

# Introduction

**T**his study is divided into six chapters: mechanical clearance; risk assessment and mechanical application; mechanical application to area reduction; the application of machines to ground preparation; the protection of vehicles and plant equipment against mines and unexploded ordnance (UXO); and mechanical cost-effectiveness.

The chapters have been selected with a view to identifying how machines can improve the effectiveness and efficiency of clearance operations. Each chapter has its own aim and methodology, but the overall objective remains the same: to highlight the advantages and improve the understanding of the use of machines in minefields.

The study was managed by the GICHD's Operational Methods Section, headed by Håvard Bach. Input was provided by Mark Buswell, Dr John Gibson, Alexander Griffiths, Leonard Kaminski, Dan Marsh, Dr Ian McLean, Dave McCracken, Rebecca Sargisson and Johan Van Zyl. A User Focus Group was established to oversee and facilitate the study. This group was made up of representatives of prominent companies and organisations in the mechanical manufacturing, operational, research and testing sectors.

As Chapter 1 explains, a choice of stand-alone mechanical systems exists — flails, tillers, rollers, sifters, combined and multi-tool systems, and adapted commercial engineering machines. The chapter reviews the characteristics of the different systems and their impact on the ground and mines within it, and considers their potential for application as the primary clearance method to remove and/or destroy mines and UXO to humanitarian standards.

Chapter 2 looks at risk assessment and mechanical application. The sub-study that forms the basis of the chapter uses risk assessment to determine the most appropriate roles for mechanical systems in reducing the dangers to the civilian population.

Chapter 3 addresses mechanical application to area reduction as part of the technical survey process. The case studies that form the basis of the chapter assessed techniques used in area reduction operations by machine and sought to establish a framework for appropriate mechanical application so as to minimise the clearance requirement.

Chapter 4 considers the application of machines to ground preparation. This reflects the potential for machines to be used to prepare the ground for other “follow-up” clearance methods. Clearance after the use of machines is currently conducted by manual deminers and/or MDDs.

Chapter 5 looks at the mine and UXO threat to vehicles and plant equipment operating in the field. The authors discuss the effect of each type of threat on unprotected vehicles and put forward suggestions on how to enhance the protection of vehicles and their occupants.

Chapter 6 aims to establish standards for calculations of the cost and productivity of a machine operating in a minefield. A software package, CEMOD (Cost-Effectiveness Model), was specially developed to support this objective.

The study’s main conclusions and recommendations complete the body of this report.

Following the bibliography and a list of acronyms, Appendix 1 provides the list of members of the study’s User Focus Group. Appendix 2 provides a glossary of technical terms used in the study report.