

MANUFACTURING TEAM CHALLENGE

COMPETITION PROJECT

Technical Briefing – June 2015

Development Seminar – June/July 2015

Regional Heats – September 2015

**Submitted By: Wyn Rowlands
UK & International Skills Expert**

Introduction

The project brief

This brief specifies the requirement for the design and production of a remotely operated recovery vehicle. The vehicle should be designed and built to recover objects from hostile environments.

This vehicle could be used to recover or investigate dangerous land-based situations which could involve areas populated with land mines or potential bomb site incidents in a built up area. It could also be adapted for recovery of samples during outer space exploration.

Description of Project

- The vehicle will be battery powered and will be remotely operated by cable connection. The operator will be at least 2 metres from the vehicle when carrying out a series of operational tasks.
- The vehicle should be capable of a speed of 10m/min.
- The vehicle will be capable of: -
 - Manoeuvring on both forward and reverse directions.
 - A 360° turn within a radius of its own length.
 - Climb an incline of 20°.
 - Moving over surface obstacles of 10mm high.
- The vehicle will recover objects of uniform shape and size up to 50mm x 50mm x 50mm to a maximum weight of 250 grams. The recovered objects to be placed into recovery area.
- The vehicle and all support equipment must be lightweight for transportation and fit into a transport enclosure 600mm x 300mm x 300mm.
- Battery power should be such to enable the vehicle to operate for 2 hours on a single battery charge.

- The remote control unit will have displays/functions to: -
 - Isolate the power when not in operation.
 - Show initial and progressive battery conditions.
 - An audible and visual warning when battery power is lost
 - It must also be fully sealed with no exposed electrical connections.
 - The vehicle should be quick to remove from its transportation means and set up ready for operation.

Safety

- As the battery discharges, a warning light or 'low battery' message should engage at which time the recovery vehicle must cease to perform all operational functions.
- The unit can only operate when initiated with a 'secret key', i.e. a removable stop/start mechanism.
- The control box must have an EMERGENCY STOP button.
- All elements of the recovery vehicle must be protected whilst in motion.
- Guarding must be in place to prevent any crush/trapping injuries.
- All electrically conductive parts must be guarded.
- No sharp edges should be evident.

Maintenance

The following components should have ease of access for removal and replacement: -

- The recovery mechanism.
- The battery.
- The means of traction.

Marking Criteria

Section	Criteria	Marks	
A	Main project performances (Inc. Section B of portfolio)	40 10	50
B	Main project costs: Manufacturing Time Materials Machining Time	7.5 2.5 5	15
C	Portfolio (Section A only)	20	20
D	Surprise project	30	30
E	Overall Project Assessment	10	10
		Total	125

A. Main Project (40 Marks)

The vehicle should be capable of: -

- Being remotely operated at a minimum range of 2 metres from the operator. (2 marks)
- Operating by battery power. (1 mark)
- Manoeuvring in both forward and reverse directions. (1 mark)
- A 360° (degree) turn within a radius of its own length. (2 marks)
- Climbing an incline of 20°. (2 marks)
- Moving over surface obstacles up to 10mm high. (2 marks)
- Recovering uniform items up to a size of 50mm cube to a maximum weight of 250 grams. (3 marks)
- Operating continually for a period of 2 hours on one battery charge. (3 marks)

The control unit should display: -

- Initial and progressive battery conditions. (2 marks)
- A visual warning when the battery power runs low. (2 marks)
- A means of isolating the power when it is not in use. (2 marks)
- An emergency stop button. (2 marks)

The vehicle and support equipment should be: -

- Sealed with no exposed electrical connections. (2 marks)
- Free of sharp corners and edges for safe handling. (2 marks)
- Lightweight for transportation. (3 marks)
- Easy to transport and if necessary, fold down to fit within a carrying case enclosure of 600mm x 300mm x 300mm. (3 marks)
- Readily assembled and dis-assembled for and following operated tasks. (2 marks)
- Easily maintained or repaired with modular items requiring minimum skill and time to replace, e.g. battery, traction unit etc. (4 marks)

Portfolio B – to be done during the competition (10 Marks)

During the competition the participants will carry out the following I.T. related tasks, rough sketches can be brought to the competition:-

- Manufacturing drawings for all components to be made.
- 3D Assembly drawing(s).
- Electronic diagrams/drawings.
- Operation instructions.

B. Manufacturing Costs (15 Marks)

Working hours (7.5 Marks)

For every 10% more expensive than the team with the lowest calculated working hour cost (see note below). 0.5 Mark will be deducted proportionally.

Additional cost for using equipment (5 Marks)

For every 10% more expensive than the team with the lowest additional equipment cost (see note below). 0.5 Mark will be deducted proportionally.

Raw materials (2.5 Marks)

For every 10% more expensive than the team with the lowest additional equipment cost (see note below). 0.5 Mark will be deducted proportionally.

C. Portfolio A (20 Marks)

A portfolio is to be presented prior to the competition. This portfolio is to be assessed as a component of this project. The portfolio is to be in electronic format but presented in both hard copy and electronic form and to include: -

- Team member details.
- Team preparation.
- Design calculations and sketches.
- List of materials and components used with catalogue prices.
- Evidence of material and component costs.
- Computer generated 3 day competition manufacturing schedule.

- A poster display 1000mm x 600mm (minimum size) detailing each team member's details and their employers, a description of the project solution including a 3D model of their vehicle, which will be presented prior to the competition and displaying during the competition.

D. Surprise Project (30 Marks)

E. Overall Project Assessment (10 Marks)

Ends