Recommendation Briefing Paper for OCIMF Member Companies on Guidelines for Transiting the Straits of Magellan including Commentary on Passages around Cape Horn

OCIMF Members only

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The OCIMF mission is to be the foremost authority on the safe and environmentally responsible operation of oil tankers and terminals, promoting continuous improvement in standards of design and operation.
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1 Introduction
There are two navigable routeing options available for vessels bound between the South Atlantic Ocean and the South Pacific Ocean transiting round the southern coast of South America. The first route is an offshore passage taking vessels south of and around Cape Horn. The second route is through the Strait of Magellan. Each route has its own hazards.

The Strait of Magellan extends over 310 miles between the Pacific and the Atlantic Ocean. The whole zone is under the control of the Maritime Governor at Punta Arenas, assisted by Port Captains in Punta Arenas, Porvenir, Punta Delgada, Puerto Natales and Puerto Eden. There are three commercial ports and four oil and gas terminals in the zone, as well as numerous small coves and landing stages for the regional traffic.

2 Purpose and Scope
The OCIMF General Purposes Committee agreed that an appropriate guidance be provided to assist members on measures to take into account when considering a transit through the Straits of Magellan. Therefore, the Navigation and Routeing Sub-Committee (NARSUC) have developed this OCIMF briefing paper.

The purpose of this briefing paper is to provide guidance for OCIMF member companies when considering a transit of their tankers through the Straits of Magellan. The paper does not make judgement on whether these transits should be undertaken, but provides additional guidance to member companies in their risk assessment processes and is in addition to information contained in other navigation documents.

In addition, the paper provides brief commentary on the alternative route of sailing around Cape Horn, which is intended to supplement the information found in other shipping guides, and to assist planners of routes in making their decisions. The commentary on Cape Horn passages begins in Part B, Section 13-20.

3 General
It is generally accepted that a vessel using the Strait of Magellan will save time and fuel on the voyage but it should be noted that this transit does introduce hazards not normally encountered in ocean routes. A risk assessment should be conducted to consider the fundamental issues surrounding safe navigation of both the offshore and inshore passages, and safeguards put in place to control the risks.

The hazards encountered in the inshore route include traffic density, shallow water, reduced visibility, narrow channels, frequent and violent squalls and strong currents. These make navigation challenging.

The western exit from Magellan, does however, provide access to an extensive area of fjords and islands, which can provide a sheltered route for some 300 miles up the west coast of Chile. This option has the advantage that, even outside of the Straits on the west side, a vessel can sail through inland waterways avoiding bad weather encountered in open seas. Passage should however be considered only if latest corrected Chilean government charts are available.

The General Directorate of Maritime Territory and Merchant Marine (Directemar) of the Chilean government provides a set of regulations and directions for transits through the Magellan Straits. Members should consult and be guided by them before arriving at an informed decision to make a passage through the Magellan straits.

The route rounding the southern tip of South America at Cape Horn offers its own challenges with storms, heavy seas, strong currents, and icebergs presenting ships with potentially hazardous conditions and delays to voyages.
Part A – Straits of Magellan

4 Pilotage in the Magellan Straits

Pilotage is compulsory for ships navigating the inland waterways between Possesion Bay and Punta Arenas, east or westbound. All Pilots Services are provided by the Chilean Maritime Authority. There are three pilotage options available:

4.1 Short Pilotage (Possesion Bay ~ Punta Arenas)
Embark a pilot at Possesion Bay; disembark at Punta Arenas, westbound (or vice-versa if vessel is eastbound). In this section of the Straits, pilotage is compulsory. If this option is taken the vessel makes the passage without a pilot for the western section of the transit between Punta Arenas and Cape Pilar.

4.2 Short Pilotage, Ocean to Ocean (Possesion Bay ~ Cape Pilar)
Embark a pilot at Possesion Bay; disembark at Cape Pilar (or vice-versa if vessel is eastbound). This option also provides pilotage through the western section of Magellan, which is not compulsory. It is recommended that two pilots be requested.

4.3 Full (Long) pilotage (Possesion Bay ~ West Coast Chilean Ports)
If the vessel is calling at any Chilean Port (except Punta Arenas) then full pilotage is compulsory. Two pilots disembark at Possesion Bay, disembarking at Ancud or Laitec, or the actual load/discharge port if this is south of Coquimbo, and vice-versa if eastbound. Alternative pilot boarding points are available; reference should be made to the South America Pilot Book NP 6, for further details. Using the full pilotage option, the vessel will transit the Patagonia Channel avoiding the worst of the heavy weather.

Pilots normally bring local charts onboard with them, however it is recommended that vessels endeavor to obtain up to date versions of their own prior to arrival, for planning and familiarization purposes. Chilean nautical charts for the whole Strait of Magellan are available through Ships’ Agents.

The passage is long and demanding of navigational personnel. For the purposes of adequate bridge team management and to avoid fatigue, it is recommended that pilotage services be employed for the whole of the transit of the Magellan Straits (Possesion Bay ~ Cape Pilar) and that two pilots be used in order that they remain adequately rested throughout the transit.

The reason for recommending two pilots is the difficulty and complexity of navigation west of Punta Arenas. One of the particularly difficult sections of the Straits involves navigation in the restricted waters approaching Paso Tortuosa. This section of the Straits does not have compulsory pilotage. There are approximately eight cables between hazards in the vicinity of Isla Carlos III Island, with approaching vessels obscured by land mass.

Pilots will report back to Port State if deficiencies are found in navigational equipment. Pilots should be provided with clean accommodation within the officer’s quarters that includes appropriate domestic facilities.

Members are advised to contact local agents for the most up to date information, and to order pilots.
5 Restrictions

The only regulatory restriction for transiting vessels is a maximum draft of 21.3 metres.

6 Weather Information

The weather is often extreme and subject to rapid change and delays may occur. Pilot boarding locations may be adjusted in periods of bad sea conditions. Allowance should be made in passage plans for the effect of delays at critical locations.

It is important to obtain weather and other routeing information ahead of transit times. It is also advisable...
to seek long-range forecasts via satellite, as there is no land station coverage west of Chile.

Radio services transmit weather forecasts and regional Notices to Mariners. However, all transmissions are in Spanish. Advanced information can be obtained via satellite. The Spanish-speaking pilot if onboard can interpret local forecasts.

Violent and often unpredictable squalls with gusts in excess of 100 knots may occur, most often along the south and west coasts of the peninsula. These squalls may be of only short duration but can significantly reduce the visibility due to precipitation. In inland waters, squalls occur most often when there are strong or gale force winds over the adjacent sea areas or at a height of several thousand meters over land. The air becomes very turbulent after passing over the mountain terrain on the west coast, causing rapid and often localized changes in both wind direction and strength in the many inland passages. Some respite from these squalls occurs when high pressure becomes established over the area but this seldom lasts for more than a few days.

Persistent gales are seldom encountered except in some of the wider stretches of the Magellan Straits. In general, gales inland are less steady in direction than those over the open sea. In the many narrow passages the wind generally follows the run of the passage. When there is a large shift of wind over the open sea, the wind may suddenly reverse direction in a narrow passage. The numerous straits, valleys and headlands may also give rise to significant local increases in wind strength due to funneling.

Fog is infrequent in these areas. Radiation fog may occur on cold, clear, calm, nights in winter, especially in sheltered valleys and inlets in the north and east; it is usually most frequent and dense around dawn.

Visibility can be affected by local conditions giving rise to a hazard to navigation. When depressions affect the area the cloud base often falls to near sea level, and visibility is frequently reduced. In addition, rain squalls, drizzle and heavy snow can significantly reduce the visibility. A noticeable feature of the area is that in the course of a few minutes, overcast skies and heavy precipitation may be replaced by cloudless skies and exceptional visibility, with mountain peaks becoming clearly visible at distances of 100 miles or more. Such changes are nearly always due to the arrival of drier and cooler air from higher latitudes.

During winter, snow may accumulate on navigation and leading lights partially or even completely obscuring them.

7 Passage Planning

The difficulties and dangers in navigating through the Magellan Straits in either direction are similar to those experienced in other narrow channels. They are accentuated by the prevalence of bad weather, especially towards the western end of the Strait and by the lack of adequate emergency anchorages. Nevertheless, by using the Strait, a westbound vessel will save time and avoid the adverse currents, gales, and the heavy head seas commonly experienced off Cape Horn and the south west coast of Tierra del Fuego. In addition, icebergs will not be encountered and ice accretion is substantially reduced. However, drifting glacial ice may be still be encountered.

The tidal streams in the eastern part of the Strait tend to be less favourable for vessels eastbound than for those westbound.

The main shipping route comprises of the following sections:

- From the Eastern entrance to Paso Ancho. In this area there are many banks, shoals, and narrows. As a consequence, tidal streams are strong and variable.
- Paso Ancho, from the south end of Paso Nuevo to the north end of Paso del Hambre, which is relatively deep and wide.
- From the north end of Paso del Hambre to Cabo Pilar. With the exception of Paso Tortuoso which is the most difficult part of this section, the depths are considerable and tidal streams weak.

A passage plan should be developed to cover the entire transit, to include, but not limited to the following:

- Timing of staged arrivals for transit through shallow waters and strong current areas;
• Own vessels manoeuvrability characteristics;
• Traffic density;
• UKC, (Under Keel Clearance)
• Watch-keeping arrangements;
• Radio and weather station frequencies;
• Guidance on large vessel priorities;
• Use of Chilean Reporting (Chilerep);
• Guidance on calculation of tidal conditions on the route.

General Guidance on passage planning can be obtained from the latest edition of the ICS Bridge Procedures Guide.

Due to the nature of the coastline in the area, and possibility of navigational aids being obscured, parallel indexing should always be used to monitor the ships progress in relation to the passage plan.

Navigation should always be conducted on the largest scale charts available. British Admiralty charts for the western portion of the Straits are not considered to be of adequate scale to be suitable for safe navigation. Therefore, fully corrected Chilean Government charts should be obtained before commencing transit.

The passage plan must be prepared well in advance of the pilot joining, and discussed in detail with him after boarding. In certain weather conditions pilot boarding may be delayed, and the passage plan must make allowance for the vessel to be repositioned into a safe area while any changes to the plan are fully discussed with the pilot, and implemented before transit through the Straits commences. A full master/pilot exchange should take place prior to the passage being commenced. Reference should be made to the latest edition of the ‘Bridge Procedures Guide’ (section 6 – Maritime Pilotage) published by ICS.

It should be noted that there are no suitable areas for emergency anchorages west of Punta Arenas and this should be taken into consideration during the risk assessment process undertaken before the voyage commences.

There is no speed reduction requirement or one way navigation areas within the Magellan straits. However, Chilean Maritime Authority regulations stipulate that ships with lengths greater than 200 metres will have preference of passage in the narrows. When transiting critical passages of Primera Angostura, Segunda Angostura and Paso Tortuoso, vessels must be in full stand by condition.

The following is brief information on currents and tidal streams; however, for further details, reference should be made to the pilot books:

• From the Pacific side a mean rate of half a knot east going current (under the influence of prevailing west and northwesterly winds) enters the Straits.
• The flood streams enter the Straits from both east and west sides. From the Atlantic, the flood stream runs westerly as far as Cabo Crosstide and continues to run for about 3 hours after high and low water (for the east going ebb). From the Pacific, the flood stream runs easterly as far as Cabo Crosstide.
• At the eastern entrance to the Strait the rate of tidal stream is from 2 to 4 knots and in Primera Angostura it reaches 6 to 8 knots, thereafter decreasing as the narrows trend southwesterly. The tidal range is 7 to 9 meters which equates to a large volume of water being periodically transferred from the Atlantic to the east part of Magellan and vice versa, and it is this movement of water which causes the strong tidal streams in the area. Generally the narrower the channel the stronger the stream.
• On leaving the narrows through both Primera Angostura and Segunda Angostura where it runs straight, the stream spreads out causing strong sets towards the banks on each side. A vessel may experience a set towards the north shore if north of the axis of the stream, or towards the south shore if south of the axis. The effect on a large vessel can be considerable, and adequate under-keel clearance and speed are necessary to maintain steering control.
Figure 3: Magellan Straits Passage

Figure 4: Magellan Straits Depths and Widths
Figure 5: Magellan Strait Hot Spots

Figure 6: Magellan Straits versus Drake Passage
Figure 7: Passing Premura Angostura
8 **Reporting Procedures**

There is no Vessel Traffic Service (VTS) in the Strait of Magellan. There is a Chilean Reporting System (CHILREP) in place but this is not on a continuous plot basis. Reliance is placed on the pilot’s communications with the shore radio stations, and other voice radio communications, though it should be noted that the language used is usually Spanish.

As pilotage is optional in certain parts of the Straits, there is no assurance that other vessels in the vicinity would be able to understand the transmissions from radio stations, or be aware of the information being broadcast.

The Admiralty List of Radio Signals (ALRS) Volume 6(S) NP 286(S) should be consulted as this provides a comprehensive source of information on all aspects of marine radio communications in the area. It has been reported that the majority of NAVTEX reports are in Spanish, and that the mountainous region can prevent reliable receipt of transmitted messages.

9 **Oil Spill Response**

Precise and updated information on oil spill response capabilities in the Magellan Straits has been difficult to obtain.

It has been indicated that a local company has management of a small number of tugs, some of which are ocean-going salvage tugs with bollard pulls in the range of 40 to 62 tonnes. It has been reported that they are currently hired out to exploration and other oil related projects and therefore may not be immediately available.

The western part of the Straits is very mountainous and inaccessible in many places such that difficulty would be experienced in deploying equipment in these areas. The currents through Magellan can be over 6 knots, rendering oil containment booms ineffective.

It has been reported that Tier 1 oil pollution equipment exists at Punta Arenas comprising: booms up to 1200 metres, oil skimmers, detergents, pumps, and a 750 m³ oil recovery barge. Supplies of dispersant/clean up chemicals are available but it is reported that the authorities are reluctant to use them. The equipment available is not sufficient to contain a major oil spillage.

In conclusion, it is unlikely that a large spillage would be adequately controllable with current resources. The nearest source of Tier 3 oil spill response equipment is Fort Lauderdale.

10 **Repairs, Towage and Salvage in the Event of Damage**

There are two ship repair yards, both with limited facilities, in the Magellan Straits area. Punta Arenas is capable of dry-docking vessels up to 3750 tons. The closest site for docking larger vessels is at Talcahuano, on the west coast of Chile, with dry docking capacity for vessels up to 96,000 tonnes deadweight.

Structural, mechanical, fabrication work, electrical and electronic repairs can be carried out at these shipyards. Both can also provide work squads to carry out repairs in situ.

There are 3 port tugs based in Punta Arenas suitable for escort services. These are with bollard pull between 55 to 73 Tons, 4400 to 5300 horse power, speed of 12.5 knots, and fitted with fire fighting equipment.

There is no evidence of STS (Ship to Ship) transfer equipment being present in the area. The nearest regularly conducted STS operations are located south of the River Plate which is some 1200 miles away. STS operations can also be arranged at Talcahuano on the Pacific coast, some 1220 miles from Punta Arenas, where essential lighterage equipment, lighterage vessels and support services are available.
11  **Navigation Risk Assessment**

Each Member Company should conduct risk assessments into the advisability of using the Magellan Straits in general. This risk assessment should include the following factors as a minimum:

- Shallow water
- Strong currents
- Reduced visibility
- Narrow channels
- Wind
- Transit direction
- Loaded or ballast condition
- Ice effects
- Pilotage
- Visibility
- Viability of alternative routes
- Oil spill response equipment
- Salvage
- Communications
- Charts and dates of surveys

Before each passage, a vessel-specific risk assessment should be conducted, based on the conclusions of the first risk assessment and the prevailing conditions at the time, to assist with the final decision making prior to sending a vessel through the Straits of Magellan.

Additional considerations may include:

- Availability of additional personnel and issues of fatigue
- Competence and experience of key personnel (in particular previous experience of Magellan Straits by senior staff)
- Suitability of ships for passage (size, engine power, manoeuvrability)
- Weather forecasts
- Reduced visibility
- Preparation of machinery to optimum working condition, including cleaning of coolers and filters. Separate the electric power source from propulsion system whenever possible, and shaft generators must not be used in inner water channels or confined passages.

12  **Reference Information**

Member Companies are also directed to the following web site addresses of Directorate General of the Maritime Territory and Merchant Marine (Directemar), of Chilean government for more specific and detailed guidance for Magellan Straits passage.

http://www.directemar.cl/pilotaje/pageA.html
Provides information on weather, regulations, piloting policy, pilotage fees and other operational information for ship masters.

http://www.directemar.cl/pilotaje/Page8.html
Provides navigation information and route description.
Part B – Cape Horn

13 Introduction to Cape Horn

Cape Horn is the promontory in South Chile, in the Tierra del Fuego archipelago, on Horn Island, which marks the southernmost point of South America. It extends into the Drake Passage and the Antarctic strait connecting the South Atlantic and South Pacific Oceans.

Storms, heavy seas, strong currents, and icebergs make passage around the Cape, potentially very hazardous. Companies should have their own procedures for passages around Cape Horn.

It should be considered that the vessel might at times have to proceed in less than favourable conditions early on, in order to ensure the best possible conditions at the most extreme latitudes. It is often the case that transits are timed to make the southernmost point before another weather system moves into the area. This may require either the vessel speeding up or slowing down some days before passing Cape Horn and this should be reflected in the passage plan as a whole, and be built into voyage assessments.

14 Risk Assessment

The passage should be part of each company’s own risk assessment process with a generic plan, adjusted on a case-by-case basis prior to each voyage, in consultation with all interested parties. Amongst the factors that should be taken into account are:

- Minimum distance off the shore;
- Direction of transit;
- Vessel laden or in ballast;
- Weather – including snow, heavy rain, icebergs, ice accumulation;
- Reduced visibility;
- Sea, swell, heavy weather precautions;
- Heavy weather ballast;
- Cold weather precautions;
- Minimum bunker reserves;
- Safe areas for refuge or when awaiting weather windows;
- Reporting systems;
- Significant changes in ETA’s;
- Contingency Plans: Oil Spill Response, availability of tug assistance, repair facilities, (see also Magellan Straits information);
- Currents and prevailing seas;
- Reliability of the vessel’s operating systems;
- Additional manpower constraints such as extra watch-keepers, etc.

15 Routes

Experience has shown that avoiding the continental shelf and staying well south (in excess of 50 miles) of Cape Horn, may be beneficial in avoiding the heaviest seas. (There is though, an increased likelihood of the vessel encountering ice, see section 17.0 on ‘Ice’)

However, there are alternatives as described below:

East Bound: There is plenty of water and sea room for the passage to be made relatively close to the coast and have the vessel passing between Cape Horn and Ramirez Island. On a clear day both can be easily visible. The vessel is then able to make for a position off Cape San Juan and from there make passage either to the east or the west of the Falkland Islands. On a passage to West Africa, proceeding
west of the Falkland Islands can add up to 180 miles to the overall distance. Points to note are, if proceeding west of the Falkland Islands the vessel becomes beam onto all weather systems. If the vessel is using a great circle route east of the Falkland Islands, the greater period the vessel will remain in the ice limits during the winter months.

**West Bound:** Whether the vessel approaches from the west or east of the Falkland Islands she will be going against weather, sea and swell. A vessel can wait for favourable conditions North of Cabo San Juan and then proceed from this point. Allowances should be made for a reduction in the vessel’s passage speed due to Easterly currents and head on weather systems. If the vessel is to pass to the North of Ramirez Island the reciprocal of the above passage is recommended, ensuring that allowances are made for the Easterly current south of Cape Horn. On a passage south of Ramirez Island, the vessel will be less affected by the currents but does increase passage time in the higher latitudes. There is no one correct answer, with vessel type, condition and company regulations being part of the assessment process.

### 16 Weather

Unexpected or variable weather conditions may be experienced in these latitudes at any time. For example, the vessel may experience freezing temperatures in summer if the wind is from the south. Information from weather services is only valid for a short period of time, and frequent updates should be sought.

Depressions develop well to the west of this area around 55° to 65° South latitude, which then move E-SE. These normally pass well to the South of Cape Horn, however, they can be very large and cover extensive areas, and it is these weather systems that constitute the “roaring forties” and “whistling fifties”.

The direction of these winds is generally from the SW to NW and the average wind speed south of 55°S latitude is approximately 22 knots, however the direction and strength can vary due to the position and size of the depressions causing them. The speed of the depressions increase from around 20 knots to 30 knots during the winter months; therefore, more than one weather system can be experienced on a single passage.

Gale force winds average around 15% of the time during the summer months, increasing to 25% during the winter. Squalls with associated high winds and reduced visibility can also affect this area (more so in the winter months). These squalls can often form very rapidly and reduce visibility to less than 5 cables.

Snow is more likely from June to September but can be experienced all year round.

It is strongly recommended that vessels are weather routed. There are many commercial routing systems available that provide the Master with the information to assist in transits both via Cape Horn and the Magellan Strait. Winds, waves, fronts, pack ice limits and icebergs are all available and with some systems, ship masters can contact providers directly for updates, or to discuss their concerns.

It should also be remembered that situations can change rapidly and vessels should maintain constant vigilance for weather forecasts. Any local forecasts received via VHF are likely to be in Spanish.

Vessels should prepare for heavy weather in their usual way as per their Company Safety Management System (SMS), regardless of weather forecasts, and always act on the basis that extreme conditions could be experienced in these latitudes. The use of heavy weather ballast should also be part of the risk assessment process.

### 17 Ice

Icebergs are present in both summer and winter seasons and can be both glacier and tabular bergs. In southern waters tabular bergs tend to be the most numerous, and can be extensive in size, reportedly up to 20 miles in length.

The likelihood of encountering ice diminishes the further north and west the vessel is, particularly in the summer season when the wind is predominantly West to North West. Bergs are found on both the Pacific
and Atlantic side of South America; however the northernmost extent is greater on the Atlantic side.

Most of the ice encountered derives from the Antarctica shelves and, after moving initially North and West, the Southern Ocean Current carries them Northeasterly. The Falkland current then carries the occasional berg up towards the Falkland Isles.

Additional manpower for lookouts should be considered, as well as the usual cold weather precautions, forming part of the SMS.

18 **Waiting Areas**

For vessels proceeding Eastbound there are no obvious locations on the western side of Cape Horn for vessels to ‘wait’ ahead of a weather window.

On the East coast, vessels proceeding Westbound can wait North of Cabo San Diego. It is recommended that vessels maintain a constant check on weather forecasts and consider utilising alterations in speed to suit desired ETA’s at the various stages of the passage.

19 **Cargo Heating Bunkers**

Consideration should be given to increased minimum bunker reserves in case the vessel encounters severe weather delays on passage. Additional fuel may also be required for cargo heating in cold winter climates.

20 **Reporting Systems**

Vessels may participate in the CHILREP reporting system; however this is not mandatory for non-Chilean flag vessels. Ships may wish to consider AMVER as an alternative.