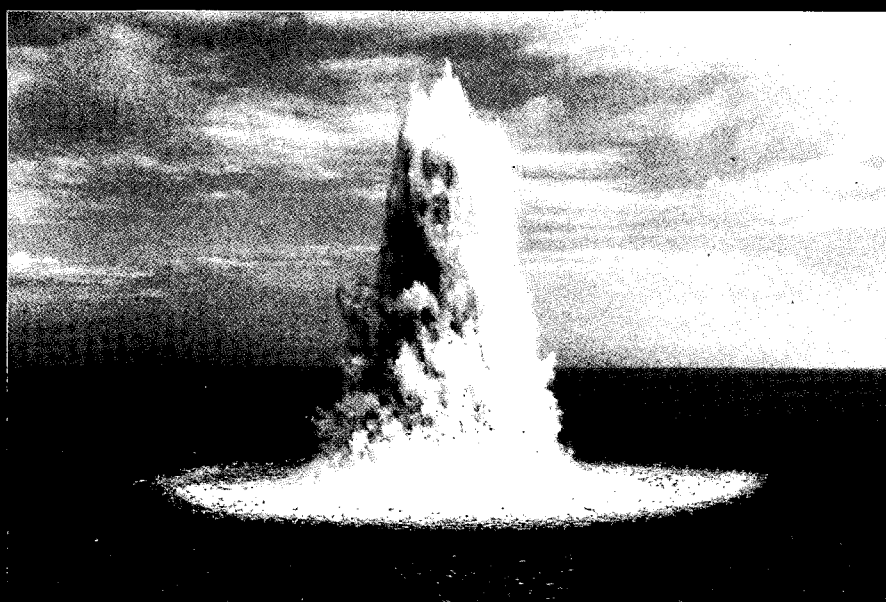


# Guidelines for the Safe Use of Explosives Under Water



# **Guidelines for the safe use of explosives under water**

**Published by MTD**  
The Marine Technology Directorate Ltd

Registered in England No. 2022686  
Registered Office:  
19 Buckingham Street  
London WC2N 6EF  
UK

Registered as a charity under the Charities Act 1960  
Registered Charity No. 295576

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ISBN 1 870553 23 3

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# FOREWORD

The project to prepare these *Guidelines* was undertaken to provide the specialist guidance needed when explosives are used in support of underwater operations.

The project was initiated by UEG, the original research and information group for the offshore and underwater engineering industries, and was included in the Marine Technology Directorate Ltd's (MTD's) portfolio of multi-sponsor projects when UEG was absorbed within MTD. Continuity of purpose was maintained through the Project Manager for the work, Mr R W Barrett, who was responsible for this project both at UEG and MTD. He also chaired the Project Steering Group.

The original work was prepared by specialist authors (indicated below) working under contract to MTD, and was funded by the following organisations:

- Amoco UK Ltd
- BP Exploration Ltd
- British Gas plc
- Health and Safety Executive
- Phillips Petroleum Co UK Ltd
- Royal Ordnance plc
- Shell UK Exploration and Production Ltd.

During the preparation of the *Guidelines* a delay was imposed which enabled new material, including the implications of recent legislation, to be taken into account. The whole document was reviewed and revised as appropriate during this interregnum; the cost of this additional work was shared by HSE and MTD.

A Steering Group comprising representatives of the sponsors, the specialist authors and MTD provided a forum for discussion during the project. Its membership has been:

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## Acknowledgements

MTD gratefully acknowledges the assistance received from the following individuals and organisations during the course of the project:

|                                       |   |
|---------------------------------------|---|
| Dr S J Bell                           | DRA Holton Heath                              |
| Dr G Cooper                           | Chemical and Biological Defence Establishment |
| Col I R Haywood                       | Royal Army Medical College                    |
| Mrs J Mirzoeff                        | Consultant                                    |
| Mr T A Hollobone                      | T A Hollobone & Co Ltd                        |
| Mr J B Hughes                         | Safety Consultancy Services                   |
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| The Diving Medical Advisory Committee |   |

The text was finalised and comments co-ordinated by Mr R W Barrett and Mr A J Brown; final editing and preparation for printing were carried out by Mr M J Wright of Techword Services.

*Every reasonable effort has been made to ensure that the guidance given in these Guidelines is based on the best knowledge available up to the time of finalising the text. However, no responsibility of any kind for any injury, delay, loss or damage whatsoever, however caused, resulting from the use of the Guidelines can be accepted by MTD, the sponsors or others involved in its publication. The document is primarily intended to provide guidance and is **not** intended to be used as a mandatory or contractual document.*

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# 1. Introduction

Explosives always have to be used with great care, but additional safety precautions are required when explosive operations take place under water. Using explosives under water – whether for a large drilling and blasting operation or for small single charges – presents special challenges.

For the first time all the operational details that have to be considered are collected together here in one volume to provide *Guidelines for the Safe Use of Explosives Under Water*. The *Guidelines* cover features that apply to all operations with explosives, such as types of explosives and ways of firing them, transport, storage and the legislation with which operations must comply. Additional factors associated in particular with underwater use include:

- the certainty of a wet environment
- probable transport by or over the sea
- weather conditions
- the remoteness of some operational locations
- the collateral effects of underwater explosions
- possible deployment by divers or ROVs
- transmission of pressure waves through water (which is particularly problematic in shallow water where multipath effects make predictions difficult).

The purpose of the *Guidelines* is to provide the specialist guidance needed when explosives are used in support of underwater operations. They cover all the factors that have to be considered when planning and mobilising an operation, be it offshore, inshore or inland. The advice contained in this document is generally international in its scope, but the legislative requirements (such as those relating to packaging, classification, labelling, transport and storage) are framed specifically on UK regulations – although the interpretations made can be extended to operations beyond UK jurisdiction.

The key to success lies in careful planning, and the *Guidelines* begin by detailing all the features that need to be considered in the plan. The chapter on packaging, transport and storage takes into account the changes introduced by recent European legislation. The chapter on operational precautions enlarges on the safety features of the plan, from security during storage to what to do after a misfire. Then follows a section on the types of explosive that are used under water, and the methods used to initiate them.

The information on pressure waves covers the risks to divers and nearby structures in the water, as well as features particular to seismic operations. The chapter on environmental precautions deals with the possible damaging effects of vibrations transmitted through the ground or through the air, and how to measure them. The final chapter details for the first time the treatment to be given by both first aiders and doctors to anyone accidentally exposed to blast injury.

The *Guidelines* are fully supported by references to literature, legislation and codes of practice. There is also a general bibliography.

Produced after lengthy consultation with key practitioners and regulators, the *Guidelines* introduce a rigorous procedure that will help to systematise and enhance the safe use of explosives under water.