UNIVERSITY OF SOUTHERN QUEENSLAND

Faculty of Engineering and Surveying

Quality Review of Unit Technical Logistic and Maintenance Processes

A dissertation submitted by

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Abstract

For any maintenance tack to be carried out successfully without accident, it requires an effective and efficient technical logistic supports working in the background. The technical logistic supports includes the availability of updated publications, non-expired POL (Petroleum, Oil, Lubricant), correct / serviceable tools, serviceable spare parts, calibrated test equipments (torque wrench / multi-meter) and others factors.

Should any of the mentioned elements is missing, or having problems, it will cause either delay or safety implications on the maintenance tasks. Hence it is important that effective and efficient management and maintenance processes must be in place ensure maintenance tacks and training can be carried out effectively and safely.

In this report, the focus will be on reviewing various quality elements in accordance to ISO 9001:2000 requirements. The quality review of technical logistic processes includes management and maintenance of publication, TMDE, tools control, POL, PLL and self-check program. It will identify the current weakness and appropriate recommendation will be made to ensure processes improvement. With effective and efficient processes in place, cost/resource saving, removed unnecessary paperwork/processes and zero accident is achievable.

ENG 4111 Research Project Part 1 &
ENG 4112 Research Project Part 2

Limitation of Use

Certification

I certify that the ideas, designs and experimental work, results, analyses and conclusions set out in this dissertation are entirely my efforts, except where otherwise indicated and acknowledged.

I further certify that the work is original and has not been previously submitted for assessment in any other course or institution, except where specifically stated.

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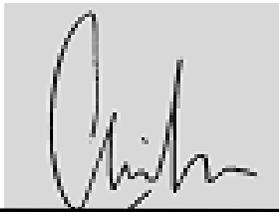
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<u>Acknowledgement</u>

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Lee Chin Fung
Oct 2006

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Glossary

AL	– Amendment Leaflet
AR	– Amendment Report
MS	– Material Specialist
BITE	– Built In Test Equipment
Cal.	– Calibration
CAN	– Calibration As Necessary
CO	– Commanding Officer
ESD	– Electrostatic Discharge
FLO	– Formation Logistic Order
HAZMAT	– Hazardous Material
IC	– In charge
ISO	– International Organisation for Standardization
MSDS	– Material Safety Data Sheet
NC	– Non-Conformity
NCR	– No Calibration Required
NSman	– National Serviceman
OEM	– Original Equipment Manufacturer
OFI	– Observation For Improvement
OLO	– Organisation Logistic Order
OM	– Operator Maintainer
Ops	– Operations
OSHA	– Occupational Safety & Health Administration
PLL	– Prescribe Load List
POL	– Petroleum Oil Lubricant
PPE	– Personnel Protective Equipment
QM	– Quarter Master
QF	– Quality Facilitator
QAC	– Quality Assurance Centre
SME	– Subject Matter Expert
SVC	– Serviceable
TMDE	– Test Measurement & Diagnostic Equipment
TMDESS	– TMDE Specification Summary
UMC	– Unit Maintenance Centre
ULO	– Unit Logistic Order
U/S	– Unserviceable

1. Introduction

Centre for NS training Excellence (NS training centre) is a training institute where it provides training to the NSman (National Serviceman). During the year, NSman are being recalled from the civilian world to the training centre to undergo weeks of military trainings. This is to ensure that they are always proficient in handling their weapon systems. When these NSman are back, the training centre needs to provide administrative, logistic and training support to ensure that the whole training process run smooth.

ISO 9001:2000 certification is the key focus the training centre is going toward. In ISO 9001:2000-quality management system, it requires the training centre to have processes in place in every aspect and ensuring customer satisfaction. Review and restructure on the current processes is a must to ensure advancement toward achieving the certification.

Due to the size of the organisation and it focuses in moving towards quality and safety, there are many quality publications promulgated to assist the training centre towards ISO 9001:2000 certification. This project serves as an excellence opportunity to review the current training centre quality manual (unit logistic order) and work processes toward ISO award.

An excellent logistic support and maintenance processes ensures safety, excellent training support and improve the equipment reliability. By achieving the ISO award, it gives public assurance and confidence that the unit provides excellence, effective and efficient training to the NSman for the defence of the nation.

2. Objective

2.1 Introduction

Quality in technical logistic ensures minimising accident rate, quality works performed, room for feedback and continuous improvement. However, having ineffective and inefficiency processes in places to "ensure" quality will only "kills" the organisation. The damages include unnecessary cost and resource wastage by performing too many unnecessary preventive maintenance tasks, or maintaining redundant quality records. All these will contribute to morale problem to the ground people as they need to go through many channels just to get things done and also increase their work load.

It is very important that effective and efficient processes are in place to gear the training centre toward ISO 9001:2000 certification. Audit walkthrough will be performed based on the ISO 9001:2000- Quality Management System Requirement, where it will indicate the current processes weakness and the training centre stand from ISO certification.

Recommendations will be provide to target on ensuring effectiveness and efficiency in the management processes of every targeted quality elements. These recommendations will include cost saving ideas, remove redundant paperwork/maintenance, re-define long inefficient processes, introducing electronic mean for monitoring purposes and finally, ensuring that the provided recommendations are able to self-sustain with room for continuous improvement . The main aim is to assist the training centre to achieve ISO certification, without incurring too much workload to the ground personnel.

With effective and efficient quality management system in place, the training quality and equipment reliability is greatly enhanced with minimum accident chances.

2.2 Area of Focus

Quality is a simple word, but to achieve quality, it involves everybody in the organisation to actively play a part to achieve it. In this project, a total of 6 quality elements have been carefully selected to be reviewed, where it contribute greatly to the training centre maintenance issues. The following are the focused elements:

a) Publication Management and maintenance

b) TMDE Management (TMDE- Test Measurement & Diagnostic Equipment)

c) PLL Management and Maintenance (PLL–Prescribe Load List = Spare parts for maintenance)

d) Tools Management and Maintenance

e) POL Management and Maintenance (POL- Petroleum, Oil, Lubricant)

f) Review on Unit Self-Check Program (a processes monitoring system)

The main focus on the review is to ensure effectiveness and efficiency to the current element processes, cost saving, removal of unnecessary paper work and maintenance. The following are the summaries on what will be reviewed:

a) Publication Management and Maintenance

Every maintenance, quality and safety issues are documented. Over the time, the procedures and requirement for any maintenance task will change from time to time due to many reasons. Publication is one big element that affects maintenance quality greatly. Hence it is very important that only the correct, well-maintained and updated publications are referred for any maintenance tasks at all time and important information is disseminated accurately and on time.

In this project, the training centre publication maintenance and management processes will be assess and reviewed. Recommendation will be provided on how to improved

accountability, management and ways to ensure those publications are always up to date and method on information dissemination.

b) TMDE Management (TMDE- Test Measurement & Diagnostic Equipment)

TMDE are test equipments such as multi meter, force gage and oscillator, which play an important part for all maintenance jobs. It is used to measure critical reading and an inaccurate TMDE might cause safety hazard to user. Hence it is very important that only precise, accurate and serviceable TMDE is used as all time.

In this project, TMDE calibration, maintenance and traceability processes will be assessed and reviewed. As sending out the TMDE to contractor for calibration is very expensive, focuses will be put into cost saving method, without compromising quality technical work and safety.

c) PLL Management and Maintenance (Spare parts Management and Maintenance)

Prescribe load list (PLL), is a comprehensive list of critical spare part for replacement dedicated to different systems. When any equipment is found to be faulty, the Operator Maintainer will troubleshoot, and rectified the fault by replacing the faulty part with the PLL item within the shortest time. Hence it is important that serviceable spare parts are always available and well maintain. In this project, the accountability and maintenance policy of the PLL held by unit will be reviewed.

d) Tools Management and Maintenance

Carelessly leaving a screwdriver near the engine air intake after an aircraft servicing is totally unacceptable. Using damaged tools on maintenance job will only bring damage to the equipment and create safety hazard to user. Hence it is important that all tools are well maintained and are accounted at all time. But performing unnecessary maintenance and accountability check, will only cost time and material wastage. In long term, it does not benefit both organisation and environment.

In this project, the processes on tools management, accountability, traceability and maintenance will be reviewed. Suggestion will be provided on effective manage of tools to achieve great cost saving.

e) POL Management (POL- Petroleum, Oil, Lubricant)

All systems need POL for both operation and maintenance need. Every POL has their own unique classification and almost all are highly flammable. Hence it is important to have a tight control process to ensure safety and accountability. However, too much control will cause many restrictions and inconvenient to user, where it will affects the overall productivity.

In this project, POL accountability and maintenance processes will be reviewed to remove unnecessary paperwork and maintenance. Recommendation will be provided on how to overcome these limitations to enhance productivity without affecting safety.

f) Review on Unit Self-Check Program (elements monitoring system)

Self Check Program is a quality monitoring system adopted by the organisation. It is a program that involves unit personnel to perform internal audit among the elements and highlight their finding for rectification and improvement. It is mentioned in ISO 9001:2000 standards, Chapter 7: Process - Auditing for Continual Improvement, "Process auditing has become a crucial component to the investigation and ultimately to the success of the audit itself."

In this project, the method on how the self checks have been carried will be reviewed and recommendation will be provided on how the self check can be carried out effectively. Instead of looking for non-conformity, the self check should look for systemic failure of the training centre quality processes where it is more critical.

2.3 Overview of the focused elements
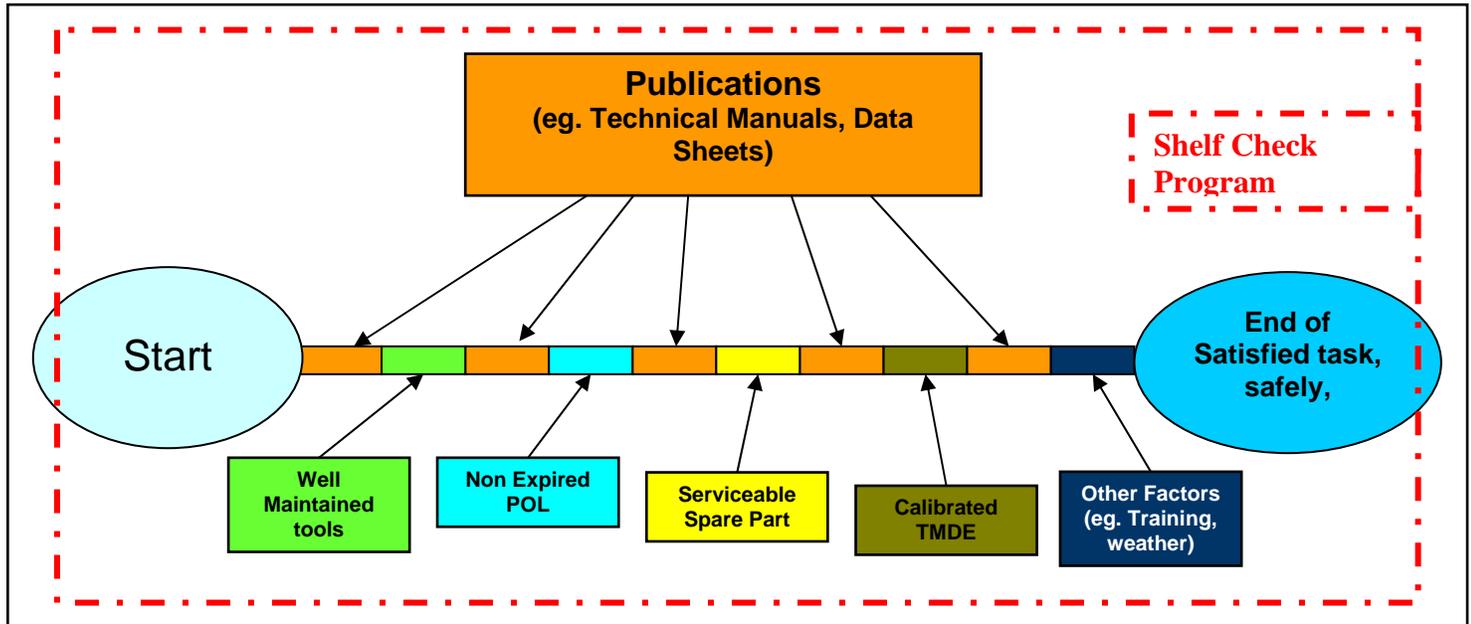
Figure 2.3 a - Quality elements relationship

All the above-mentioned elements have close relation with one another. In *fig 2.3a-Quality elements relationship*, shows that the availability of the quality elements is just like building up a path for the user to finish any maintenance tasks successfully and without any accident.

In order to complete any maintenance task successfully, the Unit Maintenance Cell (UMC) need to ensure the availability of serviceable tools, non-expired POL, serviceable spare parts and calibrated TMDE to the user. At all stage, updated publications such as technical manual, material data sheet and user manual of any TMDE must be available to the user for reference, while performing any maintenance tasks. If any of these elements is deficient, it will either cause delay to maintenance tasks or worst, cause grieve danger to user.

There are also other factors such as individual skills and weather condition that affects the output of the maintenance task. However, such factors will not be touch in this report.

Lastly, the shelf check program will perform the "monitoring job" to ensure that all personnel follow the stipulated requirements. The results of the self checks will determine

effectiveness and efficiency of any processes. Hence it is very crucial that the robust processes of every mentioned quality elements must be in place to prevent unnecessary delay problem or accidents. With quality in place, equipments are always in tip top condition and the NSman training can be carried out effectively, efficiently and safely.

3. Literature Review on the Unit Logistic Order

The Unit Logistic Order for the NS training centre was first created in Aug 2003. It served as an important document (quality manual) to uphold the commitment of the training centre toward the Organisation Quality Management System. It had been drafted and promulgated to refine and compliment the technical logistic processes requirements from the higher orders, to suit the training centre. The unit logistic order basically spells out all the technical logistic requirements and processes of the training centre.

The first review was performed and promulgated on April 2005 by the appointed Quality Facilitator at that point of time. The main focus of that review is basically refining certain quality terms used in the logistic order and major focuses on the training issues for the NSman. It does not touch much on the management processes of the 6 x quality elements which will be reviewed in this report. From then, no major review had been performed.

The promulgation of the Unit Logistic Order is a great achievement for the training centre towards ISO certification. In this report, major reviewed on the 6 critical quality elements processes will be carried out in assisting the training centre to improve the current processes. By making use of technology to replace "manual" work, together with innovative ideas, it aims to assist all personnel in the training centre personnel to reduce work load while ensuring quality and achieving ISO certifications.

4. Methodology on completing the research

This research required great understanding from many publications sources such as ISO requirements, and the organisation quality structure and requirements. Understanding the stipulated requirements, does not reflect the actual ground situations. The real problems in the training centre quality management system of the elements can only be identified through effective communication with the ground people and via the results of the audit walk through.

The following are the steps of my approach toward this research project:

1) Research on what is ISO about, how can it be applied to the training centre and what are the benefit gain from it.

2) Understand the quality structure of my organisation and training centre.

3) Understand the requirement for all the mentioned elements from the quality manual and how every element affects one another.

4) Talk to the ground persons on what is their actual practice on managing the quality issues. Often, the actual practice deviates from the stipulated orders. In return, I will share with them my purpose of performing this research where it will benefit them in long run.

5) Find out what are the problems faced and limitation in carrying out the stipulated requirements such as manpower issues, material issues or management issues. Pass year self check results will be obtained from the QF for reference.

6) Plan my audit walkthrough schedule with the relevant in-charge to ensure that they are free to assist me on any working day. This is very important as they are able to provide objective evidence and important information.

7) Research on other unit practice and also commercial company practice on how they managed the mention elements.

8) From the audit walkthrough results, and the obtained feedback from various key personnel, it will determine my recommendation for the training centre. Constant communication within all level (from QF down to individual working personnel) will be conducted to ensure my recommendations are applicable and benefits are achieved.

9) Ensure my recommendations are conform to the higher stipulated orders, organisation interest and ISO requirements. Effectiveness and efficiency in managing the element must be achieved in my recommended processes.

10) Present my research to the management of the training centre. The results of the audit walkthrough, my recommendation, benefits gain and my suggestion for future achievement for the training centre to go towards after ISO certification.

11) The recommended amendment leaflet to be promulgated will be review base on the KISS (Keep It Short and Simple) theory.

12) The report will end with a discussion on my learning form this research, environmental issues, current stand from ISO certification and future achievement for the training centre.

5. Why Quality Management System

5.1 The importance of Processes

Processes are a systemic way of approaching work and solving problems. With good processes in place, it is able to guide any personnel on how thing can be done, and what to be done in the most effective and efficient method.

Without documented processes, when a person who have performing some tasks for a long time left the job, the new person who take over him may not know what to do. He might end up performing the ineffective method again. At every stage of any processes, there must have documented proof so should there be any incident happen, the investigator is able to trace back for the root cause. That is where ISO comes in to help the organisation to establish processes in the work place.

5.2 Suitability of ISO9001:2000 for the Training Centre

ISO 9001:2000 Quality Management System provides a good framework on what is quality about. It required processes to be in place from the planning stage, implementing stage until product realisation. Every body in the organisation, from top management until the lower ground person are involved in every stage of the product realisation. Monitoring and feedback processes are to be in place to ensure continuous improvement. Since every stage of the processes is documented, it ensured traceability for documented proof when required should there be any issued occurs. ISO 9001:2000 is basically applicable to any organisation that wants to achieve it.

With the achieving of ISO, it provides great confidence to the public on the organisation quality issues. The people that come from an ISO certified organisation equips with better knowledge on quality issues and it benefit them for future advancement. The ISO certification have become so important that it had become a pre-requisite for many big tender projects, where it is able to provide confidence to the offering party that they have "good standards" and processes in place. A copy of the ISO 9001:2000 requirements, is attached in Annex B – ISO 9001:2000 Quality Management System – Requirement.

6. Overview of Quality structure

6.1 Quality Manual structure

Quality and Maintenance related Publications

Organisation Logistic Order

Formation Logistic Order

Unit Logistic Order

Maintenance related Publications

- Technical publications
- Special Technical Instructions
- Safety publications
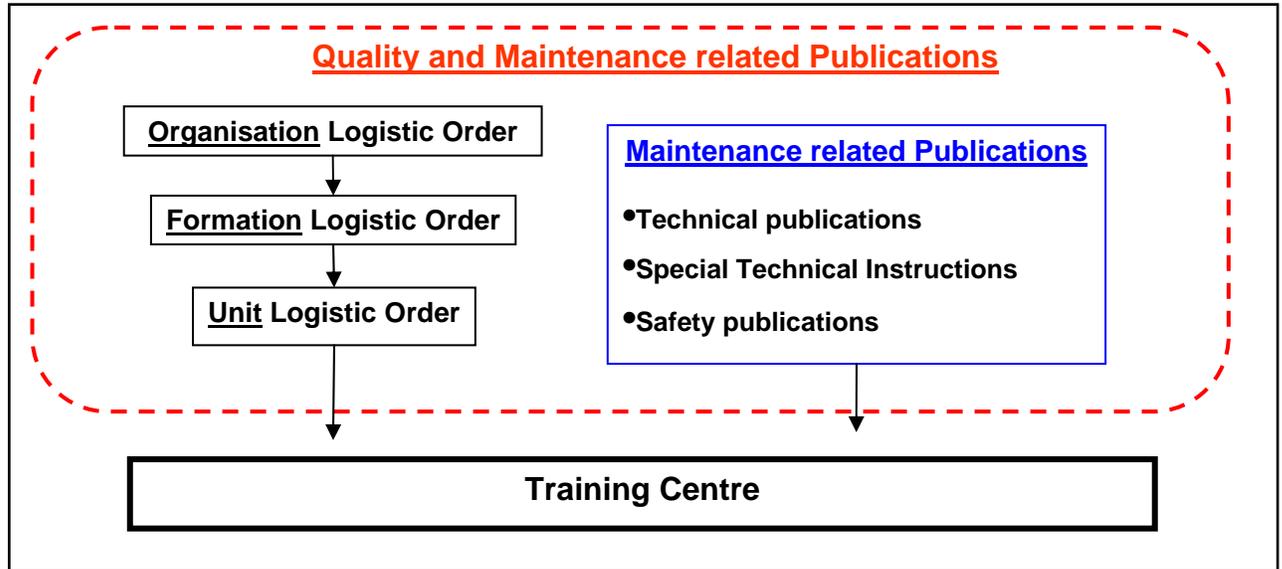
Training Centre

Figure 6.1 a - Quality Manual Structure

Figure 6.1a – Quality Manual Structure, shows the structure of the quality manuals in placed which affects the quality issues of the training centre. It is basically divided into 2 categories. Logistic Orders and maintenance related publications. The following are the summary of the each publication.

a) Organisation Logistic Order (Highest Level) – *Policy level*

The **Organisation Logistic Order (OLO)** is the highest Quality Manual, where it dictates the organisation **policies** for all technical logistic issues, quality management requirement, training and dealing with external contractors. It comes in many volumes and is equivalent to "Corporate Quality Manual", which this term is used widely in commercial sector. Quality Assurance Branch (QAB) is set up to over see all quality issues of the organisation and performs update for the Organisation Logistic Order.

In this Organisation Logistic Order, it includes critical forms and requirements that which is applied throughout the whole organisation and external contractors. All units/ personnel in the organisation are to follow the requirements set up in thie Order.

b) Formation Logistic Order (Second Level)

The **Formation Logistic Order (FLO)** is the second level quality manual which states the formation maintenance policies and requirement in accordance to their operating role and type of systems operated by the formation. Different formations have different requirements need which is not covered in the organisation logistic order. However, the requirements spelt in this order must base on the guideline set up in the higher order. Formation Quality Assurance Centre (QAC) is set up to over see all quality issues of the formation and performs update for the Formation Logistic Order

c) Unit Logistic Order (Process / Task level)

The **Unit Logistic Order (ULO)** is the quality manual for the training centre. All the work processes, quality management system requirement and the job scope of every key personnel of the unit are indicated here. The 2 higher Logistic Orders only spells out the policies/guidelines and certain key requirements. It is the Unit Logistic Order to indicate it unique maintenance requirement. The unit quality group, headed by the Quality Facilitator (QF) of the unit will oversee the maintenance of the unit logistic order.

d) Others Maintenance related publications

This category refers to all the publications on maintenance and safety issues that the training centre aer abide to it. However, the publications in this category do not affect the management policy of the unit. These publications include OEM / local produced technical manuals, system operation manuals, special technical orders and anything that affects maintenance tasks and quality issues. Should there be any clash between the OEM and Logistic Orders requirements, the Logistic Order will take precedent.

In this research, the focus will be on the unit logistic order where it determines the quality issue of the training centre toward ISO certification. Consideration will be taken from all the available publications and recommendation will be made to ensure maximum effectiveness and efficiency is achieved for the training centre quality management system.

6.2 Unit Quality Structure
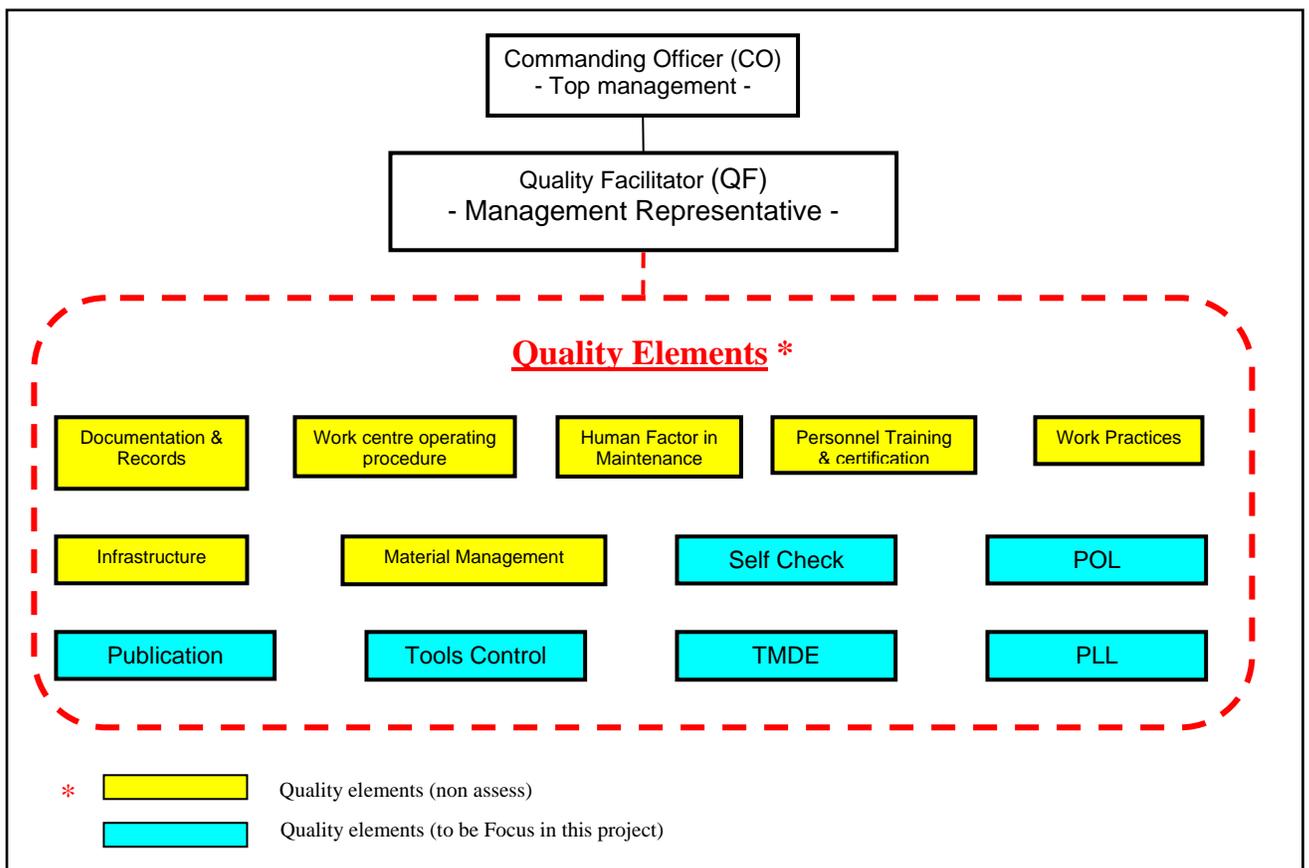
Figure 6.2 a -Unit Quality Structure

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In *Figure 6.2a, Unit Quality Structure*, the Commanding Officer is the "Boss" of the training centre and a quality facilitator (QF) is being appointed as the management representative, to oversee the training centre quality issues. The current quality structure has meet one of the clause as required by ISO 9001:2000, section 5.5.2-Management representative. 6 of the above mention elements will be discussed in this project.

The QF is the overall in-charge to oversee all quality issues of the training centre. He is assisted by the appointed element ICs in every department to manage their area of concern. The requirement in managing these quality elements are stipulated in the logistic orders. Quality meeting is held occasionally to obtain feedback, disseminating critical quality related information and assess self check report.

6.3 <u>Unit Maintenance Structure</u>

The Unit Maintenance Centre (UMC) is the department that oversee all maintenances and most of the technical logistic issues of the unit. In *Flow chart 5.3b- UMC Structure*, shows the structure of UMC.
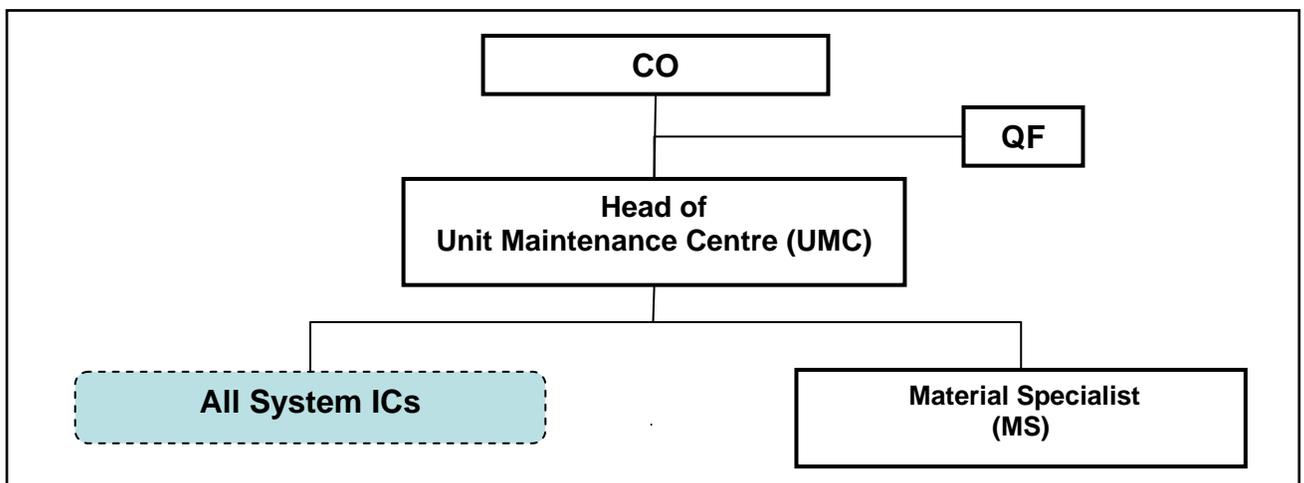
Figure 6.2 b -UMC Structure

The head of Unit Maintenance Centre (UMC) will oversee all maintenance and material issues of the training centre and is answerable to the training centre's CO. The QF will assist the CO and UMC head in overseeing the quality issues of the department. Individual system ICs are to oversee all maintenance issue of the systems/weapon equipments under their care.

All the systems ICs and the trainers for the NSman are both operational and technically trained. Hence they are called as Operator Maintainer (OM) as they are to perform front-line operation and maintenance tasks. Individual ICs will monitor, plan and inform all the respective

Operator Maintainer in the training centre on their servicing schedule for the systems. Due to the nature of the systems IC appointment, all of them hold secondary appointment such as element IC for TMDE, publication or documentation, for their respective system.

The Material Specialist (MS) are in charge of material management issues of the training centre, which include indent, destroy maintenance related items and also oversee all external transactions. For example, a system component is diagnosed to be faulty. The Operator Maintainer will inform the MS of the components needed. The MS will indent the required component from other relevant sources. Once the components arrived, the Operator Maintainer will replace the faulty component with the new serviceable one. The MS will then send out the faulty part to the designated location for repair.

7.   Audits Walk Through of Quality Elements

7.1 Overview

The purpose of this audit is to identify and understand individual element's processes strength and deficiencies. The strength, weaknesses and adaptability capability identified can be used to determine the effectiveness and efficiency of each element, which constitute much to the overall quality management system. The results will provide a good overview on the training centre stand from ISO certification.

In chapter 7 of the ISO 9001:2000, Process-Auditing for Continual Improvement, it defines the following:

a)   **Effectiveness**: refer to how well the output meets customer requirements. It is a measure of actual against intended output.

b)   **Efficiency**: is a measure of how well the internal operations are performed in terms of output and resources required to achieve the output.

In this audit report, base on the 6 identified elements' processes strength and weakness, appropriate recommendations on processes improvement, cost saving and eliminating unnecessary paperwork will be provided. The recommended recommendations will be crafted into amendment leaflets to be implemented into the Unit Logistic Order. Additional information such as cost saving calculation and procedures on using any recommended electronic programs will be provided as well.

Under each section of the audit write up, the report will present a general overview of the importance of the element, the current unit's management processes of the element and a summary of the audit findings. It will end with the overview of the recommendations, benefits gain and a conclusion on the element issues. Actual audit reports with recommendation and the suggested amendment leaflet are attached as annexes.

The details of the audit report results will include the feedback from the ground people, current weaknesses, recommendation and the finding "category". Finding are categorised into 3 categories where each category indicate different importance level. The following is the definition for each category:

1) Observation For Improvement (OFI)	Observation on area for improvement. However, it is not against any ISO clauses or any requirements.
2) Minor Non-Conformity (Minor NC)	Discrepancies are found to be against ISO clauses or any documented procedure. However, it is not a potential hazard to any personnel or equipments.
3) Major Non-Conformity (Major NC)	Discrepancies are found to be against ISO clauses or any documented procedure. Failure to comply will cause damage/ loss of equipments or personnel.

All amendment leaflets provided will be carefully redesigned in annexes form to ensure "adaptability" for future changes. This new leaflet can be easily amended without the need to re-write the whole leaflet or realign of the line serial number should there be any major management procedure change. In additional, useful, general information will also be abstracted from various relevant publications and include into the unit logistic order for easy reference and raise their awareness for certain requirements.

7.2 Publication Management and Maintenance

7.2.1 - General overview

For any work performed, despite technical or non-technical, the correct publication must be referred at all time. For any maintenance work, users need to refer to the correct and updated publication to carry out the job correctly. Hence it is very important that processes must be in place to ensure strict control of authorised publications, the availability of well maintained/updated publications and critical amendment information are disseminated to all personnel on time.

Publication management is viewed as a "major" requirement by the organisation as it is the basic foundations, to ensure all maintenance works are carry out correctly and safely. A comprehensive set of publication management policy had been established in the Organisation Logistic Order and a centre library had been established to oversee all publication issues of the organisation.

With the established policies set up in the Organisation Logistic Order, and the existence of the central library to monitor all publication issues of the organisation, it is indeed a great stepping for the training centre toward ISO certification. However these policies do not determine the publication management, control and maintenance processes of the training centre. It is the training centre responsibility to define their unique publication management procedures and promulgate it into the unit logistic order.

7.2.2 - Current Publication management process

i. Publication control processes

The publications in the unit are divided into 2 categories, technical logistic publications and Operation publications, for the training of the NSman. The central library oversees all the

technical logistic publications in organisation. The publications in the organisation are divided into 4 security levels, Restricted, Confidential, Secret and Top Secret.

The following explain the different categories:

1) **Technical Logistic Pubs:** Publications that touch on maintenance and quality issues. These publications include quality manuals, technical training manuals and system technical manuals (Both OEM and Local Series).

The central library helps to oversee all technical logistic publications issue such as performing of amendment and producing new copies.

2) **Ops (Operations) pubs:** Publication on wartime / peacetime operational procedure and operational training manual.

In this report, the management of operation publications **will not be covered** in detailed as it does not touch on any technical logistic issues and is not abide by any technical logistic order.

For any publication related issues that come to the training centre, such as new publication or amendment, base on the content classification, it will be channel to different department for processing. The following *Figure 7.2a, Current publication management processes,* shows an example on how publications are managed currently.
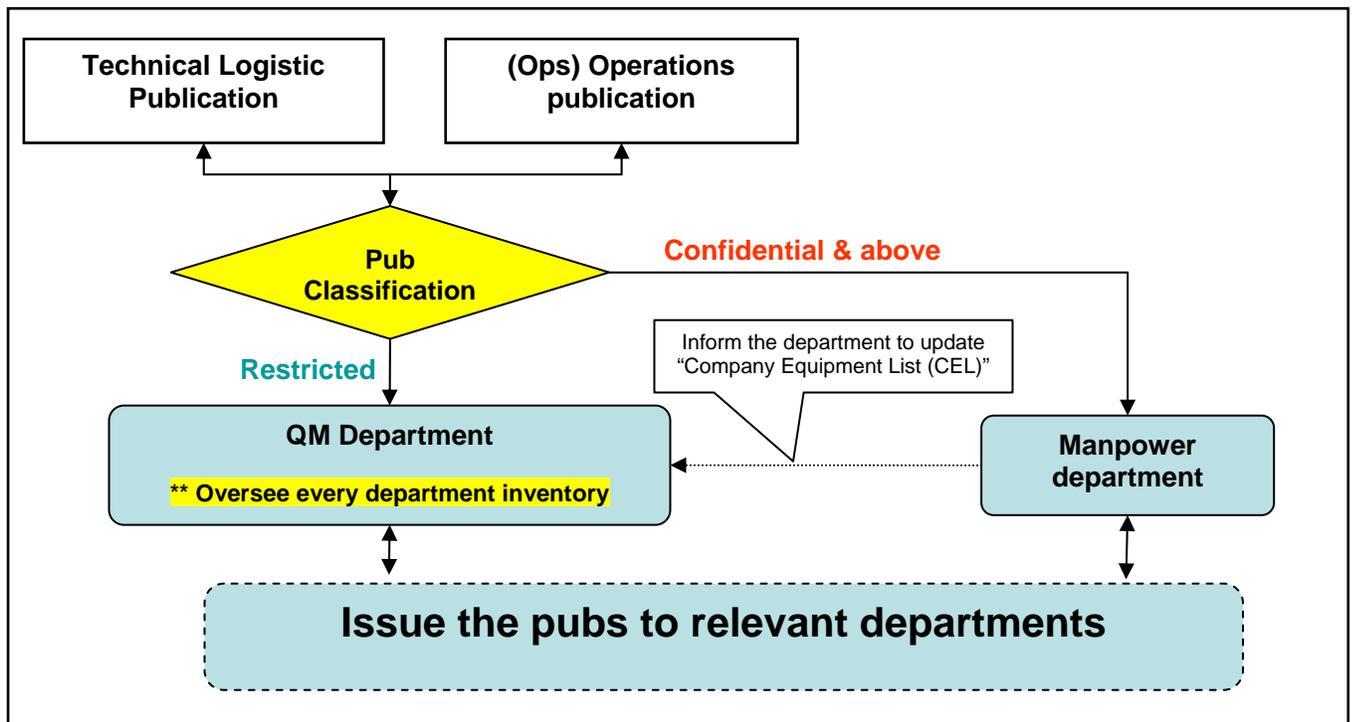
Figure 7.2 a - Current publication management process

Quarter Master (QM) department oversee all inventory issues of the training centre. They oversee the accounting of everything hold by every department such as furniture, ration, stationary, weapon systems, publications and others. All the inventories data are captured in respective department "Company Equipment List (CEL)". Every department need to perform annual inventories accountability check based on this list.

Currently, the publications are placed in respective department office, where the appointed publication IC/ sub-account holder will look after the publication under their care. Anyone who needs to use the publications for any reasons, they have to approach the appointed publication ICs to loan it.

ii. Management of New publication

For any "Restricted" publications, despite operational or technical logistic, the courier service will hand it over to the QM department. The QM will register the new publication into the receiving department "Company Equipment List (CEL)", before issuing it to them.

For "Confidential and above" publication, the courier service will need to hand it over to Manpower department, as personnel from QM department are not allowed to handle it due to security issues. Manpower department will register the received publication into their own record before passing it to the respective department. Since QM department is overseeing all inventory issues of the training, the manpower department will inform the QM to update the receiving department's "Company Equipment List" on the detail of the new received publication.

iii. Management of publication amendment

a) Technical Logistic Publication

For "restricted" amendment, personnel from the central library will come to the training centre to perform updating of amendment to all technical logistic publication. However, on the 3rd attempt failed to perform the amendment due to whatever reason, the amendment will be handed over to the respective publication IC to perform the amendment update.

For "Confidential and above", due to security level of the amendment leaflet, it will be hand over to the manpower department in a "sealed" envelope. Manpower department will check the content first, and then issue the amendment leaflet to relevant department publication IC to perform the amendment update.

Every year, the central library will issue the "unit publication inventory list" to the training centre for annual publications accountability checks. This list contains the information on unit publication inventory and the latest "amendment number" of every publication held by the training centre. Base on this list, respective publication ICs will perform physical check on the publications to ensure all are accounted and incorporated with the latest amendment.

b) Ops (Operations) Publication

For any amendment for ops publication, unit will perform the amendment themselves. QM department will take over all "Restricted" amendment and Manpower department will take over

all "Confidential and above" amendment from the courier service, and they will distributed to relevant departments to perform the amendment.

iv. Information dissemination

It is a requirement in the Organisation Logistic Order that information need to be disseminated to all the unit personnel within a time period base on the criticality of the information. Hence when any amendment is performed, the information must be disseminated to inform everyone what are the changes. The following are the level and requirement of dissemination:

    a.   Class 1 (Critical) - Immediate mass briefing to the unit by CO / QF. The attendance must be captured

    b.   Class 2 (Normal) - Disseminate within 60 days upon received of information. All personnel must read and sign to acknowledge.

Individual publication IC will be in-charge of performing information dissemination on behalf of the department head for all class 2 information.

v. Management of publication queries outside of unit

For any publication issue which is beyond unit control, it will be raised directly to relevant sources by respective publication IC. Under such circumstances, the QM and manpower departments are bypassed as they are only the "middleman" for publication transaction and accountability within the training centre. It is much faster for the publication IC to settle with the source.

vi. Maintenance and accountability processes

The following are the types of maintenance requirements in place for all technical logistic publications:

a. **Weekly** –

Account for all the publication in the respective cupboards/cabinets and also ensuring that there is no expired loan.

b. **Quarterly** –

Accountability checks and maintenance on all publications listed in Company Equipment List (CEL) where it consists of technical and operation publications. Individual department will take care of their own publications maintenance and accountability issues.

c. **Annual (external)** –

Base on central library "Unit publication Inventory List". All publication ICs are to perform publication accountability checks and maintenance on the listed publications. The results must be submitted back to the central library within one month period.

d. **Annual (internally)** –

The training centre is required to conduct annual inventory checks, which consist of everything including table and chairs. Publication accounting is required as department publication IC are required to assist QM department personnel to perform accountability checks. This check is not part of the requirement in the logistic order.

7.2.3 - <u>Audit Finding</u>

i. Strengths

With the central library in place, it enhances the effectiveness of publications management of the organisation as they are the centralised agency that oversees all publication issues. For them to perform amendment is a great move as they must ensure that amendments are

incorporated into affected publication timely across the organisation. This reduces the chances that unit personnel fail to incorporate the amendment.

The following are a summary of area established in the organisation logistic order:

a) Publication Numbering system and identification policy

b) Publication Amendment policy

c) Publication request, destruction, purchasing and incorporation new publication policy

d) Publication Stock-taking policy- (yearly accountability)

e) Management of controlled / uncontrolled publication

With the current numbering system and identification policy system in place, users are able to identify the publication type, classification, the sponsoring agencies, effective date, and amendment detail easily. In additional, all manuals comes in ring binder for easier amendment incorporation and cost saving.

ii. Weaknesses

From the audit finding, it seems that there are multiple broken communication links found within all departments. Information is not passed to the receiving end promptly or similar information was disseminated repeatedly. There are a lot of redundant publication maintenances, accountability checks and the unnecessary process chains identified

The results from the sampling checks and the duration taken to perform annual accountability check and maintenance, it proved that current publication management system is inefficient and ineffective. Although all amendments are timely updated and no safety implication is identified at the moment, the current publication management system must be improved to avoid systemic failure. Multiple process loop hole, unnecessary process chain and inefficiency are identified. It must be rectified in order to move toward ISO certification.

All the audit findings and feedbacks are lumped together base on their categories and a total of **6** findings, 3 **Minor NC** (Non conformity) and **3 OFI (Observation For Improvement)**

were observed. For detailed findings and recommended corrective action, refer to **Annex AR 1 – Audit report (Publication Management and Maintenance).**

7.2.4 - <u>Overview Of Recommendation</u>

The current publication processes need to be changed to ensure effective and efficiency. It is recommended that all publications are to be managed by "type" instead of "classification". The following Chart 6.2b – *Recommended Publication Management and Control Process,* shows the recommended changes.
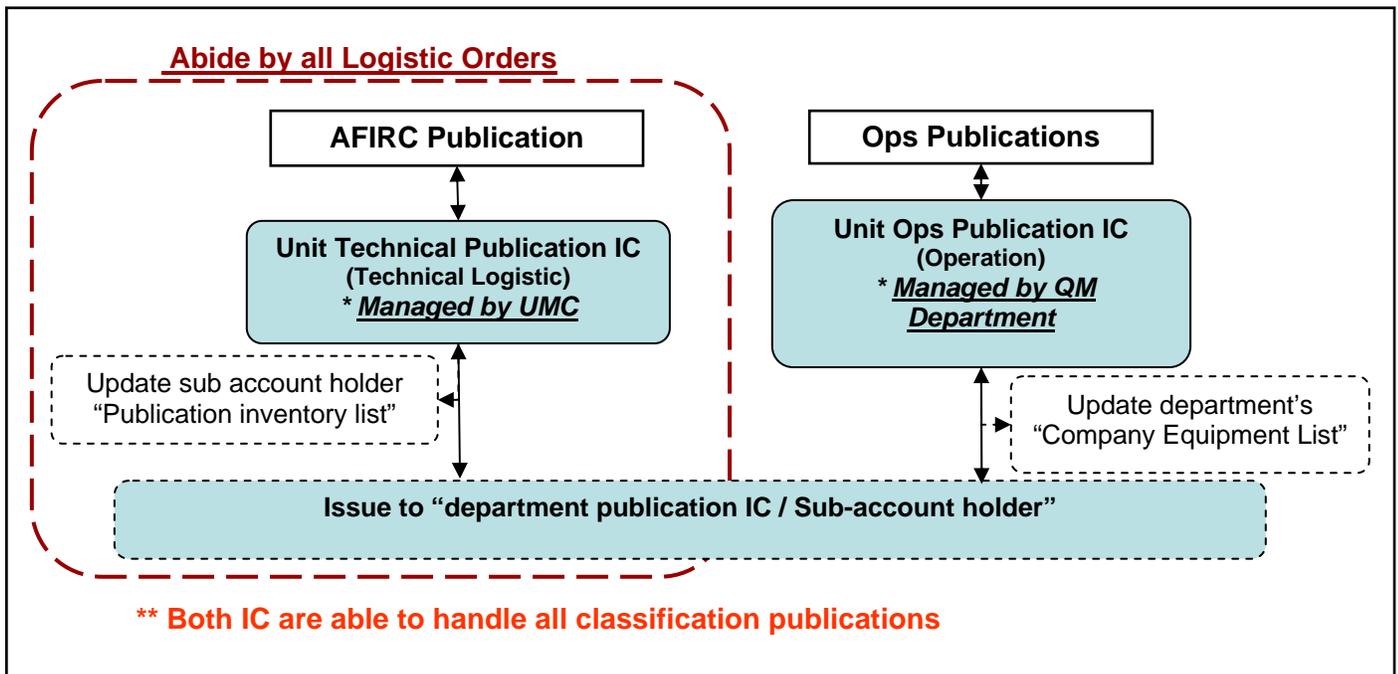
Figure 7.2 b - Recommended publication management processes

With reference to the Figure 7.2b – Recommended Publication Management and Control Process, the following are the list of recommended changes:

i.   All technical logistic publication from central library will no longer be managed by QM department.

ii.   2 personnel are assigned to become unit publication ICs. Unit technical publication IC for technical logistic publication and Unit Ops publication IC for ops publication. These 2 personnel are cleared to handle all classification of publication and will directly communicate with external source, hence eliminating the need of manpower department in the publication management process.

iii.   These 2 unit publication ICs will be the Subject Matter Expert (SME) for all publication issues. They will assist the unit higher management and QF in planning and managing of the publication processes of the unit.

iv.   Unit Ops publication IC from QM department will manage all Ops publications and continue maintaining the "Company Equipment List" for capturing of department inventory data.

v.   Unit technical publication IC will oversee all technical logistic publication issues of the unit and directly communicate with the central library. Since 80% of the technical logistic publications are held by UMC, the unit technical publication IC will be from UMC who is also an Operator Maintainer himself.

vi.   All transactions to the outside world have to go through these 2 publication ICs.

vii.   Any individual personnel / department, that are required to hold publications under their care, are term as "sub-account holder", where they are the individual system ICs or the "department's publication IC". Under the guidance of the unit publication IC, department publication IC/sub-account holder will oversee the management and maintenance of the publications held by them. They are abided by all logistic orders.

viii.   For information dissemination, both unit publication ICs will be the in-charge to summarised the content of the received amendment and highlight the importance of the information. This eliminates the need of multiple publication ICs to perform information dissemination on the same piece of information.

ix.   Email is recommended to be used as a medium for Information dissemination. This method is efficient and ensures that everyone will get the information. However, for Class 1 (critical/ safety issues) information will still be remained as mass briefing by unit CO or QF.

x.   All the forms and annexes will be re-designed to ensure "adaptability/sustainability" of the Unit Logistic Order for future changes. Record book can be used to record records, and all recommended improvement area in the audit finding will be included.

xi.   Common maintenance publications will be re-located to respective work centre or systems storage area for easy access where possible. Daily housekeeping will be performed by the one who draw out the key to access the publications.

xii.   The need to perform redundant weekly accountability and quarterly maintenance checks will be removed. Only daily housekeeping and annual accountability/maintenance are required.

xiii.   During annual publication accountability checks, Unit technical Publication IC will focus on the accountability based on the central library list, and the Unit Ops Publication IC will focus on the accountability based on individual department's "Company Equipment List".

xiv.   A Microsoft Excel spreadsheet is created to assist the both Unit Ops and technical publications IC to monitor and perform accountability check for all the publication in the training centre. In is a very effective and efficient method in performing accountability checks and monitoring. In is to be place in the common network drive where all publications IC can retrieve.

For the exact detail refer to **Annex C – Introduction to Publication Monitoring and accounting method using Microsoft Excel**

xv.   The following are a flow chart, *Figure 7.2c – Summary of the individual Publication IC Job Scope*, show the job scope of all the ICs.
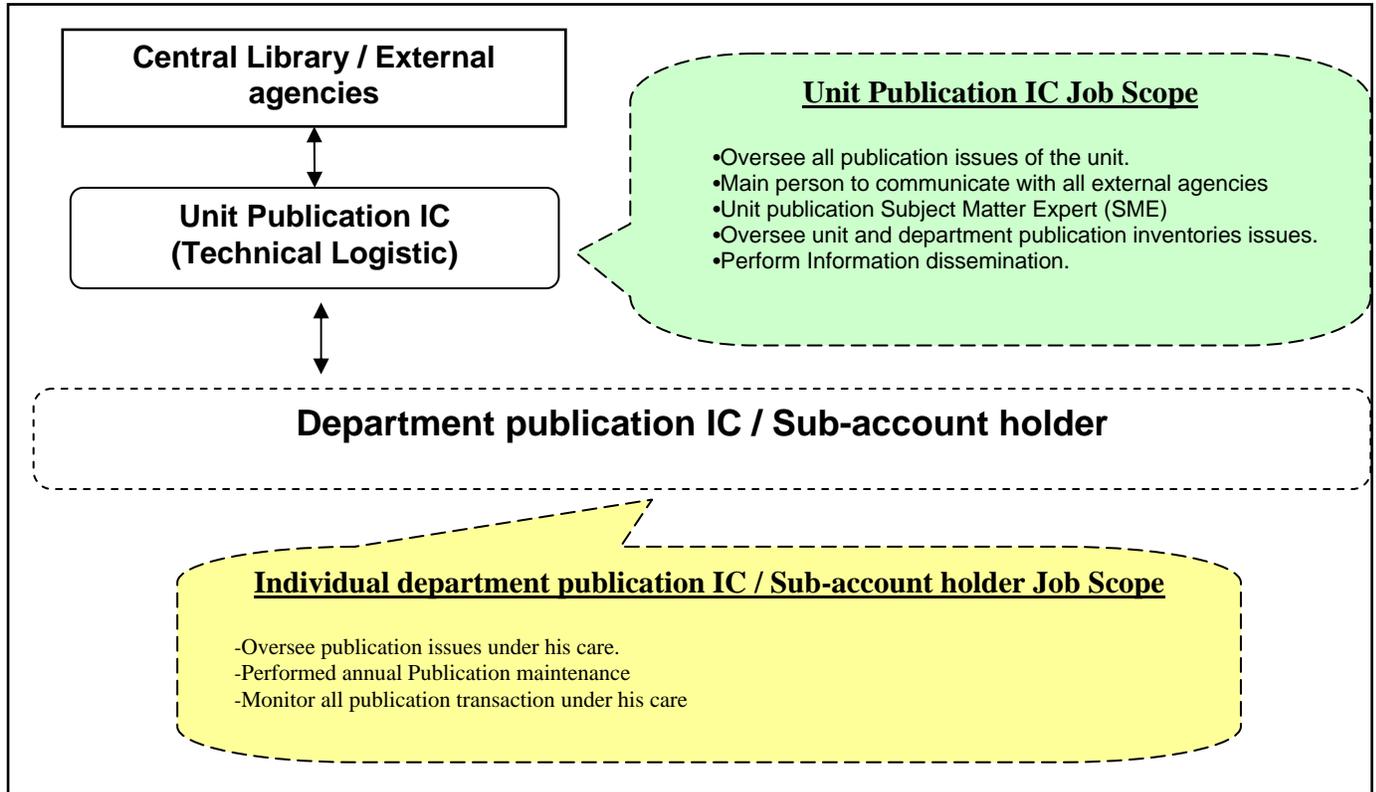
Figure 7.2 c – Summary of the individual Publication IC Job Scope

7.2.5 - <u>Benefits</u>

The following are the benefits gain from the newly recommended management processes:

i.   There are increase focuses in Unit publication management. Technical Logistic publications issued by the central library are managed by UMC personnel, and Ops publication is managed by QM department.

ii.   There is only one point of contact to the "outside world", based on the type of publication. This process is much neater and "controllable" compared to previous management process.

iii. Any publication issues, unit publication ICs are the person to look for. They can provide valuable advice to the management in publication management. They are the SME for Publications. If the QF is not around, they are still able to manage themselves.

iv. Information dissemination is faster and efficient via email from a centralised source.

v. Eliminating of weekly and quarterly check ensure at least **75%** time saving on publication maintenances, hence create capacity for unit personnel to perform other jobs and cutting away unnecessary paperwork.

vi. The time and resource saved from the new processes can be channelled toward mission success.

vii. QF is greatly assisted by unit publication ICs in managing publication issues.

viii. By allowing maintaining of quality record with record book, this helps to do a part in saving the environment by saving more papers and folders.

ix. The use of electronic mean to perform publication search / accountability checks is much more productive then physical search. The accountability check is able to reduce the current required time for publication maintenance and accountability check from **3 days** to become a **2 hrs** jobs.

7.2.6 - <u>Consideration</u>

i. The competency and efficiency of the unit publication IC must be high as he oversees the unit's publication management issues and information dissemination.

ii. Great time is required to input the publications data into the EXCEL spreadsheet and ensuring it is accurate.

iii.	As the quarterly check is removed and replaced by annual event, department publication ICs / sub-account holders must diligently perform the accountability and maintenance of the publications. Fail to do so will create more problems in the future.

7.2.7 - <u>Recommended Amendment Leaflet</u>

The new recommended Amendment Leaflet is recommended to promulgate and replace the current leaflet in the Unit Logistic Order. As the Unit Logistic Order only touch on the technical logistic aspect, this leaflet will only cover the unit technical publication IC role and his publication management.

The recommended publication management processes will be addressed in the new amendment leaflet. The new leaflet had been re-structured in annexes form, to achieve future adaptability. Should there be any changes in the requirements in the future, the QF will only need to perform amendment line by line, or change the annexes only.

Refer to **Annex AL 1 – Amendment Leaflet (Publication Management and Maintenance)**, for the recommended Amendment Leaflet to be promulgated into Unit Logistic Order.

7.2.8 - <u>Conclusion on Publication Management and Maintenance</u>

The recommended management processes of having 2 Unit publication ICs to oversee technical logistic and operation publications issues ensure a better and tighter control over publication issues. It is also much effective and efficient to have a single source, unit technical or Ops publication IC, to perform information dissemination and communicating with external agencies.

With the removal of the redundant weekly, quarterly maintenance checks and the introduction of using Microsoft Excel spreadsheet to monitor and account for all publication annually, it proved to be much efficient and effective. Great time and resource saving is achieved and capacity is created for unit personnel to focus on other training / maintenance jobs. The new publication management processes ensure better control of publication, shorter communication link and removal of unnecessary paperwork. In short, great effective and efficiency is achieved from the recommended processes.

7.3 TMDE Management

7.3.1 - General overview

TMDE (Test, Measurement & Diagnostic Equipment) management can be considered the one critical element that affects safety the most where the items consists of Multi-meter, oscilloscope, torque wrench/screwdriver, hygrometer, force tester, sliding calliper and other special-to-type test equipments. It is used to take critical reading or ensuring certain torque is met during servicing. Using an inaccurate/faulty TMDE for servicing, will have safety implication onto both the equipment and users.

For example, a technician uses a faulty torque wrench on the bolts used on the aircraft engine. If the bolt and nut is under torque, the bolt will become loose and drop off under high engine vibration during the flight. The bolt are lightly be sucked into the jet engine intake and causes engine explosion. This will cause great loses to the expensive equipment and life of the passenger and it is prevented if a serviceable torque wrench is used.

7.3.2 - Current TMDE management processes

All the system ICs are in charge of the TMDE for the maintenance of their systems. They are also term as TMDE IC where they are to keep track of all the TMDE calibration due dates, monitor the transactions and ensuring the TMDE is always serviceable when required. A list of TMDE specification Summary (TMDESS) is safe keep of individual TMDE IC, where it indicates the specification of every the TMDE held by them.

When a TMDE is due for External Calibration, individual system ICs will hand over the TMDE to the MS (Material Specialist) to send the item to designate authorised for calibration. For Internal calibration, individual system IC will bring the TMDE to the designated department (within the organisation) for calibration. When the TMDE is back from external calibration servicing, the MS will collect the TMDE from the courier service, and pass it back to individual TMDE IC.

Every TMDE items have a traceability record tag to them. When any user uses the TMDE for servicing, he must record the detail of the serviced equipment into the TMDE traceability record. The recorded details include equipment serial number, type of servicing done and the measured value of the TMDE. This is to ensure that when any particular TMDE is found "out-of-calibration / faulty" by the calibrating agencies, the training centre is able to trace which systems is affected by the faulty TMDE through the traceability record. The affected systems will be quarantine from usage until it is verified to be serviceable by another calibrated TMDE.

All the TMDEs purchased by the organisation, their calibration period are recorded in the publication, "TMDE calibration Interval", and it is issued to the training centre. This is to ensure that every work centres in organisation know the calibration interval to send out the TMDE for calibration.

All TMDEs must have a "status" sticker on it. At one glance on the sticker, users are able to know details such as the next calibration due date, is it internal/external calibrated or any special calibration requirement/instructions.

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│              TMDE IC job scopes                                   │
│      │  - Maintain TMDE Traceability Record                │     │
│         - Maintain TMDESS                                         │
│      │  - Maintain TMDE Calibration Reports                │     │
│         - Monitor Cal. Due dates                                 │
│      │  - Monitor TMDE Transaction                         │     │
│         - Perform TMDE maintenance                               │
│      │  - Ensures serviceable TMDE are always available    │     │
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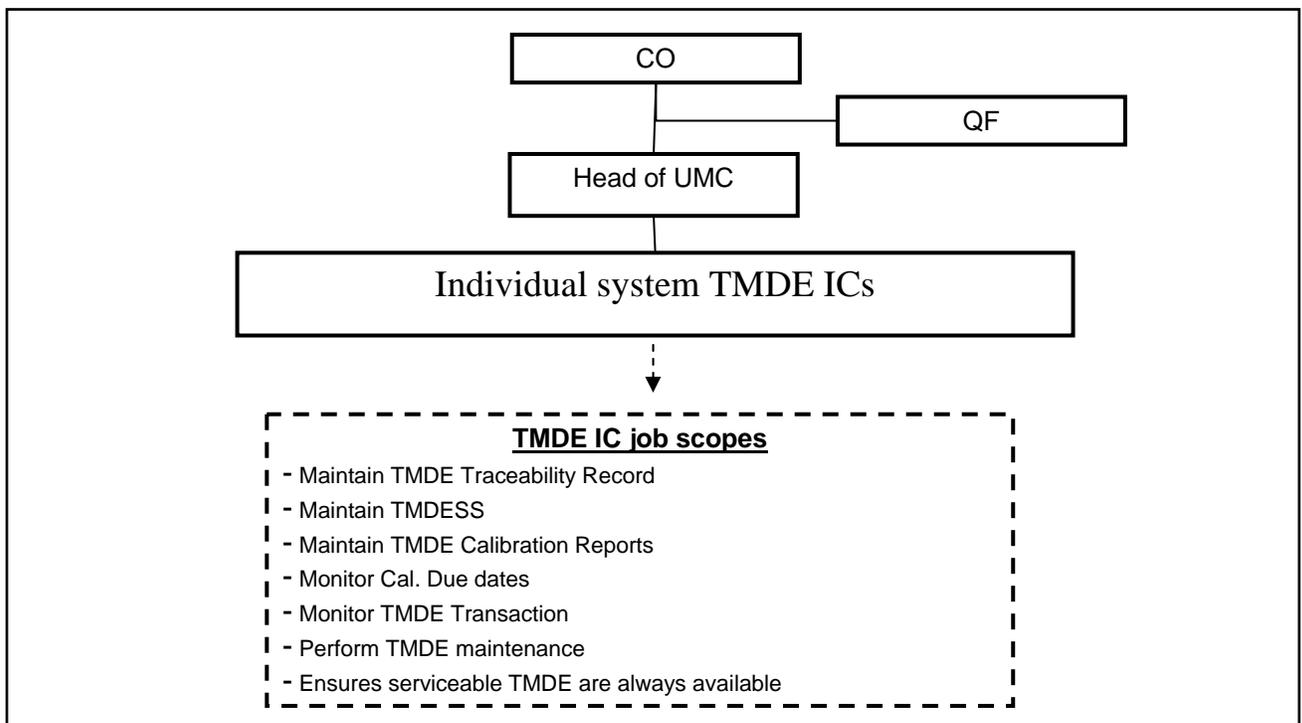
Figure 7.3 a - Current TMDE Management structure

In *Figure 7.3a*, indicate the current management structure and the summary of TMDE IC job scope. QF is assisting CO in overseeing all TMDE quality issue of the unit. Head of UMC will ensure that the department TMDE IC are performing their role such as ensuring all TMDE are send out on time and maintaining all TMDE quality records.

7.3.3 - <u>Audit Finding</u>

i. Strengths

There are various good requirements in placed such as the availability of TMDE traceability records for tracing purposes and TMDESS to allow user to obtain data on the TMDE specification. The TMDE calibration interval manual contained the calibration interval data on all TMDE purchased by the organisation. Should there be any different in calibration interval recommended by OEM and Local requirement, the TMDE calibration interval manual will take precedent.

With the requirement for "status" sticker to be on every TMDE, it allows user to identify the required critical information of the TMDE easily.

ii. Weaknesses

However, despite from the good requirements set up in the OLO there are quite a number of processes weaknesses in the training centre TMDE managements. It was found that there are problems in monitoring TMDE calibration due date as the items are always send out late for servicing. There are weaknesses in the TMDE transaction traceability, excessive "redundant" TMDEs found and individual personnel job scopes are not spelled out clearly in the Unit Logistic Order. In additional, the work load for individual TMDE IC is quite heavy as they need to maintain tonnes of quality records and equipments.

All the audit findings and feedbacks are lumped together base on their categories and a total of 6 findings, 6 Minor NC (Non conformity) and 3 OFI (Observation For Improvement)

were observed. For detailed findings and recommended corrective action, refer to **Annex AR 2 – Audit Report (TMDE Management)**.

7.3.4 - Overview Of Recommendation

i. Recommended Structure

It is recommended that a Unit TMDE IC is appointed to centralise control and monitor all TMDEs issues. In *Flow chart 7.3b, Recommended TMDE management and control process*, show the structure of the recommended TMDE management processes.
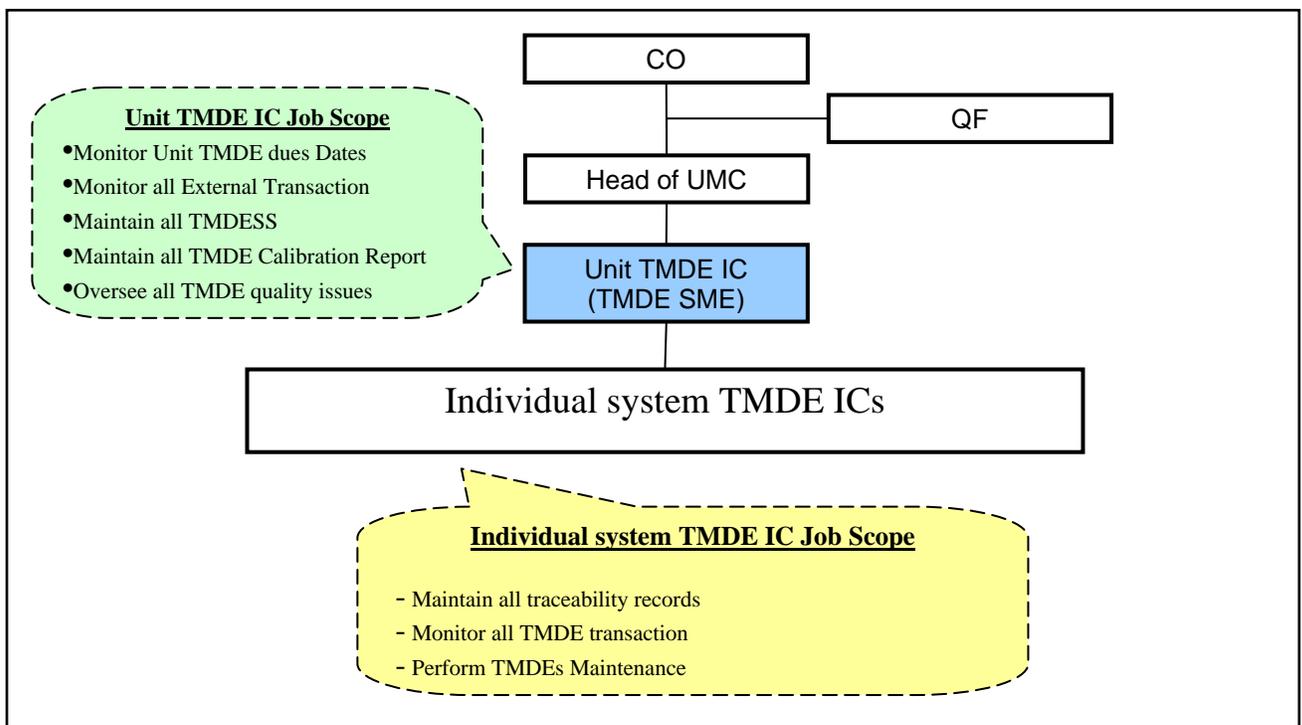
Figure 7.3 b - Recommended TMDE management and control process

With reference to the Figure 7.3b – Recommended TMDE Management and Control Process, the following are the list of recommended changes:

i.   A new Unit TMDE IC from UMC is appointed to centralised control and oversees all TMDEs issues. He plays an important role in assisting the higher management in planning the usage and movement of the Unit's TMDE.

ii.   Unit TMDE IC must manage and ensure that the required TMDE is always available for servicing as he is the unit SME (Subject Matter Expert) for TMDE. This would mean that he is the person to look for on all issue pertaining to TMDE.

iii.   The unit TMDE IC will monitor all the TMDEs calibration due dates and inform respective TMDE IC to send out the TMDE for servicing on time. When any TMDE is out of unit for any reason, unit TMDE IC will monitor the external transaction closely and ensure that the item is back to unit on time so that it will not affects any scheduled servicing.

iv.   TMDESS, Calibration reports and TMDE calibration due dates will be centralised managed and monitored by the Unit TMDE IC.

v.   Individual system TMDE IC is still around to micro-manage the TMDEs under their care. They are to monitor all TMDE transactions making sure that all TMDEs are accounted daily and also perform TMDE maintenance. TMDE maintenance such as lubricating the torque wrench, de-rusting and also yearly functional checks for those "CAN" (Calibration As Necessary) TMDE.

vi.   The newly designed amendment leaflet TMDE management and all forms ensure easy reference and future adaptability.

ii. Recommended monitoring software

A programmed Excel spreadsheet had been created to monitor the status of all the TMDE of the training centre. This spreadsheet is able to forecast and alert the user on which TMDE is due for calibration, within the timeframe set by the user. The "overview" page, give a great overview to user the status on all the TMDE status and it current location.

This software ensures user friendly, effective and efficient monitoring of the TMDE. Users do not need to constantly update and monitored the "TMDE monitoring board" anymore. The TMDE monitoring board not only take up office spaces and unable to "alert" user to send the TMDE out on time. The TMDE monitoring spreadsheet can be place in common network drives where respective IC is able to monitor and update the status easily.

Using the spreadsheet yields great benefits. It allows user to input more useful data in, and no additional cost is required to produce the software. In additional, the there are free software such as Open Office, which is free, can be used to replace the current expensive excel spreadsheet easily for future adaptability. Refer to **Annex D – TMDE Monitoring Spreadsheet**, for the detail on how to use the spreadsheet and the code used.

iii. Cost Saving From "CAN"

By identifying the rarely used and "common" specification TMDE, these TMDEs can be place under "Calibration As Necessary" (CAN) catagory. By placing these TMDE under CAN, these are no need to send these TMDEs for calibration and maintaining traceability records, hence it help to save money and time on paperwork. Although it cannot be use for servicing or performing critical measurement, it can be use for training purposes.

The following table are the calculation for cost saving by placing the identified TMDEs under "CAN" with affecting training and maintenance requirement. A total cost saving of **$10479.69** is achieved yearly.

S/n	Item Description	Part Num.	Qty to CAN	Per Cal. Cost #	Transport cost-return trips*	Total	Qty left for use
1	Multi-Meter	8600A	4	$575.38		$2,494.32	7
		BM 80	5	$188.21		$1,182.05	
		FLUKE 25 STD	10	$188.21	$48.20	$2,364.10	
2	SLIDING CALIPER	6420	4	$110.78		$635.92	2
3	Theodolite	WILD T16	5	$575.38		$3,117.90	2
4	Torque wrench	1502 MR	10	$27.40	Not Applicable -In-house Calibration	$274.00	4
		2098-5065-54	10	$27.40		$274.00	4
		TE100L	3	$45.80		$137.40	2
					Total Cost	**$10,479.69**	

Figure 7.3 c - TMDE Cost Saving Calculation

* Cost calculated based on items are individually send out.
 # Cost have be average out base on per year basis as different TMDE have different cal period

7.3.5 - <u>Benefits</u>

With the implementation of Unit TMDE IC and restructuring of the whole TMDE management processes, it brings great benefit to the Unit. The following are list of benefits:

i) The recommended excel spreadsheet to assist monitoring of TMDE calibration due dates is much effective and efficient. Every TMDE ICs is able to access the file and assist in monitoring.

ii) With centralise managed of TMDESS and calibration reports for any TMDE, it can be easily obtain from one source. Previously whoever needs these data, they need to go look for the correct TMDE IC for the records.

iii) QF and respective system TMDE IC work load are reduced with the inclusion of Unit TMDE IC to centralise managed most of the quality records and assist the QF in TMDE issues.

iv) By centralised monitoring of TMDE, Unit TMDE IC has a clearer picture on all the TMDE issues. He is able to plan and manage the TMDE efficiently. Planning such as ensuring no similar TMDE is send out at the same time and left nothing in unit to use and cost saving method

v) Placing a total of 51 x TMDE can be place under "CAN" without affecting training and maintenance requirement will help the organisation in saving $10,479.69 annually on calibration cost.

vi) Paperwork is greatly reduced by identifying which type of TMDEs does not required TMDE traceability records. These criteria are spelled out in the Unit Logistic Order so that future new TMDE that met these criteria will not need to maintain traceability record.

vii) All the recommendation and the amendment leaflet had been carefully crafted to enhance "adaptability/sustainability" of the Unit Logistic Order for future changes.

viii) The recommended processes had enhanced the tight control, effective and efficient management of unit TMDE.

7.3.6 - Consideration

The following are a list of issue need to be considered to ensure that the new recommended processes efficiency can be maximise.

i) Unit TMDE IC competency. As the Unit TMDE IC manage and oversee all TMDE issues of the unit, he must have a good knowledge on Organisation TMDE policy and all TMDE maintenance issues. Without good knowledge and managing skill, he would find it hard to manage 100+ TMDEs held by the training centre.

ii)   It will be great that all system TMDE ICs and the material are stationed in the same office. So that everyone have "closer" communication within one another. This will greatly enhance a tightest TMDE monitoring processes as there are easy, "closer" communication within one another.

7.3.7 - <u>Recommended Amendment Leaflet</u>

The new recommended Amendment Leaflet, "TMDE Management Procedures" is suggested to be promulgated into the current Unit Logistic Order to replace the old leaflet.

The "TMDE Handling/Taking over Record" Annex B of the leaflet is designed in such a way that it can be used for all Internal/External transaction record. At one glance, anyone can spot which TMDE is yet to return.

Refer to **Annex AL 2 – Amendment Leaflet (TMDE Management)**, for the recommended Amendment Leaflet to be promulgated into Unit Logistic Order.

7.3.8 - <u>Conclusion on TMDE Management</u>

With the recommendations from the audit finding, it helps the organisation in both cost and resource saving. The workload of all TMDE IC and calibration cost is greatly reduced by placing the identified TMDE under "CAN". The implementing of Unit TMDE IC to centralise control and management of unit TMDE issues has help to remove unnecessary repeated tasks perform every TMDE IC. The unit Logistic Order had been redesign for easy reference and adaptability for future amendment. The recommended processes and excel spreadsheet for TMDE monitoring ensure improved efficiency and effectiveness on unit TMDE management.

7.4 PLL Management and Maintenance

7.4.1 - General overview

Every weapon systems have their own unique Prescribe Load List (PLL) items. PLL is a list of critical spare parts identified for both preventive and corrective maintenance. These identified items are used for first line servicing and can be anything such as rubber/metal hose, filters, screws, wire or electrical / electronic / mechanical components. When any system is brought out to field for training or operation use, the system PLL will be brought along as well. This is to ensure that critical spare parts are available for use every time.

When there is a fault arises on any system, the Operator Maintainer will diagnose and identified the faulty parts, replaced them with PLL items, and continue with the system operation. These identified PLL items can solves up to 90% of the faults occur in the weapon systems. After which, the faulty part will be send to respective specialise location for repair.

These PLL items are critical for all maintenance task for the training centre, hence it is important to ensure healthy serviceability state of the PLL. With proper handling, storage condition, routine maintenance and servicing, it will ensure that the PLL is always "serviceable" to be used. In this project, it will look into the management and maintenance processes of the PLL spare part.

7.4.2 - Current PLL management process

Individual System ICs is taking care of the PLL items of their weapon types. When any system fault occurs and specific component is identified to be faulty, the Operator Maintainer will approach the respective weapon system IC to draw out the PLL for fault rectification. The faulty component will later be given to the MS to send out for repair. Upon successfully send the item out for repair, the MS will request for replenishment of PLL item

These PLL items are stored in cushion boxes which can be easily transport without fear of damage. The PLL spares play a critical role in maintenance and it must always be readily available. Individual systems ICs will monitor the transactions of his system PLL items and ensure that the boxes are always "filled up".

7.4.3 - <u>Audit Finding</u>

i. Strength

The current management of individual systems' PLL spares are manage by the system ICs respectively. This management way is good as individual system ICs knows the "problems" of his systems and he is the best person to act accordingly in managing the PLL effectively to prevent "foreseen" problems.

Great efforts have been put into ensuring the serviceability of the PLL items. All critical spare parts has been identified and promulgated into respective system publications. Items storage and maintenance requirement guidelines for different categories such as electrical, electronic or rubberise items had been establish in OLO for reference. Policies which include shelf life policy, warehouse quality policy, material management policy and others are also established.

In unit level, monthly accountability check is already in place to ensure that all PLL are properly accounted and "demand" had been put up to replenish the used up "PLL item".

ii. Weakness

The current Unit Logistic Order only indicates the requirement for the need of "PLL monthly accountability check" and the maintenance of the "PLL Transaction Record". There is no leaflet on maintenance issues of the PLL.

The storage requirement for rubberise item, electronic and mechanical component are very different and it is spelt out in different chapters of the OLO. In addition, certain components have special requirement from OEM which is different from the organisation policies. These create great problems to user as they have to cross reference to multiple publications to obtained information on maintaining these PLL spares. Inconsistency on maintaining the PLL spare was observed within all system ICs.

The findings are group together and there are a total of 4 findings, 3 x NC and 1 x OFI. From the results of the audit finding, the main problem lies on the unit logistic order. The leaflet must be reviewed and includes applicable requirements for the maintenance of training centre PLL spares. Refer to **Annex AR 3 - Audit report (PLL Management and Maintenance)** for the audit results.

7.4.4 - <u>Overview Of Recommendation</u>

The current practice on referring to other publications for the required maintenance and storage requirements for spare parts, are time consuming and inefficient. From the findings from the audit report, the following are an overview of recommended processes to improve on the current management system:

i.   PLL spares maintenance, packaging and storage requirements and procedures will be abstracted from various publication and promulgate into unit logistic order.

ii.   All PLL ICs shall perform a one-time sweep to identify all PLL spares that have shelf life, and consolidate the data and centralised monitoring the expiry date of all shelf life components.

iii.   Instead of only performing monthly accountability check on PLL items, maintenance of the PLL will be included during the monthly check.

iv.   PLL management and maintenance procedures will be spelled out in detail, which also includes the standardise method on filling up the PLL Transaction Record.

v.   A SME for PLL maintenance issue is to be appointed. He must be well verse on the maintenance requirements and is able to provide valuable advice to the QF all personnel from UMC.

7.4.5 - <u>Benefits</u>

The following are the benefits gain from the recommended changes to the Unit Logistic Order:

i.   The unit logistic Order will be re-design as a centralised referencing point for unit's personnel on requirement for PLL storage and maintenance.

ii.   Ensure standardisation on the management, storage and maintenance of PLL spares across all PLL ICs.

iii.   Ensure PLL Transaction Record is filled up correctly for easy traceability of spares.

iv.   Prevent time and resource wastage for user to "search" for PLL storage and maintenance requirements. Hence create capacity for the PLL ICs, which is also the weapon system ICs, to manage other stuffs.

v.   Using an identical spreadsheet such as Annex D – TMDE Monitoring Spreadsheet, as the centralised shelf life monitoring system ensure easy monitoring of all component shelf life date and remove time wastage for the PLL IC to perform physical check for expired component.

vi.   The SME is able to provide guidance and advice to anyone in the training centre on PLL issues.

vii.   The recommended processes ensure great time saving for the PLL ICs and ensure high serviceability state for PLL spares. Effectiveness and efficiency is greatly enhanced.

7.4.6 - <u>Consideration</u>

The following are the considerations arise from the new recommended processes:

i.   Huge time and resource is required to "re-pack" the PLL items to meet unit's requirements. Resource such as proper anti-static bag, proper boxes and material for cushioning of items. However, this process is a "One-time pain".

ii.   Should there be any changes in the higher logistic Order or OEM manual; unit will need to amend the PLL Management leaflet in the unit logistic order. However such occurrence will be very rare.

7.4.7 - <u>Recommended Amendment Leaflet</u>

In the recommended amendment leaflet, the requirements for PLL storage and maintenance have been abstracted from various technical manuals and promulgate into unit logistic order. To ensure sustainability, the recommended leaflet also includes requirements which unit may need it in the near future.

All procedures on the PLL management and filling of quality records have been addressed. This leaflet is designed as such that any future amendment, it can be performed easily and easy to understand. Refer to **Annex AL 3 – Amendment Leaflet (PLL Management and Maintenance)**, for the new recommended amendment leaflet to be promulgated.

7.4.8 - <u>Conclusion on PLL Management and Maintenance</u>

The requirements for PLL storage and maintenance have been carefully abstracted from various publications which are applicable and meet the training centre requirements. This move allows user to obtain information from the unit logistic order easily without referring to other publications and wasting time on filtering the information. In addition, clear guidelines on performing PLL management, maintenance and filling of record ensure standardisation and traceability.

7.5 *Tools Management and Maintenance*

7.5.1 - Genenral overview

Tools control is viewed to another very crucial element in term of safety, for the organisation. Using the wrong tools or unserviceable tools for any servicing job, it will only damage both equipment and cause safety infringement. Lost of tools are viewed as totally unacceptable and investigation are required.

There are cases that technician did not account for his tools after he had performed a maintenance task. When the aircraft jet engine is operated, the tool which is left near the engine intake is sucked into the engine and it shatters the turbine blade of the engine. Such equipment and cost damage can be prevented with proper management and education systems in place.

Good tools are not cheap and it requires proper maintenance such as de-rusting, cleaning and re-application of lubricant when applicable. In the report, it will look into the reviewing and improvement on the following aspect of the tools management:

      i.   Tools maintenance

      ii.   Tools control (accountability for before and after use)

      iii.   Effective / efficient management of tools to ensure cost saving

      iv.   Traceability of tools and quality records.

      v.   Reduce unnecessary paperwork and maintenance.

With proper tools management and maintenance in place, excellence condition tools are always available and maintenance quality is greatly enhanced. On the other hand, the chances of damage to equipment and cause safety infringement due poor tools management can be eliminated.

7.5.2 - <u>Current Tools management and maintenance process</u>

i. Overall management

Every system has it own dedicated prescribe tools box, where it consist of all the required tools for most maintenance job. The details of the tool listing, includes the part number and full description can be found in the respective system's publication. Should there be any need to review the tool listing, the training centre can always highlight to the higher authority for the changes.

As tools control is deem as a critical process in the organisation as it involves safety, the formation QAC department plays an active role in overseeing and involved in many processes. In the formation logistic order, the stringent processes and requirements for the following elements are spelt out clearly where unit are to comply with:

      i.   Missing tools
     ii.   Loan of tools
    iii.   Requirement for colour coding for tools

On top of the missing and loan of tools processes as required by the formation logistic order, unit logistic order will indicate their own unique requirement on tool management and maintenance. Currently all systems ICs oversee the accountability and condition of their system tools. The following are the type of management and maintenance currently in place.

ii. Maintenance and accountability

The following are the type of tools accountability check and maintenance currently in place:

    i.   Before / after use   - User are required to account for the tools used at the start and end of any servicing job.

   ii.   Weekly Check   - Inspection on all tools to ensure that there are no damaged tools and all are accounted for. Perform maintenance when necessary

iii.   Monthly Maintenance - Perform monthly maintenance on tools and TMDE such as cleaning, de-rusting and lubricating.

iii. Identification and Traceability

All the tools in the unit are identified by either colour coding or engraving the required details onto the tools. When any tool is found, the user is able to identify where does the tool belongs to. The following are the descriptions on the tools identification requirements for different categories of the tools:

    i.   Colour code   - For all common tools found in all system's tool boxes / cabinet where serial number is not applicable. It consist of 3 colour bands.

    * Colour code band requirement: Unit / system / box number

    ii.   Engraving   - Tools which are not tag according to tool boxes. These tools are usually very expensive and only used to perform "special" servicing.

    * Engraving requirement: Item serial number

There are sets of stringent requirements in placed by all level of the logistic orders and some of these requirements are actually redundant and "time wasting". In this report, it will look into enhancing the current unit management and maintenances process to make it more effective, efficient, cost savings, less damage to environment and meet all aspect of ISO requirements.

7.5.3 - <u>Audit Finding</u>

i. Strength

From the higher logistic orders and various publications, evidences shows that strong policies is in place on tools issues. Guidelines were set up on the requirement for authorised tools to be used for servicing such as tool manufacturer, country of origin and tool specifications. Polices and processes were also in place in term of overall management of tools in the organisation where these policies includes demand, scrap, report loss, loan and repair of tools etc.

It met the ISO clauses 6.3 Infrastructure requirement. All the tools purchased had fit the need for all servicing and there are comprehensive policies in place to manage the organisation tools.

All the tools are colour coded for easy traceability and reorganisation. Every toolbox has a waterproof "tool box listing" which indicates all the authorised tools to be in the box. Evidences show that focuses have been put in the maintenance, accountability and traceability requirements. At point of audit, all tools have been accounted for, and all are in excellence condition.

ii. Weakness

Although robust processes are in place, it is found that unit tools are not manage and utilise efficiently and effectively. A lot man hours and resources are used just on the maintenance of the tools. In addition, unit is holding so many repeated tools that the usage frequency of every tool is bare minimum. A lot of redundant quality record is also found, where these record can be centralised managed to ensure resource saving and better management.

A total of **4 OFI** (Observation For Improvement) were observed. For detail audit findings results and recommendation, please refer to **Annex AR 4 - Audit report (Tools Management and Maintenance)**.

7.5.4 - <u>Overview of Recommendation</u>

Continual improvement is a requirement by ISO, the following will focus on the improvement on the current practices to ensure cost saving, effective and efficiency. The following are the list of recommendation to improve on the current system.

i.   An SME for tools Management and maintenance will be appointed to assist the QF to look into tools issues and improvement projects. He is able to provide valuable advice on all tools issues of the unit.

ii. Removed weekly check as it is inefficient and redundant when "before/after use" checks and monthly maintenance already in place. **Refer to Annex E- Cost Saving Calculation for tools management,** on the man-hour cost saving calculation.

iii. Create shadow boards of the tools in accordance to each tools box type as this will reduce time wastage during the hand/taking over to tool boxes, and also for in-house accountability use.

iv. Colour duct tapes with a layer of clear tape are recommended to replace the current practice of paint marker for tools colour coding where cost saving can be achieved. **Refer to Annex E- Cost Saving Calculation for tools management**

v.   Suggest placing 80% of the tools under storage, where only yearly servicing is carried out. It helps to cut maintenance cost and POL consumption. The remaining tools are sufficient enough to perform all maintenance. **Refer to Annex E- Cost Saving Calculation for tools management**

vi. Redesign the Unit Logistic Order, to ensure adaptability of all forms. All forms will also be designed as such that, one quality can be used to record multiple toolboxes records.

vii.   Specific considerations on the use of some common hand tools have been extracted from the following sources and include into the unit logistic order for reference and safety purposes..

     1)   Accident Prevention Manual for Business and Industry - Engineering & Technology, 10th Edition (Patricia M.Laing)

     2)   Barriers and accident prevention (Hollnagel, Erik)

7.5.5 - <u>Benefits</u>

With the recommended suggestion, great benefit can be achieved. The following are the benefits can be achieved:

i.   By removing weekly check, it creates capacity for the unit personnel to perform other important task such as training and maintenance jobs. Cost saving of **$1100** can be achieved from man-hours annually. **Refer to Annex E- Cost Saving Calculation for tools management**

ii.   Shadow board system for handing/taking over /accounting of tools ensure time saving with 100% accuracy. Up to 20min can be saved for every transaction. Efficiency and effectiveness is achieved.

iii.   By using colour duct tape for colour coding. A total maintenance cost saving of $1867.50 is achieved annually. **Refer to Annex E- Cost Saving Calculation for tools management**, section 2. In additional to the cost saving, the following are the benefit for using colour duct tape:

     a.   Will not decolourise / mix with neighbouring colour

     b.   Cheap, long lasting and easy to change/maintain.

     c.   POL will not affect it de-colourisation

     d.   Water proof / oil resistance

     e.   Perform better against wear and tear

     f.   An efficient and effective method

iv. Placing the tools under storage can be achieved a total of cost saving of $11380 annually on both POL and man-hour cost. **Refer to Annex E- Cost Saving Calculation for tools management, section 3.**

In additional to the cost saving, the following are the benefit for storage policy:

    a.   Less POL is used on maintenance and it help to save the environment

    b.   Less maintenance required. Create capacity for personnel for other tasking

    c.   Great cost time saving

    d.   Tool are utilise efficiently

    e.   An efficient and effective method

    f.   Reduce paper work

v. By combining the colour duct tape and tools storage ideas, and removal of weekly checks, a total cost saving of **$14347.50** can be achieved annually**. Refer to Annex E- Cost Saving Calculation for tools management, section 5- Combine cost saving (annually), option 2, for more detail.**

vi. With the re-design of the unit logistic order, it ensures easy reference and guidance for unit personnel. Good information have been extracted from the Accident Prevention Manual for Business and Industry - Engineering & Technology (10th Edition), and promulgated into the logistic for reference. All forms are designed to ensure future adaptability and the paper saving.

7.5.6 - Consideration

The following are the considerations for implementing the recommended suggestion. However, when these consideration is overcome, a better process and cost saving is ensured.

i. One time pain for removing the existing tools colour pain marker coding and replace with colour duct tape. Great manpower and time is required.

ii.   \$972 is required for initial implementation of colour taping. The amount consists of both materials and 90 man-hours are needed.

7.5.7 - <u>Recommended Amendment Leaflet</u>

In the new amendment leaflet, the whole leaflet has been re-designed in annexes for easier future change of policy without affecting other leaflets. All the procedures have been re-written for easier understanding, clearer, include examples and "allowance for improvement". More examples and requirements have been included in the section of "Proper usage of hand tools", and weekly checks have been removed.

However, most of the recommended cost saving issues will not be included in the amendment leaflet as it is neither a policy nor procedures. Kindly refer to the amendment leaflet, **Annex AL 4 - Amendment Leaflet (tools management and maintenance).**

7.5.8 - <u>Conclusion on Tools Management and Maintenance</u>

With proper planning and management, great condition, high serviceable tool are always available without incurring high maintenance cost. The recommended ideas on changing the colour coding method, storage of tools, use of shadow board and removing weekly accountability checks ensure effectiveness and efficiency in tool management and maintenance in all aspects.

Great cost saving of \$14347.50 can be achieved from man-hour and materials annually without affecting the all maintenance quality, training and operational capability. In long term, it benefits both the environment and organisation. With lesser consumption of POL, it helps to save the environment. From all the man hours saved, it create capacity for the heavy work loaded personnel to focus more on providing better training to the NS man and performing maintenance jobs professionally.

7.6 *POL Management and Maintenance*

7.6.1 - General overview

POL is the essential "food" for operation and maintenance work for all equipments. Using the wrong POL or without sufficient POL for maintenance, it might damage the equipment or cause lost of lives. By ensuring the correct, non-expired POL is always available for servicing, the chances of equipment malfunction due to improper use of POL is eliminated.

The term POL, does not only consist of just petroleum, oil and lubricant. It consists of all flammable and non-flammable chemical which is considered as hazardous material for maintenance work. These chemical includes items such as silicon compound, super glue and liquid solution such as Isopropyl, which is consider a class 1 flammable material and it is use to clean connector contact point.

In this audit walk through on the POL management, it will look into the safety and POL management aspects. As POL is consider as hazardous material, safety is one of the key factor that unit is concern about and will do anything to enhance it. With proper POL management processes in place, safety is greatly enhanced and the quality of maintenance work is ensured.

7.6.2 - Current POL management process

The Quarter Master (QM) department oversee the POL issues of the unit. He is to ensure that the required POL is always available for consumption and he holds on to all the POL Material Safety Data Sheet (MSDS) from OEM. The QF will assist the top management and oversee the POL quality issues of the unit. The following *Figure 7.6a- Current POL Management Process,* indicate the current POL management process:
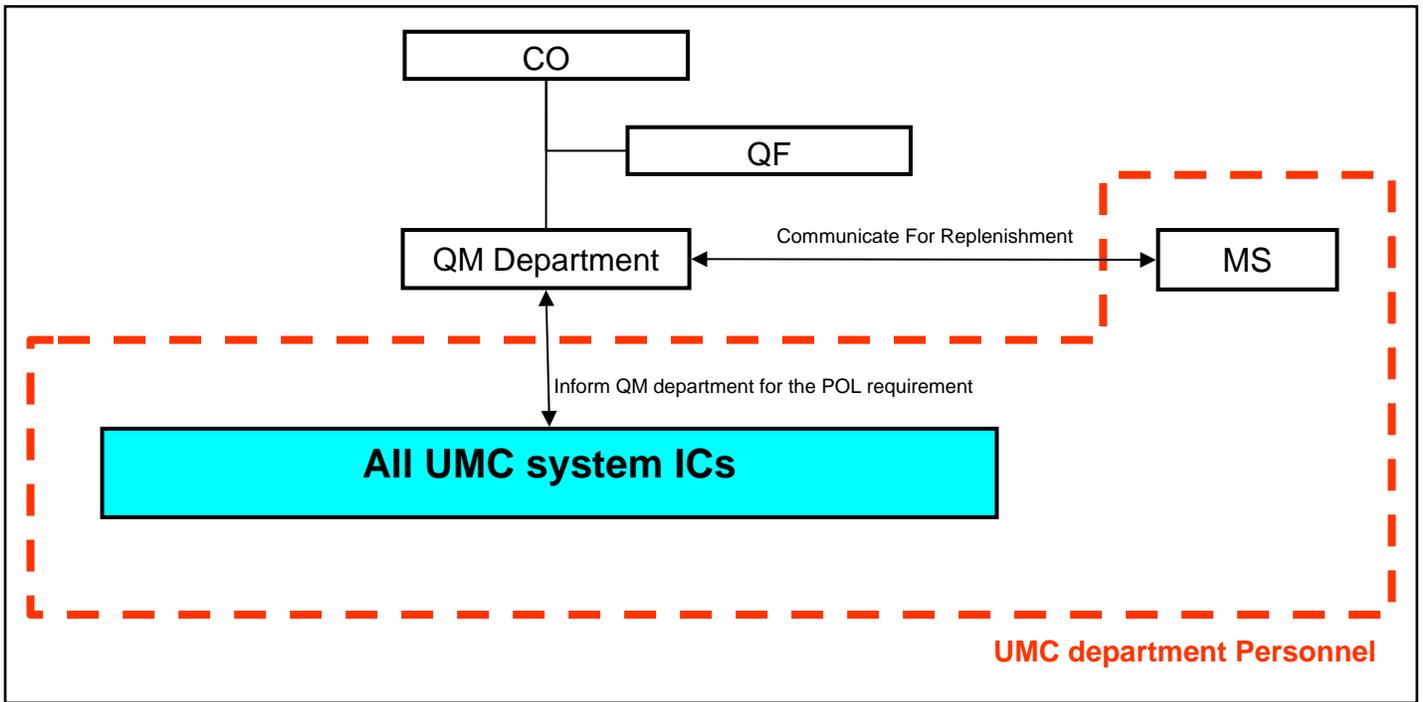
Figure 7.6 a - Current POL Management Process

For any maintenance job requires POL, individual system IC will inform the QM department on the POL requirements. This is to ensure that the required POL is available for consumption when the scheduled servicing arrived. During the servicing, the Operator Maintainer will approach the QM department to get the required POL. After the usage, the remaining POL will be returned to the QM department and the user will update the "POL consumption record".

When any specific POL stock fall below 50% and replenishment is required or special request for any additional POL, the QM department will inform MS to demand for the required POL. Once the replenishment arrived, the MS will hand over the POL to the QM department and QM department will update the data into his "POL Consumption Record"

Currently, all POL are stored in a certified POL cabinet, with a maximum storage of 250 litre of POL and it is located at least 50m away from the main building. The content of the POL cabinet and the location have to be approved by higher authority for safety reasons. There are various documents in place on how to react accordingly to different hazard such as to chemical

leak or fire hazard. Safety drills are conducted periodically to ensure all personnel knows how to react during hazard.

The following are the type of periodic maintenances required to be performed:

i.   Weekly   -   Perform POL cabinet housekeeping such as cleaning.

Ensure no expired POL and stocks are above 50%.

Check all documentation are correctly entered

ii.   Quarterly   -   Perform physical check individual POL container for leak, rust and cleanliness.

Perform POL stock taking..

7.6.3 - <u>Audit Finding</u>

i. Strength

As safety is one of the key focuses of the organisation, there are stringent sets of safety requirements and publications in place. Most personnel are trained to handle fire prevention, hazardous material control and chemical leak issues. The requirement for POL storage condition, infrastructure requirement, identification of POL disposal location, handling requirement of the POL under different classes and traceability requirement of different batch of POL are already been established. In addition, there a comprehensive set of PPE (Personal Protective Equipments) are available in the cabinet for safety.

In short, there are a comprehensive set of requirements in place to touch on all safety aspect on POL handling.

ii. Weakness

There are several improvement can be made to the current POL management processes. For example, user needs to travel a long distance with the QM department personnel to obtain basic POL such as "contact cleaner" for servicing. This process is repeated when the user needs to return the POL to the QM department. It is not effective and waste of time on such travelling where it happen everyday.

The QM department personnel are non technical trained personnel and UMC is the department that oversee all maintenance work. Since the QM department POL IC do not have much technical knowledge on all the systems and individual POL characteristics, he is unable to provide quality advice on POL issues. For example he would not know what is the different between the engine oil rated as SAE30 and SAE40. In additional, the POL required for local and in overseas maintenance may varies in accordance to the country temperature and humidity.

All the audit findings and feedbacks are lumped together base on their categories and a total of 4 **OFI (Observation For Improvement)** were observed. For detailed findings and recommended corrective action, refer to **Annex AR 5 – Audit report (POL Management).**

7.6.4 - <u>Overview of Recommendation</u>

The following *Chart 7.6b- Recommended POL Management Process* shows the new flow of the recommended processes.
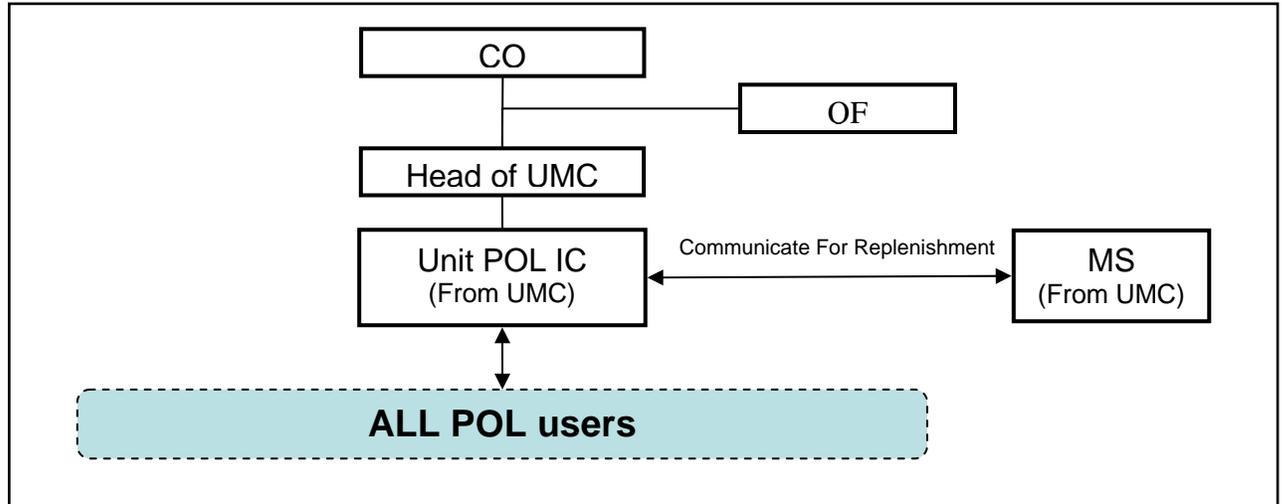
Figure 7.6 b - Recommended POL Management Process

i.   A Unit POL IC recommended to be appointed to oversee the POL issues of the unit. The new appointed POL IC is recommended to be technical trained personnel preferably from UMC. As UMC oversee all maintenance issues of the unit, better communication between MS and all POL users can be ensured.

ii.   The unit POL IC will be the POL SME for the unit as he will be given the chance to attend enrichment courses. (i.e. Workplace Safety, Fire Fighting and Hazardous Material (HAZMAT) control….). Thus he is able to provide valuable advice to unit management on POL and safety matters.

iii.   On top of the current 250L POL storage cabinet, it is recommended that training centre should have an additional 25L POL "in-use cabinet". As the 25L cabinet is allowed to be place near to the work centre, it will contain the POL which require for daily needs.

iv.   Instead of having 2 personnel constantly going over to the 250L POL cabinet to draw POL, users are allowed to draw the 25L POL cabinet key from unit POL IC

when performing servicing. They will update the POL consumption record after the servicing and return the key to POL IC. Unit POL IC will perform replenishment of the 25L POL cabinet from the 250L cabinet on a weekly basis.

v.   The unit POL IC will monitor the consumption pattern of every POL every 6 months, and adjust the holding the quantity of each POL in the POL cabinet.

vi.   Remove the requirement for the redundant Quarterly Check is recommended since weekly checks are required to be in placed. All the necessary check such as accountability check, POL cabinet maintenance and housekeeping are recommended to be performed weekly. Thus, workplace hygiene and safety is greatly enhanced.

vii.   All POL cabinets must have MSDS (Material Safety Data Sheet) available instead of the current practise that QM department keeping all the POL MSDS in the office.

viii.   The unit Logistic Order on POL management will be reviewed and re-design in such a way that all the requirement are in annexes form. It allow user to change the requirement easier, as they only need to change the particular annex and not the whole leaflet.

7.6.5 - Benefits

The following are the benefits can be achieved from the recommended processes.

i.   The process loop for getting POL for servicing is much shorter now. There is no need for individual system IC to constantly submit request for the required POL. The new Unit POL IC from UMC knows what is needed and ensures that the required stock is always available. In additional, all POL IC, system ICs and MS are within the same office, the communication links within these parties are greatly enhanced.

ii. As the unit POL IC is a technical trained personnel, he has better knowledge on POL characteristic and POL requirement needs for every system. Thus, he is also the SME for unit POL issues where he is able manage and provides valuable advices to the unit.

iii. Constant review of the POL quantity to be held in the POL cabinet will eliminate the chances of having excessive POL, which have shelf life. This will ensure reduces in resource wastage and fire hazard.

iv. By having the 25L "In-use" POL cabinet available nearer to the work centre, this eliminates the need for users to travel long distance or constantly transferring POL from big drum to small bottle which require for daily need.

v. By performing the POL replenishment from the 250L cabinet to the 25L cabinet, unit POL IC is able to control the consumption/wastage of POL by ignorant users.

vi. Safety is greatly enhanced by having the MSDS in every POL cabinet for quick referencing and having more type of PPE available. Having the 25L POL cabinet reduce the chances of POL spillage.

vii. Removing the quarterly check ensure unnecessary paperwork is reduced and thus reducing environmental impact. Effectiveness and efficiency is achieved in all aspects for the new recommended POL management processes.

7.6.6 - <u>Consideration</u>

With the benefit from the new recommended, there are also some concerns. The following are the consideration:

i. Unit POL IC competency. He must have the interest to self learn on individual POL characteristic and specification so that quality advice can be provided.

ii.   Unit POL IC must ensure that the MSDS in the POL cabinet must be updated and tally with what he is holding.

iii.   Since the POL key is allowed to be drawn out by all users that need it for servicing, the users must have the responsibility to maintain the POL cabinet and keep it clean. Honesty does plays a part as they don't "steal" the POL for own use.

7.6.7 - <u>Recommended Amendment Leaflet</u>

In the recommended leaflet provided, it has been reviewed in accordance to what is recommended. All the requirements are relocated into annexes form, where it ensures easy future amendments and the text have been re-written in simple format. New safety requirements and useful information have been added to enhance safety.

Kindly refer to the amendment leaflet**, Annex AL 5 - Amendment Leaflet (POL Management and Maintenance)** for more detailed

7.6.8 - <u>Conclusion on POL Management and Maintenance</u>

Unit POL management is improved by having UMC to centralise managed all POL issues and the new inclusion of 25L POL cabinet in the work centre. With the new appointed POL IC to be from UMC, where he has better knowledge on the POL characteristic and maintenance need, unit can be benefit from his valuable advises on POL issues. Having the 25L POL cabinet in place, it eliminates the need to constantly travel far distance to obtain common POL.

The recommended processes ensure effectiveness, efficiency and eliminate unnecessary paperwork without affecting quality and safety. In return, man-hour is saved and by reducing the wastage of paper on redundant quality records, ensures reducing of environmental impact.

7.7 *Self Check Program*

7.7.1 - General overview

Self Check is an important quality improvement program adopted by the organization to ensure quality as it is equivalent to "Internal Audit" of ISO clauses 8.2.2-Internal Audit. It is a documented activity performed to verify by examination and evaluation of objective evidence, that applicable elements of the quality system are suitable and have been planned, documented and effectively implemented in accordance with specified requirements. In short, this is a "measuring device" use to identify the effectiveness and efficiency of the element processes.

Self check helps unit personnel to be familiar with their own procedures and limitations, and address their own weakness and strengths. It is important to identify problems early before it snowball and becomes a safety hazard. In additional, Open reporting system is adopted for the reporting of self-checks results. The findings is not be classified as non-conformances as they are opportunities raised within the logistics unit itself for continuous improvement.

With self check in place, the training centre is able to ensure continual improvement on the quality aspect of the training centre, toward ISO standard.

7.7.2 - Current Self Check process

The unit Quality Facilitator will plan the routine and sequence of the 11 quality elements to be checked on 3 monthly interval. Almost all of the quality elements are dealing with maintenance aspects, individual system's elements ICs have to assist the checker by providing them objective evidence when required. The audit will be based on the all the publications which affects the element as mention in *Figure 6.1a – Quality Manual Structure*

.

Should there be any finding highlighted, the owner of the element have to rectified the problem. A satisfied **corrective** and **preventive** action must be performed within 21 days of the audit, after which a third party will come in to **verify** the action performed. All these actions are recorded and will be submitted to CO for comment. The results of the self check findings are used as part of the component for unit yearly management review.

7.7.3 - <u>Audit Finding</u>

i. Strength

The requirement for internal audit (ISO clauses 8.2.2) is met and there are document proofs that corrective, preventive and verify actions are properly carried out to rectify the faults. It also meets most of the ISO requirement, clauses 8.5-Improvement, where higher management is involve in the quality system of the unit and all the findings are safe kept for future improvement.

There is a "self check guide book" in place, where all the basis requirements for every element are summarized for quick reference. This is a great initiative as all users find it to be very useful to prepare their own element and also audit other elements. In short, the self check program ensures continual improvement, and reduces rate of non-conformity for the training centre.

ii. Weakness

Base on the pass year self check finding, I would term the currently self check program to be "Element based self check", where checker performs audit on the "element itself". However, such method is not effective as the results only indicate see the problems within the element, which can also be term as "micro view". The results obtained will not show the bigger, overall picture and these are critical information use for management review.

There is a need to change the way of performing self check, where focuses should be place in looking for "systemic failure". In additional, these checkers are all mainly from "ground" level personnel, where management level personnel are not involved.

In ISO 9001:2000, it focus is on the effectiveness and efficiency of the processes rather finding faults on non-compliance to the stipulated order. The self check program is indeed a great program to ensure continual improvement, however there are a total of **2 OFI** (Opportunity For Improvement) were noted.

Refer to **Annex AR 6-audit report (self check program)**, for the finding and recommendation.

7.7.4 - <u>Overview of Recommendation</u>

There is a need change the way on how self checks is performed to ensure effectiveness in identifying problems and overall quality management system. Since every element is closely related to one another, it is a must to perform audit which goes beyond the element itself. The following are a list of recommendations on the improvement for current self check program:

1) "Process base self check" is recommended to replace the current "Element based self check". The following are the definition:

   a. Element base:-The checker/auditor will check to ensure that individual element IC fulfilled the requirements stipulated in the higher logistic order.

   b. Process base:- Instead of focusing in finding non-conformity in the element concerned, the checker will look into the effectiveness and efficiency on the management of the elements.

2) Process base self check (as recommended in ISO 9004:2000- Quality Management System, Guidelines for Performance Improvement) recommend the checker to perform

audit trail. The checker will no longer be restricted by only performing self check within the element as he is allowed to ask for evidence concerned to other elements.

3) SME for the self check is recommended to be appointed by top management. The SME are to be very familiar to ISO requirement and will be send to attend ISO auditor course/workshop or any relevant course. He will assist the top management and QF in oversee the quality of the training centre self check program.

4) Personnel are recommended to be sent for quality courses such as ISO auditor course. Such workshop / courses enable the personnel to perform "Process base self check" effectively as they know where, what and how to look for flaws in the management of any element.

5) Higher management level personnel such as head/deputy head of departments are to be involved in the self checks program (internal audit).

7.7.5 - <u>Benefits</u>

With the recommended recommendation such as "Process base self check", it ensures great benefit to the training centre. The following are the benefits which can be achieved from the recommendation:

1) The results from the "Process base self check" can be considered, a more useful information for management review. It provide a bigger, better picture on the overall processes and integration within elements.

2) "Process base self check" results enables the management to identify systemic failure in the element itself, and also the overall effective and efficiency of the training centre quality management system.

3) By identifying systemic failure early, it enables the top management to perform "corrective and preventive" action early before the problem snowball becomes critical findings such as safety infringement.

4) Quality workshop help to build "quality and process thinking" into every personnel. By knowing how to conduct audit effectively, it improved the personnel proficiency in quality matter and know how to handle external auditor. In short, "quality competency" is ensured in all personnel.

5) Safety improvement, cost and time saving can be achieved from when people starts to contribute creative ideas to improve processes of every elements.

6) The appointed SME is able to lighten the workload of the QF, and focus on the quality of the self check program. He is able to provide guidance to all appointed checkers, and the management on self checks issues.

7) Having the higher management(Head/deputy head of departments) involved in self check, they can will have better picture on the ground level problems, individual element processes and limitation (which can be transparent to them). Their involvement in the self check program can help to drive and promote improvement to ensure effectiveness and efficiency in all elements.

7.7.6 - <u>Consideration</u>

Great benefits are achieved from the recommendations and the competency in quality matter is ensured in all personnel. However, the following are some considerations for in-cooperating the recommendations:

1) High cost in sending the personnel to quality course and ISO auditor course. Unit must plan carefully on the cost and schedule for these personnel to attending courses as they are always involves in conducting training.

2) Unhappiness may arise from department heads when they are going to be involved in performing audit checks due to many reasons.

3) The competency of the SME must be high as he is assisting QF in managing the unit self check program issues and also will be "teaching" the checker on how to conduct self check effectively.

7.7.7 - <u>Recommended Amendment Leaflet</u>

The current self check leaflet in the unit logistic order only indicate the format of form to be used for planning the self check work plan. The requirements for conducting the self checks, corrective and preventive actions are spelled in the higher logistic orders.

The recommendations provided in the report are on "self check methodology", "introduction of self check SME" and "involvement of personnel", which is not considered to be as process/requirements to be included in the unit logistic order. Hence No recommended leaflet is proved for Self Check Program.

7.7.8 - <u>Conclusion on Self Check Program</u>

Self check is a great monitoring tool to monitor the effectiveness and efficiency of all the quality elements of the unit, which constitute to the overall performance of the unit quality management system. With the involvement of department heads in the "Process based self check" and education of "quality focuses" to every personnel, systemic failure and area to be focused can be identified easily. Realizing the problem early, allows decisive, corrective and preventive actions to be performed accordingly before it becomes a big problem.

The recommended recommendations ensure involvement of all unit personnel in quality issues, and "Process base self check" ensures the overall great performance in the effectiveness and efficiency of the training centre quality management system.

8. Overall problems, recommendations and benefits

8.1 Overall problems

There are multiple "key" problems identified where it constitute to the overall performance of the unit quality management system. Tackling these problems, ensure tighter monitoring of all elements, ensuring compliance to the ISO requirements and room for continuous improvements.

The "key" problems mentioned here, does not apply to the findings identified during the audit walk through, it refer to the "Processes" and "structures" on the overall quality management system. The following are the key problems found, where it is required to change, to ensure improvement to the working processes.

1) There are too many ICs involved in managing each element. Just for TMDE monitoring, 4 ICs are performing the same jobs, and there are no consistency on how they perform their role. Some uses electronic mean to monitor calibration due dates and some uses the manual monitoring chart. Manpower are not utilised efficiently here as certain tasks are repeated performed by different ICs, where it can be centralised managed.

2) The quality area are too big for the QF to look into every details, and "micro manages" the elements.

3) The requirement spelt out in the unit logistic order is not sufficient enough to cover most of the quality area. Users are required to refer to multiple publications and leaflet in order to know what is required to be performed correctly. Such referring constitutes to waste of time and they may misses or misinterpret certain critical information.

4) The current method use to perform self check (element base) is not effective. It is unable to identify systemic failure, or the integration problems between elements. When any external auditor is to perform audit checks, audit trail will be conducted.

5)   Management level personnel (department heads) are not involved in the self check program (internal audit) and they may not have a very clear picture on what is happened on the ground level and the problem faced. Hence, certain good suggestion submitted for approval, may be rejected due to "their lack of knowledge on ground problems".

6)   There are multiple inefficient element management processes chains identified, where it involve so many personnel just to get simple things done.

7)   A lot of redundant paperwork and maintenance requirement were found. These are the main key factors which causes heavy workload to the personnel to main quality. It can be greatly reduce through proper management and cost saving project. Most of the quality records use A4 size paper, single sided. A total waste of resources and affect the environment greatly

8.2 *Overall Recommendations*

CHANGES are required to ensure quality training is provided by the training centre, as the demands are getting higher due to the terrorist treats and riots happened around the world. With robust processes in places, quality is ensured in every training conducted, maintenance jobs performed and logistic supports. With quality, personnel and equipment safety are enhanced and capacity is created for every personnel to perform at their best to think of innovative improvement ideas.

ISO requires processes to be in place, documented proof in every transaction and form of monitoring in every field. It is very important to identify what is really required to ensure quality, and what is redundant. For example, what is the need for someone to constantly conduct monthly check where weekly check is already in place? These are unnecessary paperwork and requirements.

The following are the overall recommendations on the improvement of current quality management system in addition to those mentions in respective sections:

1) Creation of Subject Matter Expert (SME) post for all elements. The following are the his scope of area:

   a.   Assist the QF in managing the all the matter subjected to the elements

   b.   Be well verse of his element matters on all requirements.

   c.   Centralise managed of key tasks when possible. Such as centralising key records such like TMDESS and master publication list.

   d.   Provide advice to the management and all personnel on the element matters.

   e.   Work hand in hand with the QF. Should the QF or the elements SME is not around, the element is still able to function strongly.

   f.   Given the authority to perform element processes reform to ensure continuous improvement such cost saving project and removal of redundant requirements.

2) The QF will focus on the integration of these elements. His job load is greatly reduced as all the SME helps to oversee the elements issues. Capacity is created for him to places focuses in the improvement of the overall unit quality management system.

3) Quality meeting is to be chaired by QF on monthly basis where it involves all personnel performing maintenances. The following are the suggested agenda for quality meeting:

   a. Update to all personnel on any amendment performed in the month and the critical changes
   b. Area of concern from each elements IC and also from the ground personnel.
   c. Open discussion for improvement on every element.
   d. All other quality matters

4) Instead of performing "element base self check", "Process based self check" (audit trail) is to be adapted to identify any systemic failure and the quality (effective and efficiency) of the

unit quality management system. In additional, all department heads are advice to be involved in the self check program.

5) Major review of all elements processes to ensure effectiveness and efficiency. Unnecessary paperwork and procedures are removed and centralised managing of "common" tasks by element SME when possible, to avoid redundant repeated tasks.

6) Review of all requirement leaflet of the unit logistic order to ensure adaptability for future changes and easy amendment. "General critical information" is abstracted from various publications to make the unit logistic order to become an important quality handbook for all issues and easy reference.

7) SME are advised to be rotated at an interval period, so that all personnel can experience, learn and well versed in all quality aspects. With such rotation, every personnel can further contribute their experience to ensure continuous improvement in every process.

8) During the management review, instead of involving the top management, department heads and QF, elements SME will also be involved in the management review as they are able to provide a clearer ground picture and provide innovative ideas to ensure effective and efficiency in unit quality system.

9) Key personnel such as the appointed SME, department heads and the QF are to attend courses pertaining to ISO issues. Where in term they can contribute their learning experience back to the organisation such as education the ground people on quality issues and also encourage improvement to the workplace.

10) Training centre should look into removing unnecessary paperwork and maintenance to save on raw material. Instead of using A4 size paper for quality record, users are encouraged to use record books if possible. Record book allows both side of the page to be fully utilise, able to hold more records per page and can be used for many years without changing.

8.3 *Overall Benefits*

Great benefits are yield from the major recommended reforms to ensure quality. ISO provides a comprehensive guideline on what is quality about and ensure continuous improvement. The recommended changes ensure effectiveness and efficiency in the managing of each element processes. Paperwork is greatly reduced, process chains are shorter, repeated tasks are eliminated and cost saving can be achieved in many ways. On a bigger picture, quality is improved, and environmental impact is reduced. With the overall recommendations, the training centre is another step toward ISO certification in technical logistic.

The following are a list of overall benefits achieved from the recommendations:

1) SME and QF are able to work closely and cover / help one another when required to ensure continuous improvement.

2) Rotation of SME allows all personnel to learn the quality essence of all elements, and passing and sharing of experience to ensure continuous improvement.

3) Process chain of all elements is shorter and personnel can get things done easier and faster.

4) More people can be involved in the quality meeting to share innovative improvement ideas.

5) Having management level personnel involve in self check ensure integration of relationship between all level personnel. In addition, their presence will act as a "pushing" factor in quality improvement.

6) Process base self check enable the training centre to identify their weakness and systemic failure easier, to be remedied. It can be used to monitor the effectiveness of my recommendations, and future improves it during the management review.

7) The removal of redundant quality records (paperwork), redundant maintenance (uses of POL) and the uses of record books, ensure time/cost saving for the personnel and promote environment sustainability.

9. Discussion

9.1 *My learning experience from this research*

I realised that there are very close link within the elements I work on. For any maintenance tasks, it may look like just a simple job such as getting the right tool, using the right technical manual and getting the right POL. However there are a lot of processes running in the background to ensure that the task can be carried out effectively and safety. Any systemic failure any of the quality elements, the whole quality processes chain will be collapsed. Delay in maintenance work will be encountered, or worst, implicate safety.

For example, in a construction yard, periodic load test is failed to be performed on the working crane. Due to wear and tear, the structure of the crane may collapse without warning and causes death to the workers.

With a strong technical logistic support doing the background jobs, training can be conducted safely and effectively with high serviceable equipment. With lesser down time on the equipment provides great confidence to the people on the reliability of the weapon systems, the nation is operating.

During the course of performing audit walk through and thinking of recommendation, it makes me to think "process" in all aspects. There must be a process in every thing we do. Without documented processes for reference, should the "key" personnel who have been performing the same job for many years left his position, anyone who take over his position will have hard time learning what to do. This is where unnecessary human error can be eliminated. With robust processes in place, maximum results are achieved with minimum work and the life of the personnel will be smooth.

Maintaining quality is a tough job. When any accident happened, top management of any organisation will introduce more maintenances and checks to be performed without thinking it is actually "killing" the workers and the organisation itself. In ISO 9001:2000, it only requires the organisation to spell out their unique **requirements**, unlike the 1994 series where all procedures

must be specified clearly. Hence it had actually given the organisation the benefits to review and promulgate their unique simple and easy processes.

Quality may means "extra works" to the worker. But on the other hand, quality processes in place could means cost saving and enhancement on safety. It all depends on how the organisation management managed it. Hence it is very important that all personnel are actively involve in providing improvement feedback and together with process base self check results, management are able to perform quality management review to ensure continuous improvement.

In every recommendation I made, I have to perform research on what is the rationale behind the current requirements and training centre limitation (e.g. Manpower). Follow by, the recommendation I made, must comply with both the ISO requirements and higher logistic orders requirements. By looking from a "bird eye view" on the overall recommended system it make me look at area where short, effective processes can be achieved with minimum paperwork. The recommended process must also ensure that there are always somebody who can cover one another job effectively when anyone is not around.

This research allows me to think quality and processes and it benefit me greatly for my future advancement into any industries.

9.2 *Environmental sustainability*

When focuses in ensuing quality in maintenance, increase in paperwork and material for servicing is evitable when safety and traceability is a concern. However, increase in non-effective servicing and maintaining redundant quality record (paperwork) is a waste of time, wastage of raw material and causes substantial damage to the environment.

The use of colour duct tape to replace paint marker, put rarely used tools under storage and using electronic mean for monitoring purposes are some initiatives to prove that

environmental friendly project can achieved cost saving as well. Efforts have been put in to identify what are the unnecessary paper and maintenance which can be removed and the use of record book to replace A4 paper are greatly encourage.

With proper planning, managing and constant review of processes to eliminate unnecessary quality records and maintenance, it benefits both the organisation and the Mother Nature.

9.3 *Current Stand from ISO certification*

Most of the required ISO frameworks are already in place in the training centre such as quality structure and having the QF. From the result of the audit walkthrough, no major systemic failure is identified. Although there is a couple of minor NC and many OFI, these can be rectified with the recommended processes.

The results also proved that with the support from the higher logistic orders and my recommended procedures, it helps the training centre one big steps toward ISO certification. With robust processes in place, an effective "process base self check" monitoring it, continuous improvement is definitely ensured.

Once the training centre re-formed is finished (where it include those elements not included in this research), and the support from higher HQ, the training centre is able to go for the first round of ISO audit.

9.4 *Suggested future direction after ISO certification*

ISO is basically a basic certification to ensure quality processes are in place. After achieving ISO certification on the first year, continuous improvements must be maintained as yearly re-certification for ISO award for the subsequent years are required. Having an effective and efficient self check in-place ensures together with active involvement of all personnel in quality improvement, continuous improvement is ensured. Zero finding (including zero OFI) is an achievable goal.

Once zero finding is achieved, the training centre may want to look into achieving **OSHA (Occupational Safety & Health Administration)** certification. It is a tough certification that encourages the training centre to establish safety, health programs, find and fix hazards to prevent workplace injuries and illnesses. In summary, at start state, unit must identify all the likelihood hazards, and prevention measures must be in place and documented. These hazards include example down to "working too long in front of computer and cause strain on the eyes and wrist", and "opening directing of the door".

According to OSHA, the agency's mission is "to assure the safety and health of workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health."

Achieving OSHA certification will further enhance public and staff confidence that the organisation look very seriously in their safety and health issues. In long term, it benefits both the organisation and staff greatly toward achieving zero accident and everybody are motivated to push the extra mile for the organisation. It will be another big leap in ensuring safety and a great achievement.

10. Summary

Quality training and maintenance tasks are achievable with robust technical logistic support acting at the back. Form the research and audit walk through, it clearly show that a lot of background work need to be done to support every maintenance task successfully. Any failure the 6 elements mention in this research, will contributed to maintenance limitation and safety implications.

Major focuses had been placed in improving the processes for publication, POL, TMDE, PLL management and self check method. Every element has an appointed element SME to assist the QF in managing the quality issues of their elements. Unnecessary paperwork and maintenance is removed. Long winded processes are shorten and neater. Tighter processes and monitoring method by electronic means are introduced and great cost saving is achievable with proper planning for tools management. With the review of the unit logistic order, a comprehensive, easy to understand with high future adaptability quality manual, is created to guide the unit personnel toward the path of ISO certification.

With robust processes in place, maintenance tasks and training can be conducted effectively and efficiently with minimum cost, minimum manpower, minimize environmental impact and yet safety is enhanced. ISO provide a good quality framework for the training centre to work towards to, ensuring quality in every aspect of the training and technical logistic support. It served as a great stepping stone for the training centre to move towards higher awards such as OSHA certification in the near future.

Reference

References

All business-One stop resource for growing business, *What is OSHA*, viewed 15 SEP 2006 <http://www.allbusiness.com/human-resources/workplace-health-safety-employment/11409-1.html>

Burns, Thomas, 1999, *Serious incident prevention*, Houston, Tex, Gulf,

CDI Consolidated devices Inc 1996, Adjustable Torque Limiting wrench 1502MR technical manual, CDI, USA

Centre for NS Training Excellence, 2006, Unit Logistic Order

Hollnagel, Erik, 2004, *Barriers and accident prevention*, Aldershot, Hampshire, England ; Burlington, VT : Ashgate

ISO Standards, ISO 9001:2000 Chapter 7: Process – Auditing for Continual Improvement viewed 18th April 2006, intranet <http://dmg.mindef/mso/publications/doc/ISO/chapter7.doc>

ISO Standards, ISO 9001:2000 – Quality Management System Requirements, viewed 15th March 2006, intranet <http://dmg/mso/publications/doc/ISO/iso9001_requirements.doc>

ISO Standards, ISO 9004:2000 – Quality Management System Guidelines For Performance Improvements, viewed 30th Sep 2006, intranet <http://dmg/mso/publications/doc/ISO/iso9001_requirements.doc>

Patricia M.Laing, *Accident and Prevention Manual for Business and Industry - Engineering & Technology (10th Edition)*, Natl Safety council

Snap-on Technologies INC, 2003, 'Catalogue 700', pp.265, Torque Measuring & Testing, Kenosha, Wisconsin USA.

U.S. Department of Labor, Occupational Safety & Health Administration (OSHA), viewed 15th Sep 2006, <http://www.osha.gov>

Annex A –
Project Specification

University of Southern Queensland

Faculty of Engineering and Surveying

ENG 4111/4112 Research Project
PROJECT SPECIFICATION

FOR   :   Chin Fung Lee
TOPIC   :   Quality review of unit technical logistic and maintenance processes

SUPERVISOR   :   Steven Goh (Faculty of Engineering & Surveying)

SPONSORSHIP   :   Centre for NS training Excellence

PROGRAMME   :   **Issue D, 18 Oct 2006**

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1.   Review the quality management processes of the following elements against ISO 9001:2000, Quality Management Systems- Requirement.

    The following are the elements of coverage:

- Publication management and maintenance
- POL management (POL- Petroleum, Oil, Lubricant)
- TMDE management (TMDE- Test Measurement Diagnostic Equipment)
- Tools management and maintenance
- PLL management (PLL – Prescribe Load List, spare part for maintenance purpose)
- Review on Unit Self-Check Program (a processes monitoring system)

2.   Collect relevant data on how the overall quality management system works and the management system of every element.

3.   Perform an audit walk through of each element based on ISO 9001:2000, Quality Management System- Requirement.

4.   Identify fields that meet the ISO requirement and it weaknesses.

5.   Provide appropriate recommendations on the management of the mentioned elements to achieve cost saving, effectiveness and efficiency.

6.   Review the current "Unit Logistic Order" that contains the processes of all the above mentioned elements. A new recommended amendment leaflets on the mentioned elements will be provided where possible.

Special Request.

    The assignment may contain sensitive information. I would like to request this assignment to be classified under **CONFIDENTIAL** until further notice.

AGREED :
(Student)

Sign   :
Date   :   19/10/2006 .

(Lecturer)

Sign   :
Date   :   19 / 10 / 2006

Annex B –

ISO 9001:2000 Quality Management Systems - Requirement

Annex B: ISO 9001:2000 Quality Management Systems - Requirement

1   Scope

1-1 General

This International Standard specifies requirements for a quality management system where an organization

a)   needs to demonstrate its ability to consistently provide product that meets customer and applicable regulatory requirements, and

b)   aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable regulatory requirements.

NOTE In this International Standard, the term 'product' applies only to the product intended for, or required by, a customer.

1.2   Application

All requirements of this International Standard are generic and are intended to be applicable to all organizations, regardless of type, size and product provided.

Where any requirement(s) of this International Standard cannot be applied due to the nature of an organization and its product, this can be considered for exclusion.

Where exclusions are made, claims of conformity to this International Standard are not acceptable unless these exclusions are limited to requirements within clause 7, and such exclusions do not affect the organization's ability, or responsibility, to provide product that meets customer and applicable regulatory requirements.

2   Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the

normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 9000.-2000, Quality management systems - Fundamentals and vocabulary.

3   Terms And Definitions

For the purposes of this International Standard, the terms and definitions given in ISO 9000 apply.

The following terms, used in this edition of ISO 9001 to describe the supply chain, have been changed to reflect the vocabulary currently used:

Supplier ™ Organization ™ Customer

The term "organization" replaces the term "supplier" used in ISO 9001:1994, and refers to the unit to which this International Standard applies. Also, the term 'supplier' now replaces the term "subcontractor".

Throughout the text of this International Standard, wherever the term "product" occurs, it can also mean "service".

4   Quality Management System

4.1 General requirements

The organization shall establish, document, implement and maintain a quality management system and continually improve its effectiveness in accordance with the requirements of this International Standard.

The organization shall

a)   identify the processes needed for the quality management system and their application throughout the organization (see 1.2),

b)   determine the sequence and interaction of these processes,

c)   determine criteria and methods needed to ensure that both the operation and control of these processes are effective,

d)   ensure the availability of resources and information necessary to support the operation and monitoring of these processes,

e)   monitor, measure and analyse these processes, and

f)   implement actions necessary to achieve planned results and continual improvement of these processes.

These processes shall be managed by the organization in accordance with the requirements of this International Standard.

Where an organization chooses to outsource any process that affects product conformity with requirements, the organization shall ensure control over such processes. Control of such outsourced processes shall be identified within the quality management system.

NOTE Processes needed for the quality management system referred to above should include processes for management activities, provision of resources, product realization and measurement.

4.2   Documentation requirements

4.2.1 General

The quality management system documentation shall include

a)   documented statements of a quality policy and quality objectives,

b)   a quality manual,

c)   documented procedures required by this International Standard,

d)   documents needed by the organization to ensure the effective planning, operation and control of its processes, and

e)   records required by this International Standard (see 4.2.4).

NOTE 1 Where the term 'documented procedure' appears within this International Standard, this means that the procedure is established, documented, implemented and maintained.

NOTE 2 The extent of the quality management system documentation can differ from one organization to another due to

a)   the size of organization and type of activities,

b)   the complexity of processes and their interactions, and

c)   the competence of personnel.

NOTE 3 The documentation can be in any form or type of medium (e.g. website).

4.2.2   Quality manual

The organization shall establish and maintain a quality manual that includes

a)   the scope of the quality management system, including details of and justification for any exclusions (see 1.2),

b)   the documented procedures established for the quality management system, or reference to them, and

c)   a description of the interaction between the processes of the quality management system.

4.2.3 Control of documents

Documents required by the quality management system shall be controlled. Records are a special type of document and shall be controlled according to the requirements given in 4.2.4.

A documented procedure shall be established to define the controls needed

a)   to approve documents for adequacy prior to issue,

b)   to review and update as necessary and re-approve documents,

c)   to ensure that changes and the current revision status of documents are identified,

d)   to ensure that relevant versions of applicable documents are available at points of use,

e)   to ensure that documents remain legible and readily identifiable,

f)   to ensure that documents of external origin are identified and their distribution controlled, and

g)   to prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose.

4.2.4 Control of records

Records shall be established and maintained to provide evidence of conformity to requirements and of the effective operation of the quality management system. Records shall remain legible, readily identifiable and retrievable. A documented procedure shall be established to define the controls needed for the identification, storage, protection, retrieval, retention time and disposition of records.

5 Management Responsibility

5.1 Management commitment

Top management shall provide evidence of its commitment to the development and implementation of the quality management system and continually improving its effectiveness by

a) communicating to the organization the importance of meeting customer as well as statutory and regulatory requirements,

b) establishing the quality policy,

c) ensuring that quality objectives are established,

d) conducting management reviews, and

e) ensuring the availability of resources.

5.2 Customer focus

Top management shall ensure that customer requirements are determined and are met with the aim of enhancing customer satisfaction (see 7.2.1 and 8.2.1).

5.3 Quality policy

Top management shall ensure that the quality policy

a) is appropriate to the purpose of the organization,

b) includes a commitment to comply with requirements and continually improve the effectiveness of the quality management system,

c) provides a framework for establishing and reviewing quality objectives,

d) communicated and understood within the organization, and

e) reviewed for continuing suitability.

5.4 Planning

5.4.1 Quality objectives

Top management shall ensure that quality objectives, including those needed to meet requirements for product [see 7.1 (a)], are established at relevant functions and levels within the organization. The quality objectives shall be measurable and consistent with the quality policy.

5.4.2 Quality management system planning

Top management shall ensure that

a) the planning of the quality management system is carried out in order to meet the requirements given in 4.1, as well as the quality objectives, and

b) the integrity of the quality management system is maintained when changes to the quality management system are planned and implemented.

5.5 Responsibility, authority and communication

5.5.1 Responsibility and authority

Top management shall ensure that responsibilities and authorities are defined and communicated within the organization.

5.5.2 Management representative

Top management shall appoint a member of management who, irrespective of other responsibilities, shall have responsibility and authority that includes

a) ensuring that processes needed for the quality management system are established, implemented and maintained,

b) reporting to top management on the performance of the quality management system and any need for improvement, and

c) ensuring the promotion of awareness of customer requirements throughout the organization.

NOTE The responsibility of a management representative can include liaison with external parties on matters relating to the quality management system.

5.5.3 Internal communication

Top management shall ensure that appropriate communication processes are established within the organization and that communication takes place regarding the effectiveness of the quality management system.

5.6 Management review

5.6.1 General

Top management shall review the organization's quality management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. This review shall include assessing opportunities for improvements and the need for changes to the quality management system, including the quality policy and quality objectives.

Records from management reviews shall be maintained (see 4.2.4).

5.6.2 Review input

The input to management review shall include information on

a)   results of audits,

b)   customer feedback,

c)   process performance and product conformity,

d)   status of preventive and corrective actions,

e)   follow-up actions from previous management reviews,

f)   changes that could affect the quality management system, and

g)   recommendations for improvement.

5.6.3 Review output

The output from the management review shall include any decisions and actions related to

a)   improvement of the effectiveness of the quality management system and its processes,

b)   improvement of product related to customer requirements, and

c)   resource needs.

6   Resource Management

6.1 Provision of resources

The organization shall determine and provide the resources needed

a) to implement and maintain the quality management system and continually improve its effectiveness, and

b) to enhance customer satisfaction by meeting customer requirements.

6.2 Human resources

6.2.1 General

Personnel performing work affecting product quality shall be competent on the basis of appropriate education, training, skills and experience.

6.2.2 Competence, awareness and training

The organization shall

a) determine the necessary competence for personnel performing work affecting product quality,

b) provide training or take other actions to satisfy these needs,

c) evaluate the effectiveness of the actions taken,

d) ensure that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives, and

e) maintain appropriate records of education, training, skills and experience (see 4.2.4).

6.3 Infrastructure

The organization shall determine, provide and maintain the infrastructure needed to achieve conformity to product requirements. Infrastructure includes, as applicable

a) buildings, workspace and associated utilities,

b) process equipment (both hardware and software), and

c) supporting services (such as transport or communication).

6.4 Work environment

The organization shall determine and manage the work environment needed to achieve conformity to product requirements.

7　Product Realization

7.1　Planning of product realization

The organization shall plan and develop the processes needed for product realization. Planning of product realization shall be consistent with the requirements of the other processes of the quality management system (see 4.1).

In planning product realization, the organization shall determine the following, as appropriate:

a)　quality objectives and requirements for the product;

b)　the need to establish processes, documents, and provide resources specific to the product;

c)　required verification, validation, monitoring, inspection and test activities specific to the product and the criteria for product acceptance;

d)　records needed to provide evidence that the realization processes and resulting product meet requirements (see 4.2.4).

The output of this planning shall be in a form suitable for the organization's method of operations.

NOTE 1 A document specifying the processes of the quality management system (including the product realization processes) and the resources to be applied to a specific product, project or contract, can be referred to as a quality plan.

NOTE 2 The organization may also apply the requirements given in 7.3 to the development of product realization processes.

7.2　Customer-related processes

7.2.1 Determination of requirements related to the product

The organization shall determine

a)　requirements specified by the customer, including the requirements for delivery and post-delivery activities,

b)　requirements not stated by the customer but necessary for specified or intended use, where known,

c)　statutory and regulatory requirements related to the product, and

d)　any additional requirements determined by the organization.

7.2.2 Review of requirements related to the product

The organization shall review the requirements related to the product. This review shall be conducted prior to the organization's commitment to supply a product to the customer (e.g. submission of tenders, acceptance of contracts or orders, acceptance of changes to contracts or orders) and shall ensure that

a) product requirements are defined,

b) contract or order requirements differing from those previously expressed are resolved, and

c) the organization has the ability to meet the defined requirements.

Records of the results of the review and actions arising from the review shall be maintained (see 4.2.4).

Where the customer provides no documented statement of requirement, the customer requirements shall be confirmed by the organization before acceptance.

Where product requirements are changed, the organisation shall ensure that relevant documents are amended and that relevant personnel are made aware of the changed requirements.

NOTE In some situations, such as Internet sales, a formal review is impractical for each order. Instead the review can cover relevant product information such as catalogues or advertising material.

7.2.3 Customer communication

The organization shall determine and implement effective arrangements for communicating with customers in relation to

a)   product information,

b)   enquiries, contracts or order handling, including amendments, and

c)   customer feedback, including customer complaints.

7.3   Design and development

7.3.1 Design and development planning

The organization shall plan and control the design and development of product. During the design and development planning, the organization shall determine

a)   the design and development stages,

b)   the review, verification and validation that are appropriate to each design and development stage, and

c)   the responsibilities and authorities for design and development.

The organization shall manage the interfaces between different groups involved in design and development to ensure effective communication and clear assignment of responsibility.

Planning output shall be updated, as appropriate, as the design and development progresses.

7.3.2 Design and development inputs

Inputs relating to product requirements shall be determined and records, maintained (see 4.2.4). These inputs shall include

a)   functional and performance requirements,

b)   applicable statutory and regulatory requirements,

c)   where applicable, information derived from previous similar designs, and

d)   other requirements essential for design and development.

These inputs shall be reviewed for adequacy. Requirements shall be complete, unambiguous and not in conflict with each other.

7.3.3 Design and development outputs

The outputs of design and development shall be provided in a form that enables verification against the design and development input and shall be approved prior to release.

Design and development outputs shall

a)   meet the input requirements for design and development,

b)   provide appropriate information for purchasing, production and for service provision,

c)   contain or reference product acceptance criteria, and

d)   specify the characteristics of the product that are essential for its safe and proper use.

7.3.4 Design and development review

At suitable stages, systematic reviews of design and development shall be performed in accordance with planned arrangements (see 7.3.1)

a)   to evaluate the ability of the results of design and development to meet requirements, and

b)   to identify any problems and propose necessary actions.

Participants in such reviews shall include representatives of functions concerned with the design and development stage(s) being reviewed. Records of the results of the reviews and any necessary actions shall be maintained (see 4.2.4).

7.3.5 Design and development verification

Verification shall be performed in accordance with planned arrangements (see 7.3.1) to ensure that the design and development outputs have met the design and development input requirements. Records of the results of the verification and any necessary actions shall be maintained (see 4.2.4).

7.3.6 Design and development validation

Design and development validation shall be performed in accordance with-planned arrangements (see 7.3.1) to ensure that the resulting product is capable of meeting the requirements for the specified application or intended use, where known. Wherever practicable, validation shall be completed prior to the delivery or implementation of the product. Records of the results of validation and any necessary actions shall be maintained (see 4.2.4).

7.3.7 Control of design and development changes

Design and development changes shall be identified and records maintained. The changes shall be reviewed, verified and validated, as appropriate, and approved before implementation. The review of design and development changes shall include evaluation of the effect of the changes on constituent parts and product already delivered.

Records of the results of the review of changes and any necessary actions shall be maintained (see 4.2.4).

7.4   Purchasing

7.4.1 Purchasing process

The organization shall ensure that purchased product conforms to specified purchase requirements. The type and extent of control applied to the supplier and the purchased product shall be dependent upon the effect of the purchased product on subsequent product realization or the final product.

The organization shall evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements. Criteria for selection, evaluation and re-evaluation shall be established. Records of the results of evaluations and any necessary actions arising from the evaluation shall be maintained (see 4.2.4).

7.4.2 Purchasing information

Purchasing information shall describe the product to be purchased, including where appropriate

a)   requirements for approval of product, procedures, processes and equipment,

b)   requirements for qualification of personnel, and

c)   quality management system requirements.

The organization shall ensure the adequacy of specified purchase requirements prior to their communication to the supplier.

7.4.3 Verification of purchased product

The organization shall establish and implement the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirements.

Where the organization or its customer intends to perform verification at the supplier's premises, the organization shall state the intended verification arrangements and method of product release in the purchasing information.

7.5   Production and service provision

7.5.1 Control of production and service provision

The organization shall plan and carry out production and service provision under controlled conditions. Controlled conditions shall include, as applicable

a)   the availability of information that describes the characteristics of the product,

b)   the availability of work instructions, as necessary,

c)   the use of suitable equipment,

d)   the availability and use of monitoring and measuring devices,

e)   the implementation of monitoring and measurement, and

f)   the implementation of release, delivery and post-delivery activities.

7.5.2 Validation of processes for production and service provision

The organization shall validate any processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement. This includes any processes where deficiencies become apparent only after the product is in use or the service has been delivered.

Validation shall demonstrate the ability of these processes to achieve planned results.
The organization shall establish arrangements for these processes 'including, as applicable.

a)   defined criteria for review and approval of the processes,

b)   approval of equipment and qualification of personnel,

c)   use of specific methods and procedures,

d)   requirements for records (see 4.2.4), and

e)   revalidation.

7.5.3 Identification and traceability

Where appropriate, the organization shall identify the product by suitable means throughout product realization.

The organization shall identify the product status with respect to monitoring and measurement requirements.

Where traceability is a requirement, the organization shall control and record the unique identification of the product (see 4.2.4).

NOTE In some industry sectors, configuration management is a means by which identification and traceable are maintained.

7.5.4 Customer property

The organization shall exercise care with customer property while it is under the organization's control or being used by the organization. The organization shall identify, verity, protect and safeguard customer property provided for use or incorporation into the product. If any customer property is lost, damaged or otherwise found to be unsuitable for use, this shall be reported to the customer and records maintained (see 4.2.4).

NOTE Customer property can include intellectual property.

7.5.5 Preservation of product

The organization shall preserve the conformity of product during internal processing and delivery to the intended destination. This preservation shall include identification, handling, packaging, storage and protection. Preservation shall also apply to the constituent parts of a product.

7.6 Control of monitoring and measuring devices

The organization shall determine the monitoring and measurement to be undertaken and the monitoring and measuring devices needed to provide evidence of conformity of product to determined requirements (see 7.2.1).

The organization shall establish processes to ensure that monitoring and measurement can be carried out and are carried out in a manner that is consistent with the monitoring and measurement requirements.

Where necessary to ensure valid results, measuring equipment shall

a) be calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; where no such standards exist, the basis used for calibration or verification shall be recorded;

b) be adjusted or re-adjusted as necessary;

c) be identified to enable the calibration status to be determined;

d) be safeguarded from adjustments that would invalidate the measurement result;

e) be protected from damage and deterioration during handling, maintenance and storage.

In addition, the organization shall assess and record the validity of the previous measuring results when the equipment is found not to conform to requirements. The organization shall take appropriate action on the equipment and any product affected. Records of the results of calibration and verification shall be maintained (see 4.2.4).

When used in the monitoring and measurement of specified requirements, the ability of computer software to satisfy the intended application shall be confirmed. This shall be undertaken prior to initial use and reconfirmed as necessary.

NOTE See ISO 10012-1 and ISO 10012-2 for guidance.

8   Measurement, Analysis And Improvement

8.1   General

The organization shall plan and implement the monitoring, measurement, analysis and improvement processes needed

a)   to demonstrate conformity of the product,

b)   to ensure conformity of the quality management system, and

c)   to continually improve the effectiveness of the quality management system.

This shall include determination of applicable methods, including and the extent of their use.

8.2   Monitoring and measurement

8.2.1 Customer satisfaction

As one of the measurements of the performance of the quality management system, the organization shall monitor information relating to customer perception as to whether the organization has met customer requirements. The methods for obtaining and using this information shall be determined.

8.2.2 Internal audit

The organization shall conduct internal audits at planned intervals to determine whether the quality management system

a)   conforms to the planned arrangements (see 7.1), to the requirements of this International Standard and to the quality management system requirements established by the organization, and

b)   is effectively implemented and maintained.

An audit program shall be planned, taking into consideration the status and importance of the processes and areas to be   audited, as well as the results of previous audits. The audit criteria, scope, frequency and methods shall be defined. Selection of auditors and conduct of audits shall ensure objectivity and impartiality of the audit process. Auditors shall not audit their own work.

The responsibilities and requirements for planning and conducting audits, and for reporting results and maintaining records (see 4.2.4) shall be defined in a documented procedure.

The management responsible for the area being audited shall ensure that actions are taken without undue delay to eliminate detected nonconformities and their causes. Follow-up activities shall include the verification of the actions taken and the reporting of verification results (see 8.5.2).

NOTE See ISO 10011-1, ISO 10011-2 and ISO 10011-3 for guidance.

8.2.3 Monitoring and measurement of processes

The organization shall apply suitable methods for monitoring and, where applicable, measurement of the quality management system processes. These methods shall demonstrate the ability of the processes to achieve planned results. When planned results are not achieved, correction and corrective action shall be taken, as appropriate, to ensure conformity of the product.

8.2.4 Monitoring and measurement of product

The organization shall monitor and measure the characteristics of the product to verify that product requirements have been met. This shall be carried out at appropriate stages of the product realization process in accordance with the planned arrangements (see 7.1).

Evidence of conformity with the acceptance criteria shall be maintained. Records shall indicate the person(s) authorizing release of product (see 4.2.4).

Product release and service delivery shall not proceed until the planned arrangements (see 7.1) have been satisfactorily completed, unless otherwise approved by a relevant authority and, where applicable, by the customer.

8.3   Control of nonconforming product

The organization shall ensure that product which does not conform to product requirements is identified and controlled to prevent its unintended use or delivery. The controls and related responsibilities and authorities for dealing with nonconforming product shall be defined in a documented procedure.

The organization shall deal with nonconforming product by one or more of the following ways:

a)   by taking action to eliminate the detected nonconformity;

b)   by authorizing its use, release or acceptance under concession by a relevant authority and, where applicable, by the customer;

c)   by taking action to preclude its original intended use or application.

Records of the nature of nonconformities and any subsequent actions taken, including concessions obtained, shall be maintained (see 4.2.4).

When nonconforming product is corrected it shall be subject to re-verification to demonstrate conformity to the requirements.

When nonconforming product is detected after delivery or use has started, the organization shall take action appropriate to the effects, or potential effects, of the nonconformity.

8.4 Analysis of data

The organization shall determine, collect and analyse appropriate data to demonstrate the suitability and effectiveness of the quality management system and to evaluate where continual improvement of the effectiveness of the quality management system can be made. This shall include data generated as a result of monitoring and measurement and from other relevant sources.

The analysis of data shall provide information relating to

a)   customer satisfaction (see 8.2.1),

b)   conformity to product requirements (see 7.2.1),

c)   characteristics and trends of processes and products including opportunities for preventive action, and

d)   suppliers.

8.5 Improvement

8.5.1 Continual improvement

The organization shall continual improve the effectiveness of the quality management system through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

8.5.2 Corrective action

The organization shall take action to eliminate the cause of nonconformities in order to prevent recurrence. Corrective actions shall be appropriate to the effects of the nonconformities encountered.

A documented procedure shall be established to define requirements for

a)   reviewing nonconformities (including customer complaints),

b)   determining the causes of nonconformities ,

c)   evaluating the need for action to ensure that nonconformities do not recur,

d)   determining and implementing action needed,

e)   records of the results of action taken (see 4.2.4), and

f)   reviewing corrective action taken.

8.5.3 Preventive action

The organization shall determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions shall be appropriate to the effects of the potential problems.

A documented procedure shall be established to define requirements for

a)   determining potential nonconformities and their causes,

b)   evaluating the need for action to prevent occurrence of nonconformities,

c)   determining and implementing action needed,

d)   records of results of action taken (see 4.2.4), and

e)   reviewing preventive action taken.

Annex C –

Introduction to Publication monitoring and accounting method using Microsoft Excel

Annex C – Introduction to Publication Monitoring and accounting method using Microsoft Excel

C.1   Introduction

Making proper usage of available electronic software function such as Microsoft Excel, it is able to assist user to achieve maximum effective and efficient publication monitoring and accounting. In the following, it will demonstrate the recommended method to perform monitoring and yearly accounting of publications.

C.2   Current accounting method

C.2.1- Accounting steps

When the central library provides the annual publication inventory list to training centre, it will be duplicated and issued to respective IC. The list consists of all the publication held by the training centre, where these publications have been distributed to different departments.

The following are the step taken for accountability checks:

a)   List is duplicated and given to different IC to perform checks

b)   Individual IC is to identify which publication belongs to them and ensure that the list tally with the unit Company Equipment List.

c)   Perform manual search for the publication from the list or vice verse, and ensure that the amendment is updated.

d)   Some titles are held by few departments, all the ICs have to sort it out and ensure the total quantity is correct.

e)   Someone will combine all the returned results to ensure that all publications are accounted.

C.2.2- Problems faced

A lot of time is wasted to perform the following:

a) Sorting out which publication belongs to which department by individual IC

b) Manual search for the publication from the list or vice verse

c) De-conflict on the quantity of the publication with the same title held by different departments

d) Compiling all the returned results from individual IC, and vetted through it to ensure nothing is missed out.

e) Ensuring the central library list tally with individual department company equipment list where it quite redundant.

f) 3 full days are required to perform this.

C.3   Using Recommended Excel spreadsheet for accountability

With the new recommended process in publication management, the departments "company equipment list" will no more be in used. Microsoft Excel spread sheet will be utilised by the unit and individual publication IC to ensure effective and efficient publication accounting and monitoring.

The new recommended accountability method is sort by "shelf listing". In the spreadsheet, it will monitor the location and quantity of any publication by it position on the shelf of each publication cabinet/cupboard. When the publication IC need to look for any publication or accounts for it, he will only need to open this "spreadsheet" and everything is there.

In the following we will see how the spreadsheet can be utilised for accounting purposes. All data are for demonstration purposes.

a) In Fig C.1, It demonstrates that all publications are sorted by their shelf location of each cabinet and are categorise into 3 "fields".

i. Cabinet shelf listing — The shelf listing of the publication, which is also the exact copy that will be placed at different shelf of the cabinet.

ii. Additional Info — Additional information such at amendment update info and other useful information.

iii. "Check Indication" — This cell is use to assist the publication IC in conducting annual accountability
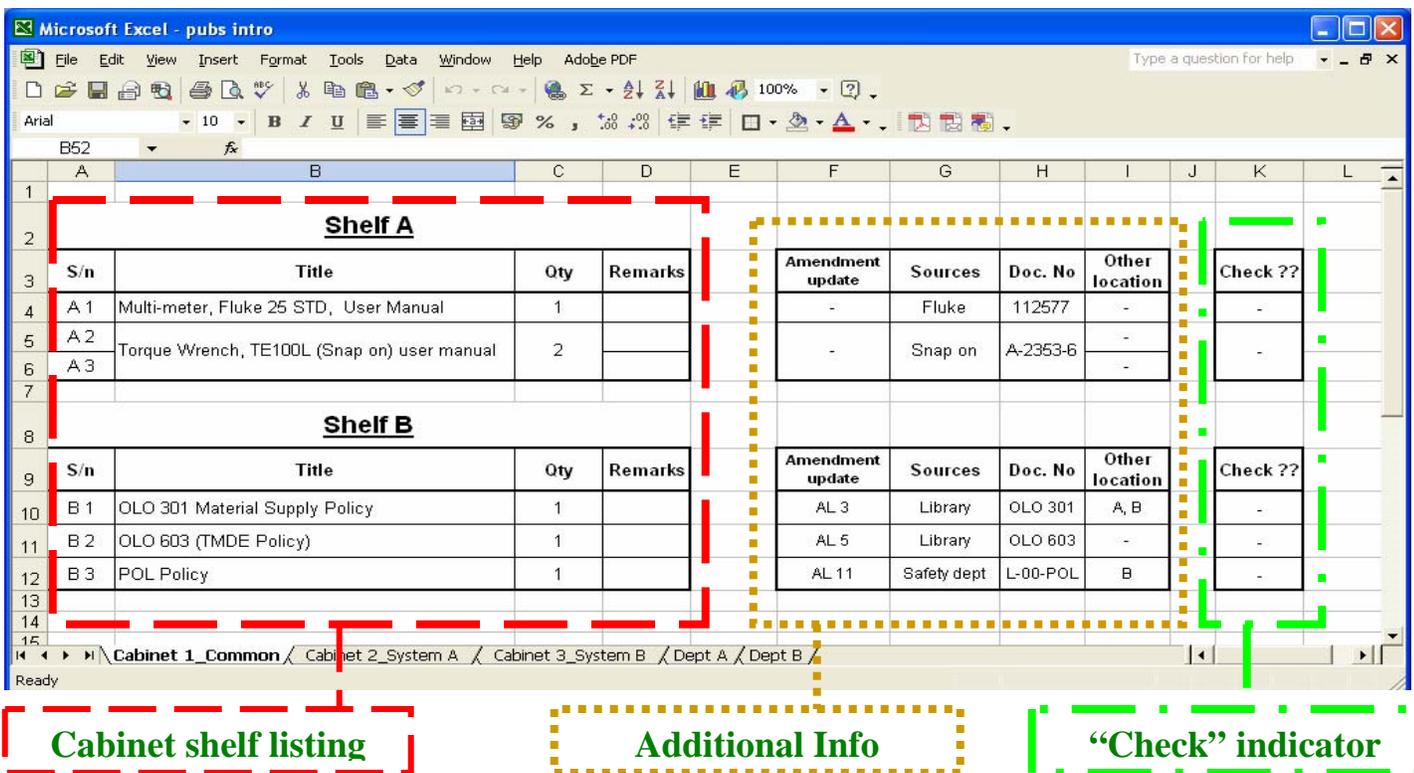
Fig C.1

b) Using the "Find" function (go to **EDIT-> Find**) to locate the publication the user need to find. In Fig C.2, it shows that the user use the "Find" function to locate the publication with the word "TMDE". It is located in shelf B2, of cabinet 1.
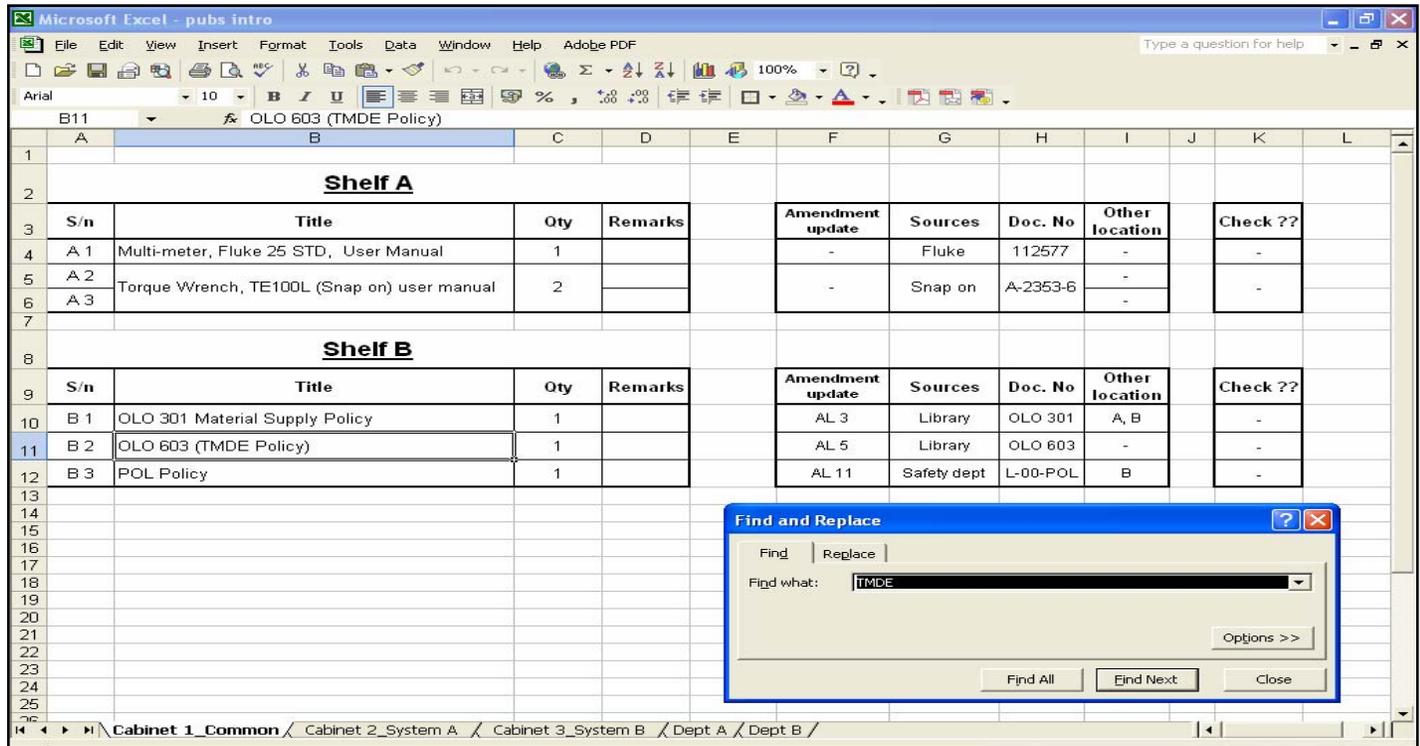
Fig C..2

c) Once the publication is located, go over to the "check indicator: and click to activate the drop down box.
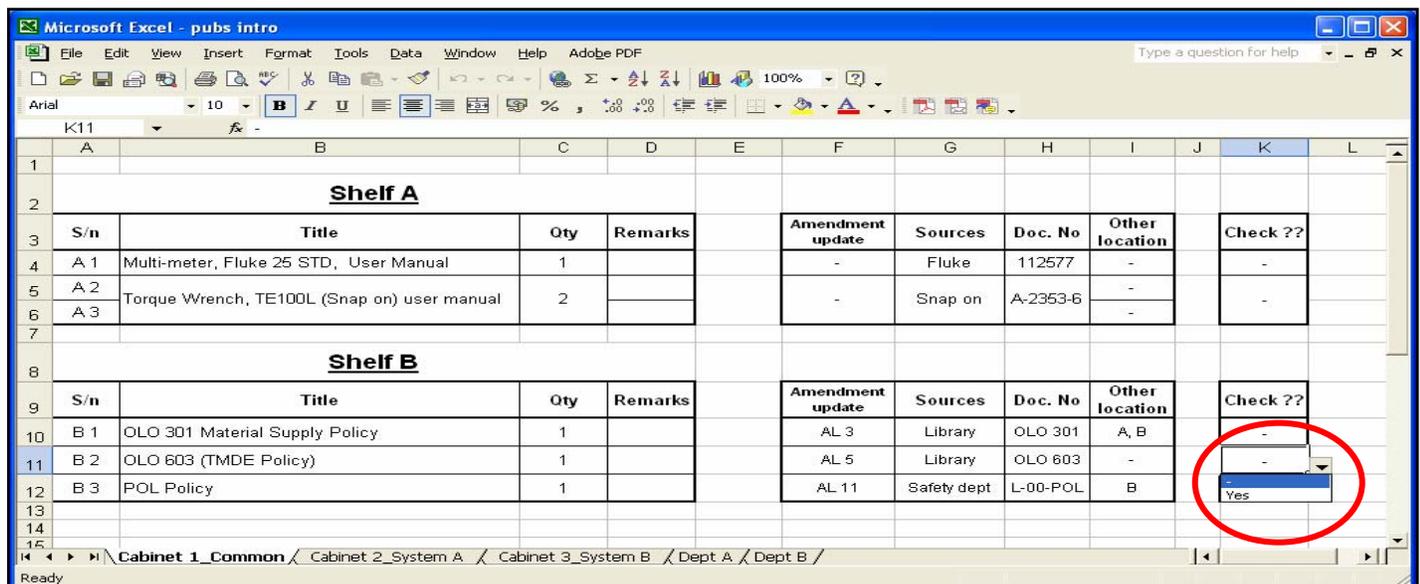
Fig C.3

d)   Choose **"Yes"** and the whole row will be highlighted to indicate that **it has been checked and accounted**. That's all.

Fig C.4

C.4   Recommended Publication accounting and monitoring methods using the Excel spreadsheet

A single Microsoft Excel file, which consist many spreadsheets, which capture all publications cabinet shelf listing data of the training centre will be produced. The spreadsheets are shared by every assigned department publication IC in the training centre where everyone is able to know who is holding what publications and where is it located. All department publication IC / Sub-account holder are to ensure that the spreadsheet under their care, cabinet shelf listings are accurate and updated.

The following are the responsibility of individual department publication IC / sub-accountholder and unit publication IC scope of responsibility to ensure this spreadsheet work effectively and efficiently in publication management. In short, the spreadsheet is used as a common database where everyone can use it to update their shelf listing and monitoring.

C.4.1 - Department publication IC / sub-accountholder responsibility

b) Ensure that the cabinet shelf listing spreadsheets are, under their care are accurate.

c) Should there be any changes to the cabinet shelf listing, respective ICs will amend the spreadsheet under his charge, print out and place in the cabinet.

C.4.2 - Unit Publication IC responsibility

a) Whenever any amendment arrived, Unit publication IC will update the "amendment leaflet number" of the received amendment of the publication into the "amendment update" cell of the spreadsheet.

b) Maintain the spreadsheet and ensure continual improvement.

c) Perform annual accountability check, and amendment received check based on this list.

C.4.3 - Accountability checks

All the publications available in the training centre tally with the shelf listing in each cabinet held by every department, and these data are captured in the Excel spreadsheet. It means that the data in the spreadsheet are equal to all the details of the publications held by the training centre. Hence base on accurate data of the spread sheet, annual accountability check can be carried out solely by **Unit publication IC** base on the following:

1) The unit publication IC will first issues the department publication inventory list to all department publication IC/sub-account holder for them to acknowledge that the data in the excel spreadsheet is accurate.

2) Once everyone has confirmed, the unit publication IC will tally the publication inventory list data from the central library against his holding by using the "find" function of the Excel spreadsheet. The "Find" function will assist the IC to locate the required publication to be accounted

3) Once found, check that the title, quantity and amendment details in the Excel spreadsheet tally with the inventory list. Once tallied, choose "Yes" in the check indicators field. The whole row will be highlighted to indicate it is accounted and correct.

4) Repeat steps 2 to 3 to account for all publications.

Using this method, discrepancy can be easily identified and rectification actions can be carried out. The following are some examples on how to recognised discrepancies:

1) There are **non-highlighted rows** to indicate the particular publication is accounted.
2) Publication indicated in the Central library Inventory list, does not exist in the Excel spreadsheet.
3) Additional data in the Central library Inventory list data does not tally with excel spreadsheet

C.4.4 - Security features

Security featured had been added to the excel spreadsheet to prevent unauthorised access and amendment. The following are the security functions

1) The Excel file is password protected. Only authorised personnel have the password to open the file.

2) All worksheet / cabinet shelf listing are individually password protected. Individual department publication IC / sub-account have different password to perform amendment to their "own worksheet" only.

3) Only Unit publication IC has the password to access and amend all data in the Excel file.

C.5   <u>Benefits</u>

Great benefits are gain from the recommendation in the management, monitoring and accounting of the training centre publication. The following are a summary of the benefit gain:

i.   All cabinet shelf listing are standardised and all publication IC can just print out form the spreadsheet.

ii.   Common publications database for all training centre personnel.

iii.   All IC are able to know what publication is available, and it exact location.

iv.   All Publications can be accounted on the desk without going to search for physical item.

v.   Just the Unit publication IC, he is able to perform the accounting of all publications. It does not need the involvement of other ICs to assist him.

vi.   The recommended processes ensure the 3 days accountability check of publications, which involve many personnel, had become a 2 hrs one-man job.

vii.   No additional cost is required is required to purchase / produce monitoring program.

viii. Great Man-hours and resources are saved.

ix.   A lot of room for improvement and more data can be included into the spreadsheet in the future.

x.   Effectiveness and efficiency is achieved.

C.6   <u>Conclusion</u>

      The recommended centralise Excel spreadsheet to monitor the location of all the publications and use for accountability checks yield great benefit in publication managements. With the involvement of all publication ICs to ensure the accuracy of all the data in the Excel spreadsheet, this spreadsheet is able to assist anyone easily on publication issues. With this, convention annual inventory accountability check of 3 days, which involved all the publication ICs, is able to be carried out within 2 hrs by the Unit publication IC himself now!! Great man-hour and resource saving is achieved through effective and efficient use of this recommended processes.

Annex D –
TMDE Monitoring Spreadsheet

Annex D – TMDE Monitoring Spreadsheet

D.1   Introduction

Due to the large amount of TMDE to be monitored, it is much effective and efficient to monitor the TMDE calibration due dates and other details by electronic mean. Since the organisation is using Microsoft Office, the Excel spreadsheet will be used as an important monitoring tool, to assist the Unit TMDE IC to monitor the status of the TMDE of the unit.

In the following report, it will demonstrate on how to use the spreadsheet, the basic "formula" used in each cell, and how it can benefit the training centre.

D.2   How to use

The following will demonstrate how the user can check the status of all the TMDE in the "summary" page at one glance.

1.   In fig D.1, the only field to be input by user is "Min. days to alert before cal" as indicated. This is to alert the user what are the TMDE due for calibration within the next number of days, set by him.

Fig D.1

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2. From the "Summary" spreadsheet, should there be any special alert happened in respective systems' TMDE it will be updated automatically and shown in this page. In fig D.2, it shows that by setting the cell "Min. days to alert before cal" = **50** days, the summary field is updated accordingly. The following figure indicates that "**one** TMDE in system B are going to due for calibration with the next 50 days (set by user).

Fig D.2

The above summary following are Interpret as:

    a) 1 x **System B** TMDE is due for calibration with the next **50 days**. It is to be send to **location X** to perform calibration

    b) Alert user that 1 x **System B** TMDE must be placed under quarantine as the calibration due date is expired. It is to be send to **location Y** to perform calibration

    c) 1 x **System B** TMDE had been send out for calibration within the organisation

3.	In the following Fig D.3, shows the exact detail of the system B TMDE.

The only cells that can be entered by user is indicated in "RED arrows" and all other cells are locked to prevent unauthorised change to the "fixed" data.

System B

S/n	Description	Part No.	Serial Num	Due date	Days to next cal	Statues	Date Send	REMARK	Cal Location	Cal Period	Cost for Cal
1	SLIDING CALIPER	6420	557	20-Nov-06	34	Send for Cal			X	24 M	$110.78
2	Digital Multimeter 8600A	329866	3211022	05-Mar-06	QUARANTINE	CAN		CAN	X	24 M	$575.38
3	SNAP ON TORQUE WRENCH	TE100L	1255	20-Sep-06		Out For Cal	20-Sep-06		Internal	12 M	$27.40
4	THERMO-HYGROMETER	HI8564	U1128	22-Sep-06	QUARANTINE	QUARANTINE			Y	24 M	$642.30
5	MULTIMETER Fluke 87IV	332-3839	71025635	19-Jan-07	93				Y	24 M	$443.10

Summary / System A \ **System B** / System C / NCR / Cupboard Listing /

Ready

Fig D.3

## D.3	Features

1)	When the **"due date"** field is entered, the **spreadsheet will calculate the "days left to next calibration"**

2)	The "statues" field will indicate the provide the following alert under different condition:

i.	**Send for calibration**

a)	When the number in the "Days to next cal" cell is smaller then the number set in the summary page, Fig D.2, it will alert the user to send the particular TMDE for calibration.

ii.	**Out for Calibration**

a)	When TMDE is send out for calibration, where the "date send" cell is filled up, it will alert the user that the item is send out to the indicated location in the spreadsheet.

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b)   The "days to next cal" will automatically disappear. However all other data such as the "calibration due date" will still remain for monitoring purposes.

iii. Quarantine

a)   When the TMDE expiry date have arrived, where "Days to next cal." cell is equal to zero, the "Quarantine" word will appear to alert the user to "Quarantine" the particular TMDE.

iv. CAN (Calibration As necessary)

a)   When the "Remark" field indicate "CAN" it means that the item is authorised to be place under CAN. Hence when the particular TMDE is expired, the word "CAN" will appeared to alert the user to segregate the affected TMDE and place it into the "CAN" cupboard.

b)   When TMDE under "CAN" it is still considered to be "quarantine". The only different is that there is no requirement to send this TMDE out until there is a need.

3) Should any TMDE is found to be unserviceable; it will be sent out immediately. Hence the "date send" field will be updated and the "remark" cell will indicate the reasons.

4) Any status indicated in the "status" cells, will be automatically updated to the "summary" page for user to have a great overview of all the TMDE status.

D.4   Security Function

There are 2 layers of password protections and the following are the functions:

Opening the file -   The file is password protected and only designated TMDE IC have the password to open the file to "READ ONLY".

Editing the Cell -   All the Cells are password protected except "Min. day to alert before Cal" for monitoring purposes. Only unit TMDE IC has the password to edit anything in the spreadsheet.

D.5   Code used

The following will indicate the code used for each cell, so that future user is able to modify the code for continuous improvement.

Statues

=IF(I3="CAN",IF(H3="",IF(F3="QUARANTINE","CAN",""),"Out For Cal"),IF(H3="",IF(AND(F3>0,F3<=Summary!C$3),"Send for Cal",IF(F3="QUARANTINE","QUARANTINE",IF(F3>Summary!C$3,"","Error"))),"Out For Cal"))

S/n	Description	Part No.	Serial Num	Due date	Days to next cal	Statues	Date Send	REMARK	Cal Location	Cal Period	Cost for Cal
1	SLIDING CALIPER	6420	557	20-Nov-06	34	Send for Cal			X	24 M	$110.78
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3	SNAP ON TORQUE WRENCH	TE100L	1255	20-Sep-06		Out For Cal	20-Sep-06		Internal	12 M	$27.40
4	THERMO-HYGROMETER	HI8564	U1128	22-Sep-06	QUARANTINE	QUARANTINE			Y	24 M	$642.30
5	MULTIMETER Fluke 87IV	332-3839	71025635	19-Jan-07	93				Y	24 M	$443.10

Summary / System A \ System B / System C / NCR / Cupboard Listing /

Ready

Days to next cal

=IF(H7="",IF(E7="QUARANTINE","QUARANTINE",IF(DAYS360(TODAY(),E7)>0,DAYS360(TODAY(),E7),"QUARANTINE")),"")

Fig D.4

D.6   Conclusion

With the introduction of the programmed monitoring spreadsheet, it is able assist all user to have better management and monitoring over all the TMDE held in the training centre. It is simple to use, user is able to add additional data easily and the spreadsheet allows a lot of room for future improvement.

Annex E –

Cost Saving calculation for tools management

Annex E - Cost saving calculation for tools management

E.1 Introduction

The report will look into cost saving methods on the maintenance and management for the unit tools without compromising quality and safety. Currently all the tools are identified by colour coding and system have a dedicated tool box to be used.

The following detail will discuss on cost saving method on the following field on yearly basis:

Section 2	:	Cost saving on tools identification method
Section 3	:	Cost saving on storage of tools
Section 4	:	Cost saving from removal of weekly checks
Section 5	:	Combine Cost saving (annually)
Section 6	:	Conclusion

E.2 Cost saving on tools identification method

a) Problem faced

Paint markers are used to colour code all the tools. In additional, a layer of clear tape is used to protect the colour code. However, the following are the problem faced with the method:

i. The colours will "mixed" with the neighbouring colour or de-colourise after about 12 months.

ii. When the tool is contacted with POL during maintenance, the clear tape and the colour code is "damaged".

iii. Most of the colour codes are applied on the "handle" part of the tools. This cause the wear and tear of the colour code to speed up.

iv. Every paint marker "dried" up after about12 month from initial use. Hence there is a need to purchase replacement.

v. It is not east to remove the paint marker when the need arises.

vi. Long Man hours are wasted on constantly maintaining these tools

b) Recommendation

Colour duct tape, with a layer of clear tape is recommended to replace the current practice of using paint marker. The following is the benefits:

   i. It will never decolourise / "mix" with neighbouring colour.
   ii. Cheap, long lasting and easy to change/maintain.
   iii. POL will not affect it de-colourisation.
   iv. Perform better against wear and tear.
   v. Easy to removed and replace when there is a need.
   vi. It will be cleverly placed at "seldom access" part of the tools.
   vii. Water proof / oil resistance

c) Cost calculation

Re-apply of colour coding occur as and when and almost every 6 monthly, the calculation is base on the solely just on applying colour coding on yearly basis:

The following are the break down of maintenance cost for each type of methods for 6000 tools (yearly):

i. Paint marker

Material:

Cost of each paint marker (big size)	=	$5
Type of colour needed	=	12
No of pain marker required each (per year)	=	3

Total cost on Paint markers required for maintenance = $5 x 12 x 3
= **$ 180**

Man Hour

Man hour* needed for 100 tools	=	**1.5hrs**
Man hour* needed for 6000 tools	=	1.5 hrs x 6000/100 = **90 hrs**.
Total Man hour* needed per year	=	90 hrs x 2 = **180 hrs**
Average Man hour cost (per hour)	=	$10

Total man hour cost per year on colour coding = $10 x 180 hrs
= **$ 1800**

Total Cost (paint marker)

Hence the maintenance cost for using paint marker annual   = Material + Man Hours
                                                        = \$ 180 + \$ 1800
                                                        = **\$1980**

**Man hour includes waiting for a single colour band to dry for 10 min plus applying clear tape over it for protection. It is performed average twice per year due to wear and tear.

ii. Colour Duct tape

Material:

Cost of each duct tape (1inch x 30M)   =   \$2
Type of colour needed   =   12
Num. of duct tape for 6000 tools   =   3

Total cost on colour duct tape required for maintenance   = \$2 x 12 x 3
                                                             = **\$ 72**

Man Hour

Implementing:
Man hour [##] needed for 100 tools   =   **1.5hrs**
Man hour [##] needed for 6000 tools   =   1.5 hrs x 6000/100 = **90 hrs**.
Average Man hour cost (per hour)   =   **\$10**

Total man hour cost on implementing   = \$10 x 90 hrs
                                                     = **\$ 900**

One time implementing. It includes taping 3 colour and with clear tape. Not waiting time is required.

Maintenance:

With the benefits from using colour duct tapes on strategic location of the tools, re-apply of duct tape is almost unnecessary. However based on worse case scenario calculation:

Man hour needed to reapply duct tape under worst case (100 tools)   = **1.5hrs**

Average Man hour cost (per hour)   = **$10**

Average additional tape required=1 (with the leftover from beginning)   = **$2**

Total maintenance cost   = $10 x 1.5 hrs +$2

                                       = **$17**

Total Cost (colour duct tape)

Total cost required on first year   = Implementing + colour duct tape cost

                                       = **$972**

Total maintenance cost for subsequence year = **$ 17**

iii. Total Saving (using colour duct tape over paint marker)

On the first year   = Maintenance cost (Paint marker) + colour duct tape (implementing)

                         = $1980 - $972

                         = **$1008**

On subsequence year = $ 1980 - $17

                         = **$ 1963**

Hence, based on 10 years time calculation, as the colour tape is deteriorate and required to change:

Saving for 10 years from implementing   = saving on first year + subsequence year

                                           = $1008 + 9 yrs x $1963

                                           = **$18675**

Average yearly saving achieved   = $18675 / 10

                                     = **$1867.50**

E.3 Cost saving on storage of tools

d) Problem faced

Currently 6000 tools are required to be maintained. These tools require weekly check and monthly maintenance as time and resources are required. POL such as WD40 is used to de-rust, and corrosion preventive compound is applied for preventive measure. However the following are the problem faced

    i.   Great Man hour is used for weekly check for 6000 tools
    ii.   Great Man hour is required to perform monthly tools maintenance
    iii.   Great resource / POL is required for tools maintenance
    iv.   Harm the environment when more POL are used
    v.   System ICs need to maintain a lot of quality records.

e) Recommendation

    1000 out of the 6000 tools have been identified, sufficient enough to perform system's servicing and also for training used. It is recommended that the 5000 tools are to be placed under preservation, and only yearly maintenance is performed.

    The following are the benefits from tools preservation:

    i.   Cost saving on man hour, as monthly maintenance become yearly
    ii.   Cost saving on resource
    iii.   Less paperwork to maintain
    iv.   Better utilisation of tools
    v.   Create capacity for user to perform other tasking
    vi.   Save the environment.

f) Cost calculation

The calculation does not include the repairing of the paint marker colour codes.

i. Current maintenance cost

Material
The following are the required POL per year (6000 tools)

Qty of WD 40	=	2
Cost of WD 40	=	$6
Qty of corrosion preventive compound	=	4
Cost of corrosion preventive compound	=	$6

Total material cost per month = $6 x 6
= **$36**

Total material cost per year = $36 x 12
= **$432**

Man hours

Weekly check (100 tools)	=	**0.5hrs**
Weekly check (6000 tools)	=	**30 hrs**
Monthly maintenance (6000 tools)	=	**40 hrs**
Average Man hour cost (per hour)	=	**$10**

Total man hour cost per month = (3x weekly + monthly) x man hour
= (3x 30 hrs + 40hrs)x **$10**
= **$1300**

Total man hour cost per year = $1300 x 12
= **$15600**

Total cost on current tool maintenance

Total cost on current tools maintenance per year = material + man hour
= $432 + $15600
= **$ 16032**

ii. Maintenance cost after storage

It is recommended that 5000 tools to be place under storage and only left with 1000 tools to be used for all maintenance. The calculation is based on 1000 tools

Material
As the required tools maintenance is 1/6 of the original, hence:

Total material cost per year   = cost for in-service tools + all tools (yearly svc)
                                             = \$432 / 6 + \$36
                                             = **$108**

Man hours
As the required man hours is 1/6 of the original, hence:

Total man hour cost per year   = cost for in-service tools + all tools (yearly svc)
                                             = \$15600 / 6 + 1300
                                             = **$3900**

Total cost on current tool maintenance (after storage)

Total cost on current tools maintenance per year   = material + man hour
                                             = \$108 + \$3900
                                             = **$ 4008**

iii. Total Saving (after storage with duct tape)

Total cost saving from storage policy (yearly)   = \$ 16032 - \$ 4008
                                             = **$11380**

E.4 Cost saving from removal of weekly checks

Number of servicing per annual   = 52
Total tools to perform weekly check after storage = 1000
Man-hour required for 100 tools (per/wk)   = 0.5 hrs
Man-hour required for 1000 tools (per/wk)   = 5 hrs
Man hour required for per annul   = 5 x 52 = 110hrs
Man-hour cost   = $10

Total cost saving with the removal of weekly checks = $10 x 110hrs
                                                                         = **$1100**

E.5 Combine cost saving (annually)

Cost saving by using colour duct tape = **$1867.50**

Cost saving from yearly storage policy = **$11380**

Total cost saving with the removal of weekly checks = $**1100**

Total achievable cost saving   = colour duct tape saving + storage saving + weekly checks
                                        = $11380 + $1867.5 + $1100
                                        = **$14347.50**

E.6 Conclusion

A maximum cost saving of **$14347.50** can be achieved with proper management of the tools, by storage, implementing effective colour coding method and removing unnecessary weekly checks. Effectiveness and efficiency in tools management is achieved.

Annex AR 1 –

Audit Report (Publication Management and Maintenance)

Annex AR 1 – Audit report (Publication Management and maintenance)

Audit finding 1/5	Recommendation
Finding : Inefficient / redundant checks and accountability method	
1. The job scope in the weekly checks is done within minutes and individual publication IC has already performed this check on a daily basis. Maintaining the quality record on the weekly check is found to be redundant.	1. Weekly and quarterly checks are to be removed as these create unnecessary paper work to record ineffective checks. It is not effective to perform such big scale quarterly check over short period of time.
2. Time required for each publication accountability check and maintenance is about **6 days** as unit is holding 800+ publications. **3 days are for maintenance** and **3 days are used for accounting.** 3 days for publication accounting shows ineffective and inefficiency in the current method of doing.	2. All technical logistic publication shall be removed from the CEL as it will be exempted from the annual unit inventory check.
3. The following are the type accountability and maintenance check performed: a) **Quarterly** – As required by the unit logistic order. Accountability and maintenance is performed base on the CEL. b) **Annual unit inventory check** - Cover all assets and publications accountability check base on the department's CEL. c) **Annual technical logistic publication check –** As required by central library. The check is base on the central library "unit publication inventory list"	3. Unit will plan for the annual publication accountability checks and maintenance, only upon receiving the latest "Unit publication inventory list" from the central library.
A total of 3 publication maintenance and accountability checks are perform annually, which mean 36 days are spend on this. This is totally inefficient, resource and manpower wastage on redundent processes.	5. Microsoft Excel is suggested to replace the current "manual" check and monitoring. Time required for accountability check is able to cut down to barely 2 hours. Refer to **Annex C- Introduction to Publication monitoring and accounting method**.
Comment: Observation for Improvement (OFI) A total waste of time on performing so many similar big scale checks unnecessarily. Unit should look into reducing unnecessary time wastage in performing repeated works. So as to create capacity for unit personnel to perform other important tasking.	

Audit finding 2/5	**Recommendation**
Finding – Inefficient Publication management	1. The whole publication management structures need to be changed. It is recommended UMC is to take care of all the technical logistic publication issues of the training centre. Instead of managing the publication by "classification" it should be managed by "type".
1. Sampling publication accountability check is performed on UMC. It was found that a particular "confidential" publication, their physical holding do not telly with the "Company Equipment List" from the Quarter Master (QM) department. However, the transaction records for the inclusion of the "unaccounted" publications are captured in Manpower department	
2. UMC is found to be holding 80% of all the technical logistic publications of the unit. UMC are found to be very dependent on the QM and Manpower department for any publication issues as the central library will only communicate with the QM or manpower department, as they are the identified "point of contact".	2. UMC will take over all the technical logistic publication issue from QM and Manpower departments, as they hold 80% of all the technical logistic publications.
This is inefficient as information have to "go a big round", before it is passed on to the maintenance centre. Should the information is delayed, it might have safety implication.	3. One of the personnel from UMC is to be appointed as the Unit publication IC. Where he will be the SME for all technical logistic publication issues.
3. The personnel from Manpower and QM department handling the publication are non technical trained, and they only act as "middleman" with no experience. They are unable to provide valuable advice to the training centre on publication issues.	4. Having UMC to control all technical logistic publication issues, process loop are shorter and information is able to reach them faster and accurately.
Comment: Potential Minor Non Conformity (NC)	For more detail on the overall change of management structure, refer to the Recommendation portion of the main report.
1. Failure to capture the "unaccounted" publication in the CEL is against ISO clauses, **4.2.4 - Control of records**, where the record must be update and accurate.	
2. The current processes in managing the publication and information are inefficient as too manage party is involve. Information is unable to reach the desired receiver smoothly.	

Audit finding 3/5	**Recommendation**
Finding – Inefficient in information dissemination method For any class 2 information dissemination, respective department publication IC will be going around with the hard copy of the amendment to disseminate the information. Those who had read the information will sign to acknowledge. The following are the finding on the current practise. 1. This method is not efficient as time is wasted for the personnel going around looking for people to read the amendment and sign to acknowledge. 2. For those who have gone for long leave or attending courses, the publication IC will have to monitor and inform the person when he returns. 3. Publications with the same titles are held my multiple departments. When amendment arrived, all department ICs perform disseminating the same information all their respective department personnel. This is inefficient as so many personnel are performing the same job. **Comment: Observation For Improvement (OFI)** 1. Unit should look into revised the current information dissemination method. In ISO 9001:2000 required management system to be both efficient and effective. The current system does not shows and sign of efficiency and effectiveness.	1. Email is recommended to be the latest medium for information dissemination as all unit personnel has email account. This method is faster and ensures all personnel received the information timely. 2. For those who are not around, they will get to know the details of the amendment from their email when they returned. 3. As UMC have almost all the publications, the appointed Unit publication IC will perform the information dissemination to all unit personnel via email. This will eliminate repeated jobs performed by other department publication IC. The recommended procedure ensures faster, centralise point of information dissemination and eliminate repeated info disseminating job. It ensured centralised control of the information dissemination quality record, and much efficient when compared to the previous method.

Audit finding 4/5	Recommendation
Finding – Improvement for Unit Logistic Order 1. Currently unit Logistic Order did not spell out the requirement for publication ICs clearly. 2. The unit Logistic order, under "Receiving of new publication" it mention "check for completeness of the received publication". However, it did not mention what to check upon receiving a new publication or amendment where great confusion will arise. **Comment: Minor Non Conformity (NC)** In ISO clauses, **4.2.1- General (Documentation requirement)**, required all procedure to be documented into the logistic order. In the current unit logistic order, requirements are not spelled out clearly and it is easily misinterpreted.	The Unit Logistic order will be reviewed and new amendment leaflet with the new recommended processes will be incorporated. All the steps and requirement will be spelt out clearly and in detailed for easy reference.

Audit finding 5/5	**Recommendation**
Finding – Improvement for publication Management 1. There are many common maintenance manual located in the office. It was found to be very inefficient for user go to the office first to obtain publication before they are able to proceed to work centre/hanger to perform maintenance. For convenience sake, many users perform loan term loan (one month) of publication just to avoid travelling. This is a selfish act as it causes unavailability of the publication to other users. 2. Each time a loan is performed, the user returned will need to fill in the loan record and someone must entertain them on the loan. It is not efficient as there must always be someone available in the office just to entertain loan. **Comment: Observation For Improvement (OFI)** The publications location should be re-organised and the processes of the loan sequence must be change to ensure convenience to all personnel, without compromising security.	1. Commonly access maintenance publications classified as "Restricted" are to be identified and relocated to the work centre or system storage area where possible. Other will still be remained in the main office. 2. When user need to performed maintenance, they will only need to draw out the publication cabinet key from the UMC office, and return it at the end of the day. A quick visual accountability check will be conducted at the end of the day to ensure all pubs are returned. 3. Such method ensure convenience to user, and yet able to trace who have access the publication cabinet. 4. Paperwork is greatly reduced, and user will not have the tendency of having long loan of any publication.

Audit finding 6/6	Recommendation
Finding : Inefficient in Traceability 1. Every publication is attached with an "identification sticker" where it indicates the storage location of the publication, where the cabinet name and shelf position are indicated. However the label does not provides sufficient information to identify the publication belong to which unit and department. 2. Every publication has a copy number in place and the central library is able to identify which copy of the publication belongs to which unit. However, in the training centre, the "company equipment list" only captures the quantity number and publication copy number is not track. Hence, no publications ICs are unable to identify they copy number of the publication they are supposed to bold. They can only recognise it by the identification sticker where it can be sabotage and swap. Should there be a need to recall any particular publication copy number in the training centre, it will be very hard as no one keep track of it. **Comment: Minor Non Conformity (NC)** 1. In ISO clause, **7.5.3 - Identification and traceability**, it requires the unit to identify the product (publication) by suitable mean and traceability is a requirement. The current practice shows poor traceability in publication issues.	1. It is recommended that more information is included in the "publication identification sticker". The sticker information shall include unit name, department, cupboard number and its position in the cupboard to enhance traceability. This requirement will be included in the new amendment leaflet. 2. A one time sweep to identify which the copy number of the publication held by every department is to be performed. It will be recorded, finalised and include in the recommended Excel spreadsheet where everyone can see it.

Annex AR 2 –

Audit Report (TMDE Management)

Annex AR 2 – Audit report (TMDE Management)

Audit finding 1/6	Recommendation
Finding : Traceability 1. For internal transaction, there is no proper record indicated that any personnel had taken over any particular TMDE for servicing. Unit Logistic Order did not mention the requirement for handing/taking over of the TMDE for servicing. 2. When a TMDE needs to be sent to external agencies for servicing, it is handed over to the MS to send out the item out. There is no transaction recorded in between the 2 personnel. 3. For External loan, (Between TMDE IC and external party), the transaction are found recorded in "External T-loan Book", a "General" transaction record book. This record book is not mention in the Unit Logistic Order. 4. The maximum loan period of TMDE is not mentioned in the Unit Logistic Order. **Comment: Minor Non Conformity (NC)** 1. In ISO clause, **7.5.3 - Identification and traceability**, traceability is a requirement where all these record must be controlled. These records are needed for evidence of transaction should any TMDE went missing. 2. In ISO clauses, **4.2.4 - Control of records**, all these quality record must be maintained to provide evidence, and these requirements shall be included into the Unit Logistic Order.	1. An authorized "TMDE Handing/ Taking over Record" form and procedures are to be incorporated into Unit Logistic Order. This quality record is to be used to record all TMDE transactions (internal/ external parties) as required in ISO standard. 2. By using only one type of record form to monitor all internal / external transaction, this ensure easier monitoring without going through various quality record for tracing. 3. Unit TMDE loan policy is to be reviewed and it is recommended to set the maximum loan period as **ONE** month. .

Audit finding 2/6	Recommendation
Finding : TMDE management 1. All the TMDE are placed in different location based on weapon system types. However, no proper shelf listing was found on the shelves, which hold the TMDEs. However every TMDE have proper "GREEN" serviceable tag (Pn: 1422) attached to it to identify and indicate it is serviceable. 2. Other than the system TMDE IC, no body would be clear of what should be on the shelves. This cause great inconvenience for other to assist the absent TMDE IC for daily accountability checks 3. Certain TMDE such as oscilloscope is s commend TMDE to all systems' servicing. It was found that user needs to go to various locations to collect the necessary TMDEs for servicing. This shows inefficiency as going around collecting items for servicing wastes time. **Comment: Minor Non Conformity (NC)** In ISO clause, **7.5.3 - Identification and traceability**, the organization shall identify the product by suitable means throughout product realization. The TMDE should be easily identified on it storage location and accounted by any mean.	1. Every TMDE shelves have an overall listing of all the items. Every TMDE and shelves are attached with labels to identify it storage location. 2. Proper Identification sticker (Pn 1606) is to be stick on every TMDE for identification purposes. The sticker is recommended as the item cannot be identified should the green tag go missing. 3. All the TMDE are suggested to be placed together in a common location for easy access by user. This can also ensure easier accounting of TMDE. 4. These requirements shall be added into Unit Logistic Order for future reference.

Audit finding 3/6	Recommendation
Finding – lack of knowledge (torque wrench)	
1. A total of 14 x torque wrench, part number: 1502MR manufactured by CDI Consolidated devices Inc, were found to be set to 150 inch lb (max. limit) when not in use. In the technical manual of the torque wrench 1502MR, it indicates that the mechanism of this torque wrench is spring loaded. It indicates "when torque wrench is not in use, keep adjustment at lowest setting".	1. The requirements for setting the spring loaded torque wrench to the minimum shall made compulsory for all Torque wrench.
2. In the traceability record of the Snap-on® torque wrench TE100FUE, with an effective range of 100ft. lb was found to be used on a bolt that required 25 ft. lb, which can be consider near "danger zone". In the Snap-on® Torque wrench catalogue 700, it indicates that the ANSI standard, ANSI B107.14-1994, allows 4% reading error between **20% and 100%** of wrench capacity. However, it was found that most personnel are not aware of this ANSI standard.	2. All unit personnel performing servicing are to be briefed on the ANSI standard and effective range of the torque wrench. This is to avoid them in using the wrong torque wrench for any jobs.
	3. Such knowledge shall be shared during sessions such as quality meeting and personnel continuous trade training.
Comment: Minor Non Conformity (NC)	4. These information and requirements are to be promulgated into Unit Logistic Order so that everybody is aware of this information in order to prevent future mishandling of the TMDEs.
1. User fail to adjust the torque wrench back to the lowest setting as indicated in the CDI Consolidated devices 1502MR technical manual. This will cause damage to the torque wrench in long run.	
2. Most personnel are not aware of ANSI standard and the effective range of the torque wrench.	

Audit finding 4/6	Recommendation
Finding – Excessive TMDEs	
1. Feedback form various TMDE IC, unit is holding too many TMDEs which are rarely used. As time and money is wasted to send these "redundant" TMDEs for calibration.	1. For seldom used and "common" high calibration cost TMDEs, they are to be identified and placed under "Calibration As Necessary (CAN)" (Preserved). If there is a need for the "CAN" TMDEs to be used, TMDE IC will send it for calibration before usage.
2. It was found that unit is holding too many "common" TMDEs for system maintenance. For example, a total of 4 different multi-meter models with similar specification are available for different systems servicing. This would mean a single type of multi-meter is capable to perform servicing for all system instead of current practise of 4.	2. "CAN" item can still be used for training purposes, but not for maintenance use.

3. The following are the quantity of the items found to the excessive. Items are grouped together by similar specifications and have the ability of inter-changing.
 	
   i. Portable Multi-meters   x 26
   ii. Adjustable Torque Wrench (30 – 150 inch Lb) x 14
   iii. Fixed Torque Wrench (8 inch Lb) x 14
   iv. Sliding Calibres   x 6
	3. No traceability record is needed for TMDEs placed under CAN. (Saves paperwork).

Comment: Observation For Improvement (OFI)	4. Unit "CAN" policy/process is to be created and promulgated into Unit Logistic Order.
1. The approving authority for to place the TMDE under "CAN" (preserving) is spelled out in OLO 603, TMDE policy. However, unit have to spell out it individual management procedure of "CAN" TMDE as required in **ISO clause7.5.5- Preservation of product**	5. By placing TMDE under "CAN", a total saving of $10479.69* is achieved yearly. * Refer to main report, chapter 7.3 TMDE matters, section "d" – Overview of Recommended Processes, subsection "iii"- Cost saving.

Audit finding 5/6	**Recommendation**
Finding – inefficiency of monitoring device	
1. There are many occasions that TMDEs are sent out late for servicing. There are also occasion that all the same type of TMDEs are send out for servicing and left no more in the unit for usage. This ends up that individual IC need to loan the similar TMDE from other work centres to perform servicing job.	1. The whole TMDE management structured will be changed. Refer to main report, chapter 7.3 TMDE matters, section "d" – Overview of Recommended Processes, subsection "i"- Recommended Structure.
2. It was found that individual TMDE ICs have their own ways of monitoring their own TMDE calibration due date. There is no standardization in monitoring method between each ICs and nothing is mention on this issue in the Unit Logistic Order.	2. A Unit TMDE IC is to be appointed to oversee all TMDE calibration issues and centralise managed certain quality records instead of the previous 4 personnel.
3. Current TMDE management based on the policy "Individual system IC will take charge of their systems' TMDE". When any IC is absent over a period of time, it was found that other system's TMDE ICs are unable to cover the absented IC job effectively. There is where the TMDE calibration lapse comes in despite that calibration due date are indicated on the TMDE serviceable sticker.	3. An Excel spreadsheet is to be created to assist the TMDE IC in monitoring calibration due dates. Refer to Annex D – TMDE Monitoring Spreadsheet.
4. When requested for any data on any TMDE issue, users have to look around for individual TMDE ICs for the required data. This shows inefficiency in unit TMDE control.	4. Calibration lapse of at least 6 months between 2 identical TMDEs is required. So that there will not be any case that the 2 identical TMDEs is out for calibration and left nothing back in unit for usage
Comment: Observation For Improvement (OFI)	
1. Monitoring processes is in place. However symptom of inefficiency is visible. The problem lies mainly in the processes.	
2. In ISO clause, 7.6 Control of monitoring and measuring devices, it provides a guideline in monitoring requirement.	5. All the job scope and work processes shall be promulgate into the Unit Logistic Order.

Audit finding 6/6	**Recommendation**
Finding – Excessive Paperwork	
1. Traceability record is maintained for Alignment Tester, part number: 1125295 by BOFOR. This is a special-to-type TMDE as it is use to test the alignment for a particular weapon firing system. Should this TMDE is found out of calibration/faulty, only the particular type of system, which the TMDE tested on is affected. Hence it is redundant to maintain the traceability record.	1. Proposed to relevant quality branch to gain approval to exempt TMDE which are special-to-type and those with BITE function from traceability record.
2. Most of the new TMDE in the market comes with the **BITE** (Built In Test Equipment) function. It is a built in test function of the TMDE where it will indicate a fault signal to the user if it is faulty. Since the TMDE prevents user from using when faulty, it is redundant to maintain the traceability record.	2. Only Critical TMDE readings are recorded in the Traceability record.
3. Various records such as "Perform short circuit test" were found. This is considered as redundant records as traceability record is meant for critical reading. Critical reading means that should the TMDE is found inaccurate; it will cause danger/damage to both the user and equipment	3. Upon approval, the section on "TMDE REQUIRED / EXEMPTED FROM TRACEABILITY RECORDS" shall be promulgated into the Unit Logistic Order
4. It is not effective in maintaining these "redundant" Traceability record as this will only increase paperwork and time wastage for users who update it.	
Comment: Observation For Improvement (OFI)	
It can be proposed to relevant department to obtain approval to review the processes on this issue.	

Annex AR 3 –

Audit Report (PLL Management and Maintenance)

Annex AR 3 – Audit report (PLL Management and Maintenance)

Audit finding 1/4	Recommendation
Finding : Unclear in Unit Logistic Order 1. The content of the PLL management leaflet of the Unit Logistic Order only specified the requirement for PLL monthly accountability check and transaction record. It did not spelled out on what to perform during these checks. 2. The PLL management leaflet failed to mention the unit unique requirements on spares part storage, packaging and maintenance requirements. The PLL ICs have to take reference from different publications/OEM manuals and also base on their own technical knowledge to perform storage, packaging and maintenance. Different interpretation and maintenance practise were observed. 3. The PLL ICs have feedback that some references referred by the Unit Logistic Order are not appropriate to be applicable to unit anymore due to changed of training requirement and unit functionality role. **Comment: Minor Non Conformity (NC)** 1. Against ISO clause, 7.2.1 Determination of requirements related to the product. Unit should determine their unique requirement on the storage, packaging and management requirements in the unit logistic order 2. Against ISO clause, 7.5.3 Identification and traceability. Unit should have identified the change of product status with respect to monitoring and measurement requirements.	1. The PLL spare parts maintenance issues will be reviewed and promulgated into Unit Logistic Order. Requirement references from OLO and OEM manual will be abstracted and modified to suit unit needs. 2. Should there be any case of 2 different maintenance requirements applicable on an identical item type (OEM verse Local requirement), the most stringent requirement will be take precedent. 3. The unit logistic order will serve as the main guideline for all PLL management issues of the unit. This will eliminate time wastage for user to "search" for the require information.

Audit finding 2/4	Recommendation
Finding : PLL storage and maintenance 1. There is no Thermo- hygrometer found in the stores to indicate the temperature and humidity level. Although all the PLL spares are place together in the same air conditioned room, the thermo hygrometer must be available to indicate the humidity level. 2. All cables in the PLL boxes are seal up by the warehouse but it did not have the PN1432- green serviceable label, attached to them to indicate it is serviceability. This card is a requirement for all electronic and mechanical components to indicate to user it serviceability. 3. 2 rubber tubes were found to be packed in transparent, sealed bag. Although it is place in the box, it will still be contacted with the sunlight when the box is opened. It is required in the OEM manual that rubberised item must be sealed in non-transparent bag to prevent degrading of the rubberise product. **Comment: Minor Non Conformity (NC)** 1. Against ISO clause 7.5.5 – Preservation of Product. Unit fail to identify the required measuring device, resources and requirement needed to ensure effective preservation of spares parts base on their needs.	1. Storage requirements recommended by both OEM and local authorities will be abstracted and promulgate it into unit logistic order. 2. The monthly PLL accountability check will be reviewed to perform maintenance as well. This serve as a monitoring opportunity to ensure the all the PLL items are properly maintained and preserved. 3. For special maintenance requirements such as perform manual rotation on rotary item over a period of time and others, will be identified and promulgate into the unit logistic order as well.

Audit finding 3/4	Recommendation
Finding : Inefficiency in PLL Transaction Record management Every PLL items have a transaction record form created to record it transaction. The record is found as Annex C- (System A / B / X / Y- PLL Transaction Record). The following are the findings found on the management on this record: 1. A "receiver assembly" was found removed from radar X PLL for a repair job. However, under the remark column, it mentioned, "For repairing". It did not indicate the item is fixed onto which particular radar serial number. There is no form of traceability here. 2. Unit Logistic Order did not mention anything on how and what to fill up in the transaction record form. Hence there is no consistency across all the PLL ICs in filling up this form. 3. The form title heading, "PLL transaction for System A / B / X /Y" does not ensure sustainability of this form. In long term, should there be removal / inclusion of any weapon systems, this transaction record form is not applicable any more. **Comment: Minor Non Conformity (NC)** 3. In ISO clause, **7.5.3 - Identification and traceability**, traceability is a requirement where all these record must be controlled and recorded. 4. In ISO clauses, **4.2.1- General (Documentation requirement)**, required all procedures to be documented into the logistic order. 5. Unit should look into sustainability / adaptability issues when designing procedures and quality record forms.	1. The new amendment leaflet will provide detailed instructions on how and what to be recorded in the transaction record form to ensure traceability. 2. The title of the Annex C to ULO 03.43.30.06- (System A / B / X / Y- PLL Transaction Record), will be replaced by "PLL Spares Transaction Records". So that this form will be applicable to all new system's PLL in future. However the format of the form will not be change as the current format is pretty good.

Audit finding 4/4	Recommendation
Finding : lack on shelf life monitoring device	
1) For "electrical rotary component" it has a shelf life of 3 years, It was found that some personnel interpret this term as "electrical fan" and never consider "potential meter" to be one.	1. Respective PLL IC shall perform a one-time sweep to identify all PLL spares that have shelf life.
At point of audit, no components were found expired.	2. A centralised monitoring system such as using "Excel" spreadsheet which is identical to Annex D-TMDE Monitoring Spreadsheet can be use for monitoring. This eliminates the requirement for PLL IC to keep looking at physical item for the expiry date, every month. This method is much effective and efficient
2) The master list for the system's PLL and unit logistic order does not indicate the need and what type of components have shelf life. The check for shelf life, performed by the PLL IC, is totally based on their experience and reading the higher logistic order.	
	3. The most stringent PLL spare maintenance requirement for shelf life items shall be abstracted from all sources and promulgated into unit logistic order.
Comment: Opportunity For Improvement (OFI)	
The current monitoring system need to be improved to ensure that all the shelf life components are monitored closely and in a much efficient and effective way as required by ISO clause - 7.6 Control of monitoring and measuring devices.	

Annex AR 4 –

Audit Report (Tools Management and Maintenance)

Annex AR 4 – Audit report (Tools Management and Maintenance)

Audit finding ¼	Recommendation
Finding :Inefficient in the process of handing/taking over of tools box 1. It took about 12-15 min to for handing/taking over a toolbox to NSman, which consists of 100 types of tools. This time is extended when the receiving party has no idea what is the description of certain special tools and sometime different OEM describe their tools differently. This is not efficient as when the toolbox is returned to owner after usage, another 12-15min is gone. That would mean an half an hour is spent on accounting of tools every time it is required for use. 2. Since there are before/after use checks and monthly maintenance in place, the weekly checks become "extra" workload. As accountability is already performed during before/after use checks, and maintenance is performed monthly. It is inefficient to perform such checks and there are not requirement from higher logistic order. **Comment: Opportunity For Improvement (OFI)** Improvements need to be made to ensure efficiency and effectiveness in tools management and control as this one of the focus for ISO standards.	1. Shadow board is recommended to be created, where it consist of the shadows of all the tools in the box. In additional, the description and part number of the tools are labelled in accordance to the shadows. 2. When handing/taking over of tool box, user will just place all the tools onto the shadow box in accordance to the "shadow". This process only took less then **5** min to perform. In total, up to 20 min is saved per day. 3. At once glance, both handing/taking over party will have a full view on what tool is missing, extra or all are accounted. 4. Weekly check is suggested to be permanently removed as it is very redundant and inefficient.

Audit finding 2/4	Recommendation

Finding : ineffective and inefficient of "painted" colour coding
 	
2. Paint markers are used to colour code all the tools. In additional, a layer of clear tape is used to protect the colour code. However, the following are the problem faced with the method:
 	
  i. The colours will "mixed" with the neighbouring colour or de-colourise after about 12 months.
 	
  ii. When the tool is contacted with POL during maintenance, the clear tape and the colour code is "damaged".
 	
  iii. Most of the colour codes are applied on the "handle" part of the tools. This cause the wear and tear of the colour code to speed up.
 	
  iv. Every paint marker "dried" up after about 12 month from initial use. Hence there is a need to purchase replacement.
 	
Which ever of the above mentioned scenarios happened, colour code is required to be re-applied. Man-hours and paint markers (very expensive) costs are incurred.
 	
Comment: Opportunity For Improvement (OFI)
 	
It is not effective and cost efficient to constantly maintain the tools where the unit should look into how this can be improved, as this is one of the focus for ISO standards.
	1. Colour duct tapes are recommended to replace the current use of paint markers.
	
	2. The method ensures cost and time efficiency, and much more effective.
	
	3. An average of $1867.50** can be saved annually, where this amount consist of the one-time implementation cost as well.
	
	** Refer to Annex E- cost saving calculation for tools management, Section 2, for the calculation of the cost saving for change of tools identification.

Audit finding 3/4	Recommendation
Finding: inefficient use of tool.	
1. Every system has a dedicated toolbox and 10 systems = 10 tool boxes. The current practice is specific toolbox is used on specific system due to traceability purposes. However, the maintenance works of the 10 system seldom happen concurrently as the system IC will plan to stagger the servicing date / time.	1. Instead of having the policy of "specific tool box use for specific system", individual system IC should identify a minimum set of tools boxes, sufficient enough to be use for all servicing.
It is a very inefficient way as the usage time for every tool is very little, and yet maintenance checks need to be carried out weekly. Huge man-hour is required to manage and maintenance these tools.	For example, only 3 toolboxes are used for all the 10 systems servicing.
	2. The rest of the boxes are to be preserved, sealed, and place under storage condition.
2. A lot of POL is used to maintain the "seldom use" tools, it is not efficient, cause damage to the environment, and also cause wastage.	3. Only yearly maintenances will be carried out for the preserved tool instead of monthly maintenance.
Comment: Opportunity For Improvement (OFI)	
Efficiency and effectiveness in tools management, maintenance and cost saving can be achieved with proper planning.	4. When Tools are effectively and efficiently used and managed and place under storage, a total of $11380[##] can be saved from man-hour and POL.
	## Refer to Annex E- cost saving calculation for tools management, section 3, for the calculation of the cost saving, for storage tools

Audit finding 4/4	Recommendation
Finding : review of unit logistic order 1. Every toolbox has a specific file, which contains the quality records of the toolbox maintenance. It was found to be wastage to have specific record for the "maintenance portion" such as weekly/monthly check, where 50 toolboxes mean 50 pieces of record. 2. The weekly/monthly maintenance checks form's title, indicate every system name. This form does not ensure adaptability for future changes. If there is a change or additional weapon system, the form needs to be re-titled. 3. The unit logistic order did not mention the maintenance requirements for connector adaptors, where it can be found in most toolboxes. However the maintenance requirements for the connector adaptors can be found in the system's maintenance manual. **Comment: Opportunity For Improvement (OFI)** 1. The Logistic order should be reviewed to ensure adaptability for future changes and look in prevent resource wastage as required by ISO 9001:2000.	1. A single record book is allowed to be use to record the maintenance of all the tools boxes instead of having individual records. This ensure resource saving, easier to managed and cut unnecessary paperwork 2. All the forms and annexes in the unit logistic order should not include the name of the every system. Instead. A general term should be used such as "tools monthly maintenance record", so that the adaptability of the form is ensured for future changes. 3. The unit logistic order is to be reviewed, restructure and include more information to ensure user friendliness, clearer instructions, requirements and future adaptability.

Annex AR 5 –

Audit Report (POL Management and Maintenance)

Annex AR 5 – Audit report (POL Management and Maintenance)

Audit finding 1/4	Recommendation
Finding : POL Management Process 1. The QM department oversee the POL issues of the unit, but the MS and most of the POL requests from the individual systems ICs are from UMC. 2. QM department had request MS to demand the SAE 30 engine oil, part number XXXX in April 06 as requested by one of the system IC. It was found that unit still have 25L of SAE 30 engine oil with different part number available. 3. The QM department personnel are not technical trained and they do not have great knowledge over POL issues. Hence they do not know what does SAE 30 stand for and they are not aware that alternate approved part number engine oil can be used. Thus they are unable to effectively advise the user on POL issues **Comment: Opportunity For Improvement (OFI)** 1. It will be benefit for the unit if the POL IC is technical trained and he is able to advise the unit on POL issues. In additional, having the QM department looking after POL issues issue are not ideal since the main user are from UMC.	1. Unit POL IC is recommended to be from UMC to oversee all POL issues for maintenance and holds all POL quality records. This process is much neater and ensures better communication as all the maintenance work, POL request and replenishment of POL by MS are oversee by the same department, UMC. 2. The new Unit POL IC is a technical trained personnel and he is able to advise others on POL issues such as suggesting alternate part number. 3. The Unit POL IC is advised to be sent for education workshop such as fire fighting course or workplace safety course. So that he is able to put he knowledge better to enhance safety in work centre.

Audit finding 2/4	Recommendation
Finding :POL cabinet Management 1. There are one "big" cabinet for all POL storage and is placed quite far away. The oil stored in the cabinet are in drums and it is inconvenience to all user where they have to keep transferring oil form the big drum into small bottle in order to bring to work centre for servicing. 2. The POL cabinet did not have any MSDS available in the cabinet as the MSDS is centralised controlled and safe keep by the QM department. **Comment: Opportunity For Improvement (OFI)** 1. It is not advisable to constantly performing transferring POL form big drum to smell container as the chances to cause spillage is high. 2. It is a requirement for the 250L POL cabinet to be placed far away from main building. But a small 25L POL is allowed to be place within 15m from the work centre.	1. A small, 25L POL cabinet is recommended to be the "In–Use POL cabinet" and the 250L big cabinet will be the "POL Storage Cabinet". 2. The 25L is allowed to be place near the work centre and user will just draw the POL from the In-use cabinet. This eliminates the need for users to travel long distance or constantly transferring POL from big drum to small bottle if they only require a small amount of POL. In long term, the chances of POL spillage will reduce, POL accountability check is easier to manage and time is saved from travelling. 3. A copy of POL MSDS is advised to be placed in every POL cabinet so that that data is easily available to all POL users.

Audit finding 3/4	Recommendation

Finding : unnecessary checks
 	
1. The Unit practise 2 checks at the moment, the weekly and monthly check. The following are the summarized job scope of the POL.
 	
   Weekly -   Perform POL cabinet housekeeping such as cleaning.
          Ensure no expired POL and stocks are above 50%.
          Check all documentation are correctly entered
 	
   Quarterly -   Check and ensure all POL containers are in good condition.
          Perform POL accountability / stock check.
          Perform house keeping on POL cabinet.
 	
   The interval for quarterly check seems to be too far apart and it was feedback that quarterly check can be performed in 10 minutes. The job scope for quarterly is critical to ensure safety the traceability, the interval of it should be shorter.
 	
Comment: Opportunity For Improvement (OFI)
 	
1. Since weekly check is in place, it is quite redundant to perform another quarterly checks where it job scope is quite important in-term of safety and quality purposes.
	1. The quarterly check is recommended to be removed from the routine checks, and combined it with the weekly check.
	
	2. By combining the job scope of the quarterly and weekly check together, it ensure a better POL management, house keeping, maintenance and cut away unnecessary paperwork for quarterly checks.
	
	3. POL IC is able to monitor the POL consumption pattern better and review the POL cabinet content list when required to suit unit POL consumption requirements.

Audit finding 4/4	Recommendation
Finding : improvement for Unit Logistic Order 1. The POL cabinet and nearby fire extinguisher location plan is approved by higher authority, and it is safe keep by certain key personnel. Although there are "fire evacuation and extinguisher plan" are pasted at critical places, the detailed information are not in the unit logistic order. 2. The record form used for weekly check, Annex A to ULO 03.43.30.05-"Weekly POL cabinet check", have the check requirements spelt out on it and it does not allow user to use record book. Should there be any changes on weekly check requirements, the whole form have to be change. It is a waste of paper to use A4 paper to maintain quality record where record book can yield much resource saving. **Comment: Opportunity For Improvement (OFI)** 1. There is a need to improve the unit logistic order to ensure future adaptability and safety on the POL management requirements.	1. All data, information and management requirement should be clearly spell out and promulgate into the logistic order. The requirement for POL cabinet location, fire extinguisher type/location plan and POL maintenance plans should be included. 2. The weekly check form shall be reviewed, redesigned and allows user to record the check details into record book instead of using new paper. 3. The requirement for weekly check shall be include as a new annex to the unit logistic order and not onto the form. Should there be any changes on the job scope on the weekly check, the form will not be affected and future adaptability is ensured.

Annex AR 6 –

Audit Report (Self Check Program)

Annex AR 6 – Audit report (Self Check Program)

Audit finding 1/2	<u>Recommendation</u>
<u>Finding : Management Review</u> 1. The self check work plan, planned by the newly appointed QF, shows that the number of internal audit to be performed on each element is almost equal. However focuses should be place more in the weakness area, such increase the number of check in the weaker elements. 2. The appointed checkers for self checks program are mostly the UMC system ICs and the trainers. Anyone who perform audit on others elements, he is able to gain experience and knowledge on that particular element where can provide suggestion to ensure continual improvement. It is found that the pool of checkers belongs to ground level, where middle management are not involved in checks. **<u>Comment: Opportunity For Improvement (OFI)</u>** 1. It is advised that more focuses can be put in the weaker element so that the quality of the particular can be improved. 2. ISO standards requirement management involvement in the quality management system. Hence they should be involved in the self check program.	1. A SME for self checks is recommended appointed.. Should there be a change of QF or QF is not available, he is able to advise top management of the self check issues. He will monitor the strength and weakness of every element and provide advice to the top management of where the focuses can be. 2. The department heads/ deputy heads are advised to be included in the self checks program. This is where they can learn and have better knowledge of the ground situation and limitation. With them involved in self check, integration and communication between the ground and management level is greatly bonded.

Audit finding 2/2	Recommendation
Finding : Self check practice 1. It was found that the internal audit, self check program, is "audit by element" and not "audit by process". Most of the audit findings are mostly documentation errors. These findings are considered "small fish" where it does not show much on the "causes" on the non-conformity 2. From the pass self check finding, all findings are fault against the requirement stipulated in higher logistic orders and other local produced publications. However, the finding should look into the effectiveness of the "requirements" stipulated in the higher logistic orders and not "blindly" following the requirement. **Comment: Opportunity For Improvement (OFI)** 2. In ISO 9001:2000, it requires the internal audit to "audit by process". Audit by element is unable to identify "systemic failure" effectively of the unit quality management system. Audit the processes (i.e. Perform audit trail), will be able to provide a better picture on the element strength and weakness. 3. Instead of looking in to "Non-compliance" to the higher logistic order, unit should look into the effectiveness of the requirement. Feedback should be provided to the higher logistic order sponsoring agency for improvement, instead of just following "requirements".	1. One personnel is to be identified to be the "self check SME". Where he will assist the QF in all the self check issues and he will send for "ISO auditor course" 2. "Process based Self Check" policy is to be replace the current ineffective "element based self check", where checker only need to ensure individual element "follows the stipulated order". 3. Systemic failure can be identified easier through audit trail (which is equivalent to process based self check). For example, the checker can start on any servicing record, and required the element ICs to provide him evidence that the servicing is carried correctly. Evidence such as TMDE traceability, loan record and personnel training certification. 4. Instead of being "reactive" to findings, unit should be "pro-active" to feedback to the sponsor of the higher logistic orders to review the requirement to ensure effectiveness in every element management.

Annex AL 1 –

Amendment Leaflet (Publication Management and Maintenance)

PUBLICATION MANAGEMENT AND MAINTENANCE

INTRODUCTION

1.   This Order spells out the publication management and control procedures on the unit's technical logistic publications. All issues pertaining to unit publications are abided by this order. The term "technical publication" used here refers to "Technical Logistic" publication such as maintenance manual, logistic order (quality manual) or safety manual.

APPLICABILITY

2.   This order is applicable to all personnel requires to handle technical publications, Unit Technical Publication IC, and Sub-account holder/department publication ICs.

PUBLICATION MANAGEMENT PROCEDURES

3.   The procedures for different publication issues and forms are attached as annexes in this order. Refer to the annexes for the procedures and requirements:

        a.   Annex A – Publication Accounting / Maintenance requirement
        b.   Annex B – Incorporating of Publication Amendment
        c.   Annex C – Receiving and Distribution of Technical Publication
        d.   Annex D - Information dissemination
        e.   Annex E - Inventory Control
        f.   Annex F – Publication Loan Policy
        g.   Annex G - Requirement for publication identification label
        h.   Annex H – Summary of unit publication management structure
        i.   Annex AA - Publication Loan Record
        j.   Annex BB – Publication Amendments Received Record

CROSS REFERENCE

4.   This Order is to be read in conjunction with the following Logistic Orders:-

    a)   OLO 703.16.002 - Recording, Accounting and Controlling Publications

    b) OLO 703.16.005 - Destruction, De-Registration (Superceded/ Obsolete/ Redundant/ Damaged Publications) And Loss Of Publications

    c) OLO 703.16.007 - Security Classification And Storage Of Technical Publications

    d) ULO 03.43.13.10 – Term of Reference for Publication IC

Publication Accounting / Maintenance requirement

1. Introduction

The publication accountability and maintenance checks are categories into 2 types of tasks, daily house keeping and annually maintenance and accountability. All publication ICs are to ensure that the following tasks are carried out diligently.

2. Daily check

All departments must perform a daily publication house keeping and checks on their publication cabinets based on the following.

i.   Ensure that all publications are properly placed back into the respectively cabinet.

ii.   Ensure that the Publication Cabinet Content list and are present in every publication cabinets.

iii.   Ensure that the every publication have the "publication identification label" and is in good condition. Perform maintenance if necessary

iv.   Account for publication in each Publication Cabinets with reference to the respective cabinet content listing.

v.   Ensure that all loan entries in the "Publication Loan Record"-Annex CC, are correctly entered

vi.   Check for expired loan from the Publication Loan Records. Recall publication immediately when necessary.

vii.   Ensure the Publication cabinets are properly locked at the end of the day The following indicate the type of security measure needed for different classification of publication:

a) Restricted   –   cupboard / cabinet with lock

b) Confidential   –   steel cabinet fitted with padlocks

c) Secret   – strong steel cabinet fitted with locking bars and secured with approved padlocks

3. <u>Annual accountability check and Maintenance</u>

a) Unit publication IC will schedule for annual check and issue a copy of the department inventory list to all department publication IC / Sub account holder.

b) All department publication ICs / Sub-account holders will perform accountability check and maintenance base on the following guideline:

    i. The total physical holding tallies with the department publication inventory list.

    ii. All technical manuals issued under CENTRAL LIBRARY bear their authority stamp

    iii. No missing, excessive or obsolete publications.

    iv. Destruction certificates are properly filed and accounted for.

    v. Uncontrolled publication are clearly marked "Uncontrolled Copy' & segregated from the controlled publications.

    vi. All publications are incorporated with the latest amendments.

    vii. Publication's "Amendment Record" sheet was up to date, correctly filled and available.

    viii. List of Effective Pages (LEPs) and amendment pages were correctly inserted and there are no missing pages

ix. All Publications are without torn, missing, misplaced or defaced pages

x. Ensure that the operation, quality and maintenance publication are segregated. (i.e. not on the same shelf)

c) Upon completing the check, individual department publication ICs / Sub-account holders will sign and acknowledge on the issued department inventory list, and return to unit publication IC.

d) Any discrepancy must be highlighted to unit publication IC to re-solve the issue immediately.

Incorporating of Publication Amendment

1. Introduction

a) Incorporating of amendment is mainly performed by 2 parties, CENTRAL LIBRARY personnel and unit personnel. The following determine who are supposed to perform publication amendment:

    i. Central Library   – Only "Restricted" amendment from them

    ii. Unit personnel   – "Confidential" and above amendment or;

                             – The "Restricted" amendment from central library will be handed to publication IC if they fail to perform it on the 3rd attempt.

b) Unit publication IC will disseminate the information of the received amendment to relevant unit personnel affected by the amendment. For the requirement on information dissemination**, Refer to Annex D to ULO 03.43.30.07 - Information Dissemination**

2. Incorporating Publication Amendment by CENTRAL LIBRARY

a) For all amendments classified as 'RESTRICTED' from central library, they will perform the incorporating of the amendments to the affected publication.

b) Central library personnel will approach Unit technical publication IC upon arrival. Unit technical publication IC will guide the central library personnel to the relevant department publication IC/ Sub-account holder, to assist the central library personnel to incorporate the new amendment.

c) Unit technical publication IC will update the information of the amendment leaflet into Annex D – Publication Amendments Received Record.

d) Individual Publication IC / sub-account holder will check for the completeness of the amendments according to the Issuing Vouchers and the guidelines below:

    i.   Ensure that amended sheets for insertion correspond to Amendment Instruction(s):

    ii.   Correct sequence of AL in the affected publication i.e. AL numbers received must be in increasing sequential order.

    iii.   Every amended sheet contains the AL number and the date of issue at the bottom left hand corner of the document

    iv.   Adequacy of AL for the affected publication such as, the number of copies received are complete and the quality of print are original and legible and without discrepancies

    v.   The Amendment tallies with the List of Effective Pages (LEP).

3. <u>Incorporating Publication Amendment by Unit personnel</u>

a) For Unit Logistic Order or amendment classified as 'CONFIDENTIAL' and above issued by central library, the courier service will hand the amendment to Unit technical publication IC to incorporate it into the affection publication.

b) Unit technical publication IC will update the information of the new amendment leaflet into Annex DD – Publication Amendments Received Record

c) The department publication IC / sub-account holder shall ensure and performed the following procedures when incorporating the amendment.

d) Ensure that amended sheets for insertion correspond to Amendment Instruction(s):

e) Correct sequence of AL in the affected publication i.e. AL numbers received must be in increasing sequential order.

f) Every amended sheet contains the AL number and the date of issue at the bottom left hand corner of the document

g) Adequacy of AL for the affected publication such as, the number of copies received are complete and the quality of print are original and legible and without discrepancies

h) Perform the amendment in accordance to the amendment instruction provided with the received amendment.

i) Ensure that amendment(s) incorporated shall be documented in the amendment record sheet of that particular publication

j) All leaflets removed as directed in the Amendment Instruction Sheet shall be destroyed

k) Amendment must be incorporated immediately for Class 1 amendment and within 10 days for class 2 amendment, upon received.

Receiving and Distribution of New Publication

1. Receiving of Publication from central library

a) Upon receiving the new publication, the Unit Technical Publication IC will check for the completeness of the Publication base on the following guideline:

   i. The publication received tally with the central library acknowledgement slip / issue voucher.

   ii. The publication bears the central library authority stamp on the cover page.

   iii. The updated amendment record sheet is available.

   iv. Perform page by page check base on the publication List of Effective pages (LEPs). Ensure all amendment leaflet is correctly inserted and no missing pages.

   v. The publication must be in good condition

b) Unit technical publication IC will take over the new publication when the requirement is met. He will take over the publication by signing on the central library acknowledgement slip / issue voucher

c) One copy of the central library acknowledgement slip / issue voucher will be kept by Unit technical publication IC. The record will be kept for minimum 2 years for quality purposes.

d) The Unit Technical Publication IC shall record and update the Unit Publication Inventory list.

e) Unit Publication IC will then distribute the new publication to relevant department and a copy of their updated department publication inventory list, for them to acknowledge.

f) A new amended copy of the department publication inventory list will be issued to the department for their quarterly check.

g) Unit Publication IC will disseminate the news on the newly received publication to the unit. **Refer to Annex D to ULO 03.43.30.07- Information Dissemination,** for the requirements.

Information dissemination

1. Introduction

a) Upon receiving any new publication or amendments, it is the unit technical publication IC responsibility to dissemination the information. This is to ensure that relevant personnel are informed of the changes.

b) Unit technical publication IC must safe keep the record of the information dissemination for minimum 2 yearly for quality purposes.

2. Dissemination methodology

a) **Read & Sign method**

   i.   A copy of the amendment shall be attached to a copy of Dissemination Name List (Annex A to FLO 01.08.01.01). The name list will include the name of all personnel affected by the amendment leaflet and all personnel must read the amendment and sign on the name list to acknowledge.

b) **Email method**

   i.   The information of the amendment leaflet shall be summarized and disseminate through email to the relevant personnel by unit technical publication IC.

   ii. The following are the amendment information that should be included in the email:

       1)   Affected publication title
       2)   Affected publication document number
       3)   Amendment Leaflet (AL) number
       4)   Summary of the changes. (i.e. what are the processes changed?)

3. <u>Dissemination requirement for different classification</u>

a) Amendment (Class 1 - Urgent)

i.   Immediate mass briefing by department head or QF. All personnel must sign on the Dissemination Name List (Annex A to FLO 01.08.01.01)

ii.   For those who are not present, the briefing will be conducted to him on the next opportunity. He must sign on the Dissemination Name List (Annex A to FLO 01.08.01.01) as well.

b) Amendment (Class 2 - Routine)

i.   Information disseminations to the relevant personnel are to be performed within 45 days upon receiving of new amendment or publications.

ii.   Information disseminations can be performed through 2 methods:

c) New Publication

i.   The unit technical publication IC will inform the unit personnel on the arrival of new publication through email.

ii.   The following are the information required in the email:
1) Publication title
2) Publication document number
3) Quantity
4) Location (the holding department)
5) Summary on what is the publication about

Inventory Control

1. Introduction

a) Unit Technical Publication IC shall oversee unit publication inventory issues and also the key person to communicate with external agencies.

b) Unit technical Publication IC will maintain and safe keep the annual central library publication inventory list issued to him during annual accountability checks

2. Annual Accountability checks

a) Unit technical publication IC will perform a comparison between central library publication inventory list and his Unit master publication inventory list.

b) Upon successfully checked, Unit technical publication IC will issue a copy of the department inventory list to all department publication IC / Sub account holder.

c) Every department publication ICs / Sub-account holders will perform annual accountability check and maintenance in accordance to **Annex A to ULO 03.43.30.07**, chapter 3- Annual accountability check and maintenance, base on department inventory list.

d) Upon successfully accounted all publications, department publication ICs / Sub-account holders will sign and acknowledge on the department inventory list and return to unit publication IC.

e) Unit publication will fax the result back to central library upon finishing the annual accountability check. Should there be any discrepancy found, discrepancy report will be raised by unit technical publication IC.

3. <u>Other Changes on inventory</u>

a) For inventory change due to new publication / destruction, unit technical publication IC will update the changes in department publication inventory list.

b) A new department publication inventory list will be issued to the department publication IC / Sub-account holder.

Publication Loan Policy

1. Introduction

a) Loan of Publications and divided into 2 part, Internal and External loan.

b) All Publications loan should be signed out from the Publication Loan Record. (Refer to Annex CC for formats of Publication Loan Records), where it can be in the form of recording book.

2. Internal Loan

a) Individual department publication IC / Sub-account holder will oversees all loan issue on publication under their charge.

b) The maximum loan duration of any publication for local use is **1 month**.

c) For any publication loan for overseas use, the loan period based will on the returned date of the equipment from over sea.

3. External Loan

a) For external loan of publication to other unit, all requests have to be channelled to unit technical publication IC.

b) Unit technical publication IC will liaises with the relevant department publication IC / Sub-account holder on the loan issue.

c) For normal publication loan, the maximum is 1 month.

d) For Publication loan which includes the loan of any weapon system, the publication loan period will varies accordance to the loan period of the system.

Requirement for publication identification label

1. Introduction

a) The publication identification label is a requirement for all unit publications. This is used to provide information on the exact location of the publication where it is stored.

b) All Unit publications must have this identification label stick on the "side" of the publication binder for easy identification in the shelf.

2. Requirement

a) The following indicate the required information on the identification label, which must be present on all technical logistic publication:

      i. Unit / Department

     ii. Cabinet name

    iii. Shelf location

    iv. Exact location of the shelf

b) The following display a sample on the design* of the label:

Unit Name / Department   **Cabinet Name**

```
+----------------------------------+
|   XXX / YYY        CAB 1          |
|                                  |
|            A 08                  |
+----------------------------------+
```

Shelf Number   **Location on the shelf**
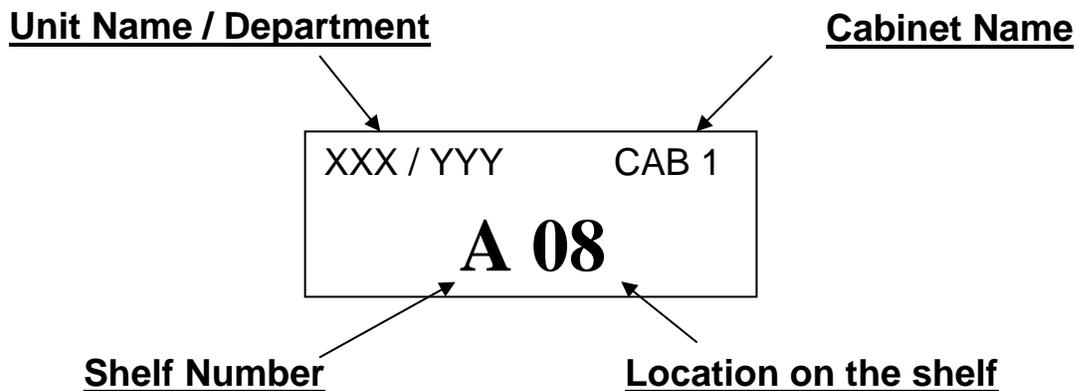
* Interpretation: Publication belong to, Unit *XXX*, Department YYY, store in Cabinet *CAB1, on* shelf *A,* location *08* on the shelf.

Summary of unit publication management structure

Central Library / External agencies

Unit Publication IC (Technical Logistic)

Unit Publication IC Job Scope

- Oversee all publication issues of the unit.
- Main person to communicate with all external agencies
- Unit publication Subject Matter Expert (SME)
- Oversee unit and department publication inventory issues.
- Perform publication amendment Information dissemination

Department publication IC / Sub-account holder

Individual department publication IC / Sub-account holder Job Scope

-Oversee publication issues under his care.
-Perform annual maintenance check
-Monitor all publication transaction under his care

PUBLICATION LOAN RECORD

(This is a CAT D record. To retain for 2 years after the record is closed)

SN	TITLE OF PUBLICATION	**Cabinet** Num.	**PUB Num.**	RANK & NAME & SIGNATURE -BORROWER	LOAN DATE	DUE DATE	REASON FOR LOAN	RANK & NAME & SIGNATURE -ISSUER	DATE RETURN	RANK & NAME & SIGNATURE -RECEIVING	**REMARKS**

PUBLICATION AMENDMENTS RECEIVED RECORD

(This is a CAT D record. To retain for 2 years after the record was closed)

WORKCENTRE: _____

MONTH /YEAR: _____

S/N	MANUALS AFFECTED	AMENDMENT LEAFLET NO.	QTY	REMARKS

Annex AL 2 –

Amendment Leaflet (TMDE Management and Maintenance)

TEST MEASURING AND DIAGNOSTIC EQUIPMENT (TMDE) MANAGEMENT

INTRODUCTION

1. This Order provides the management and control procedures for TMDE, traceability and calibration requirement of the unit

APPLICABILITY

2.   This Order is applicable to the all personnel appointed as Unit TMDE IC, system TMDE IC and all TMDE user of the unit

TMDE MANAGEMENT PROCEDURE

3. The procedures for different TMDE issues and forms are attached as annexes in this order. Refer to the annexes for the procedures and requirements:

a)	Annex A	- TMDE CONTROL
b)	Annex B	- TMDE USAGE REQUIREMENT
c)	Annex C	- CALIBRATION / REPAIR PROCEDURE
d)	Annex D	- Management of TMDE place under "CAN"
e)	Annex E	- TMDE Loan policy (Internal / External)
f)	Annex F	- Out of tolerance / unserviceable TMDE
g)	Annex G	- TMDE Required / Exempted From Traceability Records
h)	Annex H	- Unit TMDE Management Structure
i)	Annex AA	- TMDE Handing/Taking over Record

CROSS REFERENCE

2.   This order is to be read in conjunction with:-

        a.   OLO 603   – TMDE POLICY

        b.   OLO 603.10.001 – ANNEX B (Precision Equipment Record)

        c.   OLO 603.10.001 – ANNEX D (TMDE Specification Summary)

        d.   OLO 603.10.001 – ANNEX E (TMDE Traceability Record)

TMDE CONTROL

1.   Introduction

This annex indicates the role and job scope of those appointed as Unit TMDE IC and individual system TMDE ICs.

2.   Unit TMDE IC

Unit TMDE IC is to ensure the following:

a)   Oversee all the unit TMDE issue

b)   Ensure all TMDEs have TMDE Specification Summary (TMDESS) - Annex D of OLO 603.10.001. He must maintain the accuracy of the records.

c)   Monitor all TMDE calibration due date and inform individual TMDE IC when any TMDE is due for servicing.

d)   Ensure only qualified personnel to perform internal Calibration for TMDE

e)   Maintain and safe keep all TMDE calibration report by the authorised contractor when the item is back from servicing.

f)   Maintain and safe keep all "Precision Equipment Record" (Annex B to OLO 603.10.001), which is the TMDE calibration report for Internal calibration

g)   Should the authorised contractor's calibration report or internal calibration shows that the TMDE was found "out of calibration" or "unserviceable" during the testing phase of the TMDE, individual system TMDE IC must be informed on this discrepancy.

   Refer to Annex F to ULO 03.43.30.02, for action on Out of tolerance/unserviceable TMDE

h)   For requesting for additional TMDE refer to OLO 603.10.001 – TMDE POLICY

3.   <u>**Individual System TMDE** IC</u>

All **system TMDE ICs** will monitor their individual system TMDEs and ensure the followings:

a)   Ensure all TMDE are accounted and are placed properly back in their designated location on the shelf/cupboard, at the end of the day.

b)   Maintain proper "shelf listing" which indicate all the TMDE that should be found on the shelf/cupboard.

c)   Maintain all TMDE and their holding shelves/cupboards. This include the Serviceable, Quarantine and No Calibration Requirement (NCR) TMDE

d)   Monitor the loan / movement of their individual TMDEs. Ensure that there is no outstanding loan. Refer to Annex E - TMDE Loan policy (Internal / External).

e)   Calibration type sticker is present on all TMDE and calibration date is not expired.

         The following are the types of sticker available.
- i.   PN 1925A (NCR - No Calibration Required)
- ii.   PN 1925B (CAN – Calibration As Necessary)
- iii.   PN 1925C (Calibration Sticker - Internal)
- iv.   PN 1926A (Restricted Calibration Sticker – Internal)
- v.   Contractor calibration Sticker

f)   All TMDE are in good condition and all attached accessories are not missing / damaged.

g)   Batteries must be removed for those seldom used portable TMDE which is batteries operated.

h)   All spring loaded torque wrench is set to minimum range. (i.e. Minimum load or No load to the spring)

i) TMDE which are found with calibration date expired, unserviceable or suspected out of tolerance, it must be "Quarantine" first, then inform the unit TMDE IC. Send the item out for repair. Refer to Annex C to ULO 03.43.30.02- Calibration / Repair Procedures.

j) For TMDE which require External / Internal Calibration, refer to Annex C to ULO 03.43.30.02 – Calibration / Repair Procedures.

k) TMDE that is place under CAN should not mix with the serviceable TMDE even if it is still within calibration period. Refer to Annex D - Management of TMDE place under "CAN".

l) Ensure Traceability Record (Annex E of OLO 603.10.001) is available for all TMDE unless it meets the criteria that do not need the traceability record as indicated in Annex G to ULO 03.43.30.02 - TMDE Required / Exempted From Traceability Records.

m) Ensure Traceability Record is properly recorded by all users. The detail includes:

  i)   Serviced equipment serial number,
  ii)   Type of servicing (Preventive or Corrective maintenance)
  iii) The measured value.

n) Maintain and ensure TMDE Handing/Taking over Record- Annex AA to ULO 03.43.30.02, is correctly filled.

o) Any Issue pertaining to TMDE, unit TMDE IC must be informed.

TMDE USAGE REQUIREMENT

1. Requirement

All personnel using any TMDE instruments are to ensure the followings:

a. Handle the instrument with care, as it is delicate and precision equipment.

b. Clean the instrument before returning.

c. Report any damages/discrepancies to respective system TMDE IC immediately.

d. Update the Traceability record of the TMDE after usage (where applicable- Annex G to ULO 03.43.30.02- TMDE Required / Exempted From Traceability Records)

e. All spring loaded torque wrench, it must be set to the minimum range after usage. (i.e. Minimum load or No load to the spring)

f. Ensure the correct torque wrench is used for servicing. Use a torque wrench where the working range falls near the mid point of its capacity. Effective range of any torque wrench is within 20% to 100% of the wrench capacity. **Do not** use the torque wrench for any servicing should the required torque is **below 20%** of the wrench's limit.

* For example: If the range of a torque wrench **A** is between 0 inch.lb to 100 inch.lb and a hexagon bolt requires to have a torque of 51 inch.lb, torque wrench **A** can be used for this servicing as the required torque is within 20% to 100% of the limit of the torque wrench. However, if the required torque for the bolt is 19.9 inch lb or lower, torque wrench **A** cannot be used as it is below the minimum limit. A torque wrench with smaller torque range is to be used.

CALIBRATION / REPAIR PROCEDURE

1. Introduction

a) For Calibration of TMDE, it is categorize into Internal and External.

b) All TMDE calibration periodicity including NCR are specified in the publication L-23-Gen-37 (TMDE Calibration Interval)

2. External Calibration / Repair

a) For all external calibration/repair of TMDE, it will be sent out to respective authorised contractor for repair.

b) The following indicate the procedure for sending the TMDE out for calibration/repair.

c) When a TMDE is due for calibration or an unserviceable TMDE require repair actions, respective system TMDE IC will prepare the followings items of the instrument:

      i. PN 1925 (Repair/Calibration Label)
      ii. Traceability Record (Annex E to OLO 603.10.001)

d) Respective system TMDE IC will attach the PN 1925 label onto the TMDE and safe keeps the Traceability Record of the TMDE.

e) Respective system TMDE IC will hand over the TMDE to the MS using Annex AA to ULO 03.43.30.02- TMDE Handing/Taking over Record. MS will send the TMDE out to respective authorised contractor for repair/ calibration

f)   The maximum period for external calibration/ Repair is **ONE** month. Hastener must be send to respective authorised contractor to hasten them for the TMDE Calibration / Repair once the one month period is due.

g)   The unit TMDE IC will have to update the movement status of the TMDE on the TMDE Monitoring Chart or any other form of monitoring system.

h)   The unit TMDE IC will monitor the calibration and repair status of the TMDE and to hasten if the EDD (Estimated Delivery Date) is overdue.

i)   Once the instrument/equipment being returned after calibration/repair, the MS will inform the system TMDE IC to check the followings:

     i.   A new valid Calibration label for the instrument is attached and its next calibration due date is in accordance to the policy stipulated in L-23-GEN-37.

     ii.   The instrument and its accompanying accessories are not missing / damaged.

     iii. The Calibration Report is attached and provided with the instrument.

     iv.   A new PN 1422, green serviceable label is attached to the TMDE.

j)   The TMDE upon being satisfactorily checked, MS will issue back the TMDE to respective system TMDE IC. The calibration report issued by the AUTHORISED CONTRACTOR accompanying the TMDE will be safe kept by the unit TMDE IC.

k)   A new Traceability Record (Annex E to OLO 603.10.001) will be attached to the newly returned, calibrated TMDE.

l)   Unit TMDE IC will then update the new status of the TMDE in the Monitoring chart or any form of monitoring system.

3. <u>Internal Calibration / Repair</u>

a) For TMDE that have been granted In-house Calibration as stipulated in L-23-GEN-37, only In-house-Calibration qualified personnel at the specialist flight are allowed to perform in house calibration.

b) The following indicate the procedure for In house Calibration:

    i.   Individual system TMDE IC will bring the expired TMDE to the designated location within the base for calibration by qualified / authorised personnel.

    ii.   Obtain the in-house calibration report, Precision Equipment Record (Annex B to OLO 603.10.001) and submit to Unit TMDE IC for safekeeping.

c) Upon successful in performing the in-house calibration of the TMDE, unit TMDE IC will then update the status of the TMDE in the Monitoring chart or any form of monitoring system

d) Should the In-house calibration **FAIL**, it will be sent out to respective authorised contractor for repair. Refer to the following section and perform the necessary steps:

    i.   Annex C to ULO 03.43.30.02, Section 2 - External Calibration / Repair,
    ii.   Annex F to ULO 03.43.30.02- Out of tolerance / unserviceable TMDE

Management of TMDE place under "CAN"

a) When a TMDE is authorised to be placed under CAN, the following are to be ensured:

     i.   TMDE place under CAN must be segregated away from Serviceable and Quarantine TMDE

     ii.   Battery must be removed from the TMDE (when applicable)

     iii.   CAN sticker (PN1925B) must be available on the TMDE

     iv.   Perform yearly function check on the TMDE to ensure serviceability.

     v.   NO servicing is to be performed with a TMDE under CAN

b) Should a TMDE placed under CAN is needed for servicing; it must be calibrated before usage. Refer to Annex C to ULO 03.43.30.02 - CALIBRATION / REPAIR PROCEDURE.

TMDE Loan policy (Internal / External)

1. Introduction

a) Loan of TMDE are categories into Internal and External Loan.

b) All loan requirements must be met before a loan can be preceded. Refer to the respective section on the requirements.

2. Internal Loan

a) Only Authorised personnel is allowed to loan the TMDE for servicing.

b) For loan exceeding 24 Hrs. Request must be put to Unit TMDE IC and Head of UMC for approval.

3. External Loan

a) Approval must be obtain from CO for all external Loan

b) Maximum period of external Loan is **ONE** month.

c) For any outstanding loan (Loan exceeding One month), individual TMDE IC must hasten the loan party to return the TMDE.

d) For any request for extension of loan, former request with valid reason is to be directed to CO for an extension of another **ONE** month. Extension of loan is valid for one time only.

Out of tolerance / unserviceable TMDE

1. **Requirement**

a) In the event when a TMDE is found to be out-of-tolerance beyond the limits given in the TMDE Specification Summary (TMDESS), the affected tasks are to be re-validated by a serviceable TMDE.

b) The affected system TMDE IC is required to perform the following action:

    i.   Recall all the affected system that is indicated in the traceability record of the problem TMDE.

    ii.   Re-verified the task performed on the affected system with a serviceable TMDE in accordance to the data in the traceability record. Details of the re-validation action are as per OLO 603.10.001.

    iii.   TMDE calibration Discrepancy Report is to be raised to UMC head, QF and QAC.

TMDE REQUIRED / EXEMPTED FROM TRACEABILITY RECORDS

a) Critical measurement refers to measurement which when inaccurate, may:-

 i. Affect the mission capability or cause limitation to the performance of a system;

 ii. Result in injury or death to personnel;

 iii. Result in damage to or loss of equipment.

b) All TMDE for critical measurement requires traceability record. It can only be exempted when any of the following criteria are met.

 i. **TMDE that have BITE (Built In Test Equipment) function**.

 This mean that the TMDE have a self test function where it will indicate a "faulty" signal to user should there be any problem with the TMDE.

 ii. **TMDE categorize under NCR and CAN**

 iii. **Special-To-Type TMDE.**

 Specially manufactured TMDE, which can only be use on particular equipment. Should this TMDE is found out of calibration or unserviceable, only that particular equipment is affected.

 iv. **TMDEs (external calibrated) for daily and weekly servicing.**

 This is because the calibration turn-around-time (TAT) is expected to take a longer period which by then, another TMDE would have been used for the next servicing.

 v. **TMDEs (internal calibrated) for daily**

 Internal calibrated TMDE used for daily servicing are excluded.

Unit TMDE Management Structure

Unit TMDE IC Job Scope

•Monitor Unit TMDE dues Dates
•Monitor all External Transaction
•Maintain all TMDESS
•Maintain all TMDE Calibration Report
•Oversee all TMDE quality issues

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              CO
                          QF
         Head of UMC
         Unit TMDE IC
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Individual system TMDE ICs

Individual system TMDE IC Job Scope

-Maintain all traceability records
-Monitor all TMDE transaction
- Perform TMDEs Maintenance

TMDE Handing/Taking over Record

(This is a CAT D record. To retain for 2 years after the record is closed)

S/n	TMDE Description	Part. Number	TMDE location	Taken over by Rank/Name & Signature	Date Of Loan	Due Date	Handed over by Rank/Name & Signature	Date Return	Received by Rank/Name & Signature	Remark

Annex AL 3 –

Amendment Leaflet (PLL Management and Maintenance)

PLL MANAGEMENT AND MAINTENANCE

INTRODUCTION

1. This order provides the guidelines on the management and maintenance of the PLL by the respective ICs and PLL user.

APPLICABILITY

2. This order is applicable to all PLL ICs and users who required to use and maintenance PLL.

PLL Management and Maintenance Requirements

3. PLL ICs must ensure that the PLL is always filled, perform weekly check, monthly accountability and maintenance to ensure serviceability of the PLL spares.

4. Any short fall of PLL spares, request for replenishment must be performed immediately.

5. Refer to the attached annexes for the Procedure and requirement on PLL management and maintenance:

i.	Annex A	- Weekly and Monthly check Requirements.
ii.	Annex B	- Filling of PLL Transaction Record Requirements
iii.	Annex C	- PLL Spares packaging Requirements
iv.	Annex D	- PLL Spares Storage Requirements
v.	Annex E	- PLL Spares Shelf Life and Maintenance Requirements

vi.	Annex AA – PLL Spares Monthly Accountability and Maintenance Check Records
vii.	Annex BB – PLL Transaction Records

Cross Reference

The information in this Logistic Order is abstracted and is to be read in conjunction with the following publications and logistic order:

a)   OLO 301   - Material Supply Policy

b)   OLO 301.11.008   - Policy On Shelf life Of Component

c)   OLO 303   - Material Management Policy

d)   OLO 303.5.014   - Warehousing Quality Control

e)   ULO 01.01.02.08   - Spares Support

f)   TAS Radar system Organizational Maintenance Manual

Weekly and Monthly Check Requirements

1. Introduction

This annex provides the procedures on carrying out weekly and monthly checks. All PLL ICs or designated personnel are to carry out the checks in accordance to the stipulated orders.

2. Weekly Check procedures

a)   Perform weekly check on the PLL storage area temperature and humidity.

b)   The recommended condition is 20 to 26 degrees Celsius and relative Humidity of below 65%.

c)   The result of the temperature and humidity shall be recorded.

d)   If the room does not meet the stated requirement, inform the relevant department for further action on the infrastructure.

3. Monthly Accountability and Maintenance check Requirement

Monthly Accountability and maintenance check are to be performed to ensure accountability and serviceability of the PLL spares. The following are the requirements:

a)   Ensure that all PLL spares are accounted.

b)   Ensure that all PLL spares are properly packed in accordance to Annex C to ULO 03.43.30.06- PLL Spares packaging Requirement.

c)   Ensure that the PLL storage condition is in accordance to Annex D to ULO 03.43.30.06- PLL Spares Storage Requirement.

d)   Check the shelf life of every PLL (if applicable) to ensure that there is no expired item. Should any PLL spares found to be expired, perform the necessary action in accordance to Annex E - PLL Spare Shelf Life and Maintenance Requirement.

e)   Ensure that all the PLL transaction records are correctly filled. Resolve on the spot should there be any discrepancy.

f)   The results of the monthly check shall be recorded in Annex AA to ULO 03.43.30.06 - PLL Spares Monthly Accountability and Maintenance Check Record.

FILLING OF PLL TRANSACTION RECORDS REQUIREMENTS

1.   Introduction

a) This annex provides information on the procedures and requirements in filling up the PLL Transaction Record form to ensure standardisation and traceability.

b) Every PLL item requires a PLL transaction record (Annex BB to ULO 03.43.30.06- PLL Transaction Records) each, to record their transaction history such as use for servicing or loan to other unit.

c) The following indicate the requirements and procedures on filling up the transaction record under different conditions.

2.   Filling procedures and requirements

a) Issue of PLL (By line item)[#]

i.   Record the issue date, issue quantity, the remaining stock balance and the PLL serial number (where applicable).

ii.   Record the receiver personnel Rank / Name and Sign.

iii. Obtain the Reservation Number* (RESV NO.) from MS for the replenishment of the spares and record into the Transaction Record Form.

iv.   Record the reasons for the transaction of spares under the "Remark" column. The following are the requirements on recording the reason:

   a)   **Repair job** – The reason and the serial number of the system which the PLL item is used to recover. (e.g. to recover system 01)

   b)   **On Loan**   – The reason and the receiving unit name. (e.g. T-Loan to *unit*)

   c)   **Others**   – Fill in appropriate reason

b) Receiving of PLL (By line item) [#]

i.   Record the receive date; receive quantity, the new stock balance and the PLL serial number (where applicable).

ii.   Record the receiver personnel Rank / Name and Signature, who perform the replenishment / receiving of the PLL item. He must ensure that that the received PLL is in good condition and meet the requirement stipulated in Annex C to ULO 03.43.30.06 - PLL Spares packaging Requirements

iii.   For new PLL item issued by warehouse, record the PLL issue Voucher Number into the transaction record.

c) Loan of whole PLL set

i.   Official request had to be put up for request loan of PLL.

ii.   For loan of whole PLL set, there is no requirement to update every individual PLL item transaction records. However there must be a form of "handing / taking over records" to indicate the transaction.

iii.   However, if any PLL item is consumed during the loan, the receiving unit must fill up the PLL transaction record in accordance to Para 2.a.

iv.   Upon receiving the loaned PLL from the returning the party, the PLL IC must ensures that that the received PLL is in good condition and meet the requirement stipulated in Annex C to ULO 03.43.30.06 - PLL Spares packaging Requirements

* Not applicable for "Loan of PLL" as it will be returned to the unit, unless it is used during the loan

[#] For Non-applicable field, indicate with a "-" or "NA"

PLL spares Packaging requirements

1.   Introduction

Proper packaging ensures protection to materials from deterioration, damage during storage, handling and transportation. Hence it is very important all PLL spares must be packed properly in accordance to it needs and specifications.

2.   General Packaging

 All PLL spares are to pack in accordance to the below mentioned requirements:

a)   All items must properly packed by the use of foam, cushioning material, etc to fill the empty space in a carton box, wooden box, container, etc to protect the material placed in it.

b)   All PLL spares must be properly label in accordance to the PLL box content list and Annex AA to ULO 03.43.30.06 – PLL Spares Monthly Accountability and Maintenance Check records, for easy accountability and traceability. (eg. "System X - 38", refers to System X PLL, number 38 item on the content list)

c)   All PLL spares must have proper serviceable and identification labels.

d)   All hermetically sealed items are not to be opened until they are required for use.

e)   Ensures all PLL spares shelf life (where applicable) is not expired, in accordance to Annex E - PLL Spares Shelf Life and Maintenance Requirements

f)   Different type of components have special requirement on packaging. Refer to section 3- Special Packaging Requirements, for the addition special requirements.

3. Special Packaging Requirements

On top of the general packaging requirement, the following are the special packaging requirements required for different type of components.

a) Electronic / Electrical Component

i. All electronic / electrical components must be sealed in appropriate anti-static bag to prevent damage from electrostatic discharge (ESD).

b) Cables

i. Cable connectors must be blanked off with metal or plastic caps. The use of adhesive cloth taps or any other material liable to become disaggregated is strictly prohibited.

ii. Cables must be stored flat and unstressed. Cables shall be coiled and maintained by suitable support to prevent unnecessary pressure.

c) Hoses

i. Hose ends must be blanked off with metal or plastic caps, preferably screwed on (metal caps are preferable on bare hoses). The use of corks wooden plugs, adhesive cloth taps, paper wads, rags or any other material liable to become disaggregated is strictly prohibited.

ii. Hoses must be stored flat and unstressed. Hoses shall be coiled and maintained by suitable supports to prevent flattening

d) **Rubberized Product**

i.   Proper packaging is required to enhance the preservation value of the rubberized item. The following are the are some example on enhancement, where applicable:

1) Rubberized item should be stored in sealed envelopes.
2) Application of talcum powder on rubberized part
3) Usage of separation paper between rubber items
4) Usage of non-transparent plastic bags

ii.   Other suitable materials are polyethylene coated with Kraft paper; aluminium foil/paper/polyethylene laminated with opaque polyethylene

PLL Spares Storage Requirements

1.   Introduction

Storage condition is an influencing factor on shelf life. Sunlight, rain, humidity, dust, ozone, fumes, solvent, corrosive liquid and heat source are factors that cause items to deteriorate. With comprehensive storage condition, the condition and serviceability of the PLL spares is ensured.

2. Storage Requirement

a)   When the PLL is in unit, all items must be stored in a dry, air-condition place with temperature of **20 to 26 degrees Celsius and relative Humidity of below 65%.**

b)   A weekly check of the store room temperature and humidity is required to ensure that the storage condition meet the required specification. The result of the obtained temperature and humidity reading must be recorded. Inform relevant department for rectification should the room condition do not meet the requirements.

c)   When PLL is out for deployment, avoid the following:

    i.   Avoid placing the PLL boxes under direct sunlight or any heat source

    ii.   Avoid constantly opening/closing the boxes unnecessary, in order to minimize ventilation / dust

    iii.   Avoid placing the PLL boxes near any POL point or any "wet" area.

    iv.   Add desiccants into the PLL boxes as required to control humidity

d)   All PLL spares are to be stored in their designated boxes, with proper identification label or component serviceable green label, PN 1432.

e)   All PLL spares must be stored in a dark place, away from drafts, humidity and dust.

f)   All PLL spares with shelf life must be monitored and replace when required. Refer to annex E to ULO 03.43.30.06 - PLL spare shelf life and maintenance requirement, for more detail.

g)   All PLL boxes must be lock at all time.

PLL Spares Shelf life and Maintenance Requirements

1.   Introduction

a) Most PLL spares have shelf life and periodic maintenance is required to ensure serviceability of the PLL spares when needed.

b) During monthly accountability check and maintenance, respective PLL IC must ensure that the following maintenance, base on it category, is carried out on the expired PLL spares.

2.   Maintenance Requirement

a) Electrical Rotary Component

   i.   Electrical rotary component have a shelf life of 3 years. After which, the rotary component are to be exercise. If satisfactory, the shelf life can be extended by another 3 years thereafter upon 6 year, they are to be sent for Standard serviceability Test (SST) and the cycle is repeated.

   ii.   These items include rotary switch, electrical fan and potential meter and all electrical rotary parts.

   iii.   The manual rotation test date and result are to be recorded in the component serviceable Green label, PN 1432. (For example: perform manual rotation, result 'SATIS')

b) Engine – Piston and Gas turbine Engine

   i.   For engines sealed in moisture and vapour proof environment or in engine container, the maximum storage period is 3 years. After which, engines are to be inspected and preserved for another 3 years. Inspection of the drying agent condition and it humidity are to be perform once every 2 week and replacement of drying agent is to be made as necessary.

c) **Fuel Component**

i. Under proper storage condition, these components may be kept up to 6 years without inspection. After which, the component have to be send for bay inspection every 3 year to extend it shelf life.

ii. Every 6 years, the components need to be sent for bay servicing for re-preservation and replacement of preservation fluid (if any).

d) **Radar Component (Rotary)**

i. Shelf life – Nil. However any component containing rotary parts is to be operated for freedom of movement every **12** month.

ii. The freedom of movement test date and result are to be recorded in the component Green Label, PN 1432.

e) **Rubberise Product**

i. All rubberise items have shelf life as determined by OEM. However, if the OEM did not indicate the shelf life of the product, the procedures to identify and determine the shelf life of a rubberize product is stipulated in OLO 301.11.008-Policy on Shelf Life of Component, Para 3.2.9-Rubberised product.

ii. For rubberise items that exclude from shelf life, it must meet the requirements as stipulated in OLO 301.11.008 - Annex B, "Shelf Life Control Of Rubberised Products - Exclusion List".

iii. Upon expiry of the shelf life of any rubberised product, the item shall be scrapped. In case of urgent need, request for release of expired rubberised items shall be raised to the respective specialist branch for approval using the channel for concession.

iv.   Respective PLL IC will remove the expired item from the PLL box and records this action in the PLL transaction record- Annex BB to ULO 03.43.30.06. The scrape action is to be indicated in the "Remark" column of the transaction record.

v.   The expired rubberise product will be handed over to MS to perform the scrape.

PLL SPARES MONTHLY ACCOUNTABILITY AND MAINTENANCE CHECK RECORDS

(This is a CAT C record. To retain for 3 years after the record was closed)

PLL   : _____

YEAR : _____

S/N	ITEM DESCRIPTION	NSN	PART NO.	SCALE	DATE											
				SIGN												

AA-1

Annex AL 3 - PLL Management and Maintenance

PLL SPARES TRANSACTION RECORDS

(This is a CAT C record. To retain for 3 years after the record was closed)

DESCRIPTION:		SCALE:		TYPE / NO:	
NSN:		MPN:		LOCATION:	

S/N	DATE	QTY REC'D	QTY ISSUED	STOCK BAL	RECEIVED BY RANK/NAME	SIGN	RESV NO.	ISSUE VOUCHER NO.	LRU S/N	REMARKS

Annex AL 3 - PLL Management and Maintenance

Annex AL 4 –

Amendment Leaflet (Tools Management and Maintenance)

Tools Management and Maintenance

INTRODUCTION

1.   This Order provides the guidelines on management and maintenance of tools.

APPLICABILITY

2.   This Order is applicable to all personnel involved in the maintenance of Equipment/Systems, and also those who appointed as tools ICs.

REQUIREMENTS

3.   The requirement in tools management and maintenance are attached as annexes in this order. Refer to the annexes for the procedures and requirements:

        a)   Annex A   - Tools Usage Requirements
        b)   Annex B   - Tools Maintenance Requirements
        c)   Annex C   - Tools Control Requirement
        d)   Annex D   - Proper Usage of Hand Tools

        e)   Annex AA   - Tools Colour Code Matrix

CROSS REFERENCES

4.   This order is to be read in conjunction with the following: -

    a) OLO 205.05.002 - Tools Control;

    b) Accident and Prevention Manual for Business and Industry - Engineering &Technology (10th Edition); ISBN 0-87912-156-4;

    c) TM 9-243, Use and Care of Hand tools and Measuring Tools;

    d) Formation Logistic Order 01.04.03.03 – Tools Colour Coding Identification, Maintenance and Control.

<u>Tools Usage Requirements</u>

<u>Accountability Check</u>

1. Before and after use accountability checks are to be carried out before and after any maintenance task. User should check for the following:

   a) All tools tally with the tool kit listing
   b) All tools are in good/proper condition
   c) All tools have proper identification (eg. Colour Coding)

2. When any tool is not in the tools kit, it must be accounted for with present of "PN 1944-Tools Status Label".

3. The results of the accountability check shall be recorded in "Before & After-Use Tools Accountability Check Record"- *Annex D to Formation Logistics Order 01.04.03.01*

4. Any discrepancy, user must inform the system's tool IC immediately.

<u>Usage of tools</u>

1. All users must ensure serviceability of the tools prior to use.

2. Select the right tool for the job. Never use a makeshift tool to substitute for the right one.

3. Ensure all tools are cleaned and it is free from grease/oil after usage.

<u>Special requirement</u>

The following are **<u>prohibited</u>** on the usage of tools:

a) Adjustable spanners are not allowed as the bolts or nuts are prone to be rounded.

b) Electrically operated grills are not allowed to use on weapon and generators due to possibility of spark. This potentially hazardous due to the presence of fuel.

c) Do not use oily/greasy tools

d) Tools must not be modified illegally, e.g. by making an extension to increase leverage,

e) Never work on any moving machinery; always switch off the operating machine before performing any work.

f) Always ensure that all tools have been removed before switching on the machine

g) Do not operate any moving machinery before ensuring that all tools is removed.

Annex AL 4- Tools Management and Maintenance

Tools Maintenance Requirements

Maintenance Periodicity

1.   All the tools are required to be maintained, the periodicity are base on the following:

      a) In use tools   :   Monthly
      b) Storage tools :   Yearly

Monthly / Yearly Maintenance Requirements

1.   The area of inspection shall include the following:

      a. Ensures all tools are accounted and properly stored.

      b. Every Tool kits have the updated tool listing available

      c. Wear and tear condition of the tools

      d. Damage / defective tools

      e. Surface condition of tools, (eg, Ensures no rust or oily surface)

      f. Proper tool identification is available (eg. Colour coding)

      g. Condition of the identification. (Re-apply when necessary)

      h. Validity of calibration label (applicable to TMDE)

2.   Ensures that all oil and grease are clean off after the maintenance.

3.   Tools found with defects must be repaired or replaced immediately

4.   Record the status and results of the maintenance in "Tools Maintenance & Inspection Record"- *Annex B to Formation Logistics Order 01.04.03.01.*

<u>Tools Control Requirements</u>

Loan of tools (internal / external)

1. For external loan less then a month, requesting party must seek approval from Unit Logistic officer .

2. For external loan exceeding **<u>ONE</u>** month, the requesting party must seek approval from unit CO.

3. For internal loan, it shall be based on task requirement basis. The approving authority is head of ULC.

4. All loan are subjected to the maintenance and control requirement in this order.

5. All loan must be recorded in "Tools T-Loan Record(External / Internal)", Annex C to *Formation Logistic Order 01.04.03.01.*

<u>Damage/Defective tools</u>

1. Damaged / defective tools must be returned to MS through the tools IC, to perform the necessary action.

2. PN 1944 – Tools status Label, are to be updated and placed in the affected tool box/shelf. This is to indicate to other user on the tools status.

3. Once the replacement tools arrived, it must be color-coded, place back to the affected tools box and remove the PN1944 label.

<u>Missing Tools</u>

1. Refer to *Formation Logistic Order 01.04.03.01 - Loss/missing tools management*

Annex AL 4- Tools Management and Maintenance

PROPER USAGE OF HAND TOOLS

INTRODUCTION

1. Hand tools, when properly used, are instruments, which are capable of performing many jobs. Accidents involving hand tools are usually the result of misuse. It is a fallacy to assume that everyone knows how to use a common hand tool and hence, proper instructions and training are necessary to prevent misuse.

2. Specific considerations on the use of some common hand tools have been extracted from the Accident Prevention Manual for Business and Industry - Engineering & Technology (10th Edition) and included in this order.

SCREWDRIVERS

Screwdrivers are probably the most commonly used and abused tools. They should never be used as punches, wedges, pinch bars or pries. If misused in any one of the ways mentioned, they can cause injury and become unfit for the work they are intended to do. Furthermore, a broken handle, bent blade, or dull and twisted tip may cause a screwdriver to slip out of the slot and cause hand injuries.

1. When using screwdrivers, ensure that the tip fits the screw and that the handle is in good condition. A sharp square-edged blade will not slip as easily as a dull, rounded one and requires less pressure.

2. When it is necessary to work around electrical current bearing equipment, ensure that electrical current is shut off before commencing work. An insulated screwdriver should also be used.

3. When using insulated screwdrivers, users must be aware that: -
    a) The handle, insulated with a dielectric material is intended only as a secondary protection;
    b) Insulated blades are intended only as a protective measure against shorting out components.

HAMMERS

Hammers are manufactured in different shapes and sizes. Their configuration and degree of hardness also vary. Select hammers for their intended uses and use them only for those purposes.

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1. Proper use of hammers involves application of these basic rules: -

   a) Use a hammer of suitable size and weight for the job. When striking a hammer blow, the strike face of the hammer should land squarely (parallel) on the surface being struck. Avoid glancing blows, overstrikes and under strikes;

   b) When using hammers to strike another tool, e.g., wedge, chisel, punch, etc., the striking face of the hammer should have a diameter approximately 0.9 cm larger than the struck face of the tool;

   c) Hammers should never be used to: -

      i. strike another hammer;
      ii. strike another harder surface;

   c) Hammers with loose or defective handles should not be used and any hammer showing signs of excessive wear, dents, cracks, chips or mushrooming should be replaced.

2. If the handle is loose, wedge it into the eye of the hammerhead by striking the end of the handle with a mallet and driving the wedges back into the handle. Add another wedge or use larger wedges if necessary. If the handle does not become tight, the handle should be replaced.

PUNCHES

Hand punches are made in various patterns from square, round, hexagonal or octagonal steel stock. Always ensure that the punches selected are capable of performing the intended job.

1. Punches are **not** to be used other than for the following purposes: -

   a)   Marking of metal and other materials that are softer than the punch's point end;
   b)   Driving and removing pins and rivets;
   c)   Alignment of holes in different sections of materials.

2. Never use a punch that has a mushroomed struck face or a dull, chipped, deformed point. Cutting edge's point may be redressed to its original contour if blunt.

3. Faces on punches can wear due to considerable use and can be restored by grinding the face/tip back to its original angle or shape. Ensure that the temper of the material is not damaged due to overheating by dipping it frequently into water during grinding. Do not grind away more material than is necessary.

4. Any punch that is bent, cracked or chipped should be replaced.

CHISELS

1. Cold chisels have a cutting edge at one end for cutting, shaping and removing metal that is softer than its cutting edge. The following kinds of chisels are commonly used for bench metal work: -

    a) Diamond-Point Chisel - This type of chisel is used to cut V-grooves and sharp interior angles;

    b) Flat Cold Chisel - Commonly used for cutting, shearing and chipping. The width of the cutting edge determines the size. The chisel should be ground with a slightly convex cutting edge to reduce the tendency for its corners to dig into the surfaces being chiseled and concentrate the force directly on the material being cut;

    c) Cape Chisel - Cape chisels are used to cut keyways, slots or square corners;

    d) Round-Nose Chisel - Round nose chisels are used when cutting rounded or semicircular grooves and corners that have fillets. They can also be used to draw back a drill that has wandered from its intended centre;

2. When selecting chisels, the factors affecting the selection are: -
    a) Type of material to be cut;
    b) Size and shape of the tool;
    c) Depth of cut to be made.

3. The chisel should be heavy enough so that it will not buckle or spring when struck. The blade should also be large enough for the job so that the whole blade can be used for the job instead of just the point or corner.

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4. Chisels that are bent, cracked or chipped should be replaced. Cutting edges, or struck ends, may be redressed to their original contours as required. (Grinding may be necessary if chips on the cutting edges cannot be removed by sharpening on a coarse oilstone or if the bevel has become too short or rounded).

HACK SAWS

1. Hack saw blades should always be adjusted and tightened in the frame in such a way as to prevent buckling and breaking. However, they should not be so tight that the pins supporting the blade break off. Blades should be installed with the teeth pointing forward.

2. When cutting, apply pressure on the forward stroke only. Lift the saw slightly and pull back lightly in the cut to protect the teeth. Cutting speeds of 40 - 60 strokes a minute are recommended. If the blade is twisted or too much pressure is applied, the blade may break and injure the user.

3. Do not continue an old cut after changing to a new blade. The new blade may bend and break because its set of teeth is thicker than that of a used blade.

FILES

1. When using files, ensure that the right kind of file is selected and that the handle is secure and smooth. The extremely hard and brittle steel of the file is susceptible to chipping and should never be cleaned by sticking it against a vice or other metal object. Instead, a file-cleaning card should be used.

2. Files should never be used as a hammer or pry and should never be converted into a center punch, chisel or any other type of tool because the hardened surface may fracture.

3. The work to be filed should be clamped to a vice at about waist height. During filing, downward pressure should be applied during the forward strokes. The pressure should be released when bringing the file back to its original position, otherwise the teeth would be subjected to excessive wear.

4. To install a new handle, insert the tang of the file into the socket of the handle. Exerting pressure on the file with the hands, tap the handle on the bench top until the file is seated snugly.

WRENCHES

1. When using wrenches, users should be prepared for the possibility of: -

    a) Wrench slipping off;

    b)   Fastener suddenly turning free;

    c) Wrench or the fastener breaking.

2. Before using a wrench, it should be inspected for flaws/defects. Wrenches should never be ground to change the size.

3. Open-end wrenches have strong jaws and are satisfactory for medium turning. They are, however, susceptible to slipping if they do not fit properly or are used incorrectly.

4. Box and socket wrenches are used when heavy pulls are necessary and safety is a consideration. The wrenches completely encircle the nut, bolt or fitting and provide a more positive grip. Never overload the capacity of the wrench by using a pipe extension on the handle or by striking the handle with a hammer. Striking the metal weakens it and can cause the tool to break.

5. It is important that the correct sizes of box/socket wrenches are used as an oversized wrench can cause rounding of the bolt as well as slipping. The insides of the wrench should also be kept clean.

TORQUE WRENCHES

1. Torque wrenches are used when torque loads are specified for a job, especially when it is important that all fasteners are required to be fully and uniformly tightened. Use only torque wrenches that have been calibrated and ensure that its calibration period, as stated on the label, is still valid.

2. Torque wrenches with variable settings are to be reset to the lowest setting to prevent unnecessary stress on the spring mechanism after usage.

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PIPE WRENCHES

1. A common cause of injury when using pipe wrenches on pipes or fittings is slipping of the wrench during turning. The wrench should be checked to ensure that the jaws are sharp so as to provide a good grip on the surface to be worked on. The adjusting nut of the wrench should be inspected before use and if found cracked, should be replaced.

2. Extension handles should never be used on the wrench handle to provide extra leverage as the extension can strain the wrench, or the work piece, to breaking point.

3. Pipe wrenches must not be used on nuts or bolts, as the corners of the nuts/bolts will break the teeth of the wrench jaws, making it unsafe for use on pipes and fittings.

PLIERS

1. Pliers are designed for gripping and cutting operations. They should never be used as a substitute for wrenches because their jaws are flexible and frequently slip when used for this kind of work. Pliers also tend to round the corners of bolts' head and nuts and to leave jaw marks on the surface, making it difficult to use a wrench at a later time.

2. Side-cutting pliers sometimes cause injuries when short ends of wires are cut. A guard over the cutting edge of the pliers or the use of eye protection prevents short ends from causing eye injuries.

3. Pliers to be used for electrical work should be adequately insulated. Additional electricians' gloves may be worn if necessary.

4. Users must be aware that the cushion grips on handles are primarily for comfort. Unless specified as insulated handles, such handles are not intended to give any degree of protection against electric shock and should not be used on live electric circuits.

Annex AL 4- Tools Management and Maintenance

Tools Colour Code Matrix

** To be inserted upon approval

Annex AL 5 –

Amendment Leaflet (POL Management and Maintenance)

POL MANAGEMENT and Maintenance

INTRODUCTION

1.   This order provides the guidelines on the management and maintenance of the POL used by the unit. The term POL is defined to include petroleum fuels, lubricants, hydraulic and insulating oils, liquids coolants, de-icing and anti-freeze compounds together with components and additives of such products

APPLICABILITY

2.   This order is applicable to personnel involve in the receipt, handling and managing POL in the unit

REQUIREMENTS

3.   The requirement in POL management and maintenance are attached as annexes in this order. Refer to the annexes for the procedures and requirements:

    a)   Annex A   - POL Management Requirements
    b)   Annex B   - POL Maintenance and Accountability Checks Requirements
    c)   Annex C   - Fire extinguisher location Plan

    c)   Annex AA   - Format for POL Quality Record

CROSS REFERENCE

4.   This Order is to be read in conjunction with

    a.   OLO 301.05.009 – Terms for Defining Life Limits

    b.   OLO 601.05.001 – POL Quality Assurance

    c.   L-00-POL –POL Policy

    d.   L-00-HAZMAT – Hazardous Material Management

POL Management Requirements

POL Usage Requirement

1. First in first out policy is compulsory. User must use the older POL stock, before the usage of the newer one.

2. Ensure all the safety requirements are met in accordance to L-00-Pol (POL Policy). When POL of different class category is placed together, the safety requirement of the highest class take precedence.

3. All the waste POL, including servicing paper and rags that comes in contact with POL, must be properly disposed at designated POL disposal area.

4. Clean up the work area and ensure that there is no POL spillage.

5. Record the POL consumption record book. (Refer to Annex AA- Format for monitoring record).

RECEIPT OF new POL

1. Upon receiving of new POL, the receiver must ensure the following data are available:

    i. Part number / NSN number

    ii. Description

    iii. Batch No or Shelf life expired date

2. Reject the POL stock if any of the required data is not available.

3. For new POL which unit did not hold previously, MSDS must be requested from the warehouse.

4. Update the POL consumption record on the replenishment. (Refer to Annex AA- Format for monitoring record)

Prohibition

1.   Do not mix POL of different shelf life or batches in the same container.

2.   Indiscriminate dumping of POL spills/wastes in open deployment field/sites or flushing of spills into open drains is strictly prohibited. All POL spills/wastes, including materials used for spills, must de disposed at designated POL disposal area.

3.   Do not leave any POL under the sun or adverse weather when not in use.

4.   POL (base on it classes) and ignition source must not fall below the prescribe requirement in L-00-POL (POL Policy).

POL Maintenance & Accountability Checks Requirements

Introduction

1.   The POL storage area/cabinet requires **Weekly Checks/Maintenance** on the following:

>   a) POL storage area check
>
>   b) POL Container checks and maintenance
>
>   c)   POL Accountability / stock checks

2.   The Results and rectification action (if any) of the check shall be recorded in the prescribe format of "Weekly POL inspection record" in accordance to Annex AA to ULO 03.43.30.05 – Format For POL Quality Record.

3.   The scope of the checks are as follow: -

POL Storage Area checks

2.   "POL" and "Flammable" sign are prominently display.

3.   "No Smoking Sign" is prominently display.

4.   Fire extinguisher (non-expired) is available nearby and must be easily accessible.

5.   POL storage area shall be clear from any obstruction and a minimum distance of 15 metres shall be observed for parking or obstructing vehicles/equipment, to facilitate evacuation in the event of any emergency.

6.   Perform house keeping and ensure area is clean and no presence of oil spillage. Clean up if necessary.

7.   POL cabinet listing is accurate and updated.

8.   POL and chemical is to be segregated and stored separately on different shelves, compartment of different cabinets.

9.   Only approved and authorised POL is stored in the POL cabinet.

10. The maximum allowable quantity of the storage cabinet is not exceeded.

11. Nearby electrical wiring/fitting are not exposed.

12. MSDS are available for every POL in the POL cabinet.

13. Proper clean PPE are available in every POL cabinet.

POL Container checks and Maintenance

1. All POL must be properly labelled. All labels must include the POL part number, NSN number, description, and batch number or expiry date.

2. For POL which come in large container / drum and it is transfer to smaller container in order to facilitate usage, proper label must be available on every container.

3. Only approved or OEM container can be used to store POL.

4. Ensure POL is not contaminated and containers are not corroded. POL that is contaminated or corrosion on the container are to be segregated properly or disposed off immediately to the designated wasted POL point.

5. Check the expiry date of the POL. Expired POL must be disposed off immediately to the designated wasted POL point.

6. All POL containers opening are to be covered / capped properly (including empty diesel/petrol can).

7. Ensure all POL container lids/caps are serviceable and properly tighten to prevent leakage.

Accountability / Stock checks

1. Perform accountability check and ensure POL did not fall below 50% stock level in every POL cabinet.

2. Perform necessary replenishment such as putting up for POL demand or hastening when required.

<u>Fire extinguisher location Plan</u>

** To be inserted upon approval

FORMAT FOR POL QUALITY RECORDS
*(These Records are CAT D record. To retain for 2 years after the record is closed)*

a)   <u>**Weekly POL inspection Record**</u>

POL AREA: _____

DATE	Check By: Rank and Name	Checker: Signature	Discrepancy (If Any)	Corrective Action / Remarks

b)   <u>**POL Consumption Record**</u>

NSN:		MPN:			D OF Q:	
DESCRIPTION:				MAXIMUM STOCK LEVEL:	TOP UP LEVEL:	
LINE NO	DATE IN / OUT	QTY IN / OUT	QTY BALANCE	RANK AND NAME	SIGNATURE	PURPOSE (Specify Equipment used on, where possible)

*NSN: National Stock Number,   MPN: Material Part Number, D of Q: Denomination of Quantity

End of Report