



17.0 AVIATION TECHNOLOGY (450)

The KCSE examination for Aviation Technology for the year 2006, like in the previous years, consisted of two papers namely a theory and practical paper. The format for both papers was the same as in the previous years.

17.1 GENERAL CANDIDATES' PERFORMANCE

The table below shows the candidates' performance in both papers in the year 2006. Statistics for the previous three years have also been provided for comparison.

Table 20: Candidates' Overall Performance in Aviation Technology for the Last Four Years

Year	Paper	Candidature	Maximum Score	Mean Score	Standard Deviation
2003	1		60	41.03	5.81
	2		40	27.61	2.34
	Overall	33	100	68.64	6.75
2004	1		60	42.17	7.00
	2		40	26.09	3.09
	Overall	35	100	68.26	5.00
2005	1		60	36.81	8.07
	2		40	28.19	3.57
	Overall	75	100	65.00	10.00
2006	1		60	36.22	7.42
	2		40	29.59	3.23
	Overall	46	100	65.80	8.00

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

- i) The number of candidates decreased from **79** in the year 2005 to **46** in the year 2006.
- ii) There was very slight variation in the mean scores for both papers in the year 2006 compared to the previous year.

17.2 PAPER 1 (450/1)

Paper 1 (450/1) comprised of two sections; A and B, as was the case in the previous years. In this paper, most of the questions were quite well done. However, performance in questions **1, 3, 6, 10, 14** and **15** was relatively poor. The following discussion will focus on those questions which were poorly done and will specifically address the weaknesses portrayed by the candidates and present the expected responses for each question.

Question 1

- (a) *Outline two methods of preventing accidental retraction of the landing gears when the aircraft is on ground.*
- (b) *State four roles of an air traffic controller.*

Candidates were required to state the safety precautions taken to ensure that there is no accidental retraction of landing gears when an aircraft is on the ground. In addition, the candidates were

required to list the roles of an air traffic controller.

Weaknesses

Most candidates had no idea what the expected safety measures were and the various roles of a traffic controller. Those who attempted the question gave general rules on ground handling.

Expected Responses

- a) Precautions to prevent accidental retraction of the landing gear include fitting of ground lock pins, selection of ground flight mode and engagement of weight on wheel micro switches.
- b)
 - Ensuring that the runways are clear.
 - Giving authority to aircraft to carry out any operation.
 - Relaying all meteorological information to flight crew.
 - Ensuring that all the beacons are serviceable.
 - Monitoring entry of all foreign aircrafts.
 - Controlling all the movements on the airfield.

Question 3

Outline the procedure of making a lap joint by soft soldering.

This question required the candidates to give a systematic procedure of soft soldering a lap joint.

Weaknesses

Although some candidates could remember vaguely some of the steps involved in soft soldering, there was hardly any candidate who was able to give the complete procedure in the right sequence.

Expected Responses

- Cleaning the surfaces to be soldered.
- Heating the soldering iron.
- Tinning the bit of the soldering iron.
- Applying soldering flux on the joint.
- Setting the parts to be soldered.
- Soldering the parts together.

Question

Outline five operational differences between aeropiston and pure jet engines.

Candidates were required to outline the differences in operation between a pure jet engine and an aeropiston engine

Weaknesses

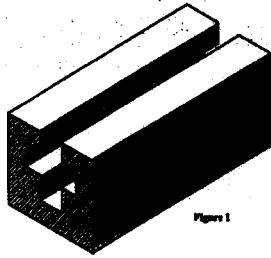
A large percentage of candidates failed to bring out the specific differences between an aeropiston engine and a jet engine. Others misunderstood the question and included some differences in construction.

Expected Responses

<i>Four Stroke Aero- piston</i>	<i>Pure Jet Engine</i>
▪ Use gasoline fuel.	▪ Use Kerosene for combustion.
▪ Generate thrust by propeller.	▪ Generates thrust by jet efflux.
▪ Intermittent Ignition.	▪ Ignition only when starting.
▪ Constant volume combustion.	▪ Constant pressure combustion.
▪ Events occur in same cylinder.	▪ Events occur in different chambers.
▪ Efficient at low speed.	▪ Efficient at high speed.

Question 10

Figure 1 shows an isometric drawing of an aircraft door rail with a mortise.



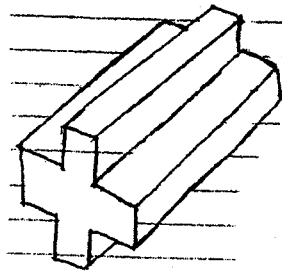
In the same view, sketch in good proportion the appropriate part to fit the mortise.

Candidates were given a rectangular block with a mortise to come up with a sketch in correct view and proportion of the part which was to fit the mortise.

Weaknesses

Most of the candidates could not visualize all the features and details of the mortise in order to sketch correctly the corresponding tenon. Besides, the block was given in isometric projection and the response should have been presented in the same projection. Although the tenon was to be sketched, the candidates were expected to come up with a neat and proportional sketch.

Expected Response



Question 14 (b)

With the aid of a labelled sketch describe the operation of a propeller speed governor.

Part (a) of this question required the candidates to define three terms related to aircraft propellers. In addition, in part (b) of the question, candidates were required to describe the operation of a propeller speed governor.

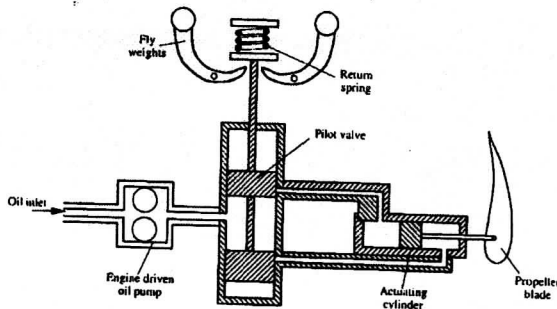
Weaknesses

The definition of terms related to aircraft propellers was very well done. However, the description of how the propeller speed governors works left a lot to be desired. Most of the

candidates who attempted this question could not come up with a complete and accurate sketch of the speed governor assembly. In their descriptions, most candidates displayed limited knowledge of how the flyweights behave at various aircraft speeds and how that affects the propeller blade angle.

Expected Responses

PROPELLER SPEED GOVERNOR



OPERATION:

On Speed: When an aircraft is on normal flight the speeder spring force is equal to the flyweight centrifugal forces and the pilot valve is neutral.

Over speed: During the aircraft descent or when the air density decreases the engine has very little work to do so that this tends to over speed the propeller. When the propeller speeds up the centrifugal force moves the flyweight apart thereby overcoming the return spring to move the pilot valve upwards. Moving the pilot valve upwards opens a port to direct high pressure oil to one side of the actuating cylinder to increase the blade angle thereby increasing the resistance of the blade through air to slow down the propeller back to **On Speed**.

Under speed: Alternatively when the aircraft is ascending or there is any increase in air density, the engine has a lot of work to do which tends to slow down the propeller. When the propeller slows down the centrifugal force decreases and the flyweight moves towards the centre thereby the return spring overcomes the flyweight to lower down the pilot valve. Lowering the pilot valve opens the other port of the actuating cylinder to decrease the propeller blade angle to reduce resistance through the air to speed up the propeller back to **On Speed**.

Question 15(b)

Outline the procedure of carrying out each of the following non-destructive tests on aircraft parts;

- (i) magnetic particles
- (ii) dyepenetrant.

Part (b) of this question required the candidates to come up with two standard procedures of testing aircraft parts for defects.

Weaknesses

The main weakness displayed by the candidates in this question was that, although the candidates had a vague idea of what each non-destructive test entails, they could not outline the steps involved in the correct sequence. When a procedure is required, the order of each step outlined is very crucial because a test cannot yield the expected result from a wrong procedure. Teachers should ensure that a correct sequence is emphasized when carrying out any test.

Expected Responses

i) Magnetic Particles

- Clean the surface to be tested.
- Pass a heavy current through the part.
- Pour iron oxide or filings on the surface.
- Evaluate the concentration of iron oxide or filings.
- Clean off the filings.
- Demagnetise the part.

ii) Dyepenetrant

- Clean the surface to be tested.
- Apply the dyepenetrant.
- Rinse and dry the part.
- Apply a suitable developer.
- Evaluate the results.
- Clean off the developer.

17.3 PAPER 2 (450/2)

All the exercises in this practical paper were equally weighted in terms of allocation of marks and time and candidates were required to do all the 10 exercises.

Weaknesses

Some poor performance was observed particularly in the exercise where the following skills and knowledge were tested.

- Joining sheet metal by soft soldering.
- Connecting various electrical components to come up with a functional circuit.
- Taking correct measurements using various precision tools.
- Reading and interpreting accurately various precision tools.
- Identify various ground equipment and where each is connected in an aircraft.
- Interpreting correctly information inscribed on various aircraft components and parts.
- Presenting ideas by freehand sketching or scale drawing.

17.4 ADVICE TO TEACHERS

- 17.4.1 Teachers should ensure that the entire syllabus for aviation technology is covered and related practical exercises for each topic are provided for the students.
- 17.4.2 Students should be proactive in carrying out various experiments, inspecting and evaluating various aircraft components, setting and adjusting various parts of aircraft etc.
- 17.4.3 Practical skills require a lot of time and practice to master. Even a simple skill like soft soldering will require time and practice to master. Teachers should therefore ensure that their students get adequate time and guidance to enhance the required skills.
- 17.4.4 Related drawing should also be taken seriously and given the time it deserves for the students to be able to communicate effectively by drawing.
- 17.4.5 Teachers should also ensure that their students know aviation tools, parts, materials etc by the correct names. Correct handling of tools, parts and materials should not be overlooked.