

# Concept of Deployable Ballistical Shield on a Mecanum Wheel Robot for Care Under Fire

Thanasit Suasan<sup>1</sup>, Watcharee Jornjumrus<sup>2</sup>,  
Vissanu Mungkung<sup>3</sup>

<sup>1</sup>Military Vehicle Division, <sup>2</sup>Energy and Fuel Division,  
<sup>3</sup>Defence Technology Analysis Department  
Defence Technology Institute  
Pakkret, Nonthaburi, Thailand  
thanasit.s@dti.or.th, watcharee.j@dti.or.th,  
vissanu.m@dti.or.th

Theeraphong Wongratanaphisan  
Department of Mechanical Engineering  
Chiang Mai University  
Muang, Chiang Mai, Thailand  
wong@dome.eng.cmu.ac.th

**Abstract**—Ground Robot has become the necessity in military operations in combat and non-combat roles. The robots substitute Explosive Ordnance Disposal (EOD) officers and sent to inspect, defuse or dispose explosive devices, preventing human from the risk of exposure to destructive and deadly explosive shock wave. There are others potential in which robot can perform to save human lives where it provides soldiers or tactical medics a coverage or protection from enemy fire with deployable ballistic shield. The current development programs are reviewed. Additionally, a mecanum wheel robot with the implementation of rocker suspension and deployable ballistic shield based on a co-development project between Defence Technology Institute (DTI) and Chiang Mai University is conceptualized.

**Keywords**—Mecanum wheel; Robot; Soldier protection; Ballistic shield robot; Care under fire

## I. Introduction

Robot has been introduced to military and homeland security operations in 1970s to neutralize terrorism's explosive devices. Three and a half decades later since its first introduction robot remains a critical tool in peace and stability operations, saves countless lives of combat and non-combat personnel throughout the world. The enhancement of today's innovative platforms and payloads unleashed possibilities of life-saving capabilities concepts. The potentials of robot in military applications are constantly being explored. One of the emerging applications is the concept of soldier protection in a form of robot configured with deployable ballistic shield. When the squad comes under hostile fire, the protective shield will manually or automatically expands to form a barrier against incoming ballistic. A scenario in which this concept will be critical is in a Care Under Fire (CUF) which describes a situation during active combat where both the casualty and the care provider are in danger from enemy fire, may or may not be behind adequate cover and may need to contribute to the firefight. It is designed to treat potentially preventable causes of death on the battlefield [1].

## II. Rational behind Shield Robot for Care under Fire

Tactical Combat casualty care (TCCC) is intended to treat potentially preventable causes of death on the battlefield. It does not begin at the hospital. It begins in the field at the point of injury and continues through evacuation to the combat hospital or forward surgery. TCCC classifies the tactical situation with respect to health care provision into 3 phases, Care Under Fire, Tactical Field Care and Tactical Evacuation [2]. The phase of Care Under Fire poses the most serious risk to both care provider and casualty. Currently, TCCC guideline is adopted and practiced under Royal Thai Army Medical Department.

Under the care under fire guideline, it is critical to consider the following: Location of nearest cover and how best to move casualty to the cover [3][4]. The risk of exposing rescuer and injured soldier to enemy fire can risk additional injuries. This can be illustrated through an incident in which Marine Corps Gunnery Sergeant Ryan P. Shane was struck by gunfire while rescuing fellow Marine and friend, Sergeant Lonny Wells who was fatally struck in the femoral artery by a sniper bullet on a street in Fallujah, Iraq. Shane was later dragged to safety by a fellow Marine [5].



Fig 1. Marine Corps Gunnery Sergeant Ryan P. Shane was struck by gunfire while rescuing fellow Marine.

This incident emphasizes the importance of cover in an active combat environment. The problem has inspired researchers to develop a solution to reduce or mitigate additional casualty or fatality during tactical engagement. There has been several researches in robot with ballistic shield.