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# Demystifying Human Factors: Practical solutions to reduce incidents and improve safety, quality and reliability

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# 2<sup>ND</sup> INTERNATIONAL WORKSHOP ON HUMAN FACTORS IN OFFSHORE OPERATIONS



## ***Demystifying Human Factors***

Practical solutions to reduce incidents and improve safety, quality and reliability

**APRIL 8-10, 2002**

**INTERCONTINENTAL HOTEL, HOUSTON, TEXAS – USA**

**Edited By:**

Christy Franklyn  
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Charles Smith  
John Wreathall

# **MMS**

*Minerals Management Service*

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## 1.0 LIST OF ORGANIZING COMMITTEE

Mr. Rodger Holdsworth	RRS Engineering	Workshop Coordinator
Professor James Reason	University of Manchester	Workshop Facilitator
Dr. John Wreathall	John Wreathall & Co.	Workshop Facilitator
Ms. Christy Franklyn	RRS Engineering	Workshop Admin./Logistics
Mr. Charles Smith	U.S. Minerals Management Services	
Mr. Jeffrey Thomas	ExxonMobil	
Ms. Denise McCafferty	American Bureau of Shipping	
Mr. Gerry Miller	G.E. Miller & Assoc.	
Mr. Frank Amato	Paragon Engineering	
Mr. Richard Meyer	Shell Exploration & Production Co.	
Mr. Bob Gilbert	University of Texas	
Mr. Bob Miles	Health and Safety Executive (UK)	
Mr. Paul Mount	California State Lands Commission	
Mr. Patrick O'Connor	BP America Inc., Upstream Technology Group	
Mr. Henry Romero	Halliburton	
Mr. Jim Spigener	Behavioral Science Technology	
Ms. Amy White	U.S. Minerals Management Services	
Dr. Thomas B. Malone	Carlow International Incorporated	
Dr. Johan Hendrikse	Paragon Engineering Services	

## 2.0 LIST OF SPONSORS

ABB Lummus Global Inc.

American Bureau of Shipping

ANP

BP America Inc.

California State Lands Commission

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ExxonMobil USA

Go Gulf Magazine

Health and Safety Executive (UK)

Norwegian Petroleum Directorate (NPD)

Offshore Technology Research Center (OTRC)

Paragon Engineering Services

Petrobras

Risk, Reliability and Safety Engineering (RRS)

Statoil

University of Texas

United States Department of Energy

United States Coast Guard

United States Minerals Management Service

### 3.0 EXECUTIVE SUMMARY

Five years have passed since the 1996 International Workshop on Human Factors in Offshore Operations. Over this period, we learned that the level of knowledge of human factors has increased dramatically. We also made significant advances in applying human factors disciplines more effectively within an organization. In order to invest the necessary resources, technical specialists, engineers and corporate leaders need to be confident that the human factors tools they choose to implement will meet the desired goals.

To this end, the 2002 International Workshop on Human Factors in Offshore Operations (HFW2002) brought together six key work groups to help those who wish to develop more effective human factors measures to reduce risk, improve safety and production performance. Each group was successful in developing a set of guidelines, tools and references that are invaluable to those active in the design of new facilities, maintaining the integrity of existing facilities, managing the workforce, conducting incident investigations, developing, implementing and controlling health, safety and environmental (HSE) management systems and managing behavioral processes. The applications and tools discussed by each working group during the course of the workshop documented practical approaches for applying human factors techniques in many areas. These reflect state-of-the-art practices within industry.

The supportive remarks, keynote addresses and theme papers presented by government leaders, representatives from regulatory and certification agencies, and management of several international oil companies clearly demonstrated the importance of applying human factors.

All six (6) working groups enjoyed a balanced number of representatives from industry, government and institutions who pro-actively discussed applications related to each topic of discussion. Exchange of information and points of discussion were based upon state of the art white papers written by working group leaders and co-chairs in attendance and submitted to each participant at the opening of the workshop. From the beginning of deliberations, each white paper was enhanced by the participants to capture the true essence of each topic and clearly established a roadmap for the practical application of human factors in the life cycle of an offshore facility.

The purpose of HFW2002 was to provide practical applications and economical solutions to effectively establish and implement human factors as accepted practice vs. an add-on to existing practice. The workshop was successful in providing tools, references and guidelines to more effectively integrate human factors into six key areas targeted by the workshop to improve safety performance and reduce risk:

- Incident Investigation
- Design of New Systems
- Design of Existing Systems
- Operations / Work Force
- Management System Practices and Policies
- Behavior Processes

It is up to Industry to develop its own specification(s) of acceptable performance with input from peers,

regulatory agencies, certification bodies, institutes and specialists to reduce risk and improve safety performance. This workshop brought together representatives of all of these organizations from different corners of the world to work together toward this common goal. The application of integrating human factors can be overwhelming without going through a long learning curve and being exposed to expensive time consuming lessons. With the aid of information developed by the HFW2002 Chairs, Co-Chairs and many participants, organizations have started to acquire the fundamental knowledge needed to integrate human factors in the lifecycle of offshore operations. What is now needed is for these organizations to start, or those that have already started, to continue, to apply the knowledge from the Workshop in their day-to-day design and operations. There is no single war to be won to improve human factors and safety; it is a never ending battle, seeking to continuously improve the safety performance.

At the conclusion of the workshop one key point was clear: ignoring human factors will result in an increase not a decrease in incidents, lower safety performance and increased costs. Human factors are paramount to all aspects of offshore operations and essential in reducing human performance-related risks.

#### **4.0 SCOPE**

The scope of HFW2002 included the following:

- Establish awareness of what human factors is
- Identify existing tools for human factors that can be used or developed to prevent incidents
- Integrate principles for human factors into offshore design by assessing guidance and identifying gaps and barriers
- Define the status of the science and technology of human factors in the management of safety, behavior and environmental hazards for offshore operations and facilities
- Provide an international forum, attracting participants from all aspects of human factor disciplines (e.g. corporate leadership, offshore facilities designers, human factors, behavioral science and safety engineers, practitioners, certification body representatives and regulatory leaders)
- Produce a record describing the current practice, science and technology of human factors engineering & ergonomics, process safety and behavioral science and the opportunities and tools for using human factor disciplines in the management of safety, behavior and environmental hazards for offshore operations and facilities  
Further promote the use of human factor disciplines to personnel and contractors responsible for managing, performing and verifying work activities in offshore facilities design, construction, operation, decommissioning, and maintenance

## 5.0 WORKSHOP OVERVIEW

The format of HFW2002, like the 1996 Workshop, was a carefully balanced, two and a half (2-1/2) day workshop with presentations on the state of the art of human factors and interactive working group sessions. A total of three (3) Supporting Remark presentations, two (2) Keynote Address presentations and nine (9) Theme Paper presentations were delivered. The manuscripts of these presentations are included in this volume. With respect to the working group sessions, there were six groups established which covered the following areas related to human factors in offshore operations:

1. **Incident Investigation Working Group** - *“Improving Incident Investigation through Inclusion of Human factors”*
2. **New Facilities Design Working Group** - *“Effectively Including Human Factors in the Design of New Facilities”*
3. **Existing Facilities Design Working Group** - *“Application of Human Factors in Reducing Human Error in Existing Offshore Facilities”*
4. **Work Force Working Group** - *“Solving Human Factor Issues as Applied to the Work Force”*
5. **Management Systems Working Group** - *“Effective Integration of Human Factors into HSE Management Systems”*
6. **Behavior Based Process Working Group** - *“Effective Application of Behavioral Based Processes in Offshore Operations”*

Each working group started with the presentation of the group’s white paper which identified the needs required to practically apply human factors related to each work group topic. Barriers to the progress of integrating human factors into operations as-well-as guidelines and references were also discussed. The position white papers were given to each participant prior to the working sessions. During the working group period, the participants were encouraged to visit more than one session to maximize their contributions to the practical application of different aspects of human factors. In addition, supporting papers were submitted to some working groups focusing on specific topics of concern.

The atmosphere of the workshop was extremely positive and upbeat. All participants felt that the level of understanding of human factors technology has undergone significant progress since the 1996 workshop. Each participant received a clearer understanding of the tools available to formally integrate human factors throughout the lifecycle of an offshore facility. Participants also learned that more fundamental human factors programs are needed to resolve issues unique to offshore operations and to understand and control human factors related failures. It is up to industry to develop its own specification(s) of acceptable performance with input from peers, regulatory agencies, certification bodies, institutes and specialists to reduce risk and improve safety performance. This workshop brought together representatives of all of these organizations from different corners of the world to work together toward this common goal. The application of integrating human factors can be overwhelming without going through a long learning curve and being exposed to expensive time consuming lessons. With the aid of information developed by the workshop Chairs, Co-Chairs and many participants, organizations have started to acquire the fundamental knowledge needed to



integrate human factors in the lifecycle of offshore operations. What is now needed is for these organizations to start, or those that have already started, to continue, to apply the knowledge from the Workshop in their day-to-day design and operations. There is no single war to be won to improve human factors and safety; it is a never ending battle, seeking to continuously improve the safety performance.

At the conclusion of the workshop one key point was clear: ignoring human factors will result in an increase not a decrease in incidents, lower safety performance and increased costs. Human factors are paramount to all aspects of offshore operations and essential in reducing human performance-related risks.

### 5.1 Supporting Remarks

Supporting remarks were given by:

Dr. Chris C. Oynes      Regional Director, Gulf of Mexico Region, U. S. Minerals  
Management Service (MMS)

Mr. Ken Arnold Chief Operating Officer, Paragon Companies

Mr. Tom Theriot      ExxonMobil Production Company, Manager, Safety, Health and  
Environment

### 5.2 Keynote Addresses

The following keynote addresses were given:

*“An overview of what was accomplished in the 1996 workshop and the status today”*

Mr. Mahdi Hasan, Vice President, Shell Exploration and Production

*“Integration of Human Factors into Classification / Certification”*

Mr. James Card, Senior Vice President, American Bureau of Shipping

### 5.3 Theme Presentations

The following theme presentations were given:

*“Overview of the P-36 Incident”*

Mr. Carlos Tadeu Da Costa Frage, E&P Structural & Naval Technology Manager  
Petrobras Exploration & Production

Mr. Jose Barusco Filho, E&P Structural & Naval Technology Manager  
Petrobras Exploration & Production

*“Return on investment in Use of Human Factors in Offshore Systems”*

Mr. Harrie J. T. Rensink, R.e., Eur Erg., Group Advisor Human Factors Engineering

Shell International Health Services

*“Analysis of Human Factors Related Accidents and Near Misses”*

Prof. James Reason, University of Manchester

*“An Integrated Approach to Behavioral Based Safety”*

Mr. Jim Spigener, Vice President, BST

*“New Method for Integrating Human Factors into the Design of Offshore Command and Control Systems”*

Mr. Adam Balfour, Managing Director, Human Factor Solutions

*“Capitalizing on Behavior Based Safety to Address Human Resource Development Needs”*

Mr. Ron Newton, President, Peak Incorporated

*“Incidents and Near Misses”*

Rear Admiral John Lang, Chief Inspector of Marine Accidents, Marine Accident Investigation Branch U. K., Dept. for Transport, Local Government and the Regions

*“Working Offshore: Its Effects and their Management”*

Mr. Mark Shrimpton, Community Resource Services Limited, Socio-Economic Consultants

*“Accident Investigation Trends – A Safety Management Perspective”*

Mr. Frank Pausina, Senior Accident Investigation Coordinator, MMS

## 5.4 Working Group Papers

There were six working groups, topics, chairs and co-chairs are identified below:

### 1 **Incident Investigation Working Group** - *“Improving Incident Investigation through Inclusion of Human factors”*

Group Leader Anita Rothblum – U. S. Coast Guard, USA

Co-Chairs: Captain David Wheal and Stuart Withington,  
UK Marine Accident Investigation Branch, USA  
William Boehm, Stolt-Nielsen Transportation Group, USA  
Marc Chaderjian, California State Lands Commission, USA  
Scott A. Shappell, FAA Civil Aeromedical Institute, USA  
Douglas A. Wiegmann, University of Illinois at Urbana-Champaign,  
USA

### 2 **New Facilities Design Working Group** - *“Effectively Including Human Factors in the Design of New Facilities”*

Group Leader: Johan Hendrikse – Paragon Engineering, USA

Co-Chairs: Rick Meyer, Shell, USA  
Gerry Miller, G.E. Miller & Associates, USA  
Ben Poblete, Lloyds Register, USA  
Kevin McSweeney, American Bureau of Shipping, USA  
George Conner, ChevronTexaco, USA  
Paul Atkinson, ExxonMobil, USA  
Pat O’Connor, BP America Inc., USA  
Hilde Heber, Norwegian Petroleum Directorate, Norway  
Eileen B. Hoff, Paragon Engineering, USA

### 3 **Existing Facilities Design Working Group** - *“Application of Human Factors in Reducing Human Error in Existing Offshore Facilities”*

Group Leader: Jeffrey Thomas, ExxonMobil, USA

Co-Chairs: Clifford C. Baker, American Bureau of Shipping, USA  
Thomas Malone, Carlow International Incorporated, USA  
John T. Malone, Carlow Associates, USA  
Ivan C.L. Rezende, Petrobras, Brazil  
Christina L. Hard, BP America Inc., USA  
Sally Carvana, BOMEL Limited, UK  
Mark Witten, ChevronTexaco, USA

**4 Work Force Working Group - “Solving Human Factor Issues as Applied to the Work Force”**

Group Leader: Bob Miles – Health and Safety Executive, UK

Co-Chairs: Dennis Atwood, ExxonMobil, USA

Amy White, Minerals Management Service, USA

**5 Management Systems Working Group - “Effective Integration of Human Factors into HSE Management Systems”**

Group Leader: Denise McCafferty – American Bureau of Shipping, USA

Co-Chairs: Rodger Holdsworth, RRS Engineering, USA

Kevin P. McSweeney and Clifford C. Baker,  
American Bureau of Shipping, USA

**6 Behavior Based Process Working Group - “Effective Application of Behavioral Based Processes in Offshore Operations”**

Group Leader: Jim Spigener – Behavioral Science Technology, USA

Frank Amato, Paragon Engineering Services, USA

Co-Chairs: Gillis Gaupreaux, Shell, USA

Brian N. Craig, PhD, CPE, Lamar University, USA

## **6.0 ACKNOWLEDGMENT**

The organizing committee would like to extend their most sincere gratitude to the Department of Interior - Minerals Management Service (MMS) and the American Bureau of Shipping for their contributions beyond sponsoring this event. The support of their staff and facilities was greatly appreciated. The major government, institutional and industrial sponsors are also acknowledged for contributions which made this event possible. The industrial participants with booth exhibitions are greatly appreciated for their effort in bringing their information to the workshop. During the Workshop, University of Texas and Texas A & M University graduate students were asked to assist in facilitating the work of each working group and four RRS Engineering staff, Ms. Christy Franklyn, Ms. Donna Hamilton, Ms. Jennifer Summers and Ms. Cathy Malek were asked to handle the logistics and administration of the workshop. Their efforts are gratefully acknowledged. Finally, the organizing Committee congratulates each of the participants for their active participation in the working group sessions with questions, comments, and suggestions. As to the request for holding the next Human Factors workshop within the next three years, it will be made known to the concerned parties.