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MANAGEMENT

CHAPTER FIVE MANAGEMENT

It has long been understood that the safe and efficient operation of any industrial enterprise depends on far more than the physical integrity of the plant and equipment. Each venture encompasses a myriad of diverse elements, both inanimate and human, which it is the task of management so to combine that every hand, as well as every working part, should perform co-operatively, and that every operation, whether routine or rare, should proceed with ease, order and success. That the quality of the management process plays a vital role in assuring the safety of offshore exploration is abundantly clear; accident reports are replete with descriptions of counteraction and confusion stemming from managerial misjudgment, operational inadequacies and basic human error.

A harsh environment or weaknesses in design or structure will rarely, in themselves, cause offshore accidents; there is always an operational component involved as a contributing factor. In several recent rig and supply vessel accidents that occurred during storms, a major problem was the lack of proper operating procedures for preparing for heavy weather – a porthole deadlight not shut, a rig not de-ballasted to survival draft, a deck load not tied down or a crew not trained to cope with the unexpected. Many of the causal connections in the web of circumstances surrounding an offshore accident are the small, routine matters of rig housekeeping that play a vital and sometimes decisive role in the promotion of safety awareness and in the protection of human lives (Appendix D, Item 1). Other management involvement comes on a larger scale when, for example, well control is lost, and the sudden threat of fire, explosion or toxic gas makes quick and correct action imperative. Blowouts are a major cause of casualties during drilling operations and investigative authorities have again and again cited as a primary contributor, the failure of management personnel to follow effective well control procedures.

The early years of this decade saw three major rig disasters and the shock produced by this series of catastrophes led to substantial changes in operating procedures and in equipment standards. That these improvements are beneficial cannot be denied; yet they alone cannot secure the safety of the men and machinery on a drilling rig off the East Coast of Canada. Advanced technology or elaborate response plans serve little purpose without competent human control. In fact complex systems or strategies may prove harmful if uninformed use is made of them, or if people are lulled into complacency by their presence. An ice alert plan may well designate safety zones and prescribe appropriate response, but recent events have shown that these plans are not infallible and that there remain a number of key points in that process where the action taken by rig management may stand between safety and potential disaster. While improvements in design, equipment and operating procedures are to be encouraged, undue reliance on them could induce a lack of appropriate vigilance

and hence heightened risk. The fundamental, overriding factor affecting human safety offshore is intelligent human control over the use of equipment and procedures and over the complex process of management that welds these elements together to form a working whole.¹

The key management issues affecting operational safety are familiar both to regulators and to those actually involved in offshore management. There must be, for each drilling rig, a straightforward chain of command, established qualifications for the person in charge, and a clear allocation of responsibility and accountability for safety matters which involves every member of the rig community. There must be, for each drilling rig and for the industry in general, clearly defined and well understood operating guidelines, contingency plans, and reporting procedures for all matters affecting the safety of the rig or its crew. There must be, for each drilling rig, competent supervisors and a capable crew who are appropriately selected, organized and trained for the tasks they are to perform.

These issues have been addressed by industry, particularly since the loss of the *Ocean Ranger*, and many improvements have been effected or promised. Questions remain, however, regarding the thoroughness and consistency with which these basic tenets of responsible management are being observed in the offshore workplace. There are indications, for example, that two recent blowouts on the Scotian Shelf were both caused by management error involving, in one case, "hesitancy in following the operator's emergency plans" and in the other "serious error in interpreting drilling parameters and failure to react in a proper and expeditious manner."²

The main participants in the management of eastern Canadian offshore drilling operations are the operating oil companies having leasehold rights to drill the exploratory wells and the drilling contractors who own the rigs and carry out the drilling programs. Recognizing the diversity of practice in an international industry and the problems inherent in attempting to regulate the human elements of an operating system, regulators have placed the onus on operators and drilling contractors to demonstrate that their activities are conducted safely.

The operating oil company that undertakes a new drilling program is at the apex of a pyramid of contractual relationships since a variety of organizations are retained to provide a wide range of services to the project. The standard practice during exploration and delineation drilling off eastern Canada is for operators to retain drilling contractors to drill their exploratory wells. Most of the drilling contractors are large companies who own substantial fleets of MODUs and drill wells for oil companies all over the world. The drilling contractor is expected to provide a suitable rig that is managed and manned by appropriate personnel. The regulatory authority must be satisfied that the drilling contractor retained by the operator is experienced and that the drilling rig to be used is satisfactory for the site and for expected environmental conditions. The drilling contractor is then held responsible by the operator for fulfilling the terms of their contract, while maintaining the safety of men and equipment and observing applicable regulations.

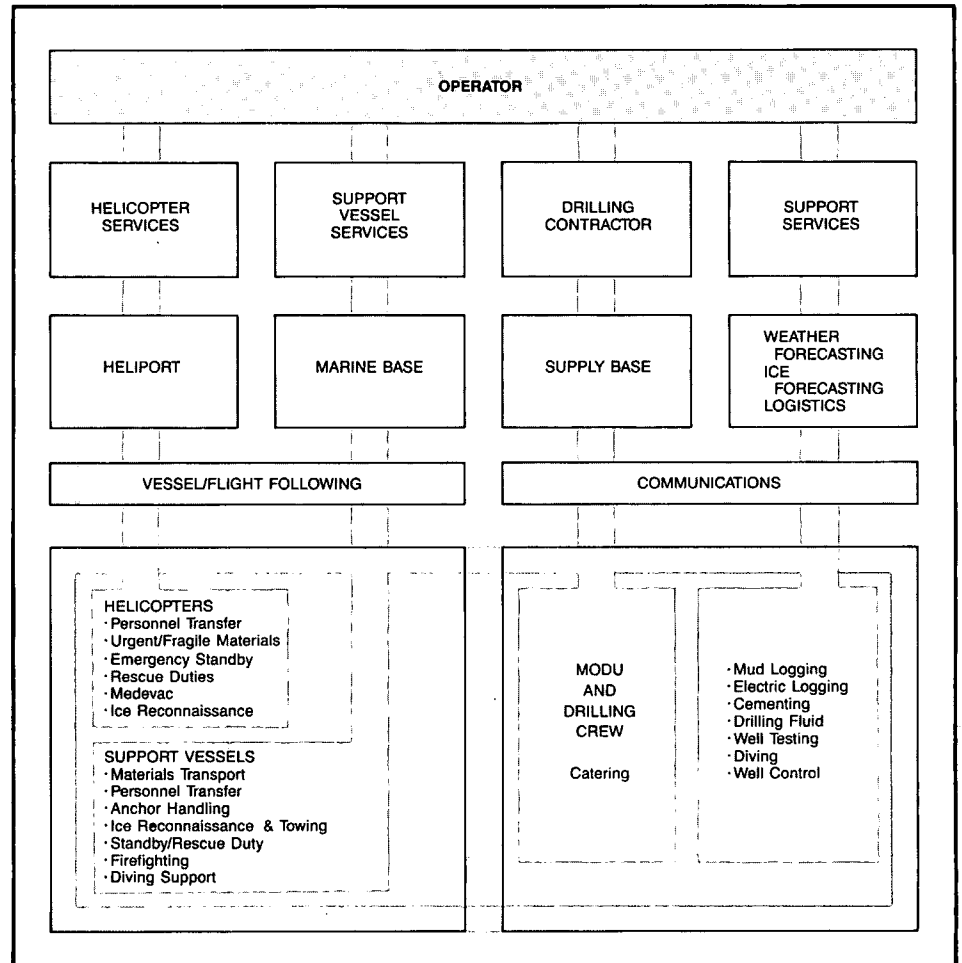
¹Analyses of offshore incidents generally attribute the lion's share of accidents to operational errors. The International Association of Drilling Contractors' "Charlie Report" (1982), for instance, cites 1,231 offshore accidents in U.S. waters, 891 or 72 percent of them caused by "unsafe acts" as opposed to "unsafe conditions". These findings are consistent with those found in other jurisdictions and other years. The Foundation of Scientific and Industrial Research of the Norwegian Institute of Technology's *Risk Analysis - Accident Experience*, 1980 presents a detailed analysis of 31 one- or two-person fatalities on board offshore installations, and concluded that their most frequent cause was "human error". The Newfoundland and Labrador Petroleum Directorate's *Risk Analysis of Drilling Units Operating Offshore Newfoundland and Labrador* 1983 and the Burgoyne report on *Offshore Safety* in the U.K. (1980) also point to the high proportion of accidents attributable to human error.

²Energy, Mines and Resources, Canada; Indian and Northern Affairs, Canada.

Report of Investigation of Events Culminating in a Blowout of Gas and Condensate at Shell et al Uniacke G-72. June, 1984

Report of Investigation of Events Culminating in a Loss of Well Control at Mobil et al West Venture N-91. April, 1985

5.1 The operator contracts a wide range of services in support of the drilling program. Each contractor may have specific management practices and methods which are dissimilar to those of the operator.

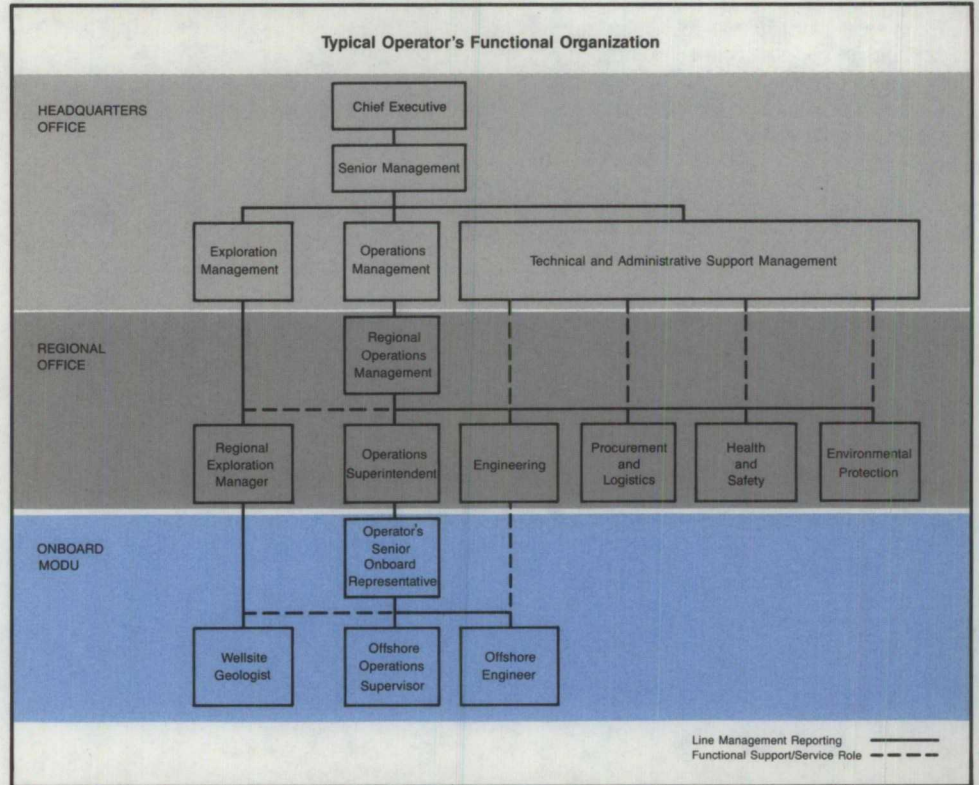


Services directly related to the operation of the rig, such as catering, are normally subcontracted by the drilling contractor. All other services are contracted directly by the operator. Materials and supplies are transported to the rig by supply vessels which also perform anchor-handling, iceberg-towing and standby duties. A helicopter service carries workers, mail, and urgent supplies to the worksite and undertakes evacuation and rescue duties. Other specialty services involve divers and diving support equipment, ice observers and weather forecasting, and the various well services necessary to the drilling operation including mud-logging, electric-logging, cementing, and well-testing. A sophisticated communications system links both the operator and the contractor with their respective shore bases and head offices.

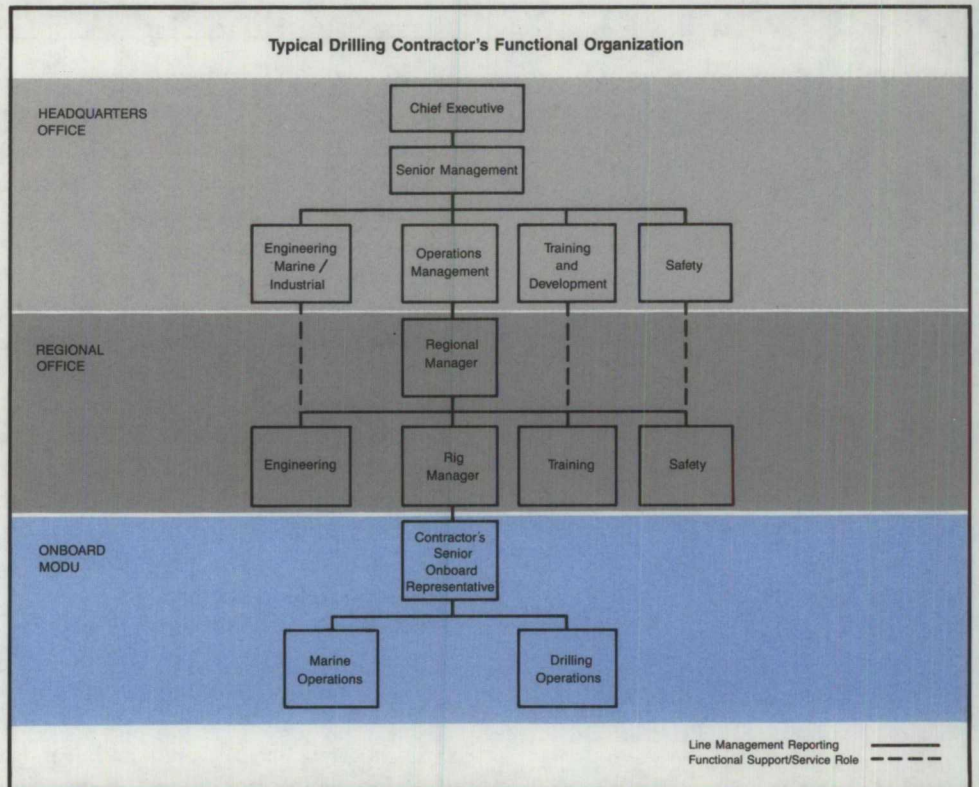
The operator is accountable to the regulator for the physical integrity of the rig that is hired to undertake the drilling program, for the performance of its management and operating personnel, and for the health and safety of everyone employed on or involved in the operation. Even though each contractor is bound by the terms of his contract to operate at all times in accordance with applicable Canadian laws and regulations, the operator is ultimately responsible for every aspect of the project, whether undertaken by his own employees or by those of a contractor or subcontractor. The operator's responsibility goes far beyond a passive reliance on others to meet the requirements of the law and public policy.

Both the operator and the drilling contractor maintain a line of authority that flows down from head office through a regional office to senior representatives on board the rig. The regional level for each organization has specific management duties for all the rigs under its jurisdiction. The operator's regional manager will

5.2 The operator's organization is divided into three distinct levels, involving personnel at the head office, the regional office and on board the MODU.



5.3 A typical drilling contractor's organization.



ensure that the exploratory drilling program is carried out within budget and with due regard for human safety and protection of the environment by overseeing the operation, by providing and co-ordinating the logistic and technical support required, and by maintaining liaison with regulatory agencies and with other operators in the area in respect of resource sharing and emergency planning. In the event of an emergency, he is responsible for co-ordinating action and support. It is highly desirable for the operator's regional manager to have had prior experience as an operator's senior representative on a MODU. In that capacity, he would have gained a knowledge and understanding of reservoir characteristics, borehole dynamics, drilling fluid chemistry, fluid flow dynamics, abnormal pressure detection, and well control theory and practice, as well as some appreciation of the problems that can arise in the marine environment. This would ensure that he has the appropriate technical knowledge to understand the nature of the difficulties that the operator's senior representative on the rig may face and the decisions he may have to make or share. If an emergency should occur, the regional manager, while relying on the judgment of the onboard representative, must be ready by reason of temperament, training and experience to cope with the problems that will be thrust upon him.

The drilling contractor's regional manager is responsible for monitoring activities on board the rig; ensuring that the unit is fully manned with appropriately qualified and trained personnel; establishing effective safety management and training programs for all on board; and maintaining the rig and its equipment in good repair. Most drilling contractors have had considerable experience operating offshore, yet they, like the operators, have their roots in land-based drilling operations. Consequently the emphasis on the industrial aspects of offshore operations has tended to overshadow the need for a complementary marine component in their onshore management teams.

The managerial partnership of operator and contractor continues on board the rig itself. The operator's senior representative on board the rig is known by a variety of titles, including offshore drilling foreman, superintendent, supervisor, or offshore operations supervisor. Whatever he may be called, he is the operator's manager at the drill site, who is responsible for the well and for seeing that the drilling program is followed and that the objective of obtaining as much geological and reservoir information as possible from the well is met efficiently and safely. In this capacity, he conveys to the senior representative of the drilling contractor the operator's requirements with respect to the drilling program, including decisions on running casing, cementing, logging, production testing, and well control. He co-ordinates and directs the activities of the various on-site contractors who supply specialist services, ensures through his regional office that supply and transportation services are provided to the rig as required and is responsible for seeing that such other support services as weather, ice forecasting and surveillance are functioning satisfactorily. In discharging these responsibilities, he will consult regularly with his regional management or with senior operating management at head office, but he remains the person responsible at the drill site for all operating decisions affecting the project and the well. During an emergency, he will consult with the person in charge of the rig and provide advice, support, and co-ordination of the contracted resources and services.

From the standpoint of operational efficiency and of safety, it is preferable to have critical operational decisions made on the drilling rig where the best information is available and where decisions can be made quickly. Therefore, it is essential that the operator's senior representative on a MODU be qualified in all aspects of managing a drilling program during normal and emergency operations. Generally, those who attain this position do so after gaining a considerable amount of experience and training as a drilling engineer or after working their way up through the operator's drilling department. This training and experience, normally received on land rigs, should be supplemented with extensive experience on MODUs. In terms of

both day-to-day operations and emergencies, the presence of a competent and knowledgeable individual in this key position will often have a substantial influence on the efficiency and general safety standards on board a rig.

The overall manager of the rig will be the senior representative of the drilling contractor. This responsibility will lie with one of two senior positions, the toolpusher who heads the drilling operation or the master who is in charge of marine matters. One person is designated by the drilling contractor as the person in charge of the rig, and the background and experience required for that designation will vary according to the type of rig, the country of registry, the corporate policies of the drilling contractor and the regulatory requirements of the Coastal State. Some semisubmersibles are operated according to the Norwegian model with the master remaining in overall charge, while others operate according to the United States model with command switching between the master, while the rig is in transit or during a marine emergency, and the toolpusher, while drilling operations are in progress. The variety of these arrangements stems from the evolution of the industry from its land-based roots to the marine environment and the genuine differences of view among knowledgeable people as to whether the industrial or marine aspects of the operation are the more crucial.

The toolpusher is in charge of and fully responsible for all aspects of drilling operations, subject only to the advice and direction he receives from the operator's senior representative on the rig under the terms of the drilling contract, and from the person in charge of the rig where he does not hold that designation. The toolpusher directs the work of the drilling crew and is responsible for the operation, maintenance and repair of all drilling equipment and ancillary systems. He is responsible for the training and development of the drilling contractor's industrial personnel and for safety management with respect to drilling in the course of normal operations and in emergencies. A toolpusher will usually have reached his position after working for a number of years as a member of a drilling crew and subsequently as a driller in charge of a crew. His experience and training are likely to have been gained on the job and through courses provided by his company or by industry training schools.

The master is responsible for marine aspects of the operation and for marine safety management. Under normal conditions when the rig is on the well, the principal marine aspects consist of supporting the drilling activity by maintaining the rig on station and minimizing its motion; keeping the platform level at the appropriate draft; transferring equipment and supplies to and from vessels; monitoring the environment, taking appropriate precautionary action to avoid marine hazards such as collision, loss of stability, ice or storms; and training the crew in evacuation and other drills for emergencies. The master will have marine qualifications, but the extent of these qualifications will differ considerably according to the country of registry and to company policy as will the extent of the master's MODU-related training and experience.

While the managerial partnership between toolpusher and master is firmly established within the United States system, it is widely recognized that joint command has, on occasion, led to overlapping responsibilities and ambiguous authority, particularly in emergency situations. The issue of which one to designate as person in charge is further complicated by the nature of the training and experience available in the marketplace today. Because the skills required to manage the drilling operation are similar to those involved in land-based drilling, senior industrial personnel are fairly readily available. Persons with the specialized marine skills needed to take charge of and operate a MODU are much harder to find, and those with the ideal combination of drilling and marine experience as well as innate leadership ability are rare indeed.

While the United States approach may be a practical solution to the command problem it challenges the standard management practice of delegating the direction

of an operation to a single individual who is entirely responsible and fully accountable at all times for all decisions and actions. As in other organizations, supervisors will be delegated responsibility for groups working in each area of expertise with full accountability to senior management. Admittedly, while a drilling rig is free of its moorings or in transit, whether self-propelled or under tow, marine operations are clearly paramount. On the other hand, when the rig is on the well, problems are most likely to occur as a result of industrial hazards such as loss of well control, explosion or fire. It is therefore both practical and necessary for the person in command to delegate authority and the responsibility for a specific aspect of that operation to someone who has the appropriate experience and qualifications. On a MODU, instances will occur where the activity becomes the responsibility of the operator's senior representative, or the toolpusher or the master. Where problems develop with control of the well, the operator's senior representative is generally in charge. Where problems develop downhole in the drilling operation or through equipment malfunctions, the toolpusher is equipped with the technical knowledge and training required to direct the remedial action. When marine-related problems develop such as loss of stability, failure of the mooring system, ice encroachment or storms, it is the master who is best qualified to be in charge. When these eventualities occur, all members of the crew should know in advance from whom they are to take direction. Nevertheless, a single individual should be in command of the rig at all times, however much he may delegate responsibility to others and however much he may consult other key crew members before reaching a decision. To transfer full command in an emergency situation, or to expect lines of communication and authority to switch smoothly from one person to another in various types of emergencies, would seem to defy one of the most fundamental tenets of management, a tenet that has been proven over time and through the course of many endeavours, be they industrial, commercial, governmental or military.

Section 4(o) Person in Command "Drilling units shall at all times have one person on the unit clearly identified as responsible for the safety of the drilling unit and its crew. On floating drilling units this person shall: be experienced in drilling unit operations; and, possess a recognized Master Mariner's Certificate. This requirement recognizes the need for the person ultimately responsible for safety to make decisions in full consultation with the person responsible for drilling operations."

*Drilling for Oil and Gas on Canada
Lands, Guidelines and Procedures.
April 1984*

It is a matter of importance that the formal qualifications necessary for an individual to assume the command of a rig in eastern Canadian waters be firmly established and that the position be certified. While certification is not a guarantee of competence, it at least provides evidence that a minimum standard of experience and training has been met. Norway requires that a ship's master be the person in charge of the MODU. He will have completed additional courses in drilling technology and rig manoeuvring and will generally have experience as a ballast control operator, stability officer and first mate before being appointed the person in charge. The United Kingdom designates an Offshore Installation Manager (OIM) for each MODU and production platform but leaves responsibility for deciding the appropriate qualifications and training of the OIM to the rig owner. The United States requires a special Industrial Master's License as the minimum marine qualification for a person in charge of a MODU registered in the United States. While in transit, however, a master mariner must be on board as the person in charge. Holders of the special Industrial Master's License will normally be experienced industrial personnel who have completed a 15 to 20 day training program provided by the United States Coast Guard.

Canada has recently taken a step in the direction of certification by developing a set of draft standards which require all MODUs to be under the command of a specifically designated offshore installation master or manager who must have both marine and drilling qualifications. A person can arrive at this position from either a marine or an industrial background. Marine candidates would receive formal instruction and training in the industrial aspects of MODU operation while candidates with drilling experience would be taught about marine matters affecting the safety of the rig. Before candidates receive final certification, extensive practical experience must be gained in MODU operation. This plan should provide the person in command with a sufficient understanding of the total operation to retain control

5.4 Offshore safety management programs require the constant attention of all crew members and specialist teams to fulfill their emergency roles. Safety meetings and debriefing sessions are held after drills to evaluate performance and discuss deficiencies.



in any foreseeable circumstance, to pass judgment on the performance of those to whom he delegates authority, and to take corrective action if that performance should prove inadequate. This program is seen as a positive step towards resolving the MODU command issue.

A number of steps have been taken by industry and regulatory agencies to improve the overall safety management of MODU operations. The Eastcoast Petroleum Operators Association (EPOA) was initially established as a forum for discussion of operating issues faced on the East Coast and to represent the industry in its relations with governments. After the *Ocean Ranger* disaster in 1982, the Association set up a Task Force on Safety to identify areas of vulnerability and to encourage the institution of corrective actions. In 1983, the EPOA became the Offshore Operators Division (OOD) of the Canadian Petroleum Association (CPA), which now provides operator co-ordination and co-operation in implementing offshore training programs, equipment evaluation and operational programs. The East Coast Operators Management Committee was established by the active operating members of CPA to provide a specific focus for regional operating concerns within the CPA OOD. Through these means, the industry is beginning the process of developing lines of communication between the major operators and various associations of contractors, notably the Canadian Association of Oilwell Drilling Contractors (CAODC) and the Canadian Offshore Vessel Operators Association (COVOA). Their participation on the Management Committee has resulted in improved consultation within the industry and in the contribution by the major contractors to the development of standards in the areas of health, qualifications and training for offshore workers.

Recommendations that were made by the Safety Offshore Task Force Report and accepted by the members of the CPA OOD have the effect of guidelines, although they have not been formally endorsed by Canadian regulatory authorities. There are other areas where the development of a common policy is desirable: for example, it is unclear whether, during discharge of cargo at the drill site, the operational needs of the rig take precedence over the safety concerns of the master of the supply vessel.

Safety management is a matter of attitude and commitment through an organization at all levels. It is a matter of leadership, of sustained and consistent application, of credibility within the organization, of involvement by all employees, of management accountability and of the systematic application of the full range of management methods and skills. It is a matter of information with respect to plans, policies and procedures. It is a matter of ensuring that equipment is properly maintained and that it can be safely operated by those who use it. It is, finally, a matter of participation by workers as well as by management and of providing a mechanism and process for the exchange of concerns and the building of mutual confidence between managers and workers. These principles of safety management are implemented in practice by setting objectives and organizing the means to ensure their accomplishment; by creating physical conditions that are safe; by establishing operating procedures and practices that will reduce risks; by auditing and monitoring performance in all respects; by investigating deficiencies promptly; and by recognizing accomplishments and results.

Most operators and drilling contractors have formal safety programs which reflect a recognition that common sense and programs of minimal safety training are no longer adequate bases for responding to high lost-time accident rates and to the costs associated with those accidents. A safety program at the level of the drilling rig is concerned with good housekeeping in work areas and living quarters, with protecting people from injury by equipment, with fire prevention, and with organizing and training to respond to emergencies. Regular drills and training for all to reinforce basic survival training and special training for emergency response teams in abandonment of the rig and lifeboat operation, advanced first aid, damage control, fire-fighting, man-overboard retrieval, dealing with toxic gas, and loss of well control are all necessary components of the safety management program. It is incumbent upon the workers and the managers to prevent the development of a cavalier attitude regarding the necessity of this training. Safety management also means involving workers at every level in this overall process. People do not learn to take responsibility without being given responsibility and it is a fundamental tenet of good management that those who are expected to abide by a set of rules or regulations should participate in making them. This principle does more than maintain employee morale; since the person closest to a particular work situation is the one best qualified to diagnose weaknesses, careful attention to worker concerns can often lead to improved efficiency and the early recognition of potential problems.

East Coast operators and contractors have reported on the nature of their safety management programs. Features of these programs include safety policy manuals; guidelines for the safety training of all levels of personnel; participation of workers; hazard identification; policy on the reporting of accidents, "near misses" and abnormal incidents; audits conducted by external non-governmental agencies and bonuses or awards for safety performance. These programs both express and are the instruments for implementing company policy. Certain operators set out required safety and training performance standards for contractors who intend to submit bids and the criteria to be used in examining the past record of the bidders. This procedure is a form of indigenous regulation and should be adopted by all operators.

The operator and the drilling contractor are required to develop, for regulatory approval, plans which outline onboard procedures for normal and emergency operations. These operating manuals and contingency plans describe the procedures that

must be followed to ensure that the well and the rig are secure at all times. These manuals set out an important part of the framework of operating principles within which the managers of the rig make their decisions and against which the management of the operation may be measured in a safety audit process. Managers exercise their discretion in reaching decisions within this framework of operating principles, which provide limits for certain operations and give warning for precautionary action to be taken. The reason for establishing procedures is to ensure a systematic and timely transition from normal to emergency operations. The acid test for contingency plans occurs when problems arise and emergency procedures are actually put into practice. Successful implementation of these plans requires continuing training and rehearsal by all members of the crew and also by those on shore who may be called upon to assist.

Foresight and careful contingency planning can provide the basis for an appropriate response to unplanned events that may threaten the security of the rig and the safety of its crew. Emergencies may be avoided or contained if managers know what to do in various eventualities and can mobilize the necessary resources in time. A clear management structure is a prerequisite to effective communications internally within the rig owner's organization and externally through the operator's organization to support service contractors, other operators, government agencies and regulatory authorities. Alert stages for foreseeable types of emergencies have been designated in advance for ice hazards, deteriorating weather conditions, loss of well control, vessel collision, and helicopter crash or ditching. The procedures to be initiated are defined by industry in consultation with the regulatory authorities, made known to all concerned and included in contingency plans.

In areas such as the Grand Banks and the Scotian Shelf where several operators are active, the industry has set up multi-operator alert response plans to improve offshore safety through co-ordinated communications and logistic support and each operator has established an emergency command centre. These response plans include a common weather-reporting and iceberg-tracking system, helicopters designated for search and rescue duty, and a central flight-following system which keeps track of all helicopter flights in relation to rig and supply boat positions. The alert plans specify the conditions which trigger a multi-operator alert and designate the equipment and facilities which may be called on in an emergency.

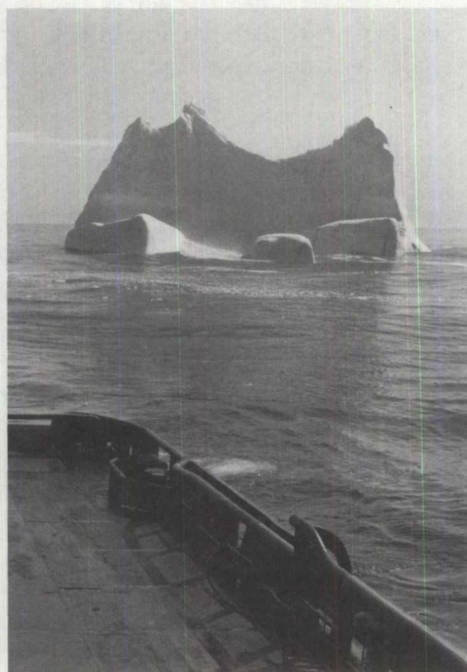
Industry's ability to respond to an offshore emergency has improved significantly since the sinking of the *Ocean Ranger*. Nevertheless, concerns have been expressed about several aspects of emergency preparedness. One area of concern is the decision-making process during an emergency. The person or group of people best equipped in terms of information and expertise to make vital decisions and take action leading, for example, to evacuation, are those on board the rig. Retaining the authority for these decisions on shore may in certain circumstances jeopardize the safety of the offshore installation and crew. A second concern is the type and frequency of training exercises and drills that are presently carried out. Courses that make use of simulated events and exercises, of the kind provided by the offshore industry in the North Sea, would provide opportunities to practise contingency plan procedures, without risk to crew or rig, while at the same time testing the validity of those procedures. They would also provide experience and training to key personnel for the responsibilities that, in the event of an emergency, would be thrust upon them and to persons with understudy roles who may be called on to take charge of particular situations.

A key to successful safety management for both management and crew members is the ability to recognize in advance those abnormalities which may lead to emergency situations. Thorough reports on accidents and incidents associated with unplanned events should form part of the onboard safety system. The regulatory authority should ensure that satisfactory reporting procedures have been established,

Section 79(1) Contingency Plans "Every operator shall ensure that contingency plans have been formulated and that equipment is available to cope with any foreseeable emergency situation during a drilling program, including:

- (a) a serious injury to or the death of any person;
- (b) a major fire;
- (c) the loss of or damage to support craft;
- (d) the loss or disablement of a drilling unit or a drilling rig;
- (e) the loss of well control;
- (f) arrangements for the drilling of a relief well should such become necessary;
- (g) hazards unique to the site of the drilling operation; and
- (h) spills of oil or other pollutants.

Canada Oil and Gas Drilling
Regulations. November 1980



5.5 Contingency plans form an integral part of the overall safety management program offshore. In the event of helicopter or supply vessel incidents, approaching pack ice or icebergs, or other emergencies, the operator's contingency plan provides guidance for decision making and the mobilization of personnel and equipment.

since complete and accurate data on any hazardous or potentially hazardous events will prove a valuable aid in effecting long-term improvements in the regulating of safety offshore. The present incident data base is inadequate as a tool for accident analysis or long-term safety planning, and a more rigorous system for reporting, recording and disseminating incident information is warranted.

Safety management programs are generally administered by staff departments which provide counselling and assistance in safety matters to operating managers. Each organization has its own approach but, to be effective, the program must reflect a strong commitment to safety by the chief executive officer and senior management, reaching down through the company to all parts of its operations. There appears to be a growing consensus in favour of co-operative employee/management plans that emphasize initiative by employees on the rigs, actively supported by operating management.

One mechanism which should improve the effectiveness of safety programs offshore is the rig safety committee. Committees have been established on all MODUs off eastern Canada and appear to be working satisfactorily but it is evident that workers do not always feel they are able to communicate freely, to management, their concerns about unsafe working practices and conditions. Workers fear that being overly vocal about safety-related matters may lead to reprisals and possibly dismissal. These attitudes and fears weaken the entire safety management process. A mechanism must be developed whereby the views of workers are accepted openly by management and valid concerns are addressed either on board or on shore. An open, responsive communication channel is necessary if the workers are to play their parts in the detection of hazards and in recommendations for greater safety.

The way in which a drilling program is managed is predetermined by the contractual arrangements between the operator and the contractors. Managing the varied group of persons engaged in the program takes unremitting attention and considerable skill. The mix of disciplines represented in a rig's crew, the widely varying levels of technical expertise among its members, the variety of their national and regional backgrounds, the changes in personnel that result from mobility within the industry as well as from the more regular rotations of the crews, make it difficult to mould this working community into a cohesive entity. A high degree of co-operation

among all those on board and a strong operational team are required if a drilling rig is to function effectively and safely. Senior management must, therefore, be sensitive to the needs of the crew and instill confidence in their own ability to control an emergency should one occur.

The strength of the commitment to safety by the senior managements of the operator and the rig owner will be manifest not only in operational policy and procedures but also in the quality of human relations throughout the organization. In the course of normal operations, safety entails constant alertness and concern to prevent the development of emergencies. The health and morale of the crew, the qualifications and training of all personnel and their suitability for the positions they hold, the dependability of communications systems in adverse conditions, the adequacy of preventive maintenance programs, and the quality of supervision of service contractors are among the variables to be managed in a manner that ensures the safety of the personnel and equipment employed in a drilling program. In the final analysis, the critical factors in safety are the calibre of the crew, the quality of their training, and the level of confidence and teamwork promoted in everyone on board. These factors are dependent on the rig owner's prime operational responsibility to see that a competent experienced person is in charge of the rig, a person capable of giving leadership that embraces an understanding of both the human and the technological dimensions of safety in the offshore.



6

TRAINING

CHAPTER SIX TRAINING

The safe and productive operation of MODUs in the hostile East Coast environment depends critically both on reliable technology and on competent, responsible human organization. In turn, the capacity of the combination of man and technology to function effectively under normal circumstances, to be sensitive to incipiently abnormal conditions and to respond resiliently to emergencies depends critically on the training of all persons involved. Training, whether it be by formal instruction, by the simulation of operations or by experience gained on the job, forms the warp of the fabric of competence and confidence that is essential both to safe operations and to a reliable capacity to meet the unexpected. The weft of this fabric lies in the organization and practices of offshore operations.

At the time of the sinking of the *Ocean Ranger* there were no statutory Canadian standards for the training of persons employed on MODUs operating on the East Coast in any capacity. For example, persons assigned to operate the ballast control system, which is critical to the stability of a semisubmersible, were not required by any regulation to have formal training. Senior drilling personnel were required to have training in well control but the form of this training was not specified. Further, significant variations existed in the standards of training adopted by different operators and contractors. Since then, owners, operators, industrial associations and regulatory agencies both federal and provincial, and indeed international, have properly given renewed attention to the issues of training for safety.

Training for safety for individuals, teams and organizations is a process of continuing development. Within this process there are minimum standards for basic safety training and specialist safety training, that are essential to achieving the level of competence and confidence necessary for work characterized by the peculiar hazards of the offshore. There has been missing in Canadian offshore operations a clear ground for the confirmation and administration of these standards, and a clear definition of the roles of industry, public and private institutions, and government in setting these standards.

Whatever provisions there are for training, either for normal drilling operations or for emergencies, there is the perennial question of the effectiveness of the training provided. The ultimate acid test, is of course, to be found in performance, in the response of individuals, teams and whole organizations to events as they actually unfold. Training, to be well founded, must be effective in the circumstances to be faced.

What understanding ought all persons on drilling rigs to have of the offshore environment? What qualifications ought individuals to have for the basic tasks that they are assigned? By what process of industrial or governmental certification are these qualifications to be categorized? Who should set standards of training? What

balance of processes of training, whether formal instruction, simulation and on-the-job experience, is appropriate? What are the agencies that can and should contribute to training for the offshore? How is the continuing capacity of individuals, teams and organizations to operate safely and productively to be verified? These are some of the inescapable questions about training which demand attention.

The underlying objective of training is to create and sustain in individuals, teams and the organization as a whole, a reliable capacity to perform their duties both in regular operations and in emergencies. The creation of a reliable capacity to perform may be considered to be built upon a combination of competence and confidence. Competence has its roots in native capability, acquired knowledge, ability to analyse, and working skills built up through experience. Confidence is established on the basis of the disciplined and practised exercise of competence in real circumstances. The disciplined exercise of competence in an emergency depends fundamentally on the qualities of leadership displayed by those in charge and on the qualities of co-operative teamwork among the crew of a rig.

Knowledge of the hazards to be encountered and against which protection is sought is necessary, if the teaching of safe practices is to be effective. The first category of training, then, that is essential for safe work on drilling rigs is orientation to and understanding of the basic issues of personal safety in the distinctive offshore milieu. This training is basic emergency and survival training. There is universal agreement that persons who visit and work on drilling rigs should have this training adapted in intensity to the roles that they individually are to play. There is general agreement that, for operations in hostile seas, topics to be considered should include hazards of the offshore environment, safety at work, safety and survival equipment, first aid, helicopter safety and emergency procedures, fire control, procedures for rig abandonment, principles of survival and the processes of search and rescue. Among the major international jurisdictions, however, there are distinct differences in the scope of basic safety training and in its regulation.

In Norway there is a statutory requirement that all members of the basic rotational MODU crew undertake a ten-day course in basic safety training. This formal training is required to be supplemented during the first period of employment by instruction specific to the company and the rig. Norwegian practice for basic safety training is one of explicit regulation both in form and in content. The basic two-part course is required to be taken at a training centre approved by government and a significant number of training institutions have been equipped to provide that service.

In the United Kingdom there is no statutory prescription of the content of basic safety training, but there are general duty requirements that all persons working on a rig have suitable training for their own safety, the safety of fellow workers and the safety of the rig. The operator has overall responsibility for safety training. The United Kingdom Offshore Operators Association (UKOOA) has produced, for the benefit of its members, guidelines for safety training, which are accepted and monitored by the regulatory authority. A statutory body, the Offshore Petroleum Industry Training Board, originally established by government as the Petroleum Industry Training Board, has prepared a schedule of courses to meet the UKOOA guidelines. That Board consists of representatives of the operators, drilling contractors, employees, and teaching institutions. Representatives of government departments attend as assessors. The UKOOA guidelines deal with the scope and length of training, the standards to be attained, the methods of certifying the attainment of these standards, and the categories of persons to receive particular training. The situation in the United Kingdom for basic safety training, therefore, is one of monitored self-regulation. The government fundamentally relies on the operators to ensure that guidelines endorsed by the government are invoked by contractors. The Department of Energy monitors this system which is supported by well-established training institutions, both public and private.

"The greatest potential for minimizing the risk of future offshore oil and gas development lies neither in technology nor regulation, but in the abilities, training and performance of the people engaged in the industrial and regulatory activities."

George F. Mechlin, Chairman
Committee on Assessment of Safety of
Offshore Continental Shelf Activities,
National Research Council,
National Academy of Sciences, U.S.A.

6.1 Weekly evacuation drills are held on all MODUs operating off eastern Canada to reinforce basic emergency training. These drills also allow individuals to become familiar with rig-specific escape routes, emergency procedures and equipment.



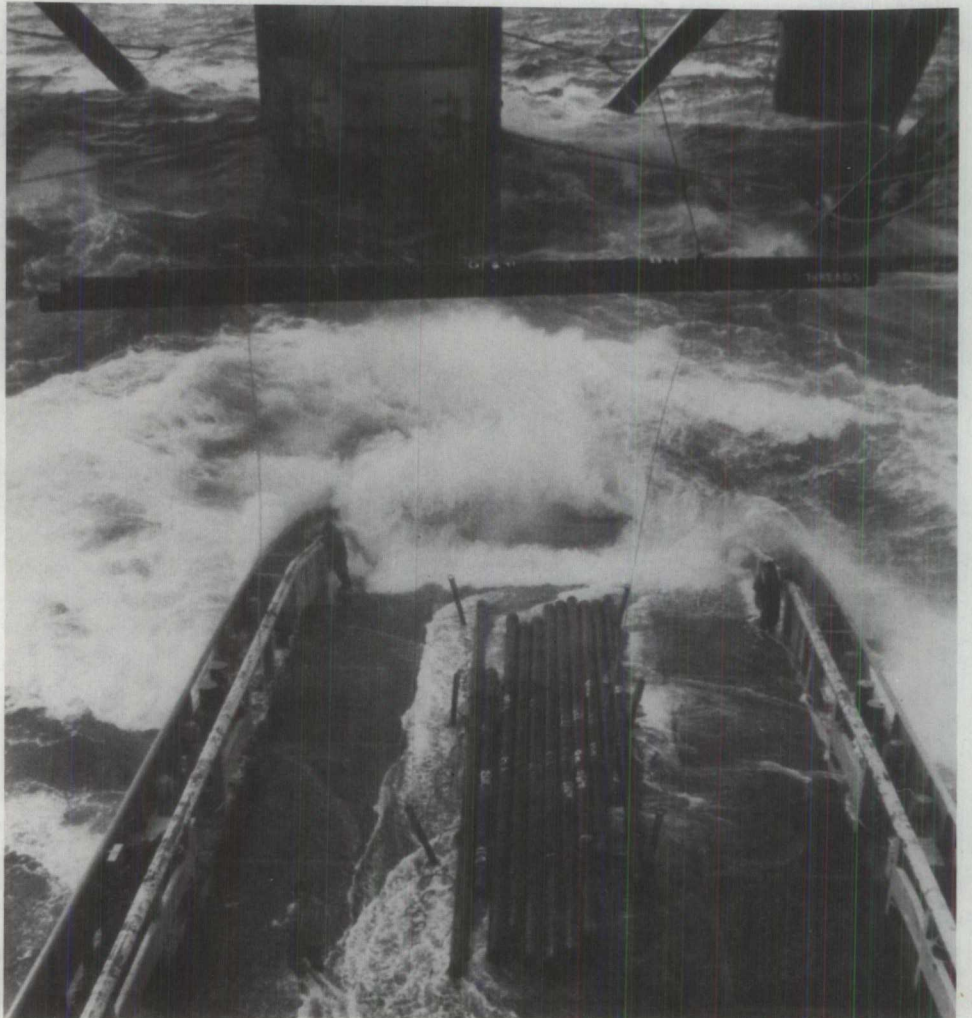
In the United States there are no statutory requirements for basic safety training. Overall responsibility for training rests with the operator when rigs and their services are contracted. Basic safety training is delivered by operators and drilling contractors through in-house courses, institutional courses, and on-the-job training. The situation is one of self-regulation without detailed government guidelines. There is, consequently, a great diversity of specific approaches.

In Canada the situation with respect to training has been complicated by the fact that both the federal and certain provincial governments have issued regulations. Before the sinking of the *Ocean Ranger*, COGLA had not established specific standards for the training of rotational crew. There was a general duty requirement that all members of the drill crew be familiar with the safety procedures that they might be required to perform, that senior industrial personnel have training in well control, and that all persons on the site be familiar with personal safety and evacuation procedures. The responsibility to ensure that these requirements were met rested with the operator.

In response to the loss of the *Ocean Ranger*, the Newfoundland and Labrador Petroleum Directorate required, on an interim basis, that rotational crew members have a Marine Emergency Duties II (MED II) Certificate as defined by the Canadian Coast Guard, or equivalent training. This certificate required completion of a 15-day course devoted, in three parts, to lifesaving, firefighting and rescue/survival. In November 1983, COGLA published guidelines specifying that every member of the MODU rotational crew should successfully complete an approved course. That course was to include helicopter safety and emergency training, rig abandonment

Section 150.(1) "Every operator shall ensure that every person employed on a drilling program... receives instruction and training in respect of all operational and safety procedures that person may be required to carry out during the course of his duties...."

Canada Oil and Gas Drilling Regulations. November 1980



6.2 The hazards of offshore drilling can arise from either the marine or the industrial aspects of the operation.

procedures, survival training and firefighting. However, COGLA issued no guidelines for specific course content. The response of industry during this period was to define the content of what it believed to be a satisfactory basic training course and to arrange for it to be offered. This course was formally endorsed by the industry in its *Offshore Safety Task Force Report* of 1983 and is known as the Basic Offshore Training (BOT) course. Following its decision to require, on an interim basis, the Coast Guard MED II Certificate, the Newfoundland and Labrador Petroleum Directorate in collaboration with the Department of Labour and Manpower worked with the College of Fisheries in St. John's (now the Institute of Fisheries and Marine Technology) to formulate a 10-day course called Basic Offshore Survival Training (BOST). This course is being offered by the Institute.

COGLA has chosen to accept any one of the foregoing courses, MED II, BOT or BOST, as meeting its general requirements for basic safety training, but MED II is accepted only on an interim basis. The significant differences in standards and orientation among these courses is symptomatic of the lack of clarity in the processes whereby standards of training are being established and confirmed. Industry questions the necessity, for all rotational personnel, of a basic safety training course that has a duration greater than five working days. It also questions the necessity of having basic offshore training completed in every instance before offshore duties begin. Underlying the conflict over the duration of basic safety training is the question of to what extent specialized training, for example firefighting, should be encompassed therein.

The situation with respect to the definition and administration of training for safety on the East Coast has been unsatisfactory. The tragedy of the *Ocean Ranger* is a haunting reminder of the importance of training. For the men at risk on rigs today it is intolerable that the means to concert the insights of industry and government on relevant training and to provide for the orderly development and administration of that training remain incompletely defined. Nevertheless, the circumstances are now deemed to be such that significant leadership can be given by all parties.

There is need for a body of competence in training at the regulatory level that has the ability and authority to formulate standards and to accept suitable proposals from industry and institutions for attaining these standards. This body of competence should be obtained through the establishment, on a statutory basis, of an Offshore Petroleum Training Standards Board with a relatively small membership drawn from persons with first-hand understanding of offshore operations and from persons with specific competence in training. The insight of workers having substantial experience offshore should also be represented. This Board should be authorized to determine, in consultation with industry, training institutions and related government agencies, requirements for training in the offshore.

The Board should publish guidelines for course requirements and exercise the authority to accept courses formulated by industry, training institutions and government agencies and to approve staff competence and special facilities required for that training. It should work with training institutions to establish means for evaluating the instructional effectiveness of approved programs. A key part of its responsibilities should be to ensure that means, acceptable to it, exist to verify that required standards of safety training are attained and sustained. Because of the worldwide character of the offshore industry, the Board should have the responsibility to assess the equivalence of foreign training against Canadian standards.

Underlying all questions of training for safety in the offshore is the issue of reconciling the mixture of marine and industrial characteristics of operations. It is natural that industry should emphasize the industrial features and that maritime regulatory agencies should emphasize the marine features of safe operations. What is critical is the melding of these two basic operating cultures in a manner that promotes both dimensions of safety in an evolving industry. For all kinds of supervision,

Table 1
Thirty-Four Basic Rig Positions

CATEGORY	POSITION
Marine	Ballast Control Operator
	Barge Engineer
	Chief Engineer (1)
	Crane Operator
	Dynamic Positioning Operator (1)
	First Engineer (1)
	Master
	Medic
	Radio Operator
	Rig Captain (1)
	Rig Electrician
	Rig Mechanic
	Watchstander
	Industrial
Data Management Systems Watchstander (1)	
Derrickhand	
Driller	
Electrical Supervisor	
Electronic Technician (1)	
Floorhand	
Motorman	
Roustabout	
Senior Toolpusher	
Shakerhand	
Sub-Sea Engineer	
Sub-Sea Engineer Trainee	
Toolpusher	
Warehouseman	
Welder	
Domestic	Chief Cook
	Chief Steward
	Cook's Helper
	Second Cook Steward

NOTE (1) The requirements for these positions depend upon the type of drilling unit and the regulatory jurisdiction.

marine-oriented and industry-oriented, there is need for a dimension of competence rooted in an understanding of the operation and the behaviour of a MODU as both a marine and an industrial entity.

Minimum qualifications and training standards for all the basic tasks to be performed by the rotational crew of the drilling contractor have recently been proposed by CPA OOD in collaboration with CAODC. The thirty-four basic positions are grouped by marine, industrial and domestic categories in Table 1. Table 2 provides the minimum qualifications and training for the positions of master, senior toolpusher, ballast control operator, and roustabout. The provisions for qualifications and training include marine and industrial elements with special training for safety. Reference is made to qualifications for supervisory responsibilities, and for critical technical tasks such as well control, stability control, crane operation, helicopter handling, firefighting, and the use of escape and rescue systems. With respect to the competence of marine rotational crew to work in the industrial environment of a MODU, the Canadian Coast Guard in co-operation with COGLA and Employment and Immigration Canada issued a draft report setting out proposed training requirements for MODU endorsements to marine certificates and also a marine program for industrial personnel. The certification of marine positions such as master, mate, engineer, and able seaman is of long standing and subject to regulatory control. The Offshore Petroleum Training Standards Board should co-ordinate these two proposals and be assigned the responsibility of approving all industrial training endorsements of these positions for service on MODUs.

It is important to distinguish between certified positions and positions for which minimum qualifications and training require certificates of particular skills. For example, in the analysis carried out by the industry, a rig mechanic is required to have an Industrial Mechanic's Certificate, and a rig medic may have a Registered Nurse's Certificate. These certificates are issued by training institutions such as schools of trades and schools of nursing that, in Canada, are approved by the provinces. For a number of positions, the industry has set out minimum qualifications that include specialized forms of training for which there may or may not be associated certificates. For example, a toolpusher is required to have Second Line Supervisors Offshore Well Control training, and a master to have an On-Site Ballast Control Course. Basic safety training is required for all positions and certificates of the completion of existing courses are being issued by the institutions, private and public, delivering the training. Certificates for well control training, which are recognized by COGLA, are being issued by the Petroleum Industry Training Service. Some rig owners provide specialized training for which they issue company certificates.

Mention has been made of differing views regarding the duration of basic safety training courses. This question is related to the extent to which specialist training for firefighting and other emergency tasks is given to all members of the rotational crew. Basic safety training should deal with common issues of safety and instruct all members on the role of specialist teams and the dependence of the safety of non-members on these teams. Specialist training should be concentrated upon individuals who together form teams and who have above average native capability to carry out specialist tasks. Practices and incentives which recognize the importance of the competence of specialized safety teams are to be encouraged. Clear standards for a universal basic safety training course, standards that are firmly administered, coupled with similarly administered specialist training courses for persons selected for their experience and native capability are preferable to an emphasis on point-of-entry training that may attempt to encompass elements best reserved for specialist training. Specialist tasks in which safety is of singular concern include: well control, ballast control, firefighting, helicopter landing, rescue of man-overboard, advanced first aid, and evacuation of a rig. The Offshore Petroleum Training Standards Board

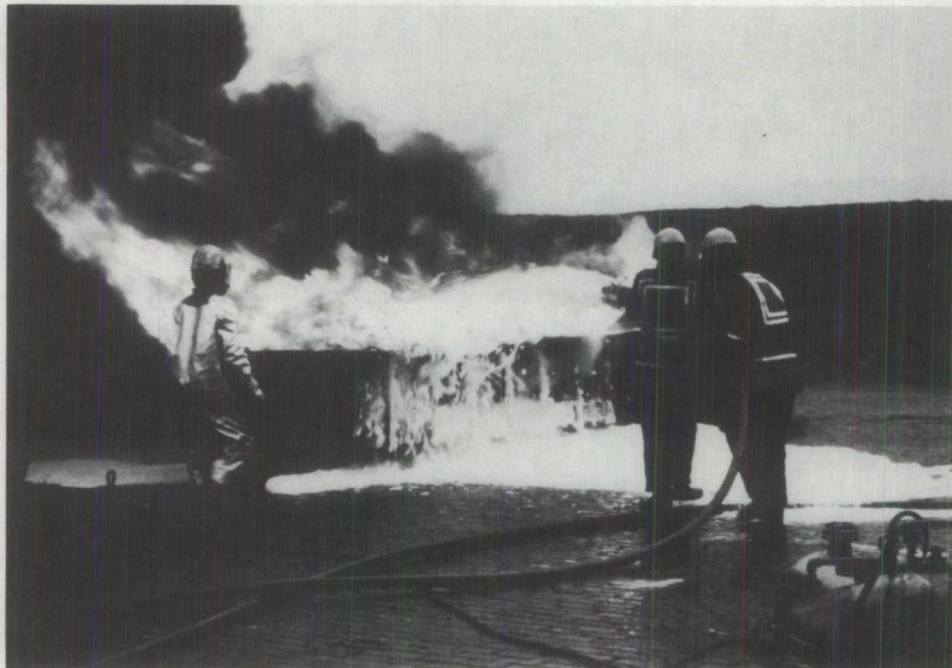
TABLE 2
An Abridged Sample of Industry Guidelines for Minimum Qualifications for MODU Personnel

POSITION	ROLE	PREREQUISITES	TRAINING COURSES (1)
Master	Responsible for the overall safety of Mobile Offshore Drilling Unit and its personnel.	<ul style="list-style-type: none"> • <i>Master Mariner's Certificate, or MODU Master Limited</i> or equivalent as determined by the Flag State requirement. • Normally 52 weeks of previous MODU experience. • Demonstrated safety, technical, managerial and supervisory skills, and mechanical aptitude. 	BOT IV First Aid (SOFA) H ₂ S Alert Offshore Fire Team Training Offshore Fire Leader Training CPR Basic Stability Training On-Site Ballast Control Course Supervision Training Management Orientation Maintain MODU Basic Stability Certificate CAODC Home Study Course (Contractor Program)
Senior Toolpusher	Responsible for managing contractors' interest in respect to obligations to clients, the well program and all personnel.	<ul style="list-style-type: none"> • Normally 52 weeks as a Toolpusher using similar equipment. • Applicable portions of CAODC study courses. • Demonstrated safety, technical, managerial and supervisory skills, and mechanical aptitude. • When designated the person in charge of the MODU, he shall meet the prerequisites specified for the Master and be thoroughly familiar with all applicable regulatory requirements. • First Line Supervisor Off-shore Blowout Prevention. 	BOT IV <i>First Aid (SOFA)</i> H ₂ S Alert Offshore Fire Team Training Second Line Supervisor Offshore Well Control <i>Offshore Fire Leader Training</i> CPR Supervision Training (Contractor Program) Basic Stability Training On-Site Ballast Control (Contractor Program)
Ballast Control Operator	Responsible to the Deck Officer on watch for control of drilling unit stability, draft and position within prescribed limits.	<ul style="list-style-type: none"> • An approved industry Ballast Control course. • A rig orientation program of 12 weeks overseen by an experienced Ballast Control Operator. • A complete knowledge of the rig's ballast system as demonstrated by passing a qualifying exam administered by the Master. • Master's approval required for all prerequisites. 	BOT IV <i>First Aid (SOFA)</i> H ₂ S Alert <i>Offshore Fire Team Training</i> On-Site Ballast Control CPR
Roustabout	Responsible for cargo work, maintenance and general labour.	<ul style="list-style-type: none"> • Entry level position. No prior experience required. 	On-the-job training as required by the contractor BOT IV H ₂ S Alert <i>Offshore Fire Team Training</i> <i>Rescue Craft Training</i> <i>On-Site Helideck Crew Training</i>

NOTE (1) Training programs indicated in italics may be applicable to crew members if they are appointed to a designated team organized to handle a specific task, e.g. fire team, rescue craft team, helicopter landing team.

SOURCE: *Industry Guidelines for Minimum Training Qualifications/Standards (Floating Units Only)*
 MODU Crew Personnel for Operations on Canada's East Coast
 Canadian Petroleum Association, Offshore Operators Division,
 East Coast Offshore Management Committee, Report #103.

6.3 The ever-present danger of fires and explosions requires that highly trained fire-fighting teams be present on all MODUs.



should approve the scope and content of certificated specialist training for these tasks.

There is no clear ground for the elaboration, from present marine custom, of the number of certificated positions. But there must be certification of skills critical to safety in the offshore. The Offshore Petroleum Training Standards Board should, in consultation with the industry, review and approve, for all the positions on the drilling rig, the range of skills for which certificated evidence (or documented equivalent) is to be mandatory. Not least important is a requirement that persons with supervisory responsibilities have the competence to manage emergency situations. It is the industry's prerogative to determine who shall be appointed to what positions. Capabilities to assume particular responsibilities can be developed through diverse paths of experience. Subject to sound, documented evidence that the experience ensures competence in and comprehension of critical areas of safety, diversity of background is not a threat to the integrity of safety offshore.

The public and private resources required to meet Canadian needs for training for the offshore are diverse. Trades and technical colleges, schools of nursing, universities, marine institutes, private firms, and corporate programs all have significant complementary roles to play. It is important that support be directed at ensuring that the component institutions can play these roles effectively and that duplication is avoided.

The need for basic safety training and for specialist safety training is clear and recognized by all concerned. What is required is a responsive framework for defining, delivering, certifying where necessary, and auditing the standards of training for safety. The proposed regulatory focus for that framework is the Offshore Petroleum Training Standards Board. While this Board must have the authority and competence to approve the substance and certification of safety training, to accept courses and certificates offered by different institutions, and to ensure that standards of training are audited, it is anticipated that initiative in the formulation of specific training needs and the transformation of needs into courses and drills can and should come in strong measure from the industry and training institutions. If training institutions are to fulfill this role it is important that their proposals be based directly on their special competence.

The collective initiative of the Canadian offshore industry with respect to training has evolved rapidly from quite old roots in the land-based industry. The East Coast Operators Management Committee has a Training Subcommittee which includes representatives from the CAODC, COVOA, and the Petroleum Service Companies of Canada. The Training Subcommittee is a technical body to which training problems perceived by industry may be brought for examination. A task force of this subcommittee develops the structure of training required to address a particular problem. Where appropriate, training proposals would go to the Offshore Petroleum Training Standards Board for approval and acceptance.

The land-based industry established in 1961 the Petroleum Industry Training Service (PITS) whose role is to facilitate the delivery of training to the industry, and to act as a certifying agent for certain courses. Training standards have been established and reviewed by an examination and certification committee made up of experts from the petroleum industry and from provincial and federal departments of government. By the mid-1970s, PITS had assumed responsibility for issuing certificates on behalf of the industry for training in blowout prevention and well control in land-based drilling. These certificates are accepted by the Energy Resources Conservation Board of Alberta. PITS is now developing an East Coast Division with a management board of senior operating managers. An Examination and Certification Committee for Offshore Blowout Prevention and Well Control has been established and a similar committee for Ballast Control is being set up. Each of these committees will parallel in composition the land-based well control committee.

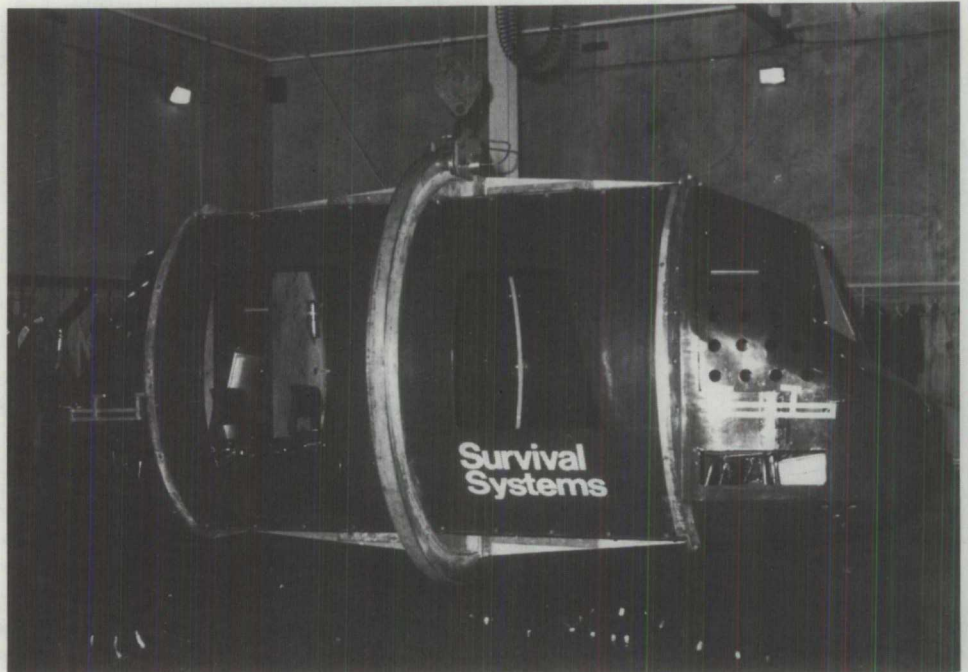
The BOT course had its origins in the early collective initiatives of the East Coast offshore industry. These initiatives should be sustained as a central part of the framework for safety training. The role of PITS in facilitating the delivery of training, on behalf of industry, and of issuing certificates of training under the surveillance of competent and broadly representative committees, could be recognized by the Offshore Petroleum Training Standards Board, subject to acceptance and monitoring by that Board of the training programs themselves.

The Offshore Petroleum Training Standards Board should ensure that there are regular reviews of offshore training on an annual basis. These reviews should include information gathered directly from representative crew members and reports of incidents that uncover particular points where improved training is indicated. Information on issues of training arising from these reviews should be transmitted to the drilling contractor, to the operator, to PITS, and to training institutions.

The effectiveness of training for safety is reflected in the qualities of competence and confidence that it develops. There are several practical means of testing competence as the underlying basis of confidence. Competence related to normal tasks is developed through experience and is best judged by performance on the job. Competence related to safety can be tested through periodic recertification of specialized training and basic safety training and through practice exercises or drills which simulate emergencies. There is broad agreement that there should be recertification of basic safety training, fire control, well control, ballast control, and other critical elements of training on a cycle of two to three years. The Offshore Petroleum Training Standards Board should establish formal requirements and guidelines for these processes, in consultation with the industry and training institutions.

The primary objectives of safety training are to prevent the development of emergencies and to ensure a resilient capacity to meet the unexpected. Significant aspects of some emergencies can be simulated away from the site for purposes of training. Current basic offshore training includes the simulation in a water tank of the procedures that must be followed to escape from a helicopter overturned in the sea. Although the industry has been backward in developing simulators analogous to aircraft simulators, these devices are coming into use and deserve more widespread attention. Persons who, for example, have the responsibility for ballast control or for

6.4 The helicopter underwater escape trainer is a simulator used to provide realistic training in escape from a crashed or ditched helicopter that has overturned in the water.



well control should have experience during training in dealing with simulated faults unexpectedly introduced.

Since major emergencies may entail serious structural damage, personal injury and rig evacuation in highly hostile seas, the reality of these events cannot be simulated on-site. Nevertheless, there is a long tradition at sea of emergency drills, of mustering of fire control teams, damage control teams, man-overboard teams, and all-hands-to-lifeboat-stations. There are opportunities, however, for innovation in devising on-site simulation procedures for emergencies, for practising teamwork and for team criticism of actions decided on in these situations. These simulations can represent some features of fire and other damage at various locations on the rig, of communications failure, and of loss of team members through casualties. The objective of training by simulation, whether it be on-site or off-site, is to develop instinctive responses to the unexpected.

The major shortcoming of training for safety in the East Coast offshore has been the absence of clear standards and a clear definition of the roles and responsibilities of government and industry. The importance of training both for safety and for efficiency is recognized by all concerned; its present weaknesses are diagnosed; its future course mapped out. There is now a need for competent, concerted action to resolve the deficiencies, to clarify the standards and to ensure that those engaged in oil and gas endeavours off our shores are trained to work effectively, responsibly and safely.