Topology Optimization of Arms & Hinges of a Combat Vehicle using FEA

D S Ugalmugale[*1], S M Magar[2], R Navthar[3], N R Patel[4]

ract— In automobile domain, It is always demanding to weight of any component/assembly without compromising rformance parameters. This research study presents dology and case studies for structural weight optimization ges & arms of ramp door assembly of a combat vehicle finite element analysis (FEA). Weight reduction of hinges rms of existing ramp door assembly is achieved by optimal ial distribution using density method of topology ization technique as well as it discusses topology ization parameters to reduce weight of the existing ponents without compromising required stiffness and gth requirements. With defining minimum compliance and as objective functions, the study highlights problem ulation by defining design and non-design volume for gy optimization using solid isotropic material with ization (SIMP) technique. As an outcome, optimal material of hinge and arm is achieved that is converted into feasible weight design considering manufacturing constraints. light weight designs are validated for their structural th using FEA. Existing and optimised designs are ared for weight, stiffness and strength parameters.

*Terms— **Design Volume , Finite Element Analysis , ural Stiffness & Strength, Topology optimization, t Reduction.**

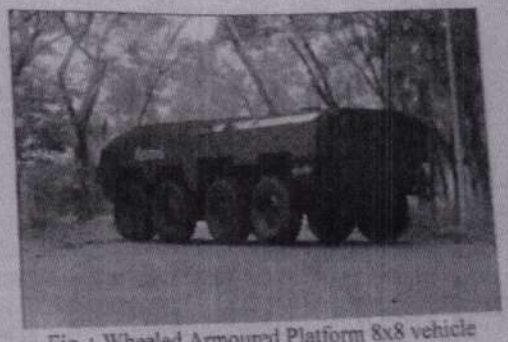

Fig 1 Wheeled Armoured Platform 8x8 vehicle

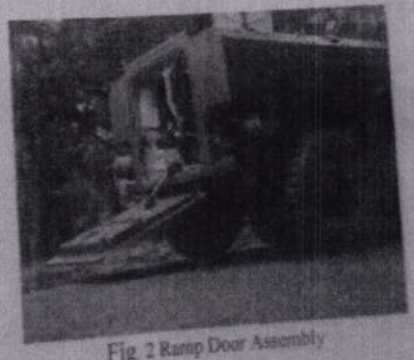

Fig 2 Ramp Door Assembly

I. INTRODUCTION

always desired to reduce weight of a combat vehicle as wn in figure:1, intending various advantages in terms of performance like ride, handling, fuel consumption, ious performance, etc. The present study highlights reduction of existing components of ramp door ly by exploring topology optimization technique using element analysis. Initially, hinges and arms of the ramp assembly are selected for the weight reduction task. P door assembly as shown in figure:2 of a wheeled vehicle is one of the critical sy... which functions as ble door that enables easy entry/exit of troops by e a ramp with adequate stepping height. The ramp mbly consists of a ramp door, hinges, arms, locks, ...ouple assembly, etc. which is operated by hydraulic

This study represents the structural topology optimization technique for achieving light weight design of existing hinge and arm as shown in figure: 3 & 4 respectively. Weight saving is targeted without compromising performance parameters defining problem formulation for topology optimization using solid isotropic material with penalization (SIMP) technique clubbed with finite element solvers. Optimised material distribution of hinge and arm is calculated by defining minimum mass as objective along with material density as design variable by specifying design and non design volume within availa... As an outcome of the study, optimal material distribution profiles of hinge ... are proposed which are converted into feasible designs considering manufacturing aspects.