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Compliance on Fire Safety Measures among Ships from Flags of Convenience Countries in Malaysian Ports

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Abstract: ***This study aims to identify the trends and performance of the top five Flags of Convenience (FOC) or open registries comprising of Panama, Marshall Island, Liberia, Malta and Bahamas as compared to the top five traditional flag states or non-FOC registries, which are Hong Kong, Singapore, China, Greece and Japan in term of their compliance to the Fire Safety (Code 7) requirements. The focus on fire safety is important since fire is known to be one of the greatest risks to safety on board ships. The outcome of this study has shown that although various measures have been taken by the international community through the introduction of stricter regulations and additional enforcement initiatives through the port state control regime, the standard produced by ships belonging to the FOC countries is still significantly lower than the standard produced by ships of the non-FOC.***

Keywords: Flags of Convenience, Fire Safety, Port State Control, Tokyo MOU.

I. INTRODUCTION

Shipping is considered as the life blood of the global economy as maritime transport dominates more than 80% of international cargo movement. In 2017, world seaborne trade was estimated to be around 10.7 billion tons with compounded annual growth rate projected to expand about 3.8% annually between 2018 and 2023 [1]. Effective maritime safety rules and regulations are needed to ensure ships involved with seaborne trade are being properly manned to avoid any major risk of accidents. The elements of maritime safety consist of technical, operational and human. Therefore, rules and regulations related to maritime safety are meant to deal with these elements [2]. Maritime safety is also related to safe operation of ships and their protection from dangers at sea.

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Malaysia is a maritime country and the maritime sector has contributed much to the development of the country's economy especially in the area of seaborne trade, maritime transportation, energy resources, food source and marine tourism. Meanwhile, safety is a very sensitive and crucial matter in the maritime industry as everything related to safety will have implications on seafarers' lives and the marine environment. Dependency on the maritime sector for the economic growth drives the need for Malaysia's Maritime Authority (referred to as Malaysian Port State Control - MPSC) the responsibility to ensure the smoothness of maritime operations, thus taking any necessary preventive measures to avoid incidents that may interrupt the smooth operations of ships at sea and whilst in ports. Implementation of international and national maritime safety rules and regulations in order to enhance the safety of shipping activities are the main role of the MPSC authority. They need to control, inspect and ensure all foreign ships that enter Malaysian ports comply with the required international safety standards. Since Malaysia is a member of the Asia-Pacific Port State Control (APPSC) Regime or popularly known as the Tokyo Memorandum of Understanding (MOU), MPSC follows the guidelines and regulations agreed under the APPSC.

According to Tokyo MOU Annual Reports, fire safety measures continue to become among the main categories of deficiencies discovered on board ships for three consecutive years from 2016 to 2018. Fire safety deficiencies of 14,960 from a total of 81,271 inspections or 18.41% were recorded in 2016, 13,707 from a total of 76,108 inspections or 18.01% in 2017, and 13,340 out of 73,441 inspections or 18.16% were recorded for 2018 [3][4][5]. Additionally, the Asia Pacific PSC in conjunction with the European and North Atlantic PSC (also known as the Paris MOU) had carried out a Concentrated Inspection Campaign (CIC) with regard to fire safety system in 2012, which disclosed that 69% of the ships detained were because of fire safety issues [6]. The preceding statistics show that negligence on fire safety measures can be considered as a threat to maritime safety throughout the Asia Pacific region. Therefore, it is worthy for the inspections done by the MPSC authority related to fire safety measures under the Tokyo MOU Deficiency Codes (Code 7) to be further examined. Additionally, vessels belonging to the Flags of Convenience (FOC) countries or open registries that used to be categorized as sub-standard ships will be the focus of

This analysis especially on those involving fire safety measures [7][8]. Although the number of sub-standard ships has reduced ever since the introduction of the Port State Control (PSC) regime, there may still be a risk that the FOC ships will continue to contribute in the increase in fire incidents in Malaysian waters. With a total of 4387 ships from the top five FOC countries, namely Panama, Marshall Island, Liberia, Malta and Bahamas recorded for entering Malaysian ports throughout 2018, it could be worrisome that such trend may contribute to the increase in the number of sub-standard vessels entering Malaysian ports [5]. Therefore, it is imperative to examine their compliance towards the Tokyo MOU Deficiency Codes especially with respect to Fire Safety or Code 7 and compare them to ships from the top five non-FOC countries as a benchmark for satisfactory performance.

II. AIMS

This study intends to identify the trends and performance of the top five FOC or open registries comprising of Panama, Marshall Island, Liberia, Malta and Bahamas as compared to the top five traditional flag states or non-FOC registries, which are Hong Kong, Singapore, China, Greece and Japan in term of their compliance to the Fire Safety Measures (Code 7). The focus on fire safety is important since fire is known to be one of the greatest risks to safety on board ships [9]. Meanwhile, Fire and Rescue Department of Malaysia (FRDM) had also recorded a total of 54 fire incidents in Malaysian waters involving merchant ships between 2012 and 2016 involving an average of 11 ships per year [10]. The period of examination of this study is from 1st January 2009 until 31st December 2018 (10 years) and data will be obtained from the Asia-Pacific Computerised Information System (APCIS) database.

III. ENFORCEMENT OF PORT STATE CONTROL REGIME

After the enforcement of the PSC regime, many open registries have consolidated their rules and regulations involving safety and security measures on board ships carrying their flags. These efforts have generally resulted in an improved and comprehensive approach towards the eradication of all the issues that were formerly featured as their weakness [11]. In order to ensure that similar improvement also happened in Malaysian ports, the performance of the selected FOC registries are compared with the selected traditional flag states or non-FOC registries. Data collection is performed through the filtering process of APCIS online database on Code 7 (fire-safety-related) deficiencies for a period of 1st January 2009 until 31st December 2018 involving the categories as listed in Table 1:

Table. 1 Code 7 of Tokyo MOU [12]

Code	Description
(a)	(b)
07101	Fire Prevention Structural Integrity
07102	Inert Gas System
07103	Division - Decks, Bulkheads and Penetrations
07104	Main Vertical Zone
07105	Fire Doors / Openings in Fire-Resisting Divisions.
07106	Fire Detection and Alarm System
07107	Fire Patrol
07108	Ready Availability of Fire Fighting Equipment
07109	Fixed Fire Extinguishing Installation
07110	Fire Fighting Equipment and Appliances
07111	Personal Equipment for Fire Safety
07112	Emergency Escape Breathing Device and Disposition
07113	Fire Pumps and Pipes
07114	Remote Means of Control (opening, pumps, ventilation, etc.) for Machinery Spaces
07115	Fire-Dampers
07116	Ventilation
07117	Jacketed High-Pressure Lines and Oil Leakage Alarm
07118	International Shore-Connection
07120	Means of Escape
07121	Crew Alarm
07122	Fire Control Plan
07123	Operation of Fire Protection Systems
07124	Maintenance of Fire Protection Systems
07125	Evaluation of Crew Performance (fire drills).
07126	Oil Accumulation in Engine Room
07199	Others (Fire Safety related).

Flag States

A flag state is generally defined as the country in which the ship is registered and has the primary legal authority governing the activities of the merchant ship [13]. Meanwhile, the FOC or open registries are the flag states that normally accept foreign owned ships into their registers. These open registries are preferred by shipowners mainly as a way of reducing costs [13]. More than 70% of the commercial fleet is registered under the open registries or FOC. Panama has become the leading FOC followed by Liberia and Marshall Island [1]. UNCTAD also revealed and illustrated the leading flag registrations for the year of 2018 as per Table 2:

Table. 2 Top 10 Flag Registration by Dead-Weight Tonnage 2018 [1]

Flag	Number of Vessel	Dead-Weight Tonnage (thousands of tons)	Share of World Total Dead-Weight Tonnage (%)
(a)	(b)	(c)	(d)
Panama	7 914	335 888	17.46
Marshall Islands	3 419	237 826	12.36
Liberia	3 321	223 668	11.63
Hong Kong (China)	2615	181 488	9.43
Singapore	3526	127 880	6.65
Malta	2205	108 759	5.65
China	4608	84 184	4.38
Bahamas	1418	76 659	3.98
Greece	1343	72 345	3.76
Japan	5299	37 536	1.95

Table II shows that the open registries are still preferable to the ship owners with the world's biggest FOC assumed by Panama, Marshall Island, Bahamas, Liberia, and Malta. These FOC countries are within the top ten of the world preferred ship registries. Vessel owners tend to consider registering their vessels under the FOC countries for reasons such as to avoid taxes, reduced enforcement on safety regulations and more relaxed labour regulations. Ford and Wilcox (2019) also argue that FOC is considered by the vessel owners because they could avoid regulations imposed by the flag states and maximise the economics benefits through reduction in taxes and crew salary [14]. Over the years, the FOC has been criticised, disapproved and become the most contentious matter in the merchant shipping industry [11]. Their compliance to international conventions such as on the aspects of security, labour, and safety have frequently been debated and compared to the traditional flag states or the non-FOC that are stricter in term of ownership requirement, management and manning of the ships [11]. The PSC regime was legalised when the International Maritime Organisation (IMO) adopted Resolution A.682(17) on regional cooperation in controlling ships and discharges from ships, which was adopted on 6 November 1991 [15].

Asia-Pacific Computerised Information System

The Asia-Pacific PSC regime was established on 1st December 1993 after member countries that participated in its final preparatory meeting in Tokyo agreed to implement it. Members of the Asia-Pacific MOU on PSC or popularly known as the Tokyo MOU agreed to cooperate and exchange information on vessels inspected by them with other members via the Asia-Pacific Computerised Information System (APCIS). All the inspection results of the 20 Asia-Pacific PSC authorities, i.e. Australia, Canada, Chile, China, Fiji, Hong Kong, Indonesia, Japan, Republic of Korea, Malaysia, Marshall Islands, New Zealand, Papua New Guinea, Peru, Philippines, Russian Federation, Singapore, Thailand, Vanuatu, and Vietnam will be stored and organised in a central database that is accessible by all members. However, it can only be edited, changed, and updated by authorised personnel after the authority that provides the data approves and authenticates it. The system is being maintained by the Asia-Pacific Maritime and Advisory Services under the Ministry of Transport of the Russian Federation.

IV. RESULTS

Meanwhile, since Malaysia is one of the Tokyo MOU signatories, all the inspections done by the MPSC are also recorded and published in the APCIS database. For inspections done by the MPSC, Table 3 shows the figure of FOC ships inspections with deficiencies in relation to the number of inspections by MPSC over a period of 10 years from 2009 to 2018.

Table. 3 Number of Inspections with Deficiencies in Relation to the Number of Inspections Conducted by MPSC on board FOC Ships [16]

Year	Flags					Total
	Panama	Marshall Island	Liberia	Malta	Baha-mas	
(a)	(b)	(c)	(d)	(e)	(f)	(g)
2018	140/358	35/141	45/117	11/41	3/13	**234/670**
2017	184/415	34/116	36/84	18/46	4/15	**276/676**
2016	146/381	28/83	33/72	7/25	2/3	**216/564**
2015	159/337	20/52	14/50	6/8	3/7	**202/454**
2014	118/261	12/43	14/43	5/16	4/11	**153/374**
2013	121/257	16/36	17/38	4/13	6/9	**164/353**
2012	140/264	12/41	14/47	7/17	0/11	**173/380**
2011	187/301	12/29	15/38	6/16	9/13	**229/397**
2010	89/182	4/15	7/25	1/7	4/9	**105/238**
2009	46/96	2/8	4/18	2/6	1/3	**55/131**
Total	**1330/ 2852**	**175/564**	**199/532**	**67/195**	**36/94**	**1807/ 4237**

In comparison, Table 4 presents similar data recorded on board non-FOC ships.

Table. 4 Number of Inspections with Deficiencies in Relation to the Number of Inspections Conducted by MPSC on board Non-FOC Ships [16]

Year	Flags					Total
	Hong Kong	Singa-pore	China	Greece	Japan	
(a)	(b)	(c)	(d)	(e)	(f)	(g)
2018	27/126	91/265	7/30	0/2	0/0	**125/423**
2017	50/175	85/257	7/21	1/5	0/2	**143/460**
2016	38/124	69/168	8/32	2/3	0/0	**117/327**
2015	41/125	57/151	28/85	1/3	1/1	**128/365**
2014	35/91	55/153	13/43	0/1	0/0	**103/288**
2013	31/91	52/127	12/33	0/1	0/0	**95/252**
2012	35/90	46/120	12/33	0/1	0/0	**93/244**
2011	30/77	41/101	4/10	0/1	1/1	**76/190**
2010	14/36	52/102	7/9	3/10	0/1	**76/158**
2009	6/20	17/56	3/7	0/1	2/2	**28/86**
Total	**307/955**	**565/1500**	**101/303**	**7/28**	**4/7**	**984/2793**

Based on Table 3, 1807 from a total of 4237 inspections on board FOC ships or 42.6% of the total inspections have resulted in findings with deficiencies. This figure is relatively high as compared to the data for non-FOC ships at Table IV that recorded 984 findings with deficiencies from a total of 2793 inspections or 35.2%. The annual comparisons between the FOC and non-FOC ships in term of percentage of inspections with deficiencies and percentage of deficiencies involving Code 7 are presented in Table V and Fig. 1.

Table. 5 Percentages of Inspections with Deficiencies [16]

Year	FOC Ships		Non-FOC Ships	
	Percentage of inspections with Deficien-cies (No. of inspections)	Percentage of inspections with Deficien-cies involving Code 7 (No. of inspections)	Percentage of inspections with Deficien-cies (No. of inspections)	Percentage of inspections with Deficien-cies involving Code 7 (No. of inspections)
2018	34.9% (234)	11.9% (80)	29.6% (125)	12.8% (54)
2017	40.8% (276)	13.6% (92)	31.1% (143)	7.8% (36)
2016	38.3% (216)	12.1% (68)	35.8% (117)	13.1% (43)
2015	44.5% (202)	14.1% (64)	35.1% (128)	8.2% (30)
2014	40.9% (153)	13.9% (52)	35.8% (103)	15.6% (45)
2013	46.5% (164)	21.8% (77)	37.7% (95)	15.1% (38)
2012	45.5% (173)	20.0% (76)	38.1% (93)	12.7% (31)
2011	57.7% (229)	29.7% (118)	40.0% (76)	9.5% (18)
2010	44.1% (105)	21.0% (50)	48.1% (76)	17.7% (28)
2009	42.0% (55)	12.2% (16)	32.6% (28)	10.5% (9)
Ove-rall	**42.6% (1807)**	**16.4% (693)**	**35.2% (984)**	**11.9% (332)**

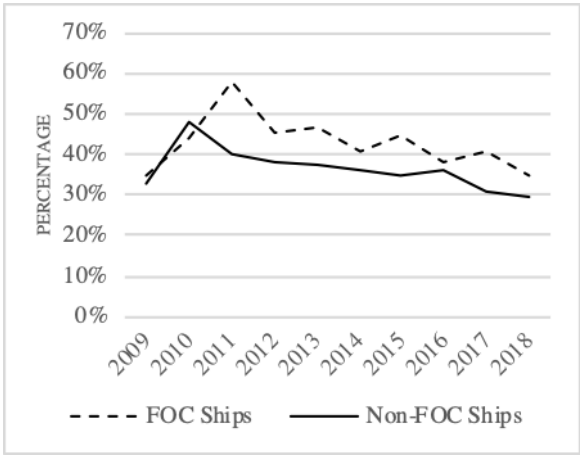

Fig. 1 Percentage of Inspections with Deficiencies [16]

With respect to the data at Table V and Fig. 1, it can be concluded that the percentage of inspections with deficiencies on board the top five FOC ships over the last 10 years is 42.6%, which is significantly higher as compared to only 35.2% involving the top five non-FOC ships. For deficiencies involving Code 7, the trend happened to be similar with 16.4% for inspections with deficiencies for the FOC ships and only 11.9% for non-FOC ships. In fact, throughout the 10 year period, the percentage of FOC ships with deficiencies involving Code 7 were higher than the non-FOC ships except in 2014 and 2018.

In order to test whether the difference between the two results is significance, a Student's T-Test for 2 independent means was done to see whether the two data sets differ significantly at risk level called the alpha level of 0.05, which is the level commonly used in social science research [17]. The outcome of the T-Test shows that the means of inspection with deficiencies involving Code 7 on board FOC ships and non-FOC ships over the last 10 years are significantly different at $p < 0.05$ (probability value is less than 0.05).

V. CONCLUSION

In conclusion, this study has shown that although various measures have been taken by the international community through the introduction of stricter regulations and additional enforcement initiatives through the PSC regime, the standard produced by ships belonging to the FOC countries is still significantly lower than the standard produced by ships of the non-FOC countries. This only shows that despite a plethora of enforcement initiatives, serious measures taken by the flag states to ensure the adherence of their vessels to contemporary safety regulations enforced globally are still necessary to ensure safety of ships and seafarers, and the protection of the marine environment. Since the adherence to fire safety measures is arguably the most important as compared to other safety measures, additional efforts need to be taken by the various flag states, whether FOC or otherwise, to reduce the number of deficiencies under Code 7. As we are generally aware, fire incident on board ship is not only dangerous to the vessel and her crew but may result in a major catastrophe to the marine and coastal environment. Since this study is limited only to ships of the top five FOC countries and top five non-FOC countries visiting Malaysian ports, it is proposed that the research to be further expanded to include all the ships visiting Malaysian ports or ports of the Tokyo MOU member countries. This will allow for a better generalisation on the adherence to Code 7 internationally.

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REFERENCES

1. UNCTAD (United Nations Conference on Trade and Development), Review of Maritime Transport 2018, UNCTAD Publication, 2018.
2. P.K. Mukherjee & M. Brownrigg, "Farthing on International Shipping", WMU Studies in Maritime Affairs Vol 1, Springer-Verlac. 2013.
3. Tokyo MOU Secretariat, Annual Report on Port State Control in the Asia Pacific Region, 2015. URL: http://www.tokyo-mou.org/ANN15.pdf [Accessed April 8th, 2019].
4. Tokyo MOU Secretariat, Annual Report on Port State Control in the Asia Pacific Region, 2016. URL: http://www.tokyo-mou.org/ANN16.pdf [Accessed April 8th, 2019]
5. Tokyo MOU Secretariat, Annual Report on Port State Control in the Asia Pacific Region, 2017. URL: http://www.tokyo-mou.org/ANN17.pdf [Accessed April 8th, 2019].
6. Tokyo MOU Secretariat, Report of the 2012 Concentrated Inspection Campaign (CIC) on Fire Safety Systems, 2013.

7. K. X. Li, "The safety and quality of open registers and a new approach for qualifying risky ships", Transportation Research Part E, Vol 35, 1999, pp. 135-143.
8. A.M. Arof & M.H. Zulkifly, "The effectiveness of Port State Control Regime on Bulk Shipping", Marine Frontier, Vol 3 (1), 2012, pp. 1-9.
9. C. Azzi, A. Pennycot, G. Mermiris. & D. Vassalos, "Evacuation of Shipboard Fire Scenarios", Proceedings of Fire and Evacuation Modelling Technical Conference, Baltimore, Marryland 15 – 16 August 2011, 2011, pp. 1-7.
10. FRDM (Fire and Rescue Department, Malaysia), Laporan Tahunan JBPM (FRDM Annual Reports) 2012, 2013, 2014, 2015 & 2016, www.bomba.gov.my/index.php/pages/view/746 (Accessed Aug 4th, 2019).
11. E. Xhelilaj & E. Xhelilaj, "International implications concerning the legal regime and policy of ship registration," Constanta Maritime University Annals, Vol 19 (1), 2013, pp. 323-330.
12. Tokyo MOU, Tokyo MOU Deficiency Codes Implemented From January 2012, http://www.tokyo-mou.org/publications/Tokyo_mou_deficiency_codes .php (Accessed July 15th, 2019).
13. M. Stopford, Maritime Economics, 3rd Edition, Routledge. 2009.
14. J. H. Ford & C. Wilcox, "Shedding Light on the Dark Side of Maritime Trade – A New Approach for Identifying Countries as Flags of Convenience", Marine Policy, Vol 99, 2019, pp. 298 – 303.
15. International Maritime Organization, Resolution A692 (17) - Regional Co-operation in the control of Ships and Discharges, London, 21 November 1991.
16. Tokyo MOU, Asia-Pacific Computerised Information System, http://apcis.tmou.org/public/#1 (Accessed July 15th, 2019).
17. W. R. Schumm, K. K. Pratt, J. L. Hartenstein, B. A. Jenkins & G. A. Johnson, "Determining statistical significance (alpha) and reporting statistical trends: controversies, issues, and facts", Comprehensive Psychology, Vol 2, Article 10, 2013, pp. 1 – 6.

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