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WORKING OFF-SHORE

A PRELIMINARY ANALYSIS OF SOCIAL
FACTORS ASSOCIATED WITH
SAFETY IN THE OFFSHORE WORKPLACE

LISANDRO PEREZ

SEA GRANT PUBLICATION NUMBER 79-001

LOUISIANA STATE UNIVERSITY CENTER FOR WETLAND AND RESOURCES BATON ROUGE, LA 70803

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MARCH 1979

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FOREWORD

This study was encouraged and supported in the hope that results would be useful in reducing personnel risks in the offshore oil and gas industry and thus lead to a lowering of employee turnover rates. It is important to recognize how high turnover rates affect the safety of the working environment. We believe the report provides a significant base for future work. There is no intent to impugn either the industry or regulatory agencies for perceived problems. Our purpose is to provide data and observations that may be used by appropriate individuals and/or organizations to mutually benefit the workers, industry, and the general public by assuring even more effective and safe production of offshore oil and gas.

Jack R. Van Lopik, *Director*
Louisiana Sea Grant College Program

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INTRODUCTION

This report presents the findings of a preliminary study of sociological factors that influence the safety of offshore work. Specifically, the focus of the analysis is on the incidence of accidents and their relationship to the social organization of the industry. The nature and direct causes of accidents and the conditions that are conducive to their occurrence are examined. The emphasis is on preventable conditions, an understanding of which can lead to the formulation of measures to minimize the incidence of mishaps.

This study of safety is viewed as exploratory for two reasons. The first is that safety was not the original focus of the study but only a factor that emerged in interviews once the study was underway. The study was to have dealt with the problem of turnover in the offshore oil and gas industry. Because safety was not the primary topic of investigation, it was not treated as a focal or dependent variable in the original research plan, and interviews were not designed to delve deeply into the safety issue.

Secondly, it is impossible for the independent researcher who lacks strong industry and government support to perform an in-depth study of conditions offshore. These research limitations are discussed in the section describing the approach and data used in the study.

This offshore safety report is an outgrowth of a larger study on labor-related aspects of the oil and gas industry of the Gulf of Mexico. That larger study was intended to identify and analyze factors that account for high labor turnover, a phenomenon that plagues most of the contractors and service industries engaged in offshore work. However, as the author delved deeper into the turnover problem, primarily through in-depth interviews with persons involved in the industry (managers, government officials, and workers), it became apparent that labor turnover was related to a variety of other labor problems as well as to the overall organization and functioning of the industry. In the course of interviews, particularly those with workers, safety and high turnover emerged as inextricably interrelated problems of special importance.

If one regards turnover as the dependent variable and concentrates on factors related to it, he can conclude that one factor in the high rate of quits in the industry is an adverse work setting. A separate survey conducted by Newman at the suggestion of the author arrived at the same conclusion. A majority of the workers he interviewed considered hazardous working conditions as the most important reason for changing jobs.¹

The offshore work setting can be expected to have a particular effect on the novice offshore worker. The hazards of using heavy machinery in a marine setting, as well as the notoriety of previous disastrous mishaps, may prompt the worker to either abandon the industry altogether or to look for less hazardous occupations within the industry. The interviews also revealed evidence that the hazards of the work setting weigh heavily in decisions of experienced workers to abandon offshore work. One worker with three-years' experience said, "I'll work two more years out here at the most, just enough to save a little more money, but after that I'm quitting. I am sure that if I work out here for ten or fifteen more years that, sometime, I am going to get hurt real bad." This attitude is very similar to that found by Althouse in his study of safety in coal mines. Many miners shared the belief that "the mine will eventually catch up with them."² This is precisely one of the reasons many younger workers do not stay in offshore work.

On the other hand, if one treats safety as a dependent variable and examines the factors associated with the incidence of work-related accidents, turnover emerges as an important consideration, primarily because it reduces the level of experience of the labor force. This will be discussed in more detail in the section of this report on the characteristics of the offshore labor force.

Since both safety and high turnover are important labor-related problems of the offshore industry and since they are reciprocally related, it was decided to concentrate on these two conditions and to divide the overall report into two parts: Part I is on safety; Part II on turnover. There is, at least in the author's mind, a sense of greater urgency about the safety problem than about the turnover situation, an analysis of which is in progress.

This is a limited, not a definitive study of offshore safety. It is clear, however, that the evidence gathered both in the interviews and, more importantly, in subsequent analysis of data from other sources, points to a compelling need for further investigation of this topic.

The Sociological Perspective

Industrial psychologists, safety engineers, and experts in personnel administration have been responsible for the large body of literature on occupational safety. A great deal of that literature takes the form of manuals or textbooks to be used by supervisory personnel in their efforts to train workers in safety procedures and to modify the workplace in ways that will make it safer, as well as to assist upper management in the formulation of safety programs and in assessing the costs of accidents.³

Despite the long-standing tradition of sociological research on industry, few sociologists have made safety in the workplace the focus of their investigations. Industrial sociologists have usually treated accidents, safety, and safety programs as independent variables, i.e.,

as factors that may influence other phenomena under study. Safety matters, and particularly the incidence of work-related accidents, are also frequently treated in sociological works in a secondary fashion, as examples of industrial inefficiency, waste, or as problems that challenge the supervisors' managerial skills.⁴ Gouldner, in *Patterns of Industrial Bureaucracy*, discusses safety at length but primarily in the context of how safety operations are organized bureaucratically and how safety programs constitute an area of management in which the workers can actively participate.⁵ Rarely does a sociologist address directly the factors in the social organization of the industry that influence the safety of the workplace. Two exceptions are the work by Althouse, previously cited, dealing with safety in coal mines and Bertrand's study of farm accidents.⁶

The paucity of sociological literature in the area of industrial safety is unfortunate, for sociologists can contribute to this field in ways that can complement the vast body of knowledge already developed by the industrial psychologists, safety engineers, and personnel management specialists. The sociological perspective is particularly relevant at this time, when many safety experts are calling for "a comprehensive effort" in understanding occupational safety.⁷ Some experts in personnel management have indicated the need for a multidisciplinary "systems" perspective that, in the words of Pigors and Myers, "offers a fruitful approach for coping with the whole network of interrelated factors that need to be taken into account if employees are to work in an environment that is reasonably healthy and safe."⁸

The contribution of sociology to an understanding of that "whole network of interrelated factors" that can affect the safety of the workplace can perhaps best be grasped if we view the offshore industry, or any industry, as a social system. A social system such as the offshore industry has fairly discernible boundaries and is composed of individuals, groups, and complex organizations (corporations, public agencies, etc.) that interact with each other. The sociologist studies the social organization of the system, that is, the "interactional processes" occurring within the boundaries of the system and between that system and other social systems.⁹ Those interactional processes are determined by three sets of variables: culture, personality, and situation. Situational variables are defined as "environmental conditions over which the individual has little or no control."¹⁰ In sociological studies of safety and accidents, situational factors are of particular importance and utility, as Bertrand demonstrated in his study of farm accidents. His findings pointed to three sets of situational (environmental) factors that were conducive to accidents: (1) socio-psychological factors; (2) labor-force factors; and (3) social control factors, that is, variables relating to the degree of formal control mechanisms that induce individuals and groups to systematically follow safety guidelines.¹¹

It is within this sociological framework that the present study of safety in the offshore workplace was approached. 'Clusters of situational

variables similar to those Bertrand found for farm accidents were also found to operate in the offshore setting.

Approach and Sources of Data

The offshore workplace is a challenging setting in which to conduct sociological research, because it is fairly inaccessible. The accessibility of the workplace to the researcher has always been a problem in industrial sociology, for the permission and cooperation of the employer is needed before the researcher can enter the workplace to observe or interview the workers. Obtaining that permission usually depends upon the goals and methods of the research project, and it is entirely possible that some studies were never carried out for lack of cooperation from employers who might have felt that the study was either meaningless or threatening. In addition to the usual problem of employer cooperation, however, the offshore work setting presents an even more formidable and unique challenge to the researcher: the actual physical accessibility of the workplace. In September 1977 there were more than 200 mobile and fixed-platform rigs scattered throughout the Gulf of Mexico. That number, of course, does not include manned production platforms. There were also at least that many support vessels. Even assuming uniform cooperation from the hundreds of companies that own all those facilities, the cost of conducting a systematic random sample of offshore workers would be extremely high beyond the means of most social-science research budgets. The only way to accomplish that task would be to lease a helicopter, which would cost hundreds of dollars a day. Systematic interviews on land are also difficult to arrange, as the workers live in widely scattered areas and report to catch-out points only minutes before their boats or helicopters are due to transport them to the rigs. They also disperse quickly upon returning to shore again. The same can be said of the marine personnel, since their boats range widely throughout the gulf, transporting personnel or supplies.

Formal interviews with workers selected by random sampling (the technique used by both Althouse and Bertrand) were out of the question. Besides, it was also perceived that interviewing only workers would not yield the desired total picture of offshore conditions. In undertaking the study of turnover it was decided that a relatively small number of respondents representing different sectors of the offshore industry would be interviewed: oil-company executives; personnel managers of the drilling, marine, and catering contractors; government officials; union leaders; and workers. The interviews were informal, with open-ended and in-depth questions following a set list of topics, but the specific content and focus of the questions were adjusted to the respondents' particular areas of expertise of activities within the industry. Workers were interviewed whenever the opportunity arose: during visits to heliports and other catch-out points (usually only for a relatively brief time), in encounters at public establishments, in coastal towns, and during the author's visit to a rig.

The author was tendered--and accepted--one company's invitation to spend two days and one night on a rig observing the activities and talking to workers. This experience was invaluable. It also underscored the major handicap of the social science researcher who attempts to enter the offshore work setting without official status or industry support--that of gaining access to the work setting.

Interviews with company executives and officials were conducted in their offices. Dispersion of respondents meant, of course, that only a relatively small number could be interviewed; interview settings (corporate and public offices, catch-out points, etc.) were widely scattered, not only in a given city, town, or region, but throughout the Gulf Coast, from Houston to New Orleans. The most the author was able to interview in one day were four respondents. Seventy-eight persons were interviewed.

A number of topics were covered in interviews. The selection of topics was derived primarily from the literature on turnover, which, as noted earlier, was the initial phenomenon under investigation. These topics were as follows:

- 1) the organization and functioning of the industry;
- 2) labor-force factors (the labor force, wages, and reward systems);
- 3) sociopsychological factors (shared attitudes, perceptions, and values); and
- 4) the role of public regulatory agencies.

This approach fit the needs of the researcher, who not only sought to discover and probe into factors associated with turnover, but who also had to learn some of the basics concerning the organization and functioning of the industry. This approach allowed an opportunity to discover the wide range of factors that were relevant to the study of turnover and also made available the perspectives of a wide range of people involved in the industry. Interviewing only workers regarding turnover would not have yielded a complete picture of the turnover problem. In fact, the list below will confirm the fact that compared to the number of workers interviewed, managers and other industry officials are over-represented among the respondents, precisely because they were more likely to have a larger view of the structure and problems of the industry. This is why there is specifically a disproportionately large number of managers of oil companies among the respondents. Oil companies form the "top rung" of the hierarchy of companies involved in offshore work, and their executives are more likely to be in a position to provide fairly comprehensive information on the functioning of the industry at every level.

Companies were selected randomly from an oil industry directory, which includes all types of companies involved in offshore work. Both

large and small companies were included. In half of the cases, interviews were sought with the top personnel manager for the gulf area, while for the other half interviews were sought with the top operations person for the area. The rationale for this procedure is that it was important to include among the respondents persons who are knowledgeable in both of these management areas. In large corporations, the letter of introduction was usually referred to a lower-level executive who replied to the letter and with whom the researcher then set up an appointment for a meeting in the respondent's office. Some individuals chose not to reply to the letter of introduction and others indicated they had no time available to meet with the researcher. When that happened, counterparts in other companies were contacted for appointments. All the interviews were conducted by the author, most of them in New Orleans, Houston, Morgan City, and Houma.

The list below classifies respondents according to their occupation or position in industries.

Officials of industry associations	2
Managers of oil companies	14
Operations segment (10)	
Operations management (4)	
Managers of marine-service companies	10
Operations segment (5)	
Personnel management (5)	
Managers of food-service companies	2
Personnel management (2)	
Government officials (federal)	6
USGS (2)	
OSHA (1)	
USCG (2)	
MARAD (1)	
Government officials (local, Louisiana area)	3
Union officials	3
Workers on exploratory drilling rigs	23
Toolpusher (2)	
"Company man" (2)	
Galleyhands (4)	
Roustabouts (5)	
Crane operators (1)	
Drillers (3)	
Motorman (1)	

Roughnecks--floormen (4)
Derrickman (1)

Workers on service vessels 8
Captains (3)
Deckhands (5)

This is not a complete list of all persons with whom the researcher spoke in connection with the study. The researcher met informally with many people who provided insights into the industry. The list above includes only those with whom interviews were conducted.

Within each of these areas of inquiry, there was some flexibility in the specific items used. Obviously, the same questions could not be asked of a company executive, a Coast Guard officer, and a worker. Consideration was given to the respondent's position, perspective, and area of expertise. The interviews, therefore, served primarily to reveal some qualitative dimensions of the turnover problem; there is no attempt to generate quantitative data from the responses.

The interviews did little more than uncover the safety problems and give some general orientation regarding the issues involved. The conclusions of this safety report depend primarily on the data gathered subsequent to, and as a result of, the interviews. These data were found in both published and unpublished sources. The published sources most heavily relied upon are government and industry publications and journals. Unpublished data were obtained from the files of the U.S. Coast Guard, the U.S. Geological Survey, and other government agencies. The characteristics and shortcomings of this information are discussed throughout this report.

Additionally, a first draft of this report was circulated to spokesmen for four major industry associations in an effort to insure technical accuracy of subjective findings reported by the author. Some useful information was obtained. However, it should not be inferred that any industry group has endorsed these findings.

Scope

This study is concerned only with the offshore oil and gas industry in the northern Gulf of Mexico. The gulf is only one of some 16 offshore regions of the world where drilling is currently underway. Although the gulf has probably been the most important of all offshore areas, we do not know enough about those other areas to maintain that any of the conclusions reached here apply to any other region besides the gulf.

It should also be noted that only safety in the offshore work setting was considered, that is, the safety of the work places of persons who actually labor offshore. We are excluding the myriad of

establishments onshore that exist because of the offshore industry (shipyards, supply yards, and tool manufacturers). Our concern is therefore limited to the safety of the personnel who work for the oil companies on production platforms or in supervisory capacities on drilling rigs, or for employees of drilling contractors, marine service companies, and food service companies. Because of evidence that is presented later, *our main concern throughout this report is with the safety of the employees of the last three types of companies, i.e., the firms that are contracted to perform these services for the oil or gas corporations.*

Organization of the Report

The first responsibility after these introductory remarks is to document the incidence of work-related accidents offshore and to deal with the question of whether those accidents are inevitable. After that, the central questions of this report are taken up: the factors in the social organization of the industry that are associated with the incidence of accidents. The analytical portion of the report concludes with a section on the reasons for the high economic costs of accidents in the offshore industry.

THE INCIDENCE AND NATURE OF ACCIDENTS

In accordance with the provisions of the Occupational Safety and Health Act (OSHA) of 1970, the Bureau of Labor Statistics conducts an annual survey of work-related injuries and illnesses. Its most recent report, containing data for the year 1973, shows that the major industry groups with the highest accident incidence rates were contract construction, mining, and manufacturing. Table 1 presents, for each of those industries, the incidence rates for all recordable cases, and it further divides these according to the seriousness of the injury or illness (lost workday cases, and nonfatal cases without lost workdays). Fatalities are included in the incidence rates for total recordable cases but are not listed separately. We have also listed in the table the specific subcategories of the mining industry, since that is the industry with which we are concerned.

The overall category of contract construction outpaced all other major industry groups in the incidence of injuries and illnesses while mining was second. Within the mining category, however, there was substantial variation. Anthracite mining exhibits by far the highest rates, followed by other coal, and then by oil and gas extraction. This subcategory is further subdivided into "crude petroleum and natural gas" and "oil and gas field services." The former are defined as the operators of oil and gas properties (i.e., primarily the oil and gas companies), while the latter include those firms engaged in providing field services for operators on a contract, fee, or other basis. These services include drilling wells, exploration, logging, mud, and cement.¹² The vast differences in the rates of the oil and gas companies and that of their contractors is obvious. The operators, whose employees are engaged primarily in either supervisory drilling positions or in the more stable production phases, exhibit the lowest incidence of injuries and illnesses in the entire mining category. In fact, their rate for total recordable cases (5.0) is even lower than that of the workers who manufacture watches and substantially below the rate for employees of museums and art galleries (not shown on Table 1). On the other hand, the rates of total recordable cases and lost workday cases for the firms engaged in oil and gas field services are, within the mining category, second only to those of anthracite mining and even higher than the corresponding rates for the contract construction category as a whole.¹³

One detail of Table 1 that should not be overlooked is that while oil and gas services, and even the entire mining category, exhibit fairly high rates of total recordable cases and lost workday cases compared with other industries, they do not have relatively high rates

Table 1. Recordable occupational injury and illness accident rates in U.S. mining, contract construction, and manufacturing industries, 1973.

Industry	Incidence rates per 100 full-time workers*		
	Total recordable cases†	Lost workday cases	Nonfatal cases without lost workdays
Mining	12.5	5.8	6.7
Metal	8.0	4.6	3.4
Anthracite	26.3	10.9	15.3
Bituminous coal and lignite	18.8	7.8	10.9
Nonmetallic minerals, except fuels	7.0	3.7	3.2
Oil and gas extraction	12.8	5.8	7.0
Crude petroleum and natural gas	5.0	1.9	3.1
Oil and gas field services	20.1	9.4	10.6
Contract Construction	19.8	6.1	13.6
Manufacturing	15.3	4.5	10.8

*The incidence rates represent the number of injuries and illnesses per 100 full-time workers and were calculated as: $(N/EH \times 200,000)$, where N - number of injuries and illnesses, EH - total hours worked by all employees during calendar 1973, and 200,000 is the base for 100 full-time equivalent workers (working 40 hours per week, 50 hours per year).

†Includes fatalities. Because of rounding, the difference between the total and the sum of the rates for lost workday cases and nonfatal cases without lost workdays may not reflect the fatality rate.

Source: Compiled from data in Bureau of Labor Statistics, U.S. Department of Labor, Occupational Injuries and Illnesses in the United States, by Industry, 1973 (Washington, D.C.: U.S. Government Printing Office, 1975), p. 13.

in the category of cases without lost workdays. Even manufacturing and agriculture (not shown) exhibit higher rates in this less serious category than the mining industry. The same is true for oil and gas field services, which drop behind manufacturing and contract construction in the cases involving no loss of workdays. This would lead one to hypothesize that in the mining industry and among the firms engaged in oil and gas field services in particular, the work-related injuries and illnesses that occur are of a more serious nature than in many other industries, involving proportionately more lost workdays, and perhaps even a relatively higher incidence of fatalities.

That hypothesis is verified if one examines the more detailed data that are available from other sources specifically on the offshore oil and gas industry in the Gulf of Mexico. One source is the U.S. Geological Survey (USGS), which is entrusted with the responsibility of insuring the safety of the drilling operation. The USGS New Orleans office keeps a record of all blowouts, explosions, fires, and pipeline breaks or leaks that have occurred since 1956 in the federal waters of the Gulf of Mexico in connection with oil and gas operations and that resulted in either loss of life, injuries, or damage to property or the environment. The USGS data do not, by any means, include all accidents occurring in the course of offshore work in the Gulf of Mexico. Marine accidents, accidents in the loading and unloading of supplies, drownings, and helicopter crashes, are excluded because they are outside USGS jurisdiction. The USGS concern is only with those accidents related to the drilling operation, those causing environmental damage, and, generally, fires and explosions. Their data do not differentiate between injuries incurred by the employees of the operators and those incurred by the employees of the contractors.

The USGS records show that from June 1956 to December 1976 there were 55 accidents within their jurisdiction in the Gulf of Mexico that involved injury or death to personnel.¹⁴ These accidents resulted in 71 fatalities and 173 injuries. That amounts to 1.4 deaths per accident and a ratio of one fatality for every 2.4 injuries. While 55 accidents are not very many, it is clear that, as one would expect given the nature of the accidents and their setting, the accidents that do occur have very serious consequences, with an inordinately high rate of fatalities. Kash et al., noting this high incidence of fatalities in outer continental shelf (OCS) operations, indicate that it may be 1.4 times higher than the fatality rate for the whole petroleum/natural gas industry, an estimate that is probably too conservative, given the low accident rate of various other segments of that entire industry.¹⁵

As mentioned earlier, the USGS figures exclude many accidents that are outside the jurisdiction of that government agency.¹⁶ Another deficiency of the USGS data is that they do not provide a great deal of additional information about the accidents.

A comprehensive and detailed data set is available through the U.S. Coast Guard. Its Information and Analysis Office maintains a statistical summary of commercial vessel casualties investigated by that agency. That office provided the author a special tabulation of all casualties occurring in the the Gulf of Mexico from July 1969 to July 1975 aboard vessels of the types utilized in offshore work. Those vessel types are as follows: oil-industry supply vessels, drilling barges, drilling tenders, rig tenders, construction vessels, offshore towing vessels, crewboats, mobile drilling rigs (all types), workover rigs, and fixed platforms. That represents virtually a complete list of all vessels involved in offshore work, particularly since the Coast Guard uses the term "vessel" broadly, including in its figures even those casualties aboard mobile rigs and fixed platforms. The figures include all

accidents that resulted in either an injury that incapacitated a worker for more than 72 hours, loss of life, or property damage, regardless of the type or origin of the accident. Accidents not occurring aboard those vessel types (e.g., helicopter crashes), are not included. These data, therefore, cannot be said to encompass absolutely all accidents occurring in the Gulf during the stated period of time in the course of offshore oil and gas exploitation, but it is probable that the number excluded is very small.¹⁷

The unpublished tabulations provided by the Coast Guard are in coded, machine-readable form, and they include not only the number of injuries and fatalities, but also information about the accident, such as the type of vessel, date, size and dimensions of the vessel, exact location, nature of the casualty, cause and contributing factors, weather conditions, inspection status of the vessel, documentation of person in charge of vessel, and other items. One disadvantage of utilizing coded data that are gathered and recorded by others is that they are sometimes cryptic, even when the codebook is available (as was the case here). For this reason, the author examined the individual files for each of the accidents that involved injury or loss of life in order to fill in some gaps and expand the coded information. These files contain at least the investigating officer's report, which was the original source of the coded information. The files on some of the more serious accidents also included transcripts of hearings and supplementary materials (photographs, newspaper clippings, and correspondence.)¹⁸ The examination of the files also served to verify whether or not the casualties indeed incurred in connection with oil and gas operations in the gulf, a fact that could not be conclusively determined strictly from the coded information on type of vessel. After an examination of the files, it was necessary to exclude two cases from the final tabulation of accidents that were analyzed. A complete listing of all cases and their specifics is presented in the Appendix.

The data from the Coast Guard indicate that in the period from July 1969 to June 1975 for OCS oil and gas exploitation in the Gulf of Mexico, there were 45 accidents that involved either a fatality or an injury that incapacitated the victim for more than 72 hours (injuries meeting that definition and consequently included in the Coast Guard figures will hereafter be referred to as "serious injuries" for the sake of brevity). These accidents resulted in 53 deaths and 73 serious injuries. Since it is practically impossible to compute an exposure figure, such as hours worked by all employees, it is not possible to translate these casualties into rates. Yet, it can be concluded that while the incidence of all serious accidents is not inordinately high, the number of deaths and serious injuries resulting from the accidents is alarming. This is consistent with the previous analysis of data from the Bureau of Labor Statistics and the USGS.

To those familiar with the offshore industry, the high incidence of fatalities and serious injuries per accident comes as no surprise. This industry is unlike, say, the light manufacturing industry, where

the usual accidents are smashed fingers, small burns and cuts, and abrasions. As previously noted, the offshore work setting combines heavy industry, drilling for flammable fuels, and longshoring with a marine setting. The reported accidents are usually serious and likely to involve fatalities and/or injuries to more than one worker.

Because the conditions that make offshore work dangerous cannot be controlled, industry executives and workers alike agree that some accidents are unavoidable. Workers went on to say that some accidents could be avoided if safety regulations were more strictly enforced.

The data from the Coast Guard for the period from 1969 to 1975 substantiate the argument that the incidence of serious injuries and fatalities in the offshore industry is unnecessarily high. According to these figures, adverse weather conditions are not the cause of most serious accidents. Eighty-one percent of all deaths and 79 percent of all serious injuries occurred during "clear" and "partly cloudy" weather conditions, while only 13 percent of all fatalities and 16 percent of all serious injuries occurred during conditions categorized as either "overcast," "rainy," or "foggy." Rough seas or wind do not account for the accidents either; 72 percent of all deaths and 71 percent of all serious injuries occurred when the sea was calm. In fact, only 4 percent of all fatalities and 5 percent of all injuries happened when the seas were described as having a "rough chop." Accidents that resulted in 63 percent of all deaths and serious injuries occurred during "calm" wind conditions. Visibility does not account for them either: 83 percent of the fatalities and serious injuries took place apparently when visibility was more than two miles.

Further evidence bearing on the question of the inevitable or preventable nature of most offshore accidents can also be found by tabulating the number of deaths and injuries according to the primary cause of the accident as determined by the investigating officer. Table 2 presents the primary causes of the accidents and the number of deaths and serious injuries that resulted from each cause. It should be noted that for the sake of brevity, only general headings of causes are presented here. More detail on specific causes is available. In Table 2 the more specific headings are presented only in the case of "equipment failure" because of the relevancy, for our purposes, of that specification.

It should be noted that "personnel fault" was the primary cause of 33 deaths and injuries, or 26.2 percent of the total. Although it does not appear in the table, it is noteworthy that "improper safety precautions" was the modal contributing factor under that broader heading, accounting for 11 deaths and injuries. "Carelessness," which followed second, was responsible for 6 deaths and injuries. In fact, improper safety precautions and carelessness accounted for 10 of the 14 deaths attributed to personnel fault. "Inexperience" and "inattention" appear as the conditions responsible for the other four deaths.

Table 2. Work-related deaths and serious injuries in the offshore oil and gas industry of the Gulf of Mexico, by primary cause of the accidents, 1969-1975.

Primary Cause	Deaths and serious injuries*		Deaths		Serious injuries*	
	Number	Percent	Number	Percent	Number	Percent
All causes	126	100.0	53	100.0	73	100.0
Blowouts	34	27.0	9	17.0	25	34.3
Personnel fault	33	26.2	14	26.4	19	26.0
Equipment failure						
Personnel fault	20	15.9	9	17.0	11	15.1
Equipment failure						
Normal wear, material fault or design	18	14.3	11	20.7	7	9.6
Adverse weather	8	6.3	3	5.7	5	6.8
Other causes	7	5.5	2	3.8	5	6.8
Fault of another vessel	6	4.8	5	9.4	1	1.4

*Serious injuries are defined as those that incapacitate the worker for more than 72 hours.

Source: Compiled and computed from the U.S. Coast Guard Commercial Vessel Casualties Files (unpublished).

Personnel fault was listed as the specific cause of 20 of the 38 deaths attributed to equipment failure because they could be traced to improper handling or maintenance by personnel. In all, 53 deaths and serious injuries, more than 42 percent of the total, occurred because of either personnel fault or "equipment failure: personnel fault." A total of 23 fatalities, or 43 percent of all deaths, could similarly be traced to personnel-related factors. In fact, "personnel fault" was the primary cause responsible for the most deaths, not the dangerous working environment.

Clearly, then, more than a few offshore accidents can be attributed to causes other than the inevitable inclement weather and the inherently dangerous task of drilling an oil or gas well. That more than 40 percent of all deaths and serious injuries could be directly attributed to the actions of personnel or to the mishandling or improper maintenance of equipment refutes the claim that the current rate of serious accidents in the offshore industry must be accepted as an inherent condition. The cases from the files of the Coast Guard that are presented in the forthcoming sections and at length in the Appendix, underscore this fact.

FACTORS ASSOCIATED WITH THE INCIDENCE OF WORK-RELATED ACCIDENTS

Accidents happen in every workplace, and the offshore work setting is no exception. However, as Bertrand notes, "while accidents may be capricious in and of themselves, the circumstances within which they occur are structured to a large extent."¹⁹

Our purpose here is to present those factors in the social organization of the offshore industry that contribute a high rate of serious accidents. Those factors are grouped under the following headings: (1) labor-force factors; (2) sociopsychological factors; (3) factors in the operation and management of the industry, and (4) social control factors: inadequate government regulation. We have relied heavily on Bertrand's analysis of situational factors in farm accidents, although our data suggested an additional set of factors that we have entitled "factors in the operation and management of the industry." This category is also regarded as situational in that we are looking at certain procedures used to operate and manage the industry that affect the safety of the working environment.

Labor Force Factors

One characteristic of the offshore labor force that has already been mentioned as having a reciprocal influence on the safety of the work place is the high rate of turnover among the personnel of the drilling contractors, marine service companies, and food service firms. The instability is particularly acute in, although by no means limited to, the entry categories. Data gathered on the situation in the marine service companies indicate that, among deckhands and cooks, the annual turnover rate is as high as 170 percent of all workers employed in those job categories. The factors responsible for this high rate of turnover are the subject of analyses still in progress and will therefore not be discussed here. Our interest in this section is on how instability affects the safety of the working environment.

A high rate of turnover means that the labor force has a high proportion of new and inexperienced workers. Studies of accidents in other industries confirm that there is a relationship between the incidence of accidents and the degree of inexperience, or proportion of new workers, in the labor force. Kitson and Campbell, for example, found that the accident ratio was four times as high among newly hired men as among the total number of workers.²⁰ They conclude that if the

number of new hires could be reduced to zero, the number of accidents would probably be reduced by 75 percent. This is consistent with the generalization expressed by more than a few personnel managers and workers of offshore companies during the course of the interviews: new and inexperienced workers are disproportionately involved in more accidents than experienced workers.

Another characteristic of the offshore labor force is that most new workers in the entry-level categories receive no formal training before going offshore. All the training is done on the job. Not only are job skills taught on the job, but basic safety procedures and precautions are also left up to the worker to learn while working. The most that some employers do is give a safety "briefing" or "talk" before the new worker goes out on the first job. In the past, there were virtually no training programs to formally teach skills and basic accident prevention to workers in entry-level jobs. This is as true in the drilling as in the marine sector of the industry. We know from studies on other industries that training has the effect of lowering accident rates and that a labor force with little or no training will have high rate of accidents.²¹

A third characteristic of the offshore labor force is chronic shortage of workers. The high rate of quits and the expansion that the industry has experienced in the past few years have created a constant demand for workers. Employers are unable to be selective in hiring practices and cannot carefully screen job applicants for liabilities such as instability, irresponsibility, mental, and educational deficiencies. This same problem was discovered by Bertrand in his study of farm accidents.²² Virtually all the personnel managers of the drilling, marine, and food service companies interviewed, like the farmers whom Bertrand studied, complained of "poor labor," which, among other things, is not likely to follow safety guidelines and exercise proper precautions.

One last characteristic of the labor force that affects the working environment is that a disproportionate share of offshore workers, particularly (but not exclusively) those in the entry categories, are under 25 years old. This is yet another consequence of the labor force turnover and of the recent expansion of employment opportunities in the industry. Young workers are more likely to share many of the sociopsychological characteristics discussed in the next section. Another principle that has been established in previous research on other industries is that there is an inverse relationship between age and the rate of accidents.²³

It can be said that, overall, the offshore labor force exhibits certain characteristics that have been demonstrated to exert a negative influence on safety. Because of the conditions of the job market, the labor force is largely inexperienced, untrained, young, and hired through a basically unselective recruiting system.

Sociopsychological Factors

Offshore workers, as a whole, cannot be described as a normative group. Company managers, officials, and even the workers themselves invariably described offshore workers as highly individualistic, and, to some extent, defiant of authority. In other words, many share a value system in which independence is a key concept. That many offshore workers place such a positive value on their independence is not surprising, for it has a tradition in both the petroleum and marine industries, particularly in the former, where the term "rugged individualism" has been used to describe the culture of the early period of that industry.²⁴ Presumably, job titles such as "roughneck" and "roustabout" reinforce these qualities.

It is not surprising that in a hazardous setting where usually males are employed this spirit of independence and individualism would also be combined with "machismo," a phenomenon in evidence in the behavior of workers and in their mess-hall conversations. This is particularly true among rig employees. It is a situation like that described by Althouse in his study of coal miners when he notes that an important component of the male-miner role is the image of "toughness and fortitude which rules out public admission of fear..."²⁵ Similarly, Bertrand found among farm workers an apparent need to establish a reputation as a "doer" and "go-getter" as well as a desire "to show one's virility."²⁶

A value system that emphasizes individualism, independence, manliness, and fearlessness and deemphasizes adherence to conventional norms has a number of behavioral manifestations that have negative implications for safety. These manifestations may include a consistent failure to follow safety regulations and to use proper precautions, as well as a disposition to knowingly take unnecessary risks that are challenging and dangerous in order to gain acceptance and respect from fellow workers. These kinds of risks are appropriately labeled by Bertrand "acts of bravado."²⁷

Because of this tendency on the part of some workers to take dangerous risks, even a company that is sincerely dedicated to a safety program finds itself frustrated through the failure of workers to observe regulations, particularly in the area of utilizing protective equipment. One norm that is frequently violated is the wearing of life jackets, which are required whenever the workers are directly over water. Many workers consider them bothersome and unnecessary, and consequently the regulation that they must be worn is frequently defied. The casualty files of both the Coast Guard and the USGS cite many examples of injuries and deaths that could have been averted had the victims been wearing the required protective equipment (see Appendix). For example, in one accident, a death occurred on a drilling rig when a heavy valve fell on a hoist that was holding several men working on the side of the rig, over water. The hoist collapsed, and one of the men fell into the water and drowned. None of the men was wearing a prescribed life preserver. A

portion of the transcript of the Coast Guard hearing that followed illustrates the workers' attitudes towards the wearing of protective equipment. A Coast Guard investigative officer is questioning one of the survivors:

Q: Aren't you supposed to wear life jackets in this area?

A: Yes, you sure are.

Q: Is it company policy to wear life jackets in this area?

A: Yes, sir.

Q: Are life jackets provided for your use?

A: Yes they are - the company requires that you wear them when working over open water like the key way area.

Q: Why weren't you and the other four men wearing them?

A: I can't say for the other men, but I can't work with one on. It gets in my way. Besides, I'm only down there a few minutes.

Q: Let me ask you this - you say the company requires you to wear life jackets, yet you and the other men didn't. Who is to see that you wear them?

A: Well, the driller and the pusher, I guess. Each man knows that he has to. I guess we just don't take the time to put them on, besides, they are hard to work with, they get in the way.²⁸

A similar defiance of basic safety guidelines caused the death of a diver in another incident. The diver suffered a mild case of the bends after surfacing from an underwater pipe-laying job and was immediately placed in a decompression chamber. He asked that the light inside the chamber be turned off so that he could go to sleep. The personnel on board the barge advised him that they would not turn out the light, for he had to be under observation and urged him not to fall asleep. Disgusted, the diver took off his T-shirt and placed it over the light bulb. The shirt ignited, caused a flash fire inside the chamber, and burned him to death.²⁹

Factors in the Operations and Management of the Industry

Corporations involved in offshore work are conscious of safety and promote programs to encourage workers to follow safety guidelines and procedures. These programs usually include a system of incentives that rewards all workers in a given work unit (rig or boat) for an unblemished collective safety record. The rig the author visited had met the safety

goals of the company with the specified period of time and each worker was awarded a \$100 U.S. Savings Bond and an ice-cream machine was installed in the mess hall.³⁰ Not many companies are that generous. One company gives trading stamps to workers, while others have no program at all. Evidence from the interviews indicates that, overall, larger companies have elaborate safety programs, while smaller companies have limited programs or none whatsoever. The limited data from the interviews also seem to indicate that drilling contractors are much more safety-conscious than the marine services and the catering companies.³¹

That many employers place emphasis on safety is not surprising in view of the high economic costs of accidents and insurance (this will be discussed at length in a forthcoming section). Nevertheless, despite companies' sincere efforts to get workers to comply with safety guidelines, there is ample evidence that many of the operating practices that have become institutionalized throughout the industry create conditions conducive to high rates of fatalities and serious injuries. In other words, while managers of most companies practice safety in the area of motivating workers to take all precautions and to be alert, in the course of carrying out the operations of their companies they engage in certain practices that have become standard operating procedures in the industry and that are unsafe. These procedures have either become such a traditional part of offshore operations that few company executives have examined them critically in terms of their implications for safety or that perhaps there are other more important considerations than safety in the minds of the firms' managers. We will discuss in detail here two such practices: (1) the obsession with saving time, and (2) long working hours.

In any business time is money. But perhaps in no other industry is this more apparent than in the exploitation of offshore oil and gas. The success of any drilling contractor or marine service company depends upon keeping their expensive equipment (rigs, boats, etc.) working. A mobile rig now costs at least \$30 million to buy, depending on its size and capabilities. One huge pipe-laying barge, recently constructed, is reported to have cost \$186 million. Drilling contractors who purchase, own, and operate these units cannot afford to have their investments idle. The same is true with marine service companies. They purchase boats from shipbuilders that cost hundreds of thousands of dollars each.

Oil and gas companies contract for the services of these companies and pay high rates that accrue daily to have these pieces of equipment deployed and functioning in their leased tracts. A small rig can cost \$20,000 a day to rent from a drilling contractor and about the same amount to service (marine services, specialized services, tools and supplies). Larger rigs can cost \$50,000 a day to rent and service. It is understandable that oil and gas companies try to maximize the productivity of the whole operation and avoid "down time." The ability of contractors to provide efficient and quick service is therefore of utmost consideration in awarding and renewing contracts. Drilling contractors, marine service companies, caterers, specialized service

companies, and suppliers must avoid delays and lost time in the operation of the rig. In the event of unsatisfactory service, the oil or gas company usually has no difficulty canceling a contract. Contracts with many of the service and supply companies are cancelable with less than a week's notice. Drilling rigs are usually contracted on a well-to-well basis.³² It should be kept in mind that there is a "company man" aboard every rig, making sure the oil company is getting the most for its investment.

It is not surprising that the safety of men working offshore could be overlooked given the pressure of marine service companies to avoid delay and also to service the rigs despite the weather conditions. In current operations, either the oil company man on the rig or the toolpusher (depending on the arrangement between the operator and contractor), through his onshore dispatcher, requests needed pieces of equipment or sets of supplies, which in many cases are crucial to the uninterrupted operation of the rig. The marine service company is in charge of transporting the needed cargo to the rig. In the event of inclement weather, instead of the oil company representative or the toolpusher taking the initiative of canceling the boat trip, it is all left up to the boat company with the tacit understanding that they are to do everything possible to deliver the equipment. A boat company with a need to establish a reputation for service will pressure its captains to take the risk. Naturally, there are limits to this in that one thing that the service company cannot do is lose a boat. The dilemma of risking losses in equipment and personnel during bad weather versus the need to establish a reputation as a dependable boat company is one that weighs heavily on the minds of the executives of marine service companies and their captains. This is one way the major operators can pass on to their contractors the risks and problems of offshore work. If the oil and gas companies owned the support vessels and serviced the rigs themselves, they would more readily weigh the costs of delaying the operation of the rig versus the risk of operating the boats in inclement weather and, in some instances, might favor the temporary delay in drilling. However, since the marine services are contracted and since the decision and responsibility to run the vessel is ultimately in the hands of the boat companies, the operators let the contractors take the risks (which the former do not share in) of operating the vessel in bad weather. The operators' major concern is with avoiding the costly drilling delays. They do not bear the costs of the accidents that may result from operating the support vessels in adverse conditions. This obsession with avoiding delays occasionally results in boats running when it would be advisable for them to stay in port.³³

Another common time-saving practice in the industry is to tow mobile rigs with the entire complement of workers on board, even when the sea conditions are not the most favorable. This occurs exclusively in short moves, within the gulf region. Obviously, the vast majority of the drilling contractor's regular personnel, particularly the drilling crews, have no function on the rig during the time it is being moved. Of course, the removal of the unnecessary personnel from the rig during

towing operations results in lost time and requires the deployment of at least one crew boat to hold and transport the workers while the rig is in tow. All this costs money.

Towing a large rig is a delicate operation, requiring the carefully orchestrated efforts of several tugs. *Ocean Industry* lists 12 major mobile rig accidents that have occurred worldwide from 1955 to 1974 while rigs were being moved or being prepared to move in good weather. It lists 17 additional major mishaps that occurred while the rigs were in transit during storm conditions.³⁴ Most of these accidents resulted in the rigs either capsizing, sinking, running aground, losing legs or support columns, breaking up, and even colliding with other vessels or rigs. Although *Ocean Industry* does not present the number of personnel injuries and fatalities resulting from these accidents, these kinds of mishaps are serious. An April 1976 capsizing and sinking of a rig in the Gulf of Mexico resulted in the drowning of 13 men.³⁵ The newspaper account of the incident and of the hearing that followed points out the delicate nature of the towing operation as well as the premium placed on saving time:

...All three tugs should have been holding the offshore oil rig into gale-force winds before the rig capsized and sank, a sea captain testified. Only two tugs were holding the rig as winds mounted April 15 and one line snapped, leaving the \$20 million rig nearly adrift. Thirteen men drowned as they fled the sinking rig in survival capsules. Earlier, the rig captain testified that one of the tugs lost power, leaving only two available for tow. "To me, it wasn't good seamanship," the captain told a Coast Guard board of inquiry Friday. "We was wondering, myself, the chief and my mate, at the time why they didn't switch the tugs in a manner where all three of them could be working into the weather instead of just two. It was an odd thing--I realized they probably wanted to save time when the weather calmed down:"³⁶

Apparently, the financial benefit of maintaining unnecessary personnel on rigs under tow is substantial, for the practice has become widespread and institutionalized in the industry. None of the executives interviewed questioned its soundness nor its implications for personnel safety, indicating only that it was standard operating procedure in the industry.

Aside from time-saving practices, another *modus operandi* of the offshore industry that may contribute to unnecessarily high accident rates is long working hours. The fewest that an offshore worker can expect to work is twelve continuous hours. Fortunately, since the drilling operation itself never stops, rigs always have two drilling crews, and the workers on those crews (drillers, derrickmen, and rough-necks) can usually expect to work no more than twelve hours. The same is true for motormen and the food service personnel, since in those job categories there are usually two full crews on board who alternate twelve-hour shifts.

The rest of the personnel on board a rig, however, not only work for twelve hours, but may also be on call at any time during the rest of the day or night. This includes not only the salaried supervisory and technical personnel (toolpusher, mechanic, electrician, etc.) but also many hourly employees, notably the roustabouts and the crane operator.³⁷

It is not unusual for roustabout crews to be awakened in the middle of the night to perform work that is necessary for the uninterrupted operation of the rig. This usually includes such things as moving stored supplies and equipment (such as drill pipe or mud) to the drilling floor where it can be utilized by the drilling crew, or, perhaps most notably, unloading needed supplies from support vessels that arrive at the rig in the middle of the night. During the one night this author spent on a rig at least one supply boat arrived at the rig, and the roustabouts and the crane operator were awakened in order to unload the supplies from the vessel.

Working more than twelve hours a day is a phenomenon not limited to personnel in the drilling sector; in fact, long working hours are even more pervasive among employees of marine service companies. Support vessels, as noted earlier, must be ready to take supplies to rigs any time they are needed. The boats, and therefore their personnel, are on call around the clock. As a matter of fact, the universal procedure in the industry is for the vessel, which is usually under contract for an extended period of time with the oil or gas company, to be deployed from a base location specified by the oil or gas company, usually a dock that functions as the operator's coastal base. The marine company personnel stay on board the vessel during their entire hitch (usually about 7 or 14 days), and they must be ready to get underway at a moment's notice at any time, usually embarking either to the rig directly or to the dock of an equipment supplier to pick up a load of needed supplies for the rig. This is why the personnel on board the vessels are paid not on an hourly basis, but either through a salary (as is the case with masters, mates, and engineers), or on a daily-wage basis (as is the case with deckhands and cooks). With the exception of the masters, who are by law supposed to be relieved every twelve hours, crews of offshore vessels frequently find themselves on duty for long periods of time. This is to be expected, given the fact that the oil or gas company expects to utilize to the fullest the boats it has under contract. In view of the high cost of leasing these vessels, the most efficient use of them is to contract the minimum number of boats needed to service all of the rigs that the operator has under contract in the area and to keep those vessels working around the clock.

As a result of these operating conditions, boat personnel, as well as many of the workers on rigs, frequently work long hours with little sleep. The author has talked to deckhands and roustabouts who can recall working, on more than one occasion, as many as 36 and 48 hours without sleep. Of course, workers paid on an hourly basis welcome this, for it means a fat paycheck at the end of the week and that they have at least a week off before the next hitch. But the implications that these

long working hours have on safety are obvious, especially in the case of crane operators and roustabouts, who are the personnel directly involved in the delicate unloading operations.

The fact that there are no unions may have negative implications for personnel safety offshore in the Gulf of Mexico. While management in other industries frequently claims that unions hamper companies with exaggerated concern for safety, it is widely recognized the greatest opportunity for cooperation between labor and management exists in the area of safety.³⁸ In matters of safety regulation, the safety engineer finds an enthusiastic supporter in the union steward and the company profits from union safety efforts. Offshore, however, there are no union stewards to point out dangerous situations and safety violations on the part of both the workers and management.

There are other conditions and procedures of the industry that contribute to the possibility of serious accidents. One is the failure of some marine service companies to operate their boats in accordance with Coast Guard requirements. Because this condition is related, however, to the question of government jurisdiction over offshore safety, it is dealt with in more detail in the following section.

Social Control Factors:

Inadequate Government Regulation

The principle that the government should act as a watchdog over the private sector in matters of personnel safety has a long history in American industry. In fact, the rise of labor unions and of government concern with the operation of private industry resulted in part from the widespread recognition of unsafe conditions in the factory. Despite notable improvements over the years and the apparent willingness of most corporations to promote safe and humane working conditions, the principle of government regulation over industrial safety is apparently still in force, with even more emphasis now than before. Regulation is based on the notion that the goal of corporations is, above anything else, the maximization of profit. Such a goal is by no means an aberration, but indeed a cornerstone, of the capitalist system.

In the offshore industry, as in some other industries, the principle of close government supervision of the health and safety of workers has been deficient in its implementation. Not that agencies have not been given jurisdiction over personnel safety in the outer continental shelf, but those agencies with jurisdiction have, in the past, and sometimes for reasons beyond their control, been less than effective in assuring the safety of the offshore work setting.

In an obvious case of overlapping jurisdiction, federal laws have given the task of monitoring the safety of workers involved in oil and gas activities on the outer continental shelf to the following: (1) Interior's Geological Survey, (2) Transportation's Coast Guard, and (3) Labor's Occupational Safety and Health Administration (OSHA).³⁹

In accordance with the provisions of the Outer Continental Shelf Lands Act, the Department of the Interior, through its Bureau of Land Management, acts as the government's lessor of OCS tracts. Once the tract has been leased, USGS is entrusted with the responsibility of issuing and enforcing OCS regulations with respect to the development of the tracts. It conducts periodic inspections of OCS facilities to assure that the lessee or operator is complying with all the regulations, particularly those that relate to environmental safety. Traditionally, its inspections have focused almost exclusively on the well system, that is, drilling equipment and procedures, the handling of the drilling fluids, and logging. USGS' concern with personnel safety is, of course, an inseparable extension of their jurisdiction over the safety of the well, and its inspections have implications for a safer workplace. In the past, however, the workplace inspected by USGS has been limited to the activities that directly relate to the well system. This is why, as was shown earlier, their figures on personnel casualties include only those resulting from blowouts, explosions, or fires.

The Coast Guard is an important government agency in the regulation of offshore safety. The safety of the support vessels has always been the undisputed responsibility of that branch of the Department of Transportation. The issuance and enforcement of regulations covering the equipment, manning, seaworthiness, and operation of most types of commercial vessels is not limited to those engaged in offshore activities. There has long been a body of regulations that covers most U.S. commercial vessels, and these regulations apply, or should apply (more on this later), to offshore support vessels.

In addition to their traditional jurisdiction over many types of vessels, the Coast Guard, through sec. 4(e) (1) of the Outer Continental Shelf Lands Act, was given jurisdiction over mobile rigs and stationary rigs and platforms. The language of that section of the legislation is important:

The head of the Department in which the Coast Guard is operating shall have authority to promulgate and enforce such reasonable regulations with respect to lights and other warning devices, safety equipment, and other matters relating to the promotion of safety of life and property on the islands and structures....⁴⁰

The emphasis in the language of the law on safety equipment and warning devices is important, for the Coast Guard, in the formulation of the regulations to implement sec. 4(e) (1), limited itself almost exclusively to inspecting and overseeing the marine-related facilities and operations of the rig or platform. In other words, the Coast Guard labeled rigs and platforms as vessels and artificial islands, and indeed treated these as vessels, regulating and inspecting only the equipment and activities of the rig or platform that are also found on ships. This is clear from an examination of the two sets of regulations the Coast Guard issued to cover mobile rigs and fixed platforms: 46 CFR

Subchapter I, Rules and Regulations for Cargo and Miscellaneous Vessels; and 33 CFR Subchapter N, Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf.⁴¹ The areas covered by these regulations are the following: means of escape, personnel landings, guards and rails, floats, life preservers, ring life buoys, first-aid kits, emergency communications equipment, fire-fighting equipment, identification marks, accident reports, work vests, emergency drills, safety zones, aids to navigation, fog signals, and other similar equipment and operational requirements. As can be seen, these are all marine-related.

A mobile rig or fixed platform, of course, has other functions and facilities besides those listed above, and the Coast Guard coverage of rigs and platforms has, at least in the past, excluded the following: (1) the drilling operation and its equipment, and (2) the handling and maintenance of heavy machinery and equipment. That the Coast Guard would exclude these mining and industrial functions is not surprising: they are areas in which the Coast Guard has had neither experience nor expertise.

Exclusion of the drilling function from the Coast Guard's supervision poses no real problem, since that is handled by the USGS. In fact, in a memorandum of understanding between the Departments of Interior and Transportation, the latter, recognizing the "expertise and capability" of the USGS in matters relating to the well, agreed to leave the regulation of that aspect of offshore activities to Interior.⁴²

However, the operation and maintenance of heavy industrial machinery and equipment not directly involved in drilling have not, in the past, been regulated by either the USGS or the Coast Guard. Prominent examples of this type of equipment are cranes (there is at least one on every rig and they are utilized to load and unload personnel and supplies to and from the support vessels), forklifts (used in the storage area), and the multitude of powerful motors that provide all the power the rig needs.

The third government agency with jurisdiction over the safety of offshore activities does have the expertise to regulate the operation and maintenance of that type of equipment: The Occupational Safety and Health Administration (OSHA). Section 4(a) of the 1970 Act of Congress that established OSHA specifically mentions the outer continental shelf lands as one of the areas included in the jurisdiction of the new agency of the Labor Department.⁴³

OSHA now has what no other government agency regulating offshore safety has: the experience and standards necessary for thorough inspections of the heavy equipment found on rigs. Machines such as cranes and forklifts are basically the same offshore as on land. OSHA field personnel are experienced in inspecting these types of equipment on shore-based industrial facilities, and they have a large body of detailed regulations upon which to base such inspections.⁴⁴ For example, more than ten pages of the agency's General Industry Standards are devoted

exclusively to cranes, covering such topics as their construction, modification, functioning of each specific part, necessary safety equipment, installation and clearance requirements, rated load markings, cabs, operation, testing, and inspection and maintenance requirements and schedules.⁴⁵ There are an additional 32 pages covering just the slings used in cranes for securing or hitching the loads.⁴⁶

Despite its potential for assuring the safety of offshore work by regulating those functions that neither the Coast Guard nor the USGS are equipped to handle, OSHA plays an inconsequential role in offshore safety. The main reason for this is that it does not have available the necessary transportation to conduct inspections. OSHA inspectors do not have helicopters at their disposal simply because there is no area or district office of that agency that is exclusively devoted to offshore safety in the gulf. Jurisdiction of the gulf area is shared by the Houston and New Orleans district offices, which also have under their responsibility fairly large land territories: southeastern Texas and the southern half of Louisiana. Offshore activities are only a small segment of the respective provinces of those OSHA offices, whose directors might decide not to pay for helicopters, which cost hundreds of dollars to rent for just one day, out of their limited budgets. After all, those district offices only share responsibility for offshore safety with the Coast Guard and USGS, while they are almost totally responsible for regulating, for example, the large petrochemical complexes located along the lower Mississippi River and the Texas coastal area.

Since employers are required to make the workplace accessible to OSHA inspectors, one alternative could be to require companies to provide transportation to the rig. Another possible solution to OSHA's transportation problem is for them to arrive at an understanding with the Coast Guard and USGS concerning activities and equipment on rigs that fall under the jurisdiction of each, and then cooperate on transportation. Since an understanding already exists between the last two agencies, one plausible arrangement is for OSHA to assign one or more of its inspectors to accompany Coast Guard inspectors on their rig visits. While the Coast Guard officer inspects the marine-related equipment and activities, the OSHA representative could inspect the industrial equipment. At present however, little cooperation between the Coast Guard and OSHA is apparent. Also, there appears to be very little communication between the two federal agencies except when a fatality occurs and an OSHA inspector must be transported, by either the company or the Coast Guard, to the scene of the accident in order to file a report. These post-mortem investigative visits constitute the full extent of OSHA involvement in offshore work, except for the rare cases when a worker files a complaint with the OSHA office, under sec. 8(f) (1) of the OSHA Act, and the employer provides transportation for a special inspection by the agency.

Despite the fact that there are three agencies of the U.S. government with the responsibility of assuring a safe offshore environment (a problem of overlapping jurisdiction that companies frequently complain about), all three of them together have not been doing a complete job.

At least one gap in the coverage can be discerned: the failure to inspect the heavy industrial equipment on rigs.

Nothing illustrates the consequences of this gap or absence of safety regulation better than accidents involving cranes. The Coast Guard data cited previously show that from October 1970 to September 1974 there were four such accidents, each resulting in a fatality. This is not, of course, a particularly high rate. What makes these accidents noteworthy is that the investigative reports by the Coast Guard clearly show that each accident resulted from an equipment failure that would not have occurred if the crane had been periodically inspected and serviced. Summaries and quotations from the reports filed by the Coast Guard officers investigating the accidents are listed, along with the reports on other accidents, in the Appendix (USCG case nos. 12428, 22022, 40035, and 51333). In all four accidents either the entire crane or the boom simply disengaged and fell. In fact, in three of the accidents, the entire crane, complete with cabin, fell overboard. In one accident (USCG case no. 40035) the bolts holding the crane to its pedestal failed due to fatigue: the crane had been modified with a heavier boom, yet the higher grade bolts necessary to hold the modified crane were never installed. In addition, the crane was lifting a load beyond its safe working capacity, and it was not under a maintenance program. Despite the negligent manner in which the crane was mounted, maintained, and operated, the Coast Guard investigative officer concluded in his report: "There is no evidence of violation of any law or regulation administered by the Coast Guard."⁴⁷ Regrettably, he is absolutely correct.

In another crane mishap, a worker was killed when the crane and cabin fell overboard. The investigation showed that a piece of equipment through which the crane was mounted on the rig was cracked. For more than two years, the crane had not been under any periodic testing or inspection program, the manufacturer's maintenance schedule had not been followed, and no operating instructions or indication of maximum safe load were posted on the crane. The investigating officer concluded what we already know: "Cranes on fixed platforms are not inspected by any government agency."

While the failure to inspect cranes and other industrial equipment on rigs is the most apparent deficiency of the government's regulation of offshore safety, it is by no means the only one. Perhaps as evident to the careful observer is the situation in the marine service industry, where long-standing Coast Guard regulations regarding the inspection, certification, and manning of vessels are not widely enforced.

Coast Guard regulations stipulate that vessels of more than 15 gross tons or carrying more than 6 passengers for hire are subject to inspections and certification standards.⁴⁸ Inspected vessels also have certain manning requirements that vary according to the specifications of the vessel. The Coast Guard administers a program to license personnel in different job categories.

Bringing a vessel up to Coast Guard specifications may cost the vessel owner in both time and money, and there is evidently a shortage of personnel in the industry qualified to receive the necessary documentation. However, many marine service companies circumvent the regulations through an arrangement called the "bareboat charter."

The bareboat charter concept contains a legal technicality (which is increasingly being recognized as invalid) whereby companies may operate vessels that are uninspected and manned by undocumented personnel. It should be noted that many companies choose to abide by the regulations and have all their vessels certified by the Coast Guard. A substantial number of marine service companies, however, apparently do find it necessary to circumvent the regulations.

In order to take advantage of the bareboat charter technicality in the most efficient manner, the company must have either a wholly owned subsidiary company or create a separate and independent company. This other company exists only on paper: it has no separate offices and its managers are the same as those of the parent company. Let us call this subsidiary the "operating company."

The original, or parent, company owns the boats and leases them to the oil or gas company. The latter now becomes the vessel's owner *pro hoc vice*. The purpose of the oil or gas company in leasing the vessel is to provide transportation for the drilling rigs it has under contract. It must transport its own employees or supplies (or those of the companies that it has under contract) for the purpose of operating the rig, thereby using the vessel in the course of its own operations.⁴⁹ The vessel's new "owner" (in reality the lessee) is therefore not "carrying passengers or freight for hire" and consequently the vessel is not subject to inspection by the Coast Guard.

The question now becomes: "Who operates the boat?" Since the oil company is the new "owner" of the boat, clearly that responsibility is in its hands. But the oil company does not want to have to deal with the complex of problems and details associated with operating the boats. It would prefer to contract out those services to specialized companies. For its part, the marine company that owns the boats would prefer to look out for its property and would be reluctant to simply turn over the operation and maintenance of the vessels to the oil company or a contractor of the oil company. However, the same company that owns the vessel cannot operate it. Here is where the operating company comes in: after leasing the boat from the company that owns it, the oil company contracts the owner's operating subsidiary to operate it. Two separate contracts are drawn up, one being the leasing contract and the other the operating contract. On paper, the oil company is contracting separate companies, but in reality, the oil company is dealing with the same people and both contracts are, in an actual but not legal sense, inextricably tied together. In fact, usually oil and marine companies negotiate a price that includes both leasing and operation. The figures

are then summarily divided into two contracts. This dual company setup is only necessary for legal purposes. These companies are known in the industry by only one of their names, usually by the name of the leasing company. Indeed, most of the people in the industry are unaware of the names of phantom operating companies, for they appear only on paper. Even the workers, who are usually on the payroll of the operating company, will regard themselves as employees of the leasing company. The operating company's name may not appear on the door of the company offices, nor on its stationery, nor in any of the directories or listings of marine service companies. Indeed, without inquiring and searching thoroughly, one may never run across the formal existence of the operating company.

Admittedly, the above description oversimplifies the bareboat arrangement, which probably varies in its specific application from company to company. Interestingly, however, its complexity is another factor that makes it difficult for the Coast Guard to enforce regulations, especially in determining which of the parties involved in an accident has violated regulations. Witness, for example, the confusion apparent in the report of one officer who was investigating the capsizing of a freight oil exploration vessel (case No. 00912):

Owners of the M/V Lady Verna are listed as H. Bouregard, P. P. Verrett, J. A. Callais, Inc. It was loaded at the Marine Mud Company Dock at Sabine, Texas. Crestwave Offshore Service, Inc., which is the construction contractor for Atlantic Richfield Co., entered into a bareboat charter with Tidewater Supplies, Inc. for the services of M/V Lady Verna on 9 Feb. 1969. Crestwave Offshore Service, Inc. then entered into an operating agreement with Tidex, Inc. on 9 Feb. 1969 for the M/V Lady Verna. Actually, Owens Marine Service paid the owner of the vessel. One of the owners of the vessel, Mr. Joseph A. Callais, was the documented master of the vessel. Mr. Callais does not possess an Ocean Operator's license. Mr. Callais hired Mr. Andrew J. Rouse as alternate master. Mr. Andrew J. Rouse, while serving as alternate master, hired the deckhand, Mr. W. C. Wells, Jr. There was no information available concerning any agreement between Tidex, Inc. and Owens Marine Service and the owner.

Until now, the Coast Guard apparently has not challenged the assumption that these bareboat charter arrangements do exempt the vessels from the inspection and manning requirements. Many industry officials interviewed indicated that the New Orleans office of the Coast Guard realizes the constraints under which the marine service companies operate, particularly in terms of personnel shortages, and that to require that all support vessels meet the regulations would be unreasonable and tantamount to shutting down the offshore industry. Presumably,

the Coast Guard's recognition of the difficulties in obtaining licensed personnel is the reason that they have not only permitted many offshore support vessels to operate uncertified, but also why they have not extended licensing and manning requirements to all rigs. At present, only self-propelled rigs have such requirements.

Executives of marine service companies that operate uninspected vessels point out that although many vessels are uninspected they are not necessarily unsafe. They maintain that it is to the advantage of the companies to run the safest operation possible with the most qualified personnel available. This is true not only because a safe operation enhances their possibilities of obtaining contracts, but also because accidents are costly, particularly in terms of insurance rates. They point out that whether or not the vessel is inspected bears little relevance to their ability to obtain contracts or to the costs of insurance. The real test is whether or not they run an operation with a good safety record, regardless of whether or not they have the blessing of the Coast Guard. In fact, more than one executive asserted that his company's uninspected vessels met all the Coast Guard regulations, but they chose not to submit to inspections they saw as having few implications for profits, attracting customers, or insurability. To them the inspection process represents an inconvenience and a loss of time.

The perceptions of the company executives about insurability are generally correct, judging from the opinion of an official of a leading marine insurance company:

Decisions as to insurability, rates and premiums usually revolve around past loss history. If a potential insured's loss record is good, the underwriter will be inclined to offer a lower rate. While no one knows what the future will bring, the only basis one has for making a decision is past "track record." Inspection and/or certification by the Coast Guard may have bearing on insurance costs, although this is not directly reflected in any given instance; again, loss experience factors are of a very great significance; however, Coast Guard certification could be a warranty (express or implied) in connection with a certain vessel.⁵⁰

Since the certification status of the vessel appears to have only a marginal impact on its insurability, we would also expect that it bears no relation to the problem under study here: the incidence of fatalities and serious injuries. However, judging from the Coast Guard statistics on casualties (which include information on the manning and inspection status of the vessel), that is not the case. Of the 126 deaths and serious injuries that occurred in connection with offshore operations between July 1969 and June 1975, 111 of them, or 88 percent, occurred on uninspected vessels (including some vessels that do not customarily

require inspection and certification). If fatalities are distinguished from injuries, the figures are as follows: 92 percent of all fatalities and 85 percent of all serious injuries took place on uninspected vessels. In terms of manning, 96 deaths and injuries (76 percent of the total) happened on vessels where the person in charge was unlicensed or undocumented. Again, differentiating between fatalities and injuries, 83 percent of the former and 71 percent of the latter occurred on vessels that were in the hands of persons who were unlicensed or undocumented.

Rigs are the most prominent example of vessels that are not required to be certified or inspected by the Coast Guard. As noted earlier, the Coast Guard has not implemented regulations concerning the manning and inspection status of rigs (except those that are self-propelled). This clarification is necessary so as not to convey the impression that all uncertified vessels on which accidents occurred were vessels that ignored or circumvented Coast Guard regulations. There are some types of "vessels," such as rigs, that are legitimately uninspected and uncertified because no regulation is required. Nevertheless, even if we exclude rigs from the analysis of casualties by inspection status, the conclusions are not very different: the vast majority of fatalities and injuries occurred on uninspected and uncertified vessels. A total of 51 fatalities and injuries occurred on vessels classified as oil industry supply vessels, construction vessels, ocean/offshore tugs, and crewboats (i.e., all other vessel types except rigs). Of these casualties, 83 percent of the fatalities and 61 percent of the serious injuries occurred on uninspected vessels. In addition, 78 percent of the deaths and 47 percent of the serious injuries occurred on vessels in which the person in charge was undocumented or unlicensed.

One problem in interpreting the above figures is that an incidence rate by inspection or certification status cannot be computed, since an accurate count of vessels in the gulf according to their Coast Guard certification status is unavailable.⁵¹ This is unfortunate, for there are two possible explanations for the observation that a higher number of casualties occur on uncertified and uninspected vessels than on those that are certified and inspected: (1) uninspected and uncertified vessels are less safe and more likely to be involved in accidents, or (2) the vast majority of offshore vessels are uninspected and uncertified. The impossibility of computing a rate of incidence by inspection or certification status precludes any definite conclusion. Nevertheless, both explanations point to a deficiency or inadequacy in the Coast Guard's regulation of the safety of offshore vessels. It has not acted to close gaps in existing regulations (as in bareboat charter arrangements), and it has also been slow to formulate regulations and extend its regulatory powers to all vessels (including rigs) engaged in offshore work. The problem of unlicensed and undocumented personnel aboard vessels engaged in offshore work was underscored by one accident (case No. 12140, listed in the Appendix). The investigative officer found that the accident, which resulted in four deaths and one injury, occurred

because of "gross negligence" on the part of the vessel's master. The master was questioned during the subsequent hearing:

Q: Do you possess any Coast Guard documents or licenses?

A: No, sir.

Q: Have you ever been asked to get a Coast Guard document or license?

A: No.

Q: Never have?

A: No, sir.

The deficiencies in the Coast Guard's regulation of offshore safety have recently drawn some criticism, particularly in the wake of accidents like those cited in this section, which underscore the need for tighter controls.⁵² In fact, crane accidents have been among those mishaps drawing particular attention, since, as noted earlier, their occurrence is particularly illustrative of the regulatory gaps.

One important source of pressure on the Coast Guard has been, indirectly, the Occupational Safety and Health Administration. As far as can be determined, OSHA, primarily because of the budgetary reasons cited earlier, is willing to let the Coast Guard be the principal agency with jurisdiction over offshore personnel safety, particularly in areas not covered by the USGS. In fact, the yielding of jurisdiction to other agencies has a basis in the 1970 Act that established OSHA. Section 4(b) (1) of the Act indicates that "nothing in this Act shall apply to working conditions of employees with respect to which other Federal agencies, and State agencies...exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety and health."⁵³ However, before OSHA can, through that section of the Act, leave any work establishment under the responsibility of a sister agency, that agency must, as stated in the law, prescribe and enforce standards or regulations. The Occupational Safety and Health Review Commission, established under the Act to adjudicate employers' contests of citations, has been clear on this point in at least two cases that have come before their scrutiny in which the authority of OSHA to issue citations was challenged because of the existence of another agency with similar regulatory power. In the case of Secretary of Labor v. Crescent Wharf and Warehouse Company, the Commission stated in its majority opinion:

Clearly, Section 4(b) (1) is intended to avoid a duplication in the enforcement efforts of Federal Agencies, the action of which provides job safety and health protection to employees.

By the same token, there is perforce an intent to have no hiatus in the protection of employees.⁵⁴

In a similar case, the Commission ruled that:

...when a Federal agency or department has authority to regulate safety and health working conditions in, e.g., railroad shops, and does not exercise that authority the said working conditions are subject to OSHA regulations.⁵⁵

The commission goes on to indicate that in order for a particular place of work to be exempted from coverage by OSHA under sec. 4(b) (1), the sister agency with authority over that work establishment must have "actually exercised its authority to prescribe and enforce safety and health standards."⁵⁶

Unfortunately, the question of the adequacy of Coast Guard coverage of offshore safety has not been ruled upon by the Review Commission since, to the best of our knowledge, the issue of OSHA versus Coast Guard jurisdiction over offshore safety has not been brought, in the form of litigation, before that adjudicative body. This, of course, is not surprising in light of what has been said about the difficulties that OSHA faces in extending its jurisdiction to offshore areas and its subsequent limited role in that work setting. Unlike the cases cited above that came before the Review Commission, OSHA has been unwilling to exercise its full authority over offshore work and has therefore apparently never forced the issue of whether or not the sister agency (the Coast Guard) is actually exercising "its authority to prescribe and enforce safety and health standards."⁵⁷

Given the provisions of the OSHA Act and their interpretations, it is clear that the Coast Guard must exercise its statutory authority over the offshore area if it does not want to share that authority with OSHA. Indeed, if the Coast Guard's coverage of offshore safety is adequate, the OSHA Act works in their favor, in effect barring OSHA from jurisdiction through the implementation of sec. 4(b) (1).

Apparently, the Coast Guard is strongly committed to retaining its authority in the offshore area, which may be one reason for such little cooperation between it and OSHA. Realizing the threat to its jurisdiction posed by the OSHA Act, the Coast Guard has very recently started formulating regulations designed to fill the most obvious gaps in their coverage of offshore safety.

The Coast Guard's most meaningful first step toward closing those gaps has been the formulation of requirements for the inspection and certification of mobile offshore drilling units. The proposed regulations were published in the *Federal Register* in May 1977 and comments were received in a public meeting the following June in New Orleans.⁵⁸ As of this writing the proposed regulations were being amended in response to those comments and will soon be implemented.

The proposed requirements in effect take the mobile rigs that drill while bearing on the seabed (submersibles and jack-ups) out of Subsection N of 33 CFR, which regulates fixed structures, and groups them with the floating mobile rigs (drill ships and semi-submersibles), which had been under 46 CFR Subchapter I. The new regulations, therefore, apply uniformly to all mobile rigs. The proposed requirements include the traditional Coast Guard areas of marine inspection noted earlier (life jackets, rafts, safety equipment, lights and signals), and much more. They contain provisions for the inspection and certification of all mobile rigs, and include design and equipment specifications for new rigs and the operation of existing rigs, stability requirements, and regulations for "industrial systems."⁵⁹ It is significant, in view of our analysis, that these new regulations place a great deal of emphasis on the certification, inspection, testing, and operation of cranes. There are also requirements for the operation of powered industrial trucks. As our discussion has shown, these new efforts by the Coast Guard are sorely needed in order to close existing gaps in that agency's coverage of the offshore work setting. In fact, in the summary of the proposed requirements one finds this statement:

This proposal requires Coast Guard inspection and certification of all mobile offshore drilling units, including approximately 87 existing units not currently under inspection.⁶⁰

The new proposal calls for recruiting and training 18 officers and 2 civilians in order to implement the new regulations.

These proposed requirements will not, however, cover all existing gaps in the Coast Guard's regulation of offshore safety. Fixed platforms are not included in the new regulations; they will continue to be subject to the provisions of Subchapter N of 33 CFR, which contains only "marine" requirements for the operation and maintenance of the rigs. The proposed requirements are also silent on the question of the manning standards or the licensing and certifying of personnel on mobile rigs. The text of the proposed regulations states that these personnel questions will be handled in a separate and forthcoming set of regulatory proposals.

It appears then, that the Coast Guard has recently been making a concerted effort to eliminate many of the deficiencies that have been noted here and that have, for many years, made its coverage of offshore safety less than adequate. Formulating regulations to certify and inspect mobile rigs is an important and encouraging step.

Formulating and enforcing new regulations for rigs, however, is only half the story. It is still unclear whether or not the Coast Guard plans to extend its long-standing regulations on inspection and certification to otherwise eligible support vessels that are operated under bareboat charter arrangements. Various Coast Guard officials have told the author that the New Orleans office of the Coast Guard plans to crack down on the practice and to strictly enforce the regulations. Apart

from these oral assurances, however, there is no concrete evidence that the Coast Guard is moving vigorously in the direction of challenging the presumed legal basis for the exemption of bareboat charters from inspection and certification.

ECONOMIC COSTS OF ACCIDENTS

The social value at issue in industrial safety is employee health and welfare. Effective corporate safety programs, as well as the controls placed on industry in matters of safety by public agencies, are justified if they do nothing else but spare workers from injury, death, or illness. Nevertheless, it should not be overlooked that a safer workplace also spares the company the loss of many dollars, primarily in the cost of liability insurance. While the economic costs of accidents are almost, in our view, an inconsequential argument for better safety given the much higher stakes involved, i.e., human life and health, we raise the issue here because (1) the economic costs of accidents in the offshore industry (and hence the cost of liability insurance) are exceptionally high; and (2) many persons in the industry would not agree with us that the economics of the issue are inconsequential.

In comparison with virtually all other U.S. industries, the monetary compensation that injured workers or families of fatally injured workers in the offshore industry receive is very high. These high compensatory payments for work-related injuries and deaths account for the high liability insurance premiums and are probably related to many factors, such as the seriousness of the injuries usually incurred in offshore work, the high incidence of fatalities per accident, the fairly high wages received by many workers, and the risky nature of the workplace. These conditions, however, when viewed in the broader context of all U.S. industrial activity, are not unique to the offshore industry.

What makes offshore deaths and injuries exceptionally expensive to offshore companies is the applicability of two federal labor laws to most offshore work: the Jones Act of 1920 and the Longshoremen's and Harbor Worker's Compensation Act of 1927. All workers on all types of offshore vessels (supply, towing, pipelaying, construction) as well as all workers on mobile drilling units are considered "seamen" and are therefore covered by the Jones Act.⁶¹ Workers on stationary platforms in federal waters are covered by the Longshoremen's Act in accordance with sec. 4(c) of the Outer Continental Shelf Lands Act of 1953.⁶²

It would serve no purpose here to enter into a detailed examination of these laws, their subsequent amendments, and the effect of Supreme Court decisions in cases involving them. The reader interested in these details and explanations is referred to the classic work in the area: *The Law of Admiralty*, by Gilmore and Black.⁶³ The tortuous development of the laws since their passage and the many exceptions to its provisions and points of legal controversy make it difficult to generalize about

the impact of these statutes on compensatory payments to workers in the offshore industry. It can be said, however, that an important consequence of these laws has been to make the compensatory payments received by offshore workers and their families much higher than those to most U.S. workers who are covered by state workmen's compensation laws. These state laws, while removing the need to establish that the employer was at fault, also place ceilings on the amount of compensation workers may receive and prohibit them from suing the employer for additional compensation. Workers on vessels and mobile rigs, however, are not covered by Workmen's Compensation Laws, and the Jones Act permits those who are injured in work-related accidents (as well as the families of fatally injured workers) to file suit against the employer, with the right of trial by jury, in order to recover for the damages incurred from the employer's "wrongful acts, neglect, or default." While the size of the awards is not dictated by the Act, apparently the courts have taken into consideration the seriousness of the accidents, the missed rate of pay, and the dangers of the work, and have in many cases awarded large sums to the plaintiffs. Unlike the Jones Act, the Longshoremen's Act is a sort of federal workmen's compensation act for harbor workers and longshoremen and there are ceilings to the award. It appears that such ceilings are substantially above those provided by state workmen's compensation laws.⁶⁴

Another factor that makes the offshore setting difficult for underwriters and their clients is the possibility of third-party action suits by workers, suits brought not against the employer but against another firm whose actions may have been responsible for, or contributed to, the accident. The offshore setting is prone to this type of litigation because of the myriad of companies involved in a single work setting. Oil companies, while they directly employ a small proportion of the total offshore labor force, are particularly susceptible to these kinds of suits.

In view of this entire situation, the following statement by an executive of a marine insurance company is not surprising:

The unique problems associated with offshore work are generally those of extremely high liabilities and extremely high costs for insuring against these potential liabilities. One of the toughest problems facing companies engaged in offshore work today is the high cost of Worker's Compensation and Employer's Liability Insurance and the unwillingness of underwriters to accept the enormous risks on small to medium sized accounts.⁶⁵

SUMMARY OF THE PRINCIPAL FINDINGS

1. While the incidence of accidents is not particularly high in the offshore industry, those that do occur have serious consequences, with a high rate of fatalities and serious injuries per accident. This is particularly true in those companies that provide services (drilling, marine) for the oil and gas companies.
2. Contrary to the widely held view in the industry that the current rate of serious injuries and fatalities is inherent in offshore work, it was found that only a small proportion of such accidents occurred in adverse weather conditions, while nearly half of those serious mishaps could be directly attributed to personnel actions or to the mishandling of equipment.
3. The labor-force factors associated with the incidence of work-related accidents are (1) a high rate of turnover that keeps the work force inexperienced; (2) the absence of formal training for entry-level workers and almost total reliance on on-the-job training; (3) the chronic shortage of workers and its effect on the hiring process and on the quality of the labor force, and (4) the disproportionately high numbers of young persons among offshore workers.
4. The sociopsychological factors associated with the incidence of work-related accidents were discussed in terms of the system of values that seems to predominate among many offshore workers which stresses individualism, independence, defiance of authority and rules, fearlessness, fortitude, and manliness. These values may manifest themselves primarily in disregard for safety rules and proper precautions as well as in the taking of unnecessary risks.
5. Despite the fact that most companies engaged in offshore work are conscious of safety and promote programs to motivate their workers to follow safe practices, there are also two general and related norms followed in the operation and management of drilling and service companies that are conducive to unsafe conditions and situations: the obsession with saving time and long working hours. The former is a result of the pattern of subcontracting in the industry and the big-money stakes in offshore operations.
6. In terms of social control factors, it was found that despite the fact that three government agencies have jurisdiction over personnel safety in the outer continental shelf, there have been gaps in the

regulatory coverage. The most obvious of these gaps has been the failure to regulate and inspect heavy industrial equipment found on rigs but not used directly in the drilling operation. Crane accidents have underscored this regulatory deficiency. The Coast Guard has recently taken some initial steps towards alleviating the situation. In addition to gaps in the federal agencies' supervision over offshore safety, barefoot charters have been allowed to flourish as a means of circumventing the Coast Guard's regulations regarding the inspection and certification of the vessels engaged in offshore work. The evidence shows that more serious accidents occur on uninspected vessels.

7. In economic terms, offshore accidents can be expensive, even more so than accidents in land-based industries, primarily because of the high cost of liability insurance. This condition is due, at least in part, to the applicability of either the Jones Act or the Longshoremen's and Harbor Worker's Compensation Act to offshore workers.

POSSIBLE REMEDIAL ACTIONS

This report should be regarded as a preliminary analysis of the sociological factors involved in occupational safety of the offshore work setting. We acknowledge the possibility of errors and shortcomings in findings and conclusions drawn from research undertaken to address a different problem, namely labor turnover. However, serious implications that these tentative findings hold for the safety of industrial workers offshore militate for more comprehensive study of the problem, either by an agency that is independent of both the industrial and regulatory interests involved in the offshore sector, or by an interagency task force.

A basic premise of this entire report has been that the incidence of fatalities and serious injuries occurring among offshore workers can be significantly reduced. Our emphasis has been on pointing out those factors in the social organization of the industry that contribute to those accidents. In this section we detail and make explicit that which was implicit in the presentation of the findings: the paths of remedial action. Undoubtedly, the implementation of most ameliorative measures presented here would entail appreciable cost to both the private and public sectors. Indeed, some readers might regard some of these actions as impossible--and they may well be correct. But if our analysis is valid and we have successfully pinpointed the social factors that contribute to that needlessly high rate of serious accidents, then the actions, which are little more than logical implications of that analysis, should serve to appreciably reduce the level of work-related injuries and fatalities. No price can be placed on the preservation of human life and health. Besides, the sum of the costs of implementing these suggestions would probably turn out to be rather small compared to the investments this industry makes in the technology and equipment necessary to exploit the resources beneath the ocean floor. It is not unreasonable to expect or suggest that a fraction of those investments be diverted to the labor factor.

The actions listed below are specific and directed towards particular agencies or sectors of the industry. In fact, they have been grouped according to the type of entity that is in the position of implementing them: state governments, drilling and service companies, oil and gas companies, and federal regulatory agencies.

Actions that might be taken by the Gulf Coast states in conjunction with the private sector

1. Officials of the states along the Gulf Coast, particularly Louisiana, should give serious consideration to establishing training programs that will prepare prospective offshore workers for entry-level jobs in the offshore industry.

A \$30 million rig with at least 40 men on board or an offshore support vessel conducting delicate towing or unloading operations is not an appropriate place for on-the-job training. Workers in the entry categories should learn basic safety principles before they go out on their first hitch. We are referring here primarily to deckhands, cooks, galley hands, roustabouts, and roughnecks. Workers in these categories should know the basics of the overall operation of a rig or boat, first aid, escape procedures, emergency situations, and basic safety precautions in carrying out their particular jobs. There should be no unskilled workers offshore. Even when the job itself does not call for any skills (as in the case of the roustabout) the worker should have at least *safety* skills before going to the rig.

The states should probably take the leadership in establishing the programs to train workers for entry-level positions in the industry. The Louisiana Marine and Petroleum Institute at Chauvin is a good example of what is needed: a vigorously supported state school to teach workers not only the skills of the particular job they are interested in, but also principles of accident prevention, safety measures, and first aid. Such a school is different from other state maritime schools in that the curriculum focuses not just on marine jobs, but also on rig and marine construction jobs (roustabouts, cooks, galley hands, roughnecks, divers, motormen, crane operators, and watchstanders). More schools like the Chauvin Institute would go a long way toward stabilizing the labor force and maximizing and enhancing the job opportunities available offshore.

Secondary

Jefferson Parish Nautical Science
Program
Jefferson Parish School Board Office
519 Huey P. Long Avenue
Gretna, LA 70053
(504) 367-3120

Petroleum Technology Program
Lafayette High School
W. Congress & Arnould Blvd.
Lafayette, LA 70501
(318) 984-5284

Nautical Science Department
Terrebonne Voc-Tec High School
Sayre Road
Houma Air Force Base
Houma, LA 70360
(504) 876-5509

St. Bernard Parish Marine
Technology Program
St. Bernard Parish School Board
E. Chalmette Circle
Chalmette, LA 70043
(504) 271-2533

Post-Secondary

American Marine School, Inc.
417 Gravier Street
New Orleans, LA 70130
(504) 525-6028

IADC Blowout Control Training
School
Div. of Continuing Education
43B Pleasant Hall
Louisiana State University
Bator Rouge, LA 70803
(504) 388-6058

Louisiana Marine and Petroleum
Institute
P.O. Box 236
Chauvin, LA 70344
(504) 594-5801

Marine Department
Young Memorial Vocational
Technical School
P.O. Box 2148
Morgan City, LA 70380
(504) 384-6526

Petroleum Service Program
Dept. of Petroleum Engineering
Technology
Nicholls State University
Thibodaux, LA 70301
(504) 466-8111

University of Southwestern LA
Petroleum Training Service
USL Box 43372
USL Conference Center
Lafayette, LA 70504
(318) 264-6231

A well-supported state school for offshore workers returns to the state a great deal of its investment, particularly in terms of increased tax revenues from a more stable labor force and in reduced unemployment levels. Even so, the entire investment need not be borne by the state alone. It was clear from the interviews we conducted with company executives throughout the industry that they would welcome the establishment of some sort of industry-wide training program. The reason that each drilling or service company has not instituted its own training program, and the reason that we are not recommending that such a program be established by each individual company, is that the competition for experienced workers is such that companies establishing such programs would probably find themselves losing their investment because their graduates would be recruited away by a competing company. This, in fact, has happened to firms that at one time had their own training programs. The training program must therefore be established on an industry-wide basis. Most company executives are keenly aware of the need for a trained labor force and would probably give serious consideration to contributing technically and financially to a serious industry-wide training effort. Oil and gas companies, although not the direct employers of the graduates of such a program, might be easily persuaded to also share the financial costs, since they have a major stake in improving the safety of the offshore workplace given the direct and indirect economic costs of accidents. It would be an opportunity to have the major operators share in the responsibility of alleviating the problems of a labor force that they indirectly employ. If the state and the hundreds of companies involved could agree on an appropriate formula for funding and administering such a school, as well as a way of resolving

existing barriers to intra-industry cooperation, then perhaps something can be established that would benefit all and yet require only a little effort and support from each.

The first step the state can take in implementing this recommendation is to work closely with industry officials in assessing the training and manpower needs of the industry.

Actions that might be taken by the offshore contractors
(drilling, marine service, and food service companies)

2. Provide multi-faceted support to the establishment of the training programs proposed in Recommendation 1.

A trained labor force is crucial not only to alleviate the safety problem, but to resolve a host of other labor-related problems that are costly to the industry. For example, better training is the key to alleviating the turnover situation.

3. Whenever possible, exercise selective hiring practices in order to employ experienced personnel with a record of stable employment and responsible behavior on the job.

While this may seem superfluous, the interviews revealed great differences between personnel managers in the selectivity of their hiring practices. While some are painstakingly careful, attempting to be as selective as possible within the constraints of a shortage of experienced workers, others seem resigned to the dictates of the labor market and take the first workers they can locate.

4. Take appropriate steps towards minimizing the incidence of quits.

This, of course, is more easily said than done, and an entire report will be devoted to the turnover problem. Supporting the training schools and exercising selectivity in hiring, both already suggested, are appropriate steps in that direction. The institution of an extensive fringe-benefit package might also be useful. Thrift-plans and stock-option plans could motivate some workers to remain with the same company. Firms with such programs find them somewhat successful in retaining a portion of their labor force. Other suggestions for reducing the incidence of quits will be presented in the forthcoming report on turnover.

5. Institute procedures whereby only those crew members necessary for the towing operation are retained aboard a rig under tow.
6. Maintain on all rigs two complete crews so that no worker has to work more than twelve hours a day.

Both of these items are aimed at two specific problems related to

the management and operation of the industry. To categorically extend Recommendation 6 to boats is difficult because in many vessels the facilities for two full crews may not be available. The managers of marine companies should nevertheless be more sensitive to the problems of long working hours and strive to do everything possible to seek remedial actions that are suited to their situation.

7. Cooperate closely with public agencies in the formulation and implementation of regulations that will improve the safety of the workplace through periodic inspections of equipment, licensing of personnel, and other measures.

This means cooperating with the Coast Guard's recent attempts to formulate and implement inspection and certification standards for rigs. It also means an end to the bareboat charter, at least as a device to avoid inspection and certification.

Actions that might be taken by the oil and gas companies

8. Encourage contractors and service companies to run a safe operation and to abide by existing regulations.
9. Discourage operations by contractors and service companies in adverse or difficult conditions.

Both of these items recognize the omnipotence of the oil and gas companies in the offshore industry. They are ultimately the source of all offshore contracts and hence of all money. Consequently, their policies and actions have repercussions throughout the hierarchy of companies involved in the industry. They also tend to suffer, as previously noted, from the consequences of poor safety. The oil and gas companies have the power and the incentive to not only demand better safety from those firms to which they award contracts, but to also ease the dangerous obsession with time that characterizes this industry. The operators should take the responsibility and initiative of discouraging service companies from taking dangerous risks for the sake of not interrupting or delaying the drilling operation. Only the oil and gas companies are in the position of easing that time pressure. In the long run, it will pay off.

Actions that might be taken by federal regulatory agencies

10. In accordance with sec. 4(e) (1) of the Outer Continental Shelf Lands Act, the Secretary of Transportation should take the necessary steps to assure that the Coast Guard is promulgating and enforcing all reasonable regulations relating to the promotion of safety of life and property on the structures located on the outer continental shelf. This includes inspection and certification of all rigs, mobile or stationary. Such inspections should be comprehensive of all aspects and functions of those rigs, except perhaps any set of operations, such as those

involving the well, which may be under the responsibility of USGS. The Secretary should also assure that the Coast Guard is enforcing existing regulations with respect to the inspection and certification of vessels engaged in providing marine services in support of oil and gas exploitative activities on the outer continental shelf, as well as promulgating any new regulations that are necessary in order to require that all such vessels be inspected and certified. To these ends, the Secretary of Transportation should do the following:

- (a) meet with representatives of the Department of the Interior in order to update, clarify, and specify the existing memorandum of understanding between the two departments with respect to the areas of jurisdiction of the USGS and the Coast Guard;
- (b) meet with representatives of the Department of Labor in order to draft a memorandum of understanding between the two departments with respect to the jurisdiction of the Coast Guard and the jurisdiction, if any, of OSHA (see Recommendation 11);
- (c) meet with representatives of the various segments of the offshore industry, as well as with the Coast Guard, in order to establish a reasonable set of deadlines for the formulation of new regulations and the implementation of both new and existing regulations that will promote safety on the OCS;
- (d) appoint a civilian official of the Department of Transportation to work with the Coast Guard in these matters, who will be responsible for keeping the Secretary informed of the progress being made in meeting the established deadlines.

11. In accordance with sec. 4(b) (1) of the Occupational Safety and Health Act of 1970, the Secretary of Labor should determine whether or not the Coast Guard is effectively exercising its statutory authority to prescribe and enforce regulations affecting occupational safety and health in the offshore industry. To this end, the Secretary should do the following:

- (a) meet with representatives of the Department of Transportation to determine the present scope of the Coast Guard's regulation of offshore safety as well as its plans for expanding that scope in the future, and to draft a written memorandum of understanding with Transportation regarding the future roles of the Coast Guard and OSHA in regulating offshore safety;
- (b) request that the Director of the Occupational Safety and Health Administration appoint an official of that agency to

work closely with the Coast Guard in order to assure that that agency of the Department of Transportation is effectively exercising its authority to regulate offshore safety, particularly if the memorandum of understanding calls for the invocation of sec. 4(b) (1) of the OSHA Act.

CONCLUSION

More than half a century ago, in 1922, a work was published that has special relevance to the findings of this study: *Social Change*, by William F. Ogburn, a sociologist at Columbia University.⁶⁶ In that classic work Ogburn advanced the idea that our material culture or technology changes at a much faster rate than our nonmaterial culture (norms, values, shared attitudes). Changes in material culture invariably necessitate adjustments in the nonmaterial culture, but since the latter changes at a slower rate than the former, there is invariably a "lag period" between the time new forms of technology are introduced and the time that the adaptive changes are made in our systems of norms (e.g., laws), and values. This "lag period," or, as Ogburn called it, "cultural lag," is a period of maladjustment that usually has negative consequences.

Ogburn discussed industrial accidents as the best example of his cultural lag thesis. The increasing incidence of accidents since the last century reflects the great technological inventions that have introduced progressively heavier and more complex, and hence more dangerous, machinery into the industrial work setting. Obviously, it was necessary for the normative system (laws, regulations, company practices) to change and adapt to these industrial technological changes. Those adjustments, however, take time, and in the meantime the resulting "period of maladjustment" meant a growing number of injuries and lost lives. Decades after the introduction of heavy machinery in the work setting we see the beginnings of such adaptive nonmaterial changes as workmen's compensation laws, factory inspections, safeguards in the operation of machinery, rest periods, a slowing down in the expected rate of worker productivity.

It is not difficult to see the direct applicability of Ogburn's ideas to the findings enumerated in this report. The offshore industry started in 1947 when the first drilling operation on a platform 12 miles off the Louisiana coast led to the discovery of the Creole Field in the Ship Shoal area. The technology that has been developed since then for the exploitation of oil and gas deposits in the outer continental shelf is truly amazing. There are, as of this writing, literally hundreds of rigs in the Gulf of Mexico, and at least one is drilling 25,000 feet into the floor of the ocean at a water depth of 3,000 feet. The advances that have been made in drilling, marine construction, pipelaying, and many other segments of the industry have made a reality of what seemed to be the impossible: conquering the awesome and unique challenges posed by offshore oil and gas development. Those advances, however, have been in the technological arena. Ogburn would not have

been surprised to learn that three decades after the drilling of the first successful offshore oil well the necessary adaptive changes in corporate safety practices, as well as in the development and implementation of a body of government safety regulations, are still inadequate.

The findings presented in this study can help bring to an end that detrimental cultural lag that has existed in the offshore industry for too long.

NOTES

1. Butch Reed Newman, "Personnel Turnover Rate Problems in the Offshore Oil-Patch Industries," unpublished paper, 1976.
2. Ronald Althouse, *Work, Safety, and Life Style among Southern Appalachian Coal Miners: A Survey of the Men of Standard Mines* (Morgantown: West Virginia University, 1974), p. 74.
3. Perhaps the best example of this literature is Willie Hammer, *Occupational Safety Management and Engineering* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1976). See also C. Richard Anderson, *OSHA and Accident Control through Training* (N.Y.: Industrial Press, Inc., 1975); Morris S. Schulzinger, *The Accident Syndrome: The Genesis of Accidental Injury* (Springfield, Ill.: Charles C. Thomas, 1956); Paul Pigors and Charles A. Myers, *Personnel Administration: A Point of View and a Method* (7th ed., N.Y.: McGraw-Hill, 1973), pp. 408-427; H. W. Heinrich, *Industrial Prevention: A Scientific Approach* (4th ed., McGraw-Hill, 1959); and Dan Peterson, *Techniques of Safety Management* (N.Y.: McGraw-Hill, 1971).
4. See, for example: Wilbert E. Moore, *Industrial Relations and the Social Order* (N.Y.: Macmillan, 1951), pp. 504-509; S. Howard Patterson, *Social Aspects of Industry: A Survey of Labor Problems* (3rd ed., N.Y.: McGraw-Hill, 1943), pp. 256-284; and Burleigh B. Gardner, *Human Relations in Industry* (Chicago: Richard D. Irwin, Inc., 1945), pp. 79-81.
5. Alvin W. Gouldner, *Patterns of Industrial Bureaucracy* (Glencoe, Ill.: The Free Press, 1954), pp. 187-206.
6. Althouse, *Work, Safety and Life among Southern Appalachian Coal Miners*;" and Alvin L. Bertrand, "Farm Accidents: Number, Types, Social Costs, and Causes; (Baton Rouge: Bull. No. 581, Louisiana State University Agricultural and Mechanical College, 1964).
7. Leo Teplow, "Occupational Health and Safety: The Need for Reappraisal," *Industrial Medicine*, XL (July, 1971), p. 24.
8. Pigors and Myers, *Personnel Administration*, p. 412.
9. Alvin L. Bertrand, *Social Organization: A General Systems and Role Theory* (Arlington Heights, Ill.: AHM Publishing Corporation, 1972), p. 5.
10. *Ibid.*

11. Bertrand, "Farm Accidents," pp. 29-32. In listing social control factors, Bertrand is in agreement with Moore, who discusses the political and legal controls of industrial activity as an important area which the industrial sociologist cannot overlook (Moore, *Industrial Relations and the Social Order*, p. 12).

12. *Standard Industrial Classification Manual* (Washington, D.C.: U.S. Government Printing Office, 1967), pp. 19-20.

13. There are, of course, some subcategories of contract construction not shown on the table, such as roofing and sheet metal work, which exhibit higher rates than oil and gas services.

14. *Accidents Connected with Federal Oil and Gas Operations on the Outer Continental Shelf* (Metairie, La.: U.S. Geological Survey Conservation Division, 1977, mimeographed).

15. Don E. Kash, et al., *Energy Under the Oceans* (Norman: University of Oklahoma Press, 1973), p. 299.

16. The USGS figures that are presented here cover the period up to December 1976, yet they do not include the following accidents, cited here only as examples of the type of accidents omitted from these data: (1) April 15, 1976, 13 men died when a helicopter carrying offshore workers crashed into the waters off Cameron (*Baton Rouge State Times*, April 23, 1976, p. 1A); and November 13, 1976, 2 crewmen drowned when their supply boat sank in the Gulf (*Baton Rouge State Times*, November 14, 1976, p. 5B). None of these accidents occurred in the course of those OCS activities under the jurisdiction of the USGS.

17. Needless to say, it is probable that every little accident, such as a battered finger, a scraped knee, or a small burn, is not reported, especially since the work setting is far from the offices of management personnel, and since there are no unions, and consequently no union stewards, to report every minute accident. It is safe to assume, however, that any accident resulting in an injury that incapacitated the worker for more than 72 hours would definitely be reported.

18. The author is deeply indebted to Cmd. W. J. Ecker, Chief of the Coast Guard Information Analysis Staff and his assistant, Lt. J. R. Comerford, for their invaluable assistance in securing for the author the unpublished tabulations and the necessary files. They also demonstrated tremendous patience and spirit of cooperation while the author examined the files at length in their offices in Washington.

19. Bertrand, "Farm Accidents," p. 29.

20. Harry D. Kitson and Claude Campbell, "Relation Between Labor Turnover and Industrial Accidents," *Journal of Industrial Hygiene*, V (July, 1923), 92-96. See also: Lucien W. Chaney and Hugh S. Hanna, "The Safety Movement in the Iron and Steel Industry, 1907 to 1917,"

(Washington, D.C.: Bureau of Labor Statistics, Bull. No. 234, 1918), and Edmund E. Dudek, "Employee Training," in *Psychology of Industrial Relations*, ed. by C. H. Lawshe (N.Y.: McGraw-Hill, 1953), p. 126.

21. Dudek, "Employee Training," p. 126.
22. Bertrand, "Farm Accidents," p. 30.
23. Schulzinger, *The Accident Syndrome*, p. 12.
24. T. Stanton Dietrich, "The Social Organization of the Petroleum Industry" (Ph.D. diss., Louisiana State University, 1948), p. 67; and Clifton D. Bryant, "The Petroleum Landman: A Sociological Analysis of an Occupation" (Ph.D. diss., Louisiana State University, 1964), pp. 140-145.
25. Althouse, *Work, Safety, and Life Style among Southern Appalachian Coal Miners*, p. 53.
26. Bertrand, "Farm Accidents," pp. 31-32.
27. *Ibid.*, p. 31.
28. Case no. 01319, United States Coast Guard Commercial Vessel Casualties Files (date of accident: November 27, 1969; date of report: March 30, 1970).
29. Case no. 10256, United States Coast Guard Commercial Vessel Casualties Files (date of accident: November 9, 1969; date of report: September 2, 1970).
30. Placing the safety records and awards on a collective, as opposed to individual, basis has the potential advantage of utilizing peer pressure to make workers follow safe practices. It probably means, however, that many minor injuries are unlikely to be reported to the front office.
31. In fact, the International Association of Drilling Contractors (IADC) has a full-time safety director on its staff.
32. When, at times, the demand for rigs exceeds the supply, operators will tend to hold on to the rigs which they have contracted and contract cancellations are rare. Even in such times, the contractor does everything possible to maintain its reputation for efficiency. In the marine service business, as well as in catering, rarely does demand exceed supply, which is why among these companies there is fierce competition, with companies trying to outdo each other in the efficiency and quality of their services.
33. A parallel situation occurs in the drilling sector, when the contractor who owns a jack-up rig has to make a decision whether or not to "jack-down" and start drilling in adverse conditions.

34. Murette Tubb, "Major Rig Mishaps," *Offshore XII* (March, 1977), p. 16.

35. This particular mishap also underscores a point made previously about the role of inexperience and poor safety training on the incidence of fatalities. The deaths resulted directly from the totally improper operation of escape capsules.

36. *Baton Rouge State-Times*, April 24, 1977, p. 10A.

37. This does not apply to many larger rigs, which have so much activity going on day and night that it is necessary to have two roustabout crews on twelve-hour shifts. Roustabouts on smaller rigs, however, in addition to working twelve hours during the day, are on call 24 hours, a situation that many of these workers favor; for not only are they paid for every hour on the job and can therefore pile up quite a bit of overtime if the rig is busy, but even if they are not working during the night, being on call means that employers are required to pay them for the equivalent of 13 hours for their twelve-hour day.

38. Hammer, *Occupational Safety Management and Engineering*, pp. 147-148.

39. We are referring here, of course, only to jurisdiction over matters concerning personnel safety, not environmental safety. Interestingly, and understandably in light of the publicity given to the Santa Barbara incident, discussions of "offshore safety" in books, articles, and reports invariably refer to oil spills and other aspects of environmental safety, virtually ignoring questions of personnel safety.

40. U.S. Congress, House of Representatives, *An Act to Provide for the Jurisdiction of the United States over the Submerged Lands of the Outer Continental Shelf, and to Authorize the Secretary of the Interior to Lease Such Lands for Certain Purposes*, Pub. L. 212-345, 1953, HR 5134, p. 463.

41. 46 CFR Subchapter I covers drill ships and semi-submersible rigs, while 33 CFR Subchapter N covers fixed platforms (drilling or production) as well as mobile rigs which drill while bearing on the seabed (submersibles and jack-ups). Modifications to this have been recently proposed, a point which will be discussed later.

42. United States Department of the Interior, "Regulations Pertaining to Mineral Leasing, Operations, and Pipelines on the Outer Continental Shelf" (Washington, D.C.: U.S. Department of the Interior, 1975), p. 71.

43. U.S. Congress, Senate, *An Act to Assure Safe and Healthful Working Conditions for Working Men and Women*, Pub. L. 91-596, 91st Congress, 1970, S. 2193, p. 3.

44. While, overall, many of OSHA's regulations have been attacked as frivolous and burdensome, we should not regard in a negative light the existence of detailed and extensive standards for the inspection of heavy machinery. Standards are the only way to assure a thorough and fair inspection. Without them, inspections might be either superficial or result in arbitrary and inconsistent citations by inspectors. Inspection standards for complex pieces of equipment such as cranes are unavoidably extensive.

45. 29 CFR Chapter XVII, 1910.179.

46. 29 CFR Chapter XVII, 1910.184.

47. Case no. 40035, United States Coast Guard Commercial Vessel Casualties Files (date of accident: July 18, 1972; date of report: June 28, 1973).

48. 46 CFR, Subchapter H, Subpart 70.05 and Subchapter I, Subpart 90.05.

49. It should be kept in mind that the oil companies are obliged to provide transportation without charge for their contractors, sub-contractors, and suppliers, so that even when it is transporting other than its own supplies and personnel it is not doing so "for hire."

50. Letter from John F. Marshall, Jr., Adams and Porter Associates, Inc., August 19, 1977.

51. Naturally, companies do not list or advertise their vessels according to whether or not they are inspected or certified.

52. Labor unions, particularly the Seafarers International Union, have been especially vocal in their criticism of what they term the "Coast Guard's lax and illogical attitude toward the training and experience requirements necessary to qualify a man for licensing on an offshore rig" (*Seafarers Log*, XXXVI [May, 1976], p. 20). It should be noted that since there are no unions offshore, the existence of poor safety regulations and practices is a factor that, at least in the eyes of the maritime unions, points out the need to organize offshore labor. These unions have therefore been at the forefront of publicizing the hazardous nature of offshore work and the need to provide more protection for the worker.

53. OSHRC Docket No. 1588, 1 OSHC at 1391 (Review Commission, November 7, 1973), quoted in Baruch A. Fellner and Donald W. Savelson, *Occupational Safety and Health: Law and Practice* (N.Y.: Practising Law Institute, 1976), p. 205.

54. *Sec. of Labor vs Crescent Wharf and Warehouse Co.*

55. OSHRC Docket No. 1348, 2 OSHC at 1315 (Review Commission, November 15, 1974), quoted in Fellner and Savelson, *Occupational Safety and Health*, p. 207.

56. Fellner and Savelson, *Occupational Safety and Health*, p. 208.

57. One fact that emerged from the interviews with company executives is that they overwhelmingly favored the Coast Guard over OSHA, as the regulatory agency with responsibility over offshore safety. It is therefore possible that, at least in some cases, employers have also been unwilling to force the jurisdictional issue on the Review Commission by contesting any of the relatively limited number of citations OSHA has issued to offshore companies as result of post-accident investigations. To force the issue is to risk having the Commission rule that the Coast Guard is not exercising its authority and that OSHA therefore is enjoined to fully implement the provisions of the OSHA Act. That, of course, is an outcome which neither the companies, nor the Coast Guard, nor OSHA, wants.

58. Department of Transportation, U.S. Coast Guard, "Mobile Offshore Drilling Units," *Federal Register*, XLII, no. 84, part 4 (May 2, 1977).

59. *Ibid*, p. 22296.

60. *Ibid.*, p. 22298.

61. Leonard LeBlanc, "Offshore Liability Underwriters Begin to Review Policy Revisions," *Offshore*, November, 1976, p. 135.

62. U.S. Congress, House of Representatives, *An Act to Provide for the Jurisdiction of the United States over the Submerged Lands of the Outer Continental Shelf*, p. 2.

63. Grant Gilmore and Charles L. Black, Jr., *The Law of Admiralty* (2nd ed., Mineola, N.Y.: The Foundation Press, Inc., 1975), pp. 272-484.

64. LeBlanc, "Offshore Liability," p. 135.

65. Letter from Marshall, August 19, 1977.

66. William Fielding Ogburn, *Social Change* (N.Y.: B. W. Hurbsch, Inc., 1922).

APPENDIX

Contained in this appendix are the specifics for each of the 45 accidents which, according to the U.S. Coast Guard Commercial Vessel Casualties File, occurred in connection with oil and gas exploitation in the Gulf of Mexico between July 1969 and June 1975 and which resulted in at least one fatality or one seriously injured person (incapacitated for more than 72 hours). The specifics of the accidents were obtained directly from the file by closely paraphrasing, and in many cases quoting, from the investigative officer's report.

Case No. 01565. Date of casualty: December 26, 1969. Date of report: July 21, 1970.

Roughneck was killed when he was struck by a drill line and was thrown against the rig's draw works (a winch-like device), "... the snub line was not properly secured in that only two clamps were used, contrary to the practice of good seamanship requiring the use of three clamps."

Case No. 01676. Date of casualty: February 15, 1970. Date of report: May 19, 1970.

Roustabout killed when struck in the head by parts of a natural gas compressor that blew apart when pressure in a cylinder built up with no escape valve.

Case No. 02568. Date of Casualty: May 6, 1970. Date of report: June 17, 1971.

Explosion of hot water heater, probably caused by failure of the thermostat. Three fatalities and four injuries.

Case No. 01165. Date of casualty: January 13, 1970. Date of report: February 25, 1970.

Blowout on rig when drilling hit a gas pocket. Crew abandoned rig and one man drowned as a result of "his own excessive fear" while in the water. "Degasser should have been constructed with sufficient strength to contain the gas pressures--or if a shutoff valve had been designed to operate against excessive pressures."

Case No. 01319. Date of casualty: November 27, 1969. Date of report: March 30, 1970.

Death occurred on a drilling rig when a heavy valve fell on a hoist which was holding a handful of men working on the side of the rig, over water. The hoist collapsed and one of the men fell to the water, drowning. "This casualty may have been minimized if the wire rope on the hoist had been inspected at frequent intervals to determine its suitability for continued service, and if personnel had been wearing life preservers."

Case No. 00690. Date of casualty: April 3, 1969. Date of report: November 19, 1969.

Injury occurred when vessel collided with rig. The vessel was traveling at excessive speed in a fog. Radar also failed to operate properly.

Case No. 00912. Date of casualty: October 2, 1969. Date of report: January 16, 1970.

A freight oil exploration vessel capsized due to shifting cargo, causing two injuries. Cargo was not secured with lashings to the deck.

"This casualty could have been prevented if adequate lashing materials had been provided the vessel and if used to secure the cargo, and if the vessel had been provided with a sufficient number of qualified personnel for proper manning and securing the vessel for sea. Evidence of violation of:

- (a) 46 USC 222(a) on the part of the owner for failure to provide two licensed Ocean Operators. The operators of the vessel exceeded 12 hours operation within a 24-hour period.
- (b) 46 USC 222(d) on the part of the owner for failure to provide a total of two deckhands. Only one such person was employed onboard the vessel as a deckhand.
- (c) 46 USC 497 on the part of the owner for failure to post or have onboard the stability letter listed on the Certificate of Inspection."

Case No. 02260. Date of casualty: May 1, 1970. Date of report: June 26, 1970.

An uninspected oil screw vessel of 102 tons collided with an off-shore structure. Violations on the part of the vessel: (1) failure to maintain proper lookout, (2) use of vessel in fishing industry while enrolled for service in oil industry, and (3) employing two seamen without USMMD.

Case No. 01669. Date of casualty: February 19, 1970. Date of report: May 5, 1970.

Death onboard an uninspected drill tender anchored at a platform with another boat alongside. The vessels rolled together, breaking off a piece of pipe that served as a handrail. The pipe struck the victim in the chest under the throat. No certified master on board. No document of mariner by one crewman. Victim was 29 years old and left a wife and three children in McComb, Miss.

Case No. 02566. Date of casualty: March 16, 1970. Date of report: August 6, 1970.

A man drowned when a "jack-up boat" doing work alongside a rig failed to perform properly in the jacking mechanism and capsized. Fatality could have been prevented if the victim had been wearing a life preserver.

Case No. 42659. Date of casualty: December 7, 1973. Date of report: not indicated.

Two workers dead as a result of a flash fire on a production platform. Failure to keep flammables from pipe being welded.

Case No. 43138. Date of casualty: April 1, 1974. Date of report: not indicated.

One death as a result of a jack-up drilling rig capsizing and sinking as it was being towed. Uncontrolled flooding of the engine room through an unsecured deck vent. Poor state of repair of hatch cover on the vent.

Case No. 50775. Date of casualty: July 1, 1974. Date of Report: not indicated.

Injury resulted from fire on a fixed platform ignited by a defective valve. "...safety controls were bypassed for platform start-up."

Case No. 12425. Date of casualty: November 13, 1970. Date of report: August 5, 1971.

Three deaths and nine injuries as an explosion in a fixed platform spewed hot chemicals on the men. The explosion took place in the glycol reconcentrator. No cause of the explosion could be immediately established.

Case No. 12426. Date of casualty: November 24, 1970. Date of report: July 20, 1971.

Victim struck on right side of forehead by a unbolt blanking cap on a fixed platform, resulting in his death. Judged to have been the fault of the deceased victim: he did not check to see if pressure was off and did not take the appropriate precautions.

"The crane was attached to a circular ring mounted on a pedestal. The crane was used for off-loading supply boats, lifting drill pipe, and general purpose work. Examination of the base indicated that the 'rotek bearing' was cracked. The crane was installed on July 1968. During more than two years the crane was not under any established periodic testing or inspection program. Although the crane was reportedly greased about once a week, and the bearings greased every 'couple' of days, the manufacturer's full preventative maintenance schedule, part of the crane's instruction booklet, was not followed. There were no operating instructions posted on the crane or an indication of maximum safe load. The following day, the crane was recovered from 100 feet of water. The victim's body was still in the cab. Cranes on fixed platforms are not inspected by any government agency."

Case No. 21712. Date of casualty: March 20, 1976. Date of report: not indicated.

Victim killed by a valve that blew on the platform and hit him on the head.

Case No. 22022. Date of casualty: January 1, 1972. Date of report: March 28, 1972.

A crane fell off a fixed platform, resulting in the death, through drowning, of a worker. The victim left six children. "That the proximate cause of this casualty was the apparent failure of part of the permanently mounted crane assembly; to wit: the breaking of the hook roller assembly attaching the crane to the pedestal. That a contributing cause of this casualty may have been the lack of a thorough inspection of all the crane's parts when the crane had last been serviced. The crane had recently been greased and checked, but the hook roller assembly had not been inspected."

Case No. 43013. Date of casualty: March 22, 1974. Date of report: not indicated.

Collision of uninspected utility boat with platform. Failure of vessel's engine to respond to the throttle.

Case No. 52517. Date of casualty: not indicated. Date of report: not indicated.

Collision of oil exploitation vessel with drilling barge. Deckhand thrown against railing and injured. Vessel failed to maintain a proper lookout during fog.

Case No. 31074. Date of casualty: September 7, 1972. Date of report: not indicated.

Injuries resulted from smoke inhalation as a result of the fire that occurred when lube oil ignited. The oil sprayed from the parting of a line. Evidence of inadequate maintenance of the engine that caused worn lube line.

Case No. 22053. Date of casualty: January 31, 1972. Date of report: not indicated.

Injury occurred on board an oil field supply vessel. Poor judgement on the part of the vessel operator to maneuver under the weather conditions. Waves came over, slamming into crew member, causing him injuries as he fell on deck.

Case No. 11487. Date of casualty: November 19, 1970. Date of report: March 11, 1971.

Vessel was tied to a rig during heavy weather conditions. Windows on the vessel broke and cut man.

Case No. 11951. Date of casualty: October 22, 1970. Date of report: April 22, 1971.

Capsizing of motor boat owned by a pipeline company which was carrying men on their way to clean up an oil spill from broken pipeline. The small boat was operated in a negligent manner, improperly loaded, and with insufficient lifesaving devices. One man was drowned.

Case No. 12140. Date of casualty: October 28, 1970. Date of report: April 16, 1971.

Sinking of a work boat moored to a well resulting in four deaths and one injury. From the report of the investigating officer:

...there is evidence to support gross negligence on the part of the vessel's master in that he, while the vessel was moored in the open seas during a period of heavy weather and boarding seas, failed to insure the watertight integrity of the vessel, failed to maintain a sea watch; and failed to properly moor his vessel thereby resulting in boarding seas to progressively flood the vessel, undetected until it foundered. Had all or even one of the above been done, it is likely that this casualty and the deaths may have been averted. There is evidence that the vessel was sent to sea, by its owners, without persons being documented, as required by 46 USC 672(i), and undermanned, both in number and ratings, as required by 46 USC 673. It is likely that had the personnel been documented and of required ratings, actions may have been different and the casualty averted. There is evidence that the master was not signed on the vessel's document as required by 46 USC 276.

From the transcript of the hearing held on November 4, 1970, pp. 8-9.

Questioning of the master:

Q: Do you possess any Coast Guard documents or licenses?

A: No, sir.

Q: Have you ever been asked to get a Coast Guard document or license?

A: No.

Q: Never have?

A: No, sir.

Portions of the transcript were off the record. One of the dead crewmen was survived by his wife and 5 minor children. Another was survived by his wife and 3 minor children.

Case No. 50245. Date of the casualty: not indicated. Date of the report: not indicated.

Collision of a deck barge with submerged gas line in Nueces Bay, Texas. Victim was piloting a self-propelled barge owned by an oil well service company which in turn was pushing a non-self-propelled barge. The collision resulted in an explosion and fire which killed the pilot. Cause of the accident is listed as the unfamiliarity of the pilot with the area--he was operating outside of the channel.

Case No. 40035. Date of casualty: July 18, 1972. Date of report: June 28, 1973.

Crane fell to the deck of the drill barge on which it was mounted. The operator of the crane fell separate from the cabin of the crane, but also fell on the deck of the barge, receiving fatal injuries. From the investigative officer's report:

"The crane operator died as a result of injuries received when a crane aboard the drill barge broke loose from its pedestal and fell approximately 90 feet to the deck of the barge. The proximate cause of the casualty was the failure of one of the bolts holding the crane to its pedestal due to fatigue. The bolt failing due to fatigue most probably was not correctly torqued when it was replaced. The failure of the first bolt put excessive strain upon the remaining bolts causing them to fail due to overload. The boom used on the crane was not the boom originally provided. The replacement boom was heavier and stronger than the boom originally provided. Contributing to the casualty was that the pedestal bolts were of a lower grade than required for the modified crane. Bolts of a greater grade than originally designed would have been required due to the modified construction of the crane. Contributing to the

casualty was the ineffective maintenance program for the crane. The load being lifted was not within the safe working capacity of the crane. The frequent transfer of ownership of the drill barge and the unavailability of maintenance and repair records preclude affixing responsibility for the replacement of the pedestal bolts. There is no evidence of violation of any law or regulation administered by the Coast Guard."

Case No. 12437. Date of casualty: May 5, 1971. Date of report: October 22, 1971.

Injuries resulted from an explosion and fire aboard an uninspected drill barge and combination drill and workover rig. Explosion was caused by the improper installation of mud check valve, permitting gas to go to the pump room and ignite.

Case No. 33054. Date of casualty: April 26, 1973. Date of report: not indicated.

A fatality occurred when the victim was struck in the head by a mooring bit. The fractured area of bit showed heavy corrosion and lack of penetration of the welds.

Case No. 53267. Date of casualty: not indicated. Date of report: not indicated.

One fatality resulted when a drilling barge capsized while being towed by two tugs. The barge took in water perhaps because of faulty sea valve or hole in the shell plate.

Case No. 10256. Date of casualty: November 9, 1969. Date of report: September 2, 1970.

Death of a diver who suffered the bends and was placed in a decompression chamber. He had been working on laying a gas line. A flash fire occurred inside the decompression chamber when he placed a T-shirt on a light fixture so that he could sleep unmolested by the light. The shirt ignited and he was burned to death.

Case No. 12395. Date of casualty: March 26, 1971. Date of report: June 21, 1971.

Fatality occurred on an uninspected drill barge, jack-up rig, as a result of equipment failure. In the drilling operation, the "tongs" broke, striking victim on chest.

Case No. 12429. Date of casualty: November 11, 1970. Date of report: July 13, 1971.

Fatality occurred on a derrick barge that was moored to a platform unloading supplies. The hoisting mechanism got caught on the cellar deck of the barge when the barge swelled; when it lowered, the beam clamp failed and the load fell. A man standing on the barge below the load got out of the way, but in so doing became

entangled in the recoiling guide lines overhead and was completely decapitated. From the report of the investigating officer:

"When linked as a single unit, the use of floating equipment (barge) and a fixed platform to hoist loads is inherently an unsafe practice. In an open seaway, movement of the barge is likely and this would then be transferred to the load. Consequently, casualties such as this can be predicted to occur with varying results. This unsafe practice may have contributed to the casualty. Measures which may prevent recurrence of this type of casualty..are within the capabilities of the barge's owners to accomplish."

Case No. 51333. Date of casualty: September 3, 1974. Date of report: December 31, 1974.

Crane boom failure on an uninspected self-propelled deck barge. Crane operator was struck and killed by the falling boom. "Nothing was hooked on to the crane at the time. The crane boom broke approximately 15 feet out from the cabin of the crane at the joint between the first and second sections of the boom. The boom sections, in the area of the failure, were joined with a lap joint. The welds in the lap joint were reported to look good; however, one of the broken welds at the joint appeared to have been cracked prior to the casualty as it was rusting, whereas the other broken welds were not. The boom fell on the operator while he was attempting to get out of the crane cabin. A contributing cause of the casualty was the weakened condition of the lap joint, which was caused by the cracked weld."

Case No. 43246. Date of casualty: June 8, 1974. Date of report: not indicated.

Sinking of a tug, resulting in two deaths and three injuries. Line broke while towing a drill barge. Inability of tug to rid itself of boarding seas during conditions of severe weather, coupled with open ports and doors which permitted water to enter.

Case No. 43273. Date of casualty: March 4, 1974. Date of report: not indicated.

Drowning of a deckhand when towing vessel sank. Vessel took in excessive water at port. The water entered through open engine room.

Case No. 22064. Date of casualty: March 10, 1972. Date of report: not indicated.

Sinking of uninspected tug while pulling a drill rig to a new site. Cook died, drowning with an apparent heart attack. The tug was pulling the rig together with two other tugs. Heeled over and sank rapidly. The tug was executing a hazardous maneuver, but one which is not unusual for oil exploration industry. Apparently, it was

not stable enough to execute the maneuver successfully. Victim left two sons.

Case No. 12384. Date of casualty: June 6, 1971. Date of report: June 25, 1971.

Collision of inspected crewboat with well jacket. Mechanical failure of steering mechanism. Two injuries.

Case No. 12442. Date of casualty: March 28, 1971. Date of report: October 4, 1971.

Collision of crewboat with well jacket. One injury.

Case No. 21090. Date of Casualty: November 26, 1971. Date of report: not indicated.

Collision of crewboat with unlighted unmarked well head, resulting in one injury. Failure of owner of well head to maintain required navigation markers.

Case No. 21609. Date of casualty: January 7, 1972. Date of report: not indicated.

Collision of uninspected crewboat with well structure. Operator failed to keep a proper lookout and to proceed with due caution. Also failure to have licensed operator in charge while carrying passengers for hire. Four injuries.

Case No. 41383. Date of casualty: March 3, 1973. Date of report: not indicated.

Collision of crewboats. Operating a passenger vessel for hire without a licensed operator. Both vessels were in violation of Coast Guard regulations. One injury.

Case No. 52278. Date of casualty: May 28, 1970. Date of report: not indicated.

Crewboat broke moorings in heavy seas, causing deckhand to fall down, incurring injuries.

The following accidents also form part of the above list, since they were included in the Coast Guard's machine-readable listing. When the author visited the Coast Guard offices, however, in order to research the specifics of each case, the files for the cases below were not available at that time. Using the date of the casualty that appears in the listing, the author searched in the south Louisiana newspapers for the news stories related to the mishaps in order to confirm that they were accidents which occurred in connection with offshore oil and gas exploitative activities.

Cases Nos. 12427 and 20471. Date of casualty: December 1, 1970. *New Orleans Times-Picayune*, December 2, 1970, p. 1.

Blowout and fire involving two platforms in the Bay Marchand area. Eight deaths and twenty workers injured.

Case No. 11315. Date of casualty: May 28, 1970. *New Orleans Times-Picayune*, May 29, 1970, p. 1.

Explosion and fire aboard an offshore oil platform that was under-¹going repairs. Damage also to crewboat anchored below. Seventeen men were aboard the rig and boat, nine perished and six were seriously injured.