

Preface

Blast mitigation is essentially a strategic system designed to reduce the aftereffects of a blast event. During a blast event, a tremendous amount of energy is released into the atmosphere (or fluid medium) in the form of high-intensity pressure pulses or shock waves as well as high-velocity fragments/projectiles. These can result in severe damage and destruction to human life as well as to infrastructure, and can result in collapse of buildings and other structures. Although the effects of blast cannot be completely eliminated, its effects can be reduced to a certain degree using innovative methodologies. The main focus of this book is to address certain novel methodologies to reduce the adverse effects of blast.

There are certain classes of structures that are susceptible to such harsh loading conditions. For example, naval ship structures are designed to resist high-intensity dynamic loads. In order for these structures to be lightweight and efficient in energy absorption, and to ensure reduced life-cycle costs, they are expected to be made of composite materials and sandwich construction. Understanding the mechanics of a blast event and its effects on these composite and sandwich structures is still an open area for research. Understanding many phenomena, such as damage progression resulting from a blast event, modeling aspects of a blast phenomenon, blast response estimations, underwater explosions, and constitutive material modeling under high strain rates, is essential to devise efficient mitigation strategies. Many of these topics are addressed in this book.

Realizing the importance of the subject “composite marine structures,” the Office of Naval Research (ONR), USA through its Solid Mechanics program, has supported research with the focus on blast effects and blast mitigation in composite structures, over the last two decades. Some of the world’s leading researchers in the field are participating in this program. Many of the chapters presented in this book are based on their ONR-supported research.

This book has a total of 23 chapters covering various aspects of blast mitigation in marine composites and sandwich structures including modeling of blast phenomena, fluid–structure interactions, structural and material damage initiation and progression, underwater explosions, novel computational methods based on higher-order sandwich theories, and innovative blast mitigation strategies.

This book is targeted for practicing engineers, academic faculty, and higher-level graduate students. The nature of the timely topics covered in this area of blast mitigation is what makes this book unique. We would like to thank all the primary contributors and their coworkers who spent considerable time in preparing these chapters and helped to finalize this unique book. We would also like to thank the ONR for their help in bringing together some of the world's leading researchers in this area to contribute to this book.

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