

### 3.8 AVIATION TECHNOLOGY (450)

The 2021 KCSE examination for Aviation Technology consisted of two papers namely Paper 1 (Theory) and Paper 2 (Practical). The theory paper constituted 60% while the Practical constituted 40% of the final mark. The format and weighting of the papers was the same as that of the previous years.

#### 3.8.1 Candidates General Performance

The table below shows candidates' overall performance for the six-year period, from 2016 to 2021.

*Table 14: Candidates overall performance in the years 2016, 2017, 2018, 2019, 2020 and 2021*

Year	Paper	Candidature	Maximum scores	Mean Score	Standard Deviation
2016	1		60	31.07	7.85
	2		40	26.90	3.50
	<b>Overall</b>	<b>143</b>	<b>100</b>	<b>57.97</b>	<b>10.12</b>
2017	1		60	36.65	6.75
	2		40	26.81	3.43
	<b>Overall</b>	<b>101</b>	<b>100</b>	<b>63.47</b>	<b>8.89</b>
2018	1		60	36.17	6.28
	2		40	23.91	3.00
	<b>Overall</b>	<b>117</b>	<b>100</b>	<b>60.09</b>	<b>8.44</b>
2019	1		60	38.81	7.22
	2		40	23.15	3.21
	<b>Overall</b>	<b>176</b>	<b>100</b>	<b>57.96</b>	<b>9.22</b>
2020	1		60	33.78	8.89
	2		40	27.32	4.22
	<b>Overall</b>	<b>200</b>	<b>100</b>	<b>61.10</b>	<b>11.92</b>
2021	1		60	35.32	8.42
	2		40	25.52	4.52
	<b>Overall</b>	<b>200</b>	<b>100</b>	<b>60.80</b>	<b>11.63</b>

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

- (i) The candidature remained at 200 in the year 2021 just like it was in 2020.
- (ii) However, the mean score dropped slightly from 61.10 in 2020 to 60.80 in 2021.
- (iii) The standard deviation also dropped slightly from 11.92 in 2020 to 11.63 in 2021.

### 3.8.2 Aviation Technology Paper 1 (450/1)

The questions which were reported to have been poorly responded to have been analyzed with a view to pointing out candidates' weaknesses and propose suggestions on some remedial measures that should be taken in order to improve in future. The questions for discussions include 3, 4, 8 (a), 11, 12(a), 15 (a) and 15 (b).

#### Question 3

State four categories of the Kenyan airspace.

#### Weakness

Some candidates were not the categories of the Kenyan airspace.

#### Advice to teachers

Teachers are advised to adequately cover the syllabus including the Kenyan airspace.

#### Expected responses

- (i) Class A airspace  
All flights are provided with air traffic control service and are separated from each other (IFR only).
- (ii) Class B airspace  
All flights are permitted and are provided with air traffic control service and are separated from each other ( both IFR and VFR).
- (iii) Class C airspace  
All flights are permitted and are provided with air traffic control service and IFR flights are separated from other VFR flights.
- (iv) Class D airspace  
All flights are permitted and provided with air traffic control service. IFR flights are separated from other VFR flights.

#### Question 4

Highlight three advantages and three disadvantages of using composites as materials for aircraft construction.

#### Weaknessy

Most of the candidates could not give the advantages and disadvantages of composites as materials.

#### Advice to teachers

Teachers are advised to cover the syllabus more adequately including the materials used in aircraft construction.

### Expected responses

#### Advantages of composite materials

- i. High strength to weight ratio
- ii. Longer life than metals
- iii. High corrosion resistance
- iv. High tensile strength than steel or aluminium
- v. Easily repairable
- vi. Eliminates joints and fasteners

#### Disadvantages of composite materials

- i. Difficult to conduct inspections
- ii. Very expensive processing equipment
- iii. Product often toxic and hazardous
- iv. Lack of standardized methods of construction and repair
- v. General lack of repair knowledge and expertise
- vi. Expensive in cost as compared to metals

### Question 8 (a)

Explain the function of each of the following aircraft instruments:

- i. Machmeter
- ii. Turn and slip indicator
- iii. Artificial horizon

### Weakness

Most of the candidates could not explain the function of the aircraft instruments.

### Advice to teachers

Teachers are advised to do more coverage on aircraft instruments.

### Expected response

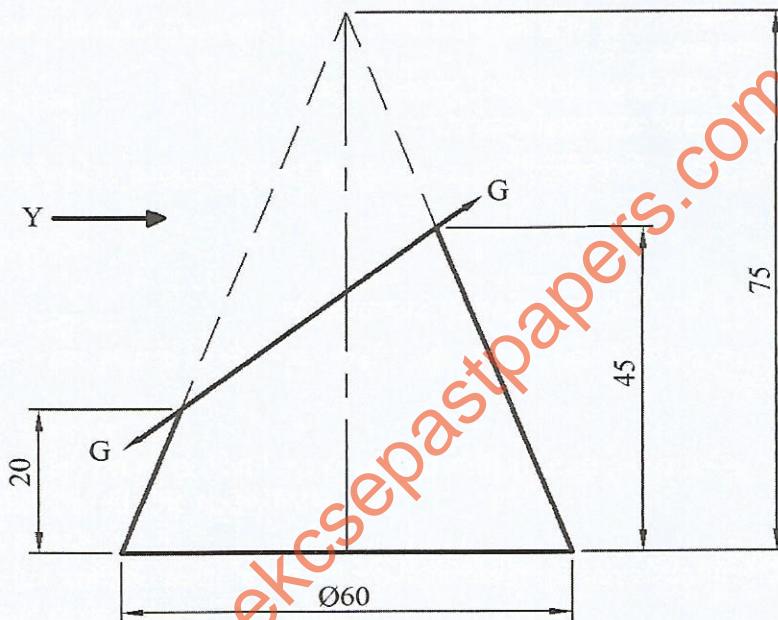
- i. Machmeter is used to indicate air speed in relation to the speed of sound
- ii. Turn and slip indicator is used to show the rate of turn of an aircraft in degrees per second.
- iii. Artificial horizon is used to indicate to the pilot the aircraft orientation relative to the earth's horizon and gives an immediate indication of the smallest orientation change.

### Question 11

**Figure 1** shows the front elevation of a truncated cone, cut along plane G–G. On the A3 paper provided, draw **full size** the following views in 1st angle projection:

- Front elevation
- End elevation in the direction of arrow Y
- Plan

(14 marks)



**Figure 1**

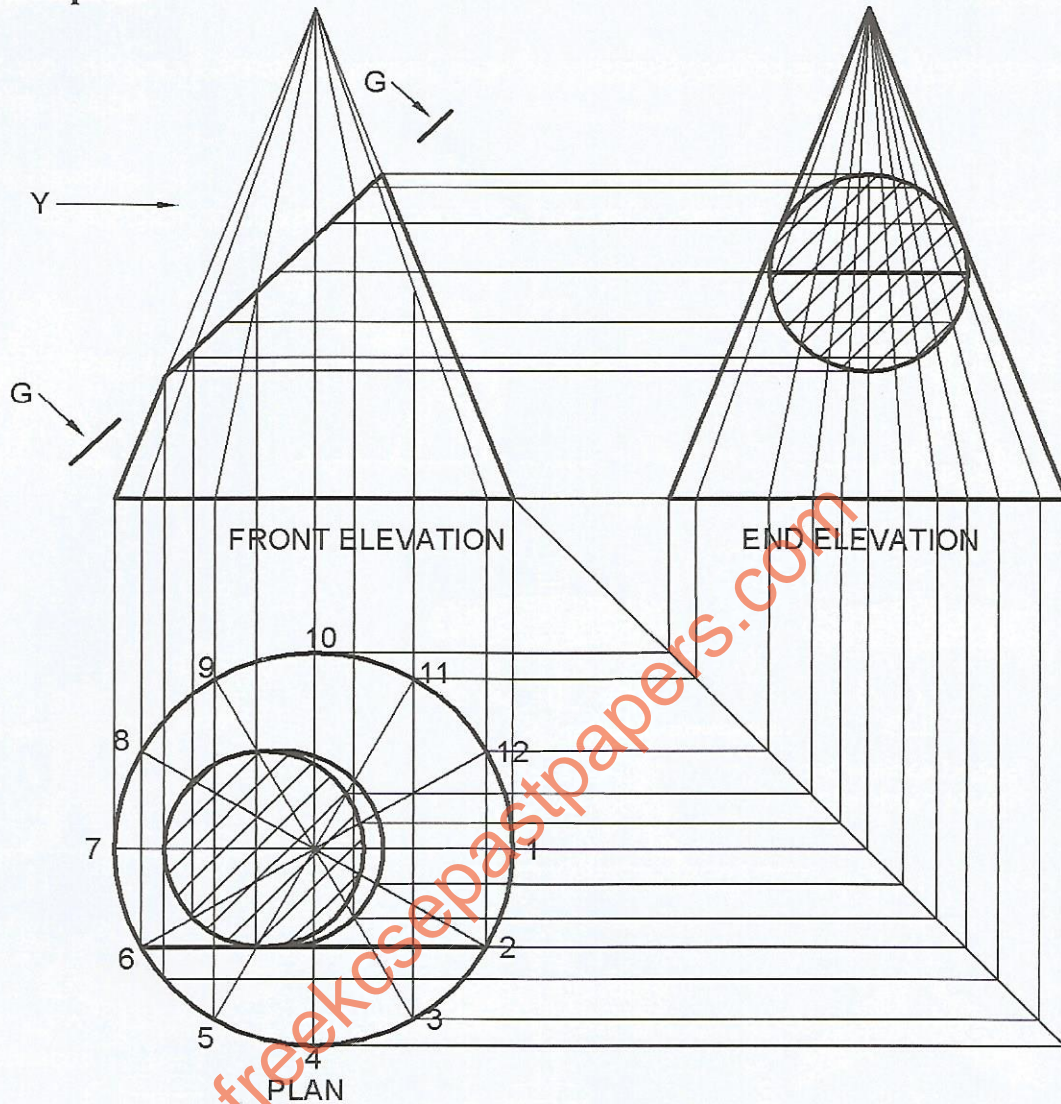
#### Weakness

Most of the candidates could not draw the views asked for in first angle projection but instead drew the development of the truncated solid.

#### Advice to teachers

Teachers are advised to give students more practice on drawing of solids in orthographic projection.

**Expected response**



- Copying the figure - 1 mark
- Drawing the plan - 1 mark
- Dividing plan into 12 divisions - 1 mark
- Complete projection of points from plan - 1 mark
- Projector from F points from FE to plan - 1 mark
- Plotting of points of transaction to plan - 1 mark
- Joining the points with a smooth curve - 1 mark
- Hatching the face which is cut - 1 mark

**8 marks**

- Projecting points from F.E. to E.E. - 1 mark
- Projecting points from F.E. plan to E.E. - 1 mark
- Joining points to obtain E.E. outline - 1 mark
- Plotting points to obtain the cut face - 1 mark
- Joining the points to obtain the cut face - 1 mark
- Hatching the cut face - 1 mark

**14 marks**

**Question 12 (a)**

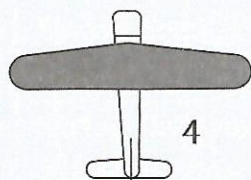
Use sketches to show six types of wing shapes used on various aircrafts.

**Weakness**

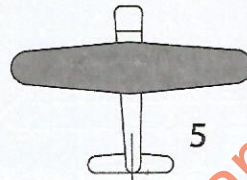
Some candidates were showing sketches of aircraft wing positions instead of wing shapes.

**Advice to teachers**

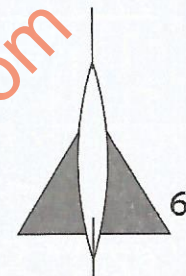
Teachers are advised to explain to the students the difference between wing shapes and wing positions of aircrafts.

**Expected response**

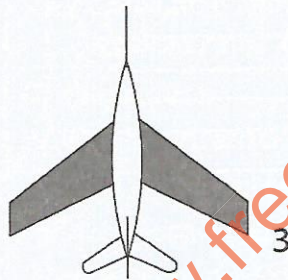
Tapered leading edge  
Straight trailing edge



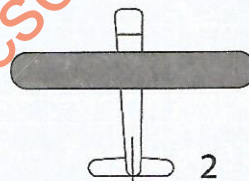
Tapered leading  
and trailing edge



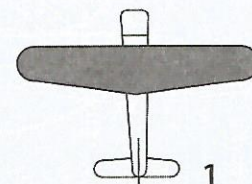
Delta wing



Swept back wing



Straight leading and  
trailing edges



Straight leading edge,  
tapered trailing edge

Sketching  $6 \times \frac{1}{2} = 3$  marks

Naming  $6 \times \frac{1}{2} = 3$  marks

TOTAL = 6 MARKS)

**Question 15 (a)**

With the aid of sketches, show each of the following marshalling hand signals at night

- (i) Hold/standby
- (ii) Stop engines
- (iii) Normal stop
- (iv) Turn left

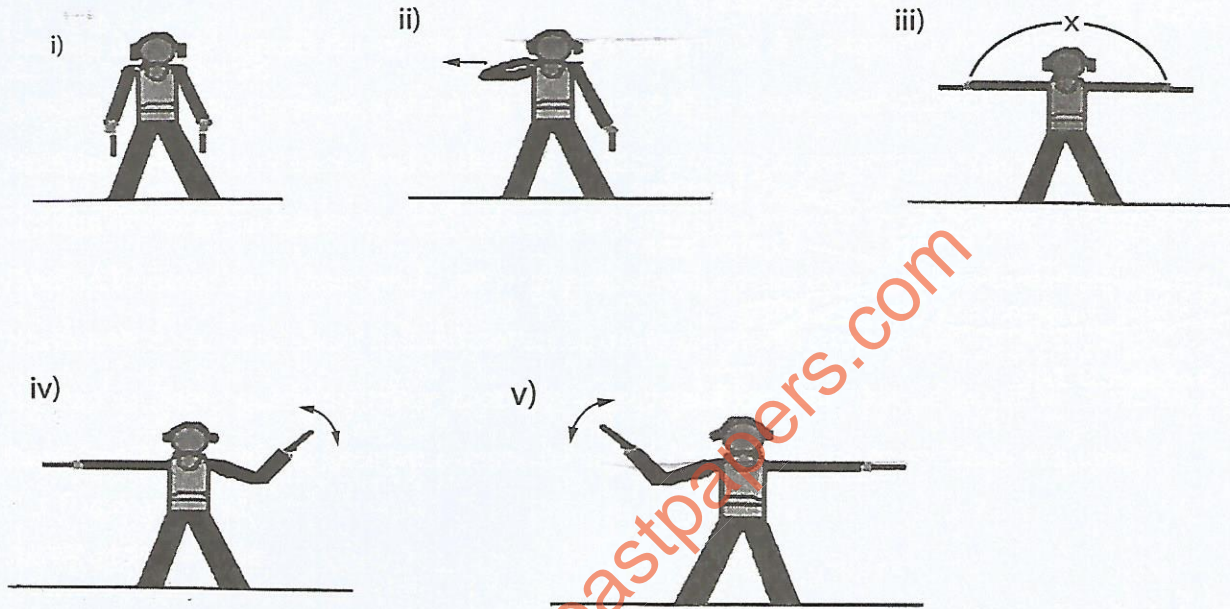
**Weakness**

Some candidates could not position the hands properly to show the signals.

### Advice to teachers

Teachers are advised to demonstrate to the students properly different hand signals as used in the marshalling process.

### Expected response



### Question 15 (b)

With the aid of sketches, differentiate between the trim tab and balance tab as applied to aircraft control surfaces

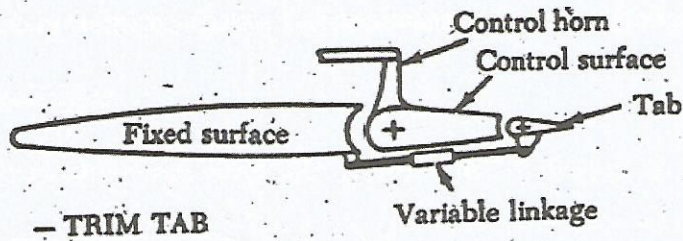
### Weakness

Some candidates were not able to sketch properly the tabs to differentiate between the trim and balance tab.

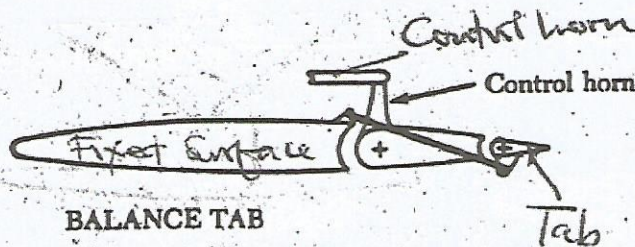
### Advice to teachers

Teachers are advised to explain to the students the difference between different tabs and use sketches for the students to understand properly.

### Expected response



Sketch 1 x = 1 mark  
labelling any 3 x ½



Sketch 1 x = 1 mark  
labelling any 3 x ½

### 3.8.3 Aviation Technology Paper 2 (450/2)

This practical paper comprised of 10 equally weighted exercises which were compulsory. The various practical skills tested in this paper included the following:

- Sketching the pictorial view of the assembly of a piston and a connecting rod.
- Using the tools, equipment and materials provided to fabricate an aircraft engine exhaust duct.
- Identification of parts of a crankshaft, then measuring the size of different compartments.
- Painting parts of an aircraft and stating the observation made.
- Measuring the specific gravity across of the cells in a battery provided.
- Using a spring balance with different loads to establish Newton's law of motion.
- Using water and syringes to establish how the law of hydraulic pressure is used in aircrafts.
- Demonstration of the procedure of replacing piston rings.
- Demonstration of performing mouth to mouth respiration in case of an electric shock
- Cutting and bending of different material to establish their application in aircrafts.



## Weaknesses

Although the overall performance was good, some weaknesses were noted in most of the questions as discussed below.

**Station 1:** Some students could not sketch the part labelled A in pictorial.

**Station 2:** Some candidates could not undertake the task of fabrication with the details provided

**Station 3:** Some candidates seemed not to be familiar with the parts of a crankshaft.

**Station 4:** Some candidates were not able to record the correct observations.

**Station 5:** Some candidates had difficulties in taking the measurements as required.

**Station 6:** Some candidates had difficulties in setting up the experiment and taking readings as required

**Station 7:** Some candidates made the wrong observations due to poor set up of the experiment.

**Station 8:** Some candidates had difficulties in using the piston ring remover and expander.

**Station 9:** Some candidates were unable to demonstrate the procedure of mouth to mouth respiration

**Station 10:** Some candidates were unable to cut and bend different materials as required.

## Advice to Teachers

Schools offering the subject are advised to source for aircraft instruments from grounded aircrafts in the airstrips and airports within their locality for learning purposes. They should also purchase materials required for practice.

Teachers should ensure they cover the syllabus fully with more emphasis in the following:

- Give students practicals exercises in drawing to improve in the skill of drawing.
- Involve students in practicals which involve fabrication.
- Use realia to explain parts of the aircraft and involve students in practicals.
- Give students practicals on parts of the aircraft.
- Involve students in practicals on measurements of specific gravity.
- Give students adequate practicals to be familiar with how to carry out experiments
- Carry out more experiments related to the aircraft system.
- Involve students in practicals on first aid.
- Enable students to carry out practicals in cutting and bending of materials.