In modern times dynamic stress analysis is becoming increasingly important for various engineering applications. These applications may range from analysis of on-shore and off-shore structures subjected to earthquake, high velocity wind, wave-action and explosive-blast loadings; to analysis of surface and airborne-transport vehicles and other high speed machinery; and last but not the least to estimate stresses in biological systems subjected to impulsive loading conditions. Collisions and impact by projectiles can set up dynamic stresses in all these situations. The different time histories of loading can produce different responses to the same system, due both to the variation in the magnitude of inertia forces so generated and also to that in the material properties at different strain rates. Due to its importance from the point of engineering design and also from the point of a better understanding of material properties, the subject of dynamic stress analysis and materials engineering have attracted the attention of many research workers in the past. Although significant amount of insight in these respects have been developed, the subject being rather intricate would continue to attract attention of more research workers in future.

Analytical methods of dynamic stress analysis are generally involved, and quite often numerical and experimental methods are resorted to for the purposes of engineering design. Dynamic finite element method is a powerful numerical technique, but it invariably requires a large computing system and also
it becomes often necessary to verify the basic assumptions of the finite element model through experimental studies. Over the years, the experimental methods also have gradually been refined, especially due to the development in the area of electronics. Again, through the development of Micro-processors, hybrid systems involving physical and mathematical models are becoming increasingly popular. The experimental methods of stress analysis can be broadly classified as pointwise and full-field methods. Electrical resistance strain gauges with the assistance of storage oscilloscope can quite conveniently be used to record strain-histories under dynamic loading conditions. However, it is a point-wise method and at best can be mounted at a few selected station points, generally on the surface of the structure. When full-field stress analysis is desired, photoelastic method can be used with advantage. However, model photoelastic studies are conducted on transparent birefringent solids, and to interpret the prototype stresses from the model stresses is not an easy task. A birefringent coating applied directly on the prototype surface appears to be an attractive method for this purpose. However, some difficulties in this regard have yet to be overcome before the technique can be widely used to study dynamic stress analysis problems.

A beam is a common structural element, and in several applications, simply supported beams with over-hang are employed in practice. Transverse and longitudinal bridge girders and chassis of rails- and road-wagons are some of the typical applications of the same. In the present study model photoelastic technique has been employed to determine dynamic stress distributions in a simply supported beam with over-hangs. A Fastax framing camera has been employed to record the dynamic
fringe photographs. Keeping the overall length of the beam as constant, the locations of the supports have been changed to generate different over-hang ratios. A freely falling mass was employed to induce a low velocity impact at the central and quarter span locations of the beam. The contact force history generated by the impact was measured by using a suitable force transducer. The over-hang ratio which produced the most unfavourable boundary stress distributions has been identified.

Next, beams made of two other materials, one metallic and the other polymeric, having identical supports and geometric conditions as the model photoelastic beam, have been subjected to similar impact loadings. The contact force and strain histories in these beams have also been found out by using a force transducer and electrical resistance strain gauges, respectively. Utilising these data, an attempt has been made to correlate the contact force, the maximum tensile stress and a material constant for such simply supported beams with over-hang subjected to a low velocity impact by a light striker.