



**DYNAMIC POSITIONING CONFERENCE**  
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**ANNUAL DYNAMIC POSITIONING TRIALS FOR  
DYNAMICALLY POSITIONED VESSELS**

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## INTRODUCTION

Vessel owners and operators wishing to demonstrate that their vessels not only meet the various rules, regulations and requirements but also are suitable for a range of activities often do so using a vessel assurance system where they can make a range of documents, including certificates, manuals and inspection reports, available to charterers and others.

The vessel assurance can be divided into four main areas, namely statutory, safety, management and work related. Within these documents for a dynamically positioned (DP) vessel could be the latest annual DP trials report, a small but significant part of DP assurance and vessel assurance, and this paper intends to look at that topic together with some others that may impact on it.

As we know from build through commissioning and throughout its working life a DP vessel goes through a number of trials, audits and inspections including customer acceptance trials, sea trials, failure mode and effects analysis (FMEA) proving trials and annual DP trials amongst others. These trials and audits are designed to prove or confirm operation in various systems states which will be further explored later in this paper.

## IMO GUIDELINES

The starting point for the requirements of a DP system on board a vessel is the International Maritime Organization Marine Safety Committee's circular 645 (IMO MSC/Circ. 645) *Guidelines for Vessels with Dynamic Positioning Systems*.

These guidelines, published back in 1994, were drawn up from the knowledge and experience of these systems at that time. They cover such areas as:-

- Equipment classes
- Functional requirements
- Operational requirements
- Surveys, testing and the Flag State Verification and Acceptance Document (FSVAD)

Furthermore they form the only internationally agreed requirements covering vessels in equipment classes 1, 2 and 3. This brings its own issues as have been aired at this and other conferences and seminars over the years such as that of class 0 and class 1.5.

Recent years have seen calls for the IMO guidelines to be revised. However the workings of IMO and its committees are such that it is not easy to get a work item such as this onto the appropriate work programme. Also this is not too put to one side the sterling work done by the MTS DP committee and by my own organization, the International Marine Contractors Association (IMCA), in trying to expand on this guidance.

Additionally the Marine Safety Forum has recently convened a workgroup entitled *Clarity on operational requirements for DP vessels* to develop an interpretation of these guidelines to help vessel owners, vessel operators and others understand what is expected with regard to a DP vessel. To do this the group has returned to the IMO guidelines, out of which the classification society requirements have been previously developed.

In its terms of reference this group is to examine current legislation and Industry guidance and sift the key elements required for each class of vessel. Give guidance on:

- Flag state and Classification society, their respective roles and authority on what they can and cannot do:
- The required auditing regimes, documentation, checklists and certification vessels should have:

- Machinery configuration, referencing systems and their use;
- Certification of personnel and recording of DP experience;
- Guide users where to find this information.

The documents currently being looked at by the group are the IMO guidelines and IMCA M 182 *Guidelines for the Safe Operation of Dynamically Positioned Offshore Supply Vessels* with the proposed output from the workgroup a document guide for industry possibly time-lined to fit into North West European Guidelines for the Safe Management of Offshore Supply and Rig Move Operations (NWEA guidelines) revision 2011. At the moment this is a work in progress with desired outcome which is yet to be agreed across that sector of the industry.

**ANNUAL DP TRIALS**

Returning to the theme of this paper, preparing the vessel for DP and verifying the DP operations throughout its working life, the place of the annual DP trials amongst all the other considerations for DP has been well-illustrated in the following diagram from the Dynamic Positioning Centre in London, used as part of their course delivery.

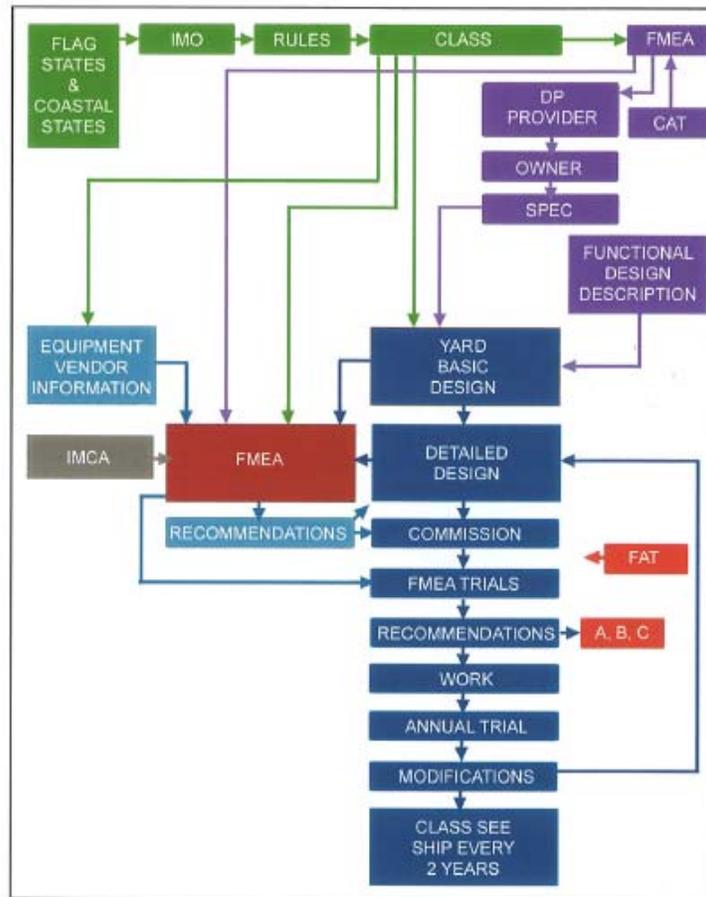


Figure 1 – A vessel life cycle with respect to DP design and verification © The Dynamic Positioning Centre

So are we clear what annual DP trials are? As mentioned above the IMO have produced their DP guidelines in which it says the following about annual DP trials:

“Annual survey should be carried out within three months before or after each anniversary date of the initial survey. The annual survey should ensure that the DP-system has been maintained in accordance with applicable parts of the guidelines and is in good working order.

Further an annual test of all important systems and components should be carried out to document the ability of the DP-vessel to keep position after single failures associated with the assigned equipment class.

The type of test carried out and results should be documented in the FSVAD.”

The Marine Technology Society, and Det Norske Veritas through their reprint of the MTS guidance as the recommended practice *Dynamic Positioning Systems – Operation Guidance*, says:

“To be conducted annually.

Findings and recommendations to be addressed in accordance with their criticality.

Previous trials reports and associated close out documentation to be kept on board.”

Classification societies in their rules for DP say much the same, because the class rules were based upon the IMO guidance, but state it with just a slight difference in wording from society to society. So, for example, Germanischer Lloyd says:

“Further an annual test of all important systems and components shall be carried out to document the ability of the DP vessel to keep position after single failures associated with the assigned class notation (DP annual trials)”

## IMCA AND ANNUAL DP TRIALS

IMCA has been involved in developing guidance to assist vessel owner and operators and others with this area for a number of years, one of the first documents produced being 101 DPVOA *Example of a DP Vessel's Annual Trials Programme* in 1991, DPVOA being the Dynamic Positioning Vessel Operators Association, one of the forerunners of IMCA.

This document gave an insight into the preparation and delivery of an annual DP trials programme through being a completed example of a trials report. Although the passage of time has now made this document look dated, it was innovative and insightful building upon the experiences of those involved in trials and other aspects of DP.

This was followed in 1993 by 112 UKOOA – Part 2 - *Guidelines for Auditing Vessels with Dynamic Positioning Systems*, which was developed by a working group made up of UKOOA (UK Offshore Operators Association, now UK Oil & Gas), DPVOA, UK Health & Safety Executive and UK Department of Transport, being the interested parties in this area at that time. As its title highlights, this document deals with the auditing of DP vessels and within its section on documentation mentions annual DP trials. Amongst the objectives for this guidance were providing a common standard procedure for auditing and making DP testing and acceptance procedure more efficient. Furthermore the guidance talks about independent auditors or witnesses for these trials, another area which has raised some issues over the years.

In 1997 the next guidance document produced and published by IMCA for this area was IMCA M 139 - *Standard Report for DP Vessel Annual Trials* which is soon to be replaced with a revised document that has been extracted from the recently issued IMCA M 190 *Guidelines for developing and conducting annual DP trials programmes for DP vessels*. The former guidance was designed to be an example of a concise summary of the trials.

The next step on the annual DP trials guidance road was trials for mobile offshore drilling units which are often on location for a period greater than the interval between consecutive annual DP trials renewal dates. To help overcome this problem of the vessel not being available for the conduct of these trials, a system, similar to the continuous inspection of machinery space equipment operated by classification societies, was devised. This allowed for the annual DP trials to be carried out as tests over the course of the year, between the previous trials date and the renewal date.

Of course if the charterer of the vessel is prepared to release it for annual trials or the vessel is between charters it would still be acceptable to carry out the trials as a single event. But here we have to be pragmatic and this release of the vessel is rarely achievable. This has resulted in the development and issue of appropriate guidance contained in IMCA M 191 - *Guidelines for Annual DP Trials for DP Mobile Offshore Drilling Units* in 2008.

Finally we arrive at the new guidance documents, IMCA M 190 - *Guidelines for Developing and Conducting Annual DP Trials Programmes for DP Vessels* and IMCA M XXX – *Example of an Annual DP Trials Report*. The preparation of these documents, after a tendering process, was undertaken by the consultants, GL Noble Denton.

Thus the suite of guidance on annual DP trials published by IMCA is as in the following table.

1991	101 DPVOA	Example of a DP Vessel's Annual Trials Programme
1993	112 UKOOA	Guidelines for Auditing Vessels with Dynamic Positioning Systems
1997	IMCA M 139	Standard report for DP vessel annual trials
2008	IMCA M 191	Guidelines for Annual DP Trials for DP Mobile Offshore Drilling Units
2011	IMCA M 190	Guidelines for Developing and Conducting Annual DP Trials Programmes for DP vessels
2011	IMCA M XXX	Example of an Annual DP Trials Report

Table 1 – Guidance relating to annual DP trials

## GUIDELINES FOR DEVELOPING AND CONDUCTING ANNUAL DP TRIALS PROGRAMMES

The first of these new documents, IMCA M 190 *Guidelines for Developing and Conducting Annual DP Trials Programmes for DP vessels*, was issued in June of this year. This guidance is divided into sections, of which the four containing the major parts of the guidance are:

3. Existing Industry and Statutory Requirements for Annual DP Trials
4. Development of the Trials Programme
5. Conduct of the Trials
6. Format of the Trials Report

The other sections cover an introduction to the document, a glossary of terms used and references. All these sections are complemented by a further three appendices giving examples of the report, the summary letter and the findings list.

## DEVELOPMENT OF THE TRIALS PROGRAMME

This section firstly identifies the aims of annual DP trials programme. These are, as stated within the document:

- demonstrate that the DP system is fully functional, performing as intended with full power and thrust availability;

- verify the level of redundancy established by the FMEA;
- verify the effectiveness of essential protective functions and alarms;
- verify that the failure modes and effects of any modifications or upgrades are fully understood and incorporated into the FMEA and operational procedures;
- meet the requirements of the classification society for annual survey;
- meet the requirements of the classification society for periodical renewal survey (as appropriate);
- be an effective tool for verifying, updating and generally managing the FMEA, thereby avoiding the need to re-do the FMEA.

The guidance then moves on to reviewing the FMEA so as to fully understand the redundancy concept as it is applied to the vessel. Here it notes the features which should be identified:

- Worst case failure design intent (WCFDI);
- Operating configurations;
- DP capability in the intact and post WCF conditions;
- Redundant groups to which DP related equipment belong
- Common points connecting redundant elements;
- Protective functions upon which the redundancy concept depends;
- Alarms required to indicate potential hidden failure or loss of redundancy;
- Equipment and systems which may suffer a significant deterioration in capacity/performance;
- Equipment and systems which may suffer a significant deterioration in accuracy;
- Fail safe condition of thrusters.

It is now possible to draw up the tests to be conducted which should cover performance, protection and detection. This is also the opportunity to consider what tests may not need to be carried out and what tests can be carried out with the vessel not on DP.

This particular section concludes with a short section on DP vessel assurance which can be carried out as part of the trials and identifies the documents and evidence which can be reviewed. These are as follows:

- FMEA including action taken to close out findings;
- Annual DP trials including action taken to close out findings;
- CMID (or similar) including action taken to close out findings;
- DP capability plots;
- Training and experience of key DP personnel;
- DP operations manual and associated procedures and checklists;
- DP incidents including action taken to close out findings;
- Planned maintenance of DP system components.

## CONDUCT OF THE TRIALS

This section gives a wealth of guidance on actually carrying out the tests including generating the results. Here we encounter a number of issues. Firstly the tests generate results but are they findings, observations or recommendations? In other IMCA guidance such as IMCA D 024 *DESIGN for Saturation Diving*

*Systems (Bell)* and IMCA M 149 *Common Marine Inspection Document* there are non-conformances/points noted and findings respectively. Within the appendices to this new guidance an example findings list is given and so that could be taken that findings is the preferred term. However observations could be an equally valid term. We will return to the term recommendations later.

To this is added another issue, the need to categorise the findings. The categories used are:

- A. For immediate attention
- B. For action when reasonably convenient
- C. For future attention/consideration

There was, and still is, a lot of discussion about these categories. As stated within the document a finding in category A indicates that the vessel does not comply with the redundancy requirements and so this is for immediate action. The category B is identifying deficiencies within non-critical redundancies and examples of these are also given within the document such as position measuring equipment over and above that required being found faulty. Finally category C is for future attention or consideration, and as stated, can be somewhat subjective and here some findings, those for future consideration, could be thought of as recommendations. Again some examples of these are given such as deficiencies in the planned maintenance schedules.

Finally, having decided that there should be findings or observations, should those witnessing the trials make any recommendations regarding these findings or observations? As with other IMCA inspection documentation recommendations are not explicitly called for. There should be clear indication of what is required to be remedied in the report and then it is up to the vessel owner to decide how this is going to be closed out. Of course the vessel owner may do this in discussion with other parties such as the witnesses or client seeking their recommendations.

## FORMAT OF THE TRIALS REPORT

The final section within this small group is that of the trials report. Here guidance is given on how to set out the report with the suggestion that the following sections should be present in the report:

- Executive summary
- Introduction
- Vessel particulars
- Conclusions
- Findings

In addition the test sheets for completed tests should be included within the report. The use of a standard format such as this would allow like for like to be compared within the vessel owner's fleet and within the wider DP fleet if desired and allowed. However it always has to be borne in mind that this annual DP trials report is vessel specific.

## COMPETENCE OF PERSONNEL

The guidance also contains a section on the competence of persons developing the trials programme. This area has always raised a number of issues amongst those involved and it is hoped that the guidance here will help to address some of these concerns.

The qualifications and experience which might be expected of these persons is set out as:

- Qualified engineer or mariner
- Produced at least one FMEA

- Witnessed at least three annual DP trials
- Knowledge of class rules and IMCA guidance
- Familiar with IMCA station keeping database
- Knowledge of operation of vessel

Here, in addition to outlining expected competence, IMCA has endeavoured to help all parties by also producing an Auditor/Inspector Logbook which could be used to record qualifications, training and experience gained by consultants acting as independent witnesses and to demonstrate competence to various customers and clients.

IMCA		Auditor/Inspector Logbook
		<u>Contents</u>
Part 1	<b>Personal Details</b>	
Part 2	<b>Explanatory Notes</b>	
Part 3	<b>Qualifications/Certificates</b>	
Part 4	<b>Employment Record</b>	
Part 5	<b>Record of Continuing Professional Development</b>	
Part 6	<b>Competence Assessment Record</b>	
Part 7	<b>Record of Audit/Inspection Experience</b>	

Figure 2 – IMCA Auditor/Inspector Logbook

## EXAMPLE OF AN ANNUAL DP TRIALS REPORT

Briefly this document, IMCA M XXX *Example of an Annual Trials Report* was being developed at the time of writing. In essence it is Appendix 1 of IMCA M 190 *Guidance for Developing and Conducting Annual DP Trials Programmes for DP Vessels*, with some brief guidance notes on its use added.

## CONCLUSION

It is hoped that this work has continued clarity where needed in this area and addressed the issues raised. It is also noted that revised documentation on FMEAs is due from at least one of the classification societies and, of course, this all has to fit together comprehensively.

Additionally the area of DP, and of DP competence, is coming under closer scrutiny from many parties, not least maritime administrations and clients. Hopefully these documents will bring further understanding, confidence and assurance to annual DP trials.

It would be remiss of me if I did not acknowledge the work done by GL Noble Denton in preparing the document, the members of IMCA in commenting on the draft and our technical director in overseeing this work.

## REFERENCES

*DP Operations Guidance* – Marine Technology Society – 2010

*Dynamic Positioning Advanced (Simulator) Course Operator Manual* – The Dynamic Positioning Centre – 2009

*Dynamic Positioning Systems – Operation Guidance - Recommended Practice DNV-RP-E307* – Det Norske Veritas – 2011

*Guidelines for developing and conducting annual DP trials programmes for DP vessels (IMCA M 190)* – IMCA – 2011

*Guidelines for Vessels with Dynamic Positioning Systems (IMO MSC/Circ. 645)* – IMO – 1994

*Rules for Classification and Construction – Ship Technology – Seagoing Ships – Dynamic Positioning Systems* - Germanischer Lloyd - 2010