# 1.0: Introduction

## 1.1: Project Background

Landmines present a massive humanitarian hazard to residents in surrounding areas. It is estimated that around 110 million anti-personnel landmines have been planted (CARE, 2003). Widespread adoption of a treaty to ban landmines (International Campaign to Ban Landmines, n.d.) has reduced the number of landmines being planted, however they still pose risk to civilians, as once planted, they are difficult to disarm or remove. Several flow-on effects compound the severity of the landmine hazard. Areas with landmines are no longer usable for agriculture, trading or housing due to the risk of explosion. It is estimated that up to 35 percent of land area in Afghanistan and Cambodia is unusable due to landmines (CARE, 2003). Secondly, demining is a slow process with large humanitarian cost. It is estimated that for every 5000 landmines removed, one deminer is killed and two are injured (Minesweepers, n.d.).

This humanitarian cost could be reduced by developing an alternative method to demine, which removes the risk to human life.

The proposed solution is developed within the following design constraints:

* The solution must be autonomous and make use of an Arduino Uno for control
* The solution must have a maximum width of 160mm length of 220mm, and a maximum mass of 0.7kg.
* The sum of costs of components used in the vehicle must be no greater than $150 AUD
* The solution must use a manufactured component detailed in **[APPENDIX: Manufactured Component]**
* The vehicle must have no wireless data transfer or physical connection to any external device
* The solution must have no sharp or dangerous parts

The vehicle must be developed within these constraints, to mark landmines within a simulated landmine board, with eight landmines consisting of a spring-loaded disk fitted with a magnet to aid detection. The simulated landmine board is 1650mm in diameter, and eight landmines must be located and marked within five minutes. The spring-loaded landmines are activated with a point load of 0.2N, so the solution must not drive over the landmines.

## 1.1: Project Scope

The project is based on the development of an autonomous deminer to suit a small-scale prototype model. Table 1 shows a breakdown of specific attributes which are in and out of scope.

Table

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| --- | --- |
| **In Scope** | **Out of Scope** |
| * Development and design of subsystems for development of small scale prototype, and integration to create an effective prototype. * Failure mode and effects for small-scale prototype demonstration * Mass calculations and life-cycle analysis for small-scale and full-scale prototype | * Full-scale specific design considerations, such as sensor selection for non-magnetic landmines * Potential failure modes and effects for full-scale implementation, although these may be similar to small-scale prototype |

It is important to note that the report is based on small-scale modelling of the design problem, and full-scale implementations may vary.

## 1.2: Aims

The project aims to develop specification for an effective virtual prototype autonomous landmine sweeper, including specification of sensor systems, development of control software and necessary supporting calculations for mechanical systems. Sustainability of the solution is considered in situ, along with possible real-world failure mode and effects.

Suggestions are provided for necessary considerations and modifications when scaling up the prototype to be used in a real-world scenario.

# Bibliography

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