of year, wind, waves, tides, current, cloud cover, temperature, visibility, and the presence of other ships. Completing the Environmental Assessment Worksheet (Figure 6-6) helps ensure that environmental factors are not overlooked during planning. For an extensive dive mission, a meteorological detachment may be requested from the local or regional meteorological support activity.

6-4.4.1.1 ***Natural Factors.*** Normal conditions for the area of operations can be determined from published tide and current tables, sailing directions, notices to mariners, and special charts that show seasonal variations in temperature, wind, and ocean currents. Weather reports and long-range weather forecasts shall be studied to determine if conditions will be acceptable for diving. Weather reports shall be continually monitored while an operation is in progress.

NOTE **Diving shall be discontinued if sudden squalls, electrical storms, heavy seas, unusual tide or any other condition exists that, in the opinion of the Diving Supervisor, jeopardizes the safety of the divers or topside personnel.**

6-4.4.1.2 ***Sea State.*** A significant factor is the sea state (Figure 6-7). Wave action can affect everything from the stability of the moor or the Dynamic Positioning of the ship to the vulnerability of the crew to seasickness or injury. Unless properly moored, a ship or boat drifts or swings around an anchor, fouling lines, and dragging divers. Because of this, any vessel being used to support surface-supplied or tended diving operations on fixed objects such as the ocean bottom, a wreck, or an underwater structure shall be secured by at least a two-point moor or use a Dynamic Positioning vessel IMO Equipment Class 2 or 3 per Appendix 2B. Exceptions to diving from a two-point moor or Dynamic Positioning vessel IMO Equipment Class 2 or 3 may occur when moored alongside a pier or another vessel that is properly anchored, or when a ship is performing diving during open ocean transits and cannot moor due to depth. A Dynamic Positioning vessel or three- or four-point moor, while more difficult to set, may be preferred depending on dive site conditions. Exceptions for using a Dynamic Positioning vessel IMO Equipment class 2 or 3 can be found in Appendix 2B.

Divers are not particularly affected by the action of surface waves unless operating in surf or shallow waters, or if the waves are exceptionally large. Surface waves may become a serious problem when the diver enters or leaves the water and during decompression stops near the surface.

6-4.4.1.3 ***Tender Safety.*** Effective dive planning shall provide for extreme temperatures that may be encountered on the surface. Normally, such conditions are a greater problem for tending personnel than for a diver. Any reduction in the effectiveness of the topside personnel may endanger the safety of a diver. Tending personnel shall guard against:

- Sunburn and windburn
- Hypothermia and frostbite
- Heat exhaustion

6-4.4.1.4 ***Windchill Factor.*** In cold, windy weather, the windchill factor shall be considered. Exposure to cold winds greatly increases dangers of hypothermia and all types of cold injury. For example, if the actual temperature is 35°F and the wind velocity is

diving team in first aid procedures and participate in diving operations when the presence of diving medical personnel is indicated, as when particularly hazardous operations are being conducted.

Diving medical personnel evaluate the fitness of divers before operations begin and are prepared to handle any emergencies which might arise. They also observe the condition of other support personnel and are alert for signs of fatigue, overexposure, and heat exhaustion.

There are no hard and fast rules for deciding when a medication would preclude a diver from diving. In general, topical medications, antibiotics, birth control medication, and decongestants that do not cause drowsiness would not restrict diving. Diving Medical Personnel should be consulted to determine if any other drugs would preclude diving.

6-8.8.8 **Other Support Personnel.** Other support personnel may include almost any member of the command when assigned to duties that support diving operations. Some personnel need specific indoctrination. Small-Boat operators shall understand general diving procedures, know the meanings of signals, and be aware of the mission objectives. Other personnel, such as winch operators or deck crew, might interact with the operation directly, but only when under the control of the Diving Supervisor. Engineering personnel may be directed to secure overboard discharges and lock the shafts; a sonar operator might be required to secure equipment and put a Do Not Energize tag on the power switch (see Figure 6-20 for a detailed Ship Repair Safety Checklist).

The Officer of the Deck (OOD) or Command Duty Officer (CDO) is responsible to the Commanding Officer for the operation and safety of the ship and crew during the watch. The Watch Officer shall be concerned with the activities of the diving team. The OOD/CDO shall stay informed of the progress of the operation, of any changes to the original plan, and shall be notified as far in advance as possible of any special requirements. The Officer of the Deck or Command Duty Officer shall be alert for any shifting of the moor or Dynamic Positioning vessel not being able to maintain its position due to changing weather/sea conditions. He shall inform the Diving Officer and/or Diving Supervisor of any changes in these conditions.

6-8.8.9 **Cross-Training and Substitution.** Each member of the diving team should be qualified to act in any position on the team. Because it is probable that substitutions will be made at some point during a lengthy mission, dive plans and diving schedules should organize personnel and work objectives so that experienced personnel will always be available on site. All personnel who participate in the operation should be included in initial briefings.

6-8.8.10 **Physical Condition.** Diving candidates shall meet the specific physical requirements for divers set forth by the Commander Naval Medical Command and pass a physical screening test as outlined in MILPERSMAN Article 1220.100. Once qualified, the diver is responsible for maintaining good health and top physical condition.

6-8.9.4 **Recompression Chamber Requirements.**

1. An on-station recompression chamber is defined as a certified and ready chamber on the dive station.

2. A recompression chamber shall be on-station for all planned decompression dives or dives deeper than 100 fsw.

3. Civilian divers shall remain at the location of a manned recompression chamber for 1 hour after surfacing from a dive that requires a recompression chamber on station.

6-9 ORGANIZE AND SCHEDULE OPERATIONS

6-9.1 **Task Planning and Scheduling.** All phases of an operation are important. A common failure when planning an operation is to place excessive emphasis on the actual dive phases, while not fully considering pre-dive and post-dive activities. Another failure is to treat operations of a recurring nature with an indifference to safety that comes with over-familiarity. In developing a detailed task-by-task schedule for an operation, the following points shall be considered.

- The schedule shall allocate sufficient time for preparation, transit to the site, rendezvous with other vessels or units, setting up and testing the Dynamic Positioning system on site or establishing a secure mooring
- Bottom time is always at a premium, and all factors that shall affect bottom time shall be carefully considered. These include depth, decompression, number of divers available, support craft size, and surface and underwater environmental conditions.
- The number and profile of repetitive dives in a given time period are limited. This subject is discussed in Chapter 9.
- Plans may include the option to work night and day; however, there is an increased risk of a diving mishap from fatigue.
- The level of personnel support depends on the diving techniques selected (see Minimum Manning Levels, Figure 6-16).
- In planning tasks, non-diving topside support personnel shall be selected carefully, especially those who are not members of the diving team.
- Any schedule must be flexible to accommodate unexpected complications, delays, and changing conditions.
- The Diving Supervisor shall anticipate difficulties and be prepared to either overcome them or find alternative methods to circumvent them.
- If divers have been inactive and operating conditions permit, work-up dives should be conducted in-water or in the recompression chamber.

6-9.2 **Post-dive Tasks.** A diving operation is completed when the objective has been met, the diving team demobilized, and records and reports are filed. Time shall be allocated for:

DIVING SAFETY AND PLANNING CHECKLIST

(Sheet 3 of 4)

__ 7. Ensure that all divers have removed anything from their mouths on which they might choke during a dive (gum, dentures, tobacco).

__ 8. Thoroughly drill all personnel in Emergency Procedures, with particular attention to cross-training; drills should include:

Emergency recompression	Rapid undressing	Fire
First aid	Rapid dressing	Embolism
Restoration of breathing	Near-drowning	Electric shock
Blowup	Entrapment	Lost diver

D. ESTABLISH SAFE DIVING OPERATIONAL PROCEDURES

__ **Complete Planning, Organization, and Coordination Activities:**

__ 1. Ensure that other means of accomplishing mission have been considered before deciding to use divers.

__ 2. Ensure that contingency planning has been conducted.

__ 3. Carefully state goals and tasks of each mission and develop a flexible plan of operations (Dive Plan).

__ 4. Completely brief the diving team and support personnel (paragraph 6-7).

__ 5. Designate a Master Diver or properly qualified Diving Supervisor to be in charge of the mission.

__ 6. Designate a recorder/timekeeper and verify that he understands his duties and responsibilities.

__ 7. Determine the exact depth at the job-site through the use of a lead line, pneumofathometer, or commercial depth sounder.

__ 8. Verify existence of an adequate supply of compressed air available for all planned diving operations **plus an adequate reserve for emergencies.**

__ 9. Ensure that no operations or actions on part of diving team, support personnel, technicians, boat crew, winch operators, etc., take place without the knowledge of and by the direct command of the Diving Supervisor.

__ 10. All efforts must be made through planning, briefing, training, organization, and other preparations to minimize bottom time. Water depth and the condition of the diver (especially fatigue), rather than the amount of work to be done, shall govern diver's bottom time.

__ 11. Current decompression tables shall be on hand and shall be used in all planning and scheduling of diving operations.

__ 12. Instruct all divers and support personnel not to cut any lines until approved by the Diving Supervisor.

13. Ensure that ship, boat, or diving craft is set up on site using a Dynamic Positioning mode or securely moored and in position to permit safest and most efficient operations (exceptions are emergency and critical ship repairs).

14. Verify that, when using surface-supplied techniques, the ship, boat, or diving craft has at least a two-point moor or is in position using a Dynamic Position vessel class 2 or 3 in accordance with Appendix 2B.

__ 15. Ensure that, when conducting SCUBA operations in hazardous conditions, a boat can be quickly cast off and moved to a diver in distress.

__ **Perform Diving Safety Procedures, Establish Safety Measures:**

__ 1. Ensure that each diver checks his own equipment in addition to checks made by tenders, technicians or other support personnel.

__ 2. Designate a standby diver for all diving operations; standby diver shall be dressed to the necessary level and ready to enter the water if needed.

__ 3. Assign buddy divers, when required, for all SCUBA operations.

Figure 6-19. Diving Safety and Planning Checklist (sheet 3 of 4).

DIVING SAFETY AND PLANNING CHECKLIST

(Sheet 4 of 4)

__ 4. Take precautions to prevent divers from being fouled on bottom. If work is conducted inside a wreck or other structure, assign a team of divers to accomplish task. One diver enters wreck, the other tends his lines from point of entry.

__ 5. When using explosives, take measures to ensure that no charge shall be fired while divers are in water.

__ 6. Use safety procedures as outlined in relevant Naval publications for all U/W cutting and welding operations.

__ 7. Brief all divers and deck personnel on the planned decompression schedules for each particular dive. Check provisions for decompressing the diver.

__ 8. Verify that ship, boat, or diving craft is displaying proper signals, flags, day shapes, or lights to indicate diving operations are in progress. (Consult publications governing International or Inland Rules, International/Inland local signals, and Navy communications instructions.)

__ 9. Ensure that protection against harmful marine life has been provided. (See Appendix 5C.)

__ 10. Check that the quality of diver's air supply is periodically and thoroughly tested to ensure purity.

__ 11. Thoroughly brief boat crew.

__ 12. Verify that proper safety and operational equipment is aboard small diving boats or craft.

__ **Notify Proper Parties that Dive Operations Are Ready to Commence:**

__ 1. Diving Officer

__ 2. Commanding Officer

__ 3. Area Commander

__ 4. Officer of the Deck/Day

__ 5. Command Duty Officer or Commanding Officer of ships alongside

__ 6. Bridge, to ensure that ship's personnel shall not:

- __ turn the propeller or thrusters unless using a Dynamic Positioning Vessel and the Diving Supervisor has been notified and agrees to ship's configuration.
- __ get underway
- __ activate active sonar or other electronics
- __ drop heavy items overboard
- __ shift the moor or change position using Dynamic Positioning mode without prior approval from the Diving Supervisor
- __ Change any agreed upon Dynamic Positioning setting without first getting approval from the Diving Supervisor

__ 7. Ship Duty Officer, to ensure that ship's personnel shall not:

- __ activate sea discharges or suctions
- __ operate bow or stern-planes or rudder
- __ operate vents or torpedo shutters
- __ turn propellers

__ 8. Other Interested Parties and Commands:

- __ Harbor Master/Port Services Officer
- __ Command Duty Officers
- __ Officers in tactical command
- __ Cognizant Navy organizations
- __ U.S. Coast Guard (if broadcast warning to civilians is required)

__ 9. Notify facilities having recompression chambers and sources of emergency transportation that diving operations are underway and their assistance may be needed.

Figure 6-19. Diving Safety and Planning Checklist (sheet 4 of 4).

ACN-7A

13-3.1 **Mixed Gas Diving Methods.** Mixed gas diving methods are defined by the type of mixed gas diving equipment that will be used. The three types of mixed gas diving equipment are:

- Surface supplied gear (MK 21 MOD 1, EXO BR MS, KM-37)
- Semiclosed circuit and closed circuit UBAs
- Saturation deep dive systems

For deep dives (190-300 fsw) of short duration, or for shallower dives where nitrogen narcosis reduces mental acuity and physical dexterity, helium-oxygen diving methods should be employed.

Because of the unusual hazards incurred by long exposures to extreme environmental conditions, extended excursions away from topside support, and great decompression obligations, semiclosed circuit and closed circuit diving should only be undertaken by specially trained divers. Semiclosed circuit and closed circuit diving operations are covered in depth in Volume 4.

Saturation diving is the preferred method for dives deeper than 300 fsw or for shallow dives where extensive in-water times are required. Disadvantages of saturation diving include the requirement for extensive logistic support and the inability of the support ship to easily shift position once the mooring is set unless using a Dynamic Positioning vessel IMO equipment class 2 or 3 per Appendix 2B. For this reason, it is very important that the ship be moored or dynamically positioned as closely over the work site as possible. Using side-scan sonar, remotely operated vehicles (ROVs) or precision navigation systems will greatly aid in the successful completion of the operation. Saturation diving is discussed in Chapter 15.

13-3.2 **Method Considerations.** In mixed gas diving, the principle factors influencing the choice of a particular method are:

- Depth and planned duration of the dive
- Equipment availability
- Quantities of gas mixtures available
- Qualifications and number of personnel available
- Type of work and degree of mobility required
- Environmental considerations such as temperature, visibility, type of bottom, current, and pollution levels
- Communication requirements
- Need for special operations procedures

APPENDIX 2B

Guidance For U.S. Navy Diving On A Dynamic Positioning Vessel

2-B.1 INTRODUCTION:

A Dynamic Positioning (DP) vessel is defined as a vessel actively using its propulsion systems to maintain position and heading. This station keeping ability can be manual or automatic. Ship's propulsion systems include thrusters, main propellers, rudders, and the machinery and controls required to provide power to them. Main propellers and rudders are included only if they are controlled by the DP system.

The hardware for a DP systems consist of position references (such as Global Positioning Systems (GPS), Differential Global Positioning Systems (DGPS), taut wire, and acoustic transponders), gyrocompasses, vertical motion sensors, environmental sensors, ship's propulsion systems, and all the cables and cable routing associated with these components. A computer is used to integrate these subsystems into the total DP system. The computer monitors the desired position against output of the position references, gyrocompasses, environmental sensors, and vertical motion sensors (when employed by the DP system). When there is a difference it will direct thrust in the necessary direction to get the ship back into the desired position and/or heading.

DP is a rapidly maturing technology, having been born as a result of the increasing demands of the rapidly expanding oil and gas exploration industry in the 1960's and early 1970's. In 2008, well over a 1,000 vessels have DP capabilities and that number continues to grow.

Over the preceding decades, commercial diving operations have used DP vessels with great success. DP vessels meeting IMO Equipment Class 2 or 3 are a proven safe and reliable method of conducting manned diving operations. However, no effort should be spared to establish DP operational reliability and to ensure that, if the vessel does lose station, the effects on the divers are minimized. All personnel connected with the operation should keep this in mind at all times. The general conduct of U.S. Navy diving operations from DP vessels shall follow the same principles as other diving operations.

DP advantages include:

- Vessel is fully self-propelled; no tugs are required at any stage of the operation.
- Setting-up on location is quick and easy.
- Vessel is very maneuverable.

- Rapid response to weather changes is possible.
- Rapid response to changes in the requirements of the operation.
- Versatility within system (i.e. track-follow, ROV-follow and other specialist functions)
- Ability to work in any water depth.
- Ability to complete short tasks quicker, thus more economically
- Avoidance of risk of damaging seabed hardware by mooring lines and anchors.
- Avoidance of cross-mooring with other vessels or fixed platforms.
- Ability to move to new location rapidly

DP disadvantages include:

- Failure to keep position due to equipment failure, if adequate system redundancy does not exist
- Higher long term day rates than comparable moored systems
- Higher fuel consumption
- Thrusters could be a hazard to divers
- Loss of position in extreme weather or in shallow waters and strong tides
- Position control is active and relies on human operator input (as well as equipment)
- More personnel required to operate and maintain equipment

2-B.1 THE PURPOSE OF THIS APPENDIX IS TO PROVIDE THE FOLLOWING:

- Guidance to determine the correct type DP vessel used for U.S. Navy diving.
- Guidelines to determine the suitability of the DP vessel for U.S. Navy diving.
- Guidelines for establishing an operational plan for conducting U.S. Navy diving on DP Vessel of Opportunity (VOO).
- Specific guidelines for Surface Supplied Diving while operating in the DP mode on a VOO.

Implementation of these guidelines will vary from vessel to vessel because the characteristics of each vessel will affect its suitability. Therefore, there may be minor variations to these guidelines as different VOOs are used.

2-B.2.1 GUIDANCE TO DETERMINE THE CORRECT TYPE DP VESSEL.

The International Guideline for classifying DP systems, reference (a), is used as a resource for the classification societies to help set and maintain a uniform standard. The Classification Society acts as an independent third party to review the design and witness the construction, installation, and testing of the DP system to ensure it meets recognized standards, such as the IMO Equipment Class standard. It also ensures the system is properly maintained with surveys. There are different class notations depending on the level of redundancy that is necessary for the DP system. See Table 2B-1

Three examples of Classification Societies that issue equipment class notations for DP vessels are:

- American Bureau of Shipping (ABS)
- Lloyds Register of Shipping
- Det Norske Veritas (DNV)

Table 2B-1. Classification Society and International Maritime Organization (IMO) Equipment Class Notations.

DESCRIPTION	IMO EQUIPMENT CLASS
Manual position control and automatic heading control under specified maximum environmental conditions	-----
Automatic and manual position and heading control under specified environmental conditions	Class 1
Automatic and manual position and heading control under specified maximum environmental conditions, during and following any single fault excluding loss of a compartment. (Two independent computer systems)	Class 2
Automatic and manual position and heading control under specified maximum environmental conditions, during and following any single fault including loss of a compartment due to a fire or flood. (At least two independent computer systems with a separate back-	Class 3

up system)	

As seen in Table 2B-1, IMO Equipment Class 2 or 3 will maintain automatic or manual position and heading control under specified maximum environmental conditions, during and following any single-point failure of the DP system. For the purposes of U.S. Navy diving operations, single-point failures are those failures that would cause the vessel to lose position from either a drive-off or drift-off. There is a possibility that a system redundancy would no longer exist once a failure occurs. Therefore, the Officer-in-Charge will have to determine if the underwater operation has to be stopped and divers recovered to the VOO.

DP vessels used for U.S. Navy diving operations shall meet IMO Equipment Class 2 or 3. There are limited exceptions to this rule, such as certification, training, or qualification dives where the diver does not interact with the bottom or a fixed structure. DP systems meeting IMO Equipment Class 1 are, by definition, subject to single point failure and are not suitable for diving operations and require mission specific waiver.

2-B.2.2 GUIDELINES TO DETERMINE THE SUITABILITY OF A DP VESSEL

U.S. Navy personnel shall ensure that operational environmental conditions will not exceed the vessel's or the DP system's capabilities. Embarked Navy personnel must understand the DP vessel's capabilities and identify the status of the DP system by including indications provided when predetermined limits are being approached. Indications shall be at the dive control station and on the bridge of the VOO.

After a VOO has been selected, all foreseeable emergencies relating to the diving operation shall be identified and contingency plans established.

The following is provided as a guide to ensure a DP vessel is suitable for U.S. Navy diving operations:

- A Failure Modes and Effects Analysis (FMEA) is required by Classification Societies and accomplished during the classification/certification process and should be available for review by U.S. Navy personnel. The FMEA should include the following:
    - Identification of back up or compensating equipment for each failure (Does it cover emergency situations that could occur during the mission?)
    - A description of the major components of the DP system, including whether individual thrusters/propellers can be

taken off-line from the whole system.

- Identification of any significant failure modes that will affect the mission. If so, are procedures are in place to mitigate the failures and have the procedures been used and shown to be satisfactory.

- The method of detecting a failure or an impending failure.

- Affect of the failure on the ship's station keeping ability.

- Capability of position references for depth of water at dive site.

- A risk assessment shall compare the planned operation against the FMEA to ensure the system is compatible with the mission (water depth, currents, waves/swells, winds, etc.).

- Technical evaluation of the DP Vessel. Conduct a general inspection of the overall DP system including the Uninterrupted Power Supply (UPS) system to verify adequacy for the dive mission. .

- Identify the position references that will be used in the DP system: Will subsea position references and/or surface position references be required? (taut wire, hydro acoustic, GPS, or DGPS).

NOTE: Wire and depressor of taut wire system may interfere with diving operations since a vertical wire and depressor are used to establish the set point for the ship. If possible, inspect them to ensure they are in good working order.

- Identify any positioning and heading constraints for the DP vessel.

- Will the diver be working on or near the bottom or a fixed structure?

- What is the Diver deployment and recovery location with respect to thrusters and/or main propulsion?

- Do the Diver underwater communications interfere with acoustic positioning systems?

- Do satellite communication systems interfere with GPS/DGPS signals?

- Are there any operational related external forces that could reduce station keeping capabilities (i.e., salvage recovery or heavy lifts, helicopter wash on wind sensors, etc.)

- Verify that there is documentation that shows that the DP vessel has the appropriate Class Notation in accordance with a Classification Society and Flag State. Ensure vessel has no outstanding liabilities against it.

- Verify that appropriate authorities (Classification Society and owner) have approved deck and supporting structure modifications for foundation loads from the diving system, if modifications were made.

- Review vessel DP history and crew qualifications/experience.

- Review for reliability and proficiency (has the system experienced significant down time and have there been operator errors?)

- Test and operate the system while assessing the DP vessel's ability to hold position in depth of water at mission site. Do all the alarms, monitors, and displays operate properly in accordance with reference. (b)?

2-B.2.3 GUIDELINES FOR ESTABLISHING AN OPERATIONAL PLAN FOR THE DP VESSEL

Operational planning is essential with agreement reached on all aspects of the mission, including emergency procedures for any foreseeable contingencies. Both the DP vessel crew and the U.S. Navy personnel need to be aware of the effects of each other's operations and emergency procedures and how they affect their respective systems. The vessel crew and Navy personnel shall work together to establish clear lines of communications and command and control. The responsibility and authority of all personnel involved in the management of the diving operation shall be clearly defined. Key DP vessel personnel include the Master, Chief Mate, Chief Engineer, bridge watch standers, and DP operators. Key US Navy personnel include the Officer in Charge, Master Diver, Safety Officer, and dive system operators.

Operational planning should include the following factors at a minimum:

- Is the position of the work site close to the ocean bottom, surface hazards or other obstructions?

- Vessels maneuverability while in DP mode and requirement to move vessel while Divers are deployed.

- Expected weather conditions while on the dive site.

- Predicted tide and/or current conditions while on the dive site.

- Expected sea state and swells at dive site.

- How to optimize vessel position over dive site.

- Power of the DP vessel and thruster configuration for the dive mission.

- Depth of water at and around the dive site. Identify if water is too deep or shallow for proper operation of position references.

- Location of position reference sensors on VOO. Are there any factors that can affect their input/output while on station? (e.g., helicopter blade affecting anemometer or obstruction on bottom interfering with taut wire depressor location).

- Time required to recover Divers back to a safe location or the VOO and are escape routes to get out of a hazardous condition impeded by subsea or surface objects.

2-B.2.4 SPECIFIC GUIDELINES FOR SURFACE SUPPLIED DIVING WHILE OPERATING IN THE DP MODE.

"DP Mode" is defined as being the use of motive power (thrusters or propellers) to position the ship over a dive site. The requirements are based on the premise that at no time should the length of umbilical from the tending point to the diver allow the diver to come into within 15 feet of the nearest thruster or propeller that is in an operating mode. Very great care is needed in the planning and execution of shallow and surface oriented diving operations to minimize the effect of thrust units on the divers. The effects of thrust unit wash or suction should be carefully considered and precautions taken to guard against them particularly when the divers pass the potential wash zone. The use of thrust diagrams when planning dives can also help. Inhibiting or deselecting certain thrusters may be necessary and the resulting reduction in the vessel's operational limitations should be taken into account. Divers umbilical lengths and the manner of deploying them (i.e. over the side, from a stage, etc.) should be so chosen that divers and their umbilical are physically restrained from going to positions where they or their equipment could come into contact

with thrust units or be adversely affected by their wash. There is no simple approach to the problem due to the differences encountered in the vessels and worksites.

Surface supplied diving can be performed from a DP vessel in the DP mode whether over the side or through the moonpool, if the following conditions are met:

- In accordance with reference (c) a diagram showing any hazards to the divers such as; (thrusters, propellers, rudders, and suctions) specific to each vessel shall be provided in both DP and dive control to enable the DP operator and the Diving Supervisor to visualize the relative position of the vessel, the deployment device and the divers in relation to the worksite, and to plan operations accordingly.

- Written procedures shall be prepared for emergency situations (i.e. changes in alert level status, alarms, loss of communications, moving the vessel, etc.)

- The Dive Team must be familiar with the vessel's overall design and operating characteristics (i.e., position of thrusters, propellers, intakes, obstructions, etc.)

- Diver umbilicals shall be tended at all times. The tending point is defined as the surface or in-water point from which the diver's umbilical can be securely tended. Where the planned excursion is such that the diver could be brought within range of any of the physical hazards identified by the risk assessment (such as vessel thrusters, propellers, suctions, etc.), his umbilical shall be physically restrained at the tending point to prevent it from coming with 15 feet of such hazards.

- Use of a stage is recommended. The umbilical should be attached along the stage wire and the appropriate amount of umbilical should be coiled up on the stage allowing one diver to be tended by the other.

- Diver umbilicals shall be marked every 10 feet.

- The diver and standby diver shall be in direct communication with the Dive Supervisor at all times.

- The Dive Supervisor shall be provided with relevant DP alarms and communications systems to the bridge and/or DP control

station.

- The topside tenders shall be able to listen to all communications between the Divers and the Supervisor and shall be able to talk directly to the Supervisor.

NOTE: The conditions listed above do not mirror the conditions listed in reference (c). When conditions conflict, defer to the conditions listed above.

2-B.2 CONCLUSION:

Sound diving procedures along with Operational Risk Management (ORM) are essential for using DP vessels for US Navy diving operations. The guidance given in this appendix used in conjunction with references (b) and (c) is required to conduct safe diving operations from a DP vessel.

CAUTION: Routine SCUBA diving operations are not authorized on DP vessels. To conduct emergency SCUBA diving operations, all forms of motive power, i.e., thrusters or propellers, within 50 feet of diving operations shall be de-energized in a manner to prevent inadvertent operation. SCUBA divers shall be tended from the waterline via small boat or stage.

2-B.3 REFERENCES:

(a) International Maritime Organization, Guidelines for Vessels with Dynamic Positioning Systems, Maritime Safety Committee (MSC) Circular 645, June 1994

(b) International Marine Contractors Association (IMCA) Guidance note # IMCA D010 Rev.1 Diving Operations from Vessels Operating in Dynamically Positioned Mode, January 1998

(c) Consensus Standards for Commercial Diving and Underwater Operations, Section 7.0, Dynamic Positioned Vessel Diving Systems and Operations, 5th ed., Association of Diving Contractors International, 2004