra handled (pneumatically) = 7150

No. of hatches = 5

Cargo worked 8 hrs. / day

\[
\frac{7150}{(45)(8)(5)} \quad 3.97 \text{ days}
\]

+ 18% allowance for Sundays, holidays and bad weather

\[
\frac{460}{(45)(8)(5)} \quad 4.69 \text{ days}
\]

**Total Days in Port per Round Voyage:**

- Seattle 17.47 days
- Shanghei 38.35
- Manila 6.04
- San Francisco 4.69

Total 66.05 days

**Total Days at Sea per Round Voyage:**

51.1 days

1 As reported by J. J. Murphy, Genl. Mgr. Am. Pres. Lines
2 See page 37 for computations
Total Number of Voyages per Year:
(Allowing 7 days for Annual Overhaul)

\[
\frac{365 - 7}{(66.05 + 51.10)} = \frac{358}{117.15}
\]

Total No. of Voyages = 3.06
Operating Expenses

1. Fixed Charges per Year
   a) Charter rate per year:
      
      $7,987.50 per month
      
      \( (7,987.50)(12) = 95,750 \)

   b) Interest on charter rate:
      
      \( c \cdot 2\% = (95,750)(.02) = 1,915 \)

   c) Insurance:
      
      Hull and machinery  \( 2 \)
      
      Protection and indemnity
      
      \( @ \ .90/\text{t} = (.90)(7176) = 6,460 \)

      Note: P. & I. insurance is based on history of ship - the above is of necessity an average figure.

   Total 35,160

2. Repairs, Maintenance, Annual Overhaul, and Repair Reserve per Year
   a) Hull  \( @ \ .60 \in (B + D) \)

      \( (.60) 417(57 + 37.33) = 23,600 \)

   b) Machinery  \( @ \ 2.70/\text{IHP} \)

      \( (2.70)(2500) = 6,750 \)

   c) Machinery Reserve  \( @ \ 1.50/\text{t} \)

      \( (1.50)(7176) = 10,780 \)

   Total 41,130

1 Taken from p.46 of the "Log" April 1947
2 As reported by the American Hull & Insurance Syndicate
3 Taken from statistics given by Prof. L.B. Chapman for Ship Operation Problem # 31, M.I.T.
3. Fuel per Year
   
a) Sea fuel for main propelling unit and auxiliaries:
   
   $9.75 \text{ ton at San Francisco}\
   ($9.75)(621.5) = 6050$
   
   $21.80 \text{ ton at Shanghai}\
   ($21.80)(790.9) = 17210$
   
   Per voyage = $23260$
   
   Total sea fuel/yr. = (3.06)(23260) $71,300$
   
   b) Lubricating oil
   
   $\text{$.80/gal. and 7.5 bbls./ton}$
   
   ($0.80)(2.42)(7.5)(42)(3.06) = 1,865$
   
   c) Port fuel
   
   $\text{3.0 tons / day}$
   
   21.44 days at $9.75$/ton
   
   ($9.75)(21.44)(3)(3.06) = 1,920$
   
   44.39 days at $21.80$/ton
   
   ($21.80)(44.39)(3)(3.06) = 8,650$
   
   Total port fuel / year = $10,750$
   
1 Cost figures for fuel oil May '47 by Sheehan of Standard Oil of New Jersey, Boston Office.
2 Lube oil price as given in course in Ship Operation by Prof. L.B. Chapman, M.I.T.
3 As reported by chief engineer S/S William J. Bryan - Waterman Co.
### Crew Expenses

#### Wages per Year

<table>
<thead>
<tr>
<th>Position</th>
<th>Rate</th>
<th>Yearly Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captain</td>
<td>$616</td>
<td>$7,392</td>
</tr>
<tr>
<td>Chief Mate</td>
<td>$396</td>
<td>$4,752</td>
</tr>
<tr>
<td>Second Mate</td>
<td>$316</td>
<td>$3,792</td>
</tr>
<tr>
<td>Third Mate</td>
<td>$290</td>
<td>$3,480</td>
</tr>
<tr>
<td>Bosun</td>
<td>$205</td>
<td>$2,460</td>
</tr>
<tr>
<td>A. B. Seamen</td>
<td>$172.50</td>
<td>$10,350</td>
</tr>
<tr>
<td>Ordinary Seamen</td>
<td>$150</td>
<td>$5,400</td>
</tr>
<tr>
<td>Carpenter</td>
<td>$187.50</td>
<td>$2,250</td>
</tr>
<tr>
<td>Deck Maintenance</td>
<td>$187.50</td>
<td>$2,250</td>
</tr>
<tr>
<td>Chief Engineer</td>
<td>$574</td>
<td>$6,880</td>
</tr>
<tr>
<td>1st Asst. Engineer</td>
<td>$396</td>
<td>$4,752</td>
</tr>
<tr>
<td>2nd Asst. Engineer</td>
<td>$316</td>
<td>$3,792</td>
</tr>
<tr>
<td>3rd Asst. Engineer</td>
<td>$290</td>
<td>$3,480</td>
</tr>
<tr>
<td>Oilers</td>
<td>$187.50</td>
<td>$6,750</td>
</tr>
<tr>
<td>Firemen/w. t.</td>
<td>$175</td>
<td>$6,300</td>
</tr>
<tr>
<td>Wipers</td>
<td>$177.50</td>
<td>$4,270</td>
</tr>
<tr>
<td>Eng. Utility</td>
<td>$177.50</td>
<td>$2,130</td>
</tr>
<tr>
<td>Radio Operator</td>
<td>$254</td>
<td>$3,048</td>
</tr>
<tr>
<td>Chief Steward</td>
<td>$220</td>
<td>$2,640</td>
</tr>
<tr>
<td>Chief Cook</td>
<td>$205</td>
<td>$2,460</td>
</tr>
<tr>
<td>Asst. Cook</td>
<td>$185</td>
<td>$2,220</td>
</tr>
<tr>
<td>2nd Cook and Baker</td>
<td>$185</td>
<td>$2,220</td>
</tr>
<tr>
<td>Messmen</td>
<td>$150</td>
<td>$5,400</td>
</tr>
<tr>
<td>Steward's Dept. Utility</td>
<td>$150</td>
<td>$5,400</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>$101,408</td>
</tr>
</tbody>
</table>

**Straight wages** 101,408

**Overtime - 25%** 25,352

**Vacation pay** (computed at 2/52 1,170 of wages for 30% of crew)

**Subsistence** 19,200

(at $1.35 per man - 365 days)

**Total crew expense** $147,140

---

1 Taken from U. S. Lines wage scale - do not represent minimum wages
5. **Supplies per Year (incl. L.O. & MUF):**

Deck Dept. + Steward's Dept. + Eng. Dept. = $35,000

MUF at $.35/ton \(\sqrt{= (408.8)(.35)}\) 144

L.O. (calculation already given) 1,865

Total $37,094

**Port Charges San Francisco per Year:**

Customs house broker fees

at $5 for entering and $15 clearing

\[ (20)(3.06) \times 5 = 61.25 \]

Tugboat rates (assisting)

4000-5000 net tons - $45

\[ ($45)(2)(3.06) = 552.50 \]

Pilotage services

Richmond to Martinez at $45

\[ ($45)(3.06) = 274.00 \]

Pilotage in and out

at $.01 1/8 per net ton and 2.00 per ft. deepest draft

\[ H = \frac{(10,655)(35)}{(417)(57)(.76)} = 20.7 \text{ feet} \]

\[ \left(\frac{.01}{8}\right)(43.79)(3.06) + 2(20.7)(3.06) = 382.00 \]

Agency fee

at $50 per day for 15 days - $25

per day all after 15 days

\[ ($50)(4.69)(3.06) = 704.00 \]

1 Statistics taken from Ship Operation Problem #31, given by Prof. L.B. Chapman, M.I.T.

2 Actual figures for May 1947.
Reporting Charge:

$0.00

(5) (5.06)(2) $50.60

Customs Port Entry

($2) (5.06) 6.12

Total charges
Pricco $2,010.47

Port Charges Seattle Per Year

Customs House Broker Fees:

@$15 - entry and clearance
($15)(5.06) $46.00

Pilotage:

@$1.15 per nautical mile - min. = $25
($1.15)(2)(50)(5.06) $219.00

Tugboat Rates:

@$55 (5,000 to 10,000 G. T.) Assisting
($55)(2)(2)(5.06) $428.00

Handling Lines:

Taking lines $9.60
Letting go $6.50
($16.10)(5.06) $49.50

1
Note: No wharfage or dockage charges as cargo is delivered to consignee's docks.

2Actual figures as of May, 1947
Reporting Charge:
@ $5.00
($5) (3.06) (2) $50.60

Customs Post Entry:
($2)(3.06) $6.12

Total charges
Seattle $779.02

Port Charges Shanghai Per Year

Quarantine Service:
@ $9,000 per entry below 5,000 N. T.
@ $6,000 per clearance below 5,000 N. T.
($15,000)(3.06) $46,000

Wharfage:
@ $780 per ft. per day
($780)(38.55)(3.06)(44.5) $4,040,000

Tonnage Dues:
@ $65 per N. R. T. per ent. and clear.
($65)(4,379)(3.06) $872,000

1. No dockage charges as cargo loaded at consignor's dock.

2. All charges given in Chinese CNY except as noted; actual figures for May, 1947.
Towage:
- $45 / tug

($5)(2)(2)(3.06) = $550 (U. S. currency)

Customs Supervision:
- $16,000

($16,000)(3.06) = $49,000

Pilotage In and Out:
From Sea to Woosung

($2 / ft. + .0025 per G. R. T.)

Woosung to Shanghai

($3 / ft. + .0025 per G. R. T.)

$224 (U. S. currency)

$310 (U. S. currency)

Plus 20% surcharge effective 12/1/46

$1070 (U. S. currency)

Agency Fee:
- $30 / day

($30)(38.35)(3.06) = $3,520 (U. S. currency)

$5,007,000 (CNC) + $5,674 (U. S. currency)

$5,007,000

@ 12,000 CNC to $1.00 American (May '47)

$417

Total Charges Shanghai
(U. S. Currency) $6,091

1 12,000 CNC to $1.00 American quoted as the official rate by the Foreign Dept. of the First National Bank of Boston (May, 1947).
Port Charges Manila Per Year: ¹

Pilotage:

- $100 - anchorage to pier (3,000 G. R. T. & over)
  
  ($100)(2)(3.06) $611.00

Customs Clearance

- $20 - Entrance Stamps
  
  ($20)(3.06) $67.20

- $2 - Bill of Health
  
  ($2)(3.06) $67.20

Tonnage Dues:

- $7.5 per N. R. T. per yr.
  
  ($7.5)(4379) $5,730.00

Agency Fee:

- $50 / day
  
  ($50)(6.04)(3.06) $923.00 (U. S. Currency)

Towage:

- $35 / tug
  
  ($35)(2)(3.06) 428.00 (U. S. Currency)

Berthing Fee:

- $0.02 / G. R. T. / day
  
  ($0.02)(7175)(6.04)(3.06) 2,650.00 (U. S. Currency)

Total (U. S. Currency) $7,181.00

¹ Charges given in $ (Philippine Currency) unless otherwise noted; actual figures for May, 1947.
Rate of exchange - Peso = $0.4965 as stated by First National Bank of Boston.
<table>
<thead>
<tr>
<th>Total Port Charges Per Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td>$2,010.47</td>
</tr>
<tr>
<td>Seattle</td>
<td>779.02</td>
</tr>
<tr>
<td>Shanghai</td>
<td>6,091.00</td>
</tr>
<tr>
<td>Manila</td>
<td>7,181.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$16,061.49</strong></td>
</tr>
</tbody>
</table>

**Management Expenses:**

| Company Personnel and Office Expenses | $40,000 |
| Agency Fees                           | -       |
| **Total**                             | **$40,000** |

**Cargo Expenses - General Information:**

The freight contract calls for free in and out delivery of cargo; so only expenses will be those of checkers and clerks. No hold watchmen will be required with these cargoes, and a ship's A.B. will be kept on gangway watch instead of hiring a shore watchman.

---

1 Agency fees already tabulated under "Port Charges" - classification as to management or port expense depends on accounting system.
Cargo Expenses - San Francisco:
Checkers and Clerks:
@ $1.05 / cargo D. W. ton
($1.05)(7150)(3.06) $22,950
Ship's Gangway Watch:
(Member of ship's crew)
@ $1.00 / hr.
($1.00)(4.69)(16)(3.06) 229
Total $23,179

Cargo Expenses Seattle:
Checkers and Clerks:
@ $.95 / cargo D. W. ton
($.95)(10741.26)(3.06) $31,200
Ship's Gangway Watch:
@ $1.00 / hr.
($1.00)(17.47)(16)(3.06) 860
Total $32,060

Cargo Expenses - Shanghai:
Checkers and Clerks:
@ $.70 / cargo D. W. ton
($.70)(9770.19)(3.06) $20,900
Ship's Gangway Watch:
@ $1.00 / hr.
($1.00)(38.55)(16)(3.06) $2,050
TOTAL $22,950
Cargo Expenses - Manila:

Checkers and Clerks:

@ $0.60 / cargo D. W. ton

($0.60)(7150)(5.06) $15,100

Ship's Gangway Watch

(Member of ship's crew)

@ $1.00 / hr.

($1.00)(6.04)(16)(3.06) $296

Total $15,396

Total Cargo Expenses:

San Francisco $23,179
Seattle 32,060
Shanghai 22,950
Manila 13,396

Total $91,585

1 This data based on F. I. and O. contract
Total Operating Expenses Per Year:

- Fixed Charges: $154,125
- Repairs and Maint. and Reserve: $41,130
- Fuel: $82,050
- Supplies (incl. lube oil and MUF): $37,009
- Crew Expenses: $147,130
- Port Charges: $16,061
- Management: $40,000
- Cargo Expenses: $91,585

Total: $589,090

Gross Revenue From Cargo Per Year:

- Lumber @ $50.50 / 1000 bd. ft.
  \[ ($50.50)(5850)(3.06) \] = $905,000
- Copra @ $24 / ton
  \[ ($24)(7150)(3.06) \] = $525,000

Total: $1,430,000

Deductions to Arrive at Net Revenue:

- Damage claims @ 2%
  \[ ($1,430,000)(.02) \] = $28,600

Net Revenue Per Year:

\[ $1,430,000 - $28,600 = $1,401,400 \]

\(^1\) Revenue only paid on 5850 thousand board feet, according to Waugaman of Wiggins Lumber Co. in Boston. This is a 10% allowance that is always given to lumber cargoes.
Profit Before U. S. M. C. Deductions and
Federal Income Tax Deductions:

Net Revenue $1,401,400
- Total Expenses 589,090

Total $ 812,310

Average Profit Per Day:

\[
\frac{812,310}{365} = 2,200
\]

U. S. M. C. Deductions on Excess Profits:

"The Commission recaptures 50% of the first $100 per day profit above the Charter's margin of 10% return on capital investment (capital investment means operating and preoperating expenses for 60 days - it is further defined in the "Ship's Sales Act"), 75% of all profits between $200 and $300 per day, and 90% of all profits in excess of $300 per day."

Capital investment = $100,000 (approx.)
10% return on investment = ($100,000)(.10) = 10,000
90% deduction on ($812,310-10,000) = (.90)($802,510) = $722,000

Total U. S. M. C. deduction = $722,000

Taken from amendment to "Ship Sales Act", page 46 of the April, 1947 "Log"
Profit After U. S. M. C. Excess Profits

Deduction and Before Federal Income

Tax Deductions:

Profit Before Deductions $812,510
- U. S. M. C. Deductions 722,000

Total $90,510

Return on Investment

$100,000 = necessary capital

\[ \frac{90,510}{100,000} = 90.51\% \]

To Determine Return on Investment

When Vessel Bought Instead of Chartered

and Manned With American Crew:

The only change in operating expenses is that
"depreciation" is substituted for "charter rate,"
and a new figure will be used for "interest".

Change in Fixed Charges on Bought Vessel:

(a) Depreciation:

1. @ 1/15 ($544,506) $56,300

(b) Interest on $544,506

@ 2%

\[ \times .02($544,506) = 10,880 \]

\[ \frac{10,880}{56,300} \]

1 Floor price valuation on vessel 5 years old
taken from "Ship Sales Act"
2 Note that insurance costs are the same as on page 48. This
   based on type ship and history - the figures for insurance
   were supplied by the American Hall and Insurance Syndicate.
Original Items "a" and "b" under Fixed Charges when Vessel Chartered:

II. (a) Charter rate $95,750
   (b) Interest on charter rate Total 1,915
       $97,665

Difference in I and II - Reduction in Operating Expenses:

$97,665 - 47,180 = $50,485

Profit before U.S. Maritime Commission Deductions and Federal Income Tax Deductions:

Net revenue $1,401,400
Total expenses ($589,090 - 50,485) $538,607

Average Profit per Day

$62,793 = $2,360

$62,793 = profit before federal income taxes as the vessel is owned and there are no U.S.M.C. deductions on excess profits.

Return on Investment:

\[
\frac{62,793}{(0.50)(544,506) + 100,000} = 232\%
\]

1 50% required as defined in "Ship Sales Act" - 25% of value of ship for net worth and 25% down payment plus operating and preoperating expenses for 60 days of $100,000.
To Determine Return on Investment when Vessel Bought and Manned with a Norwegian Crew:

The only change in operating expenses in this situation over the vessel bought and manned by an American crew will be the "Crew Expenses." The wages and subsistence will be lower and there will be no overtime or vacation pay. Also there will be less crew.

<table>
<thead>
<tr>
<th>Norwegian Crew Expenses</th>
<th>Wages per month</th>
<th>Wages per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captain</td>
<td>1500 kroner</td>
<td>18,000 kr.</td>
</tr>
<tr>
<td>Chief Mate</td>
<td>924</td>
<td>11,100</td>
</tr>
<tr>
<td>Second Mate</td>
<td>749</td>
<td>9,000</td>
</tr>
<tr>
<td>Third Mate</td>
<td>633</td>
<td>7,600</td>
</tr>
<tr>
<td>Bosun</td>
<td>533</td>
<td>6,460</td>
</tr>
<tr>
<td>A.B. Seamen</td>
<td>519</td>
<td>31,350</td>
</tr>
<tr>
<td>Ordinary Seamen</td>
<td>553</td>
<td>19,950</td>
</tr>
<tr>
<td>Carpenter</td>
<td>553</td>
<td>6,650</td>
</tr>
<tr>
<td>Deck Maintenance</td>
<td>430</td>
<td>5,160</td>
</tr>
<tr>
<td>Chief Engineer</td>
<td>1400</td>
<td>16,800</td>
</tr>
<tr>
<td>1st. Asst. Eng.</td>
<td>1166</td>
<td>14,000</td>
</tr>
<tr>
<td>2nd. Asst. Eng.</td>
<td>1002</td>
<td>12,024</td>
</tr>
<tr>
<td>3rd. Asst. Eng.</td>
<td>795</td>
<td>9,550</td>
</tr>
<tr>
<td>Oilers</td>
<td>538</td>
<td>19,380</td>
</tr>
<tr>
<td>Wipers</td>
<td>436</td>
<td>10,450</td>
</tr>
<tr>
<td>Firemen / W.T.</td>
<td>519</td>
<td>18,700</td>
</tr>
<tr>
<td>Engine Utility</td>
<td>650</td>
<td>7,800</td>
</tr>
<tr>
<td>Radio Operator</td>
<td>683</td>
<td>8,200</td>
</tr>
<tr>
<td>Chief Steward</td>
<td>757</td>
<td>9,080</td>
</tr>
<tr>
<td>1st. Cook</td>
<td>592</td>
<td>7,100</td>
</tr>
<tr>
<td>2nd. Cook &amp; Baker</td>
<td>439</td>
<td>5,260</td>
</tr>
<tr>
<td>Messmen</td>
<td>355</td>
<td>17,050</td>
</tr>
</tbody>
</table>

Wages = 270,654 Kr.

Subsistence @ $0.75/man

Wages = $54,133

Total = $63,983

These wages include war bonus of 250 Kr./mo. - rates of exchange - 5 Kr. = $1.00.

Because of the lack of facilities at present in Shanghai and Manila, dry-docking, machinery repairs and maintenance costs are computed as if all the outside repair and maintenance work were done in either Seattle or San Francisco.
Difference in Crew Expenses between Norwegian and American:

\[ \$147,130 - 63,983 = \$83,147 \]

Profit before U.S.M.C. Deductions and Federal Income Tax Deductions:

Net revenue \( \$1,401,400 \)

- Total expenses \( \$558,607 - 83,147 \)

\( \$945,940 \)

Average Profit per Day:

\[ \frac{\$945,940}{365} = \$2,590 \]

\( \$945,940 \) = profit before federal income taxes as the vessel is owned and there are no U.S.M.C. deductions on excess profits.

Return on Investment:

\[ \frac{\$945,940}{(50\%) (544,506) + 100,000} = 254\% \]

1 As previously computed for American crew.
Cl-B - Diesel
Table of Data and Results

Characteristics of C-1-B¹ (Full Scantling Diesel):

- L.O.A. 418' - 0"
- L.B.P. 395' - 0"
- Beam 60'
- Depth (molded) 37.5'
- Draft (molded loaded) 27.5'
- Load displ. 12,875
- Bale capacity 448,786 cu.ft.
- No. of hatches 6 (equivalent)
- Gross tonnage 6750 tons
- Net tonnage 4800 tons
- Service sea speed 14 knots

\[
\frac{V}{JL} = .71
\]

- Bunker capacity 654 tons
- Single twin screw - single screw
- Type of machinery - Diesel
- RPM 85.5
- Propeller diameter 18'

Trade route - Seattle - Shanghai - Manila - San Francisco

1 Data taken from U.S. Maritime Commission plans of Vessel.
Distances between ports:

- Seattle-Shanghai: 5067 miles
- Shanghai-Manila: 1156 miles
- Manila-Frisco: 6221 miles
- Frisco-Seattle: 791 miles

Total length of voyage (incl. 2% var.) 13,500 miles

Bunkering ports - San Francisco and Shanghai

Cubic or DW cargo - D.W. outbound; cubic homebound

Charter rate - $140,500/yr.

Crew - deck dept. - 16, Engine dept. 14, Steward dept. 10

Displacement at beginning of voyage 12,875 tons

Calculated EHP 2570

Propulsive coef. \( e_p = 0.762 \), \( e_n = 0.641 \), \( e_l = 1.19 \), \( e_r = 1.0 \)

SHP installed \( (m = 1.15) = 4000 \)

Average SHP for 12,875 Tons Displacement \( (m=1.15) = 4000 \)

Fuel consumption per SHP per hr. \( = 0.38\# / \text{SHP/hr.} \)

Hull weight + equipment wt. + outfit wt. = 3130

Weights

- Machinery weight = 600
- Margin weight = 170
- Total built weight = 3900

Fuel oil per voyage (incl. 10% reserve) \( \text{see p. 71} \) = 705.1 tons

Lube oil = 4.28 tons

Crew and stores = 415.0 tons

Total = 5024.38 tons

\( \sqrt{10\% \text{ based on round voyage - } 20\% \text{ for one-way}} \)
Gross DW

Cargo DW (round voyage) 8,975 tons

Average cargo (tons) carried per voyage
- outward 8,309.2 tons
- homeward 6,400 tons

Average cargo carried (% DW capacity) 88.5%

Average measurement cargo per voyage
- outward 5,540,000 bd. ft. - 8,309.2 tons
- homeward 6,400 tons

Passengers carried per voyage none

Number of hatches worked - 6 (equivalent)

Tons of cargo handled per day
- Seattle 672
- Shanghai 306
- Manila 1190
- San Francisco 1525

Days in port per round voyage (incl. 16% margin) 49.1

Days at sea per round voyage 40.2

Round voyages per year 4.02

Average cargo rate per ton $27.20

Cost of fuel per ton: outward $19.88, homeward $28.28

Percentage of year at sea 44.2%
Characteristics

LBP = 395
Beam = 60
Depth = 37.5
b = .694

Speed-Length Ratio and Displacement:

\[ \frac{V}{\sqrt{L}} = \frac{14}{\sqrt{395}} = \cdot 71 \]

\[ \text{Displ.} = \frac{(L)(B)(H)(b)}{35} = \frac{(395)(60)(27.5)(.694)}{35} \]

\[ \text{Displ.} = 12,875 \]

To Compute EHP Taylor's Method:

\[ \frac{L}{(100)^3} = 208.5 \quad \frac{B}{H} = \frac{60}{27.5} = 2.18 \]

\[ \sqrt{C} = 16.5 \]

\[ \sqrt{S} = C \quad L = 16.5 \quad (12875)(395) \]

\[ S = 37500 \text{ sq.ft.} \]

\[ \sqrt{R_f} = fSv^{.825} = (.009)(37500)(14^{.825}) \]

\[ R_f = 41,700 \]

\[ \sqrt{R_T} = (1.4)(12875) = 18,000 \]

\[ R_T = 597,000 \text{ lbs.} \]

\[ \sqrt{EHP} = \frac{(R_T)(V)}{325.5} = \frac{(59,700)(14)}{325.5} \]

1 Taken from p.96 Principles of N.A. Vol. II
2 " " pp.109,110,111,115, P.N.A. Vol. II
3 " " p.112, Principles of N.A. Vol. II
EHP = 2570

To Compute SHP from EHP:

\[ \text{SHP} = \frac{(EHP)(m)}{(e_p)(e_r)(e_t)(e_h)} \]

Prop. diam. = (25.75)(.7) = 18'

\[ Ktd = \frac{(58.913)(EHP)}{(1.024)(1-t)(1-w)^2(V)^3(D_{prop})^2} \]

1 \[ e_h = \frac{1 - t}{1 - w} = \frac{.8}{.69} = 1.16 \]

2 \[ Ktd = \frac{(589.3)(2570)}{(1.024)(.8)(.66)^2(14)^3(18)^2} = .523 \]

<table>
<thead>
<tr>
<th>J</th>
<th>J^2</th>
<th>Kt</th>
</tr>
</thead>
<tbody>
<tr>
<td>.50</td>
<td>.2500</td>
<td>.131</td>
</tr>
<tr>
<td>.55</td>
<td>.3020</td>
<td>.158</td>
</tr>
<tr>
<td>.60</td>
<td>.3600</td>
<td>.188</td>
</tr>
<tr>
<td>.65</td>
<td>.4225</td>
<td>.222</td>
</tr>
<tr>
<td>.70</td>
<td>.4900</td>
<td>.258</td>
</tr>
<tr>
<td>.75</td>
<td>.5625</td>
<td>.294</td>
</tr>
</tbody>
</table>

Above values of Kt based on: \( Kt = (Ktd)(J^2) \)

MWR = .20

4 bladed prop., BTF = .05

\[ J = .635 \]

2 \[ e_p = .641 \]

1 Taken from pp.148,149, Principles of N.A. Vol. II
2 " " pp.160-163 " " 
To Compute Weights:

Cubic No. = \frac{(395)(60)(37.5)}{100} = 8900

H + E + O = (8900)(.35 \text{ wgt. coef.}) = 3130 \text{ tons}

Machinery:

\frac{(4000)(336)}{2240} = 600 \text{ tons}

Margin:

(.0455)(3130 + 600) = 170 \text{ tons}

Light displ. = 3120 + 600 + 170 = 3900 \text{ tons}

Load displ. = 12875 \text{ tons}

Gross DW = 12,875 - 3900 = 8975 \text{ tons}

Taken from pp.160-163 Principles of Naval Arch.
Vol. II
Fuel Rate:

\[ f = 0.38 \text{#/SHP/hr.} \]

Time at Sea for Round Voyage:

2 Distance - Seattle to Shanghai
   (via Soya Kaikyo and N. of Aleutians)
   Shanghai to Manila
   (via east of Taiwan)
   Manila to San Francisco
   (via Balintang Channel)
   San Francisco to Seattle

+ 2% variation in steering

Total = 13,500 miles

\[ \frac{13,500}{(14)(24)} = 40.2 \text{ days} \]

Fuel Weight for Round Voyage:

\[ \left( \frac{4000}{2240} \right)(13500)(24)(40.2)(0.38) = 654 \text{ tons} \]

Lube Oil Weight for Round Voyage

@ 10 gals./100 mi. and 7.5 bbls./ton and 42 Gal/bbl.

\[ \left( \frac{13500}{100} \right)(10) \left( \frac{1}{42} \right) \left( \frac{1}{7.5} \right) = 4.28 \text{ tons} \]

1 Taken from Trial Data of U.S. Maritime Commission
2 Distances taken from Dept. Commerce "Table of Distance between Ports."
Weight of Fuel (+10% Allowance) + L. O. + Stores for Round Voyage:

Fuel = 654 tons

10% allowance \( \frac{1}{10} \) = 65.4 tons

Lube oil = 4.28 tons

 Stores: (including crew, potable water and consumables)

Formula: 10 tons + 30 tons per 1000 miles

\[ \frac{10 + 30 (13.5)}{1000} = 415 \text{ tons} \]

Total weight = 654 + 65.4 + 4.28 + 415 = 1138.7 tons

Cargo Deadweight - Bunkering and Supplying Ship for Round Voyage:

Cargo DW = Gross DW - fuel, L.O., Stores, Water, etc.

= 8975 - 1138.7 = 7836.3 tons

Check on Service Displacement:

<table>
<thead>
<tr>
<th>Cargo DW</th>
<th>7836.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.O., L.O. &amp; Stores</td>
<td>1138.7</td>
</tr>
<tr>
<td>Light displ.</td>
<td>3900.0</td>
</tr>
<tr>
<td>Load displ.</td>
<td>12,875.0</td>
</tr>
</tbody>
</table>

\( ^{1} \)20% allowance for one-way as 10% based on round voyage

\( ^{2} \)Data taken from course in Ship Operation by Prof. L.B. Chapman, M.I.T.
Weight of Fuel for Voyage from San Francisco to Shanghai (Stopping at Seattle):

Total distance $= 791 + 5067 = 5858$ miles

Steaming time $= \frac{5858}{14}(\frac{24}{24}) = 17.4$ days

\[
\frac{4000(24)(17.4)(.38)}{2240} = 283 \text{ tons}
\]

$+ 10\%$ fuel allowance $= 28.3$ tons

Total fuel weight $= 311.3$ tons

Weight of Lube Oil for Voyage from San Francisco to Shanghai (Stopping at Seattle):

$4.28 \frac{5858}{13500} = 1.86$ tons

Weight of Stores for Round Voyage (All Stores Taken on at San Francisco)

Stores: (including crew, potable water and consumables)

Formula: $10$ tons $+ 30$ tons per $1000$ miles

$10 + 30(13.5) = 415$ tons

Total Weight of Fuel, Lube Oil and Stores Leaving San Francisco (Note: that vessel is bunkered for voyage to Shanghai only - but is stored for round voyage):

Total weight $= 311.3 + 1.86 + 415 = 728.6$ tons

Fuel allowance should be $20\%$ for one-way.
Fuel Consumed between San Francisco and Seattle (791 miles):

Steaming time = \( \frac{791}{(14)(24)} \) = 2.35 days

Fuel wt. = \( \frac{(4000)(24)(2.35)(.38)}{2240} \) = 38.2 tons

Lube Oil Consumed between San Francisco and Seattle:

\( \frac{(4.28)(791)}{13500} \) = .255 tons

Stores Consumed between San Francisco and Seattle (including potable water):

\( \frac{(4150)(791)}{13500} \) = 24.3 tons

Total Weight of Fuel, Lube Oil, and Stores Used between San Francisco and Seattle:

Total wt. = 38.2 + .255 + 24.3 = 62.76 tons

Cargo Deadweight at Seattle:

Cargo DW = Gross DW - fuel, L.O., stores

= 8975 - 728.6 + 62.76

Cargo DW = 8309.2
Check on Service Displacement:

| Cargo DW | 8309.20 |
| F.O., L.O. & Stores | 665.84 |
| Light displ. | 3900.00 |
| Load displ. | 12875.04 tons - check |

Weight of Fuel for Voyage from Shanghai to San Francisco (Bunker in Shanghai for Return Voyage):

Total Distance:
- Shanghai to Manila: 1156
- Manila to San Francisco: 6221

Steaming time = \( \frac{7377}{1156 + 6221} \) = 21.9 days

\[
\frac{(4000)(24)(21.9)(.38)}{2240} = 358 \text{ tons} \\
+ 10\% \text{ fuel allowance} = 35.8 \text{ tons} \\
\text{Total fuel wt.} = 393.8
\]

Weight of Lube Oil for Voyage from Shanghai to San Francisco (Obtain in Shanghai for Return Voyage):

\[
\frac{(4.28)(7377)}{13,500} = 2.33 \text{ tons}
\]

Weight of Stores Left for Voyage from Shanghai to San Francisco:

\[
\frac{(415)(7377)}{13,500} = 226.5 \text{ tons}
\]

Allowance should be 20%
Total Weight of Fuel, Lube Oil and Stores for Voyage from Shanghai to San Francisco

Total wt. = 393.3 + 2.33 + 226.5 = 622.6 tons

Fuel Consumed between Shanghai and Manila (Vessel Runs Light between These Ports):

Distance = 1156 miles
Steaming time = \( \frac{1156}{(14)(24)} \) = 3.44 days
Fuel weight = \( \frac{(4000)(24)(3.44)(.38)}{2240} \) = 56 tons

Lube Oil Consumed between Shanghai and Manila:

\( \frac{(4.23)(1156)}{(13,500)} \) = .368 tons

Stores Consumed between Shanghai and Manila:

\( \frac{(415)(1156)}{13,500} \) = 35.6 tons

Total Weight of Fuel, Lube Oil and Stores Used between Shanghai and Manila

Total wt. = 56 + 3.7 + 35.6 = 92 tons

Cargo Deadweight at Manila:

Cargo D.W. = Gross D.W. - fuel, L.O., Stores
= 8975 - 682.6 - 92
Cargo D.W. = 8444.4 tons
Check on Service Displacement:

| Cargo D.W. | 8444.4 |
| F.C., L.O. and stores | 530.6 |
| Light Displacement | 3900.0 |
| Load Displacement | 12,875.0 tons - check |

Determination of Amount of Lumber Vessel Can Carry:

Bale Capacity: 448,786 cu. ft.

Broken stowage: 24%

Stowage Factor of Douglas Fir $\approx 89$

Underdeck Capacity:

$$\frac{448,786}{(89)(1.24)} = 4070 \text{ thousand board feet}$$

Deck Load Capacity:

$$(4070)(36\%) = 1470 \text{ thousand board feet}$$

Total Capacity:

$$4,070,000$$

$$1,470,000$$

$$5,540,000 \text{ board feet}$$

To Compute Height of Deck Load of 1,470,000 Board Feet of Lumber:

Cubic Vol. required:

$$(1470)(89)(1.24) = 161,700 \text{ cu./ft.}$$

Effective deck area of vessel:

$$(395)(60)(.85)\sqrt[3]{V} = 22,695 \text{ sq. ft.}$$

$$22,695(.70)\sqrt{V} = 15,888 \text{ sq. ft.}$$

Height of deck lumber:

$$\frac{161,700}{15,888} = 10.2 \text{ feet}$$

1 See page 508 of Leeming's "Modern Ship Stowage"

2 Data provided by Wiggin's Lumber Co. - Boston

3 Ratio of area of deck of ship to area of circumscribed rectangle.

4 Factor used to account for midship housing, winches, and masthounds areas.
Total Cargo D.W.:

5,540 1000 board feet $1.5

D.W. tons (2240 lbs.) = 8309.2 tons

Note: - Net cargo revenue based on approximately 90% of
5,540,000 or 5,000,000 board feet.

Fuel Costs - May, 1947

San Francisco

Bunker C - $1.50 bbl.

Diesel Oil - $2.65 bbl.

New York

Bunker C - $2.22 bbl.

Diesel Oil - $2.74 bbl.

Shanghai

Bunker C - $3.36 bbl.

Diesel Oil - $3.77 bbl.

Manila

Bunker C - $3.56 bbl.

Diesel Oil - $3.88 bbl.

1 See page 283 of Leeming's "Modern Ship Stowage".
2 Data received from Standard Oil of New Jersey.
Computation to Determine Advisability of Bunkering in Both San Francisco and Shanghai:

Cargo D.W. of Lumber at Seattle = 8309.2 tons

8309.2 tons = 5,000,000 board feet of revenue cargo

Gross Cargo Revenue on Lumber:

\[5,000,000 \times \$50.50 \text{ per 1000 board feet} = \$252,500\]

Average Cargo Rate per Ton:

\[
\frac{\$252,500}{8309.2} = \$30.40
\]

Difference in Cargo D.W. by Fueling at San Francisco for Round Voyage:

\[(654^{2} + 4.28) - (311.3 + 1.86) = 345 \text{ tons}\]

Increased Cargo Revenue by Fueling at San Francisco and Shanghai:

\[($30.40)(345) = \$10,840\]

Loss in Cargo Revenue Due to Increased Cost of Bunkering in Shanghai as Opposed to San Francisco:

<table>
<thead>
<tr>
<th>Location</th>
<th>Bunkering Cost per Bbl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanghai</td>
<td>$3.77</td>
</tr>
<tr>
<td>San Francisco</td>
<td>$2.65</td>
</tr>
<tr>
<td>Difference</td>
<td>$1.12 per bbl.</td>
</tr>
</tbody>
</table>

1 Conference rate supplied by J.J. Murphy, American President Lines
2 Note that no reserve allowance made because ship can carry only 654 tons.
$1.12 \times 7.5 \text{ bbls. per ton} = \$8.40 \text{ per ton}

Total difference in bunkering costs:

\((\$8.40)(345) = \$2,900\)

Net Increase in Cargo Revenue by Bunkering in
San Francisco and Shanghai as Opposed to Bunkering
in San Francisco for Round Voyage:

\(\$10,840 - \$2,900 = \$7,940\)
Days in Port - Seattle - Round Voyage:

Hatch Rate\(^1\) = 11,000 board feet/hr.

No. of equivalent hatches = 6

Amount of lumber = 5,540,000 board feet

Cargo worked 8 hours/day

\[
\frac{5,540,000}{11,000 \times 8 \times 6} = 10.48 \text{ days}
\]

18\% allowance for
Sundays, holidays, and bad weather = 1.89 days

total days = 12.37

Days in Port - Shanghai - Round Voyage:

Cargo worked 8 hours per day

Hatch Rate = 5,000 board feet/hr.

\[
\frac{5,540,000}{5,000 \times 8 \times 6} = 23.0 \text{ days}
\]

18\% allowance for
bad weather, Sundays, and holidays = 4.15 days

total days = 27.15

Days in Port - Manila - Round Voyage:

Hatch Rate for Copra\(^2\) = 35 tons/hr.

Stowage factor = 70\(^3\) - No. of hatches = 5 (Do not use ship's gear)

Bale capacity = 448,786

---

1 See page 282 of Leeming's "Modern Ship Stowage"
2 As reported by J.J. Murphy, General Manager, American President Lines, Boston
3 See page 593, Leeming's "Modern Ship Stowage"
Tons of copra handled = \( \frac{448,786}{70} = 6,400 \)

Cargo worked 8 hours/day

\[
\frac{6400}{(35)(8)(5)} = 4.57 \text{ days}
\]

18% allowance for Sundays, holidays, and bad weather

\[
\frac{.82}{5} = .16 \text{ days}
\]

Total days = 5.39

Days in Port - San Francisco - Round Voyage:

Hatch Rate for Copra - 45 tons/hr.\(^1\)

Tons of Copra Handled (pneumatically) = 6400

Cargo worked 8 hours/day

No. of hatches\(^2\) = 5

\[
\frac{6400}{(45)(8)(5)} = 3.56 \text{ days}
\]

18% allowance for Sundays, holidays, and bad weather

\[
\frac{.64}{5} = .13 \text{ days}
\]

Total days = 4.20

Total Days in Port per Round Voyage:

Seattle = 12.37

Shanghai = 27.15

Manila = 5.39

San Francisco = 4.20

Total = 49.11 days

---

1 As reported by J. J. Murphy, General Manager, Am. Pres. Lines, Boston

2 Equivalent hatches have no significance in this case.
Total Days at Sea per Round Voyage:

40.2 days\(^1\)

Total Number of Voyages per Year
(allowing 7 days for annual overhaul):

\[
\frac{365 - 7}{49.11 \times 40.2} = 358
\]

Total Number of Voyages = 4.01

\(^1\) See page 5 for computations
Operating Expenses

1. Fixed Charges per Year
   (a) Charter Rate per Year:
       $11,708.33 per month
       ($11,708.33)(12) = $140,500
   (b) Interest on Charter Rate:
       @ 2% = ($140,500)(.02) = $2,820
   (c) Insurance:
       Hull and Machinery @ $35,000
       Protection and Indemnity @ $.90/GT = ($.90)(6750) = $6,075
       Note: P.&I. insurance is based on history of ship - the above is of necessity an average figure
       Total $184,395

2. Repairs, Maintenance, Annual Overhaul, and Repair Reserve per Year
   (a) Hull @ $.60
       ($.60) 395(60)(37.5) = $23,080
   (b) Machinery @ $2.70/SHP
       ($2.70)(4,000) = $10,800
   (c) Machinery Reserve @ $1.50/GT
       ($1.50)(6,750) = $10,120
       Total $44,000

1 Taken from page 46 of the "Log", April, 1947
2 As reported by American Hull Insurance Syndicate
3 As taken from statistics given by Prof. L.B. Chapman for "Ship Operation Problem #31" - M.I.T.
3. Fuel per Year and Lube Oil

(a) Sea Fuel for Main Propelling Unit and Auxiliaries:

$19.88/ton at San Francisco\(^1\)

\[ \text{\$19.88}(311.3) = \text{\$6,180} \]

$28.28/ton at Shanghai

\[ \text{\$28.28}(393.8) = \text{\$11,110} \]

Per Voyage = \$17,290

Total Seafuel/yr. = (4.01)(\$17,290) = \$69,100

(b) Lubricating Oil

@ \$0.80/gal.\(^2\) and 7.5 bbls./ton

\[ \text{\$0.80}(4.28)(7.5)(42)(4.01) = \text{\$4,340} \]

(c) Port Fuel

@ 1.5 tons/day\(^3\)

16.57 days @ \$19.88/ton

\[ \text{\$19.88}(16.57)(1.5)(4.01) = \text{\$1,970} \]

32.54 days @\$28.28/ton

\[ \text{\$28.28}(32.54)(1.5)(4.01) = \text{\$5,530} \]

Total Port Fuel/yr \$7,500

---

1 Costs figures for fuel oil, May, 1947 by Sheehan of Standard Oil of New Jersey, Boston office
2 Lube oil price as given in course in "Ship Operation" by Prof. L.B. Chapman, MIT
3 As reported by Chief Engineer S/S Rattler - U.S. Lines
### Crew Expenses - Wages per Year

<table>
<thead>
<tr>
<th>Position</th>
<th>Straight Wages</th>
<th>Overtime 25%</th>
<th>Vacation Pay</th>
<th>Subsistence</th>
<th>Total Crew Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captain</td>
<td>$616</td>
<td></td>
<td></td>
<td></td>
<td>$7392</td>
</tr>
<tr>
<td>Chief Mate</td>
<td>396</td>
<td></td>
<td></td>
<td></td>
<td>4752</td>
</tr>
<tr>
<td>2nd. Mate</td>
<td>316</td>
<td></td>
<td></td>
<td></td>
<td>3792</td>
</tr>
<tr>
<td>3rd. Mate</td>
<td>290</td>
<td></td>
<td></td>
<td></td>
<td>3480</td>
</tr>
<tr>
<td>Bosun</td>
<td>205</td>
<td></td>
<td></td>
<td></td>
<td>2460</td>
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<tr>
<td>A.B. Seamen</td>
<td>172.50</td>
<td></td>
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<td></td>
<td>10350</td>
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<tr>
<td>Ordinary Seamen</td>
<td>150</td>
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<td></td>
<td>5400</td>
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<tr>
<td>Carpenter</td>
<td>187.50</td>
<td></td>
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<td>2250</td>
</tr>
<tr>
<td>Deck Maintenance</td>
<td>187.50</td>
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<td></td>
<td>2250</td>
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<tr>
<td>Chief Engineer</td>
<td>574</td>
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<td>6680</td>
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<tr>
<td>1st. Asst. Engineer</td>
<td>396</td>
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<td></td>
<td></td>
<td>4752</td>
</tr>
<tr>
<td>2nd. Asst. Engineer</td>
<td>316</td>
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<td></td>
<td></td>
<td>3792</td>
</tr>
<tr>
<td>3rd. Asst. Engineer</td>
<td>290</td>
<td></td>
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<td></td>
<td>3480</td>
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<tr>
<td>Oilers</td>
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<td></td>
<td></td>
<td>13500</td>
</tr>
<tr>
<td>Wipers</td>
<td>177.50</td>
<td></td>
<td></td>
<td></td>
<td>4270</td>
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<tr>
<td>Eng. Utility</td>
<td>177.50</td>
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<td></td>
<td></td>
<td>2130</td>
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<tr>
<td>Radio Operator</td>
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<td>3048</td>
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<tr>
<td>Chief Steward</td>
<td>220</td>
<td></td>
<td></td>
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<td>2640</td>
</tr>
<tr>
<td>Chief Cook</td>
<td>205</td>
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<td></td>
<td>2460</td>
</tr>
<tr>
<td>Asst. Cook</td>
<td>185</td>
<td></td>
<td></td>
<td></td>
<td>2220</td>
</tr>
<tr>
<td>2nd. Cook and Baker</td>
<td>185</td>
<td></td>
<td></td>
<td></td>
<td>2220</td>
</tr>
<tr>
<td>Messmen</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td>5400</td>
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<tr>
<td>Steward's Dept. Utility</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td>5400</td>
</tr>
<tr>
<td>Electrician</td>
<td>294.50</td>
<td></td>
<td></td>
<td></td>
<td>3534</td>
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<tr>
<td></td>
<td><strong>$105,392</strong></td>
<td><strong>26,348</strong></td>
<td><strong>1,212</strong></td>
<td><strong>19,700</strong></td>
<td><strong>$152,652</strong></td>
</tr>
</tbody>
</table>
5. **Supplies per Year (not including lube oil):**

Deck Department, Engine Department, and Steward's Department:

$35,000^1$

Port Charges San Francisco per Year$^2$:

Customs House Broker Fees:

@ $5 for entering and $15 for clearing

\[(\$20)(4.02) = \$ 80.40\]

Tugboat Rates (assisting):

4,000-5,000 net tons: $45

\[\left(\$45\right)(4)(4.02) = \$ 725.00\]

Pilot Services:

Richmond to Martinez @ $45

\[\left(\$45\right)(2)(4.02) = \$ 361.18\]

Pilotage In and Out:

@ \$0.01\frac{1}{8} per net ton plus \$2. ft. deepest draft

\[\left(0.01\frac{1}{8}\right)(4800)(4.02) plus \left(\$2\right)(23.67)(4.02) = \$ 407.00\]

Agency Fee:

@ $50 per day for 15 days - $25/day all after

\[\left(\$50\right)(4.2)(4.02) = \$ 845.00\]

---

1 As taken from statistics presented by Prof. L. B. Chapman for "Ship Operation Problem #31" - Marine Transportation, M.I.T.

2 Actual figures for May, 1947
Reporting Charge:

@ $5.00

($5)(4.02)(2) $ 40.20

Customs Post Entry:

($2)(4.02) $ 8.04

Total Charges S.F. $2,921.82

Port Charges Seattle per Year:

Customs House Broker Fee:

@ $15 - entry and clearance

($15)(4.02) $ 60.30

Pilotage:

@ $1.15 per nautical mile, minimum $25

($1.15)(2)(30)(4.02) $277.00

Tugboat Rates:

@ $35 (5,000 to 10,000 G.T.) assisting

($35)(2)(2)(4.02) $564.00

Handling Lines:

Taking lines $9.60

Letting go $6.50

($16.10)(4.02) $ 64.80

1 Note: - No wharfage or dockage charges as cargo is delivered to consignee's docks.

2 Actual figures as of May, 1947
Reporting Charge:
@ $5.00
($5)(4.02)(2) $ 40.20

Customs Post Entry:
($2)(4.02) $ 8.04
Total Charges Seattle $1314.34
(Note no agency fee as Seattle home port)

Port Charges Shanghai per Year:

Quarantine Service:
@ $9,000 per entry below 5,000 N.T.
@ $6,00 per clearance below 5,000 N.T.
($15,00)(4.02) $60,300

Wharfage:
@ $780 per ft. per day
($780)(27.15)(4.02)(416) $3,540,000

Tonnage Dues:
@ $65 per N.R.T. per entry and clearance
($65)(4800)(4.02) $1,255,000

Towage:
@ $45/tug
($45)(2)(2)(4.02) $722 (U.S. Currency)

Customs Supervision:
@ $16,000
($16,000)(4.02) $64,320

1 No dockage charges as cargo loaded at consignor's dock.
2 All charges given in Chinese CNC, except as noted; actual figures for May,
Pilotage In and Out:

From sea to Woosung
($2/ft. plus .0025 per G.R.T.)

Woosung to Shanghai
($3/ft. plus .0025 per G.R.T.)

($2)(27.5) plus (.0025)(6750)(4.02) $289 (U.S.Currency)

($3)(27.5) plus (.0025)(6750) 4.02 $358 (U.S.Currency)

Plus 200% surcharge effective 12/1/46 $1294 (U.S.Currency)

Agency Fee:

@ $30/day

($30)(27.15)(4.02) $3260 (U.S.Currency)

$4,919,620 (CNC) plus $5923 (U.S.Currency)

$4,919,620
@ 12,000 CNC to $1 American quoted as official rate by the Foreign Dept. of the First National Bank of Boston (May, 1947).

$1 American (May '47) $409

Total Charges Shanghai $6332
(U.S. Currency)

Port Charges Manila per Year:

Pilotage:

@. $100 - anchorage to pier (3000 GRT and over)

( 100)(2)(4.02) $804

1 12,000 CNC to $1 American quoted as official rate by the Foreign Dept. of the First National Bank of Boston (May, 1947).

2 Charges given in (Philippine Currency) unless otherwise noted; actual figures for May, 1947. Rate of exchange: esc = $.4965 (First National Bank of Boston)
Customs Clearance:
- @ $20 - Entrance Stamps
- $2 - Bill of Health
  \[(22)(4.02)\] $88.50

Tonnage Dues:
- @ $12.5 per N.R.T. per yr.
  \[(12.5)(4800)\] $5,760.00

Agency Fee:
- @ $50/day
  \[($50)(5.39)(4.02)\] $1,080 (U.S. Currency)

Towage:
- @ $35/tug
  \[($35)(2)(2)(4.02)\] $562 (U.S. Currency)

Berthing Fee:
- @ $.02/G.R.T./day
  \[($0.02)(6750)(5.39)(4.02)\] $2,820 (U.S. Currency)

Total (U.S. Currency) $7,762

Total Port Charges per Year:

<table>
<thead>
<tr>
<th>Port</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td>$2,466.82</td>
</tr>
<tr>
<td>Seattle</td>
<td>1,312.34</td>
</tr>
<tr>
<td>Shanghai</td>
<td>6,332.00</td>
</tr>
<tr>
<td>Manila</td>
<td>7,762.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$17,873.16</strong></td>
</tr>
</tbody>
</table>
Management Expenses:

Company Personnel and Office Expenses $40,000

Agency Fees  

Total $40,000

Cargo Expenses - General Information

Freight contract calls for free in and out delivery of cargo; so only expenses will be those of checkers and clerks. No hold watchman will be required with these cargoes, and a ship's A.B. will be kept on gangway watch instead of hiring a shore watchman.

Cargo Expenses San Francisco:

Checkers and Clerks:
@ $1.05/cargo D.W. ton
($1.05)(6400)(4.02) $26,900

Ship's Gangway Watch:
(members of ship's crew)
@ $100/ hr.
($100)(4.2)(16)(4.02) $270

Total $27,170

Cargo Expenses Seattle:

Checkers and Clerks:
@ $.95/ cargo D.W. ton

1 Agency fees already tabulated under "Port Charges" - classification as to a management or port expense depends on accounting system.
Cargo Expenses Shanghai:

Checkers and Clerks:

@ $.70/cargo  D.W. ton

$.70)(8309.2)(4.02) $24,400

Ship's Gangway Watch:

@ $1.00/hr.

($1.00)(12.37)(16)(4.02) 800

Total $32,600

Cargo Expenses Manila:

Checkers and Clerks:

@ $.60/cargo  D.W. ton

$.60)(6400)(4.02) $15,450

Ship's Gangway Watch:

(member of ship's crew)

@ $1.00/hr.

($1.00)(5.39)(16)(4.02) 348

Total $15,798
### Total Cargo Expenses\(^1\):

<table>
<thead>
<tr>
<th>City</th>
<th>Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td>27,170</td>
</tr>
<tr>
<td>Seattle</td>
<td>32,600</td>
</tr>
<tr>
<td>Shanghai</td>
<td>26,140</td>
</tr>
<tr>
<td>Manila</td>
<td>15,798</td>
</tr>
</tbody>
</table>

**Total** $101,708

---

\(^1\) This data based on F.I. and O. contract
### Total Operating Expenses Per Year:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Charges</td>
<td>$184,395</td>
</tr>
<tr>
<td>Repairs and Maintenance and Reserve</td>
<td>44,000</td>
</tr>
<tr>
<td>Fuel</td>
<td>76,600</td>
</tr>
<tr>
<td>Supplies (incl. lube oil)</td>
<td>39,340</td>
</tr>
<tr>
<td>Crew Expenses</td>
<td>152,652</td>
</tr>
<tr>
<td>Port Charges</td>
<td>17,873</td>
</tr>
<tr>
<td>Management</td>
<td>40,000</td>
</tr>
<tr>
<td>Cargo Expenses</td>
<td>101,708</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$656,568</strong></td>
</tr>
</tbody>
</table>

### Gross Revenue From Cargo Per Year:

- **Lumber** @ $50.50 / 1000 bd. ft.  
  \[(50.50)(5000)(4.02)\] = $1,012,000
- **Copra** @ $24 / ton  
  \[(24)(6400)(4.02)\] = 617,500

**Total** $1,629,500

### Deductions to Arrive at Net Revenue:

- **Damage claims** @ 2%  
  \[(1,629,500)(.02)\] = $32,590

### Net Revenue Per Year:

\[1,629,500 - 32,590 = 1,596,910\]
Profit Before U. S. M. C. Deductions and Federal Income Tax Deductions:

- Net Revenue $1,596,910
- Total Expenses 656,658

Average Profit Per Day:

\[
\frac{940,252}{365} = 2,580
\]

U. S. M. C. Deductions on Excess Profits:

"The Commission recaptures 50% of the first $100 per day profit above the Charter's margin of 10% return on capital investment (capital) investment means operating and preoperating expenses for 60 days - it is further defined in the "Ship's Sales Act"), 75% of all profits between $200 and $300 per day, and 90% of all profits in excess of $300 per day." ¹

Capital investment = $100,000 (approx.)

\[
10\%\ \text{return\ on\ investment} = \frac{($100,000)\cdot .10}{10,000} = $10,000
\]

90% deduction on $940,252 - 10,000 = (.90)($930,252) = $836,000

Total U. S. M. C. deduction = $336,000

¹ Taken from amendment to "Ship's Sales Act" - page 46 of the "Log", April, 1947
Profit After U. S. M. C. Excess Profits Deduction and Before Federal Income Tax Deductions:

Profit Before Deductions $940,252
- U. S. M. C. Deductions $36,000
$104,252

Return On Investment:

$100,000 = necessary capital

\[
\frac{104,252}{100,000} = 104.25\%
\]

To Determine Return On Investment When Vessel Bought Instead of Chartered and Manned with American Crew:

The only change in operating expenses is that "depreciation" is substituted for "Charter rate", and a new figure will be used for "interest".

Change in Fixed Charges On Bought Vessel:

(a) Depreciation:

\[\frac{1}{15} \times ($912,859) \times 1 \times \frac{1}{15} = 60,900\]

(b) Interest on $912,859:

\[2\% \times ($912,859) \times 0.02 = 18,250\]

Original Items "(a)+"(b)" Under Fixed Charges When Vessel Chartered:

II. (a) Charter Rate $140,500
(b) Interest on Charter Rate 2,820
Total $143,320

Floor price valuation on vessel 5 years old taken from "Ship Sales Act."
Profit Before U. S. M. C. Deductions and Federal Income Tax Deductions:

Net Revenue $1,596,910
- Total expenses (656,658 - 64,170) 592,398

$1,004,512 = $2,740

$1,004,512 - profit before federal income taxes as the vessel is owned and there are no U.S.M.C. deductions on excess profits.

Return on Investment:

\[
\frac{1,004,512}{[(50\%)(912,589) + 100,000]} = 180\%
\]

1 50% required as defined in "Ship Sales Act." - 25% of value of ship for net worth and 25% down payment plus operating and preoperating expenses for 60 days of $100,000.
To Determine Return on Investment when Vessel Bought and Manned with a Norwegian Crew:

The only change in operating expenses in this situation over the vessel bought and manned by an American crew will be "Crew Expenses". The wages and subsistence will be lower, and there will be no overtime or vacation pay. There also will be fewer men in the crew.

Norwegian Crew Expenses: 1

<table>
<thead>
<tr>
<th></th>
<th>Wages per Month</th>
<th>Wages per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Captain</td>
<td>1500 Kroner</td>
<td>18,000 Kroner</td>
</tr>
<tr>
<td>1 Chief Mate</td>
<td>924</td>
<td>11,100</td>
</tr>
<tr>
<td>1 Second Mate</td>
<td>749</td>
<td>9,000</td>
</tr>
<tr>
<td>1 Third Mate</td>
<td>633</td>
<td>7,600</td>
</tr>
<tr>
<td>1 Bosun</td>
<td>538</td>
<td>6,460</td>
</tr>
<tr>
<td>5 A. B. Seamen</td>
<td>519</td>
<td>31,350</td>
</tr>
<tr>
<td>3 Ordinary Seamen</td>
<td>553</td>
<td>19,950</td>
</tr>
<tr>
<td>1 Carpenter</td>
<td>553</td>
<td>6,650</td>
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<tr>
<td>1 Deck Maintenance</td>
<td>430</td>
<td>5,160</td>
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<tr>
<td>1 Chief Engineer</td>
<td>1400</td>
<td>16,800</td>
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<tr>
<td>1 1st Asst. Engineer</td>
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<td>14,000</td>
</tr>
<tr>
<td>1 2nd Asst. Engineer</td>
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<tr>
<td>1 3rd Asst. Engineer</td>
<td>795</td>
<td>9,550</td>
</tr>
<tr>
<td>6 Oilers</td>
<td>538</td>
<td>38,760</td>
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<tr>
<td>2 Wipers</td>
<td>436</td>
<td>10,450</td>
</tr>
<tr>
<td>1 Eng. Utility</td>
<td>650</td>
<td>7,800</td>
</tr>
<tr>
<td>1 Radio Operator</td>
<td>683</td>
<td>8,200</td>
</tr>
<tr>
<td>1 Chief Steward</td>
<td>757</td>
<td>9,080</td>
</tr>
<tr>
<td>1 1st Cook</td>
<td>592</td>
<td>7,100</td>
</tr>
<tr>
<td>1 2nd Cook and Baker</td>
<td>439</td>
<td>5,260</td>
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<tr>
<td>4 Messmen</td>
<td>355</td>
<td>17,050</td>
</tr>
</tbody>
</table>

Wages = 271,344 Kroner

Wages = $ 54,269

Subsistence = $.75 per man = 9,850

Total = $ 64,119

1 These wages include war bonus of 250 Kr. / mo. - rate of exchange - 5 kr. = $1.00
Difference in Crew Expenses

Between Norwegian and American:

$152,652 - $64,119 = $88,533

Profit Before U. S. M. C. Deductions and Federal Income Tax Deductions:

Net Revenue $1,569,910

- Total Expenses
  ($592,398 - $88,533)  503,065

$1,066,045

Average Profit Per Day:

$1,066,045 = $2,920

$1,066,045 = Profit before federal income taxes as the vessel is owned and there are no U. S. M. C. deductions on excess profits.

Return On Investment:

\[
\frac{1,066,045}{[(50\%)(912,589) + 100,000]} = 191.5\%
\]

1 As previously computed for American Crew
Acknowledgement of Sources of Information


Huebner, Grover C. "Survey of Foreign Trade and the American Merchant Marine."


