SHIP YEAR 2005 edition

The Official Yearbook of the South African Institute of Marine Engineers & Naval Architects

R85.00 $13.00 €11.00 £7.00

CAPE MEDIA

THE NAVAL LOGISTIC MANAGEMENT SYSTEM FOR THE NEW SAN PATROL CORVETTES

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INTRODUCTION AND BACKGROUND

The Naval Logistic Management System (NLMS) is a computer resource used in the logistic management and support of the Prime Mission Equipment (PME) of the new SA Navy Patrol Corvettes MEKO® A-200. The NLMS is being acquired by the SA Navy as part of the Corvette Acquisition Programme from the German shipyard Blohm+Voss GmbH, who as part of the German Frigate Consortium (GFC) are responsible for the delivery of the Platform (i.e. the basic ship without weapon systems).

The NLMS is for Onboard and Ashore use, based on a personal computer system designed to support logistic support tasks. The NLMS provides:

a. Access to logistical data, including the input and control of relevant information such as maintenance scheduling, stores management and the generation of Job Cards (preventive and corrective maintenance).

b. Failure Report initiation and management. This is part of the Failure Recording, Analysis And Corrective Action System (FRACAS), for analysis of corrective maintenance actions related to failures.

c. The generation and management of Interactive Electronic Technical Manuals (IETM's).

d. The NLMS also supports Life-Cycle-Cost calculations (for missions) and Bill-Board-Crew analysis.

The NLMS is an integrated system based on a relational, common source database. Support information is passed electronically via a ship-shore link between the Ashore NLMS site and NLMS onboard each of the four ships, once the ships have berthed.

Log-Tek Engineering Solutions (LTES) are a local logistics company sub-contracted by the GFC to assist with the development of the Integrated Logistic Support (ILS) System for the Platform, as part of the Direct Industrial Participation (DIP) programme. LTES, as the GFC's South African logistic partner have been trained in the appropriate technologies to participate in the necessary development and production effort. This has contributed to the fulfilment of DIP obligations via the production of logistic deliverables in the RSA.

In this regard, Interactive Electronic Technical Manual (IETM) deliverables have been produced on a version of the NLMS during the acquisition. This has created a productive environment where user feedback as well as suggestions regarding end user / SA Navy requirements have been fed back to the developers, during the production and through participation in development workshops and reviews on the system.

LTES have further been empowered to assist the SA Navy with operational support of the Patrol Corvettes e.g. the NLMS.

This article provides an overview of the NLMS and the local LTES production effort related to the NLMS, including some of the challenges faced in this regard. The pertinent aspect of this work is the development and production of IETM's and planned maintenance information on the IETM Module of NLMS.

NLMS OVERVIEW

The Naval Logistic Management System (NLMS) consists of four program modules:

a. Maintenance Material Management System (m^3)

b. Interactive Electronic Technical Manuals (IETM) (Description, Operation, Onboard Maintenance and Parts Data)

c. Life Cycle Cost (LCC)

d. Onboard Crew Organisation (BBO).

Figure 1 provides an overview of the system with respect to its functional modules.

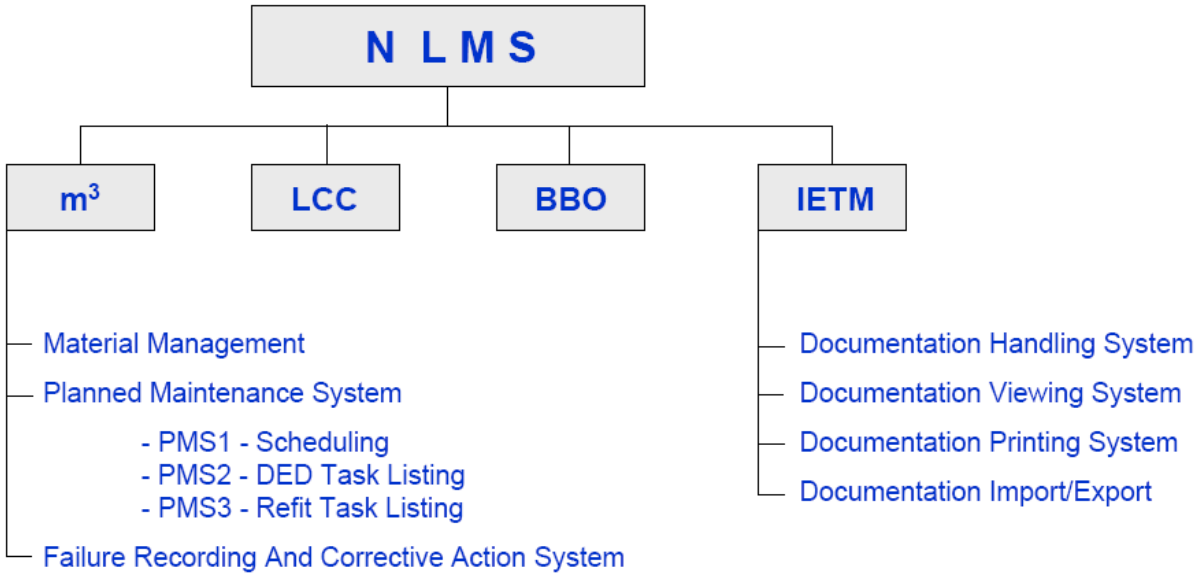


Figure 1: NLMS Functional Modules

The NLMS is an integrated system providing relational capabilities using a common source database. The system provides interactivity between various functional modules and includes a configuration and administration function. The basic functionality of the various modules is as follows:

Maintenance Material Management System (m^3)

This is a computer-aided servicing and maintenance system with integrated material management. The basic information managed by the system is shown in Figure 2.

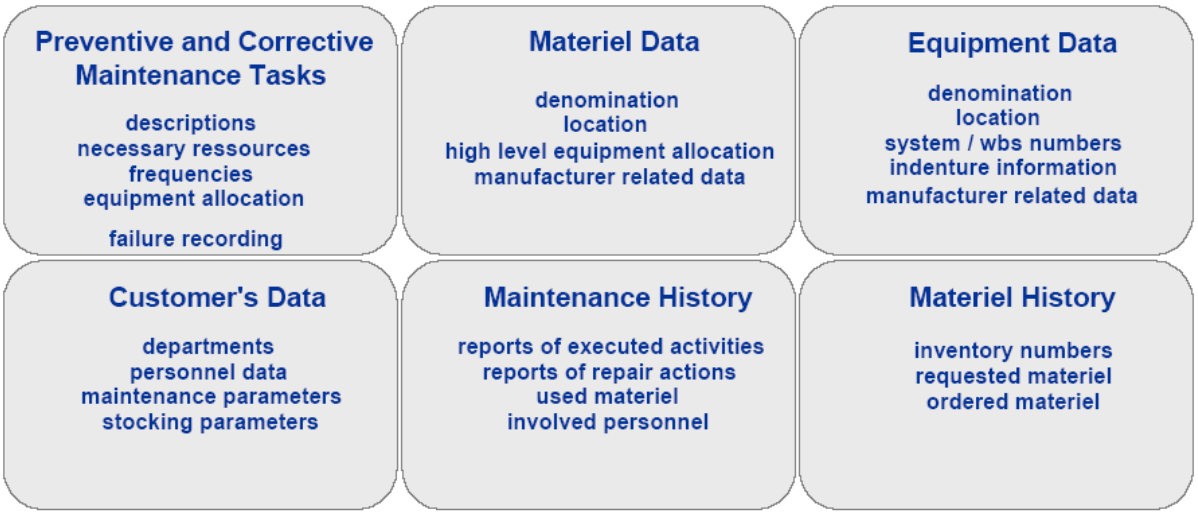


Figure 2: Information on m^3 System

The main highlights of the m^3 System are:

a. Task Scheduling per ship according to Periodicity, the Operational Cycle Model and Equipment Utilisation.

b. Optimises task scheduling according to resource availabilities and priorities.

c. Provides Material Prognosis for preventive maintenance for a definable period.

d. Provides continuous Material Monitoring and History.

e. Provides for the generation and control of Failure Reports.

f. Has links to access procedural information contained in the IETM.

g. Has an inherent control mechanism for data integrity

The m^3 System has an electronic interface with the IETM module, from which information such as maintenance procedures and resource and spares requirements for tasks is accessed.

The objective of the m^3 System is to provide effective and efficient material and maintenance management to facilitate maximum equipment operational availability on the ships.

Interactive Electronic Technical Manuals (IETM's)

The Interactive Electronic Technical Manual module is designed for the usage, management and maintenance of the electronic documentation used on the system. Figure 3 provides an overview of IETM with respect to its functional elements.

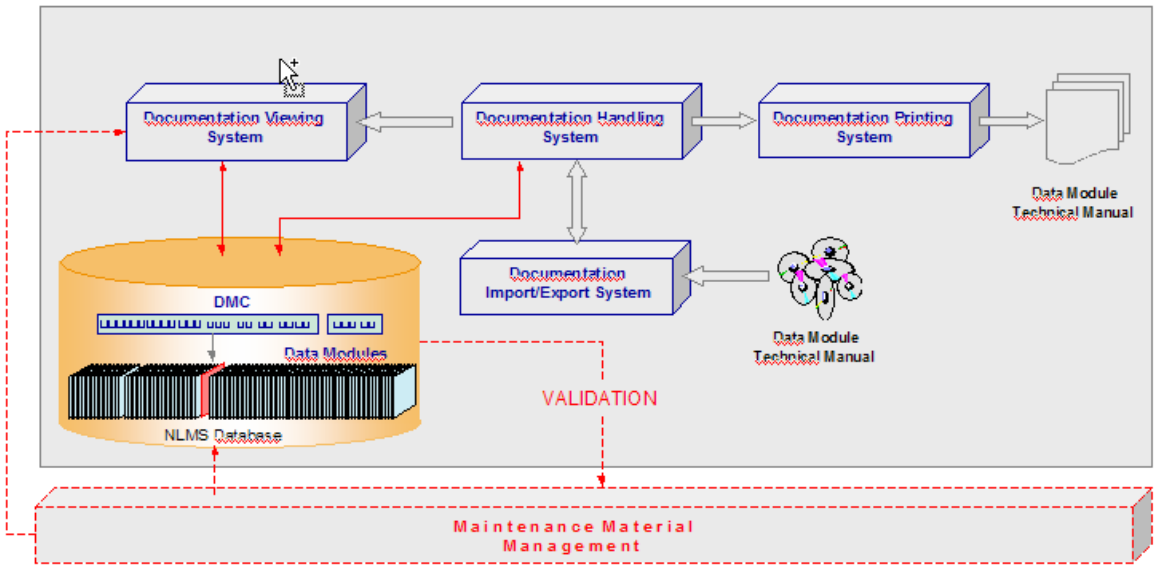


Figure 3: Interactive Electronic Technical Manual

The basic functionality of the IETM module is as follows:

a. The Document Handling System (DHS) provides for the structuring and management of the Data Modules (DM) that make up the individual IETM's (manuals).

b. The Document Viewing System (DVS) provides for the viewing of information contained in the IETM's (data modules) on screen, using Microsoft Internet Explorer. The DVS also provides for printing of individual DM's onboard the ships.

c. The Document Print System provides for the printing of complete books at the Ashore NLMS site.

d. The Document Import / Export module provides for the import and export of IETM DM's at the Ashore NLMS site.

Refer to Figure 6 for an overview of this module with respect to the development of the IETM information content.

The main highlights of the IETM are:

a. Management of the configuration status of each document.

b. Same "Look and Feel" for each document (RSA MIL SPEC 53).

c. Quick access to referenced information by “mouse click”.

d. Interfaces with Maintenance Material Management (m^3).

e. Distribution of updated information without delay.

f. Inherent control mechanism for data integrity and data validation.

Life Cycle Cost (LCC)

This module assists ashore System Management with mission planning with respect to varying mission profiles, in consideration of the main cost drivers e.g. fuel, lubricants, etc.

Onboard Crew Organisation

This module facilitates the organisation and management of crew onboard the ships with respect to postings, ranks, numbers, etc.

The NLMS Ashore is the primary site where the management and maintenance of the support information (Data Content) is done. It provides for the consolidation of relevant information from the four ships via a ship-to-shore IT link, as well as the management and transfer of new or revised information to the ships. Updates are automatically exported to the ships once the ship-to-shore connection is made. Figure 4 shows the transactional process in this regard.

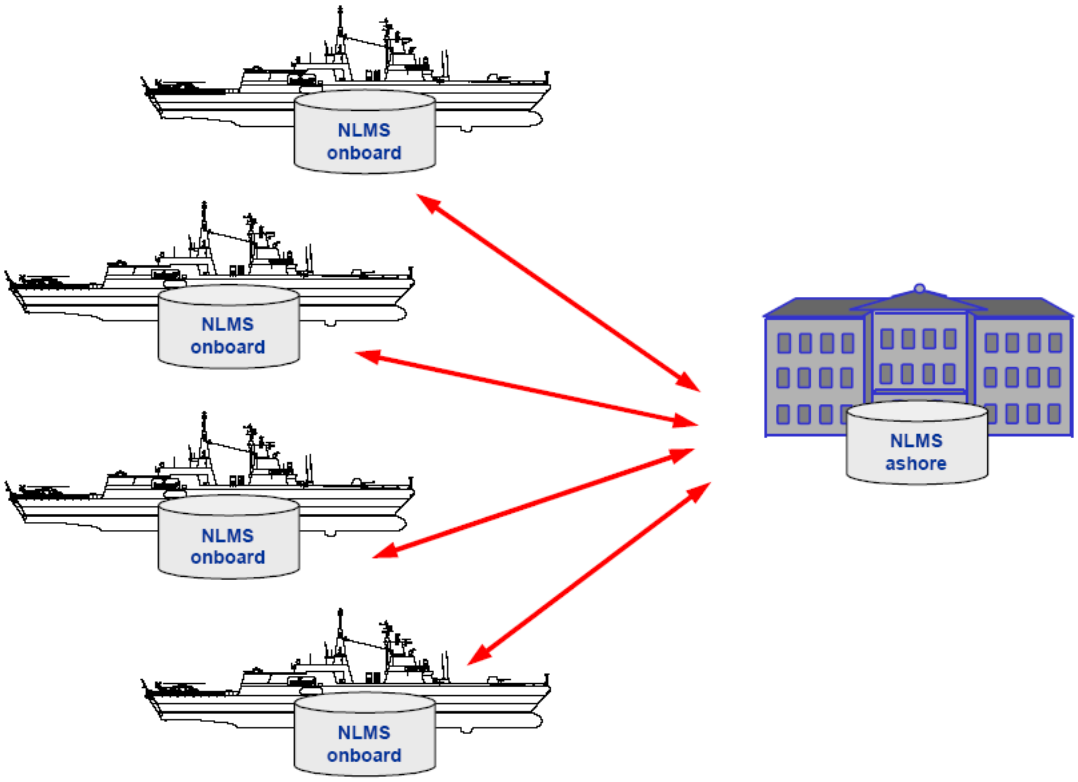


Figure 4: Transaction Process

The NLMS abides by the principle of creating information once and using it many times. An example of this is the use of maintenance information contained in the data modules (DM’s) of the IETM for the onboard preventive maintenance activities of the m^3 System. Information such as task periodicities and resource requirements used in preventive maintenance planning and activities within the m^3 System are updated in the applicable DM’s of the IETM module. This information is then sourced by the m^3 System as required. Information in this regard therefore only has to be updated once.

INTERACTIVE ELECTRONIC TECHNICAL MANUALS (IETM MODULE)

There are two main aspects to the NLMS, (1) the application software providing the functionality of the system, and (2) the Data Content (i.e. the support information managed and used within the NLMS relevant to ship operation, maintenance and support activities).

> Note: Data Content is information used for management, maintenance and / or support purposes that is loaded and used via a computer system e.g. maintenance planning and material management information, maintenance procedures, IETM's, etc.

This topic relates primarily to the Data Content of the IETM module of the NLMS, used to provide onboard crew with operation, maintenance and support information, available to them electronically at applicable workstations on the ship. This information was firstly delivered as hardcopy technical manuals at system and equipment level, for vetting and acceptance by the SA Navy, and then as Final Technical Manuals (with associated magnetic media). The work in this regard covers the conversion of information contained in the manuals to IETM's (i.e. information relevant to onboard Line 1 operation and maintenance). The following is a brief overview of the process to bring the required information into the NLMS (IETM).

Conversion Process Overview

Standard Generalised Mark-up Language (SGML) tagging is used in the conversion of available and /or scanned magnetic media to electronic documentation format. This provides interactivity and structure to the electronic documentation, resulting in a Class 3 IETM as required by the SA Navy.

> Note: Class 3 IETM's are typically SGML-tagged documents with some level of added intelligence and hyper linking through a linear structure

In the conversion, the data module (DM) approach is used whereby individual elements of information are compiled into a single DM e.g. one DM for each maintenance task. Document Type Definitions (DTD) were provided by the GFC, which define the structure for the individual DM's in terms of what SGML element are used and the properties and attributes of these elements. Three DTD's are applicable:

a. A Descriptive DTD for textual type descriptive information

b. A Procedural DTD for aspects of the manuals that contain procedural steps such as maintenance tasks, and

c. An Illustrated Parts Data DTD for parts data and associated illustrations.

The compilation / grouping of DM's then makes up the individual IETM's (i.e. for each technical manual), based on the international standard AECMA Spec 1000D. This is done generally in accordance with the SA Navy documentation standard, RSA MIL SPEC 53.

Business Rules tailored to the specific programme requirements are provided, that govern the entire process of conversion to IETM, including structuring (i.e. the Business Rules interpret the DTD's on how the structuring of the DM's that form the IETM must be done). All converted information (Data Content) then resides within the database for accessing via the IETM module (Document Handling System or Document Viewing System), or m^3 System of the NLMS.

The process is considerably more complex than this simplistic overview provided to give readers a general understanding of this aspect of the work.

Regarding planned maintenance, preventive maintenance (PM) tasks and procedures required for onboard maintenance do not follow the traditional approach of hard copy PM cards contained in a separate, stand alone planned maintenance system. With the NLMS, all preventive maintenance information is included in the relevant section of the IETM's (i.e. Category 5C- Planned Maintenance Procedures, of RSA MIL SPEC 53). This information is then accessed electronically from the Planned Maintenance System of the m^3 Module of NLMS. Job Cards are then printed out onboard the ships, inclusive of required procedural

and resource requirement information. This approach facilitates the easy updating and control of relevant information to ensure that the latest information is used (i.e. related information only has to be updated and controlled in one place).

IETM / Documentation Tree

This topic relates to the structure of the IETM's within the Document Handling System (DHS) of the IETM module. This structure is achieved via the electronic linking of associated IETM data modules. The concept is to have a high level Ship Information Manual (SIM) providing an overview of the complete vessel, linking down to lower level more detailed documentation, firstly at system and then at equipment level. Figure 5 shows a typical documentation structure.

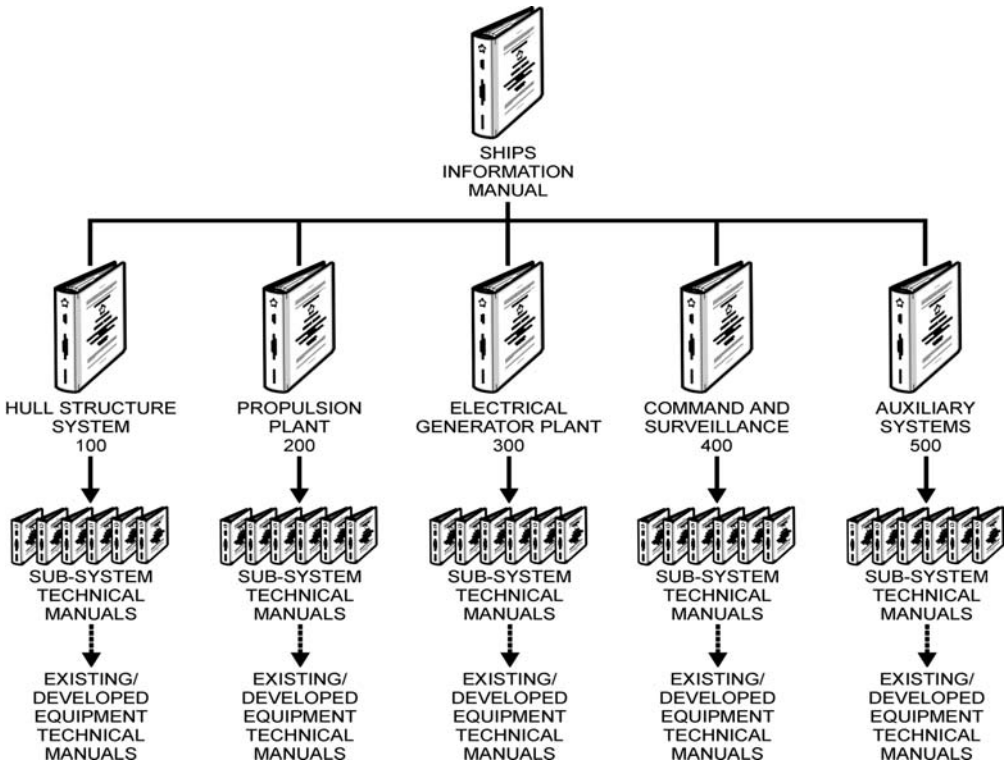


Figure 5: Typical Documentation Structure

A benefit of this type of structure, once the content and electronic linking have been validated, is that it provides a virtually foolproof guide for accessing information for new and existing ship staff. In this way, one can drill down in a structured, logical way from the high-level ship and system overviews contained in the SIM, to more detailed operating, technical and maintenance information in the system manuals and equipment manuals. It is also possible to link upwards from lower level to higher level information e.g. equipment to system to ship.

It must be noted that linking is also done within individual DM's and to associated DM's within individual IETM's (manuals), as applicable. Referencing is also done in IETM's to hardcopy technical manuals, where these are not available electronically e.g. a reference to an in depth workshop manual.

Challenges in the Development of IETM's

In the course of progressing this part of the work, numerous significant challenges have been met and overcome. The following is an overview in this regard.

The NLMS, while based largely on a previous version of the system used on other ships, has itself been under re-development with respect to system enhancements and specific end user requirements. At the same time, the Data Content has had to be produced locally on a development version of the system, with modifications and updates to the NLMS application software coming through as the work progresses. This has understandably influenced

production as things can change; possibly resulting in some rework, but it has had the benefit of providing useful feedback from a realistic production environment to the GFC developers. It has also allowed SA Navy end users and programme personnel (SAN and Armscor) view the system in a productive environment during development, no doubt facilitating the situation where the final acceptance of the system by the client will go smoothly with few, if any surprises.

The SA Navy standard for documentation, RSA MIL SPEC 53 is a standard for hard copy technical manuals and not electronic documentation (an update to accommodate electronic documentation is pending). The necessary tailoring has however been done so that together with the international standards DEF STAN 060 and AECMA 1000D, an optimum solution for the programme has been realised, to the satisfaction of the client.

The supplied source data (technical manuals) have been a mixture of existing manuals for off-the-shelf-equipment (e.g. pumps, motors, etc), revised system manuals for systems acquired with non-standard configurations and newly developed system manuals (in this case developed to the SA Navy standard). In this regard, LTES have the responsibility to develop the overall Ship Information Manual (SIM).

These many different formats (some only available in hardcopy format) are required to be restructured into a single format for the IETM's. Figure 6 shows the IETM development process with respect to the various source material formats and the IETM System.

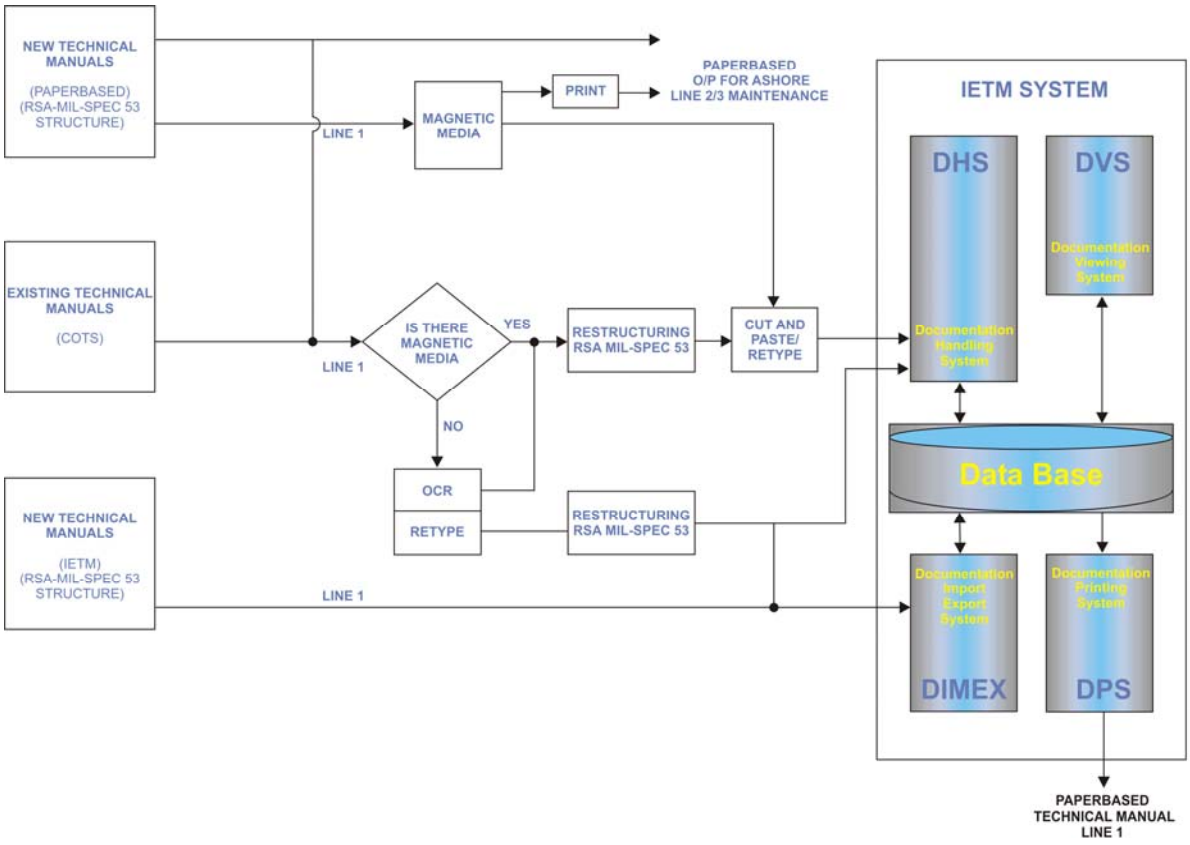


Figure 6: IETM Development Process

A further challenge relates to the supplied manuals being restructured into individual data modules (DM's). In this regard, one manual results in many DM's (sometimes 100's for a complex system). At least two aspects are pertinent in this regard:

a. Different people would come up with different approaches to restructure the individual manuals. Although the Business Rules provide guidance, there is no strict recipe and personal preference will always play a part, thus there had to be strict control of the restructuring. The challenge is therefore to achieve the optimum structure for each IETM so that information can be readily found in an easy, logical way. Since the information is intended for end users of the ship systems, their involvement at this stage

could have its advantages avoiding possible changes at a later stage. The subjective nature of this however means that the more people involved the more permutation one could come up with. Competent, experienced technical authors familiar with end user requirements are necessary at this stage of the development to address this challenge. Less skilled workers can then be used to populate the structure provided with the required information from the manuals.

b. Sound configuration control of the many thousands of DM's, tracking back to the applicable source material (manuals), is vital both in the development of the IETM's and in operational phase support. During the operational phase, changes to equipment that result in changes to technical manuals, or any enhancements to manuals will be made to the original manuals and not to the IETM's. Such changes will have to be carried through to the IETM's and the question of which DM's are affected and need to be updated will be pertinent.

   This need has been addressed by using the available fields in the Documentation Handling System (DHS) of the IETM module to ensure strict traceability to applicable source data for each DM. There is also a need to be aware of the status of the source data used. To this end, a control database is used to manage configuration control of all supplied source material with respect to version and individual page status.

   In addition to this, the NLMS has a strong built in configuration control functionality controlling the version status of individual IETM's and associated DM's. This includes controlling each DM with respect to its applicability to each ship. In this regard, there could be a situation where there are four variations of a DM, one for each ship.

CONCLUSION

The Naval Logistic Management System (NLMS) is proving to be an excellent system that will no doubt meet and exceed client expectations in its implementation. It is a complex, user friendly system that provides interactivity, effective configuration management functionality and relational database capabilities.

The good knowledge and understanding of the system built up over time in the production of the Interactive Electronic Technical Manuals and related work has resulted in Log-Tek Engineering Solutions (LTES) being able to fulfil its obligations as the South African logistic partner to the German Frigate Consortium (GFC) to the fullest extent. LTES understandably in this scenario have probably the best "user" experience on the developed system. This has resulted in further opportunities to support their German customer by developing the Training Manuals and Test Procedure for the system, and by assisting with the presentation of initial training on the system to SA Navy users and administrators. In this regard, the Technology Transfer to local industry obligation of the GFC has been fulfilled with LTES capable to support the SA Navy with the system in the operational environment.

The SA Navy face challenges in the implementation of the system in their operational environment. This primarily relates to revising relevant processes and procedures to accommodate the promulgation of electronic documentation, maintaining the configuration baseline comprising many thousands of data modules as part of the Engineering Change process, and addressing security issues arising from the need to have certain confidential information available on the ships and SA Navy LAN's. As it is a new system, training the selected personnel to operate and maintain the system is also very important. Good knowledge of the system established by the programme logistic team during the development of the system and a proactive approach ensure that these aspects are addressed satisfactorily and in the best interest of the end users of the system.

While the NLMS has currently been developed as a military application and there has been some interest expressed within the SA Army in its use, it has great potential to also be used for commercial applications. The programming capability exists to, without significant effort and cost, tailor it for use in the commercial marine and other commercial environments.

All in all, the realisation of this system, in support of the operational and support needs of the new SA Navy Patrol Corvettes MEKO® A-200, is the result of a fine team effort. This includes the programme logistic management team (comprising the contracting and logistic programme management authority ARMSCOR, the SA Navy and supplier representatives), together with the system supplier, the German Frigate Consortium (Blohm+Voss GmbH) and their SA logistic partner, Log-Tek Engineering Solutions.

ACKNOWLEDGEMENTS:

South African Navy

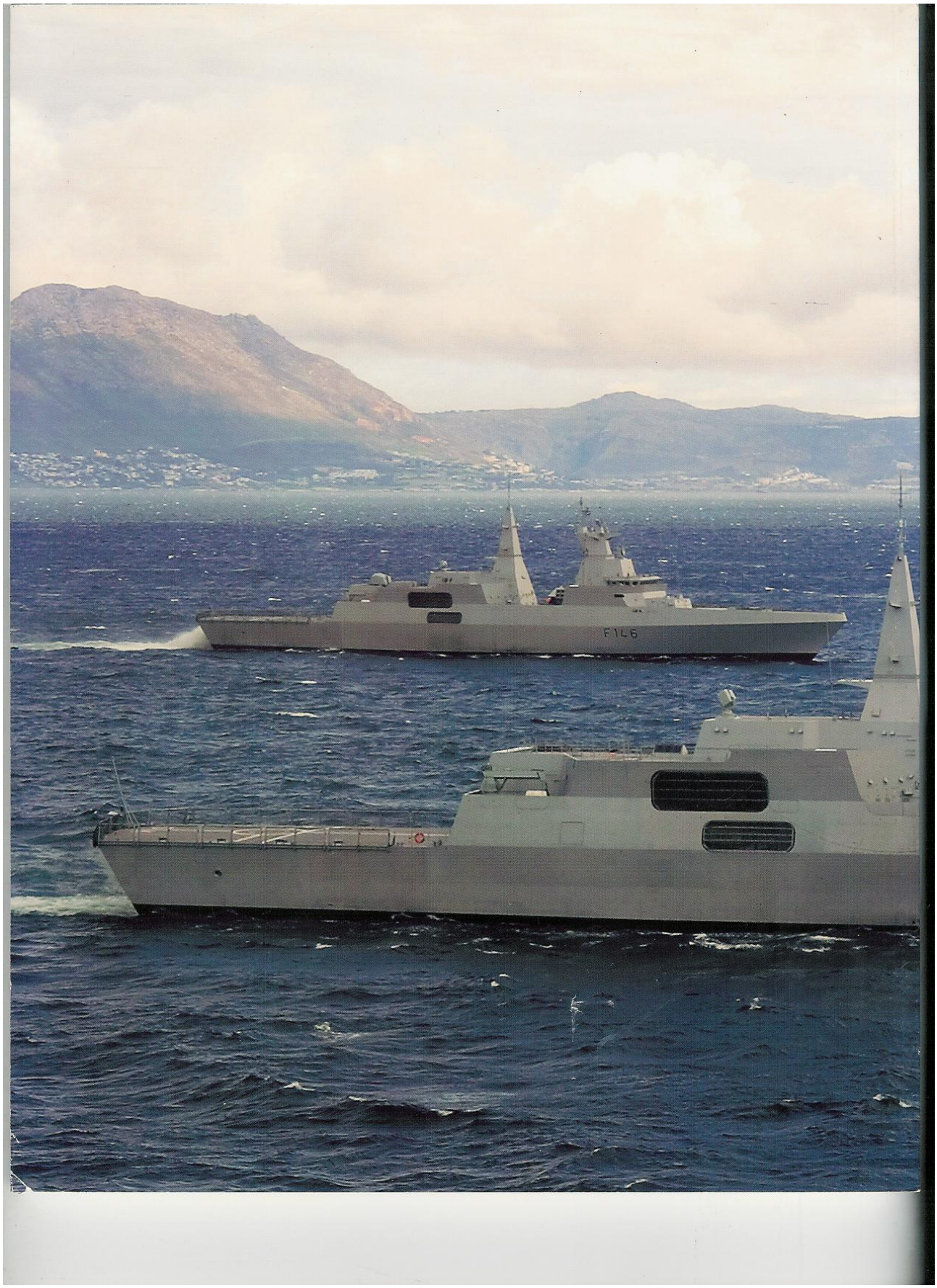
Armaments Corporation Of South Africa (ARMSCOR)

German Frigate Consortium (GFC), comprising Blohm + Voss GmbH, Howaldtswerke-Deutsche Werft AG and Thyssen Rheinstahl Technik GmbH

Log-Tek Engineering Solutions (LTES).

REFERENCES:

RSA-MIL-SPEC 53	Specification For SA Naval Support Publications, Part 1 and Part 2.
DEF STAN 00-60	Integrated Logistic Support - Part 10: Electronic Documentation
AECMA 1000D	International Specification For Technical Publications Utilising A Common Source Database
1312560863OZ00010	IETM Business Rules.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