

## Chapter 66

# Just Doesn't Look Right: Exploring the Impact of Humanoid Robot Integration into Explosive Ordnance Disposal Teams

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### ABSTRACT

*This chapter provides a critical analysis of the potential short- and long-term cultural, emotional, and ethical outcomes facing Explosive Ordnance Disposal (EOD) specialists working closely with anthropomorphic robots in daily team situations as viewed through the interdisciplinary lens of Human-Robot Interaction (HRI) research. Effective small group communication and decision-making is especially critical for EOD teams. Communication failures cause immediate safety concerns, potential physical and psychological harm to EOD team members, and similar repercussions for any individuals in close physical proximity of the Unexploded Ordnance (UXO). The complexity of EOD Team duties, coupled with the inherent limitations of human performance, make it gravely important that technicians have tools that aid rather than hamper team goals. The U.S. Military is seeking a refinement of EOD robot design, including the incorporation of some humanlike characteristics such as biped design, upright walking ability, and responsiveness to human voice and gesture commands. These characteristics can be arguably useful for robots to move in human spaces, learn in a humanlike way, dexterously disarm munitions, and communicate efficiently with human users. But while humanoid design may move the role of the robot to one that becomes potentially more effective in some environments, it may complicate emotional and ethical issues in terms of how human team members view the robot – as an extension of self, an external tool, a team member, a pet, or other entity.*

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## INTRODUCTION

*An example of Just Doesn't Look Right (JDLR) is when you're looking at a conventional object or event and being able to tell that something is amiss. Usually this is based on experience (physical) and/or your Spidey senses (mental) acting up based on the surroundings. I've gone through that a number of times and it definitely makes you more cautious. (MSG. A. Matuska, 741st Battalion, EOD (personal communication, September 9, 2011))*

Even though the widespread use of humanoid robots currently seems to be far off in the future, it is important to investigate new HRI issues and contribute to successful systems at the early stages of putting the fundamentals of these technologies in place.

In the United States military, Explosive Ordnance Disposal (EOD) technicians go through some of the most rigorous specialized training in learning how to effectively and safely defuse deadly Improvised Explosive Devices (IEDs) and U.S. and foreign chemical, biological, radiological, and nuclear (CBRN) unexploded ordnance (UXO). U.S. military EOD specialists often work stateside assisting local and state civil authorities to disarm and dispose of hazardous devices. They are also tasked with supporting the U.S. Secret Service, State Department, and other Federal agencies (Cooper, 2011; United States Army, 1997) such as the U.S. Department of Homeland Security, U.S. Customs Office, and Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). Their services protect the President, Vice President, and other officials and dignitaries, as well as aiding security at large international events. Perhaps lesser known to the general public is that U.S. Military EOD specialists also train and assist domestic civilian law enforcement personnel (Larry, 2008, para. 2; United States Army, 1997) and international friendly and allied force military EOD specialists (Gibson, 2009; Owolabi, 2010, para. 1; Valentin, 2011).

EOD personnel are not new to the history of the U.S. military but have found an unfortunate new significance in recent years. In 2010, 368 U.S. and NATO troops were killed by IEDs in Afghanistan, approximately as many as in the 3 previous years combined--about a 70% increase from 2009 to 2010 (iCasualties.org, 2011). A total of 3,360 troops were injured by IEDs, an increase of 178% over the year before (Whitlock, 2011, para. 2). IEDs have been responsible for 70% of coalition casualties in Afghanistan since 2001 and remain the primary cause of North Atlantic Treaty Organization (NATO) fatalities (DOD Personnel and Military Casualty Statistics, 2007).

According to an official of the Department of Defense's Joint Improvised Explosive Device Defeat Organization (JIEDDO), current military data reports insurgents in Afghanistan plant up to 1,400 EIDs per month; at the peak of the Iraq war there were over 4,000 IEDs planted per month (Mora, 2010). In 2010, the U.S. military increased the number of road-clearing teams in Iraq from about 23 to 56 (Flaherty, 2010) and in 2011, increased the road-clearing troops in Afghanistan from 12 to 75 (Dreazen, 2011). Reported numbers vary, but there are currently about 3,000 tactical robots in Iraq and Afghanistan used for reconnaissance and UXO sweeping (Osborn, 2010, para. 1), with about 2,000 ground robots in Afghanistan alone; a ratio of approximately one for every fifty troops (Axe, 2011).

Unfortunately, these numbers are only a piece of the larger story because IED threats are increasing every year globally and represent greater than ever hazards to worldwide military personnel, domestic first responders, and civilians. Because the Defense Advanced Research Project Agency (DARPA) arm of the U.S. Department of Defense (DOD) publicly indicates that they are exploring the options of humanoid robot design for use in EOD situations, these statistics and this chapter focus on American personnel in order to discuss the impact of using humanoid robots in U.S. military EOD teams.

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