A revised Operating Model for the Marine Engineering General Service to improve the lived experience of Surface Fleet Marine Engineers.

J F A Ellis, BEng

Synopsis

It has been seen in recent years that there is a chronic inability to retain Marine Engineers which in turn has led to critical gapping in surface units and the potential for the inability to deliver the operational imperative and safely operate warships at sea. The cause of this catastrophic failure is a melting pot of various shortcomings including regular programme instability coupled with the pressure to deliver power to command, battling with inadequate stores and overbearing administration all whilst covering for existing gapping within their unit. The result of this is that Marine Engineers are suffering "burnout" and seeing that the "grass is greener on the other side" leading to highly skilled personnel leaving the service which leads to a spiral and the future of the Marine Engineering General Service branch being uncertain.

There have been multiple attempts to improve the lived experience of Marine Engineers, but these solutions have been concentrated on treating the symptoms rather than the root cause of why Marine Engineers leave the service. The backbone of the revised operating model is to improve Support Solutions by enhancing the access to stores, tools and instructions; to better utilise the Time accessible to Marine Engineers to achieve preventive maintenance and effective training, and finally to bring more choice into the Career pipeline of RN Marine Engineers rather than forcing everyone into a "one size fits nobody" career that holds poor recognition and reward for being the highly skilled workforce that is required to facilitate the operational requirements of modern naval warfare.

This lack of recognition is a prime example of why many personnel make the decision to leave the RN at the LET and PO ranks where upon they can utilise the engineering skills and knowledge gifted to them by the RN to work in a civilian company for an increased salary doing much of the same work whilst not having the pressures of deployment or lack of stores support.

This paper will discuss the changes to the employment of Marine Engineers; the rationalisation of maintenance and the delegation to charge engineers in order to move away from a Navy that does not trust the monitoring systems available and loading unsustainable routines on watchkeepers, to a more efficient engineering workforce that is able to conduct greater preventative maintenance and deliver power to command within a sustainable timeframe.

Keywords: Optimisation, Sustainability, Maintenance Management, Lived Experience, Standards and Certification

1. Introduction

It is the Leading Engineering Technician (Marine Engineering) (LET(ME)) and Petty Officer Engineering Technician (Marine Engineering) (POET(ME)) that are the key focal points of the Marine Engineering General Service (MEGS) branch delivering the maintenance that underpins the seaworthiness and safety case of Royal Navy (RN) warships. With growing tensions across the globe and pressures to increase the availability of units, retention is vital to ensure the safe and efficient operation of platforms to deliver the operational outputs required. To successfully meet Defence Outputs there is a necessity for regular movement of personnel across platforms often leaving departments with critical gapping and an unsustainable workload. Tasks must be completed by other personnel within the unit in addition to their own terms of reference, leading to "Burnout" of our engineers. Burnout is further exacerbated by programme instability, overbearing maintenance administration and stores availability, therefore pressurising engineers to deliver maintenance with insufficient time. Lack of capacity reduces the ability to grow resilience across the department through effective onboard training, developing on the foundation qualifying courses, as such marine engineers are subject to a "one size fits nobody" ethos to training.

Planned maintenance is often of a lower priority to internal operational requirements or emergent defects. Time taken to complete other serials reduces the capacity for skilled engineers to proceed with preventative maintenance which should support a decrease in the likelihood of defects occurring. There is often seen to be an increased use of unsociable working hours to ensure the completion of maintenance and training required to safely operate the propulsion plant, leading to frustration and disparity between personnel onboard. With a necessity to maintain seagoing units at high readiness the majority of a unit's time alongside is conducting Fleet Time Support

Author's Biography
SLt J F A Ellis RN is currently employed in SURFLOT engineering delivering the revised MEGS Operating Model with aims to revitalise the ME branch. Earlier experience includes specialist training on HMS Richmond and HMS Kent.

 https://doi.org/10.24868/11169

Periods (FTSP) or the rectification of Operational Defects (OPDEFs), therefore marine engineers are routinely remaining onboard to rectify defects and FTSP maintenance prior to immediately returning to sea.

Previous attempts to revitalise, rejuvenate and treat the MEGS retention crisis have been unable to fully deliver as they have not treated the systemic delivery and career problems, instead focussing on short term solutions to battle the workforce structures. To improve the lived experience of marine engineers a solution with two key themes has been envisioned: Career and Time. By improving the efficient usage of engineering time there is a reduction in the volume of daily work to better align the working hours of marine engineers to those of other departments leading to reduced fatigue. Coupled with this is the removal of overbearing Unit Maintenance Management System (UMMS) administration, to ensure consistent time for excellence in maintenance and operation. Furthermore, the ability to control the concession process for a greater number of maintenance tasks has been delegated to charge qualified engineering heads of department (HoDs), empowering seagoing engineers to make decisions as to these tasks with the ability to request guidance and direction from the Platform Chief Engineer and Platform Authority. In addition to improving the utilisation of engineering time, a revised career pipeline allows marine engineers the freedom to choose how far and how fast they progress their career, offering the ability to choose the amount of academic training they wish to conduct resulting in the opportunity to have a reduced amount of time at HMS SULTAN, instead delivering on operations.

2. Employment

The naval watch system has been utilised since the days of sail and yet it is found that engineers are being tasked to complete excessive work on top of this, which in turn leads to dissatisfaction. Currently personnel are to conduct watchkeeping duties of up to eight hours per day as well as section maintenance, divisional responsibilities, and career progression task books. Regular occurrences of marine engineers working excessive hours are noted on units. To this end the sea watch routines have been altered to a “West Country” routine leading to two “all nights in” per four-day watch cycle, as well as utilisation of the long first and long morning (6-hour watches vice 4 hours), allowing for the proper rest and recuperation that personnel require. The implementation team have had the opportunity to evaluate, alter and remove existing policy that has felt to be out of date or non-conducive to the lived experience of engineers onboard. All of this change is supported by a Command Charter that changes the thought process on a large number of traditional ideologies that have been conducted with the reasoning that “this is the way we’ve always done it”. Utilisation of the Command Charter where periods such as maintenance days are to be properly adhered to, as well as not always requiring equipment back online immediately but rather in accordance with the Command Aim. Additional timing for defect rectification enables the most experienced maintainer to conduct rectification and maintenance whilst not being taken away from guaranteed rest periods whilst also being able to take the time to instruct junior engineers how to operate, diagnose, repair, and maintain the equipment that they work with. This is essential in the development of junior engineers and the building of resilience across the department. By protecting forenoons through the reallocation of whole ship evolutions to later in the day, it has enabled engineers to conduct more extensive maintenance during the forenoon watch as they are no longer required to be drawn away from core maintenance tasks to complete whole ship evolutions. Thus, it is as if every day is a half maintenance day which exceeds the number of recommended days by one half day per week in accordance with Fleet Operating Orders (BRd 9424(1)). Feedback from Fleet Operational Standards and Training (FOST) noted that engineering standards on ships have vastly improved in a matter of short months as engineers now have greater time to conduct preventative maintenance, ships husbandry assigned to them and provide specialist advice to other departments conducting their own husbandry. This kind of maintenance and discussion with the unit’s command team enables engineers to Lock Off and Tag Out (LOTO) equipment, conduct the necessary diagnosis or repair to hopefully ensure that equipment remains in working order. Ultimately leading to a reduced number of Operational Defects (OPDEFs) and greater reliability in systems, lessening the risk of failure at key operational moments. Furthermore, all members of the marine engineering department now have increased capacity during the working day that can be utilised for structural preservation and husbandry of MMS, which previously would be subcontracted during a maintenance period or deprioritised to be conducted outside of the working day. Historically, due to the poor standards of ship’s husbandry across all departments, the care and protection of a platform was handed to external agencies for refit and upkeep periods in a poor state. This led to platforms taking longer to return to the fleet than originally expected or scheduled for and in some cases, it has not been financially viable to repair.

 https://doi.org/10.24868/11169

3. Training

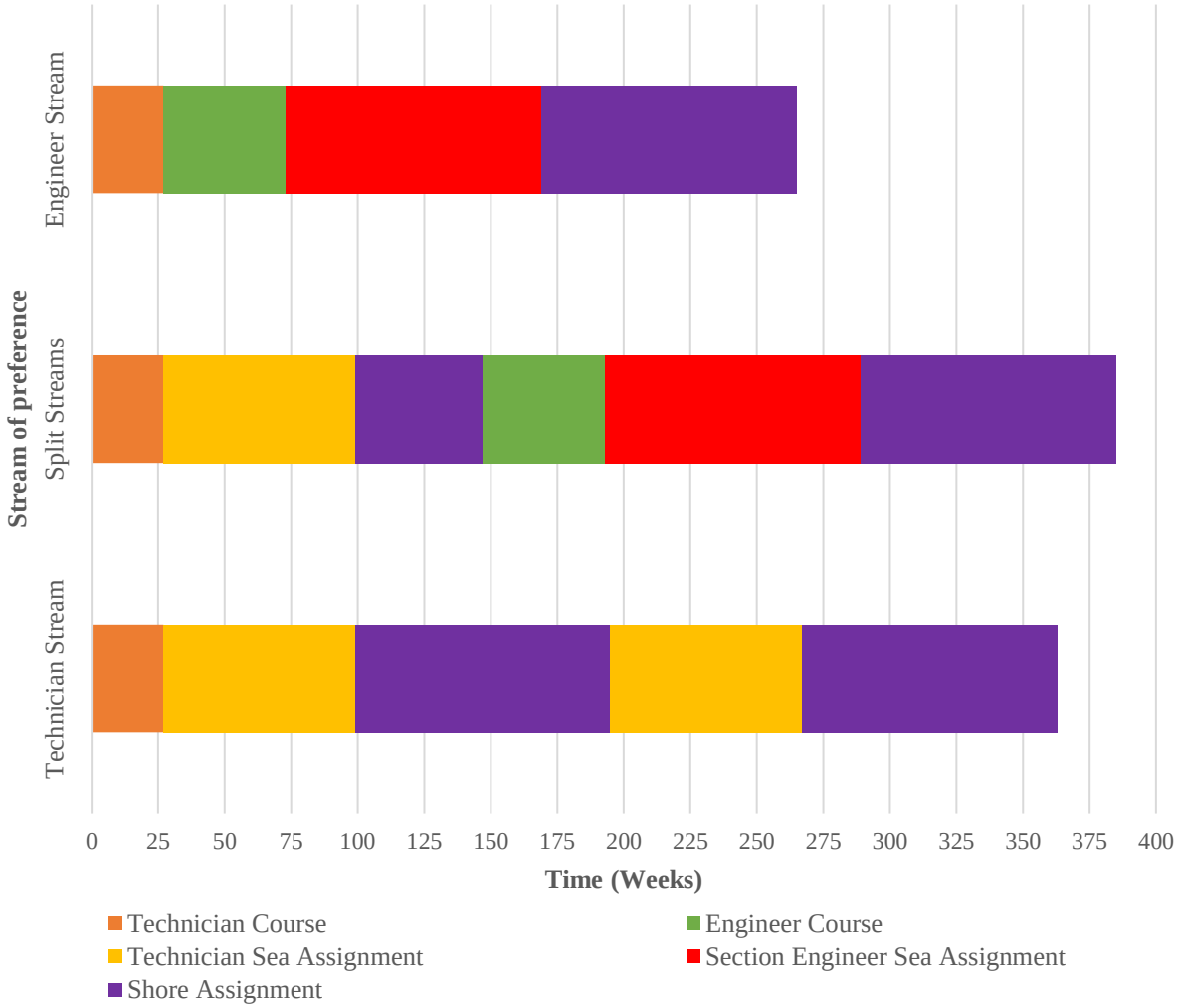

Figure 1: Indicative Career Progression of LET(ME) to POET(ME)

Under the revised Operating Model there is greater opportunity for marine engineers to choose how fast to progress in their career, enabling those who do not wish to progress through the rank hierarchy to remain in gainful engineering employment. Those who do not want to complete all technical and foundation degree modules still have the ability to promote to Warrant Officer. Marine engineers are no longer forced into extensive academic courses at HMS SULTAN, instead there is now an opportunity to offer personnel the choice to conduct higher rank qualifying courses (QC) by three different streams, as seen in Figure 1. The Engineer stream allows for personnel to conduct both Technician and Engineer streams of LET(ME) or POET(ME) QC in one endeavour before returning to operational units as a section engineer having fully completed specialisation training. The split stream allows for marine engineers to have a 'journey person's time' developing experience through section support and conducting routine maintenance whilst on watch prior to returning to HMS SULTAN for the Engineer stream QC. Finally, the Technician stream is for those that do not wish to complete their foundation degree as part of POET(ME) QC or to stovepipe into one ME specialisation, instead supporting all sections during their shortened sea assignments yet still having the opportunity for promotion and gainful engineering shore employment. Technicians will be the key personnel who are trained as Marine Engineering Officers of the Watch (MEOOW) as the operators and supervisors of the propulsion plant; also conducting routine maintenance on watch, whereas section engineers will be conducting in-depth maintenance on equipment requiring greater technical knowledge delivered to them on the Engineer stream QCs. However, marine engineers are not restricted to follow one career path of either Technician or Engineer, instead having the ability to move between the streams

 https://doi.org/10.24868/11169

so that there is an opportunity to choose as and when they conduct qualifying courses to support their personnel preferences.

4. Maintenance Management

As part of the revised operating model the intention was to reduce the amount of administration relating to maintenance by the removal of thousands of UMMS tasks. The criteria for removal being ME activity driven tasks, duplicate tasks, or those that fall under the remit of good engineering standards, such as “check for leaks” or “check earthing straps”, which are drilled into every marine engineer as soon as they start their first career course at HMS SULTAN. This removal of tasks has culminated in a reduction of up to 2633.45 hours of maintenance loading per month (dependant on class of ship), as seen in Figure 2, enabling marine engineers to conduct preventative maintenance as they are not burdened by the overwhelming number of UMMS tasks. Feedback from units that have implemented the new operating model have announced that engineers are feeling refreshed as they are now either required to conduct in depth technical maintenance and OPDEF rectification or, if they are fulfilling a technician position, they are watchkeeping and conducting routine maintenance, not both. Furthermore, by reducing the UMMS tasks that are required to be completed whether that be by the removal, reallocation or grouping of tasks has heavily reduced the number of hours that personnel must be at a computer terminal undertaking the administration of task completion, reduction in total administration clicks is in excess of 5,000 leading to a minimum of 48.83 maintenance hours saved monthly as seen in Figure 3. These hours can then be utilised by personnel for preventative maintenance, divisional responsibilities, personal and career development or rest and recuperation.

Class of Ship	Number of Tasks Removed	Monthly Loading Reduction (Hours)
QEC	198	2146.67
T45	278	1753.45
T23	196	1346.84
Hunt	188	2633.45

Figure 2: UMMS Tasks removed.

Class of Ship	Total Admin Clicks Saved	Total UMMS Access Hours Saved
QEC	10,312	71.00
T45	5,528	48.83
T23	15,048	98.17
Hunt	6,568	56.58

Figure 3: UMMS Admin Burden Reductions per month.

With operational requirements increasing in tempo, and despite OPDEFs being categorised with a respective repair timeline, engineers often strive to repair these systems as soon as possible at the detriment of their own well-being. Furthermore, due to the demand for equipment to be brought to full operational capability at its earliest opportunity there is often seen to be little to no time allocated for the onboard development and training in the equipment. Reluctancy to conduct diagnosis or repair on equipment that does not fall within personnels specific remit instead relying on part of ship or the Original Equipment Manufacturer (OEM). This management of OPDEF rectification expectations has been addressed in the implementation of the Command Charter, encouraging Operational Commanders of Warships and their schedulers to have a better understanding of defect ramifications, the time required for the diagnosis and repair and the importance of engineering training to provide excellence in OMDR and sustainable organic resilience. Through the changing of mindsets and ideologies about maintenance management and OPDEF rectification, coupled with the sharing of knowledge across the department there will be an increased likelihood for marine engineers to be less inclined to label themselves exclusively through their training. Instead focussing on a whole department approach so that defects are able to be diagnosed and repaired by anyone from the department no matter which trade they have specialised. Direction and guidance from SURFLOT Engineering is that no equipment is ‘untouchable’ and only to be maintained by the OEM, in turn encouraging engineers to conduct intrusive diagnosis and repair during the uninterrupted forenoon watch. If equipment is already Locked Off Tagged Out and out of action then the outcome of repair attempts by an RN

 https://doi.org/10.24868/11169

engineer will not be detrimental to the operational capability of the unit, no matter the outcome. However, by this same engineer having greater time to conduct an initial attempt at reparation may bring equipment to a usable state or conduct detailed diagnostics that can be supplied to the OEM reduces the length of time whilst alongside for this equipment to remain out of action. If personnel are less reluctant to 'type cast' themselves to one specialisation but rather encouraging a wider engineering knowledge and prowess, it improves the likelihood of personnel having the freedom and capability to transfer between platforms and classes of ship throughout their career. This choice can improve satisfaction of Marine Engineers as they are now able to choose their career progression rather than having it chosen for them.

5. Maintenance Delegation

In the existing operating model, tasks must be completed by their due date else ship's staff would have to raise a formal concession as to the reasons why this maintenance was not conducted. Under the new operating model, tasks are not required to be concessed if ship's staff are unable to complete tasks by the 'Due' date, but rather there is now an 'Overdue' approval limit in accordance with Figure 4 (BRd 1313). Engineers now have greater capability to plan maintenance around ships' operations and programmes to ensure deconfliction from activities such as FOST Directed Readiness Training where all personnel will be required for training evolutions. The 'Overdue' approval limit grants seagoing engineers the capacity to move maintenance later in their programme to account for unforeseen events such as priority OPDEFs, lack of or incorrect stores and immediate programme changes that are frequent in the schedule of an operational warship, so long as the risk has been mitigated. Flexibility in maintenance management enables Operational Commanders the opportunity to retain their units at sea thus increasing availability of ships. To prevent complacency and poor engineering management UMMS databases are regulated and monitored by assurance agencies, such as FOST, ensuring that maintenance tasks are not being left for completion at the 'Overdue' date on regular occurrences without sound justification.

Defined Periodicity	Delegated 'Overdue' approval limit
1 Month or Less	Date of next scheduled occurrence
Up to 6 Months	1 calendar month past Due
Up to 12 Months	2 calendar months past Due
Up to 24 Months	3 calendar months past Due
24 Months or More	4 calendar months past Due
Non-Calendar based triggers (elapsed time, rounds fired, etc.)	10% past Due (rounded up to the nearest full unit of measurement)

Figure 4: 'Due/Overdue' Approval Limit

As part of the revised MEGS OP Model, Engineering HoDs that have passed their necessary charge qualifications, whether that be marine or weapons, are being formally delegated the authority to concess Category A (ship staff conducted and overseen) maintenance of both Safety and Environmental as well as Operational tasks in accordance with Figure 5 (BR1313). Authority has been formally delegated to unit Marine Engineer Officers (MEOs) and Weapon Engineer Officers (WEOs) by the Platform Authority working from Defence Engineering & Support (DE&S) Abbey Wood. By offering the Engineering HoDs the ability to concess Category A maintenance, ships have a far greater ability to react to ever changing command aims and taskings they are directed to. Under the old model a concession would take anything up to thirty-five working days to be processed by the team of personnel in DE&S. Through the delegation from the Platform Authority, it enables charge qualified engineering HoDs to decide whether equipment remains safe to operate whereas their civilian counterparts may never have been onboard an RN warship and have minimal operational experience or knowledge as to the implications of the equipment. Furthermore, as the engineering HoD is onboard they are able to witness the operation and estimate the risk of failure as well as the implications that it will have on operational capability if this equipment is removed from command whether by failure or by LOTO.

Task Category	SE	OP	Non-OP
FHA and PVR Product concessions	PA*	-	-

 https://doi.org/10.24868/11169

Cat A	PA*	Platform Charge Engineer	UMMS Manager
Cat A1	Platform Charge Engineer	Platform Charge Engineer	UMMS Manager
Cat A2	PA*	Platform Charge Engineer	UMMS Manager
Cat A3	PA*	Platform Charge Engineer	UMMS Manager
Cat A4	PA*	Platform Charge Engineer	UMMS Manager
Cat B	PA	PA**	PA**
Cat B1	PA	PA**	PA**
Cat B2	PA	PA**	PA**
Cat B3	PA*	Platform Charge Engineer	UMMS Manager
Cat C	PA	PA**	PA**

Notes

* The PA may, in writing, formally delegate these approvals to the Platform Charge Engineer.

** The PA may, in writing, formally delegate these approvals to a duly authorised, individual within the waterfront support organisation. The individual may then be added to the PA's UMMS Approver Group allowing them to approve concessions within the UMMS application.

Figure 5: UMMS Maintenance Concession Approvals

Also, the MEO has the power to concess Flexible Hose Assembly (FHA) and Pressure Vessel Register (PVR) product concessions, once again reducing the administration from collection of eleven signatures to only one, being the MEO. This removes the necessity to contact the Equipment Authority (EA) who may not be of immediate assistance due to different working hours especially when a unit is deployed and in a different time zone or operating outside of office working hours. This opportunity allows for MEOs to conduct diagnosis and a risk assessment of the likelihood of failure and risk to life and operations.

6. Conclusions

The revised MEGS Operating Model has aimed to improve the lived experience of marine engineers through two key themes: Time and Career. Improved utilisation of time has been conducted by the normalisation of the volume of work required by personnel to conduct and the removal of the requirement for personnel to conduct watchkeeping and section maintenance. Career opportunity and freedom has been at the forefront in the development of revised career streaming, offering marine engineers' choice as to the quantity and duration of the academic training they conduct.

These two pillars are supported by the Command Charter and the repackaging of UMMS tasks, which will ensure that there is sufficient timing for engineering personnel to conduct intrusive diagnosis and repair whilst imparting knowledge and guidance to junior engineers. In turn this will increase the organic resilience of the department as more personnel are utilising their experience and knowledge across all engineering problems. Consistent time for preventative maintenance, repair and diagnosis will aid in the early identification and rectification of defects thus increasing the availability and operational capacity of units.

The delegation of the ability to concess category A maintenance and FHA and PVR product concessions empowers the platform charge engineers to carry out their duties as professionally charged qualified engineers whilst also reducing the UMMS administration. The ability for engineers to plan maintenance around ships programme remains in force, however through the use of the due/overdue function there is now greater ability to dynamically react to immediate programme changes, supply chain issues or emergent priority defects.

Through the implementation of these initiatives, it is assessed that the MEGS branch will start to recover as personnel should encounter burnout less frequently with an improved lived experience. This in turn delivers the ultimate aim of retaining professionally competent Marine Engineers that are capable of the delivery and operation of a safe, efficient, and deadly navy.

Acknowledgment

 https://doi.org/10.24868/11169

This paper is supported by the Marine Engineering General Service Operating Model implementation team and wider Marine Engineering General Service Discipline.

References

Fleet Operating Orders BRd 9424 Volume 1. pp 124. Edition: January 2022.
Maintenance Management in Surface Warships BR 1313 Chap 1 pp 5, Chap 9 pp 9. Edition: February 2024

 https://doi.org/10.24868/11169