

E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



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DESIGN COMPETITION 2025

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IMRAN TORIQ

SINGLE RETRACTABLE POWER STEP FOR HIGH GROUND CLEARANCE VEHICLES

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ABSTRACT

This paper aims to highlight an innovation of an automatic power step system used mainly for high ground clearance vehicles such as 4x4s and SUVs. Though numerous power steps are available in the market, they are unsuitable for all vehicles. This research was intended to fill the gaps by introducing this innovation that may become a new choice for the user. The design concept features a single-arm mechanism with a short and slim running board, as suggested by its name. This design-based innovation focused on functionality that suits the user's requirements and enhanced car accessibility. It was constructed using basic components through a cyclical feasibility study process, design and modelling, construction, fitting, and testing. The system has two major components: metal frames and electrical components. The step was designed to be attached to the main chassis of the vehicle beneath the floor and adjacent to the door. The step will be extended once the car door is opened and retracted back when the door is closed. The system also includes lighting and an alarm for the safety of the user and the system. The system has been tested and used by a few cars for its performance and feedback.

1. INTRODUCTION

The high ground clearance vehicles are quite challenging to access, especially for elderly people or young kids. Although some vehicles are equipped with sidesteps, those are of fixed attachments, permanent, and fitted almost to the rocker panel of the cabin and are not so practical for use when the vehicle is lifted for more ground clearance. Some users use a small chair for elderly people to step into the car, which looks primitive and troublesome. This research is both timely and crucial in achieving meaningful outcomes. This power step is a small module that uses a basic electro-mechanical system designed for each vehicle door. It is equipped with LED lights and an alarm as a safety feature for the user and the system. The lamp will be lit when the door is open and automatically switched off when the door is closed. The system operates using the vehicle's battery power supply.

2. METHODOLOGY

The project was completed through a cyclical process of feasibility study, design and modelling, construction, testing, and fitting, as shown in Figure 1.

2.1 Feasibility Study. This study aimed to assess the practicality and viability of the project. It involved collecting detailed information on vehicle structural parameters relevant to system installation, including ground clearance and safety considerations. Items required for the project were also considered for their availability and practicality. Costing and personal hours for the jobs were also considered in this study.

2.2 Design and Modelling. A cardboard prototype was used to design and simulate the movement of the actual step mechanism. This approach ensured design accuracy before the complete construction of the step. It also enabled the designer to understand better and refine the variables involved in adjusting the position of the stepping board as needed.

2.3 Construction. The jobs include cutting and welding metal frames and brackets, as well as preparing the electrical control module.

2.4 Fitting and Testing. The fitting and testing process is the final step of the process. This process is repeated until all the identified flaws are rectified.

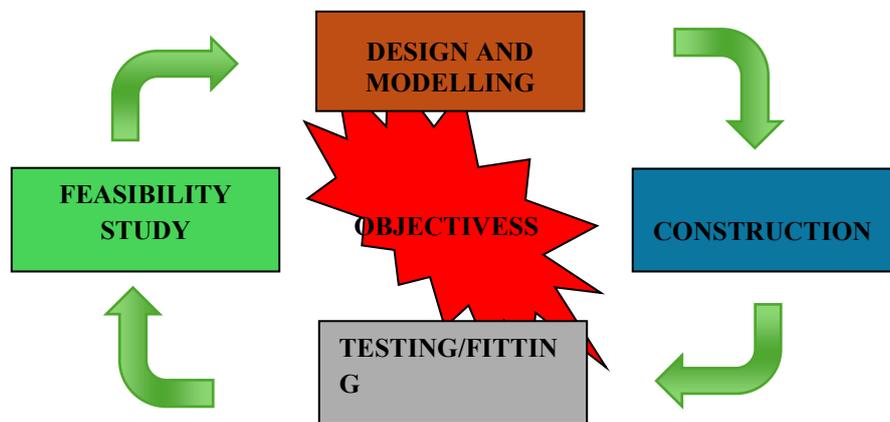


Figure 1: Design-based cyclical process model

3. FINDING

The project was successfully developed and tested, as shown in Figure 2 below. The functionality enhances vehicle accessibility and maintains ground clearance. It also promotes safety and ease of use for users with high ground clearance vehicles. The system may be further improved in the area of control modules for its smooth operation and to further enhance user safety.



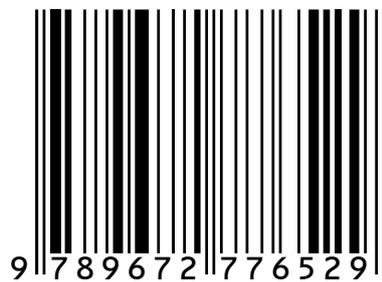
Figure 2: Pair of power sidesteps

4. CONCLUSION

The research for this innovation has met its objectives and fulfilled the need for some high-ground-clearance vehicles for users. It is a practical system that is convenient, safe, and, importantly, enhances vehicle accessibility. It is also a new product available to enrich the choice of high-ground-clearance vehicle users.

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