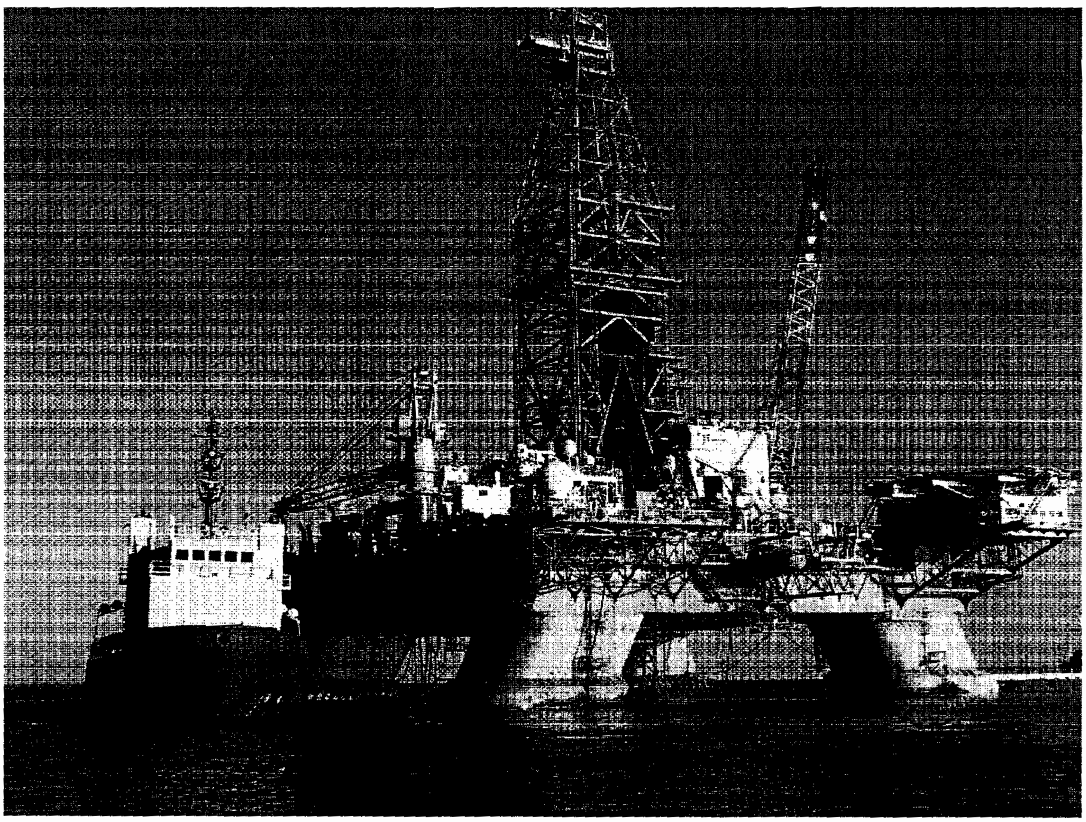
Transocean

Deepwater Horizon Bridge Procedures Guide



"A DP operator often lives with hours upon hours of tedious boredom interspersed at rare and infrequent intervals by moments of emergency." - Anonymous

3749
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From: Captain
To: Bridge Team

Subject: Bridge Procedures Guide

This BRIDGE PROCEDURES GUIDE is a collection of vessel specific information, lessons learned, best practices, and corporate knowledge gathered in the first five years of *Deepwater Horizon's* operation.

Nothing in this manual supercedes approved company, client, class, or regulatory standards. This guide publishes procedure, deviations from which may sometimes be justified. Deviations should be communicated to the Master and documented on a Written THINK Plan or other tool. Do not confuse this with policy, which is promulgated in the Master's Standing Orders.

Deepwater Horizon's history is one of success, among the best in the fleet. By capturing these success stories regarding DP and other marine operations, we can continue to be the best. The controlled copy of this document is saved in the Master's electronic public folder and will be revised from time to time.

______________ Master	______________ Master
______________ Date	______________ Date

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INTRODUCTION

On the *Deepwater Horizon,* we are committed to achieving the highest possible standards of performance as required by Transocean and our client. This standard can not be achieved without the commitment of every individual associated with this rig. You will be expected to demonstrate your professionalism and commitment to this standard in our daily operations.

Throughout any operation, the maintenance of safety is of the utmost importance. No operation will be undertaken without the highest regard to the safety of the people involved. It is therefore very important that you conduct yourself in a professional and safest manner possible as you go about your duties. Also included in this is the importance of ensuring that your fellow crewmembers maintain the same safety consciousness to ensure that their safety and safety of their co-workers is not compromised.

This guide has been developed to assist individuals in performing their duties onboard the *Deepwater Horizon*. This guide is in no way intended to replace a thorough study of the manuals on the bridge, which relate to equipment or watchstanding, but rather to provide guidelines which must be maintained. The contents of this guide form the operating guidelines that will help us attain the highest level of operability and professionalism on the *Deepwater Horizon*.

DEEPWATER HORIZON OVERVIEW

HISTORY

The *Deepwater Horizon* is a fifth generation semi-submersible drilling rig built by Hyundai Heavy Industries in Ulsan, South Korea. The rig was commissioned in February 2001 and made the transit to the Gulf of Mexico arriving in August 2001. Since arriving in the Gulf of Mexico, the *Deepwater Horizon* has been primarily contracted with British Petroleum (BP) and has been associated with such projects as Atlantis and Tubular Bells. In January 2005, the *Deepwater Horizon* set a world record for water depth for a DP positioned semi-submersible at 9,636 feet. We have also set records for the longest core sample, fastest well drilled for BHP, and the deepest well drilled for BP in the Gulf of Mexico.

CHARACTERISTICS

The *Deepwater Horizon* has two pontoons each connected to the hull by two columns. Each of the pontoons has a width of 17.5 meters (approx. 57' 5") and a length of 114.0 meters (approx. 373' 11") and is rectangular in form. The extreme breadth of the rig is 78.0 meters (approx. 255' 10") from the outside edges of each pontoon. Each of the pontoons supports four of the thrusters, which are mounted in pairs at the forward and aft end of each pontoon. The columns are each surrounded by a Column Outer Belt (COB) tank at the operating draft to provide additional stability and to prevent damage in the event of a collision. Within the columns are tanks for the storage of bulk material, liquid mud, fuel, base oil, and water.

The upper hull of the rig is 61.0 meters (approx. 200') wide with a length of 81.5 meters (approx. 267' 4"). The upper hull contains the living quarters, offices, engine rooms, mud pump rooms, mud pits and numerous other spaces necessary for the functioning of the rig. The accommodations and offices take up the forward third of the hull. Spaces for conditioning and pumping mud take up most of the center third of the hull with the engines and power distribution systems taking up most of the after third. The Bridge (or Central Control Room) is located on the port forward corner of main deck and contains most of the dynamic positioning and navigational equipment.

The forward half of the main deck is dedicated to the storage of tubulars, casing and other equipment that is temporarily aboard the rig. The after half of the Main Deck is designed for the storage of riser, but is also used for general storage while on location and drilling. The paint locker and hazardous material storage is located on the starboard aft corner of the main deck.

The drill floor and derrick dominate the central portion of the Main Deck. The top drive and hook are suspended on running gear that runs through sheaves mounted at the derrick crown which is 242' above the drill floor. Operations on the drill floor are controlled primarily from the Driller's Workstation (DWS), which is also known as the Doghouse or Driller's Shack. The rotary is located at the center of the drill floor, which is also the geographic center of the rig.

DP SYSTEMS OVERVIEW

CONTROLLERS

The *Deepwater Horizon* is equipped with four independent DP controllers. Three of these controllers (A, B, and C) are located in the Process Equipment Rooms located on the port aft side of the bridge and the fourth (F) is located in the ECR.

The primary controllers (A, B, and C) all take inputs from all of our position reference systems, wind sensors, motion reference units (MRU) and gyro compasses. Each controller then uses that data to generate command signals to the thrusters. The commands from the three controllers are compared to one another and erroneous data is rejected.

One controller is set as the master. This controller is the computer that communicates with the operator stations and places the information on the network. This master computer is selected by the operator and can be set as any of the three primary controllers.

On the *Deepwater Horizon,* we try not to change the master controller when connected to the wellhead or during other drilling operations. The master controller should only be switched with the consent of the Sr. DPO on watch.

The redundancy of the controllers gives us the ability to reboot a single controller without affecting our positioning ability. This should only be done as a last resort and then, only with the consent of the senior vessel management (Captain, OIM, Electrical Supervisor).

In the event of a failure of one of the controllers, the system should continue to operate normally. The Master, Electrical Supervisor, and Drill Floor should be notified and the Alert Status changed to "Advisory" or "White" condition.

With only two controllers operating, the master controller will control the thrusters and no voting will occur. If a problem is detected with the master controller, control will automatically switch to the other active controller and an alarm will sound.

The fourth controller (F) is designated as the back-up computer and is configured to assume control in the event of a catastrophic failure of all three DP controllers or the loss of the bridge through fire or other event. This controller is also used when maintenance is being performed on the primary DP controllers. The back-up can be controlled either through operator stations on the bridge or though the operator stations located in the ECR. The back-up controller is supplied with environmental and position information that has passed through a DP sensors isolation box located in the ECR. This box helps protect the back-up from surges. The sensor isolation box also feeds sensor information to the primary DP controllers.

Control of the DP system can be transferred to the back-up controller by pressing the command transfer button. This lighted, red button is located on SDP OS-1, labeled "Emergency command transfer to backup DP." To initiate a command transfer, push in the button on SDP OS-1 and the button will lock in the down position and light up more brightly. A message is displayed on the screen informing the operator that the back-up controller is now controlling the thrusters.

Control is regained from the back-up by releasing the button. When regaining control of DP in the CCR, verify that you have thrusters enabled. When control is transferred to the back-up the thrusters are deselected on the primary DP and need to be re-enabled before they are available for use.

Upon arriving at a new location, the button that switches control will be tested. This should be a bumpless transfer with the backup assuming control without further input from the operator. Once all of the field arrival tests are completed on the back-up, control is returned to the bridge.

It is also possible to take control with the back-up by pressing the command transfer button in the ECR. This button is located on the SDP panel in the ECR and functions in the same manner as the switch in the CCR. If control is taken in the ECR it has to be given back to the primary system, there is no way to regain control from the CCR. The back-up can still be controlled from the CCR through the operator stations.

REFERENCE SYSTEMS

The DP system requires accurate and continuous position feedback information to operate correctly. Loss of this positioning information can lead to a loss of station (drive-off or drift-off). We have redundant position reference systems with various types and different providers of corrections in addition to redundant environmental and vessel motion sensors.

DGPS

There are four GPS receivers on the *Deepwater Horizon*. Two of these are Trimble GPS receivers and two of them are Seatex GPS receivers. The two Trimble antennas are located on the derrick crown. One Seatex receiver is located on the starboard forward elevator house and the other is on a ventilator on the port aft quadrant of the rig. There is a spare Trimble antenna located on the starboard aft corner, which can be used by the GPS receivers in the ECR. This was the original mounting location for GPS #1 before it was moved to the crown shortly after the rig came out of the yard.

Correction signals are received through Spotbeam receivers and INMARSAT-B. Two of the Spotbeam receivers are located on the top of the derrick with the third in the starboard forward antenna farm. One of the Spotbeam receivers on the crown is a Racal receiver and the other is a Fugro receiver. Although Racal was bought by Thales, who was then bought by Fugro, we still refer to it as the Racal Spotbeam to differentiate it from the other. The Spotbeam antenna in the starboard forward antenna farm is also a Racal antenna. The INMARSAT-B receiver is located in the starboard forward antenna farm.

The computers that calculate the positioning information are separate from the GPS receivers and the correction receivers. These computers integrate the signals into a single output that are fed to various systems on the rig. The computers for GPS #1 and GPS #3 are located in the ECR and the computers for GPS #2 and GPS #4 are located in the CCR/Bridge.

Access to these computers is restricted and all work must be approved by the Sr. DPO. This is especially important for the ETs. If they are changing settings in the DGPS computers and the bridge is not aware, information may be lost. If that information is not communicated, we might change the settings back to their original settings undoing previous troubleshooting and work. They too might undo previous troubleshooting and work.

GPS #1 and GPS #2 run on Multifix 4 software to calculate their position. They receive corrections from all of the correction antennas on the rig, allowing greater redundancy through the use of multiple correction signals.

The Multifix interface provides a great deal of information to the operator. We typically have data displayed which shows the latency of the correction signals, the signal to noise ratio of the positioning signals and a positioning window which graphically shows the accuracy of the positioning solution. This is in addition to other windows that show other useful information. In the Black Book, a page shows the preferred set-up for the information on the screen. A consistent set-up allows the operator to see changes or patterns in the data being displayed.

GSP#3 and GPS #4 use Seatex 200 software for calculating the rig's position. The Seatex computers only receive corrections from the Fugro Spotbeam antenna and the INMARSAT-B receiver. If the Fugro Spotbeam antenna is damaged, GPS #3 and GPS #4 lose their correction signals when the INMARSAT-B receiver is shadowed by the derrick. The other difficulty is the fact that the INMARSAT-B is on the list of equipment that is shut off during radio silence.

The Seatex software does not provide as much information to the operator as the Multifix software, but it is more user friendly. The main feature of the Seatex interface is the large graphical positioning view. This allows the operator to see a setpoint in relation to the rig. There are also displays that show the satellite constellation and the signal to noise ratios for each of the satellites.

On occasion, one of the GPS will send too many data packets to the DP system in a short period of time. In order to protect itself from overload, the DP controllers will shut off the data port where the data from the GPS is received. When this happens, you will get the message "GPS 1 Disabled" with information on the number of data packets received. In order to reenable the port, the controllers must be rebooted. A reboot of the computer will not solve this problem. Before starting the process of rebooting the controllers, contact the ETs and the senior management. This is an operation that creates risk in positioning of the vessel, so additional THINK drills and risk analyses should be conducted. Once all departments that might be effected are ready, reboot the controllers one at a time. Wait for each controller to run for a couple of minutes to ensure that it is stable before moving to the next.

ACOUSTICS

Acoustics are the primary positioning system for the *Deepwater Horizon*. The heart of the system is two HiPAP transceivers located amidships on each pontoon. Each transceiver is made up of hundreds of individual elements that can transmit and receive signals. The numerous elements also allow the system to determine the bearing to a transponder based on the facing of the individual element. The system is controlled by the Acoustic Positioning Operator Station (APOS) that runs in the background on each of the DP operator stations.

We typically operate a five transponder array in Long Base Line (LBL) mode with a sixth transponder in Super Short Base Line (SSBL) mode.

LBL works by determining the range to each of five beacons by measuring the time it takes a signal to be transmitted to the beacon and then received by the HiPAP. Each beacon is set with a small delay to prevent the signals from being simultaneously received by the HiPAP. These ranges are plotted and errors removed to give a fix. The errors are displayed on the APOS as residual. Generally, the smaller the residual, the better the fix will be.

Five LBL transponders are usually placed in a pentagon shaped array with the wellhead at the center of the array. The LBL array is deployed upon arrival at a new well location prior to any drilling activities. An array radius of 150 to 200 meters allows the ROV to recover transponders on any vessel heading in the event of a battery failure or other failure. This radius also creates good geometry for the LBL calculations and allows the rig to operate away from the center of the array. LBL can run with as few as three transponders in the array, but the fix will not be as reliable. If a single transponder fails, no fixes will be possible. The transponder array is interrogated at 4 second intervals while operating in LBL mode. This rate can be changed, but we have found that this rate provides us with good fixes and battery life.

SSBL works by measuring the range and bearing to a single transponder and calculating the vessel's position on that measurement. This system is more liable to errors due to sound velocity changes and spurious noise. All of the transponders that are in the LBL array may also be placed in SSBL mode, but they can not be used in LBL and SSBL modes simultaneously.

The sixth transponder (SSBL) is placed near the wellhead to provide back-up positioning system in the event of GPS failure or loss of LBL positioning.

A log of the transponders and their batteries is maintained on the bridge. The log contains the date of deployment and recovery, channel settings, the battery status for each transponder, and a list of new batteries.

We measure the battery life of the transponders (ping count) on a weekly basis. This is usually done on Sunday night or Monday morning and the results are logged in the transponder log. A battery life near 4 million pings (frequently more) while running the transponders on high power for navigation and telemetry is the normal value.

GYRO COMPASSES

The *Deepwater Horizon* is equipped with three gyro compasses. All three are Anschütz Standard 20 gyro compasses. Two of the gyros (2 and 3) are mounted in the process rooms aft of the bridge and the third (1) is located aft in the ETs shop.

All three of the gyro compasses feed the primary DP controllers (A, B, and C). One is selected as the master and is the only gyro that feeds the DP system. No voting occurs between the three gyros, but the DP system does compare the signals from the three gyros and produces an alarm if one of them varies from the others by more than 2 degrees.

Gyro #1 is used by the back-up DP controller (F). This is the only gyro that is connected to the back-up. Gyro #1 is also used by the port HiPAP transceiver for positioning. If Gyro #1 is unavailable, the back-up controller will be unable to function and the port HiPAP will be unavailable for positioning. If maintenance is to be performed on this gyro, a critical system work permit needs to be completed and the DP Alert status should be changed to "Advisory" or "White" condition.

Gyro #2 is used by the starboard HiPAP transceiver to calculate pitch and roll for correcting the acoustical signals. Each gyro is tied directly to its respective HiPAP transceiver that can not be switched to an alternative gyro input.

Gyro #2 feeds a repeater on the forward edge of the helideck and Gyro #1 feeds a repeater located on the after lifeboat deck. Gyro #2 also feeds the ARPA and AIS units with heading information while the ECDIS is fed by Gyro #3. We use azimuths of the sun and stars to calculate gyro error, which are taken once per watch. Gyro #2 typically runs around 2° of Westerly gyro error.

MOTION REFERENCE UNITS

Two Motion Reference Units (MRU) and one Vessel Reference Sensor (VRS) are used to correct positioning signals received from the reference systems. Collectively, we refer to them all as MRU for numbering and data logging. The APOS system uses the signal from MRU to correct the transducer signals and the DP system uses the data to account for vessel motion on the DGPS positions.

There are two different types of MRUs on the *Deepwater Horizon*. MRU #3 is a Watson and is located in the Stbd Process Room. MRU #3 only feeds pitch and roll data (no heave) to the DP system. MRU #1 and MRU #2 were made by Seatex. MRU #2 is located in the Port Process Room and MRU #1 is located in the ECR.

MRU #1 is tied to the Port HiPAP and the back-up DP controller. This MRU is the only feed to those two systems. The Port HiPAP will not be operational if MRU #1 is unavailable. The back-up controller will continue to operate, but it will not correct the DGPS positions because the MRU will give a constant signal of 0° for pitch, heave and roll. In calm weather, or when the cranes are not moving this is not too bad, but if there is a lot of rocking and rolling, the rig will "chase" the top of the derrick.

WIND SENSORS

There are three wind sensors to feed wind data to the DP system. All three wind sensors are located on the top of the derrick. The wind sensors consist of a propeller attached to a wind vane, (Anemometer). The direction reading can be adjusted by the ETs using a set screw where the vane attaches to the rotational shaft. Generally, the ETs go to the top of the derrick and adjust the vanes relative to the bow while confirming the reading with the bridge on the radio. Wind sensors #2 and #3 have displays on the bridge and wind sensor #1 has a display in the ECR on the forward bulkhead.

Two of the wind sensors (#2 and #3) are connected directly to the primary controllers (A, B, and C), the third (#3) is connected to the back-up, and the primary controllers via the sensor isolation box located in the ECR.

The wind velocity is corrected within the DP system to account for the difference in wind speed from the top of the derrick to a theoretical point 10 meters off the sea surface. This usually results in the wind reading within the DP system being up to 30% lower than the derrick top readings.

DRAFT SENSORS

Our draft is used by the DP system as part of the calculations. Our draft affects the amount of surface area visible to the wind and current. The DP system has to be able to account for these changes in resistance. The vessel model is programmed with values for our primary operating draft and interpolates the data for other drafts. This makes the DP behave a little more squirrelly when operating at unusual drafts due to operations. Operating at these unusual drafts must be approved by the captain and chief mate prior to ballasting.

The draft reading used by the DP system is an average of the readings from each of the corners of the rig. One sensor is located in the pumproom of each quadrant. These sensors work by measuring the hydrostatic pressure to determine the draft.

In the event that the sensors are not working or inaccurate, the draft can be entered into the DP system manually using observed readings. To read the drafts marks on the columns, we typically use the lifeboats during quarterly launchings. When manual draft readings are required and it is not possible to launch the lifeboats, there are platforms located beneath the upper hull for reading the draft marks on the inboard side of each column.

THRUSTERS

There are eight thrusters on the Deepwater Horizon. There are two thrusters located at each corner of the rig and are numbered starting at the starboard forward corner and moving in a clockwise pattern around the rig.

The thrusters are Aquamaster UUC 7001 azimuth thrusters. These thrusters are rated at 5,500 kW (7375 horsepower) at 110 RPM. The thrusters have a fixed pitch propeller that can run in the ahead and astern direction. Thrust in the astern direction is limited to 60% of the thrust in the ahead direction and is only available in manual level control.

Each of the thrusters and thruster drives are located in their own watertight space. The thruster drive and control spaces are located in pairs in each of the columns.

Thruster speed is controlled by a variable frequency drive and electric motor. Speed commands are generated by either the SDP or the STC consoles depending on the operating mode. Speed commands may also be generated by the SVC if the thruster is in maintenance mode and the Megastar control panel in the thruster space when in local control. When the thruster is operating in DP mode reverse thrust is not used, instead azimuthing of the thruster is used.

The SDP or STC system generate azimuth commands when they are in control or azimuth commands can be generated through the SVC when the thruster is in maintenance mode. When the thruster is in local control, azimuthing of the thruster can be controlled using the Aquamaster control panel in the thruster space.

Steering commands are routed via the network to the SVC process station that controls the hydraulic steering pumps. Commands range from 180° to -180°, which are transmitted using a variable DC voltage signal. The SVC is supposed to allow the thruster to go smoothly from 180° to -180° without having to azimuth the thruster in a complete circle. If an error occurs in this logic, it will be most noticeable with the current directly on the bow.

The Thruster Emergency Stop control panel is located on the SDP and STC consoles in the CCR/Bridge and on the STC console in ECR. These buttons trip the breaker on the thruster causing it to stop. The button will depress and light up when activated. The thruster can only be restarted after an electrician has reset the breaker in the thruster space. Before the electrician can reset the breaker, the emergency stop button has to be released.

In the event there is a failure of the DP controllers, control of the thrusters can be gained using the STC consoles. The yellow buttons on the STC console activate systems that entirely bypass the controllers. When the button is depressed, it will route thruster commands directly to the individual thruster controllers using a dedicated cable. This will allow a limited amount of control over the vessel in an emergency.

DP CONSOLES

The DP system is interfaced and controlled through four SDP (Simrad Dynamic Positioning) consoles. Three of the consoles are located on the bridge and one is located in the ECR. The console in the ECR is dedicated for the use of the back-up controller, but the three consoles on the bridge can control both the primary controllers and the back-up.

The SDP consoles are only interfaces to the DP controllers. No positioning calculations or thruster commands originate there. This means that we could lose all of the SDP consoles and the rig would still maintain position on DP assuming that the thrusters and reference systems were still available, but no changes to the setpoint or DP set-up would be possible until the consoles were restored.

In addition to the SDP consoles, there are two STC (Simrad Thruster Control) consoles; one on the bridge and one in the ECR. The STC consoles can be used to control the DP system, but are primarily used while underway. The speed and direction (azimuth) of individual thrusters can be controlled from the STC for maneuvering or manual control. Controls for the thrusters while underway are also located on the STC consoles. The thrusters can be placed into group control from the STC consoles only. Group control allows four of the thrusters to be controlled as a single entity.

Most critical controls can be accessed through the push buttons on the DP consoles. The most critical controls are double press controls meaning that the have to be pressed twice to activate or deactivate them. These controls are highlighted with white buttons.

For routine operations, control is normally kept at SDP OS-1. This console allows easy access to the SVC for checking the status of generators and thrusters. Control of the back-up is usually kept at SDP OS-2. This allows the back-up to be viewed without interfering with the operation of the primary DP.

UNINTERRUPTIBLE POWER SUPPLIES (UPS)

There are numerous UPS systems that supply power to DP systems in the event of a loss of power. Generically, each UPS consists of a battery, an inverter/rectifier, a transformer, and a manual by-pass switch. Five UPS support the DP controllers and operator stations, one is used by each HiPAP, and each of the thruster controllers has a dedicated UPS.

The main DP controllers are connected to three UPS in triplex to provide power. This allows any one of the three UPS to provide power to any of the controllers. There is a chance that the cable connecting the three UPS to the controllers could be damaged, but the back-up should still be available due to an independent power source. The same three UPS also provide power to the operator stations located in the CCR. Each operator station is connected to two UPS so the loss of any two UPS should not result in the loss of all operator stations.

UPS 12 and 13 are dedicated for the use of the back-up controller and associated systems. UPS 13 provides power to the DP isolation box that allows Gyro 1, Wind Sensor 1 and MRU 1 to be used by both the back-up and the primary controllers. If UPS 13 fails, all reference systems that go through the DP isolation box will be lost. This will result in the back-up controller being unavailable for use. This is important to know when maintenance is being performed on the UPS.

ENGINEERING OVERVIEW

Standing watch on the *Deepwater Horizon* requires a certain level of knowledge of engineering systems and procedures. This section will deal primarily with the systems that you need to be familiar. Procedures will be dealt with in a later section. Control of systems by the marine department will follow established procedures and good marine practices.

Many of the engineering systems can be controlled via Simrad Vessel Control (SVC) consoles on the bridge including thrusters, generators, and bilge systems. Other systems cannot, such as water makers, rig air, and sewage systems. Assuming pilothouse control of engineering frees engineering staff to complete preventative maintenance work while increasing the DPO's situational awareness.

We have a duty engineer and oiler (motorman) on watch at all times. They make up a critical part of the watch and are available to respond quickly to engineering problems. Open communication and professional relationships between the ECR and Bridge personnel are essential. Therefore, Deck Officers, regardless of who has control of SVC Machinery, must be aware of major work and the general location of the engineer on watch. Likewise, discuss the battle rhythm with the ECR at the beginning of the watch, including approaching weather, water and fuel available from boats, cement jobs, and maintenance that may affect them.

The 6 Hour DP Checklist has an entire section dedicated to the engineering systems. This will help you develop your situational awareness at the beginning of your watch. A transfer of control form will be filled out by the duty engineers prior to transferring control. The form indicates the status of various systems, saves the data in an Access database, and communicates the information to the Chief Engineer and Bridge. The form also forces the duty engineer and Sr. DPO to have a verbal handover by requiring signatures. Hard copy forms should be filed on the Bridge for the duration of the well.

MAIN ENGINES

The vessel is equipped with six main diesel generators (MDG). Each generator is comprised of a Warstila diesel engine connected to an ABB generator. Each of the generators is rated for continuous operation at 7 MW, but they can be run at higher loads for short periods in an emergency.

Each generator is housed in its own space with independent auxiliaries and fuel supplies. Three of the engine rooms are located on the port side and three on the starboard.

Although the generators are designed to be independent, there is a single failure that can affect multiple engines. The ESD which shuts down the ventilation is broken into two separate ESD; one for the port engine rooms and another for the starboard side. This means that in the event of a failure of a single ESD you can lose half of your generator capacity. To avoid this, we strive to maintain one engine on each side of the vessel during normal operations. Be aware that this separation is not always possible and is a potential failure.

FUEL SYSTEM

Our engines are designed to work on either diesel or heavy fuel oil. Since the vessel came out of the yard, we have been running entirely on diesel. If the decision is made to run on heavy fuel oil, the system will have to be adjusted so the fuel oil will circulate through the jacket water heaters. This will allow the fuel to remain viscous enough to be easily pumped.

Fuel can be stored in four tanks in each pontoon, but four of the eight tanks are used as ballast tanks. If we need to use those ballast tanks for fuel storage, the lines will have to be swapped from the ballast system to the fuel system. The fuel line is blanked off and the section of piping which leads to the tank has been removed.

Fuel from the main tanks is transferred to the settling tanks when needed. Typically, the engineers fill the settling tanks every watch. This is based on our normal usage. There will be times when they have to be filled mid-watch, but that is rare.

From the settling tanks, the fuel is passed through purifiers to remove any particulates that remain after settling. This purified fuel is stored in the service tanks until it is needed. To prevent the more particle heavy fuel from running through the purifiers, the suctions for the settling tanks is well off the bottom of the tank.

The purifiers are made up of a series of spinning disks. Centrifugal force causes the heavier particulates to be thrown to the outside of the disk and is separated from the fuel. This "sludge" is sent to the sludge tanks and eventually to the waste oil tanks where it can be shipped ashore for disposal.

There are two sets of settling and service tanks; one set for each side of the vessel. The two sets are interconnected and can feed either side of the rig. The tanks are nominally independent to prevent contamination in from one set to the other.

Head tanks for each engine are used to provide a limited source of fuel in the event of the failure of the individual pumps. Flow from each engine's fuel pump is used to keep those tanks full. When the fuel pump is first started, you will often get a high level alarm for the head tank. This is normal.

When loading fuel from supply boats, the fuel must be visually inspected prior to loading. The boat should supply a sample. A sealed sample is also collected and is kept for future testing. Although the law says that you have to keep the sample onboard until the fuel has been used up, this is difficult where we mix the fuel into common tanks. Instead, we keep them for a year to insure that the fuel has been used.

The visual inspection looks for bacterial contamination within the fuel sample. There are bacteria that can survive, and thrive, in diesel fuel. Although this is not usually a problem in the Gulf of Mexico, it can still be a problem on occasion. Bacteria in the fuel can cause problems with the engines because of the lower firing efficiency of contaminated fuel. The presence of bacteria can be detected by cloudiness in the sample. The visual inspection of the sample will also detect the presence of excessive water or sediment in the fuel.

Power Management System

Regardless of who has control of machinery, maintaining adequate power and available regenerative power is the DPOs responsibility while on the desk. You should always know what the load start, upper limitation, and lower limitation points are. The Functional Design Specification is the best source of vessel specific information on these issues. Power management includes, but is not limited to, calling for extra generators, using bias, and adjusting heading or gain as necessary.

Monitor the bus load trend on the SDP trend window, power window, and/or on SVC OS3. Understand that Hotel Load is calculated, not measured, and is equal to Total Load minus Thrusters and Drilling. It may read negative when tripping pipe. PMS Step 3 and 5 alarms are common when tripping and not a concern if they clear immediately. Likewise, due to a SVC programming error that miscalculates available power, Thruster 4 Force Reduction alarms on

SDP are a common problem. OPDOC 21 contains guidance on responding to nuisance SDP Consequence Analysis alarms while tripping pipe. OPDOCs are kept in a binder in the bridge bookshelves.

You should know beforehand which engine is lined up to come on next and whether the engineer prefers to let the engines load start or to warm up first. If time permits call the engineer before starting one. Otherwise, call as soon as possible so they can line up water makers, make rounds, and adjust fans. Secure the engine immediately if you receive a Low Voltage Alarm.

Check the following when connecting a generator to the bus:

- Is HTCW less than 60°C?
- Are there problems on the Safety Page?
- Are the LO pumps in auto?
- Are the FO distribution valves lined up to draw from the same line?
- Is the KVAR equal among the online generators?
- Are the Fresh Water Circulation Pumps in auto?
- Are the main bearing temperatures greater than 70°C?

When the decision is made to secure a generator, let the engineer know so they can secure the water maker. Be careful to click "Disconnect" rather than "Stop". The generator will come off the bus and the engine will cool down. Try to keep the bus load between 25% and the load start point.

Deepwater Horizon normally operates on a unified bus with eight switchboard breakers set on auto. These breakers are checked as part of the 6 Hour DP Checklist. When the bus is split, you will see this indicated on both the SVC and SDP displays. The SVC "Power" page will display four yellow boxes labeled "A" for one bus and four blue boxes labeled "B" for the other bus. On the SDP system, the "Power" view will display two color coded trends for Bus "A" (Available Bus "A" and Load Bus "A") and two color coded trends for Bus "B" (Available Bus "B" and Load Bus "B"). Also on the SDP system, the "Power Consumption" view will display two Power Consumption bar graphs (Bus "A" and Bus "B").

The power management system will monitor the power loads and will start another engine to prevent a blackout. This is a back-up to proper watchkeeping. The DP watchstander should notice power levels rising and act to have another engine started prior to an auto-start becoming necessary. Typically, we try to have a reserve of an entire engine worth of power. This will allow us to suffer the loss of one engine without a loss of position. It will also give the system more time to react.

There are two philosophies about power management. One philosophy is that the computer should be allowed to manage the power. That is what it was programmed for and we shouldn't interfere. The other philosophy is that the operator is more capable of anticipating changes in operations and can start an engine before it becomes necessary. We follow the second philosophy. This means that we trust the operator to make the call when another generator is necessary. The engineers should respect that as well.

Power is distributed throughout the vessel using eight main switchboards. One main engine and thruster are connected to each of six switchboards for redundancy purposes. There are also two additional switchboards with feeds for the drilling packages. The switchboards feed 11 kV power to the thrusters and drilling packages and also feed transformers where the power is reduced in voltage for use by other systems. The transformers used to provide power for the rest of the rig are distributed so there is a switchboard in each quadrant of the vessel. This provides a certain measure of redundancy in the event of a fire or other damage.

BILGE SYSTEM

Dozens of bilge alarms are scattered throughout the ship. Immediate response to a high alarm will prevent damage to machinery and electrical equipment, especially in the engine and pump rooms. High level alarms in voids below, or aft of a running engine, probably indicate a failed salt water line that needs immediate attention. Ask the engineer, Chief Mate, night AB, or anyone you can find to investigate as soon as possible.

Sump pumps should automatically start when a high level alarm is received. When the level has returned to normal, they should shut off automatically. You may not even notice they have come on. In these spaces, a high high alarm will sound when or if the sump pumps cannot keep up with flooding. You will also get a long running alarm if the pump is running for a sufficient length of time.

There are Bilge Holding, Separator, and Waste Oil tanks on each side of the vessel. The sump pumps discharge to the Bilge Holding tank and collects water from all deck below the upper hull. You will receive a high alarm on the Bilge Holding tank when it reaches 1.5m innage. Pump the contents to the separator tank, but not less than 1.0m to avoid getting air in the pump.

The Waste Oil tank collects bilge water from the engine rooms and purifiers. Deck drains go to the Separator tanks and can fill up quickly when it rains if the scuppers are plugged.

DRILL WATER SYSTEM

There are twelve drill water tanks onboard, two in each forward column and four in each aft column. Normally, there is one pump online. Read the pressure on the Drill Water Port window. As always, slack tanks should be avoided but realize pumps can overheat when we're not using much water due to water recirculating to the suction side of the pump. You will sometimes have to transfer drill water to ballast with very heavy or very light deck loads.

The port and starboard drill water systems can be isolated by a valve in the warehouse. This is common during Cement Jobs and when loading drill water.

When you get a call that there is insufficient pressure on the drill water system, there are a number of options available to remedy the situation. The easiest solution is to start another drill water pump. Although this is the easiest solution, it is not the preferred solution. Running an extra pump creates problems in terms of excessive pressure on the system and filling other drill water tanks. Because the recirculation valves are left open on the pumps, this opens a path where water can fill one or the other of the drill water tanks depending on which pump is pumping better. Another problem with the higher pressure associated with multiple pumps is excessive erosion of piping.

During cement jobs, it is usually better to split the drill water system. This separates half of the drill water system from the variations that are a normal part of pumping and mixing cement. This can also be done if the drilling department is doing water intensive operations like cleaning tanks.

The best, and also most difficult, solution to the problem of low pressure is to adjust the settings on one pump to restore pressure system wide. If possible, the first step should be to swap from sucking on a mostly empty tank to a full tank. Many times this will boost your system pressure by almost one bar.

There will be occasions when this does not work. If opening a fresh tank does not raise the pressure, adjust the percentage to the recirculating valve that is open. This time consuming process involves making an adjustment and then waiting 30 seconds to a minute to see the effects. Use the pulse up and pulse down controls for the valve to get better control over the valve. If a larger change is needed, give the valve an open or closed command, and then quickly hit stop. Another trick is to close the valve and then open it so the percentage is reading about 30%. That is usually in the area where you get the best results. Mostly, this will involve a great deal of trial and error before you get the settings correct.

POTABLE WATER SYSTEM

There are four potable water tanks forward, two per side. Engineers will set the pumps and valves to automatically fill the day tanks, by the use of thye SVC, and the system needs little attention from the bridge watch. Understandably, it is ok to leave some water in these tanks rather than suck sediment out of the bottom of a tank.

The vent for the potable water day tank is located in the port forward column on the 28.5m level. This vent is located at a level approximately 80% of a completely full tank. If the tank is overfilled, the excess water will start to flow onto the deck. When filling this tank, monitor the transfer to prevent flooding this space.

Part of our potable water supply is made using evaporator style water makers. There is one water maker connected to each of the main engines. A vacuum is maintained within the water maker lowering the boiling point of the water sufficiently so the exhaust from the engine will boil seawater. The steam, which is fresh water, is condensed back into liquid water to provide potable water, and the brine is pumped back into the ocean.

Most of our potable water comes from supply boats. This water must be tested prior to loading to ensure that there are no contaminants. When preparing to load potable water, make sure that the captain of the supply boat is aware that a sample is going to be necessary.

SEA WATER SYSTEM

The sea water system is used to provide cooling water for vessel systems and is a source of sea water for the fire fighting system. Sea water is supplied to the sea water ring main by the use of pumps in the pontoons. There are two sea water service pumps in each quadrant. Typically, there are two or three pumps online depending on demand.

We try to maintain the pressure on the sea water ring main between 3.2 and 4.0 bar. For normal operations with two engines running, this can be done with two pumps. One pump is kept in standby to maintain the pressure in the event of sudden demand. If the pressure is maintained over 4.0 bar, it tends to erode the piping. This is especially important at the spoolpieces where the line size is reduced.

It can be difficult to maintain the proper pressure while the Derrickman is using water in the pits. You can also expect nuisance water maker high salinity alarms. Keep an extra pump on until they are finished.

Two fire pumps are located above and outboard of Engines 1 and 6. These pumps are connected to the sea water ring main and are used to maintain pressure on the fire main. The pumps are activated by low pressure on the fire main. Due to normal pressure drop on the system, the fire pumps will start. When this happens, call the engineer to secure them. We cannot secure them from the bridge and they must be secured using the matrix panel in the ECR. If they are allowed to run for too long, the mechanical seals will fail.

The fire stations in the columns, helifuel storage, and helideck foam systems take water off the sea water service lines by bypassing the fire pumps. The moonpool deluge system uses the fire main.

BRIDGE EQUIPMENT

RADARS

There are three navigational radar antennas onboard. Two of these are X-Band (3 cm) radars and the third is an S-Band (10 cm) radar. One of the X-Band antennas and the S-Band antenna are located on the starboard forward corner of the rig while the other X-Band antenna is located on the port aft corner of the rig.

Either of the ARPA stations on the bridge can be used with any of the radar antennas. There is an electronic switch in the starboard process room that integrates the radar signals and allows the ARPA to control any antenna. Typically, we operate with the forward X-Band antenna on the forward ARPA and the after X-Band on the aft ARPA. This allows us to monitor traffic around the rig.

Due to its longer wavelength, the S-Band radar is more effective during inclement weather but is less capable at detecting small targets. It is also less accurate at measuring the bearing to a target. When operating with the S-Band radar, the forward ARPA is unable to track targets automatically. The S-Band radar is best tuned with the tuning bar all of the way to the left side. This is important to know when swapping from an X-Band antenna to the S-Band antenna.

Because of its proximity to structures on the rig, the after X-Band radar frequently suffers from degraded detection ability. The rig structures reflect the radar waves back at the antenna that eliminates some of the sensitivity of the receiver. When the radar is correctly tuned, a supply boat target is usually picked up at a range of five or six nautical miles. The radar is tuned best when the red bar is about one-third of the way from left to right. This is just a rough approximation and will have to be adjusted until targets show up clearly.

In addition to the navigational radars, we also have Doppler weather radar onboard. This antenna is located on the starboard forward corner of the rig and is used to track weather systems in the vicinity of the rig. The radar detects moisture in the air and measures the speed at which it is coming towards or moving away from the antenna. The higher the speed of the moisture, the more vivid its appearance on the screen. Weather severity is measured with light green being the least severe and magenta being the most severe.

ECDIS

The Electronic Chart Display and Information System (ECDIS) are used to integrate several systems on the bridge. The ECDIS is primarily used while underway; but, because of the nature of our operations, we use it for monitoring traffic as well.

All of the charts used by the ECDIS are digitized versions of NOAA charts. The digitizing process breaks the chart down into data bits, which can be selected, based on user preferences. These data bits are used to create layers of information that can be turned on or turned off.

One of the layers that can be added is the radar information. The ECDIS will display the radar picture from the forward X-band radar as an overlay to the chart information. This allows you to see where ships are in relation to safety fairways or other locations. Our AIS is also tied into the ECDIS. This allows radar targets to be identified easily on a single display.

We get our electronic charts from NOAA. The charts are all located on a website and are free for download. In the event that we are going to be working outside of US waters, we will have to set-up for the delivery of British Admiralty chart service. This is a service that we have to pay for so it will have to be set up and approved well in advance of our departure from the Gulf.

In case of an emergency, we maintain a disk with all of the charts in the cabinet under the chart table. This will likely contain older, uncorrected versions of all of our charts, but should be sufficiently accurate until they can be corrected.

When creating the voyage plan for transit to a new well, create a voyage plan on the ECDIS as well. The ECDIS will provide a valuable tool for planning routes, getting courses and distances, and determining distances from platforms and other navigational hazards. Once that information is calculated on the ECDIS, it can be easily transferred to the written report for approval by the Captain and Rig Manager.

RADIOS

The *Deepwater Horizon* is equipped with numerous radio systems. Many of these are VHF systems, but we also have MF, HF and UHF radios onboard. There are fixed VHF stations located on the bridge, in the ECR and in the Drill Shack. Each of the cranes also has a fixed VHF station. These stations are Sailor RT2048 VHF radios that are capable of transmitting on US and International VHF frequencies. As a part of the GMDSS system, three of the VHF stations have the ability to use Digital Selective Calling (DSC).

The GMDSS equipment is located on the bridge with a second, less capable, system located in the ECR. The station on the bridge is equipped with a MF/HF transmitter for voice and telex transmissions, Inmarsat-C and Inmarsat-B transceivers and an Inmarsat-B voice line. Two VHF-DSC radios are also located on the bridge; one on the forward console and the other on the GMDSS console.

Along the aft bulkhead is the Inmarsat-B equipment. There is a display, a keyboard and a printer. Next to the printer is the Inmarsat-B voice line. There is a log that needs to be completed by the person making the call whenever a call is received or made.

Printers for the Inmarsat-C and the MF/HF telex are located on top of the GMDSS station. The telex printer tends to spit out more paper than is necessary. We have had numerous technicians from Radio Holland out to troubleshoot the problem and none of them has been able to solve it.

WHISTLES

The *Deepwater Horizon* is equipped with four separate whistle systems. Three of these can be used for sending navigation whistle signals and the fourth is a dedicated fog signal. All three of these whistles are controlled from the CCR.

Our most used whistle is the pneumatic whistle located on top of the CCR underneath the helideck. This is the whistle that we use during drills (fire and abandonment) signals to supplement the PA/GA alarms. The control for this whistle is located at the forward end of the CCR and is directly connected to the whistle by a cable running through the overhead. There is an air isolation valve located at the base of the whistle itself that can be used to shut off the whistle in the event that it gets stuck in the on position.

The primary whistles are located on a platform underneath the forward end of the upper hull. One whistle has four elements, which give it omni-directional capability, and is air powered. The other is a single element that faces forward and is electrically powered. Because of their size, personnel need to be given warning before sounding these whistles. These whistles are connected to the automatic whistle controls located on the navigational console at the forward end of the CCR. It can be operated either individually or in tandem through a switch on the control panel. For independent operation, #1 is the air powered whistle and #2 is the electrically powered whistle.

Before operating the electric whistle, the power switch has to be in the on position. Once it has been given time to warm up, the whistle can be operated in automatic mode as a fog signal or in manual mode by pressing the button marked "At Will." The fog signal can be operated in either 1 minute signaling mode or 2 minute signaling mode depending on the requirements for the rules of the road.

Our fourth whistle is the dedicated MODU Fog Signal located on top of the BOP house. This is a "beeping" fog whistle which sounds at one minute intervals. The controls are located on the column behind the DP console. The fog signal is provided with a battery back-up that is periodically tested.

AIS

AIS (Automatic Identification System) works along the same lines as transponders used by aircraft. The unit transmits vessel specific information on a schedule, which can be used by other vessels. This transmission schedule is based on a number of variables, but the most important of them is rate of turn. The faster you are turning, the more frequently the AIS will transmit updated information. Among the information transmitted is our course and speed over ground, call sign and heading.

Our navigational status is also transmitted to other vessels. When getting underway or arriving on location ensure that the status is updated. This includes the destination information. As per the captains, the "Persons on board" section, is to read "0" to prevent the passing of vital information to potential terrorists.

The controller for the AIS is mounted on the aft bulkhead of the bridge. This controller is where the connections to the antenna, gyro #2 and interface come together. There is a small control box where the transmitted heading is displayed and can be adjusted as necessary.

The interface for the AIS is located above the STC console on the bridge. It has a touch screen and allows the operator to change the parameters to be transmitted to other vessels. The interface also allows the operator to see the information transmitted by other vessels.

The VHF antenna ,for the AIS, located on the platform mounted on the port aft corner of the helideck and is used for both transmitting and receiving data from other vessels.

Next to the VHF antenna is a GPS antenna used by the AIS to provide timing signals. This GPS antenna feeds no position information to the AIS.

Positioning information is provided by a serial connection to DGPS #2 along with Speed Over Ground (SOG) and Course Over Ground (COG) information. This connection to DGPS #2 is split off the cable for the ECDIS just outside of the cabinet for DGPS #2. Both the ECDIS and the AIS are treated as a single output by the Multifix software.

FIRE & GAS SYSTEM

The fire and gas system is independent from other systems on the vessel although it is connected to many of the systems on the rig. At the heart of the fire and gas system are two cabinets; one containing the process units connected to detectors and the other containing the control units for the emergency shut-down system. These two cabinets have a dedicated, dual network system that is tied into the SVC dual network through a network bridge. This connection allows the fire and gas system to be accessed through any of the SVC consoles.

MATRIX PANELS

These are panels hardwired to the safety networks for controlling the fire and gas system. There are three matrix panels on the rig. One is located in the CCR, one in the ECR and one in the DWS, which can each control the entire system.

The most prominent controls are the ESD (Emergency Shut Down) buttons on the right side of the panel. There is one button for each of our ESD zones. To activate an ESD flip up the protective cover and press the button. This will cause the button to light up and an audible alarm to sound on all of the matrix panels. It will also cause an audible alarm to sound on the SVC. If an ESD is activated from the SVC this will be displayed on all of the matrix panels.

Fire pumps and the foam pump can be started from the matrix panels. The foam pump can be stopped from any of the matrix panels, but the fire pumps can only be stopped from the panel in the ECR.

The silence, acknowledge and reset buttons function the same way that they do on the SVC and can be used if no SVC is available or if all of the SVCs are being used for other operations.

BRIDGE CONSOLE

SSS OS-1 is a console that is designed to be primarily used for controlling the fire and gas system. This console is located in the CCR and is hardwired to the safety network. Through the connection to the SVC network, this station can also be used as a standard SVC with all of the normal functionality.

ALARM LOGIC

There are numerous inputs to the fire and gas systems that are treated as confirmed fires. These inputs are:

- Two detectors are activated in a single zone
- Activation of a Manual Call Point
- Sprinkler System Release
- Foam System Release
- Non-acknowledge of a single alarming detector for 1 minute

The two detectors in a zone can be any combination of smoke, heat or flame detectors within the zone.

If there is a confirmed fire, the fire and gas system will send an output to the SVC to activate the general alarm and other effects. These effects can include activating ESD, closing fire doors, or activating fire fighting systems. The only fighting systems that activate will be sprinklers or foam. There are no automatic releases for the CO2 system.

OUTPUTS COMMON

Outputs common are, as the name implies, outputs from the SVC to the Acusta PA system and the emergency beacon lights. These outputs are designed to warn the crew of a dangerous system without input from the DP watchstander. As such, if the conditions for a confirmed fire or high-high level on the combustible or toxic gas detectors are met, the SVC will activate the appropriate alarms and beacons.

During normal operations, we override all Outputs Common from the SVC. This is to prevent false alarms. Where the bridge is continuously manned, we have the ability to see alarms and judge their validity before sounding alarms. This allows us to maintain that alarms not heard on Sundays are the real thing.

There are two levels of Outputs Common; one with delays and one without. The outputs with delays are designed for unmanned control rooms. If an alarm is not silenced within 1 minute of activation, the alarms will sound. These delayed outputs still require the non-delay outputs to be non-overridden for activation.

Where we typically have all of the beacons and audible alarm outputs overridden, in the event of an actual emergency, the beacons and alarms will have to manually activated by removing the overrides. This ?????????????

EMERGENCY SHUTDOWNS

The purpose of the Emergency Shutdown (ESD) System is to maintain an adequate level of safety for personnel, protect the environment against pollution and to protect the installation and its equipment. They are designed to be automatically or manually triggered in the event of an emergency on the vessel.

There are several triggers for ESD. The primary method of ESD activation is through the cause and effect matrix of the Fire and Gas system. If a fire or gas is detected, the appropriate ESD will be automatically activated for the effected spaces. For most of the spaces on the vessel this involves shutting down ventilation to and from the effected spaces. For many of the machinery spaces there will be additional ESD securing power or fuel to equipment.

Sometimes there are situations where the ESD activated through the fire and gas system are not sufficient to control the situation or conditions are different than anticipated. In that event, some ESD might have to be activated manually. If an ESD needs to be activated manually, there are several methods of activating them. All ESD can be manually activated using the matrix panels on the bridge, in the ECR, or in the Driller's Workstation.

ESD can also be activated using the SVC. This can only be done at a location that has control of Safety. Normally, Safety is controlled from the SVC on the bridge. In the event of an emergency where the bridge must be abandoned, transfer control to the ECR, or another station, to ensure that full functionality is maintained.

CAUSE AND EFFECT MATRIX

There are two sequences of events that are critical to understand within the Fire and Gas System. For every, activation, emergency shutdown, or event in the Fire and Gas system, there is a sensor detector or alarm that cause or initiates an action and/or response.

FIRE PUMPS

The fire water system provides water for protection of equipment and systems through out the rig. Two fire pumps are furnished for this purpose, with one pump located in each outboard second deck engine room. Each pump provides 100% of the maximum fire water requirement for the rig. Each pump is an end pump rated for 550 (gpm). The pumps are driven by 29.8 kw (40 hp) electric motors.

The fire water pumps take suction from the sea water ring main. The pressure in the fire water ring main is maintained by the Sea Water System. The fire pumps start upon excessive pressure drop in the fire main. The discharge of each pump is controlled by an automatic valve that is set to maintain system pressure below 150 psi. Relief valves are provided to discharge water to the hull if system pressure exceeds 175 psi.

The ring main provides several connections to hose stations on the Drilling, Main, Second and Third Decks. In addition, the fire main supplies water to fire monitor protecting the well Testing Equipment Area, Accommodations Sprinkle System, and Cellar Deck Deluge System. Hose stations on the Drilling Deck, Main Deck and at the Life Boats are 2-1/2 in. size. Each hose station consists of collapsible hose stowed on a hose rack, angle valve, 106 gpm nozzle, and spanner wrench. Hose stations in Engine Rooms are supplied with 4 ft applicators; 6 ft applicators are provided on the Helideck. All hose station is located within watertight cabinet enclosures.

FOAM SYSTEM

The foam system is used to provide fast and effective fire suppression for the helideck and helicopter fuel storage until fire teams can be mobilized to fight a fire. The system is highly automated and can be activated by a single person. Foam will be applied for approximately ten minutes before the foam supply tank will be emptied.

The helideck foam system can be activated by push buttons located on the rail of each perimeter platform. The helicopter fuel foam system can be activated by a push button located forward of the helicopter fuel tanks.

When activated, the automatic valve on the fire water supply will open. Seawater will be sent to the desired system (helideck or helicopter fuel) and will also be allowed into the foam tank. As seawater fills the tank, it compresses the rubber bladder containing the foam solution. It is this compression of the bladder that forces the foam solution out of the tank and into the fire main where it mixes to create the foam.

The rubber bladder protects the foam solution in the tank from being contaminated by the seawater. To refill the tank following use, the seawater has to be drained from the tank and the foam bladder sucked back against the wall of the tank. A vacuum is hooked to the lower drain to provide the suction on the bladder. This allows the foam solution to be poured into the tank. If the suction was not provided the foam solution would have to be pumped into the tank under pressure to force out the bladder.

To perform the monthly PM on the helideck foam system, the foam tank must be isolated from the fire water system. This is accomplished by closing the seawater inlet valves and the foam isolation valves on the aft side of the foam tank. This is designed to isolate the system to prevent the inadvertent release of foam. In addition to physically isolating the foam system, the outputs within the SVC to the ESDs need to be overridden.

To shut-off the foam pump verify that the "Start Pump" command is inhibited and then use the stop pump button on the matrix panel to stop the pump. The activation buttons on the helideck platforms and at the helicopter fuel tanks also must be reset or inhibited before trying to stop the foam pump.

SPRINKLER SYSTEM

The sprinkler system is part of our automatic fire protection for the accommodations. The sprinklers are all of a fusible link style. This means that for most situations, only a single sprinkler should activate. It also means that the activation of the sprinkler system due to a fire will not cause water damage or extensive flooding in spaces other than the space with the fire.

Water for the sprinkler system is provided from the sprinkler tank located on the starboard forward 28.5 meter level. The ?????????

CALL BOXES

There are two types of emergency call boxes on the vessel. The most common type are of the break glass to activate type. These are located in spaces throughout the vessel and send an activation signal to the SVC. Each of them is assigned a tag number for identification within the fire & gas system. When activated, an audible alarm will be sounded on the SVC and an indication of the location will be displayed in the messages section with the tag number and a description of the location.

The round, push button type call boxes are tied directly to the Acusta system. This allows them to trigger the General Alarm bypassing any overrides that might be in place through the SVC. These call boxes are located in important spaces around the vessel. There are three on the bridge; one next to each outside hatch, and one on the forward console. One is located in the ECR. Another is located in the Toolpusher's office with the sixth in the Driller's Workstation.

When one of the push button call boxes is activated, the General Alarm will sound. The red beacons associated with the General Alarm will only be activated if they are not overridden in Outputs Common.

One difficulty with the push button call boxes is the fact that no indication will be given about the origin of the alarm. Because they are not tied into the SVC, they are not assigned a tag number or provided with an input. During crew training, emphasize the fact that if someone activates one of the push button call boxes they must call the bridge and inform the watchstanders of the nature of the emergency and the location.

WATCHSTANDING PRACTICES

BRIDGE TEAM MANAGEMENT

Although the *Deepwater Horizon* is not a traditional merchant vessel, watches are run as they would on most deep sea ships. We maintain a radar and weather lookout in addition to maintaining the DP watch. The addition of ballasting and monitoring engineering systems adds additional burdens that emphasize the need for cooperation between watch-standers.

Our Bridge Team Management procedures are designed to:

- Eliminate the risk that an error on the part of one person may result in a disastrous situation
- Emphasize the necessity to maintain a good visual lookout and to carry out collision avoidance routines
- Monitor wind, seas and current to anticipate thruster and generator requirements

Bridge Team Management is more than just a concept. It is the implementation of ways of working that recognizes that reliable and consistent standards can only be maintained when they are based on sound principles and reinforced by effective organization. All members of the team have a part to play in this. The title "Team Management" understates the interaction required within the team for such a system to work. It does not refer to an act of management by one person but a continuous adaptation of all of the team members to fulfill the roles that they have been assigned.

Responsibility for the watch rests with the Sr. DPO. They are responsible for ensuring the safe operation of the vessel. This responsibility means that they will be relying on their watch partners to provide information about current status and any changes that might occur. As the responsible watchstander, the Sr. DPO is legally responsible for everything that occurs. The exception to this is while the vessel is underway and the Sr. DPO does not have a marine license. In that situation, the mate on watch with the highest license will be responsible for safe navigation and collision avoidance.

The Sr. DPO is also responsible for maintaining the smooth log and ensuring that all paperwork is completed correctly and in a timely fashion.

It is important to maintain professionalism on the bridge at all times. We need to be professional in our dealings with other vessels and other departments on the rig, which makes all of our jobs easier and more efficient. Remember that you will be held responsible for information given to other departments. This refers to information given to another department, decisions which are made, or logged data. Ensure that the rationale for what was done and why it was done are logged and in accordance with our governing policies.

When you need information always start by asking your watch partner. It shows a lack of awareness if you call asking someone for information that was just relayed to the bridge ten minutes ago. Frequently your watch partner will know the answer to the question that you are asking.

If reading or studying is to be done during the watch, DP or marine reference materials are the only acceptable form of material. Many visitors will appear on the bridge at all hours of the day. Reading non-industry related material will lead to a perception of unawareness and is unacceptable. This also holds true for material on the bridge computer. When non-bridge personnel are on the bridge, you should not be doing non-bridge related computer work.

If studying for a license upgrade, the on watch time devoted to this should be limited. Most of your studying should be done off watch. If you would like to study while on watch, ensure that all of your other work is completed and get the prior approval of the Sr. DPO.

STANDING ORDERS

Like most merchant ships, the *Deepwater Horizon* has Master's Standing Orders, which must be signed by all DP watchstanders when first reporting to the vessel. These standing orders include information about bridge operations and provide expectations about when the Captain must be called. These are often enhanced through verbal instructions about other times the Master expects to be called.

If you are calling the Captain in an emergency, make sure that you are calling the Captain with enough time for them to do something whenever possible.

When arriving on the vessel each hitch, review the standing orders binder and verify that there have been no changes in the standing orders since you departed the vessel. Sign and date any new orders that are placed in the binder.

COMMUNICATION

Communication is a very important part of your job on the bridge. We are often the first point of contact for venders, auditors or inspectors. Because this first impression is very important, always be very professional on the phone, radio or in person.

Do not call our vendors without first clearing it with the Captain, Chief Mate or the supervisor that is responsible for that piece of equipment. For the vendors of our DP equipment, the Electrical Supervisor will usually be the one making the phone call to a vendor or technical support. Our responsibility for the equipment does not usually extend to that level, and you will be violating the proper chain of command by just picking up the phone and calling someone.

Remember that this is a professional environment. Your communication with your co-workers and other departments should reflect this.

Keep pages on the PA system professional. Although you might hear other departments making obscene noises in the background or using cutesy nicknames, avoid the temptation. Pages that you make are heard by everyone on the vessel. This includes the clients and your supervisors. Unprofessionalism on the PA system reflects poorly on the marine department as a whole and you as an individual.

PHONES

Phones are the primary form of communication within the rig. There are well over 150 phone locations spread throughout the rig. It has been said that there is nowhere on the rig where you are more that 50 feet from a phone.

Phone #124, which is located at the navigational console on the bridge, is the emergency number that is posted on all of the phones throughout the vessel. Occasionally you will hear people make pages mistakenly asking for people to call that number because is listed on every phone. This sometimes causes people to mistake it for the phone number of the phone they are at.

Always answer the phone with "Bridge (or Control Room) this is <insert name>" as a courtesy to the person calling. Find out whom you are talking to on the phone. This will help you when someone asks, "Who told you that?"

When communicating with other departments on the telephone use clear communication and come to the point. Courtesy is expected at all times, but do not tie up the phone with idle chit chat. Our phones up here are part of the emergency response for the vessel and shouldn't be tied up needlessly.

After 1800, the phone near the computer (200) becomes the default phone for people that do not know what extension to enter. When answering the phone for an outside phone call, make sure to include the vessel name in addition to your name when you answer the phone. There are many people that do not know whom they are calling and putting the vessel name in your answer solves some of their dilemmas, but not all. There are still many calls that come in where people are very surprised to be talking to someone who is not on land. There are also a large number of people that call out here not knowing who they are looking for. It is one of the joys of caller ID. They have the phone number but no clue who called.

During emergencies, ignore the outside phone calls. If it truly important that they are answered, the Captain or Sr. DPO will assign someone without other duties to answer the phones.

RADIOS

All DP operators on the *Deepwater Horizon* are required to have their flag state radio license. As licensed radio operators you are expected to communicate on the radios following the guidelines set by the FCC and ITU including language, channel use and hailing procedure.

When calling other vessels always give the name of the vessel being called first. Do not fall into the Gulf of Mexico habit of giving your own vessel's name first. This shows poor procedure and sounds unprofessional to deep sea vessels transiting the area.

When communicating with other vessels be brief and courteous and remember to follow the regulations regarding radio communication procedures and avoid being a "Chatty-Kathy" on the radio. Idle conversation with other vessels on the radio averts attention from the DP panel and can interrupt the focus of your watch partner.

LOGBOOKS

There are two types of logbooks that we use on the *Deepwater Horizon*; the smooth log and the rough log. Old smooth log books are stored in the captain's office and old rough logs are stored on the bridge.

The smooth log is an official log as defined by the Coast Guard. As such, it can be used as evidence in court proceedings. The Sr. DPO is responsible for maintaining the smooth log and ensuring its accuracy. The smooth log is used to track major operations, inspections, and drills which occur on the vessel.

At the change of the watch and at midnight, an entry needs to be made which details the current status of the vessel. This includes a description of the weather, visibility, rig operations, and navigation lights. As an example this entry could read:

> **0000 VESSEL IN AUTO DP IN AN EASTERLY MODERATE BREEZE AND SLIGHT SEAS WITH GOOD VISIBILITY. TWO GENERATORS AND FOUR THRUSTERS ONLINE WHILE TRIPPING IN THE HOLE ON THE DRILL FLOOR. LIGHTS FOR A VESSEL RESTRICTED IN ABILITY TO MANEUVER, OBSTRUCTION LIGHTS, AND PERIMETER LIGHTS ENERGIZED AND BURNING BRIGHTLY. SR. DPO J. BLOW ASSUMES THE WATCH.**

This entry can be personalized to a limited extent, but must still have all of the required information.

When filling out the weather portion of your entry, ensure that you match the weather that has been entered by the incoming watchstander. If there is any question about the weather conditions, which are going to be logged, discuss it before entering it in the logbook. This is a legal document and the weather conditions are often a vital question in the event of an accident. If two different versions are logged it will raise doubts about the remainder of the entries.

Equipment tests, inspections, and drills must be logged in red ink. It is also logged in red whenever control of machinery and propulsion are transferred between the ECR and the Bridge.

All watchstanders are responsible for maintaining the rough log. The rough log is used for tracking all vessel operations. Any occurrence should be logged if it involves operations. This includes starting or stopping thrusters, internal bulk transfers, boat operations and changes to the DP system.

Each day should have its own page in the rough log. If there are, more entries than can fit on a single page continue onto a new page, but always start a new page with the beginning of each day regardless of the amount of blank space at the bottom of a page. Regardless of what you may have previously learned, we do not draw a line through the blank space and make a notation for *no further entries*.

The oncoming watchstander is responsible for logging the weather in the smooth log when they come on watch. Even if operations prevent the weather from being written in the book right at the change of the watch, you should note the conditions on a piece of scratch paper or keep the NOAA weather observation sheet so it can be entered when operations calm down.

Navigation Lights

Throughout the maritime industry, there is a raging debate; is a DP drilling vessel making way or not? That is the main question that determines the navigation lights that we show.

There really is not any question that we are underway: we are not at anchor (we don't even have one), we are not aground, and we are not made fast to the shore (if the thrusters are turned off the riser will not hold us on location).

Our interpretation of the rules is that we are not making way. This interpretation allows for the least amount of confusion with other vessels. As a power-driven vessel, Restricted in Ability to Maneuver, not making way, we only show red-white-red on the forward and aft sides of the derrick while the BOP is connected, but no sidelights or masthead lights. We supplement the RAM lights with the obstruction lights for a MODU operating on the US continental shelf.

Once we are disconnected, we show sidelights and masthead lights with the obstruction lights extinguished. When the BOP is recovered and we have no more equipment suspended beneath the vessel, we are no longer restricted in our maneuverability and the RAM lights must be extinguished.

The control panel for our navigation lights is located on the forward console outboard of the ECDIS. There are switches for each of the navigation lights except for the obstruction lights. The RAM lights on the derrick and the anchor lights are simple on-off switches while the other lights can be toggled to different filaments.

Each of the sidelights, masthead lights and the stern light have upper and lower filaments to provide redundancy. The A light is the upper filament. To make maintenance easier, we try to use the upper filament whenever possible because of its easier accessibility within the light fixture. The RAM lights are simply light bulbs in fixtures that have no back-up.

An audible alarm notifies the watchstander when a light has been extinguished. he silence button is located at the bottom of the panel. Most of the time this is due to a burned out bulb or filament, but it can also be due to a blown fuse within the control panel. Test the fuse for the alarming light with a known good fuse before sending an electrician up the derrick to change a light that might not be burned out. When underway at night, the lights on the panel can be dimmed using a dimmer switch on the lower left corner of the panel.

The RAM lights are located on the forward and aft side of the derrick about halfway up the tapered section. They are accessed by ladders that run up the forward and aft sides of the derrick. The upper masthead light is located directly under the platform that spans the face of the derrick at the bottom of the tapered section, while the lower masthead light is located on the flag pole (foremast) forward of the pipe deck. At the forward corners of the main deck are white enclosures for the sidelights.

RADAR WATCH

Maintaining a proper radar watch is important for ensuring the safety of the vessel while on location and underway. Typically, we operate the radars on a 12 mile range. This allows us to see traffic with enough time to allow them to take early corrective action.

Enabling the target trails feature allows the watchstanders to see what a target is doing without initiating a track. With trails enabled, each target will show a "wake" allowing the operator to determine the targets relative course and speed. This reduces the workload by allowing the watchstander to focus on vessels approaching the rig.

The effectiveness of the radar is largely determined through tuning the radar. If the radar is not tuned correctly, it will be less likely to detect targets at longer ranges. When adjusting the tuning of the radar, make small adjustments and observe the changes. This works best if you have a target on the radar to see the results. When you get the strongest return off the target, the radar is tuned properly.

Gain and weather settings are also important for detecting targets. If the gain is too low or the weather filters are set too high, targets will not register on the screen. When adjusting the gain, set all of the weather filters to zero and increase the gain to its maximum setting (9). Decrease the gain setting until there is little or no backscatter off the derrick. This is noticeable if you have a large vessel within 6 miles of the rig. If the gain is set too high, the target will "spread out" in a ring. Once the gain is set correctly, put the sea clutter filter in auto. If there is still rain clutter on the screen increase the rain filter until you just get "sparkles" of rain on the screen or truly heavy rain. There should always be a small amount of sea clutter on the screen. This ensures that legitimate targets are not being filtered out.

BRIDGE OPERATIONS

BALLASTING

Never ballast without knowing why you are ballasting. Without all of the information, you could make an existing situation worse. There could be flooding or a sea water line could have ruptured. In this situation, you are blindly correcting for a change in trim rather than finding and correcting what is causing the change in trim.

A good rule of thumb when ballasting is "raise the rub." The pipe hanging in the derrick basically is a giant pendulum. By pumping out on the side where the rub is occurring, you are moving the top of the derrick away from the rub and the pipe must follow. Typically, we are a little down by the starboard bow to keep the pipe centered in the hole. This is important to remember because the drill floor will call and ask you to level the rig up. What they are really wanting is the pipe centered in the hole.

Because the rig is square, ballasting is simpler than on a ship shaped hull. Our trim can be easily adjusted while not changing our draft. The rate we flood ballast tanks basically is the same as the rate at which we pump out of a ballast tank. This means that if you need to bring the starboard side of the rig down you can pump out of a tank on the port side and flood into the tank opposite it on the starboard side to change the trim without changing our draft. This is very important when the rig floor is performing depth critical operations like cementing or testing BOPs.

There are many conditions where we cannot ballast without permission from the rig floor. The most important of these is during well control problems. When the rig floor is looking for a kick, changes in the trim of the rig will alter their trip tank readings and give false indications. Following a cement job the rig floor will usually request that we not ballast. You will want to verify this request. Usually they want us to keep the rig level without changing our draft. If they really want us not to ballast make sure that you get the name of the toolpusher who makes the request.

When getting ready to land out the casing call the rig floor and find out the wet weight of the casing to be landed out. The wet weight of the casing is the weight of the casing minus the buoyancy created by the casing displacing the mud. By knowing this number, you can pre-calculate the amount the draft will change by. If the drill floor approves you can add ballast to account for that weight loss before the casing is landed. Only do that with the express approval of the toolpusher. If you ballast down in anticipation of landing the casing and they are very close to the bottom, you could land out the casing early and cause damage. Usually we wait until the casing has been landed out and then ballast back down to drilling draft after getting permission from the toolpusher.

Most of the time we have a change in trim it will be due to crane movement. We are unable to ballast fast enough to compensate for swinging cranes as they move. The best policy is to determine what will keep us level for the most time. If the crane is swung out over the supply boat alongside for ten minutes and over our deck for two, ballast for the hook being over the supply boat. Often, the drill floor will call asking you to correct problems trim which were caused by the crane. Politely let them know that it is a crane and when the crane swings everything will be fixed. Be aware that if the crane is loading heavy lifts like casing and putting them in one section of the deck you will have to ballast to compensate for that added weight. The crane operators are supposed to call us before moving the gantry crane, but they do not always seem to remember.

Another cause of unexplained trim changes are transfers of liquid from one tank to another. The pumphand will usually make an announcement before moving mud between the columns and the pits, but if they are busy it won't always happen. It doesn't take much 16 pound liquid mud to change your trim. The engineers will also transfer water between the drill water tanks and fuel without calling the bridge first.

When planning your ballasting, ensure that you leave only one slack tank in each quadrant to prevent excessive free surface. Open up the quadrant view and check the levels of the tanks you are planning on using. Frequently a tank will look empty or full on the main screen but still be slack. This is especially true when pumping out tanks. We can usually get ballast tanks down to 0.5 meters with the main ballast pumps.

To pump out ballast, line up the desired tank to the discharge side of the ballast and open the overboard discharge. When all of the valves are open, start the pump and open the discharge valve for the ballast pump. This will prevent you from putting too large a load on the pump as you start it. If you start the pump with the discharge valve open the pump tries to accelerate all of the water in the system, not just the water within the impellor. That puts a great deal of strain on the bolts that attach the impellor to the drive shaft of the pump that will eventually fail.

Never start the pump without the suction valve open and either a tank or a sea chest lined up to the pump. If the pump is running without a supply of water, the pump will overheat and damage the seals and eventually the motor of the pump.

Always flood the tank from a sea chest and never fill a tank using a ballast pump. The vents are not designed with a capacity for pumping water into the tank. To fill a ballast tank line up the tank to be filled to the sea chest.

When you get the high alarm while filling the tank, leave the tank lined up for at least one minute to ensure that the tank is truly full and water has filled up into the vent line. This will eliminate the possibility of free surface in the tank. Ballast tanks 15S and 15P will give high alarms while there is still a meter of air in the tank so make sure that they are full before switching to another tank.

STABILITY

We are responsible for maintaining the vessel in a stable condition at all times. As a part of this responsibility, we calculate the stability on a nightly basis. The Sr. DPO working the noon to midnight watch is responsible for making sure that it is completed.

Stability is calculated using Ocean Motions software customized for use with this vessel. This software is installed on the computer mounted inside a Kongsberg cabinet. This computer is set up to communicate with the SVCs, which allow the ballast, fuel, and water tanks to be automatically gauged. The mud and bulk tanks are not automatically gauged so their values will have to be entered from daily reports.

When starting a new day's stability report, create a new report based on the previous day's report, do not create a new sl.2 file. A new sl.2 file is created if you use the "new file" command in the drop down menu. Instead, click on the load icon (kind of looks like a snow covered mountain), and click on the box that says new. Ensure that the previous day is highlighted before clicking on this; otherwise, you will just end up making a copy of the report at the top of the list.

When naming the new report, make sure that both the month and the day are two digits (i.e. 2006/05/06). This will make sure that the reports stay in the correct order when they are automatically sorted by the program.

Periodically, the Sr. DPO, or their designee, will have to go out on deck and get a new deck survey. This should be done at a minimum of once per week. It should also be done if there have been large changes in the deck load following the arrival or departure of a supply boat. Print out the previous day's deck load and use that as a basis for the new deck survey. Many of the items will remain the same; this will save you some writing.

The deck is broken up into zones to make entering the data easier. There are thirty-eight zones on the main deck. Twenty-five of them are forward and 13 of them are aft. Weights entered into each zone are assumed to be at the geographic center of the zone unless the exact position is entered. For the weights that we are dealing with, this is accurate enough. When entering the items into the report, enter the weight in pounds and metric tons (2204.6 lbs/mt). Most of the items on deck have a weight sticker with the weight in pounds, but the program uses metric tons. By placing both numbers for each item, this reduces the workload for later use. Try to enter the weight of an individual piece if possible. Sometimes the quantity of an item will change and having individual item weights allows adjustments to be made easily.

When the deck survey is completed, start a new deck report and gauge the tanks. This will ensure that the tank readings are for the same conditions as your deck survey. Also, make sure that you have the setback for the time that you did your deck survey. This will minimize errors due to time differences.

Each night when you have finished the stability report, the variable deck load (VDL) needs to be calculated. There is a spreadsheet on the desktop of the stability computer, but the formula is also printed on the keyboard cover of the stability computer. The formula is...

VDL = Displacement - Lightship - Ballast - Drill Water - Potable Water - Fuel - Upper Hull Liquids - Bilge Drain Tanks

The vessel is limited to the amount of VDL that it can carry. At drilling draft, this limit is 8202 metric tons and 7839 at transit draft. These values are in the Operations Manual for the vessel and can not be exceeded. Often when getting ready for a rig move, they will want to load up the rig in anticipation of the next well. Beware that loading large volumes of water based mud, which often has a weight of approximately 16 pounds per gallon, can carry you over that limit. Especially when you consider that for the rig move, you will have the riser on deck which will count against your VDL.

Bulk Transfers

Bulk transfers are one of the most common operations that we conduct as a bridge team. We are responsible for loading product from the boats, ensuring that the day tanks are filled and pumping product back to the boats if necessary. Bulk products typically means cement and barite, but on occasion can mean gel.

The main bulk tanks are located in the four columns. There are two tanks in each column with their bottoms on the 24 meter level. The system is segregated so that the cement tanks are in the starboard columns and the barite tanks are in the port columns. Both sets of day tanks are located in the Cement Room.

There are electronic gauges on the tanks, but these tend to be inaccurate. Because of this, the tanks need to be sounded when there are changes in the tank level. The tanks are sounded through the sounding port at the top of the tank. The tables include the nine inches of the sounding tube, so leave that in your readings. When there are changes in the quantity of bulk on board, the Mud Engineer or Cementer are going to want a printed report for their records. We also print a copy of the bulk report every day to put in the well binder.

We have an Excel spreadsheet that we use to calculate the tank levels and usage. This program is fairly simple to use. Just type in the sounding into the block and the program will automatically calculate the volume within the tank. It also uses formulas to calculate the amount used or received.

Because these formulas have to make some assumptions to work, there are some conditions that will give strange and inaccurate results. If you are using out of the day tanks and load product from a boat directly into the day tank, it will give you an inaccurate result. The program assumes that if the amount in the bulk tank drops and the amount in the day tanks increase, then the bulk was transferred from the bulk tank to the day tank. If there is some doubt, the amount yesterday compared with the amount today can usually allow the answer to be determined.

There is a button on the controls for "End Transfer." This button will allow you to empty and fill a tank and keep track of them separately.

Supply Boat Operations

Coordinating supply boat operations is another one of those important tasks that we do on a regular basis. Although there are several departments that deal with supply boats, we are responsible for coordinating the different departments. This requires the watchstanders to know what the priorities of the client, the drill floor, and the deck department are. Sometimes those priorities can be conflicting and it is our job to serve as mediators to develop a plan.

When a boat leaves the dock, the dispatcher should give the bridge an ETA and send up a copy of the manifest. Print out a copy of the manifest and put it on the clipboard by the chief mate's desk. Before hanging it up, review the manifest for hazardous cargo (radioactive or explosives) which has special storage or reporting procedures. Make sure that the deckpusher knows what time the boat is expected.

When the boat calls when getting close to the vessel, update the deckpusher with the actual arrival time and determine where they want the boat.

If an upcoming operation requires a specific side of the rig, work this out with the deckpusher before the boat arrives. Develop a game plan that looks as far into the future as possible so when people call and ask, the answer is available without having to call a bunch of different people. Take into account upcoming weather that might effect boat operations. If you know that a boat is coming with heavy lifts and there is heavy weather coming, it might be better to get the heavy lifts off when the seas are calmer and delay the bulk. Make sure to communicate the plan with the boat. They might have limitations that we are unaware of. These limitations could include stability limitations, manifolds being blocked by cargo or company specific guidelines.

Boats arriving on location are required to test their steering and propulsion prior to coming alongside. The results of these tests should be logged in the smooth log when the boat comes alongside for the first time each visit. Boats that are coming to the rig for the first time or with an unproven DP system must be tied up for transfers involving products that are hazardous or when a spill would have to be reported. The captain will make the decision as to when a boat has proved itself reliable enough for DP transfers.

When preparing to load bulk from a boat alongside, do not line up the system on the rig side until the boat has confirmed that the hose is hooked up and they are ready to transfer. This will prevent a possible incident where pressure in our lines causes the hose to jump or a release of product while they are hooking up the hose.

Underway Watchkeeping

The nature of watchstanding changes while underway. We go from being a stationary vessel that everyone else has to avoid to being a vessel making way. This significantly changes our rights and responsibilities under the Rules of the Road.

Traffic avoidance is the most important job while underway. Many vessels do not realize that we are making way, and maneuver as if we were stationary. This means that communication with other vessels should be conducted early to allow us or the other vessel to make a small change to pass safely. With our slow speed, we tend to maintain our course while other vessels make the necessary changes, but this does not always happen.

The vessel's position must be plotted a minimum of once per hour while underway. When operating in shallow or restricted waters, this frequency will be increased, but for most transits, once an hour is sufficient. Our position, course and speed over ground, and distance to go are recorded in a notebook for quick reference. Use the plotted position to determine the course to steer that will maintain the intended track.

Transocean requires a noon position report from the vessel while underway. There is a noon slip saved on the computer for this. The rig floor will call and ask for the position at midnight because this is the number that is logged in the IADC logbook.

Once we have left location, the RAM (Restricted in Ability to Maneuver) lights must be extinguished. The masthead lights, sidelights and stern light must be lit between sunset and sunrise.

ROV Operations

Our ROV is located on the starboard forward corner of the vessel. The cursor runs down the inboard side of the starboard pontoon at thruster #1. The cursor consists of two wires that guide the ROV into the water and back into the storage position.

Because the cursor for the ROV runs alongside thruster #1, the thruster must be secured before the ROV is launched or recovered. This will prevent the suction or wash from the thruster from damaging the ROV or cage. When the ROV calls to have you shut off thruster #1 for launching, never tell them explicitly that thruster the thruster is off. Tell them instead that you have secured the thruster long enough for them to get past. If they "know" that the thruster is not running when they launch, they might not call you when it is time to recover. There is always a chance that we will have started the thruster while they were on bottom. If we allow them to think that the thruster is always running they are more likely to call before moving past the thruster. There have been some exciting moments when the ROV has assumed that the thruster was still not running and gone past the thruster and seen the spinning blades.

When the ROV dives, their video feed will be transmitted on CCTV camera 30 or 31. They have two channels to choose from and it changes periodically. When the ROV is in the water, have their video feed displayed on one of the bridge monitors that you can see from the DP desk. This will allow the DP watchstander to monitor their operation and coordinate our efforts.

The ROV performs an inspection of the riser every other day. This allows them to verify that we have no leaks or damage to the riser. They also inspect and perform maintenance on the BOP and LMRP while it is connected to the wellhead.

We coordinate with the ROV and drill floor during spud-in and landing out the BOP stack. All parties involved, in this operation, will communicate on the same VHF channel.

While landing out the BOP or latching up the LMRP following disconnect, the ROV will give us steering directions to position the subsea equipment correctly. The ROV will line up the move using their onboard compass and communicate the move in terms of range and bearing to be moved. The compass on the ROV is a flux-gate compass; it is affected by the steel of the BOP or riser. The ROV will back away to line up the move in order to escape the magnetic influence. The ROV coordinate with the rig floor about lowering or raising the BOP or LMRP to prevent damage to the landing surfaces.

Oceaneering has established that they are able to give directions accurately. Often, while you are watching on the monitor you might not agree with the operators directions, but do not question them over the radio. There are times when the move they are making is due to the request of a client rep in their control van rather than what the ROV operator wants to do.

LIFEBOAT OPERATIONS

There are four lifeboats onboard the vessel. Two are located forward, and the other two are located aft. Lifeboat #2 is the designated rescue boat, which lowers faster and has the double doors at the stern for rescue work.

The lifeboats are to be launched and recovered every 90 days as part of Coast Guard requirements. During launching, numerous systems need to be tested. Some of those tests include: The deluge system, steering, propulsion in ahead and astern, and the batteries. Once you have pulled away from the rig, reset the hooks. Have the boat crew visually verify that the hooks are in the locked position and the green line on the hook is horizontal. When the hooks are reset, the remainder of the tests can be completed. When the deluge system is engaged, the throttle must be in neutral to prevent damage to the engine or the deluge pump.

When preparing to return to the rig, re-verify that the hooks are locked in the closed position. The coxswain must visually inspect each hook. There have been numerous instances of hooks coming open once the boat is lifted out of the water. This often leads to serious injury for the boat's crew and sometimes deaths.

The lifeboat steering system is controlled by a steering wheel connected to the rudder by a cable linkage. The cable in lifeboat #3 tends to be "stickier" than the others. There have been occasions when the cable has broken from the strain placed on it while making rudder movements. If this happens, have the ABs disconnect the hydraulics and rig up the tiller. Before launching lifeboat #3, ensure that you are familiar with this process.

As the coxswain of the lifeboat, the decision on how to maneuver the lifeboat falls is up to you, but here are some tips that have been learned over the years. The easiest approach to the falls is to go between the forward and aft columns on the side to be retrieved. There is plenty of space between the columns and the tensioners to stay well clear and still make a straight approach toward the falls. Line up the boat so you are passing as close to the falls as possible. If you can brush them with the side, that is ideal. Do not take the falls directly over the boat because they can hang up on the deluge system and damage the piping. Go slow because these boats don't have much backing power.

Lowering lifeboats is one of the most dangerous things that we do on the rig. Always double and triple check the safety equipment in the boat prior to lowering or raising. It cannot be emphasize enough how dangerous it is raising or lowering lifeboats, or how serious the consequences are if something goes wrong

WEATHER RECORDING AND REPORTING

Weather is recorded in the smooth log a minimum of every six hours by the incoming watchstander. The direction of wind and seas are logged in cardinal directions (N, NW, and NxW) for the direction they are coming from. Current direction is logged in degree form (000°-360°) and is logged as direction toward. Temperatures are recorded in Celsius and entered into the logbook to one decimal place (tenths of a degree). The current's speed is entered to two decimal places (hundredth of a knot).

When winds are over 35 knots, the weather conditions are logged every three hours. If sustained winds exceed 45 knots, the weather is to be logged hourly. If vessel operations are being effected by weather, the weather should be logged more frequently. This could include conditions when a supply boat is unable to work alongside due to weather, or if drilling operations such as running riser or casing are suspended due to weather.

We are a voluntary participant in the National Oceanic and Atmospheric Administration's (NOAA) weather reporting system. As a participant in this system, we try to send weather observations to NOAA at least every six hours. We also send copies of those observations to our weather forecast providers. By sending these observations in, we increase the accuracy of future forecasts we receive. This is especially important during hurricane season when accurate forecasts are vital to a timely transit out of the path of an oncoming storm.

Weather can be coded for transmission using either the AMVER/SEAS software on the computer or by using the reference books from NOAA. The coded weather must be received by NOAA within ten minutes of the top of the hour or it is unusable.

We have a NOAA supplied barograph on the chart table. NOAA provides all of the supplies and in return expects us to send in the recordings periodically. There is a manila envelope in the cabinet of the chart table for mailing in the recordings. New envelopes for mailing in the recordings are in the Administration drawer of the filing cabinets. Verify that all of the information has been filled in prior to placing the recording in the envelope; this includes the position of the vessel at 1200 GMT across the top of the recording.

We are also expected to send in a hard copy of our observations. If you use the AMVER/SEAS software, an electronic archive is updated when an entry is made. This archive has to be copied onto a floppy disk and placed in the envelope with the barograph recordings. If you code manually, fill out the Marine Observations book and place these sheets in the envelope. We try to send in recordings and weather observation data at least once a quarter.

Helicopter Operations

Unlike many rigs, the bridge is the communication point for helicopter operations. We are the ones that coordinate with the HLO and the helicopter.

The helicopter radio is located in the chart room on the bridge. The frequency and volume level should be checked prior to coming on watch. When the helicopter calls for its twenty minute ETA, make a page to inform the HLO and helicopter teams that a helicopter is inbound. When the pilot makes that initial call they will sometimes want weather data, inbound passengers and weights or other information. Make sure that you have that information available. The pilots will also usually request meals. As a courtesy, even if they don't ask, have meals ready to be taken up when they land. Call the galley at 215 to verify that meals will be brought up to the bridge.

On occasion, we will be asked to assist the HLO with helicopter operations. Generally this involves running the scissor lift or other less critical jobs. Sometimes though, we are asked to serve as a part of the fire team or help with fuel or baggage. If you aren't familiar with those operations, make sure that you go over the job and its responsibilities before the helicopter lands.

Once the helicopter is on the deck, heading changes should not be done. If a heading change must be done while a helicopter is on deck, communicate with the pilot and ensure that the heading change will not create a dangerous situation with the helicopter.

FIRE AND EMERGENCY DRILLS

Fire and emergency drills are typically held on Sunday mornings. These drills are required by the HS&E manual. For the drills, the Sr. DPO will take over the DP operation while the DPO on watch will coordinate the response from the bridge. This typically involves communicating with the Chief Mate by VHF radio and getting answers from the personnel on the bridge or in other spaces. The DPO is also responsible for maintaining a log with the times and events for the drill. There is a form on the bridge computer that is printed out to give a framework for logging.

Off-tour watch personnel go to the lifeboats and are in charge of operations there. The Assistant Drillers (AD) are responsible for taking the muster and communicating with the bridge. This frees up the Sr. DPO and DPO to conduct training and oversee the lowering and raising of the lifeboats. The DPOs are responsible for maintaining order at the lifeboats. Side conversations should be kept to a minimum and personnel at the lifeboats should not be leaning on the handrails watching the fish around the columns.

The DPOs are responsible for ensuring that the training is conducted at the lifeboats during the drills. There is a schedule of lectures to ensure that we cover all of the topics required by Transocean. This schedule is posted above the Chief Mate's desk and can also be found on the public drive. The training lectures are kept in the file cabinets on the bridge. These lectures are provided to ensure a consistency of the information that is provided to the rig personnel. Due to the large amount of background noise, especially at the aft lifeboats, the megaphone should be used for all lectures and announcements. The megaphone is kept in the cabinet below the chart table.

Drills should be run as actual emergencies. Idle chit-chat should be kept to a minimum so clear communication between personnel can be accomplished. Although this is the ideal, the actual conditions during the Sunday drills usually have non-bridge personnel having numerous side conversations which have nothing to do with rig operations. These should not distract the watchstanders from their duties.

The night before the drills, sign should be put up to remind the crew of the upcoming drill so they can plan accordingly. The signs are magnetic and need to be placed in the mess room, the ladder way down to the accommodations and the door to the smoke shop. The drill signs are kept in a file cabinet on the bridge.

CONFINED SPACE ENTRIES

Confined spaces are defined as a tank, mud pit, tunnel or similar where there is a danger, lack of oxygen or the presence of toxic gases. All spaces that are not normally lit, ventilated and not normally manned are also considered confined spaces.

A Permit to Work must be completed for any confined space or tank entry and a copy must be posted outside the area to be entered. The work permit must also be logged in the work permit log outside of the Coffee Shop (Smoke Shack). If the confined space entry concerns marine equipment or marine personnel, the Captain should be given the opportunity to review the work permit before it is taken to the OIM for his signature.

Any personnel entering confined space must be trained in the hazards of confined space entry and use the equipment that must be utilized.

Responsible persons and the Emergency Response Teams must be trained and exercised in the proper use of the installation or facility-specific confined space rescue and retrieval equipment.

A stand-by person must be assigned and clearly identifiable for any confined space entry also must not have any other duties. The standby person must also have a radio and be in contact with the bridge. This will allow them to call when someone enters or leaves the confined space.

Only personnel who have satisfactorily completed Transocean's confined space awareness training will be authorized by the OIM to be assigned as a stand-by person.

The following equipment must be available for confined space entries:

<u>For work within confined space</u>:

- A portable gas detector capable of continuously monitoring the oxygen the oxygen content, H2S content and lower Explosive Limit complete with accessories to allow remote detection.
- An explosion-proof air exhaust fan.
- A minimum of two explosion-proof portable lights.
- Explosion-proof radio communication set.
- Appropriate warning signs and barricades

<u>For vertical confined space entry over 6 feet 7 inches (2 meters):</u>

- A portable tripod with a combined fall arrestor/retrieving winch or similar system
- One Company approved full body harness per person.

<u>For rescue within confined space:</u>

- One 30-minute Self-Contained Breathing Apparatus (SCBA) per rescue team member.
- A stretcher that allows rescue of an injured person.

VENTILATION OF CONFINED SPACES

Before completely removing the fastening devices on a confined space, the internal pressure must be checked and vented; also, the atmosphere in the confined space must be changed out three complete times and sampled for oxygen levels and combustible gas using a portable gas detector. If levels of toxic, inert or combustible gases or oxygen levels are detected that present dangerous hazardous conditions, the area must not be entered until measures have been taken to render the space safe.

The ETs are responsible for ensuring that all of the gas detectors are maintained and calibrated. The gas detectors are stored on the bridge and should only be issued to personnel that have been trained in their use. Typically all of the DP Operators, Chief Mate, the Bosun' and the ABs have been trained in the use of the gas detectors. These people should also be aware of the actions to take in the event that the air in the space is not safe for entry. If it is necessary that the confined space entry be suspended, the air must be retested prior to reentry.

Atmosphere below 19.5% oxygen content, or above 22%, by volume must not be entered except in an emergency for rescue purposes. If an entry must be made under those conditions, only personnel equipped with positive pressure respirators will be allowed to enter the space. The air in the staging area immediately outside the space also needs to be checked for sufficient oxygen content to ensure that the personnel supporting the rescue will not be at risk.

CHART CORRECTIONS

The 1800-0600 DPO is responsible for ensuring that the charts and publications are maintained in terms of corrections and having the most current version of charts onboard. We download Notice to Mariners from the National Geospatial Intelligence Agency, what used to be National Imagery and Mapping Agency (NIMA). They are usually available online on each Saturday night. All chart and pub corrections should be completed within one week of release. If you need help getting them finished in a timely manner, ask the other watchstanders for help, but never leave the vessel with corrections outstanding. There is a week from release of the corrections to crew change day and that should be sufficient to get them finished before you leave.

When you have downloaded the corrections, transfer the relevant corrections to the recording cards kept in the white binder in the cabinet under the chart table. If there is a notification of a new chart edition, make a note of that on the correction card as well in addition to ordering the new chart through EMPAC. Only when all of the corrections have been made on the chart or in the pub for the week is the card initialed and dated. When all of the corrections for the week have been finished, initial and date the sheet in the front of the binder.

We use rub on transfers to correct our charts. This makes for neater, more professional looking corrections. There are small, black pens which can be used for correcting the text on the charts. Avoid using the tape style white out. The tape is not as durable as the liquid white out and will eventually rub off. The warehouse stocks the white out pens which are especially convenient for chart corrections.

While correcting pubs always tape in the corrections. If the correction is a replacement of existing text draw a single line through the text to be replaced. The taped in correction should only have tape on one side with the tape closest to the binding of the pub. This will allow the correction to lay flat when the pub is closed and still allow the reader to view the text under the correction.

AZIMUTHS

Azimuths of the sun and stars are used to calculate the compass error of the gyro compasses and the magnetic compass. Due to its proximity to the bridge, Gyro #2 is the gyro that has its error calculated most frequently. The repeater for gyro #3 is located on the aft lifeboat deck, but it is not directly calculated as often. We usually just take the results for Gyro #2 and use the gyro error for it to calculate the error for the other two.

When an azimuth has been shot and the results calculated, the results need to be entered into the Compass Observation Book. This allows changes in the gyro error to be tracked and if there start to be differences, maintenance can be requested. Due to the nature of our operation, we routinely enter the data into the logbook differently than the book calls for. Most of the columns remain the same, but instead of heel, we note what celestial body was shot. Don't forget that the column labeled "error" refers to compass error for the magnetic compass, not gyro error. There is a separate column for gyro error. Compass error is the variation plus or minus the deviation.

In the remarks column note deck cargo operations which can effect the magnetic compass. Loading or running casing can change the deviation of the magnetic compass by more than ten degrees either direction.

BRIDGE PAPERWORK

One of the important duties that DPOs carry out on the *Deepwater Horizon* is maintaining the paperwork for the marine department. We are responsible for completing and filing all of the paperwork required by our Safety Management System and by rig operations. This paperwork includes, but is not limited to the GMDSS logbook, THINK drills, START cards, bulk report, current report, DP 6 Hour Checklists, GRS Marine report, Captain's Morning Report, inspection sheets, Watch Handovers, and hitch handover notes.

The GMDSS logbook is an official document that is used to track testing and the status of our radio equipment. The DPO (or ADPO) who is working days is responsible for completing the daily tests on the GMDSS system. Remember that you have to have a valid flag-state GMDSS license to transmit with the system. If you do not have a valid flag-state GMDSS license, talk to your supervisor about starting the process.

We test and log the status of the GMDSS system daily in accordance with 47 CFR 80.409e which states that we must log "...The position of the ship at least once per day;" and "A daily statement of the condition of the required radiotelephone equipment..." We also log when the electricians test the batteries, which is an entry made in red ink.

Transocean expects everyone to complete THINK drills as a part of their work. As a minimum, each crew (A,B,C or D) is expected to complete one per day. The Sr. DPO and DPO for each crew should work out in advance a plan for completing their required THINK drill. Any activity which is not a part of our normal routine should have a THINK drill completed. Everyone that is going to be participating in the activity should participate in the creation of the THINK drill.

START cards are required from each member of the crew. Our management expects a minimum of one per day from each member of the crew. START card participation is tracked by the RSTC and medic, and if you are not participating, you will not receive your safety points for that particular month. When you complete a START card, turn it in to the Chief Mate who will make sure that they are given to the RSTC for review and tracking.

The marine department is responsible for tracking the amount of bulk on the rig. There are a number of reports that have to be maintained in addition to logging the numbers in the smooth log. The Bulk Report, which tracks the dry bulk on the rig, needs to be completed daily and a copy placed in the well binder. This needs to be done regardless of whether or not there is a change that day. The client sometimes likes to be able to see the day-to-day changes in the bulk, or the fact that there was no change.

Once upon a time, we didn't have to do a written current report, but since then, it has evolved into a widely distributed report. It is completed twice per day (0600 and 1800) by the Sr. DPO and distributed to numerous people on the rig, in the Houston office and to some of BP's shoreside personnel. Because this report goes to so many people off the vessel, it is very important that the information is accurate and verified prior to it being sent. If a number like riser tension or mud weight doesn't match what BP has in their drilling plan, it starts people asking questions which usually lead people to wonder why the bridge is sending out bad information.

One of our mandated pieces of paperwork is the 6 Hour DP Checklist. This checklist logs the status and settings of various DP components at the beginning of each watch. The DPO coming on watch is responsible for completing the checklist as soon as possible after assuming the watch. In addition to sections that are filled out when coming on watch, there is a section where the status is logged hourly. When the checklists are completed, they are filed until the end of each well. At the end of each well, the checklists will be archived in the document locker on the third deck. These checklists are official documents and will often be reviewed in the event of an incident. Ensure that the information is accurate, because it is very easy to read a number on the screen and still write the number from the line above on the report.

Every night, the DPO is responsible for ensuring that the marine department portions of the GRS report are updated. In addition to the dedicated page for the weather, boat and status, the departmental activities report must be completed. Enter both the activities of the bridge crew and the seamen. The Boson's logbook is the best source for finding out what the seamen did for each day. When filling out the page with the weather and vessel status, remember that the GRS is in Imperial units (standard tons and degrees Fahrenheit). The toolpusher will validate the report around 0400 each morning so the report must be completed by that time. When you finish the report, export a .PDF file with the weather and vessel status and then e-mail that as an attachment to the BP dispatcher. They need the information for their morning reports and don't have access to GRS. If you don't know how to export a report, ask the Sr. DPO or Chief Mate to show you.

Every morning, the Sr. DPO is responsible for generating the captain's morning report. This report is generated through an Access database that saves the data and generates the report. This report has a summary of all of the activities that happened overnight in addition to weather data, supply boat operations, drilling operations and current equipment status. There is also a section where workorders that effect the marine department are tracked. This report is exported in a snapshot format and e-mailed to the Chief Mate and the Captain.

As per Transocean policy, a written handover is required when being relieved at the end of your watch. To accommodate this policy we have created bound books for end of watch handover notes. The notes need to give your relief any information that they will need to accomplish their entire watch. This includes, but is not limited to: current or upcoming boat operations, drilling operations, reference system changes, equipment status changes, or other useful information. These notes are stored on the bridge when the book is filled and serve as a good reference for daily operations. Remember that these notes are likely to be reviewed in the event of an incident so ensure that they are complete and professional.

FILING

The filing of bridge documents and assorted paperwork aboard the Deepwater Horizon is generally done by the 1800 to 0600 DPO. The mud, stability and bulk reports are all filed daily. The daily reports need to be three hole punched and placed in the appropriate sections of the well file. At the end of each well, the 6hr DP checklists will be added to the well file that will then be archived in the ships document library.

Other paperwork to be filed can be found in the "To Be Filed" box on top of the filing cabinets. Papers to be filed are likely to be, but not limited to the following; PMs, DP checklists, equipment manuals as well as weekly drill summaries and muster sheets. PMs will be filed in their respective folders located in the "Lifesaving Working Files" drawer of the filing cabinet. Once filed, you will enter the date and name of inspector on the cover sheet. If you should run out of cover sheets, they may be accessed on the bridge computer under the "Safety Inspection Checklists" shortcut icon on the desktop. When the files have reached critical mass, they are archived in the "Archived PMs" drawer in the filing cabinet. DP checklists have their own file located in the "Dynamic Positioning System" drawer in the filing cabinet.

Bridge team THINK drills are to be collected from the Chief Mate after they are been signed. A copy of each is made and once copied shall be marked with "CM" at the top of the original to indicate copy has been made. The originals shall then be turned in to the RSTC. The copies shall be filed in chronological order in the THINK drill binder. Note on the cover page how many have been written for each day. These copies must be kept in the binder for 90 days, after which, they may be used as scratch paper or placed in the recycling bin.

Please note that it will be perceived as being extremely unprofessional if you leave papers that have not been filed at the end of your hitch for your relief. Along those lines, you should make every effort not to let the filing accumulate in the "To Be Filed" box and file THINK drills in a timely manner.

RADIO SILENCE

Hopefully, the rig floor will give us a few days notice before radio silence is going to be implemented. If this is true, make announcements over the PA informing people to start bringing cell phones to the bridge in anticipation of radio silence. If we don't get the advance notice, we have to rush to collect phones from people that are sleeping. When people arrive on the vessel, they are asked to indicate whether they have a cell phone onboard. This log is kept in the transit room and can be used to develop a list of the cell phones that need to be collected. When cell phones are brought to the bridge, have the person label it with their name and then place it in the drawer of the chart table. People are responsible for collecting their own cell phones before leaving the vessel, but politeness dictates that we make an announcement to remind an off going crew.

One piece of equipment that is shut off during radio silence is the INMARSAT-B. In addition to serving as a piece of communication equipment, it also serves as a receiver for correction signals for the GPS system. If the Fugro Spotbeam antenna on the crown is damaged, shutting down the INMARSAT-B system will result in no corrections being received for GPS #3 and GPS #4. In the event that the crown Spotbeam is not working, we have received permission to leave the INMARSAT-B system energized. This will mean that the master Radio Silence switch cannot be used. If this is the case, ensure that the crane radios have been switched off before informing the rig floor that radio silence is in place.

DP PROCEDURES

DP WATCHKEEPING

Of all the jobs that we do on the bridge of the *Deepwater Horizon*, DP Watchkeeping is the most important. The purpose of this vessel is to drill wells and that can only be accomplished when the rig is on location. The key factors to ensure an effective DP watch are vigilant and conscientious watchkeeping combined with an ability to react immediately with the correct remedial action in the event of an incident.

When the rig is engaged in DP operations, two competent DP operators must be in CCR. One of whom will man the DP desk continuously The manning of the DP should be undertaken on a rotation of one hour to ensure that the on desk watchstander can maximize their concentration during the watch.

During their hour on the desk, the DP watchstander can answer the telephone and deal with DP related issues, but all other business should be conducted by the off desk watchstander. Some of this business includes, but is not limited to, ballasting, handling of bulk cargo, answering fire alarms, and handling outside phone calls.

Every change that is made to the DP system, SVC or other operation should be communicated to your watch partner, without exception. It shows good procedure and awareness to pass along information when deselecting reference systems, changing parameters, or dealing with phone calls pertaining to operations.

DPOs will not make changes to the DP system or operations until granted permission by the Sr. DPO unless a blanket approval has been given. Regardless, all changes should be communicated between watch partners.

DP ALERT STATUS

As per Transocean policy, we operate with four DP alert status levels. These levels are:

GREEN – the vessel is in a normal operating condition.

- The vessel will be under DP Control and the DP system operating normally with an appropriate back-up system operating.
- Thruster power and total power consumption is equal to or less than the maximum thrust and power that would be needed after the worst case single failure to avoid exceeding a critical excursion.
- Vessel's indicated position and heading are within predetermined limits.
- Negligible risk of collision exists from other vessels.

ADVISORY – the vessel will still be able to maintain position, but there has been an equipment failure which could combine with another failure result in a further degradation of operating status.

YELLOW – the vessel has lost some form of DP capability. A system, component or equipment has failed leaving the vessel with no suitable back-up so that a further such failure will result in an immediate loss of position. In addition, it must be noted that in the event of a well control situation outside of normal parameters, the change of alert status may be generated by the Drill Floor.

RED – the vessel has no ability to maintain its position keeping ability.

The Sr. DPO has the authority (and responsibility) to change the DP alert status when necessary. Changing to Yellow or Red status sets into motion reactions on the drill floor which are automatic.

WATCH CIRCLES

Our watch circles are geographic representations of our alert status. We have red and yellow watch circles that mandate the corresponding alert status. This is designed to prevent damage to the wellhead and subsea equipment.

Transocean supplies software that allows us to calculate our watch circles based on their riser analysis. Watch circles are calculated twice daily at 0600 and 1800, or if there is a significant change in the conditions.

The main factors which effect the size of our watch circles are wind and current, but mostly current. For most weather conditions, our drift times allow us to have the Transocean 53 meter (250 foot) limit for our watch circles.

HEADING CHANGES

Unlike drillships, we aren't required by operations to make as many heading changes. Because of the shape of the vessel, changes for wind and seas aren't needed as frequently. There are times when heading changes are necessary though like high current, to accommodate drilling or supply boat operations, or to minimize vessel motion.

Before initiating the process for making a heading change, calculate the breakout torque for the SDC ring and the maximum wellhead torque. These numbers can be found in the riser analysis that we receive for each well. The tables are entered with either mud weight or riser tension, but riser tension is usually more accurate due to overpull for current. The table will give a result for the number of degrees of heading change that is required to overcome the friction preventing the SDC ring from turning (breakout torque) and the maximum degrees of heading change which can be made without damaging the wellhead if the SDC ring fails to turn. The table also gives a number which is the percentage of the maximum wellhead torque when the SDC ring breakout should occur. If the percentage of maximum torque is over 80% then heading changes probably won't be possible. As a rule, the higher the riser tension, the higher the breakout torque.

Once it has been determined that it is safe to begin the heading change, start notifying the required personnel. There is of personnel in the order that they should be called. Any one on that list can stop the heading change process until it can be reviewed by the captain or OIM. Communicate with supply boats alongside to ensure that they will be able to maintain position and continue current operations while the heading change is made. Also notify supply boats that are standing by so they are aware of the upcoming change. That will keep a boat from going to the wrong side when you call them alongside.

Have the subsea engineer press up the SDC ring and verify that the hydraulics have functioned correctly. We have the ability to press up the SDC from the BOP panel on the bridge in an emergency, but that is not approved as a standard procedure. When pressing it up from the bridge, actuate the ring and wait at least 8 minutes for the ram to actuate and the ring to pressure up. The green indicator light for actuate will come on immediately, unlike other systems, this does not mean that it is pressed up and ready to turn. When the SDC ring is pressed up, the subsea engineer will stand-by in the moonpool area to verify that the SDC ring is working properly and the inner barrel of the slip joint is moving. The subsea engineer should have a VHF radio for instant communication with the bridge in the event that something is not working correctly.

When you have received word that the SDC ring is pressed up, enter your new heading and set the rate of turn. The rate of turn should be between 3 to 5 degrees per minute for normal turns, but can be set as high as 10 degrees per minute when connected or with the ADCP deployed. Rates of turn greater than 10 degrees per minute can disrupt communications due to limitations in the slew rate of our satellite antennas. A rate of turn of around 3 to 5 degrees per minute should provide enough torque to break the SDC ring free without compromising positioning. If the rate of turn is too slow, there is a chance that the torque will not break free the SDC ring before we reach the wellhead limits.

As the turn progresses, monitor the reference systems and positioning. Small errors in the offsets can cause reference systems to drift and the DP system's preferences for maintaining heading can result in a loss of position relative to the setpoint. When the DP controllers are reset, the offsets for the references systems are reset to their defaults. There is some discrepancy between the default settings and the actual positions of the antennas from when they were moved. Periodically confirm with boats alongside to ensure that they are not having problems keeping up with the heading change. For some reason, they don't always tell us when they are having problems.

When the heading change is complete, notify the appropriate personnel. This can be done either through phone calls or by making a page on the PA system. Log the heading change in the back of the rough log with the starting and finishing headings.

POSITION CHANGE

Changing of position can be done either while connected to the seafloor or while not connected. Procedures have been put in place to make sure that each position change is closely monitored, all appropriate personnel notified, logged properly and performed properly. Position changes could be initiated due to ROV/transponder operations, high current causing excessive bend in the riser, DP field arrival trials and riser angle analysis. In any case, before conducting a position change all proper personnel need to be notified, a list has been generated and is posted on the DP desk.

After all notifications have been made, the next step is to correctly enter the position change in the DP system; this can be done many different ways. You can enter it in as a range and bearing move, you can click on the center of the rig and drag it to the correct position, you can enter the latitude and longitude and you can enter specific distance moves either to the fwd/aft and port/stbd axis. Nevertheless, in any case after entering the position it is safe practice to have your watch partner double check the coordinates.

OFFSET WHILE CONNECTED

There are some situations where offsetting the vessel off location is necessary for rig operations. The most likely of these situations is during high current to minimize the curving of the riser. By offsetting the vessels, the riser angles induced by the force of the water will be corrected. There is risk in this because the riser behaves in a dynamic fashion, it isn't necessarily bowed in a smooth curve. It could be in an "S" shape or other complex shape and an offset could actually make the situation worse. While offsetting, monitor the riser angles and the riser tension for dangerous changes.

Because of the potential for damage, offsets of our position once we have landed out the BOP should only be done under the express instruction of the OIM and Captain except in an emergency situation. If possible, any offsets should be done while they are not drilling to prevent keyholing (when the drill pipe wears a hole or groove in the riser) the riser. The subsea engineer should be notified and monitoring their instruments as the offset is made.

Offsets can be used as a last ditch effort to avoid collision. With our typical watch circles, the vessel can offset by the width or length of the vessel. Although proper watchkeeping should prevent this sort of issue from arising.

GAIN SETTINGS

We typically operate in low gain for normal operations. The gain settings are highly customizable, so it is very rare that we will place the system in medium gain, and almost never operate in high gain. When the gain is set to high, the vessel tends to "chase" itself around the setpoint. It will use more power than is necessary and cause more fluctuations than normal as it ramps and rests thrusters.

If low gain is not sufficient for positioning, use custom gain to smooth out the vessel motion. The goal is to have the rig moving in a nice, gentle pattern around the setpoint. This is the best pattern for power management and also makes it easier for boats alongside to follow our motion.

THRUSTER BIAS

We use thruster bias in instances where not enough load is generated by propulsion to run the generators at an ideal load. Also, we use this option when drillers are tripping in the hole to keep the regen capacity of the generators at acceptable levels.

ENVIRONMENTAL CHANGES

One of the advantages of the DWH compared to conventional drillships is the square like shape that we have. In most cases changes in the weather do not dictate a change of heading for us. Some time when there is a large swell than we may change heading to give the vessel a better ride, but this will all depend on current operations on the rig floor and whether a heading change can be done.

TRANSPONDER DEPLOYMENT AFTER BATTERY CHANGE

Deploying a transponder can be one of the most frustrating jobs on the bridge. This is usually due to trying to establish communications with the transponder prior to deployment.

The transponder's memory is cleared whenever the battery is changed. This happens when you drain the capacitor which is a necessary step to reset the ping count of the transponder. Another side effect of clearing the memory is the transponder resetting to the default channel. The default channel for each of the transponders is logged in the transponder log bog.

When the ROV dives with the transponder, have them stop at approximately 1000 feet to establish communication with the transponder. Verify that the side of the ROV cage with the transponder is facing the HiPAP transceiver that you are using. Ensure that you are communicating with the transponder on its default frequency and read the ping count. This will verify that the reset was completed correctly. If the ping count has not reset to zero, the transponder needs to be brought back to the surface and reset. Once you have established communication with the transponder and ensured that it was reset, change the operating frequency from the default frequency to the transponder's normal operating frequency.

When the channel has been changed successfully, place the transponder in SSBL mode and activate the transponder. When you get a response from the transponder, verify that the depth reading and the location correspond with the actual location of the ROV cage.

If you are having trouble communicating with the transponder while it is on the cage, cage the maximum range to something that is slightly greater than the cage depth. This will minimize the area that the transceiver has to sweep to establish communications. You might also try switching from a fixed transponder to a mobile transponder. Once you have established communication with the transponder, return the settings to the original settings.

After establishing communication with the transponder, shut off the transponder and the ROV can proceed to the bottom. When they reach the bottom, reactivate the transponder. If the transponder doesn't respond, ensure that the settings have been returned to their original settings. If you have changed the range settings less than the water depth, the transponder will not respond. Once you are getting responses from the transponder, you can steer the ROV to the correct location. When the transponder is in the correct location, place it in LBL positioning mode and include it in the LBL array.

Perform a Run Time calibration to remove any differences in position between where the transponder was prior to recovery and the redeployed location.

DP ARRIVAL TRIALS

DP Trials are normally undertaken to establish functionality of the DP Station Keeping and associated systems and to demonstrate the capability of the vessel to meet its DP design criteria for the purpose of Class accreditation or as pre-acceptance trials to the client.

More commonly, we use DP Field Arrival Trials to confirm that all DP equipment is operational prior to beginning each well. Transocean's policies state that if the DP system has been offline for more than 48 hours or you are starting work for a new client, the trials must be completed. Because of our slow speed, this typically means that we are required to do arrival trials for every well.

Because of the time requirements for completing all of the arrival trials, we have broken them down so that the entire procedure of tests are completed every four wells. There is a matrix where the tests are broken down by well located in the DP Folder on the computer. Most of these tests are completed every well, but the more time consuming tests are split apart.

Many of the tests can be completed while the drill floor is starting the first stages of the well. Only the manual control tests are a problem with equipment in the water. The power spikes associated with testing the limits and functionality of the DP joysticks can cause problems both with the drill floor and ECR. Because of this, we try to complete those tests before the drill floor starts picking up pipe or casing. Once the joystick tests have been completed, the remainder of the tests can be completed while they are running casing or moving pipe. Vessel movements won't effect their operation as long as position moves are kept less than 0.3 knots through the water. If one of the tests is going to effect the drill floor, call the toolpusher on tour and arrange a time where it will be possible to complete the test. Try to develop an idea of how long the tests will take before you make the call. Very often, you can sneak a 10 minute test in while they are rigging up or down between operations.

There will often be a significant amount of pressure to allow normal operations to resume upon arrival at the new location. This means that they are going to want six boats alongside transferring all of the mud and bulk for the entire well. Unfortunately, having boats alongside can limit your options for conducting trials. If boat operations can still be conducted while trials are ongoing, make sure that the Captain and OIM is aware that this will be happening. Also, verify with the supply boat's captain that he is aware of the moves that the vessel will be making.

Transponder Deployment at a New Well Location

Deployment of the transponder array at a new location is one of the critical tasks that can slow down drilling operations. In order to prevent this, preplanning can be done to make the job go more smoothly. Prior to moving to the new location, determine the array configuration. The array should be deployed so that all of the beacons can be recovered regardless of the heading. Our ROV typically has 200 meters of tether so a 150 meter radius for the array allows the ROV to reach the transponders on all headings.

If bottom topography and field conditions allow, the LBL array should consist of five transponders set out in a pentagon shaped pattern. The geometric center of that array should be as close to the well location as possible.

There will be times when ridges or valleys on the seabed must be avoided with the transponders. Both of these features will mask a transponder if not accounted for. Study the bathymetric chart for the well before planning the array to look for bottom features. Most of the time, these features can be avoided by rotating the transponders within the array.

LBL Array Calibration

When arriving at a new location you will have to calibrate the LBL array before it is available for use as a reference system. There might also be times when the array will have to be recalibrated during the course of a well, but this should be avoided if at all possible as it will cause changes in the position that might effect the DP system. Instead, attempt a run-time calibration.

If starting with a blank array, make sure that all of your transponders are in SSBL mode. Activate them one at a time and import them into the LBL array. This can be done through the LBL array data interface. You can do multiple transponders at once, but this can lead to errors in the transponder arrangement.

Once you have all of the transponders in the LBL array, place them all in LBL calibration mode and measure the baselines. We typically have the APOS make 8 measurements and make measurements in both directions. Once you have measured the baselines, calculate the residuals and place the transponders back in LBL positioning mode.

When all of the transponders are in LBL positioning mode, you can use the LBL array for positioning. If there is enough time, do a run-time calibration to "fine tune" the array before using it in the DP system. It will take about 16 minutes to perform the run-time calibration.

We typically use channel B-82 as our LBL interrogation frequency. This frequency needs to be set before starting any of the calibration process.

There are times when the measuring of the baselines can be extremely time consuming. This can happen if there is a lot of noise near the seabed that can interfere with the transponders sending signals to each other. As a possible solution, you can reduce the number of measurements or only measure in a single direction.

Determination of True Stack Heading

When the BOP has been landed on the wellhead at a new location, one of the first things that need to be done is the determination of the true heading of the BOP. Also known as the "Stack". The first part of this process involves the calibration of the riser angle sensors prior to running the riser and landing out the BOP.

While the BOP is still on the transporter, you will need to verify the sensors are working correctly. The easiest way for us to accomplish this is by trimming and listing the rig. This will give the sensors the same input as the BOP being tilted. The readings on the Blue and Yellow pod should follow the motion of the rig. Do not forget that the BOP will be rotated 90° counter-clockwise after it is in the water. This places the yellow pod toward the bow of the rig. The yellow pod is marked with a black, painted "Y", but don't worry about the fact that it is painted blue. Coordinate with the drill floor to find a time to do this test that will not interfere with the critical path. After the transporter is moved beneath the rotary, there will be time while they attach the hoses and mux cables.

After about 100 to 300 meters of riser have been run, the riser angle sensors need to be calibrated. This is accomplished by going into the riser monitoring and clicking on the "RAM Config" tab. Prior to starting the calibration process, ensure that all of the bias settings from the previous well have been removed and log the riser angle values. Just before landing out the BOP, log the biased values for the sensors again to verify that no changes have occurred since calibration.

Following landing out, have the ROV read the lower flex joint angles off the bulls-eyes and compare the readings with the riser angle sensor reading. The highest bullseye on the LMRP is located on the Blue Pod side of the LMRP.

Once all of the sensors are confirmed to be working make a position move toward the bow of the rig and place a 1° angle on the lower flex joint. To calculate the distance for the move, use the formula:

Tan 1° x Water Depth (meters) = offset to achieve 1°

When the rig has been moved the correct distance, the sensor reading in the X axis should read 1°. If you are lucky, the reading in the Y axis will read zero. If it doesn't, there is a difference between the stack heading and the vessel heading. This happens regularly due to errors in making up the joints of riser. It can sometimes work out to an error of 1/4 ° per joint run. To determine the true stack heading move the rig left or right until the reading in the Y axis reads 0°. If the number is negative, move the rig to starboard, and for positive move the rig to port.

DP Software Management

DP EMERGENCIES

ADVISORY CONDITION (WHITE ALERT)

The vessel shall be in the advisory condition when one of the following conditions apply:

- A failure in a subsystem has occurred leaving the DP system in an operational state but with no suitable back-up available. An additional fault will cause a loss of position.
- The vessel will be under DP control and the DP control is operating but with reduced capability in some way (i.e. loss of a thruster, loss of a generator).
- Thruster power and total power consumption is equal to, or less than the maximum thrust and power that would be required after the worst case single failure to avoid exceeding the critical situation.
- Vessel's indicated position and heading are within predetermined limits.
- Negligible risk of collision exists from other vessels.

The advisory condition is designed in order that vessel personnel can assess any failure or loss of performance against current and planned operations so prudent changes to planned operations can be made. The specific conditions when advisory condition will be used will be defined in the Well Specific Operating Guidelines (WSOG).

YELLOW ALERT

The vessel shall be in a yellow alert condition when any one of the following conditions applies:

- Vessel's position keeping performance is deteriorating and/or unstable.
- Vessel's indicated position deviates beyond established limits for efficient riser management.
- Environmental conditions exceeded vessel's anticipated operational capability limits.
- An individual thruster power demand reaches a predetermined upper limit (nominally 80%) for any period more than occasional peak demands (i.e. less than 1 minute).
- Total power demands exceed predetermined upper limit (nominally 65%) for any period of more than an occasional 1 minute duration sudden peak demands (i.e. a power demand of greater than 65% and a duration of 1 minute).
- Risk of collision exists from another vessel.
- Risk of a Well Control situation outside normal operational control criteria.

RED ALERT

The vessel shall be in a red alert condition when any one of the following conditions applies:

- A loss of control such that the vessel will not be able to maintain either heading or position control or a loss of control of both functions.
- There is an imminent risk of danger by maintaining the vessel on location (i.e. Collision).
- There is an imminent risk of danger to the vessel and crew due to a deteriorating Well Control situation.

BLACKOUT

Electrical blackouts result when electrical demand exceeds the ability of the electrical system to meet the demand for electrical energy. Since all electrical energy is generated on site, the operators can control electrical supply and demand. Avoiding blackouts becomes a matter of assuring the electrical demands are not allowed to exceed the capacity of the on-line generators. Most drilling rigs blackouts occur when engine/generator sets unexpectedly shut down without warning. This type of blackout is a function of electrical supply. Examples of this are; fuel system failure, mechanical failure, control system failure or human error. This type of shutdown is much more difficult to avoid than the type caused by excessive demand, but may be effectively handled if the power management system operates rapidly and effectively to reduce electrical demand to within the capacity of the remaining generators.

Other blackouts occur because fixed and variable load increases unchecked until the capacity of the on-line generator/s is exceeded. This type of blackout is a function of electrical demand. As demand increases, the engine/generator sets must supply more power, until they reach and or exceed their capacity. When an engine/generator exceeds its real power capacity or its electrical capacity the engine overheats or the generator goes over current. As soon as the first engine shuts down due to over temp. or over current a cascade of shutdowns ripples through any other remaining engines/generators as they too exceed their thermal or current capacity. This class of blackout can be avoided by monitoring total energy demand in comparison to available supply and quickly reducing loads to coincide with online capacity for sudden engine/generator trips.

Drilling loads and the rig's thrusters are controlled by Variable Frequency Drives (VDFs). These drives are solid state frequency conversion systems, which can be easily controlled by the power management system. In each case, control signals can significantly reduce the input power demand of a drive in from one to five cycles.

The control system performs the following functions:

- Monitor the condition of each diesel generator/engine set and start up or shut down specific generator sets in response to alarm conditions or parameters measured and monitored by the system.
- Control the load sharing of the generator sets on-line.
- Monitor the load situation of the grid to initiate starting and stopping of engine/generator sets as required to maintain sufficient power to the electrically driven equipment. This is accomplished while at the same time not allowing unnecessarily high amounts of power to be connected to the grid.
- Control the regenerated power limit for the drilling drawworks equipment during drilling tripping operations.
- Provide system blackout protection.
- Provide blackout restart of the power system in the event of a total system blackout.
- Maintain sufficient power at all times for the operation of the ships thrusters to maintain vessel position.

REFERENCE SYSTEM LOSS

Loss of a single reference system shouldn't cause a loss of position or a drive-off. The redundancy of our reference systems is designed to prevent this. There are some considerations that must be addressed in the event of the loss of a reference system.

Why did the reference system fail? This is the first question that must be answered once it has been determined that our DP performance is not going to be adversely effected. For a

GPS, look at whether or not it is a problem that could effect the other GPSs. Is it poor satellite geometry, or masking by the derrick? For the HPR, look at your transponder batteries or sources of external interference. Although we don't have to worry much about noise interference from boats alongside, it could be excessive mud in the water blocking signals or the ROV dragging a transponder away.

Coordinate with the ETs to eliminate internal sources of errors before moving on to calling shoreside support. Some of these internal errors could be receiver or demodulator problems, masking by cranes (GPS 2 or 3), changes in settings, or bad connections.

LOSS OF POSITION

A loss of position can be caused by many different things; weather, high current, loss of thruster(s), loss of generator(s), blackout, operator error and reference system failures. In any of these cases, the DPO needs to think quickly and troubleshoot what is causing the loss of position. The goal is to stabilize the vessel before switching to "Red Alert" status.

HIGH CURRENT

High current operations can carry the highest risk for the loss of position. Transocean's and BP's policies and guidelines regarding high current (High Current Guidelines) are spelled out in detail, which is located in the "Black Book". You should not hesitate to call the Captain and OIM if the current starts to climb rapidly and power consumption increases accordingly. Before calling, check the reading on the ADCP. The DP system is only looking at what force is not accounted for to maintain position against the wind, everything else is considered current. Sometimes waves or swell can raise the current readings on their own.

Because of the shape of the vessel, it can react erratically in high currents. Much like a catamaran sailboat on a mooring, the heading will yaw from side to side "hunting" to keep the bow into the current. Most of the time, this will result in the normal forces acting on the vessel bringing the bow (or stern) back into the current. If the DP system is set up with a high gain on the yaw, the DP will fight this tendency probably resulting in a larger error circle.

When the current is over 2 knots, according to the DP system, we are required to keep either the stern or the bow within 10° of the system selected heading. This is to minimize the forces required to maintain the vessel on position and ensures that if the current continues to increase, we will be prepared.

The Captain and OIM must be informed at this time. They will be making the decision about the future course of action. The client and drill floor should also be informed. Most likely, this will increase the level of reporting about the current and increases the level of record keeping on the bridge. The current must be logged in the smooth log on an hourly basis when the current is over 2 knots.

Typically, we have made printouts of the ADCP screen and the DP screens on an hourly basis when the current increases over 3 knots. This provides an easy to read history of the changes in the current and the DP system as it reacts to changes. It also maintains a record in the event of a loss of position resulting from the high current.

If position keeping is degraded by the current, get the Captain and OIM involved early. There are many decisions that need to be made which will effect the future of the well and how operations will be conducted. The decision to displace the riser or other preventive measures can usually only be instigated by either of those two. As always, if position keeping is too badly degraded, you have the responsibility to initiate a yellow alert, or if necessary, a red alert to protect the well and the vessel.

Management of the power plant becomes vital during high current conditions. The thrusters are able to draw more power than can be produced. If the power use exceeds 80% of the available capacity, the rig will automatically go to yellow alert and drilling operations will cease. The Captain and OIM will make the decision whether the riser will be displaced with sea water at that time. A capability plot should also be run to see the effect of the loss of a thruster or a generator. Most likely, the loss of a generator at that point would result in the loss of position.

THRUSTER LOSS

A thruster dropping off line can be a serious problem. Turn more thrusters on if they are available. Notify all appropriate personnel immediately.

RUNAWAY THRUSTER

A runaway thruster could be caused by a malfunction in the thruster control unit or a hydraulic system failure causing the thruster not to respond to steering commands. If this happens this could cause instability in positioning and cause other thrusters to over compensate and cause a drive off. You can check this by looking at the thruster setpoint/feedback page also by looking at the thruster page on the svc. If this happens, immediately turn off the thruster. Alternatively, you can turn extra thrusters online first and then turn off the bad thruster. There are many ways of shutting off thrusters, but the quickest for this instance would be to hit the emergency stop button on the DP console. Notify the ECR and Electricians if this happens.

LOSS OF NETWORK

SDP FAILURE

There is a need to differentiate between an SDP Operator Station (OS) failure and SDP Controller failure. Failure of an Operator Station does not prevent the DPO from taking control at one of the two remaining stations at the console. Failure of an SDP Controller does not affect the other controllers since they are all receiving the same inputs, but only one can be in command (master) at any given time. Each controller is able to detect faults independently on inputs, and a fault in one should be voted out by the other two.
In any event, the ET on tour and/or the Electrical Supervisor, and the Captain must be notified right away, and the Drill Floor should be put on Advisory Status.

ENGINEERING OPERATIONS

ASSUMING CONTROL OF ENGINEERING

In order to free up engineers to perform maintenance around the rig, the bridge has been taking control of machinery and propulsion. This operation has potential for damage to equipment and loss of life. Control of engineering should only be assumed if operations permit. We always have the right, and obligation, to refuse to take control of engineering if operations on the bridge preclude proper monitoring of engineering systems. If operational necessity requires us to take control of machinery, remember that the captain and chief mate are available as supplemental watchstanders.

The Duty Engineer has the right to take control of machinery in the ECR at anytime. During emergencies, it is usually prudent to have control of SVC on the Bridge to free the engineer to respond. The Chief Engineer is stationed on the Bridge during emergencies.

Every six hours the engineering checklist should be completed as a part of coming on watch. This checklist is part of the six hour DP checklist and the requirement for completion is included in Transocean's operating standards.

Before transferring control, there should be a verbal handover between the DP watchstander and the engineering watchstander. Always verify with the Sr. DPO that control may be taken. Once command has been taken, log it in red in the logbook. After sending control to the bridge, the engineering watchstander should bring the written handover over and have it signed by the DP watchstander. At the least, a written handover should be e-mailed to the bridge for review.

Once control is received on the bridge, check the temperatures of any generators that are running. This will allow you to determine what the temperatures were in the event of a later temperature alarm. If the temperatures are at or near the alarm limits when you assume control, it isn't as shocking as if the temperatures climb from well below an alarm limit.

Check the level(s) of the active drill water and potable water tanks to see if you are going to need to swap to a new tank. Hopefully, the engineers will already have checked this before transferring control, but they won't always get the chance.

Keeping one CCTV monitor cycling through the engine room and thruster cameras is good marine practice when in control of machinery.

STARTING GENERATORS (SVC)

Times may arise when you may need to manually start a generator from an SVC while the Bridge has control of machinery. Open the "Power" page and determine which generator you would like to use. Place the mouse cursor over the "G" one the rendering of the generator and left click. A menu will appear offering you multiple choices. Select the "Start" tab by left clicking with the mouse. The generator will then start and run through its warm up and synchronization procedures and will be indicated by the icon being yellow. When it is ready, you will see progress from "Start Aux" to "Run Idle" to "Run Ready" displayed above the generator icon on the page and the icon will have turned from yellow to green. Once the generator is run ready you can add it to the buss by left clicking on the "Connect" tab of the menu. If given enough time it is best to check that at least one of the bearings has reached at least 75°. You can do this by accessing the window for the selected generator.

Stopping Generators (SVC)

When in control of engineering, you will be requested to, or have to, start an engine as a part of operations. If possible, verify with the Engineer on tour as to which engine they would like started, but if they are unavailable, start the next generator in the standby sequence.

To stop a generator, open the "Power" page and select the generator you wish to stop. Place the mouse cursor over the "G" one the rendering of the generator and left click. A menu will appear offering you multiple choices. Select the "Disconnect" tab by left clicking with the mouse. If it is standby mode, it will shut down on its own after you have disconnected it. If it is not in standby mode, once the generator is off the bus you may shut it down by selecting the "Stop" tab in the menu. The generator icon will turn from green to yellow when the generator is in its cool-down and from yellow to clear when it is off.

Starting Thrusters (STC)

Any thruster not in maintenance mode can be started from the STC consoles on the bridge or in the ECR. To start a thruster from the STC console, simply double press the stop/start button for the desired thruster. Verify with the DP watchstander which thruster is to be started before giving the start command.

Once the start command is given, the green indicator light above the start/stop button will start to blink. On the SVC, you will see the hydraulic, lubrication and cooling pumps start. A start command will go to the converter and the converter's capacitor will charge. Once the capacitor is charged, the converted will start.

Before starting any thruster, verify that that the lube oil pump, hydraulic steering pumps and cooling pumps are all in automatic control. This can be verified by looking at the individual thruster page on the SVC and ensuring that all of the required pumps have a small green "a" next to the pump icon. Also, verify that the thruster is not in maintenance mode.

If the ECR is in control of machinery and propulsion, you should call the ECR before starting any thrusters. In the event of an emergency, any available thrusters may be started without first calling the ECR.

When a start command is given, the RPM and azimuth commands from the SDP are forced to zero. This forced zero command will be released 10 seconds after the ready signal is received from the SVC.

Starting Thrusters (SVC)

When the bridge has control of machinery and propulsion, thrusters can be started using the SVC. In order for this to happen, the thruster to be started must be in maintenance mode. Thrusters can be placed in maintenance mode only if they are not enabled in the DP system. This is usually not a problem when starting a thruster, but can be a problem when trying to stop a thruster. You have a responsibility to ensure that maintenance is not occurring on the thruster before starting it from the SVC and you should inform the duty engineer. In the event of an emergency, any available thrusters may be started without calling the duty engineer.

Before starting the thruster, verify that that the lube oil pump, hydraulic steering pumps and cooling pumps are all in automatic control. This can be verified by looking at the individual thruster page on the SVC and ensuring that all of the required pumps have a small green "a" next to the pump icon.

On the individual thruster page, click the "Start Thruster" button in the lower right corner of the screen. Once you have given the start command, the dialog box in the lower right corner will get a green border. The start-up dialog within this box will update as the auxiliaries, converter and drive are started. If there is a problem in the start process, the border of the dialog box will turn red and an error message will be displayed. During troubleshooting, this dialog box is a valuable tool for determining exactly where in the process a problem is occurring.

If you want the thruster to be available for use in the DP system, the thruster must be changed from maintenance mode to SDP mode. For trouble shooting the thruster can be left in maintenance mode. In maintenance mode, the thruster can be given azimuth and RPM commands through the SVC. Individual pumps can be started and stopped if they are put into manual mode. While in maintenance mode, the thruster will be blocked from receiving control signals from the STC consoles or the DP system.

STOPPING THRUSTERS (STC)

First, ensure that you have deselected the thruster in the DP desk and that you have enough thrusters remaining for the conditions. Simply press the "Start/ Stop" button twice. Remember that starting and stopping thruster merits a rough log entry.

STOPPING THRUSTERS (SVC)

As with stopping thrusters on the STC, first ensure that you have deselected the thruster in the DP desk and that you have enough thrusters remaining for the task at hand. Once the thruster is deselected on the desk, you would then access the individual thruster page on the SVC. Once there, switch from SDP mode to Maintenance mode by clicking on the upper right hand tab. Once in Maintenance mode you may stop the thruster by selecting the "Stop Thruster" tab in the lower right hand corner of the screen. Once the thruster is stopped you should then re-enable the SDP mode so you can start the thruster from the STC if needed.

SPLIT BUS OPERATIONS

Although we normally operate with a unified bus, we have the ability to operate in a split bus configuration. When the bus is split, generators 1, 5 and 6 are on bus A and generators 2, 3 and 4 are on bus B. To split the bus, circuit breakers 2-1 and 5-1 need to be tripped. With the bus split, there will be an equal number of thrusters and drilling drives on each bus.

If there is time before entering split bus operation, verify that the load is divided equally and there is sufficient power available for each bus. The captain will determine the minimum number of generators that will be maintained on each bus for redundancy.

Careful monitoring of power loads is important during split bus operations. Drilling loads and thruster loads are often distributed unevenly between the two buses. Problems with generators or drilling loads are not distributed throughout the entire power system. This makes the system more vulnerable to a single engine assuming the entire load and the blackout of one bus.

Another side effect of a split bus is the fact that it is more difficult to create load using the thrusters. There are only two thruster pairs (2/7 and 4/5) which can be placed in bias that only create load on a single bus. The other two thruster groups (1/8 and 3/6) will increase the load on both buses. This is important during drilling operations where the online mud pumps are on a single bus. Substantial thruster loads are often required to generate a bus load that is less vulnerable to the load dips created by tripping in the hole.

FUELING CRANES

In February 2005, we had a fire in the starboard crane. Negligence on the part of the crane operator during fueling was the root cause of the fire. The investigation of that fire provided many of the procedures that we now follow when fueling cranes.

Cranes are fueled using the fuel oil service pumps. There are port and starboard pumps that feed the service fueling loops which are also divided into port and starboard sections. These loops can be crossed over, but it requires the engineers to open manual valves within the system. For normal operations, the pump associated with the crane to be fueled is used. The port crane is fueled by the port pump (#2) and the starboard crane is fueled by the starboard pump (#1). We are only responsible for fueling the cranes when we have control of machinery and propulsion.

As a result of the fire there are several guidelines which must be observed:

- The crane must be off and parked in the cradle
- The Task Specific Think Drill must be reviewed by all personnel involved in the fueling and a sheet signed
- The crane operator must be in the crane cab and be in communication with the bridge or ECR depending on who has control of machinery for the duration of the transfer
- Someone must be standing by the nozzle at the tank for the duration of the transfer

The crane operator will line up the system within the crane and call to have the pump started. Go to the Fuel Purification screen on the SVC and start the associated pump. The pressure will go up to around 3.5 bar if everything is lined up correctly. Once the fuel is flowing, the crane operator should call and confirm that they are receiving fuel. They should call you to shut off the fuel before shutting off the nozzle, but if they do not you will see a jump in pressure as they shut off the fuel. Shutting off the pump will stop the flow of fuel. If the nozzle is closed, there will be residual pressure on the system.

DRILLING OPERATIONS

DRILL FLOOR/ BRIDGE RELATIONS

Although our main function as DP operators is to maintain position, we must always be very mindful that the drill floor is the bread winner. In most situations, we need to defer to the wishes of the drill floor unless they would compromise position keeping or vessel safety. Here is a list of a few golden rules to follow when dealing with the rig floor.

- Always best to be proactive if you see the pipe rubbing ie call them before they call us
- Anticipate rig floor activities that may change your draft or trim and respond accordingly: a few examples, landing out, venting riser tension, transference of mud
- When they are in the hole they closely monitor their pit volumes, therefore it is critical that you call the floor before you ballast.
- It is a good practice to inform the floor of any expected inclement weather or rain clouds in the area.
- Avoid calling the driller directly when they are making a connection or tripping in general. It is generally best to call a toolpusher at 110 than to bother a busy driller.

WELL CONTROL

When they are in the hole, it is possible that they will take a "kick." That is they may find pressure in the hole they were not expecting. There may be gas associated with the kick and it is important to find out if that is the case. If we take a kick, the drill floor will shut in the well and try to alleviate the pressure. When we go into a well control situation and when we come out of it must be smooth logged. We are not allowed to ballast for any reason unless we get explicate permission from a tool pusher in this situation. If there is gas associated with the kick, we must illuminate the no smoking light on the smoke deck and also make a page announcing the suspension of hotwork. If boat ops are in progress it is best to check with a Senior Toolpusher to ensure that they can continue. Also remember that the Captain must be made aware of the situation as soon as it develops even if it means calling his quarters after hours.

HIGH GAS

We commonly encounter gas in the well while drilling. The mud-logger keeps track of the units of gas and announce them over the PA. If they reach over 200 units he will call us. We then make a PA that we have high gas and are suspending outside smoking and hotwork. The no smoking light then must be illuminated. The mud-logger should call us when the gas subsides and we will make a PA announcing the resumption of hotwork and outside smoking. We then turn off the no smoking light.

DERRICK

The derrick is the tall (242 ft) structure jutting from our rig. The derricks primary purpose is to hold the crown block. It's similar to a crane boom in its ability to facilitate hoisting but with the huge exception that it does not move. Numerous things are located in the derrick such as but not limited to; The Crown and Traveling blocks, standpipes, vent lines, finger boards, lighting, cameras, wind sensors and antennas. Do yourself a favor and climb to the crown to check out the antenna array up there and enjoy the view.

Crown Block, Traveling Block and Drawworks

Think of this as a big block and tackle. The Crown and Traveling Blocks both have 8 sheaves but normally only use 7 but will switch to 8 if heavier than normal weights are expected. This changes it from a 14 to a 16 block purchase. 2 inch wire rope is lead through the sheaves and is used to pull the top drive up and lower it down. The winching action of the wire rope is provided by the drawworks which is the massive blue winch/ tugger located on the rig floor.

Top Drive

The Top Drive hangs from the derrick and consists pipe handler, drilling motor, integrated swivel, link tilt system remote and manual blowout preventer as well as a guide dolly. It rotates the drill string, supports the drill string in the hole and is where mud is introduced into the drill string. It can produce 1,150 horsepower, has a 750 ton capacity and can handle pipe up to 6 5/8 diameter.

Rotary Table

Before they had modern top drives, the rotary table was used for turning the drill string. In as far as its rotation is concerned it is mostly used to make up drill collars on modern rigs. Its main purpose on the DWH is hold the weight of the drill string when making up connections. Its uses a master bushing and bowls to create a hole to use slips in holding the string. You must be careful not to let the drill pipe rub on the bowls when they are drilling ahead as they are very expensive to replace.

Mouse Holes

We have two mouse holes aboard. One which is used to make up drill strings while the rotary table is in use and the other is used to store a drill string offline until it needs to be added to the main string.

PRS

There are two pipe racking systems (PRS) on the rig floor, one forward and one aft. They work as big arms to rack and unrack stands of drill pipe and to move them to and from the rotary table. They move along a set of tracks to and from the rotary table and are generally controlled by one of the Assistant Drillers. They don't move enough weight around for us to be concerned about this in regard to stability.

Buckie

The bucking machine (Buckie) is utilized to make up drilling assemblies offline. Primarily, this is used for making up the components of the Bottom Hole Assembly (BHA). This usually consists of drill collars, measure-while-drilling (MWD) tools, and directional assemblies. The machine is also capable of making up all test tool assemblies, casing hangers, and other bottom hole components. This improves our efficiency by moving these tasks out of the critical path.

Riser Handling System

Also known as the riser skate and is located just aft of the rig floor. When riser is run, the gantry crane picks up joins of riser from the aft bays and places them on the skate. The skate then moves forward into the drill floor where the top drive picks up the joint of riser. This sequenced is reversed when they are pulling riser. The skate can also used when they want lay out drill pipe in the same manner. the skate itself does not affect vessel stability to much but the action of the gantry crane is quite noticeable port and starboard.

PIPE TRANSFER CONVEYOR

Located just forward of the drill floor, it works as a conveyor belt for getting tubulars from the forward pipe deck to the rig floor. The knuckle boom crane will pick up tubulars and place them on the conveyor and then conveyor will move them to the rig floor. This replaces the conventional "V" doors found on many older rigs.

BOP

Blow Out Preventers (BOP) are used to ensure that gas or oil in the hole remains in the hole. The BOP coupled with the Lower Marine Riser Package (LMRP) makes up a key component of our well control system. When disconnecting from the well in an emergency, the BOP will remain attached to the wellhead while the LMRP will remain attached to the riser.

There are two modes of operation for the BOP, EDS-1 and EDS-2. EDS-1 is used for normal drilling operations when there is only drill pipe running through the stack. EDS-2 is used when casing or other heavy pipe is running through the stack. This reduces the amount of time that we are truly unshearable.

In the event of an emergency disconnect, a sequence of events will occur once the EDS button is pushed, either on the drill floor or from the bridge. If we are drilling (EDS-1), the blind shears will close, cutting the pipe and sealing off the wellbore. All of the failsafe valves on the stack will close as well. Then the stack stingers will de-energize and withdraw into the control pods, the stack PT (pressure-temperature) sensor wet mate/break connector will retract, and the choke/kill mini-collet connectors will unlatch. This is done to allow us to reconnect at a later time. Only when all of these steps have finished will the LMRP connector release. If we are running casing (EDS-2), the casing sheers will close before the blind sheers. The remainder of the sequence will remain the same.

In either EDS sequence, a signal will always be sent to the Hydralift Tensioner control panel in the electrician's shop so that the tensioner's throttling valves will function to prevent the tensioners from catastrophically pulling the riser up into the rig floor substructure.

The BOP contains the ram type preventers, while the LMRP contains annular type preventers. A ram type preventer is a large, metal block with a rubber lining that will close around the pipe to seal in the well. There are mounted in pairs and meet in the middle. One of the ram type preventers on the BOP is designed to cut the pipe and seal off the well at the same time. One of the other ram type preventers is designed strictly for cutting only and can cut casing as well as drillpipe. An annular preventer is doughnut shaped hard rubber seal that will close around the pipe. The preventers will be closed to stop uncontrolled flow of mud from the well.

RUNNING RISER

Riser is large bore pipe which works to guide drillstrings, down hole tools and casing into the well. It also is used to pass drilling mud to and from the well via the choke and kill lines which are smaller diameter pipes attached to the outside of the riser joint. We have Marine riser in that it is outfitted with buoyant foam that will reduce the weight of the riser hanging off the rig. You will hear the joints that do not have the foam referred to as "slick" joints. When running riser we are usually offset 100m from the wellhead. We need to keep they vessel trimmed to the rig floors satisfaction to keep the riser from rubbing and damaging the buoyant foam. We monitor the VHF (usually channel 10) they can quickly communicate if they are rubbing and we can ballast accordingly. We also keep track of the time each joint of riser is in the spider in the Riser Run Sheet. Remember to zero out your X and Y bias values in the Riser Monitoring Setup on the SDP before landing out.

PULLING RISER

Once we unlatch from the well we usually will perform a controlled drift so the can pull riser. The controlled drift is used to negate any current forces acting upon the riser string. Bathymetric charts must be consulted before the drift takes place to ensure we do not run the BOP in the mud in shallower water. We also ballast a lot during riser pulls and you have to be mindful of the gantry crane moving back and forth when you are planning your ballast procedure. As in running riser we monitor the VHF to ensure a timely response to any requests for ballasting from the rig floor.

RUNNING CASING

Casing is large diameter steel pipe that ensures a pressure tight connection to the pay zone. The casing helps to ensure that pressures and fluids outside of the well are not allowed to enter and helps maintain the integrity of the well during drilling. The third party service hands are responsible for running casing and supply their own slips and tongs. They coordinate their activities with our drilling crew and often use the roughnecks for labor.

It is recommended that you estimate the change in draft when landing out casing and ballast accordingly. Once the cement job commences you will not be able to ballast until it has fully set and you get permission to do so from a toolpusher.

AUXILIARY DRAWWORKS

While running the initial string of casing, which is usually 36" or 38" in diameter, we will be making up the second string of casing using the auxiliary drawworks. Careful planning of this operation is necessary due to maintenance on the BOP happening in the same location. By making the inner string up offline, we are able to do two operations concurrently; spudding in and making up casing. Sort of a poor man's dual activity derrick.

When arriving on location, the 22" pipe handling equipment is ready to pick up the 22" casing, as per our standard operating procedures. There is a maximum weight limitation for the BOP transporter that is used to move the casing from the auxiliary drawworks to the rotary. The rig floor will calculate the weight and then monitor the weight as the string is being made up. We are also capable of handling sub-sea trees for well completion if necessary.

When running casing in the moonpool, weather is always a concern. If the sea state gets to be too large, the connections between the joints can work free. While running casing, log the weather more frequently than normal to provide a record in the case of an incident. This should probably be done if there are seas greater than 4 feet running through the moonpool.

ACTIVE HEAVE

Active heave compensation is used when drilling operations are sensitive to changes in the length of the drilling string. As the name implies, it works by using the drawworks to compensate for vessel motion. The drawworks will take in and pay out line to maintain the bit or other bottom hole tools at the same depth. This made is activated through controls on the driller's chair when needed. An alarm will sound on the SVC when we have control of machinery.

When Active heave is selected, the power management system (PMS) creates a false load of 2500kw (1250kw per drilling switchboard) to ensure that sufficient power is available. This acts as a cushion for the rig floor if needed, but it is not indicative of actual power used. This false load will cause additional generators to start sooner than actual power usage requires.

Mounted on SVC OS-3, is a reference card with load start parameters for both Normal and Active Heave operations.

GLOSSARY

Acusta
AD – See Assistant Driller
ADCP – Acoustic Doppler Current Profiler
ADPO – Assistant Dynamic Positioning Operator
AD Shack – See Drillers Workstation
AIS – See Automated Identification System
ARPA – Automated Radar Plotting Aid. This is an interface to the radar system. It displays useful information to the operator. It can automatically track targets and generate the course and speed of the target, which is used to determine the target's CPA.
Assistant Driller – As the name implies, this person assists the driller in performing their duties. During routine drilling operations, they will be operating the PRS from the right-hand chair. They are also responsible for running the equipment associated with the offline mouse hole. There are typically two assistant drillers on per tour.
Automated Identification System – Radio system used for automatically transmitting vessel information to other vessels in the area. The system works on VHF frequencies to transmit and receive. Our course, speed, call sign and destination is transmitted to other vessel and the same information is received from other vessels.
Auxiliary Drawworks
Bar – A metric unit of measure for pressure. One bar is equal to the average pressure exerted by the atmosphere at sea level. It is equal to 14.5 pounds/in^2 or 29.5 inches of mercury.
BHA – Bottom Hole Assembly.
Black Book
Blowout Preventer -
BOP – See Blowout Preventer
Box End – The female end of drill pipe.
Breakout – The process of taking strings of drill pipe apart.
Breakout Heading
Bug blower
Casing
Cathead
CCR – Central Control Room. Another name used to describe the Bridge.
Chain Tong – A manual tool used to make up or breakout pipe. The tool consists of a handle that varies in length depending on the amount of torque that is needed. At one end of the handle is a chain similar to a bicycle chain that is used to adjust the size and to get a bite on the pipe.
Chicksons
Choke and Kill Lines
Circulate Bottoms Up
CPA – Closest Point of Approach. A passing vessel will be at the closest geographic point to the vessel at this distance.
Crown
Crown Block
Cube
Deadman
Degasser
Derrickman
Desander
Desilter
DGPS – Differential Global Positioning System. GPS positions which have been corrected to remove errors for ionospheric conditions or other factors that might affect GPS positioning.
Dies
Diverter
Diverter Housing
Directional Drilling
Doghouse – Another name for the Driller's Workstation.

Dope – Lubricant applied to the threads of the drill pipe to prevent the threads from becoming frozen together. The dope also provides protection to the threads of the pipe. It is applied to the box end of the drill pipe while tripping out of the hole using a brush.

DPO – Dynamic Positioning Operator

Drawworks

Drill Collars

Drillers Workstation – Also known as the Doghouse, this is the compartment where the drilling equipment is controlled. We have two onboard, one on the starboard aft side of the drill floor and the other on the starboard forward side. The forward workstation is also known as the AD Shack.

DWS – See Drillers Workstation

Dynamic Positioning Operator

ECDIS - Electronic Chart Display and Information System

ECR – Engine Control Room

Elevators

ESD – Emergency Shutdown. A function of the fire and gas system used to remotely secure systems in the event of and emergency. These can be used to secure ventilation, fuel or energy. They are controlled using the SVC or matrix panels.

ET – Electronic Technician.

Finger Board

Fishing – The process of retrieving objects that have been lost downhole.

Fishing Tools – Tools of various types that are used during fishing operations. Some of these tools include inside grapples, outside grapples and magnets. An outside grapple is a sleeve that fits over the object while an inside grapple screws into the object to be recovered.

Flex Joint

Gantry Crane

GM

GPS – Global Positioning System. A system of 24 satellites in orbit that transmits time signals to receivers on Earth that are used to develop accurate positioning and velocity data.

GRS – Global Reporting System. Transocean's internal software for tracking data associated with operations and drills.

Gumbo Box -

Heavyweight

HiPAP – High Precision Acoustical Positioning. Simrad system for using transponders on the seabed to provide positioning information through transceivers mounted on the hull.

HPR – Hydro-acoustic Position Reference

IBOP – Inside BOP

ID – Inner Diameter

IMCA – International Marine Contractors Association.

IMO – International Maritime Organization. A committee of the United Nations tasked with regulating marine safety and maritime trade.

Iron Roughneck

ISM – International Safety Management.

Jarring

Jetting In

Jewelry

Junk Basket – A downhole tool that is part of the BHA while drilling in an area where metal or other 'junk' is in the hole where they are drilling. As the mud circulates past the tool, heavy particles will be caught and collected. When the tool is brought to the surface, it can be emptied. Occasionally, there will be magnets installed in the tool to assist in the collection of metal objects.

KG

Kickoff

Landing Joint

Landing Out

LMRP – Lower Marine Riser Package

Manrider

MARSEC – Maritime Security Level. MARSEC is a measure of the perceived security threat against the vessel. This system has three levels that are numbered one through three. The lowest, and most common, level is "Level #1" which represents a general threat. Each level of MARSEC has responses that are described in the vessel's security plan.

MDG – Main Diesel Generator

Mini-Drawworks

Monkey Board

Motorman

Mouse hole

M/T - Empty

Mud Pit

Mud Weight

MUX Lines

MWD – Measure While Drilling. These are complex tools which are mounted as a part of the bottom hole assembly while drilling.

NHC – National Hurricane Center. A branch of NOAA responsible for tracking hurricanes and hurricane forecasting in the Atlantic Basin.

NOAA – National Oceanographic and Atmospheric Administration. This is the Government entity responsible for monitoring weather within the United States. They create the weather forecasts for the United States and surrounding waters including the North Atlantic and Gulf of Mexico.

NUC – Not Under Command. A vessel, which through some exceptional circumstance is unable to maneuver as required by the rules of the road and is therefore unable to keep out of the way of another vessel.

OD – Outside Diameter

Pin End – The male end of drill pipe.

POB – Persons on Board.

Pod

POOH – Pulling Out Of Hole

PRS – Pipe Rack System

PSI – Pounds per Square Inch. Equal to 70 millibars of pressure or

Pumpman

Pup Joint

RAM – Restricted in Ability to Maneuver. A vessel, which from the nature of her work is unable to maneuver as required by the Rules of the Road.

Riser

Riser Skate

Rock Catcher – Device used to remove rocks or chunks from bulk material as it is loaded. Our rock catchers are located at the bulk loading stations immediately after the end of the loading hoses.

Roughneck – Also known as a floorhand. These people on the drill floor are doing the actual work. They are slinging the tools, making up and breaking out pipe, and doing the cleaning.

Rotary

ROV – Remotely Operated Vehicle. Small, unmanned submersible used for underwater operations. The ROV is remotely piloted from a control van on the starboard forward corner of the vessel. The ROV is a critical piece of operations during the landing and release of the BOP. The ROV also makes periodic surveys of the riser and subsea equipment looking for leaks and other defects.

ROV in the Air

Sack – One sack is the unit of measure for dry bulk material like barite or cement. The sack is based on the weight of the material rather than the volume. One sack of barite is equal to 100 pounds (45.4 kg) and one sack of cement is equal to 94 pounds (42.6 kg). In terms of volume, one sack of barite is 1.35 ft^3. The volume of one sack of cement varies, but is usually around one ft^3 per sack.

Sandtrap

SDC Ring

SDP – Simrad DP

SDPO – Senior Dynamic Positioning Operator. According to Transocean's policies, this is a DPO with one year of experience and a superior evaluation.

Service Loop

Setback

Shaker
Sidetrack
Skate
Slip and Cut
Slip Joint
Slips
Slugging
SOLAS – Safety of Life at Sea. Series of regulations created by the IMO to regulate safety and lifesaving equipment onboard vessels. These regulations were enacted because of the sinking of the *Titanic*. There are regulations specifying the number of lifeboats, lifeboat equipment and lifejackets. Within the Gulf of Mexico, these regulations are enforced by MMS and the US Coast Guard.
Stabilizer
Stack
START
STC – Simrad Thruster Control
Storm Packer
Subs
SVC – Simrad Vessel Control
Tensioner
THINK
TIH – See Tripping in Hole
Tongs
Top Drive
Tripping in the Hole
Trip Tank
Tugger
UFJ – Upper Flex Joint
Variable Deck Load – A measure of the capacity of the vessel. Variable deck load is calculated by subtracting the lightship, fuel, water and ballast from the displacement. This will show the amount of drilling material onboard. The vessel is limited to 8220 tons of variable deck load while at drilling draft (23.0m).
VDL – See Variable Deck Load
V-Door
VHF – Very High Frequency
Wiper
Wiper Rubber
Wind Wall
WTD – Watertight Door

APPENDIXES

APPENDIX A – REQUIRED READING LIST

APPENDIX B – RIG SPECIFIC OJT

APPENDIX C – FIELD ARRIVAL TESTS

APPENDIX D – SOFTWARE MANAGEMENT SYSTEM

APPENDIX E – VESSEL SPECIFICATIONS