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Commissioning

# Introduction

It is fundamental in providing effective Aids to Navigation (AtoN) that their performance and reliability meet the operational needs. To ensure this is achieved, it is important that components, equipment and systems are checked before implementation, fitment and use. The impact of not effectively achieving this can extend far beyond the inconvenience of have to undertake an unplanned repair.

# Scope

The concept of commissioning can be applied to a wide range of systems, such as the fit of mooring components, to the commissioning of remote monitoring and control systems. Often the phases of commissioning develop from the smaller discrete items, built up to complete assemblies and systems.

This can extend to the complete supply and checking of parts, equipment, tools and instruction to ensure efficient and effective implementation of AtoN installation. This is critical at remote and difficult to access locations.

Commissioning can be considered a key part of any quality system in ensuring no defective parts or systems are employed on operational AtoN.

The extent or scale of these tasks need to reflect the size, complexity or criticality of the equipment or system being deployed. Additionally, the scope of these tasks maybe be applied to a first of type production solution, but significantly reduced to the production product.

# Concept of commissioning

Commissioning is often thought of as the act of getting something working and confirming its correct operation. It can however be wider than that, given the ever more complex systems required for AtoN and eNavigation.

Commissioning especially needs to be focused on those aspects that impact on the effective performance on the AtoN and as such, every component that contributes to this, needs to be identified and commissioned.

Given something like a buoy, this can include the dimension of the key mooring components, the material that these are made from, the colour of the buoy, and the character and operation of the lantern, to name but a few.

The key purpose of commissioning is to ensure that the correctly specified components are used. These may then be built up to form assemblies which assemble and function as designed. Records of any measurements and functions need to be recorded to allow the process to be repeated if necessary and to inform others of what is correct.

# The identifiaction of CRITICAL FACTORS

## What needs to be captured?

Throughout the design phase, the design engineer would be able to identify the critical factors that need to be measured, checked or function tested. Some of this information may be supplied by manufacturers of equipment or materials and may be presented in the form of certification of performance.

In addition to the requirement for final operational performance, there can also be critical limits for transporting hazardous goods or equipment such as batteries in order to comply with statutory regulations. The early identification of such constraints is important to avoid unplanned difficulties in the delivery of AtoN equipment.

## Measurement and visual Checks

The identification of critical factors will also determine the manner in which such factors are to be checked. This is usually in the form of either measurement or visual. Examples of each of these could be:

* Lantern optical performance – measurement within tolerance. See Figure 1
* Battery connectivity – visual
* Battery state of charge – operational measurement

1. Light distribution curve showing tolerances

# Measurements and records of parameters

It is important that throughout the commissioning or during each commissioning phase, that records of any measurements and tests are captured. This provides a historical record for the future and confirmation of performance, leading to a level of confidence to proceed to the next stage.

One of the most essential measurements is the verification of performance, usually against a reference or standard. An example could be the material of chain to a Lloyds standard or the measurement of a lantern range or sectors to an IALA recommendation.

Alternatively, it could be confirmation of the correct operation of a diesel generator set following a mains failure. Either way, it is important that the steps taken are recorded to allow this operation to be repeated in the future.

Such records allow a baseline of operation to be captured for future comparison and assessment. A repeat of these tests through a product life will inform of any degradation and hence allow a prediction of end of service life.

# Functionality

The functionality of individual items need to be proven in isolation and then slowly built up into more complete and complex systems. Proving at each stage, the predicted operation is achieved. This process is always done where full facilities are available to remedy any issues encountered.

Such testing, allows confirmation of correct software programming, operating levels and functionality, both during correct and adverse operating conditions. This highlights the importance of both positive and negative testing. That is testing and simulating fault as in line with the designed operation, but also the importance of needing to do negative testing. That is creating unexpected situations and confirming that the unit or system is able to function correctly without adverse impact to the AtoN.

# Link to future maintenance

The measurements taken at the time of commissioning allow comparison to the original baseline giving the opportunity to evaluate performance and assess or predict service life. Such information is useful in planning for replacement without having to react to a failure.

Occasionally, for critical factors, these points are monitored remotely to ensure a failure or deviation of such a point against the baseline, can be responded to. An example of such a point could be the system battery voltage.

Naturally, a record of functional checks and how these were achieved, allows conformation of correct operation of a system throughout its life. In order to avoid maintenance induced failures, such test should be non-intrusive, otherwise the frequency of such test should be balanced against the benefit they bring.

It is also important to capture setting, configuration and measurements during commissioning as such information provides a useful reference when replacing equipment. It ensures that any replacement equipment is configured the same as the original and allow a repeat of identical tests to confirm correct operations.

Consistent configuration, setup and testing of common equipment can aid in the early identification of common faults, aiding in the adoption of a proactive approach to rectification before unplanned failure.

# Validation

Although it is important to capture, measure and record all factors that can influence the effective performance of an AtoN, it should also not be overlooked that validation by the customer or key stakeholders is also a critical factor in concluding commissioning.

Such validation maybe achieved through observation by the customer or stakeholder, but could also be achieved through evidence of how the mariner uses the new AtoN.

# Monitoring

As part of assessing effective unattended operation in line with the expected functionality, a period of normal operation “soak test” should be monitored and recorded.

To determine the longer term effectiveness of the systems, user feedback can be captured and used as evidence to support any further changes or as further validation to the design.

Over the long term, monitoring of the performance of systems and equipment is important and useful information. Such information informs designers, engineers and organisations alike as to optimisation of future design. This leads to the elimination of common failures connected to historical design solution and returns a cost saving to organisations.

# References

1008 - Guideline on Remote Control & Monitoring

1. Examples of Typical Systems Requiring Commissioning













1. An Example of a Test Sheet

| **Station:** | | | **Date:** | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | | |  | |
| **Test Sheet No:** | **CS23-10** | | |  | | |
| **System:** | **Modular Superstructure:**  **Soak Test** | | |
|  | | | | | | |
|  |  |  | | |  | |
| Pre-Test Checks: | | | | |  | |
| **Activity** | | | | | **Pass/Fail** | |
| 1) Ensure the following: | | | | |  | |
| * 1. The Commissioning of the Modular Superstructure has been completed | | | | |  | |
| b) All equipment is securely fitted and in good order | | | | |  | |
|  | | | | |  | |
| Modular Superstructure Soak Test: | | | | |  | |
| **Activity** | | | | | **Pass/Fail** | |
| **SOAK TEST SET-UP** | | | | |  | |
| 1. Confirm that the lantern lens is covered with suitable material, but photocell is exposed. | | | | |  | |
| 1. Confirm that the Racon connector is not connected to the Racon. | | | | |  | |
| 1. Confirm that all cables are connected (apart from the Racon). | | | | |  | |
| 1. Confirm that all unused connectors are suitably protected with dummy connectors or covers. | | | | |  | |
|  | | | | |  | |
| **SOAK TEST** | | | | |  | |
| 1. During the soak test, the Modular Superstructure and its equipment must not be touched.   *Any changes during the soak test must be noted in the comments section below.* | | | | |  | |
| 1. Advise the Planning Centre that the buoy is now prepared for Soak Test Validation | | | | |  | |
|  | | | | |  | |
| **CHECKS AFTER 24 HOURS**  **To be completed by the Planning Centre:** | | | | |  | |
| 1. Using archive data from CMCS check or confirm the following: | | | | |  | |
| * From Values History determine if the Navigation Light and Outstation Awake status is transferred from the buoy to the CMCS and on / off times are as expected.   *Note: the Navigation Light status can be found at database address BXXX00 and the Outstation Awake status at BXXX07.* | | | | |  | |
| * From the Activity History determine if the buoy communications are at the expected levels of three minimum and seven maximum exchanges from the buoy to CMCS.   *Note: calls to and from an outstation are logged as Message Code 32.* | | | | |  | |
| * Using Alarm History confirm that no other alarms were received during the 24 hour period. | | | | |  | |
| * Comms can be established with the buoy in the one hour window at 12:15 UTC | | | | |  | |
| * Using Trend View and the reference trend at the end of this document confirm that the battery voltage trend shows that the Charge Controller is regulating the battery voltage.   *Note the battery voltage analogue can be found at database address EXXX10.* | | | | |  | |
|  | | | | |  | |
| **CHECKS AFTER ONE WEEK**  **To be completed by the Planning Centre:** | | | | |  | |
| 1. Using archive data from CMCS check or confirm the following: | | | | |  | |
| * From Values History determine if the Navigation Light and Outstation Awake status is transferred from the buoy to the CMCS and on / off times are as expected. | | | | |  | |
| * From the Activity History determine if the buoy communications are at the expected levels of three minimum and seven maximum exchanges from the buoy to CMCS. | | | | |  | |
| * Using Alarm History confirm that no other alarms were received during the one week period. * Comms can be established with the buoy in the one hour window at 12:15 UTC | | | | |  | |
|  | |
| * Using Trend View and the reference trend at the end of this document confirm that the battery voltage trend shows that the Charge Controller is regulating the battery voltage. | | | | |  | |
| **CHECKS AT END OF SOAK TEST**  **To be completed by the Planning Centre:** | | | | |  | |
| 1. Record length of soak test. | | | | | days | |
| 1. Using archive data from CMCS check or confirm the following: | | | | |  | |
| * From Values History determine if the Navigation Light and Outstation Awake status is transferred from the buoy to the CMCS and on / off times are as expected.. | | | | |  | |
| * From the Activity History determine if the buoy communications are at the expected levels of three minimum and seven maximum exchanges from the buoy to CMCS. | | | | |  | |
| * Using Alarm History confirm that no other alarms were received during the soak test period. | | | | |  | |
| * Comms can be established with the buoy in the one hour window at 12:15 UTC | | | | |  | |
| * Using Trend View and the reference trend at the end of this document confirm that the battery voltage trend shows that the Charge Controller is regulating the battery voltage. | | | | |  | |
| 1. Take a screenshot of the battery voltage trend and append it to this document.   **To be completed by the Buoy Yard** | | | | |  | |
| 1. Confirm that all equipment is still securely fitted and in good order. | | | | |  | |
|  | | | | |  | |
|  | | | | | | |
| **Comments:** | | | | | | |
|  | | | | |  |  |