

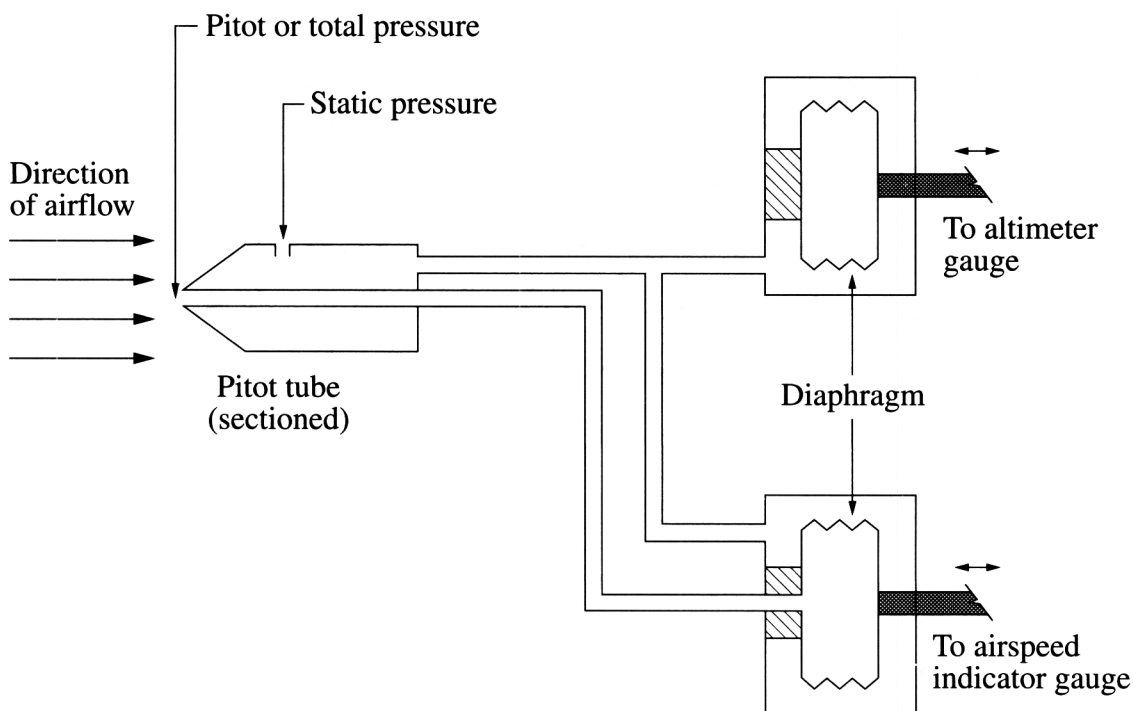
Engineering Studies

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 airspeed indicator determines airspeed from the pressures sensed by the pitot tube ~~but~~ by the velocity of the airflow recording the pressure of the air which either expands or decreases the diaphragm which moves the indicator gauge to show the pilot the speed of which the aircraft is travelling.

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 than steels because they contain corrosion-resistant composite materials which prevent the aluminium alloys last longer before corroding.~~
Aluminium alloys
could contain ~~some~~ corrosion-resistant composite materials which ~~prevent~~ ^{make} the aluminium alloys last longer before corroding.

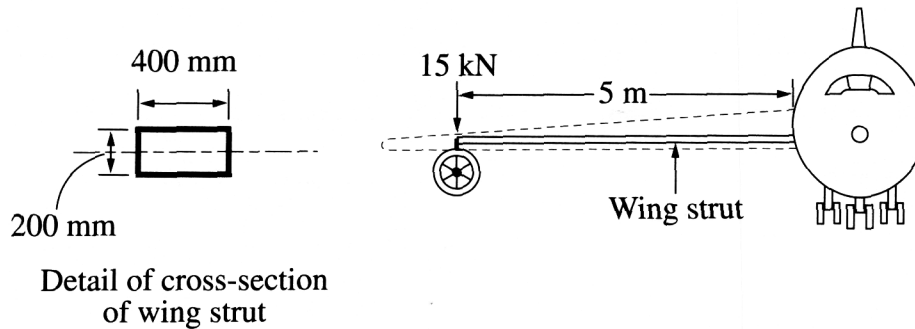
- (ii) Identify ONE advantage and ONE disadvantage of the use of composite materials to replace aluminium alloys in aircraft components. 2

One advantage would be the cost of the composite material being cheaper.
One disadvantage would be that the composite materials will be less corrosion-resistant than the aluminium alloys.

Question 15 continues on page 23

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 the wing strut is on the ground it doesn't ~~only~~ have the ~~weight~~ force of the ~~wing~~ air and the different air pressures above and below the wing. ~~These~~ ~~forces~~ ~~as~~ well as the weight of the wing strut all these forces have to be ~~held up~~ held up by the wing strut while in the air.

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

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

$$\frac{My}{I} = \frac{15000 \times 100}{267 \times 10^6}$$

$$= 5.6$$

Bending stress = 5.6 kPa

Question 15 continues on page 24

Question 15 (continued)

- (d) Outline TWO conditions that may cause an aircraft to stall during flight. 2

• The angle of attack may be too great

• The aircraft ~~may~~ may be travelling too slow

End of Question 15