



DYNAMIC POSITIONING CONFERENCE
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REGULATORY SESSION

(Competency Assurance Framework – First Year in Review)

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Abstract

This paper discusses the trials and tribulations of setting up a companywide competency framework for a small to medium sized consulting firm. What began as a small idea to differentiate ourselves from the competition and provide transparency to our clients quickly evolved into something much more. As more and more guidance was becoming available, the internal program focused on adapting and adopting them, transforming and evolving into a scheme that could provide a backbone for the company's technical infrastructure for decades to come.

The following paper and presentation will discuss the process described above from inception to the 365th day of its application. What facets of the development and application cycles of the program were easy, which were tedious, why were some ideas scrapped and why did others see the light of day.

The reasons for creating a competency framework are many but the two most important ones are competition and value. The DP consulting and assurance field is bursting with various providers who can all supposedly provide the same level of service at lower and lower price points. This race to the bottom leads to an influx of sub-standard DP FMEAs and DP assurance documentation. The competency framework can be utilised to match the right competencies with the job at hand and ensure that the right training can be provided. This in turn provides value to the clients as they are not paying for the wrong competencies and allows healthy competition to thrive in a transparent client driven economy.

This paper will go through the application process of the competency framework, how it was designed to maximise efficient utilisation of resources and how it led to a change in mindset within the company and its DP practitioners. Finally, the paper will discuss the tangible results of creating the competency framework. How it influenced both the company and its clients, and its pros and cons. The results will be presented without bias to help the reader be the judge of whether it is the right way forward, or not.

Abbreviation / Definition

ASOG – Activity Specific Operating Guidelines

AGP – Advanced Generator Protection

AGS – Advanced Generator System

CAF – Competence Assurance Framework

DGMS – Diesel Generator Management System

DP – Dynamic Positioning

DST – Decision Support Tools

FMEA – Failure Modes and Effects Analysis

LFI – Learning from Incident

LOC – London Offshore Consultants Ltd.

MDAT – Mapping Delivery Ability Tool

MTS – Marine Technology Society

PDDP – Guidance for Professional Development of DP Personnel

SME – Subject Matter Expert

SWOT – Strengths, Weaknesses, Opportunities and Threats

TECHOP – Technical and Operational Guidance (MTS)

TA – Technical Authority

WSOG – Well Specific Operating Guidelines

Introduction

To introduce the paper, it is important to introduce LOC and what its employees do.

- LOC is an independent marine and engineering consultancy and survey organisation
- LOC provide high quality services to the shipping and offshore energy industries
- LOC was established in London in 1979
- Since then, LOC has developed into an international, multi-disciplinary organisation, with offices across the world
- LOC now has a team comprising of over 400 professionally qualified personnel



Figure 1 LOC Headquarters

It is important to note that the last bullet mentions professionally qualified personnel. For this paper, the author will be focussing on one small aspect of the services provided by LOC and that is in the field of DP (Dynamic Positioning).

LOC has various personnel engaged in DP activities in the sectors of:

- Shipping
- Oil and Gas
- Renewables
- Yachts

These personnel range from ex Master Mariners, Chief Engineers to Electrical Engineers and Control System Engineer and number to around 25 worldwide.

In September of 2017, there was a realisation within the company that LOC had to differentiate itself from just another DP solutions provider. The company decided that it had to become one of the best DP solutions providers in the world.

For the above purpose, one of the major roadblocks identified was that though we had professionally qualified personnel performing DP related work, there was no way of measuring their competency.

Competence is defined as:

The demonstrable characteristics that enable performance of a job, for properly doing the job, the individual requires skills and knowledge essential for the set duties.

A competency is a set of defined behaviors that provide a structured guide enabling the identification, evaluation and development of the behaviours in individual employees.

The team now wanted to make sure that all DP personnel in the company had the required competencies to perform various DP services. This would involve identifying all required competencies, mapping current competence levels and providing a pathway to all required competencies in a transparent, cost effective, industry accepted and time framed manner. The following paper will document the process from inception to completion, identifying interesting waypoints on the way.

DP Services as provided by LOC

DP Consultant

- DP FMEA
- DP FMEA Proving Trials
- Annual DP Trials
- DP Operation Manual
- FMEA and Criticality of control systems
- Load Analysis
- Design / Drawing reviews

DP Surveyor

- Vessel Assurance
- Suitability Surveys
- ASOG / WSOG development
- Gap Analysis Tools
- LFI and other DST

A multi-disciplinary approach is a must for all the above deliverables.

Vision

A quick storyboard was drawn of the proposed path to provide a solution to the question of how we map DP competency, and thereafter, how do we utilize this information to improve.

The team realized that this would not be a quick process. The following milestones were identified:

- Propose tentative solution
- Present it to the company board of directors
- Modify as per their recommendations
- Start limited testing locally in a controlled environment
- Split all DP personnel into sub groups according to their qualifications and related tasks to provide easier mapping and training
- Make sure local region adopts it completely and lessons learnt are gathered
- Implement world wide / company wide
- Increase competence requirements
- Create a self-sustaining framework based on a set of rules and conditions which will grow and evolve
- The framework is absorbed into all aspects of LOC and is not a separate entity anymore

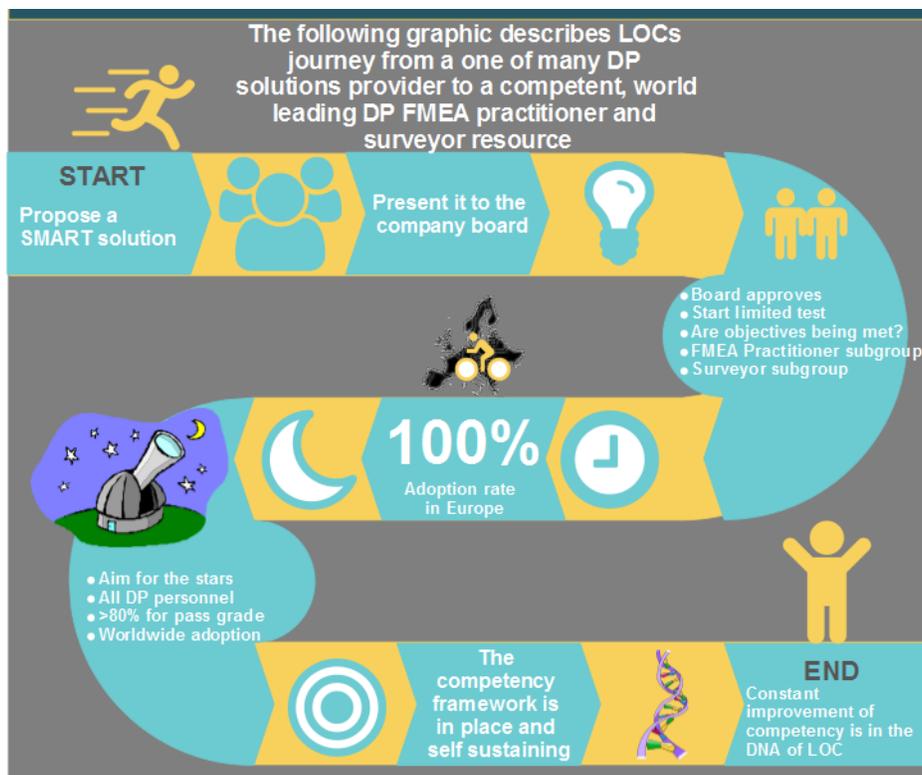


Figure 2 LOC Journey

Mission Statement: The end goal is to have a living, growing competence assurance framework in place that would imbibe itself in the culture of the company and inculcate its employees, both old and new, with a spirit of self-improvement and constant learning.

Project Timeline

- September 2017: A prospective problem was identified. This was not only within the company but in the DP industry as a whole
- October 2017: A tentative solution was brainstormed. Tier based structure called the Competency Assurance Framework
- December 2017: Paper outlining the CAF is submitted to the board of directors. CAF evolves into training identification and career supplement
- February 2018: Final approved document released for implementation. Documents DP Consultant and Surveyor paths with a 3-tier system
- March 2019: Initial subjects chosen to undergo assessment. Capabilities of individuals highlighted, and feedback received on the assessment process
- April – May 2019: CAF is applied across Europe and Africa, tangible results. Other bodies like IMCA and MTS are coming out with guidance on competence for DP solutions providers
- June – August 2019: Constant tuning of CAF with adoption of guidance documents into the framework. Next step is to test newly modified framework and then apply it worldwide

Brainstorming Sessions



Figure 3 Identify the problem

The first objective was to identify the roadblock correctly. What were the causal and contributory factors to that roadblock. Only once the crux of the problem could be identified, could a targeted solution be defined.

The problem was thus broken down into many sub problems defined below:

- What do the clients want?
- What is currently in the market like what we are trying to achieve?
- Lack of visibility of current competence within the company
- Identify what makes a competent DP practitioner
- Map current practitioner competence and compare to that of a competent DP practitioner
- Identify relevant training to fill in gaps in competency
- Identify motivational factors and factors that cause dissension
- Provide all the above in a cost efficient, resource friendly manner
- The solution will need to be self-sustaining and evolving without a need to reimplement

The team could not ignore the main issues and provide a temporary solution, nor did they have the resources to reinvent the wheel and over engineer the solution. To be acceptable by the company, the solution would have to be SMART.

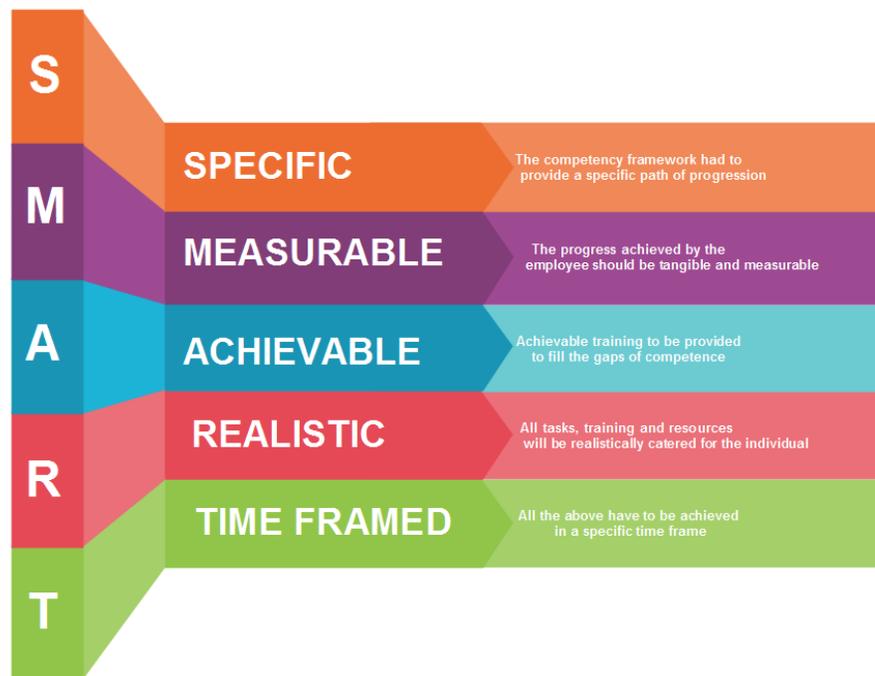


Figure 4 SMART Solution to the identified problem

Sticking to the above points while brainstorming, made sure that we looked at all aspects of the solutions proposed and kept optimizing to reach as best a solution as we could.

Specific: The competency framework had to provide specific goals and objectives to progress.

Measurable: Competency and progress would be measurable and tangible so that it could be understood industry wide

Achievable: The complete process had to be achievable, cost efficient and should provide its results while not tying up resources

Realistic: The framework and all its solutions had to be realistic in both their objectives and process. Over engineering or temporary solutions were not realistic options

Time Framed: Both achieving the goals of the framework and achieving each individual competence targets had to be time framed

The concept was to self-regulate required competence for performing DP related job scopes. The process would involve an initial assessment to map current competencies. Provide a clear pathway to train and improve. It had to encompass all the different streams involved with dynamic positioning. Finally, all of it had to be wrapped in an industry wide common language. Tentatively termed as a competence assurance framework (CAF) a paper was drafted to address the above issues and provide a means of assessment, mapping competence using industry guidance and known nomenclature. There was a need to create a tier-based plan to match with competence so that there was a perceptible way to create training modules and identify gaps in competence. It also gave a clear pathway to aim for in improving competence levels and keeping ahead of the curve as the industry is constantly growing and evolving.

SWOT Analysis

As a final step, a SWOT analysis was carried out to evaluate the Strengths, Weaknesses, Opportunities and Threats that the framework would have to cater for. The following were identified:

Strengths:

- Provide tangible path for employee progress
- Identifies employee strengths and weaknesses
- Transparency to the clients
- Pushes employee to strive to better knowledge and expertise
- Modular and thus can easily be adapted to new fields and requirements

Weaknesses:

- Transparency to the clients
- Resource hungry without quick ROI
- Ties up important revenue generating resources
- Questioning experience and competence can become tumultuous

Opportunities:

- Novel to the DP market
- Transparency prevents a race to the bottom
- Proven experience and competence to help improve brand and image
- Identify employee training requirements
- Motivate employees with career progression through knowledge expansion
- Ability to penetrate emerging markets due to proven methodology

Threats:

- Can be misunderstood by clients if not marketed correctly
- Can identify poor competence within the workforce which may require drastic actions to be taken
- Can be used to limit employee progress
- Can create loss of work due to lack of competence in the workforce

From the analysis it was clear that if not properly managed, the strengths could become weaknesses and opportunities could become threats. Now that the CAF had clearly identified the internal processes required, the SWOT analysis showed that there had to be a focus on how it is marketed and understood by the industry. The wrong language or message could easily cause misunderstanding with clients which would undermine all the effort and work put in. There was no industry precedence within DP service providers and thus there was a need to take the framework out to the client base and get feedback.

The draft was now taken to a few select clients and feedback was received. The competence assurance framework is purely to map competencies and identify potential training opportunities. From the feedback, there was a need to clarify that competence did not relate to position and / or cost. As DP is such a large field, a job might require a set of competencies that will not be available with any one person and thus the CAF would assist in selecting the most efficient combination of resources that will need to be attached to the job to fulfill its competence requirements. The objective was not to define minimum competencies and thus cut costs but rather push all personnel towards excellence in their chosen fields. This would be a time and resource intensive exercise and thus it would need to be adapted in the culture of the company worldwide. All the above would need to be translated out across the industry and thus the CAF had to be tuned again to include language that would comprehensively explain the aims and objectives in a way that would be difficult to miscommunicate.

Implementation

LOC Document EA-SHIP-SOP-001 Competence Assurance Framework (DP) is created. The competence assurance framework is developed based on the principles which include but are not limited to the following criteria

- Competency refers to ability, skill and attribute that are associated with job performance.
- Competencies are defined in terms of behaviours including timely decision making and customer service.
- LOC considers both Core Competence and Technical Competence.
- Core competencies are directly aligned with and support the primary goals and strategies of LOC, which are assessed by the respective line managers. Core competencies are not discussed in this document.
- Technical competencies are the knowledge and abilities required to achieve results based on the defined competence levels of DP practitioners.

All personnel working with DP and related services shall have the appropriate level (Tier) of technical competence for the work they are assigned to undertake. New personnel will need to complete their assessment either as part of the recruitment process or within the probationary period.

The CAF established two categories of technical competence: DP Surveyors and DP Consultants. Tiers are established in both streams starting with Tier 1 for relatively basic competence raising to Tier 3, the highest level of competence. Personnel in one category may establish their competence in the other, whilst tier competence requirements will vary for each.

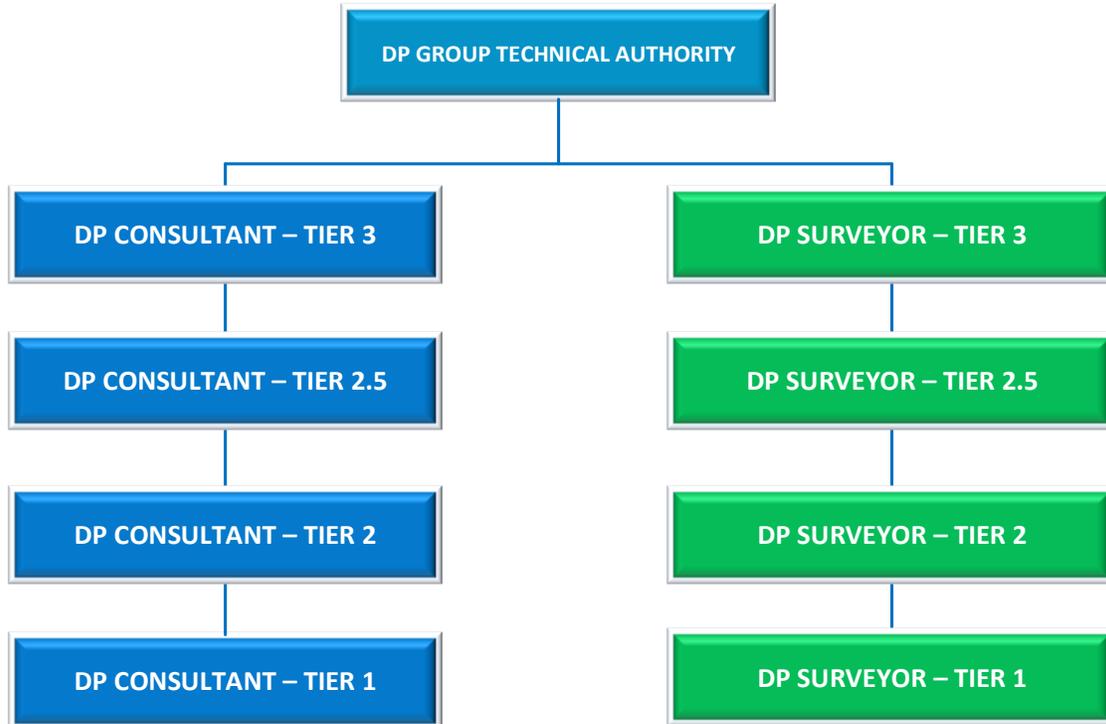


Figure 5 DP Competence Framework

The “Guidance for Professional Development of Personnel Engaged in DP Operations Using the Mapping Delivery Ability Tool (MDAT)” was used to provide competency and skill level definitions. The different competencies were mapped into three distinct skill levels:

AWARE: -- Able to explain, describe, discuss, identify, locate and report on the area of knowledge and its relevance, potential impact and consequences to the operations associated with the industrial mission.

KNOWLEDGEABLE: Able to demonstrate understanding of the terminology and vocabulary in the area of knowledge. Able to demonstrate understanding of the operations associated with the industrial mission and potential impact, consequences. Able to execute planned procedures. Able to plan, prioritize and adapt to evolving situations.

SKILLED: Able to translate guidelines and standards in the area of knowledge and its relevance to the operations associated with the industrial mission and potential impact, consequences into practical actions. Able to develop review and modify procedures in the area of knowledge. Able to evaluate, differentiate, discriminate, validated and communicate solutions to common technical and operational problems. Provide mentorship and training in the area of knowledge, relevant to the industrial mission.

The CAF was separated into two separate pathways, DP Consultant and DP Surveyor, based on job scopes and the qualifications / experience of the personnel performing those job scopes.

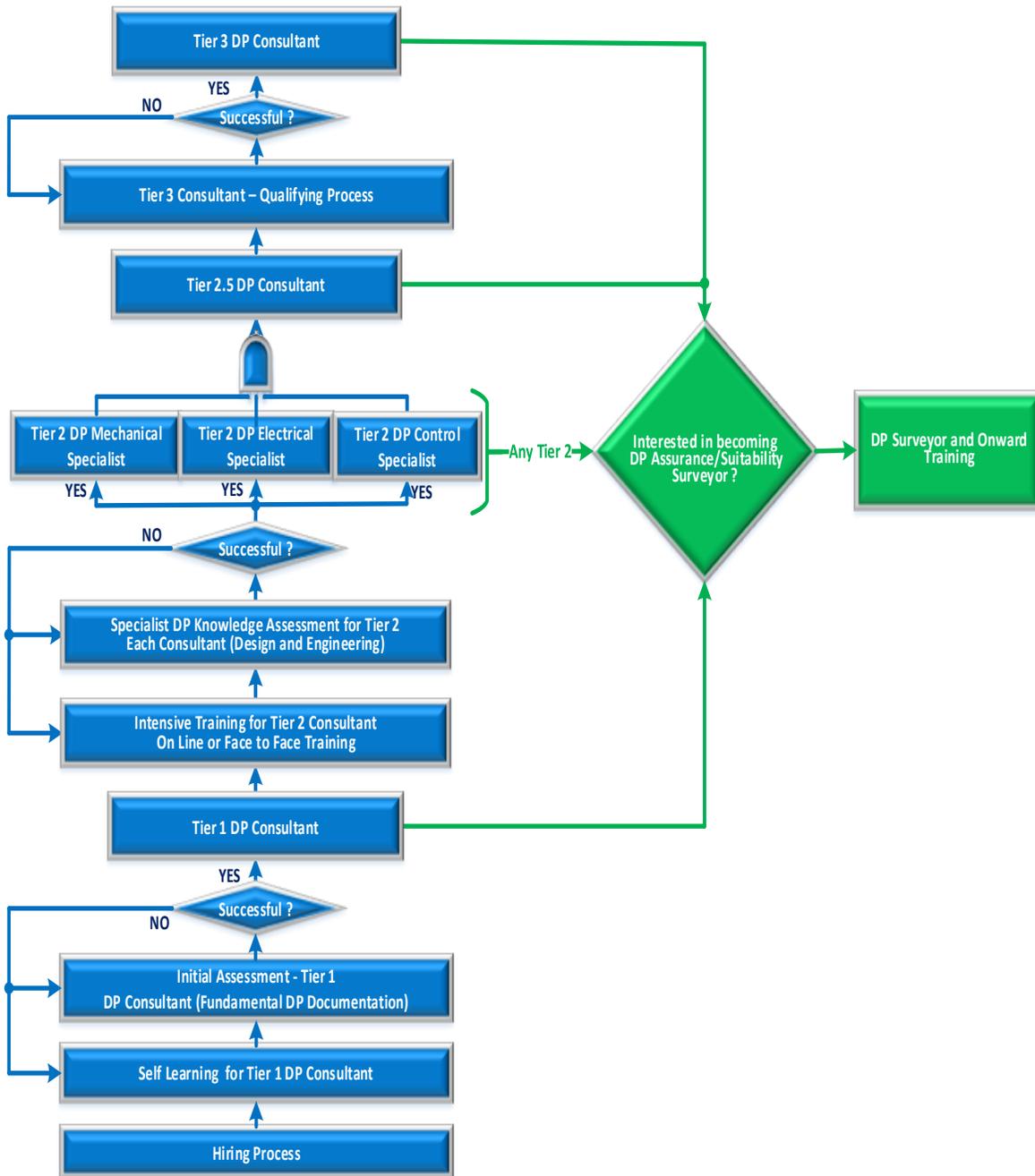


Figure 6 Flowchart showing DP Consultant Pathway

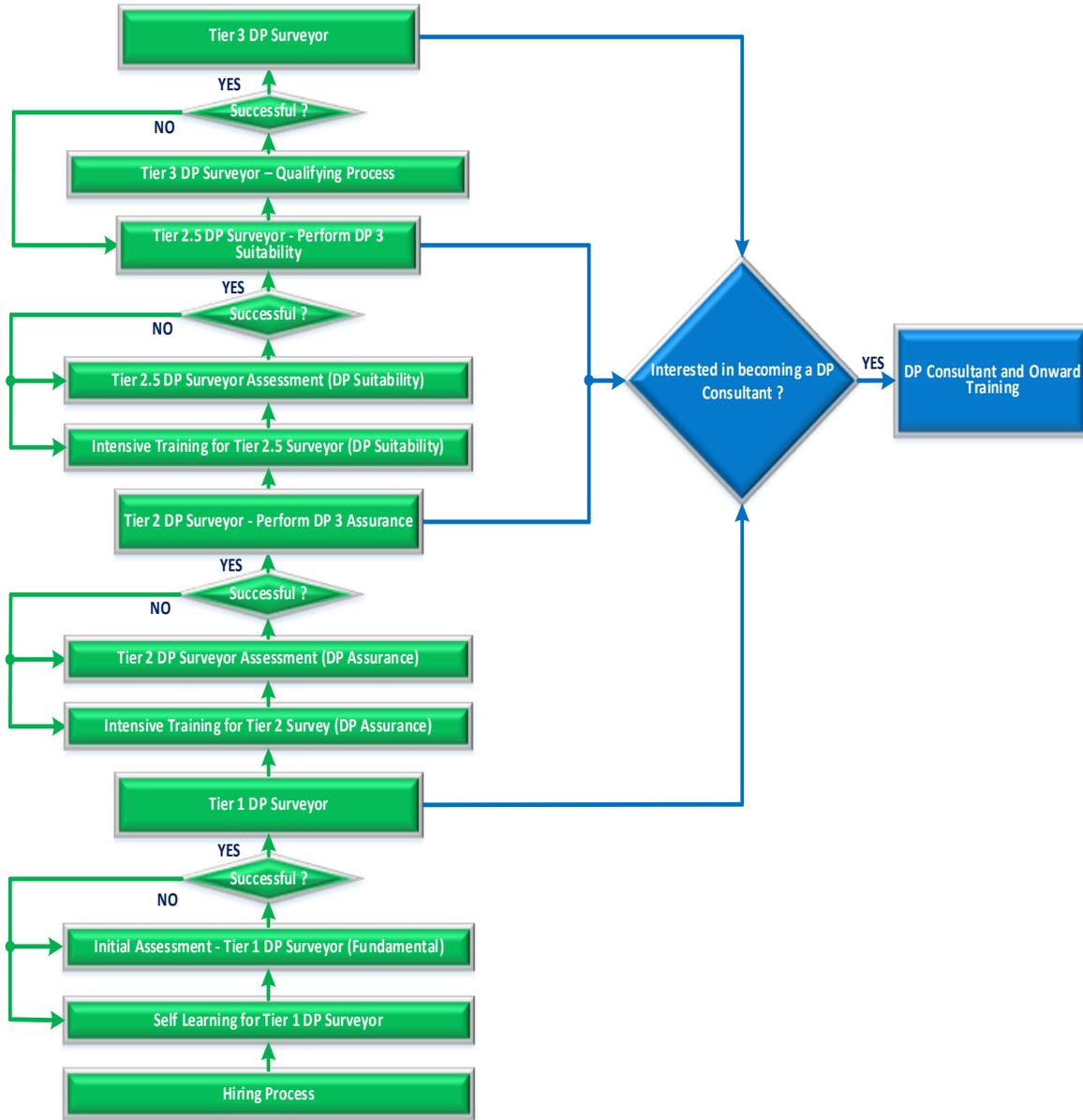


Figure 7 Flowchart showing DP Surveyor Pathway

DP Consultant:

- 3 Tier System
- Split into Electrical, Control and Mechanical Streams at Tier 2 level
- Tier 2.5 is Tier 2 in all three streams mentioned above
- Tier 3 awarded to personnel “Skilled” in all competencies with demonstrable experience and industry wide acceptance

DP Surveyor

- 3 Tier System
- Tier 2 for DP Vessel Assurance competence
- Tier 2.5 for DP Suitability Studies
- Tier 2.5 is Tier 2 in all three streams mentioned above
- Tier 3 awarded to personnel “Skilled” in all competencies with demonstrable experience and industry wide acceptance

The CAF also identified the set of responsibilities for each tier level, based on their competence.

Tier 1 DP Consultant Responsibilities:

- Preparation of annual DP trials programs and witness the trials.
- Perform FMEA for DP-2 open bus vessels such as Logistics/Supply/AHTS vessels under the supervision of Tier 2 DP consultant.
- Preparation of proving trials for DP-2 vessel such as Logistics/Supply/AHTS vessels under the supervision of Tier 2 DP consultant.
- Perform Gap analysis (FMEA, Proving Trials, Annual trials) using MTS tools of vessels such as Logistics/Supply/AHTS vessels
- Perform drawing reviews of non-complex systems
- Assist in performing FMECA of Industrial Mission equipment and systems
- Witness FAT / CAT of DP related equipment
- Review / QA DP documentation of all the above vessels

Tier 2 DP Consultant Responsibilities:

Table 1 Tier 2 DP Consultant Responsibilities

Mechanical Specialist	Electrical Specialist	Control Systems Specialist
Analysis of complex mechanical systems in an FMEA.	Analysis of complex electrical systems in an FMEA.	Analysis of complex control systems in an FMEA.
Assist in performing FMEA on electrical and control systems under close supervision.	Assist in performing FMEA on mechanical and control systems under close supervision.	Assist in performing FMEA on mechanical and electrical systems under close supervision.
Witness Annual DP Trials.	Witness Annual DP Trials.	Witness Annual DP Trials.

Perform basic DP Vessel assurance audits.	Perform basic DP Vessel assurance audits.	Perform basic DP vessel assurance audits.
Perform basic DP suitability surveys.	Perform basic DP suitability surveys.	Perform basic DP suitability surveys.
Assist in performing FMEA proving trials.	Assist in performing FMEA proving trials.	Assist in performing FMEA proving trials.
Perform in depth and detailed DP design / drawing reviews – Mechanical systems.	Perform in depth and detailed DP design / drawing reviews – electrical.	Perform in depth and detailed DP design / drawing reviews – control systems.
Perform Gap analysis using MTS tools.	Perform Gap analysis using MTS tools.	Perform Gap analysis using MTS tools.
Perform FMECA of Industrial Mission equipment and systems - Mechanical.	Perform FMECA of Industrial Mission equipment and systems – electrical systems.	Perform FMECA of Industrial Mission equipment and systems – control systems.
Witness FAT / CAT testing of equipment.	Witness FAT / CAT testing of equipment.	Witness FAT / CAT testing of equipment.
Review / QA all DP documentation.	Review / QA all DP documentation.	Review / QA all DP documentation.

Tier 3 DP Consultant Responsibilities:

- Project manage all DP projects.
- Able to manage DP consultants and/or DP surveyors.
- Take part in industry forums providing direction for rules and regulations, guidance and standards.
- Perform a complete FMEA / FMECA and FMEA / FMECA proving trials and annual DP trials.
- Perform in depth and detailed DP design / drawing reviews.
- Perform Gap analysis using MTS tools.
- Perform FMECA of Industrial Mission equipment and systems.
- Witness FAT / CAT testing of equipment.
- Review / QA all DP documentation.

Training

Given below is the training provided to ensure competence is maintained and these topics are then assessed to ensure DP personnel are continually developing their competence.

Table 2 DP Consultant Training

DP Consultant	
Tier 1	Tier 2
<p>Regulatory requirement and standards for all the types of DP vessel (DP1, DP2 & DP3)</p> <p>Awareness of the industry guide lines such as IMCA and MTS etc.</p> <p>Understanding of overall redundancy concepts (mechanical, electrical and control systems)</p> <p>Ability to conduct the analysis based on the concept of performance, protection and detection</p> <p>Ability to analyse and predict loss position that can be caused by drive off or drift off</p> <p>Ability to read and interpret all the single line and detailed drawings</p> <p>Ability to understand system configurations of all the three sections and predict failure effects</p> <p>Ability to identify cross connections between independent redundant equipment groups and to conduct failure propagation analysis</p> <p>Knowledge to understand the configuration modes of all the three systems and to analyse failure modes and their effects based on the configuration modes.</p> <p>Ability to predict consequences of configuration errors, hidden failures and mal-operation errors.</p> <p>Ability to analyse capabilities in position keeping in relation to the availability of redundant groups.</p>	<p>Recap of the regulations, standards and industry guide lines applicable to DP-1, DP-2 and DP-3 vessels.</p> <p>Detailed analysis of all the mechanical and auxiliary systems associated with the DP system up to DP -3 vessels.</p> <p>Different configuration methods of system with minimum of four redundant groups.</p> <p>Compartment analysis for DP-3 vessels.</p> <p>In depth analysis of closed bus operated DP vessels</p> <p>In depth analysis of cross connected independent redundant equipment groups for fault propagation.</p> <p>Training based on power system distortions, power system stability, protective device co-ordination etc.</p> <p>Advanced power management systems, additional protection systems such as AGP, DGMS and AGS etc.</p> <p>Effect of interface with industrial mission systems such as such as drilling systems, pipelay systems, lifting cranes and stability systems.</p> <p>Analysis of DC grid and hybrid systems (Electrical-mechanical, Electrical with storage devices).</p>

Table 3 DP Surveyor Training

DP Surveyor		
Tier 1	Tier 2	Tier 2.5
<p>Regulatory requirement and standards for all the types of DP vessel (DP1, DP2 & DP3).</p> <p>Awareness of the industry guide lines such as IMCA and MTS etc. and use of gap analysis tool to conduct gap analysis of FMEA, Proving Trials and annual trials.</p> <p>Understanding of overall redundancy concepts (mechanical, electrical and control systems).</p> <p>Ability to review FMEA and DP proving trials document to assess whether the vessel systems are fail safe based on the concept of performance, protection and detection.</p> <p>Ability to interpret capability analysis to understand limiting environmental conditions during intact and worst-case failure conditions.</p> <p>Ability to understand the intended environmental condition of the project and identify whether the vessel can maintain position during intact and faulted condition.</p> <p>Ability to write CAM, TAM, ASOG, WSOG and DP operations manual.</p> <p>Ability to analyse electrical load analyse to identify whether the power systems can provide enough electrical power to DP</p>	<p>Recap of the regulations, standards and industry guide lines applicable to DP-1, DP-2 and DP-3 vessels.</p> <p>Understanding of overall redundancy concepts (mechanical, electrical and control systems) up to DP-3 vessel including closed bus configuration.</p> <p>Ability to review FMEA and DP proving trials document to assess vessels up to DP-3 including closed bus configuration to see whether the vessel systems are fail safe based on the concept of performance, protection and detection.</p> <p>Ability to review compartment analysis for DP-3 vessels.</p> <p>Knowledge on the advanced power management systems, additional protection systems such as AGP, DGMS and AGS etc.</p> <p>Understanding of the effect on interface with industrial mission systems such as such as drilling systems, pipelay systems, lifting cranes and stability systems.</p> <p>Understanding of the concept of DC grid and hybrid systems (Electrical-mechanical, Electrical with storage devices).</p>	<p>Recap of the requirement for DP assurance.</p> <p>Understanding system and operational limitations of a DP vessel.</p> <p>Sound knowledge of different industrial missions such as cable lay, pipe lay, drilling and lifting operations etc.</p> <p>Further knowledge on analysing capability analysis of complex DP-3 vessels to determine limiting environmental conditions, demanded thrust power under intact and post failure conditions.</p> <p>Further knowledge on analysing electrical load analysis of complex DP-3 vessel systems to determine whether a vessel is provided with enough electrical power to support industrial mission while feeding thrusters and auxiliary systems to maintain position as per the capability analysis during intact and post failure conditions.</p> <p>Further knowledge on writing CAM, TAM, ASOG, WSOG and DP operations manual of complex DP-3 vessels vessel including closed bus configuration.</p>

and mission equipment during intact and defined WCF condition.		
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Assessment

DP Consultant: The assessment for DP Consultants exists at Tier 1 and Tier 2 levels. These are accompanied by a qualifying process which include review of work done with / without supervision. The assessment is a written examination which will test the knowledge of the person under test in a variety of competencies essential in completing their responsibilities. The assessment is a combination of a quiz, interview, example deliverables and approval from the Technical Authority (TA).

DP Surveyor: For a DP Surveyor, the assessment exists at Tier 1, Tier 2 and Tier 2.5 levels. These are accompanied by a qualifying process which include review of work done with / without supervision. The assessment is a written examination which will test the knowledge of the person under test in a variety of competencies essential in completing their responsibilities. The assessment is a combination of a quiz, interview, example deliverables and approval from the Technical Authority (TA).

Retuning after MTS Techop ODP 16

MTS releases the draft version of the Techop ODP 16 (Competency Elements for DP Professionals – DP SMEs / DP FMEA Practitioners) in April 2018. The MTS Techop introduces a list of core competencies for DP SME and FMEA Practitioners. This is found to be slightly limiting based on LOCs current structure. However, the core competencies have to be aligned with the technical competencies in the CAF (Table 4).

Table 4 MTS Techop Identified Competencies

COMPETENCY NUMBER	DP SME (SURVEYOR) CORE DP COMPETENCY	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY
1	Deliverables and decision support tools	Deliverables and decision support tools
2	Barrier philosophy and defence in depth	Barrier philosophy and defence in depth
3	DP Concepts	DP Concepts and engineering
4	DP guidance and basis of requirements	DP guidance and basis of requirements
5	Verification and Validation	Verification and Validation
6	In Execution Support	Power Plant configured as a Common Power System (Closed busties)
7	Impacts of Station Keeping on the Industrial Mission	Cross connections, External interfaces and influences
8	Impacts of the Industrial mission on Station Keeping	In execution support
9	Defining, Identifying and managing interfaces relevant to DP station keeping	Industrial Mission (Impacts and Management)

Required Competency Levels	<ul style="list-style-type: none"> • Four at Mastery • Three at Skilled • Two at Knowledgeable 	<ul style="list-style-type: none"> • Four at Mastery • Two at Skilled • Two at Knowledgeable • One at Aware
<ul style="list-style-type: none"> • Competencies marked in red font are required to be at Mastery level. • DP FMEA practitioners intending to carry out unsupervised work on analysis of vessels operating with closed busties must have mastery in Competency 6 – ‘Power Plant configured as a Common Power System (Closed Busties)’. 		

Gap Analysis

A Gap analysis was carried out between the CAF and the MTS Techop to find out the gaps that existed between them. The gap analysis process highlighted that there were certain gaps in the document that needed to be filled to bring it in line with the MTS guidelines. However, it also identified that the CAF was more suited to how LOC recruited personnel and operated. So, the CAF itself was more suited to be applied to LOC, with some gaps aligned with the MTS Techop.

Gap Check - LOC DP Competency Frame work to MTS TECHOP ODP 16 (P)					
Row	MTS Section	Requirement	LOC Framework Section	Requirement	Gap (R/Y/G)
1	Main intro	It is only a guide for companies to develop their own system of assessment. An example of areas to cover is included as is a pilot scheme	1	Section 1 outlines the applicability, a brief intro and frame work description, including the key competency funnels (Consultant and Surveyor) c/w tier levels in each area. Key in the MTS guidance is that the system needs to be suitable for the business in which it will be used. The TECHOP is set-up to recognise charterers SMEs and vessel owners' FMEA practitioners. LOC services mirror that to a point - particularly on the FMEA practitioner side, though we often provide expertise to the Client's SME. It is not often that LOC acts as the SME for its clients though we should be ready and able to demonstrate our capability and competence. Overall, the 'Surveyor' funnel side needs further consideration to reach a SME level (based on the TECHOP definition)	Yellow
2	App 1 DP SMEs Summary	TECHOP provides general guidance on subjects which prospective DP SMEs should become proficient.	1	See above	Yellow
3	1.1 & 1.2	Competence and proficiency scale (3-tiers Knowledgeable, skilled and mastery for SME and 2 others below that at Aware and Not Aware)	2	Competency levels are laid out from Tier 1 to Tier 3. They do not match the TECHOP but do match the way we recruit and train our personnel and eventually deliver the work we are awarded. TECHOP does not differentiate between the skill sets, and competency in each, whereas the LOC Tiers do. The LOC process fits closer to the IMCA FMEA writing requirement of multiple competencies to prepare the study. We need to be cognisant of the IMCA requirements as well as MTS without diluting the result. The TECHOP level of DP FMEA practitioner matches the LOC DP consultant tier 2.5 (+/-). The match between the SME and the DP Surveyor funnel is less clear. Though I am not convinced that we need to match it fully for all our work, at the Tier 2.5 and 3 we must see the TECHOP DP SME as a minimum standard to achieve. This way providing high level consultancy to oil majors is possible and demonstrable. The system needs to suit our business which it does. Close monitoring after start-up is required. There maybe work to do for the Tier 2.5 or 3 and this should be assessed.	Yellow
4	1.3	DP SMEs shall demonstrate core competencies against a prescribed scale: 4 at Mastery, 3 at skilled, 2 at knowledgeable	2	The direct comparison between LOC's Tiers and TECHOP core competencies is not possible because of the explanation given in row 3 above. The use of the TECHOPs 9 core competencies and levels required is a good basis for the Tier 2.5 or 3 and above in the LOC process. This should be confirmed	Yellow

Figure 8 Gap Analysis of the CAF compared to the MTS Techop

Results of the Gap Analysis showed the following: 11 Green, 1 Grey, 30 Yellow, 0 Red.

The results showed that the CAF had not missed anything relevant. However, there were lot of inadequately covered points which not needed to be looked at and corrected. The following points had to be carried out:

- Align tier system with the Techop

- Align competence elements with the Techop
- Adopt interview based assessment in addition to written and review based
- Specific training and career path to be highlighted

Based on the similarities in competencies and pathways it is decided to align DP Consultant with FMEA Practitioner and DP Surveyor with DP SME. According to the previous requirements in the CAF it is calculated that Tier 2 in both will pathways will meet or exceed the required competence levels as defined by the MTS Techop.

DP SME Expectations: The MTS Techop introduces the mastery level in addition to those in MDAT. The CAF needs to be returned to suit the new skill levels mentioned in the Techop. The CAF also needs to be returned to suit the new skill levels mentioned. For Tier 1, all unsupervised work-related competencies will meet or exceed the minimum requirements mentioned in the Techop.

Table 5 DP Surveyor Competency Levels

Level	Proof Points
Knowledge	<ul style="list-style-type: none"> • Able to interpret and evaluate information and advice from experts in an area of expertise. • Able to use the correct terminology (vocabulary) of the area of expertise. • Able to hold an informed debate with experts in the area of expertise. • Able to ask questions that test the viability of proposals in an area of expertise. • Able to carry out some of the activities with help.
Skill	<ul style="list-style-type: none"> • Able to perform consistently and satisfactorily the majority of activities of an area of expertise. • Able to translate guidelines and standards for the area of expertise into practical actions. • Able to solve imaginatively, common technical/operational problems in the area of expertise. • Able to guide and advise others in technical/operational aspects of the areas of expertise.
Mastery	<ul style="list-style-type: none"> • Troubleshoot / adapt / evaluate alternate and / or novel solutions objectively. • Be able to diagnose and resolve significant complex, non-routine problems in the area of expertise. • Able to creatively solve significant, complex, non-routine problems in the area of expertise. • Able to adapt practices from other markets or countries for use in the area of expertise. • Able to generate substantial improvements to local practices and procedures for the areas of expertise.

	<ul style="list-style-type: none"> • Demonstrate experience in applying technical and operational expertise to achieve business objectives safely and predictably. • The ability to objectively evaluate proposals (including alternate solutions) or offer alternative solutions and risk mitigations to resolve DP-related issues.
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DP FMEA Practitioner Expectations: The MTS Techop introduces the mastery level in addition to those in MDAT. The CAF needs to be retuned to suit the new skill levels mentioned in the Techop. The CAF also needs to be retuned to suit the new skill levels mentioned. For Tier 1, all unsupervised work-related competencies will meet or exceed the minimum requirements mentioned in the Techop.

Table 6 DP Consultant Competency Levels

Level	Proof Points
Aware	<ul style="list-style-type: none"> • Able to recognize the relative importance of an item or concept. • Be able to find further information in guidance and standards. • Be able to recognize when it is necessary to seek assistance.
Knowledge	<ul style="list-style-type: none"> • Able to interpret and evaluate information and advice from experts in an area of expertise. • Able to use the correct terminology (vocabulary) of the subject. • Able to hold an informed debate with subject matter experts. • Able to ask questions that test the viability of technical explanations and solutions. • Able to carry out some of the activities with help.
Skill	<ul style="list-style-type: none"> • Able to perform the majority of activities required for DP system FMEA in a consistent and satisfactory manner. • Able to translate guidelines and standards for DP system FMEAs into practical actions. • Able to solve imaginatively, common technical/operational problems in the area DP system redundancy and fault tolerance. • Able to guide and advise others in technical/operational aspects of DP System FMEA and related mission critical equipment.
Mastery	<ul style="list-style-type: none"> • Evaluate alternate and / or novel solutions objectively. • Be able to diagnose and resolve significant complex, non-routine problems in the area of DP system design and related mission critical equipment. • Able to creatively solve significant, complex, non-routine problems. • Able to adapt practices from other engineering disciplines for use in DP system verification. • Able to generate substantial improvements to local practices and procedures for DP system design and analysis.

	<ul style="list-style-type: none"> • Demonstrate experience in applying technical and operational expertise to the evaluation of DP system design and analysis. • The ability to objectively evaluate proposals (including alternate solutions) or offer alternative solutions and risk mitigations to resolve DP-related issues.
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The guide to assigning skill levels on the basis of answers was also adopted from the Techop to the CAF.

MASTERY - A candidate with mastery in the subject competency will speak fluently and be able articulate all the main concepts associated with a particular subject without prompting or recourse to asking follow-on questions. (that is to say they will mention many of the issues which are the subject of the follow-on questions). The candidate will demonstrate that they understand all or most of the issues at a conceptual, philosophical and practical level – Mastery may be awarded on the basis of such a performance alone but further confidence in the appropriateness of the categorization may be gained from the answers to follow on questions.

SKILLED - A candidate who is skilled in the subject competence is likely to demonstrate a sound understanding of the practical issues in the main question but may be less able to articulate the philosophical and conceptual issues in the main question and may need to be prompted to expand their answer to allow their understanding of the conceptual and theoretical issues to be assessed. The score awarded to such a candidate is likely to be influenced by their performance in the follow-on questions.

KNOWLEDGEABLE – A candidate who is knowledgeable in a particular competence may give a fairly limited response in reply to the main questions but will be able to demonstrate the scope of their knowledge by correctly answering most of the follow-on questions in a manner that gives confidence they understand the practical important of the issues raised by the questions.

AWARE – A candidate who is only aware of issues within the subject competence is likely to need significant prompting and use of follow-on questions to gain an understanding of their knowledge. Their answers may be at a superficial level. They may struggle to answer the main question. They may not be able to answer all the follow-on questions.

NOT AWARE – A candidate who is not aware will likely ask for the main question to be repeated in a different way or be expanded or may state they have no knowledge of a particular subject.

NOTE – FAILURE TO ACHIEVE MASTERY – When it becomes clear during the oral exam that a candidate is not going to achieve Mastery in the four competencies required to be a DP SME, the examiners should use the follow-on question to help develop a study plan to assist the candidate in achieving the required competencies at the next opportunity.

SUMMARY – The nature of the answer provided to the Main Question is likely to influence the assignment of a particular skill level most strongly – The follow-on questions will typically reinforce that assessment or improve the score of a candidate who did poorly in the main question.

After the CAF had been returned, each tier level now had to be assigned competency requirements based on the Techop. The following competency level requirements were chosen for each level based on assessment of existing procedures.

Table 7 Tier 1 DP Consultant Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Knowledgeable
2	Barrier philosophy and defence in depth	Knowledgeable
3	DP Concepts and engineering	Skilled
4	DP guidance and basis of requirements	Skilled
5	Verification and Validation	Knowledgeable
6	Power Plant configured as a Common Power System (Closed busties)	Knowledgeable
7	Cross connections, External interfaces and influences	Skilled
8	In execution support	Aware
9	Industrial Mission (Impacts and Management)	Knowledgeable

Table 8 Tier 2 DP Consultant Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Mastery
2	Barrier philosophy and defence in depth	Skilled
3	DP Concepts and engineering	Mastery
4	DP guidance and basis of requirements	Mastery
5	Verification and Validation	Mastery
6	Power Plant configured as a Common Power System (Closed busties)	Mechanical – Skilled Electrical – Mastery Control Systems - Skilled
7	Cross connections, External interfaces and influences	Mastery
8	In execution support	Knowledgeable

9	Industrial Mission (Impacts and Management)	Skilled
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Table 9 Tier 2.5 DP Consultant Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Mastery
2	Barrier philosophy and defence in depth	Skilled
3	DP Concepts and engineering	Mastery
4	DP guidance and basis of requirements	Mastery
5	Verification and Validation	Mastery
6	Power Plant configured as a Common Power System (Closed busties)	Mechanical – Skilled Electrical – Mastery Control Systems - Skilled
7	Cross connections, External interfaces and influences	Mastery
8	In execution support	Knowledgeable
9	Industrial Mission (Impacts and Management)	Skilled

Table 10 Tier 3 DP Consultant Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Mastery
2	Barrier philosophy and defence in depth	Skilled
3	DP Concepts and engineering	Mastery
4	DP guidance and basis of requirements	Mastery
5	Verification and Validation	Mastery
6	Power Plant configured as a Common Power System (Closed busties)	Mastery
7	Cross connections, External interfaces and influences	Mastery
8	In execution support	Skilled
9	Industrial Mission (Impacts and Management)	Skilled

Table 11 Tier 1 DP Surveyor Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Skilled
2	Barrier philosophy and defence in depth	Skilled
3	DP Concepts	Skilled
4	DP guidance and basis of requirements	Skilled
5	Verification and Validation	Knowledgeable
6	In Execution Support	Knowledgeable
7	Impacts of Station Keeping on the Industrial Mission	Knowledgeable
8	Impacts of the Industrial mission on Station Keeping	Knowledgeable
9	Defining, Identifying and managing interfaces relevant to DP station keeping	Knowledgeable

Table 12 Tier 2 DP Surveyor Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Mastery
2	Barrier philosophy and defence in depth	Mastery
3	DP Concepts	Mastery
4	DP guidance and basis of requirements	Mastery
5	Verification and Validation	Knowledgeable
6	In Execution Support	Knowledgeable
7	Impacts of Station Keeping on the Industrial Mission	Skilled
8	Impacts of the Industrial mission on Station Keeping	Knowledgeable
9	Defining, Identifying and managing interfaces relevant to DP station keeping	Knowledgeable

Table 13 Tier 2.5 DP Surveyor Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Mastery
2	Barrier philosophy and defence in depth	Mastery
3	DP Concepts	Mastery
4	DP guidance and basis of requirements	Mastery
5	Verification and Validation	Skilled
6	In Execution Support	Skilled
7	Impacts of Station Keeping on the Industrial Mission	Mastery
8	Impacts of the Industrial mission on Station Keeping	Mastery
9	Defining, Identifying and managing interfaces relevant to DP station keeping	Mastery

Table 14 Tier 3 DP Surveyor Competence Levels

COMPETENCY NUMBER	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY	COMPETENCE LEVEL REQUIRED
1	Deliverables and decision support tools	Mastery
2	Barrier philosophy and defence in depth	Mastery
3	DP Concepts	Mastery
4	DP guidance and basis of requirements	Mastery
5	Verification and Validation	Skilled
6	In Execution Support	Skilled
7	Impacts of Station Keeping on the Industrial Mission	Mastery
8	Impacts of the Industrial mission on Station Keeping	Mastery
9	Defining, Identifying and managing interfaces relevant to DP station keeping	Mastery

Table 15 DP Technical Authority Competence Levels

COMPETENCY NUMBER	DP SME (SURVEYOR) CORE DP COMPETENCY	FMEA PRACTITIONER (CONSULTANT) CORE DP COMPETENCY
1	Deliverables and decision support tools	Deliverables and decision support tools
2	Barrier philosophy and defence in depth	Barrier philosophy and defence in depth
3	DP Concepts	DP Concepts and engineering
4	DP guidance and basis of requirements	DP guidance and basis of requirements
5	Verification and Validation	Verification and Validation
6	In Execution Support	Power Plant configured as a Common Power System (Closed busties)
7	Impacts of Station Keeping on the Industrial Mission	Cross connections, External interfaces and influences
8	Impacts of the Industrial mission on Station Keeping	In execution support
9	Defining, Identifying and managing interfaces relevant to DP station keeping	Industrial Mission (Impacts and Management)
All above mentioned competencies at Mastery		

Finally, the assessments were modified to specifically cater to the 9 core competency requirements. The PDDP2 Tool was used to assist in developing and modifying the assessments.

Conclusion

- A final CAF document has been created based on the new guidance documents. It is live in its current state.
- The DP SME path has been aligned with DP Surveyor and the FMEA Practitioner path has been aligned with DP Consultant
- Each tier requirement has been mapped as Aware / Knowledgeable / Skilled / Mastery as per guidance
- New assessment and training programs are in the process of being developed
- All DP Personnel in Europe and Africa have begun their journey and are making progress (due to the guidance)
- The target for Europe / Africa to arrive at their destination is end 2018. All 25 DP Personnel within LOC will be on the framework
- Any new recruits will be assimilated into the competency framework seamlessly and be able to show their competence easily

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