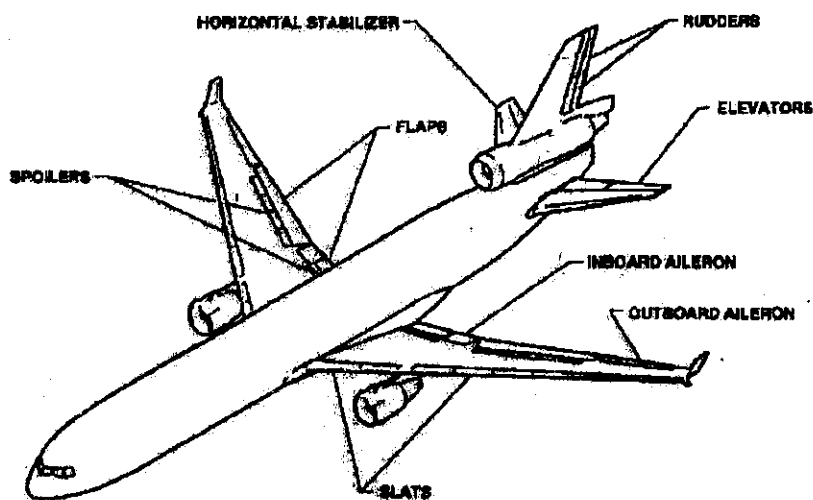


本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

1. (20%) The MD-11 (as shown) uses winglets. The MD-11 also has leading edge slats and double-slotted Fowler flaps on the wing.
- What aerodynamic purpose do winglets serve?
 - Name two other approaches that would provide a similar effect for an aircraft.
 - What changes do the double slotted Fowler flaps make to the wing's cross-sectional shape?
 - What function does the leading edge slat perform as part of the high-lift system?



MD-11 FLIGHT CONTROL SURFACES

2. (15%)
- Give a sketch of an airfoil and a wing; show the major geometrical parameters that determine the shape of them.
 - What are the three major aerodynamic coefficients of an airfoil? Give sketches of the three curves versus angle of attack for a typical laminar airfoil.
 - Describe the effects of aspect ratio, taper ratio and sweep angle on the aerodynamic performance of the wing.
3. (15%)
- Sketch an aircraft in climbing flight and draw the forces that act on it. Assume the thrust acts along the flight path. Include the horizon and the flight path angle, γ .
 - Write equation for the forces acting along the flight path and write equation for the forces perpendicular to the flight path.
 - If the forces along the flight path were less than zero, what would the aircraft do?

(背面仍有題目, 請繼續作答)

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

4. (15%) Consider an airplane of speed V in a level turn of radius R and with a roll angle ϕ . Define the lift load factor $n = L/W$. Show that the turn radius can be expressed as:

$$R = \frac{V^2}{g\sqrt{n^2 - 1}} \quad (\text{Note: } W = mg)$$

5. (15%) What is the V - n diagram for an aircraft? What is its significance?
6. (20%)
- (a) In aircraft design, what are the major concerns in selecting appropriate structural materials?
- (b) Why are composite materials important in modern aircraft technology?
What are the *disadvantages* of composite materials?