2003 HIGHER SCHOOL CERTIFICATE EXAMINATION

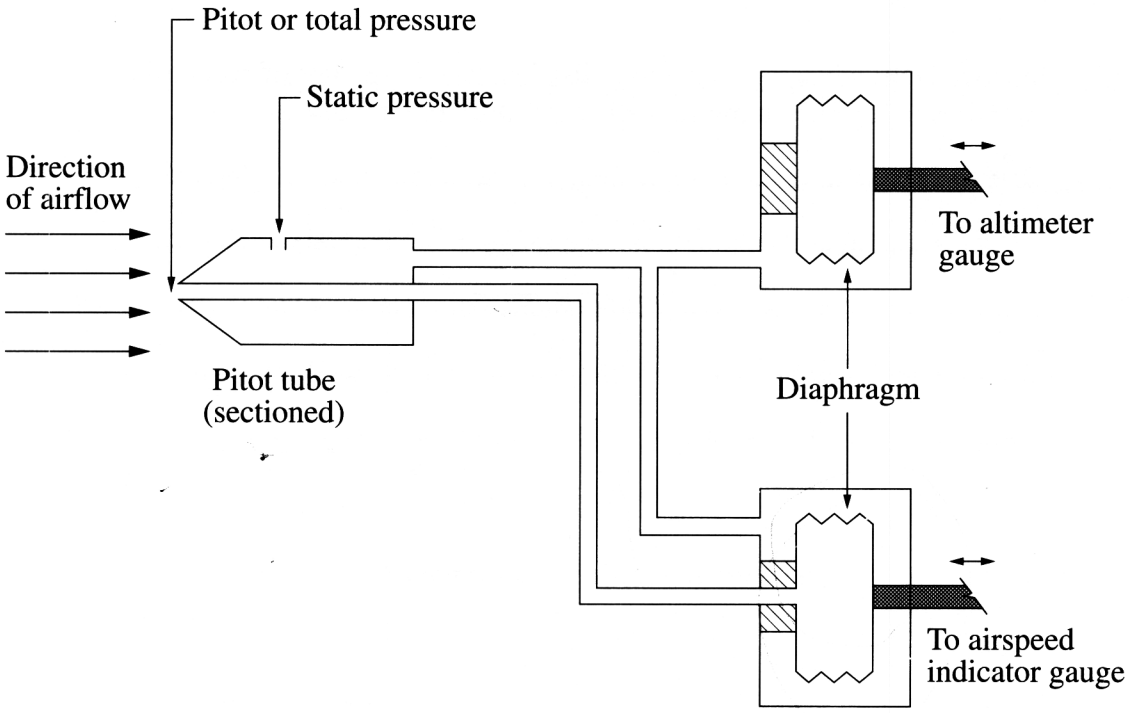
Engineering Studies

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 functions by comparing the air pressure within one area with another pressure in another area. when this is done speed detected.

Question 15 continues on page 22

Marks

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 steel because they don't ~~corrode~~ electrons as easily as steel does also Aluminium creates an flux on its surface which helps prevent corrosion.

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

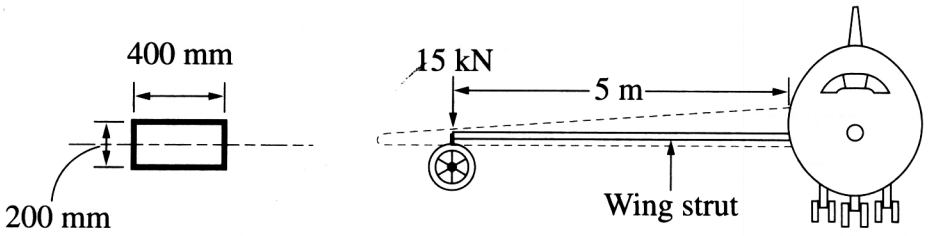
Advantage: Composite materials are strong, light, they have great strength to weight ratio. The disadvantage is ~~they fail~~ that when they fail they are expense to repair, and also they fail suddenly without warning.

Question 15 continues on page 23

Marks

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.



Detail of cross-section of wing strut

(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**

The stresses experienced by the aircraft strut when stationary tensional forces. This is from the long span of the wing. when the aircraft is flight flying of forces such as wind resistance, or drag. These are tensional forces. The wing strut has to be strong enough.

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

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

$\frac{My}{I} \cdot 15x$

$\frac{15}{267 \times 10^6}$

$\frac{1500N \times 5m}{267 \times 10^6}$

Bending stress = 28089887.64 : MPa

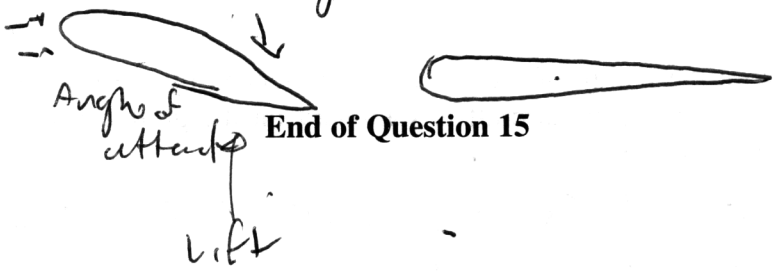
Question 15 continues on page 24

Marks

Question 15 (continued)

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

The condition that may cause the aircraft to stall during flight One, wind turbulance. two, When the craft is taking of if the angle of attack is to high no lift is generated so it will stall. if no lift generated it can be seen



End of Question 15