Good morning, everyone.I also thank the School of Engineering faculty and technical staff for providing access to the necessary resources.(a) Cantilever boundary conditions do not consider the flexibility of wing-fuselage attachments (b) For flutter analysis of V-Tail and buffeting, complete aircraft might be analyzed (c) Following phenomena which render the flutter model non-linear, have not been considered, and hence, they might be covered in future projects a. Stall flutter b. LCOs (especially the subcritical regime) c. Control surfaces freeplay, etc Slide 27.(b)The aircraft is free from flutter and divergence throughout its specified flight envelope o Min flutter speed (at sea level)299 kts o Min divergence speed (at sea level)531 kts (c)Comparison of flutter results from the three schemes show that o All the methods exhibit reasonably close agreement o k method offers conservative results for all altitudes o pk method predicts higher flutter speeds than those given by semi-analytical framework Slide 25.In aviation it can lead to phenomenon like Control Reversals - where control inputs produce opposite effects, Divergence - where instability leads to unbounded deflection and Flutter- where aerodynamic forces interact unfavorably with a structure's natural vibration modes, potentially leading to rapid and uncontrolled oscillations.The main problems detected in the CAD model included: [Click] Inconsistent Geometry, Gaps Between Bodies, Component Intersections, Missing Elements These geometric inconsistencies were systematically addressed through careful CAD healing operations to ensure the model accurately represented the physical structure.The main aim of this work was to carry out the aeroelastic flutter analysis of the wing of Medium Altitude Long Endurance (MALE) Unmanned Aerial Vehicle (UAV) to determine the critical speeds corresponding to divergence and flutter.Because surface dimensions of all the components were significantly larger than the thickness, from the solid model, a reduced shell model was constructed by removing the thickness dimension and adding it as thickness to 2D shell elements.This analysis identifies the natural frequencies, mode shapes, and damping characteristics of a structure, which are essential for subsequent aeroelastic and flutter analyses.Therefore, stability characteristics were evaluated at different flight conditions where speed was fixed at 184 kts (340.74 kph) and altitudes were varied from sea level to 30,000 ft (9144 m) which is 5,000 ft higher than the maximum operating altitude with interval of 5,000 ft (1524 m).Naturally, it makes sense as with the increase in altitude, the value of density decreases, and the magnitude of dynamic pressure required to exert aerodynamic force sufficient for flutter onset implies a higher value of velocity.k method offers conservative results for all altitudes, whereas, pk method predicts higher flutter speeds than those given by extended eigenvalue framework.As the aircraft wing can be adequately modelled as a cantilever beam, we find that its stiffness is a function of Modulus of Elasticity (E), Moment of Inertia (I), Polar Moment of Inertia (J), its length (span) and support conditions.(d)Neutrally stable oscillatory behavior at the operational conditions indicates the possibility of LCOs (e)Variation in the thickness of the ribs do not imply any significant trend or effect on the flutter speed.(f)In comparison with the mass, aeroelastic characteristics are relatively more sensitive to the structural (bending and torsional) stiffnesses of the wing, which are directly proportional to the first and third powers of the thickness of the spars, respectively.The field of Aeroelasticity got prominent after the famous Tacoma Narrows Bridge collapse, which highlighted how aeroelastic phenomena can lead to catastrophic outcomes.In this analysis, the first ten natural modes of vibration have been extracted, however, in the flutter analysis, only the first six modes will be considered owing to the high significance of first modes and their markedly decreasing contribution as the number of modes goes towards the higher side.The analytical formulation of the flutter model starts with the derivation of the equations of motion from the Lagranges equations followed by the eigenvalue analysis which is commonly known as p method.Having determined the stability characteristics and critical speeds corresponding to flutter and divergence, it makes sense to analyze how the aeroelastic performance parameters of the wing can be enhanced.The maximum speed of the UAV was assumed to be 160 kts (303.5 kph) which implies that according to MIL STD 8870, the UAV should not encounter flutter till at least 184 kts (340.74 kph).In this project, I'll be presenting our research on flutter analysis, a critical phenomenon in structural and aerospace engineering.Subsequently a parametric study was carried out to study the effect of variation in rib and spar thickness on critical flutter speeds.Modal analysis is a critical step in understanding the dynamic behavior of structures, providing valuable insights into their natural vibration characteristics.[Click] As all the eigenvalues are pure imaginary, the system will undergo neutrally stable oscillations - thereby indicating flutter-free state Slide 15.k method has established its supremacy in the industry practices as one of the fastest methods of flutter root extraction.Whereas p method is accepted to be the most accurate method of flutter analysis owing to its mathematical formulation.A parametric study was carried out in which the effect of variation of thickness of structural members such as ribs and spars on the critical flutter speed was studied.Today I'll be presenting my Aerospace project on the Flutter Analysis on the wing of a UAV.Slide .2