

# DESIGN AND FABRICATION OF RECUMBENT CONVERTABLE WHEELCHAIR

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## **Introduction:**

Disability has affected thousands of families in the world. As of today approximately 650 million people, are suffering from a disability. In a developing country like India, there are almost 21.9 million people with some of the other disabilities. Regardless of their disabilities, these people still need to get up each morning and live life. For most, this can only be possible with the help of a wheelchair. Wheelchair has become a boon for most of the movement impaired individuals right from its earlier introduction. As time changed the requirement of the wheelchair also changed to make out the needs of different classes of patients. Lots of research has been going on this field and which are aimed at fulfilling these requirements. So many problems are faced by bedridden patients sometimes they feel lonely and will be craving for a change in their ambience. The ordinary wheelchair is used by them but this wheelchair moves by manual means and is rigid. This is where the significance of the recumbent wheelchair arises as this reduces the burden of the caretaker. The recent developments in robotics, artificial intelligence, and sensor technology promise enormous scope in the development of advanced wheelchair. In order to overcome the problems, an ordinary wheelchair adequate features need to be designed. The recumbent wheelchair comprises a wheelchair that can be converted into a complete bed.

## **Objectives:**

The objective of this project is to analyze and prototype a wheelchair cum bed, based on an existing wheelchair with extensive fact findings and research on existing models, the technology used, market scenario, and customer requirements. It improves the balance and postural stability of old age people. It can convert a sleeping position from a sitting position easily. This project introduces a new design model of a wheelchair for physically disabled which can be used for moving from one place to another. The project provides a helping tool to the disabled and helps them move around, additionally, the wheelchair can be converted into a

bed. The wheelchair features such as DC actuators that act as shock absorbers along with dampeners to prevent head jerks. The wheelchair designed reduces dependency on caretakers and family members and promotes the feeling of self-reliance.

## **Methodology:**

### **Concept Generation**

Based on Product Design Specification concepts are generated using a mind mapping tool. The mind mapping technique is used to visualize various ideas. So this classification considered all the aspects of the concept design.

The course of our work begins with the planning phase involving initial research, literature survey, and background study.

1. It is followed by the concept generation phase that includes evaluating existing wheelchairs, customer requirements, and concept designs.
2. Prototyping the wheelchair into a complete bed and we progress towards testing a feasible model.
3. Collection of all the types of equipment and materials required for the overall wheelchair cum bed enhancement setup.
4. Forming of a lightweight wheelchair cum bed structure that would carry up to 80- 90 kg.
5. Implementation and connection of all the equipment are like actuator, function controller box, remote and battery.
6. Implementation of DC actuator, which would convert the Wheelchair into Bed and lifts the wheelchair into adjustable height.

## **Conclusion:**

A prototype of the recumbent wheelchair device for a patient weight of 100kg was designed and fabricated. The chair to bed conversion feature of this device makes patient transfer easier. The use of simple shifting aids such as patient shifters can further optimize the patient transfer by avoiding heavy lifting situations and possible back injury to the caregivers. This device combines the concept of patient mobility, patient transfer as well as patient comfort. This enables the user to have twofold utility and satisfaction. Thus the spending of time for the patient to shift from a normal wheelchair to a separate stretcher or from a separate stretcher to wheelchair vice versa is reduced. The DC actuator used herein have simple operation principles. Therefore, fault detections are simple. Also, the system proves to be non-hazardous.

Software and techniques used in the design of the device must be altered in accordance with the needs. For this study, several software packages were used independently to create and obtain an optimal wheelchair-stretcher convertible device design. The specific packages used include AutoCAD 2010, 3ds Max 2014.

**Scope for future work:**

One of the objectives of this product that is to eliminate the step of shifting the patient from bed or stretcher to wheelchair and vice versa especially in the case of paralyzed patients was successfully attained. It reduces the effort of the caregivers and makes sure that the patient is not hurt during the process of conversion. It is possible to save 50% space by the wheelchair-bed device. The product will thus likely be an efficient mobility aid in hospitals.