23.0 AVIATION TECHNOLOGY (450)

The year ***2008 KCSE*** examination for Aviation Technology was composed of a theory paper and a practical paper. Although both papers were marked out of ***100, Paper 1 (450/1)*** was scaled down to ***60%*** while ***Paper 2 (450/2)*** was scaled down to 40%. The format for both papers was the same as in the previous years.

23.1 CANDIDATES' GENERAL PERFORMANCE

The table below shows the candidates' performance in the Aviation Technology (450) examination for the year 2008. Performance statistics for 2007, 2006 and 2005 have been given in the table for comparison.

***Table 28**: Candidates' Overall Performance in Aviation Technology for the last Four years*

Year	Paper	Candidature	Maximum Score	Mean Score	Standard Deviation
	1		60	36.81	8.07
	2		40	28.19	3.57
2005	**Overall**	**75**	**100**	**65.00**	**10.00**
	1		60	36.22	7.42
	2		40	29.59	3.23
2006	**Overall**	**46**	**100**	**65.80**	**8.00**
	1		60	31.87	6.27
	2		40	22.17	2.32
2007	**Overall**	**53**	**100**	**54.04**	**7.00**
	1		60	34.78	5.84
	2		40	26.56	2.94
2008	**Overall**	**63**	**100**	**61.33**	**7.79**

From the table above, the following observations can be made:

23.1.1 The overall mean score improved from ***54.09*** in the year 2007 to ***61.33*** in the year 2008

23.1.2 There was also an improvement in the candidates' performance in both papers in the year 2008 compared to the year 2007.

23.2 PAPER 1 (450/1)

Although the overall performance was good, it was noted that most candidates performed quite poorly in ***questions 2, 6, 7, 9, 12*** and ***14***. This part of the report will therefore focus on these questions which were poorly done and will specifically address the weaknesses portrayed and present the expected responses.

Question 2

(a) Name the **two** types of batteries used in aircraft electrical systems.

(b) State **three** main functions of battery in an aircraft electrical systems.

The candidates were required to know the common types of batteries and the function of a battery in aircraft electrical systems.

Weaknesses

Most of the candidates failed to give the correct answers mainly because of lack of knowledge in this topic. The topic should be given adequate coverage during teaching

Expected Responses

(a) Lead acid.
Nickel cadmium.

(b)

- Maintains dc system voltage under transient conditions.
- Supplies power for short term heavy load when the generator for ground power is not available.
- Supplies limited power to operate essential services in case of an emergency.

Question 6

Describe the **three** main components in a simple aircraft jet engine.

The candidates were expected to describe the main components of a simple jet engine.

Weaknesses

The candidates did not know about the construction of a simple jet engine. From their responses, it was evident that majority of the candidates had not covered this topic and could therefore not give the expected responses.

Expected Responses

- ***Compressor:*** a series of blades or airfoils, some rotating (rotors), some stationery (stators) that draw air and compress it.
- ***Combustion chamber***: Circular containers consisting of flame tubes, burners, igniters etc. in which atomized fuel and air are ignited for combustion.
- ***Turbines:*** devices comprising rotors and stators which gain toque from expanding gases to turn the compressor and other accessories.

Question 7

With the aid of a labelled sketch, describe the semimonocoque aircraft fuselage construction. (5 marks)

This question required the candidates to illustrate how a semimonocoque fuselage is constructed.

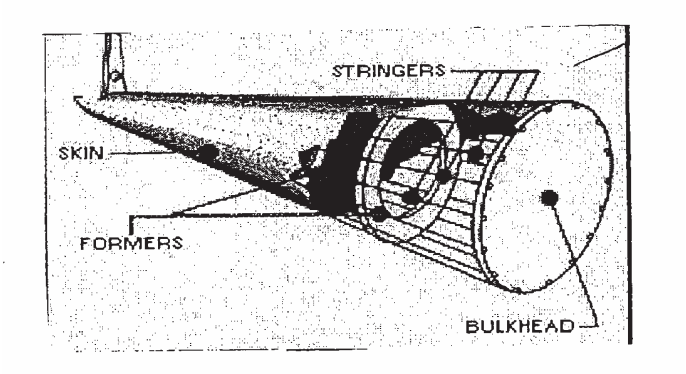
Weaknesses

The question was straight forward for the few candidates who possessed the knowledge required. However, most of the candidates had very little knowledge about fuselage and their responses left a lot to be desired.

Expected Responses

Semimonocoque literally means half a shell

- It comprises internal braces which include longitudinal and vertical members.
- Longitudinal members are stringers and or lengerons
- The skin provides cover and carries most of fuselage strength.



Question 9

(a) State **four** requirements of aircraft hardware as compared to ordinary hardware. (2 marks)

(b) List all the information contained in the manufacturer's specifications on aircraft hardware. (2 marks)

The candidates were expected to identify the unique requirements for aircraft hardware as opposed to general hardware requirements.

Weaknesses

Some candidates listed the requirements for ordinary hardware and hardly gave exclusive requirement for aircraft hardware. Similarly, there was no unique information given in part (b) of the question. A few candidates attempted to give information applicable to general hardware.

Expected Responses

(a)

- Corossion resistance.
- Tensile strength.
- Temperature resistance.
- Weight to strength ratio.

(b)

- Strength.
- Material.
- Size and tolerance.
- Finish.

Question 12

(a) With the aid of a labelled sketch define the three aircraft propeller blade angles when the engine is running.

(b) Explain the operation of an aircraft propeller.

(c) Explain the difference in operation between fine pitch and coarse pitch in a two-speed propeller.

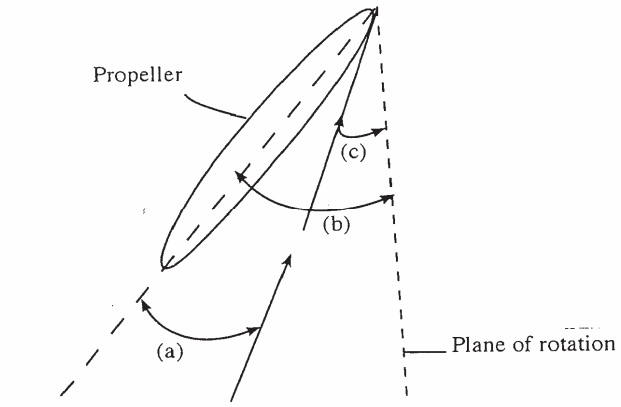
The candidates were required to have an indepth understanding of the construction and operation of an aircraft propeller.

Weaknesses

Most candidates had scanty knowledge about the propeller blade angles, the basic operation of aircraft propeller and the operational differences between fire pitch and coarse pitch.

Expected Responses

(a)



(b) The propeller consists of blades which are aerofoil section and is rotated by the engine

(i) The propeller converts engine power into aerodynamic forces.
(ii) The portion of the force acting forward is thrust power.
(iii) The portion acting in the plane of rotation is the propeller torque.
(ii) The trust conversion efficiency depends on the configuration and aircraft forward speed.
(iii) The simple fixed pitch configuration is inefficient at most speeds while the variable pitch constant speed propeller is reasonably efficient at most aircraft speeds.

(c) ***Fine pitch propeller***

- Has low blade angle which moves forward a small distance through the air and will take a small volume of air.
- Requires relatively low power to rotate, allows high propeller speed to develop and achieves only limited airspeed.

Coarse pitch propeller

- Has high blade angle which will advance a long distance through the air and will take large volume of air.
- Requires greater power to rotate, limits propeller speed than can be developed and achieves high speeds.

Question 14

(a) Outline the procedure of repainting an aircraft.

(b) Explain **two** ways in which each of the following factors can cause an accident in aviation industry:

(i) technical defect;
(ii) weather;
(iii) servicing error;

(iv) pilot error.

The candidates were expected to outline the steps of repainting an aircraft body and also explain how some given factors can cause an accident.

Weaknesses

The main weaknesses portrayed by the candidates was lack of completeness in their answers which was an indicator that finishing and safety had not been exhaustively taught. Teachers should ensure that even the minor syllabus topics like finishing are thoroughly covered.

Expected Responses

(a)

- Position the aircraft in the painting hanger.
- Earth or bond the aircraft.
- Mask areas not to be painted
- Remove the old paint.
- Clean the aircraft surfaces to be painted.
- Inspect and rectify any defects.
- Pre-treat the surface.
- Prepare and apply the primer.
- Prepare and apply the paint.
- Polish the surface.
- Unmask the aircraft.
- Remove the earthing/bonding.
- Complete the documentation.
- Discharge.

(b) (i) ***Technical defect:***

- Can result in failure of entire aircraft.
- Failure of navigational and other equipment.

(ii) ***Weather:***

- may lead to pathological (uncontrollable) condition.
- can cause instant failure, for example: - lightning strike.

(iii) ***Servicing error***

- Unknown engine fault.
- Failure to conform with preventative maintenance schedule.

(iv) ***Pilot error***

- Can lead to wrong decision or action.
- Can cause omission or incompetence.

23.3 PAPER 2 (450/2)

This paper, as in the previous years, comprised of ***ten (10)*** compulsory questions which were equally weighted in terms of marks and time allocation. At each station the candidates were required to carry out certain tasks that were examined. The tasks included the following:

- Preparing parts list for a given assembly.
- Making an undercarriage bracket to a given size and shape.
- Interpreting weather photographs.
- Connecting and examining electrical circuiting.
- Identifying aircraft parts and taking measurements.
- Identifying defects in some parts and materials.
- Making aerofoils and relating them to an aircraft.
- Carrying out experiment related to aircraft instruments.

- Determining suitability of aircraft hardwares.
- Performing an experiment related to propulsion.

23.3.1 Weaknesses

The following weaknesses were noted:

23.3.1.1 ***Failure to follow instruction***: ***Question 1*** was a related drawing question and some candidates did not read the instructions given. They went ahead to redraw the assembly instead of preparing a parts list as instructed in the question. In ***question 4***, the female connector was the one to be crimped while the male connector was to be soldered. Some candidates failed to follow this specific instruction.

23.3.1.2 ***Inability to measure accurately and make deductions:*** In ***question 5***, the candidates were to determine the condition of the cylinder bore from the measurements taken. Some candidates failed to draw the desired deductions due to incorrect measurements taken.

23.3.1.3 ***Identification of parts:*** Naming of parts, components and material is a requirement in this paper and some candidates had difficulties in getting the correct names or terminologies for different parts, materials etc

23.3.1.4 ***Inability to determine condition of parts***: In some ***questions like 6(a)*** and ***9***, the candidates were required to determine the condition of some hardware and parts by examination or measurement. The majority of the candidates could not identify the rejection criteria for those defective parts and hardware.

23.3.2 Advice to Teachers

The teachers should ensure that all the syllabus topics are taught exhaustively and that relevant exercises are given to the students to reinforce the theory covered. The students should also be given adequate time to apply the concepts taught and each student should be encouraged to participate in doing the actual experiments and practical exercises. Appropriate teaching aids like aircraft components and models should also be used.