

# **Driver Ergonomics in an Off – Road Vehicle**

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**ABSTRACT:** It is quite essential for any automobile of its kind to make sure that the driver and passenger within the automobile are quite comfortable within it and that their ride is happily executed and that the point where driver ergonomics comes into play. Driver ergonomics is an important parameter that cannot be neglected while designing any automobile that is intended to carry passengers within it. In a nutshell it can be defined as the ability to fit you to your car so you can drive in a way that maximizes the natural ability of your body to move and respond to physical stress. Now our subject of consideration is an off road vehicle that by itself is considered to be exposed to rough terrain conditions and also supposed to carry one driver within it so it is quite a lump some job to keep both the facts under consideration and deduce the driver ergonomics for the same.

**KEYWORDS:** Driver Ergonomics, Off Road Vehicle.

## **I. INTRODUCTION**

As previously foresaid the driver ergonomics is quite a essential factor in designing of any concerned automobile and that becomes much more important while designing an off road vehicle where the conditions for sustainability of the vehicle in rough conditions as well as the driver ergonomics should be taken to consideration . So let us first clear the basic definition of the two key elements concerned with our paper.

- A) Driver Ergonomics :** Driver ergonomics may be defined as the ability of an individual to Fit him to his car so that he can drive in a way that maximizes the natural ability of his body to move and respond to physical stress and hence enhance driving satisfaction to the concerned driver. It is a branch of applied science mainly concerned with designing and arranging things people use so that the people and the things interact most efficiently and safely.
- B) Off-Road Vehicle :** As said previously an Off-Road vehicle is the vehicle that has to be designed keeping in mind the ambience and the rough terrain conditions under which it should generally work. Thus in a brief way an off road vehicle can be defined as the vehicle that has the ability to drive on and off plane surface, a bit “amphibian” in characteristics and often have the specifications of having efficient and strong suspension systems, tyres with deep tread aspects.

## **II. CONSEQUENCES OF ERGONOMICS NEGLIGENCE**

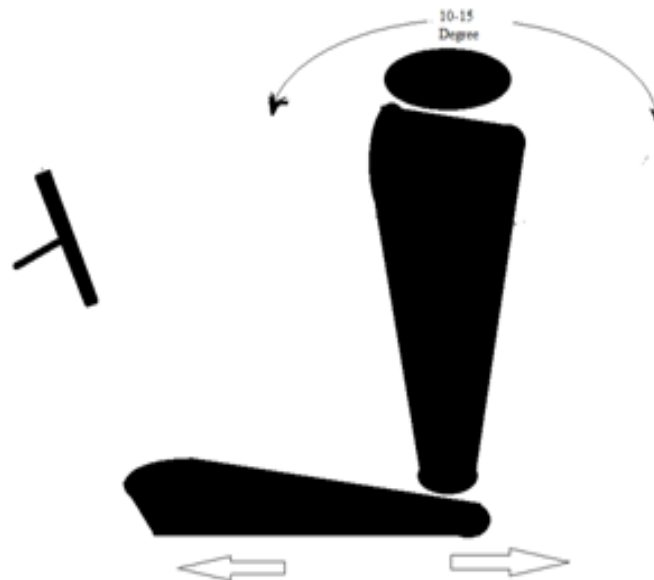
Clearly the ergonomics-negligence refers to the scenario in which while designing a vehicle not enough attention has been paid to the driver ergonomics stuff. While the consequences have not any direct effect imposed on the performance of the vehicle but it might have malignant consequences that can be caused to passengers or drivers present in the vehicle. Let us have a look upon the harmful effects of ergonomics negligence.

- (1) Disorder of dorsal muscle and back pain.
- (2) In some instances bad driver ergonomics can also lead to fatal Spondylitis.
- (3) Pain in neck.
- (4) Disorder of muscles, tendons, ligaments associated with the back portion.

(5) Lagardness in muscle functioning or weakness

**III. PERFORMANCE ASPECTS**

From the engineering aspect it was quite essential that we study the detailed analytical report that is concerned with our vehicle and just notify its important aspects. As we are designing the ergonomic capacity of an off road vehicle so we kept the vehicle ergonomic capacity in accordance with the rule that as a prototype of a commercial product, the design intent should be to accommodate drivers of all sizes from the 95th percentile male to the 5th percentile female. The largest driver must be able to meet the roll cage minimum clearances, and fit into a comfortable driving position, while wearing the entire required driver’s equipment. The smallest driver must be able to comfortably reach all of the vehicle’s controls.



Seat Adjustability : An Important Parameter of Driver Ergonomics designing

**IV. ERGONOMICS ENHANCEMENT**

In our study we have proposed and incorporated some idea for better enhancement of the driver ergonomic features in an off road vehicle and those points are as follows

<p>Size Adjustments concerning the driver</p>	<p>(1)The optimization of the vehicle should be done in such a way that maximum legroom area can be made available to the driver so while driving the vehicle his/her leg remains in a comfortable seating posture and he/she can perform all the operational features efficiently and effectively. Car seat tilting brackets can be one specific useful adaptation to give an extra 4-6 inches of legroom for longer people.</p> <p>(2) The rear supporting member should be made adjustable within a 10-15 degree range of adjustability so</p>
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	<p>while driving the dorsal portion including the spinal chord remains relaxed and no stresses or pressure is induced upon it so that will get rid of all exclusions of back pain, pain concerning the spinal chord.</p>
Position Of Steering	<p>(1)While designing the steering features of the vehicle keeping its engineering aspects in to views we should also incorporate some aesthetic features for example it is better to make sure that the steering support system of the vehicle should not interfere with drivers knees at any point and allow its free play and thus making the entry in and out of the vehicle quite easy of a job rather than increasing its complexity.</p>
Seat	<p>(1)Nowadays adjustable seat is quite common special feature that is incorporated within a vehicle and that is done so that driver could adjust the features of the seat according to his own physical standards so that he does get a smooth and comfortable ride.</p> <p>(2) Proper lumbar support has to be incorporated within the vehicle most of the times. The lumbar support should be proper adjusted so that the curve of our spine remains properly supported</p>
Visibility Of the concerned driver	<p>(1) One of the very essential factors while designing the ergonomic features of any vehicle is to provide a clear line of sight for driver visibility also incorporated with mirrors.’</p>

### V. RESULTS AND FIGURES

We wanted to design our off road vehicle keeping in mind that all the proposed driver ergonomic enhancement features are truly violated by us and so we did incorporated the following features within our vehicle so that driver can have a comfortable ride. The specific features are as follows

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SEAT INCLINATION	<p>An Optimized seat inclination of 12.5 degree “Angle Of Adjustability” is provided so while driving the dorsal portion including the spinal cord remains relaxed and no stresses or pressure is induced.</p>
ROLL CAGE MEMBER ADJUSTMENT	<p>(1)Precaution is taken so that the rear right hand member which has the maximum probability of fouling with the drivers hand while driving and thus raising questionability on the ergonomic value of the vehicle shall be tilted (+/-) 10 degree with our value being +10 degree.</p> <p>(2) Rear Overhead member should be located above drivers seat by 41 inches to avoid fouling with drivers head while he or she is driving. It is basically credible to keep +5 degree clearance than the safe limit and so we kept our value to a safety limit of 46 inches.</p>
LEGROOM SPACE ADJUSTMENT	<p>(1)There were a total of 10 members incorporating the horizontal and side members in our proposed design of legroom area and precautionary measures were taken so that no cross members are entertained in the legroom area to minimize the chance of collision of drivers leg and the members ensuring safety driving.</p>
AESTHETIC ERGONOMIC ADJUSTMENT	<p>(1) Sometimes along with engineering aspects it also does become quite important to make sure that the design seems appealing as well it benefits the concerned customer. We in our vehicle as a point of aesthetic feature as well as ergonomic value had thought of proper cushioning our seats with sponge and cotton so that it may seem appealing as well as acts as a cushion to the driver .</p>
ABC PEDAL PLACEMENT	<p>(1) The Accelerator-Brake-Clutch Assembly makes an essential part of each and every vehicle . We have mounted the ABC pedal assembly on the upper member in our proposed design so that the drivers leg remain at rest while operating the pedal arrangements provided only fingers operation of the legs are sufficient to execute them.</p>

<p>SIZE ADJUSTMENTS CONCERNING THE DRIVER</p>	<p>(1)The RRH member is tilted backward at an angle of 12 degree to enhance the ergonomics adjustment</p>
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Fig: Driver seat adjustment angle (12.5degree)



Fig: Ideal front visibility of the driver



Fig: Proposed model showing free leg room area

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