

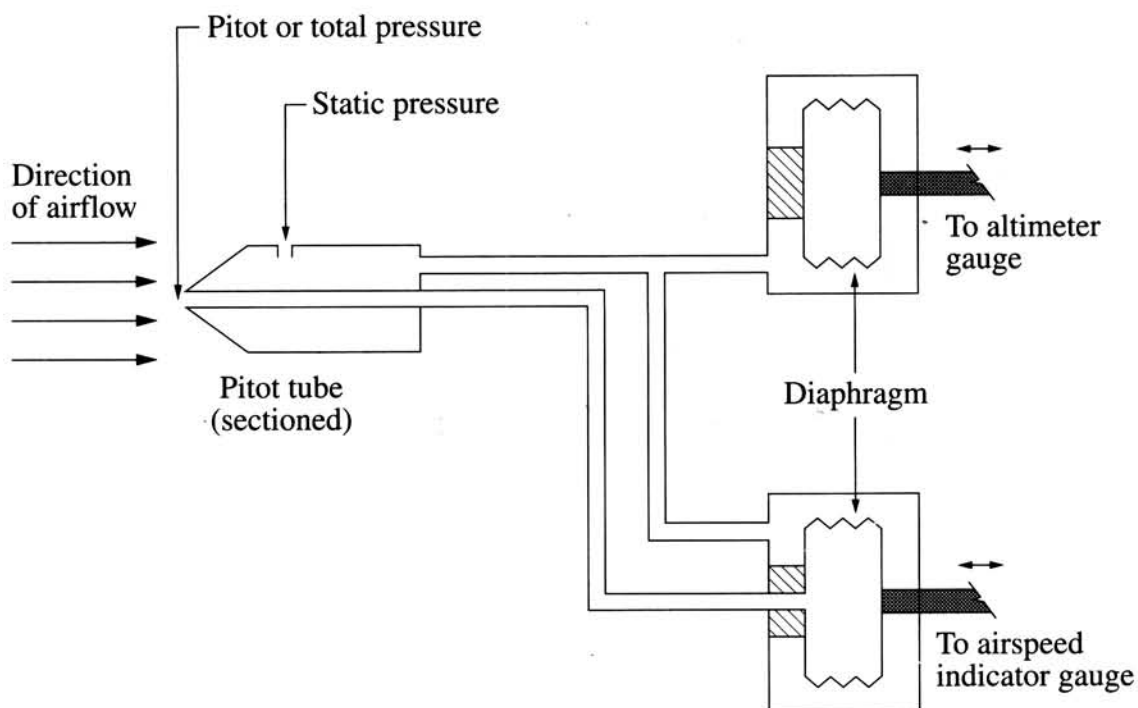
Engineering Studies

Section II (continued)

Marks

Question 15 — Aeronautical Engineering (15 marks)

In common aircraft instruments a pitot tube is connected to both the altimeter and airspeed indicator.



- (a) Explain how the airspeed indicator determines airspeed from the pressures sensed by the pitot tube. 3

The air enters the pitot tube and is through two separate tubes, an inner tube and an outer tube. The difference between the static pressure and the pitot pressure determines airspeed.

Question 15 continues on page 22

Question 15 (continued)

- (b) (i) Aluminium and its alloys are generally more active than irons and steels in the galvanic series. Explain why aluminium alloys are more corrosion-resistant than steels. 2

Aluminium alloys are more corrosion resistant because of the properties they have. When aluminium corrodes it leaves a flaking substance that protects from further corrosion.

- (ii) Identify ONE advantage and ONE disadvantage of the use of composite materials to replace aluminium alloys in aircraft components. 2

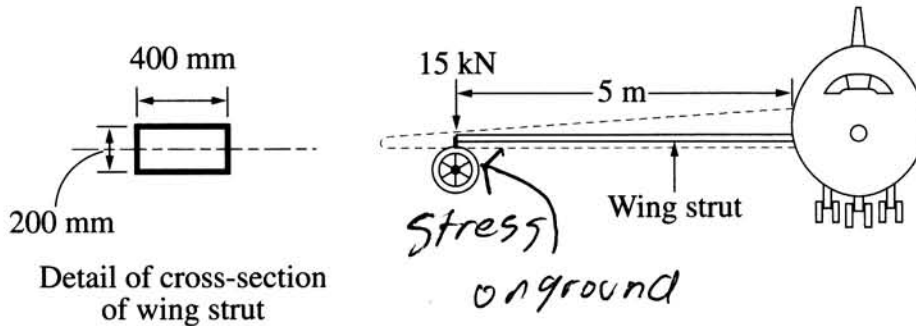
An advantage would be they are easier to produce.

A disadvantage is they are heavier than aluminium.

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Question 15 (continued)

- (c) In the diagram of an aircraft, the wing has been shown as hidden outline to reveal the wing strut, which has uniform section along its length.



- (i) Compare the nature of the stresses experienced by the surfaces of the wing strut when the aircraft is stationary on the ground and when the aircraft is in flight. 3

When on the ground the only stress is at the end of the strut

When in flight there is a force hitting it read on also the lift and drag forces.

- (ii) Determine the maximum value of the bending stress when the strut experiences a force of 15 kN at its end. 3

Use $I = 267 \times 10^6 \text{ mm}^4$.

Bending stress =

Question 15 continues on page 24

Question 15 (continued)

- (d) Outline TWO conditions that may cause an aircraft to stall during flight.

2

1. The angle of attack is too steep

End of Question 15