FM 20-11

HEADQUARTERS,
DEPARTMENT
OF THE ARMY

Military Diving

US ARMY PREFACE

This edition of Field Manual (FM) 20-11 is an authorized reprint of United States (US) Navy diving manual SS521-AG-PRO-010. The references identified in this preface provide specific Army doctrine that differs from the Navy doctrine addressed in this manual. Any differences stated in the references listed below apply to Army diving personnel and teams only.

MANAGEMENT OF ARMY DIVING

Army Regulations (ARs) 611-201 and 611-75 provide regulatory guidance for the Army diving program. These regulations govern selection, qualification and requalification, rating and disrating, and physical standards of soldiers who are engineer divers. AR 611-75 also establishes the criteria for individuals applying for engineer diving duties.

ARMY ENGINEER DIVING

FM 5-490, *Engineer Diving Operations*, provides a doctrinal basis for planning and using engineer divers in the theater of operations (TO). It describes the responsibilities, procedures, capabilities, constraints, and planning considerations for conducting underwater operations throughout the TO.

Table of organization and equipment (TOE) numbers 05-530LA00 and 05-530LC00 establish the organizational structure, manning, and equipment authorizations for the engineer diving teams. The US Army Engineer School is the proponent for the engineer diving TOEs.

ARMY SPECIAL OPERATIONS FORCES (ARSOF) DIVING

ARSOF combat diving is uniquely designed to meet Special Forces infiltration/exfiltration and foreign internal defense mission requirements. The training differs greatly from engineer diving in many aspects, and this manual addresses the physiological, technical, and equipment issues that are, in some cases, inherent to both diving communities. Selection, qualification, recertification, and physical standards for ARSOF combat divers are identified separately in AR 611-75.

Sometimes there are significant differences between the duties, responsibilities, qualification, and staffing outlined in this manual and those required within the ARSOF community. One example is the requirement for a combat dive supervisor to be a graduate of the combat dive supervisor school and not necessarily the senior diver. Another example is the requirement for a combat dive medical technician to be present on all dive sites. The ARSOF diving community does not have master divers and has different qualification criteria for enlisted and officer certification.

ARSOF operation planning, diving doctrine, equipment selection, duties, and responsibilities are addressed in either United States Army Special Operations Command (USASOC) Regulation 350-20, *USASOC Diving Program,* (point of contact [POC] is Commander, USASOC, ATTN: AOOP-TRS, Fort Bragg, NC 28307-5200) or Training Circular (TC) 31-25, *Special Forces Waterborne Operations* (POC is Commander, USAJFKSWCS, ATTN: AOJK-DT-SFA, Fort Bragg, NC 28307-5000). All ARSOF combat diving activities must be done according to this manual, AR 611-75, and USASOC Regulation 350-20.

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Foreword

Department of the Navy
Naval Sea Systems Command
20 January 1999

Revision 4 of the U.S. Navy Diving Manual is a comprehensive update and reorganization of the previous revisions. Most significantly, the Manual has been divided into 5 stand-alone volumes to replace the previous two volumes, which will allow the operators to take the necessary volumes to the dive site.

The dive manual is updated to provide the latest procedures and equipment currently being utilized by military divers. It also includes two entirely new procedures to provided greater flexibility for diving operations: Chapter 10 on Nitrogen-Oxygen (NITROX) Operations and the Diving at High Altitude section of Chapter 9.

This new revision is also reformatted for electronic dissemination. It will be promulgated on a CD-ROM disk as well as in hard copy. Changes to the manual will be posted on the NAVSEA 00C web site (www.navsea.navy.mil/sea00c) to ensure that the most accurate and timely updates are provided to military divers.

This revision is a compilation of input and review by Navy divers involved in all aspects of diving operations. Experts from every area of military diving were consulted on specifics in their field and also utilized to review the finished version.

Many people were involved in this colossal effort, however I would like to pass along special thanks to a dedicated professional who expended countless hours to produce the best tools for military divers possible. HTCM (MDV) Mike Washington was the driving force behind the completion of this revision. His invaluable expertise makes this revision reflect what the fleet needs.

On behalf of all Navy divers everywhere, I want to thank MDV Washington for his unparalleled dedication and professionalism in completing this important task.

R. S. McCORD
Director of Ocean Engineering
Supervisor of Salvage and Diving

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Safety Summary

STANDARD NAVY SYNTAX

Since this manual will form the technical basis of many subsequent instructions or directives, it utilizes the standard Navy syntax as pertains to permissive, advisory, and mandatory language. This is done to facilitate the use of the information provided herein as a reference for issuing Fleet Directives. The concept of word usage and intended meaning that has been adhered to in preparing this manual is as follows:

“Shall” has been used only when application of a procedure is mandatory.

“Should” has been used only when application of a procedure is recommended.

“May” and “need not” have been used only when application of a procedure is discretionary.

“Will” has been used only to indicate futurity; never to indicate any degree of requirement for application of a procedure.

The usage of other words has been checked against other standard nautical and naval terminology references.

GENERAL SAFETY

This Safety Summary contains all specific WARNINGS and CAUTIONS appearing elsewhere in this manual and are referenced by page number. Should situations arise that are not covered by the general and specific safety precautions, the Commanding Officer or other authority will issue orders, as deemed necessary, to cover the situation.

SAFETY GUIDELINES

Extensive guidance for safety can be found in the OPNAV 5100 series instruction manual, Navy Safety Precautions.

SAFETY PRECAUTIONS

The WARNINGS, CAUTIONS, and NOTES contained in this manual are defined as follows:

WARNING **Identifies an operating or maintenance procedure, practice, condition, or statement, which, if not strictly observed, could result in injury to or death of personnel.**

CAUTION **Identifies an operating or maintenance procedure, practice, condition, or statement, which, if not strictly observed, could result in damage to or destruction of equipment or loss of mission effectiveness, or long-term health hazard to personnel.**

NOTE **An essential operating or maintenance procedure, condition, or statement, which must be highlighted.**

WARNING Hyperventilation is dangerous and can lead to unconsciousness and death. (Page 3-20)

WARNING Never do a forceful Valsalva maneuver during descent or ascent. During descent, this action can result in alternobaric vertigo or a round or oval window rupture. During ascent, this action can result in a pulmonary overinflation syndrome. (Page 3-23)

WARNING Do not use a malfunctioning compressor to pump diver's breathing air or charge diver's air storage flasks as this may result in contamination of the diver's air supply. (Page 4-11)

WARNING Welding or cutting torches may cause an explosion on penetration of gas-filled compartments, resulting in serious injury or death. (Page 6-19)

WARNING Scuba equipment is not authorized for use in enclosed space diving. (Page 6-24)

WARNING Skip-breathing may lead to hypercapnia and shall not be practiced. (Page 7-30)

WARNING During ascent, the diver without the mouthpiece must exhale to offset the effect of decreasing pressure on the lungs which could cause an air embolism. (Page 7-36)

WARNING During enclosed space diving, all divers shall be outfitted with MK 21 MOD 1 with EGS or MK 20 MOD 0 that includes a diver-to-diver and diver-to-topside communications system and an EGS for the diver inside the space. (Page 8-28)

WARNING The divers shall not remove their diving equipment until the atmosphere has been flushed twice with air from a compressed air source meeting the requirements of Chapter 4, or the submarine L.P. blower, and tests confirm that the atmosphere is safe for breathing. Tests of the air in the enclosed space shall be conducted hourly. Testing shall be done in accordance with NSTM 074, Volume 3, Gas Free Engineering (S9086-CH-STM-030/CH-074) for forces afloat, and NAVSEA S-6470-AA-SAF-010 for shore-based facilities. If the divers smell any unusual odors they shall immediately don their masks. (Page 8-28)

WARNING If the diving equipment should fail, the diver shall immediately switch to the EGS and abort the dive. (Page 8-28)

WARNING If job conditions call for using a steel cable or a chain as a descent line, the Diving Officer must approve such use. (Page 8-31)

WARNING Altitudes above 10,000 feet impose a serious stress on the body and significant medical problems may develop while the acclimatization process takes place. Ascents to these altitudes must be slow to allow acclimatization to occur and prophylactic drugs may be required. These

exposures should always be planned in consultation with a Diving Medical Officer. Commands conducting diving operations above 10,000 feet may obtain the appropriate decompression procedures from NAVSEA 00C. (Page 9-42)

WARNING Mixing contaminated or non-oil free air with 100% oxygen can result in a catastrophic fire and explosion. (Page 10-10)

WARNING No repetitive dives are authorized after an emergency procedure requiring a shift to the EBS. (Page 17-24)

WARNING Hypoxia and hypercapnia may give the diver little or no warning prior to onset of unconsciousness. (Page 17-40)

WARNING The MK 25 does not have a carbon dioxide-monitoring capability. Failure to adhere to canister duration operations planning could lead to unconsciousness and/or death. (Page 18-20)

WARNING CPR should not be initiated on a severely hypothermic diver unless it can be determined that the heart has stopped or is in ventricular fibrillation. CPR should not be initiated in a patient that is breathing. (Page 19-15)

WARNING This procedure is to be performed with an unmanned chamber to avoid exposing occupants to unnecessary risks. (Page 22-17)

CAUTION This checklist is an overview intended for use with the detailed Operating Procedures (OPs) from the appropriate equipment O&M technical manual. (Page 6-45)

CAUTION Avoid overinflation and be aware of the possibility of blowup when breaking loose from mud. It is better to call for aid from the standby diver than to risk blowup. (Page 8-27)

CAUTION Never attempt to interpolate between decompression schedules. (Page 9-6)

CAUTION In very cold water, the wet suit is only a marginally effective thermal protective measure, and its use exposes the diver to hypothermia and restricts available bottom time. The use of alternative thermal protective equipment should be considered in these circumstances. (Page 11-5)

CAUTION Prior to the use of variable volume dry suits and hot water suits in cold and ice-covered waters, divers must be trained in their use and be thoroughly familiar with the operation of these suits. (Page 11-6)

CAUTION **The MK 16 UBA provides no visual warning of excess CO_2 problems. The diver should be aware of CO_2 toxicity symptoms. (Page 17-4)**

CAUTION **Do not institute active rewarming with severe cases of hypothermia. (Page 19-15)**

CAUTION **If the tender is outside of no-decompression limits, he should not be brought directly to the surface. Either take the decompression stops appropriate to the tender or lock in a new tender and decompress the patient leaving the original tender to complete decompression. (Page 20-3)**

CAUTION **Acrylic view-ports should not be lubricated or come in contact with any lubricant. Acrylic view-ports should not come in contact with any volatile detergent or leak detector (non-ionic detergent is to be used for leak test). When reinstalling view-port, take up retaining ring bolts until the gasket just compresses evenly about the view-port. Do not overcompress the gasket. (Page 22-22)**

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