ISF Institute of Research and Education (IIRE)

IIRE JOURNAL of MARITIME RESEARCH & DEVELOPMENT (IJMMD)

November 2018
ISF Institute of Research and Education (IIRE)

IIRE JOURNAL of MARITIME RESEARCH & DEVELOPMENT (IJMRD)

Volume 2 Issue 2

November 2018
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ISSN: 2456-7035

Published by:

ISF INSTITUTE OF RESEARCH AND EDUCATION (IIRE)
410, Gemstar Commercial Complex, Ramchandra Lane Ext, Kachpada,
Off Link Road, Malad (W), Mumbai 400 064, INDIA.
Website: www.iire.in, www.isfgroup.in

Link of Publication: - http://iire.in/ojs/index.php/IJMRD
Place of Publication: - Mumbai
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TOWARDS MANDATORY STANDARDIZATION OF TECHNICAL DOCUMENTATION

Dr. (Capt.) Suresh Bhardwaj

Abstract

Technical documentation guides the operators in handling machinery and technology safely. In the operation of ships and its machinery, there is no standard for technical documentation. Every manufacturer creates technical documentation the way he thinks is best. Because of this, all technical manuals delivered for a ship look different and are structured differently. In case of an integrated system, the designer or yard delivers own technical documentation separately and merely adds the manuals from the component manufacturers, which for the crew is a nightmare to use. This paper advocates mandatory standards for technical documentation in the operation of ships and its equipment.

Keywords: Operation Manuals, Technical documents, ASD S1000D

1. INTRODUCTION:

Technical documentation guides the operators in handling machinery and technology safely.

In the operation of ships and its machinery, there is no standard for technical documentation. Every manufacturer creates technical documentation the way he thinks is best. Because of this, all technical manuals delivered for a ship look different and are structured differently. In case of an integrated system, the designer or yard delivers own technical documentation separately and merely adds the manuals from the component manufacturers, which for the crew is a nightmare to use.

BIMCO 2015 report says that technical manuals delivered with many ships do not give “any form of rational guide for operation and maintenance of the ship and her equipment,” and that this is “responsible for a number of accidents” [BIMCO 2015]. CHIRP (Confidential Human factors Incident Reporting) Maritime Advisory Board has recommended that “Manufacturers of equipment for safety critical marine applications should provide operating and maintenance manuals to a common document standard” and that “A relevant authority should verify the compliance and audit its continued compliance” [CHIRP 2014, p. 2].

This paper is contributing to this field by suggesting a concrete technical
documentation (TD) standard, which is ASD S1000D. (ASD is Aerospace and Defence Industries Association of Europe)

This specification is already mentioned in a document of the Institute of Marine Engineering, Science and Technology (IMarEST) which was handed in to the Maritime Safety Committee of the IMO in 2014 [IMarEST 2014].

2. TD CAUSED ACCIDENTS:

An analysis of the accident reports published in MARS (Mariners’ Alerting and Reporting Scheme – a confidential reporting system run by Nautical Institute, UK) for the years 2012 to 2015 is carried out with specific reference to failures in maintenance and operation which is classed as follows:

• **Missing maintenance**, - At the first sight this seems not related to TD. But TD contains not only instructions on how to perform the job, but also how often and under which conditions.
• **Maintenance procedures missing** - Here the difference lies in the responsibility for the failure which in this case is on the manufacturers or yard side.
• **Maintenance procedures not respected** - is the case when the crew was performing maintenance, but not in line with the procedures being available
• **Maintenance procedure wrong**, - where the crew followed the instructions, but these were not correct or incomplete.
• **Operations information not respected,**
• **Operations information missing,** and
• **Non standardized communication** – different interpretation of TD

Deeper analysis revealed that an average 17% of the accidents related to TD whereas 7% of all the accidents related to TD involve casualties.

Furthermore, requiring the TD onboard ships is only one aspect, but requiring it be used is another. When this aspect is compared with Civil Aviation, Civil Aviation requires the maintenance organization to “provide a common work card or worksheet system - that transcribes accurately the maintenance data onto such work cards or worksheets [EASA 2003, para. 145.A.45(e)]
Such a provision would necessarily require the TD to be onboard ships and it being used at the same time. This would suitably address the most common reasons for accidents involving the usage of TD.

An Australian Transport Safety Bureau (ATSB) investigation report is noteworthy. While being at anchor the vessels “number two oil-fired thermal oil heater exploded. The explosion seriously injured three crew members and severely damaged the thermal oil heater and surrounding equipment and fittings” [ATSB 2012, p. iii]. As to the cause for the explosion, it was found “that, during maintenance, the thermal oil heater burner nozzle had been assembled incorrectly. This was because ... the manufacturer supplied instructions were not clear and detailed” [ATSB 2012, p. iii].

3. TD RECOMMENDATIONS DO EXIST:

In Shipping, recommendation on TD do exist. MSC.1/Circ. 1253 states “that the attention of all relevant stakeholders needs to be drawn to the importance of ships’ crews having access to up-to-date, accurate and user-friendly shipboard technical operating and maintenance manuals, particularly for safety-critical marine equipment” [IMO 2007, para. 1]. It is these manuals which are commonly referred to as technical documentation (TD).

So also, IACS Recommendation 71 provides criteria for the development of user-friendly technical manuals for operation and maintenance of the ship and her equipment [IACS 2000, para. 1]. Recommendation 71 stresses the usability of TD to be of considerable importance and puts the responsibility on those who provide it, i.e. the manufacturers.

IACS Recommendation 71 also introduces information categories for the content to be delivered. These are:

a) Purpose and planning (what is the system/equipment for);
b) Handling, installation, storage and transit (how to prepare it for use);
c) Technical description (how it works);
d) Operating Instructions (how to use it);
e) Fault action list (how to restore operating condition)
f) Maintenance instructions (how to keep it working);
g) Maintenance schedules (what is done when);
h) Parts list (what it consists of);
i) Modification instructions (how to change it),
j) Disposal instruction (how to dispose of it).

ISM code also in its Paragraph 1.4 specifies in the functional requirements of the SMS that the “company should develop, implement and maintain”:

a) “Instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and Flag State legislation”. [IMO 1993, para. 1.4.2]
b) “Procedures to prepare for and respond to emergency situations.” [IMO 1993, para. 1.4.5]

These instructions and procedures mentioned above must rely on the TD coming from the yard or manufacturers. It includes maintenance as well as operational information, and both are required to operate the vessel safely.

Matter-of-fact, currently the only regulation that could be interpreted as requiring manuals to be held on board ships is the ISM Code, BUT the obligation lies with the vessel’s owners and does not extend to a general requirement for manufacturers to supply such manuals” [MAIB 2010, p. 28]

“Specifically, these regulations (the ISM code) apply to vessel owners and operators, and do not address the role that equipment manufacturers and shipbuilders have in ensuring that equipment is safe and fit for purpose. Consequently, poor design, limited access for maintenance, and weak instruction manuals are regularly found as contributory factors in accidents.” [MAIB 2010, p. 33].

A recent amendment to ISM Code vide MSC 353(92) effective 1st Jan 2015 – may cover this to some extent:
"12.2 The Company should periodically verify whether all those undertaking delegated ISM related tasks are acting in conformity with the Company's responsibilities under the Code." However, it really depends on the owner or operator, as to how much they can push. Standardization yet remains a far cry.

4. THE BASIC S1000D PROCESS:

The basic process used by the S1000D specification is shown in Figure 1. In the context of the shipping industry: In the initial phase of the project the ship-owner and the marine engineers discuss the features of the future vessel. In this phase the design becomes clear, what equipment will be used and what conditions it will be operated in.

This represents the first box in Figure 1 where the same is done for the TD. Already before the TD is being created the requirements for it are agreed with the yard or manufacturer. S1000D supports this process with supplying projects with a list of so called business rules (BR).

The next step is to agree on what kind of information is needed. For this S1000D introduces the term ‘information sets’. A basic feature of S1000D is to focus on information units instead of monolithic manuals. Such an information unit might be the procedure how to assemble the nozzle of the thermal oil heater burner. These information units are called Data Modules (DM)
Based on the design from step 1 one can already derive which components have to be considered. Together with the decision on what kind of information is needed in step 2 a list of required DM can be set up, the so called Data Module Requirement List (DMRL)

“The (DMRL) supports planning, reporting, production and configuration control”. It is usually a contractual document that specifies the extent of the TD to be delivered. This step is represented by the third box from the left in Figure 1.

The production of the DM is represented in Figure 1 by the fourth box from the left. When the production of the DM and related information like illustrations is finished, the data can be published.

The TD of a component like a main engine can easily consist of several thousands of DM. In addition, there are illustrations or multimedia contents too. All these objects must be managed in a consistent way. The S1000D concept for achieving this is the Common Source Database (CSDB).

“It (the CSDB) is an information store and management tool for all objects required to produce the technical publications within projects.

The major objectives for a CSDB are:

- support the technical publication process
- support the controlled authoring
- support the QA process – verification by manufacturer and client
- support the data exchange with partners, suppliers and customers - allows for merging parts of the TD coming from different manufacturers into one CSDB
- support the delivery of technical publications on various media independent from the source storage format” [ASD 2012, Chap 4.2 p. 1]

Very important - the layout of the data shown to the crew is the same for all TD.

In addition, the same content can be used on different media like hand held devices or even an optical head-mounted display in the future.
5. CONCLUSION:

For addressing the quality of the TD the introduction of ASD S1000D as a technical documentation standard has been suggested. The basic S1000D process covers all aspects of the life cycle of TD. It supports the projects from the beginning and again gives clear guidance on what to agree on during each stage of the project.

The specified quality assurance cycle allows for keeping the TD up-to-date while clearly addressing verification methods and responsibilities. The exchange of the TD using S1000D transfer packages allows for a seamless exchange according to fixed rules.

The rather high number - 7% of all accidents that are related to TD and involve casualties is seen as a justification enough for making this mandatory.

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ABOUT THE AUTHOR:

Dr (Capt) Suresh Bhardwaj has 40 years of work experience, which includes 5 years as Master and in command of various types of ships of the merchant marine; subsequently 25 years of multi-disciplinary shore experience in senior and top management positions spanning the marine industry verticals of commercial operations, consultancy, academia and research.
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