

Θέμα 10^ο

Aircraft Electrical Systems II

Word Study 1 – Quiz

Combine and circle the letters in the table so as to form thirteen words. The words can appear vertically, horizontally, or diagonally. One of them has been done for you.



A	M	P	E	R	A	G	E
M	O	L	F	L	P	A	M
M	N	A	I	U	O	U	L
E	I	C	W	M	S	G	I
T	T	A	S	P	I	E	G
E	O	R	E	S	E	T	H
R	R	D	I	R	E	C	T
C	U	R	R	E	N	T	W

1. LIGHT
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.

Word Study 2

Connect the initial letters below with their appropriate counterparts in the box to form the correct terms. The first one has been done for you.

1. sw- *itch*

2. ig-...

3. la-...

4. in-...

5. st-...

6. ch-...

7. ca-...

8. co-...

9. wi-...

-itch	-capacity	-all	-nition	-nding
-strument	-ring	-mponent	-arge	—

Word Study 3

Match the terms on the left with their definitions on the right.

1. depleted (battery)	a. The electrical energy, measured in watts, delivered by any electric device.
2. regulator	b. An instrument used to indicate the level of fuel contained in a tank.
3. rectifier	c. A device that transfers electric energy from one AC circuit to one or more other circuits, either increasing (stepping up) or reducing (stepping down) the voltage.
4. inverter	d. A device, such as a diode, that converts AC to direct DC.
5. turn indicator	e. A set of lights located on the aircraft used to signal its position, heading, and status and to aid in collision avoidance.
6. circuit (electr.)	f. An electrical converter that converts DC into AC.
7. transformer	g. A closed path followed or capable of being followed by an electric current.
8. fuel gauge	h. A device used to control the flow of gases, liquids, or electric current.
9. anti-collision lights	i. A flight instrument that indicates the angular rate of turn of an aircraft about its vertical axis.
10. output (electr.)	j. Wholly or partly empty.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
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Reading 1 – Introduction to Electrical DC Circuits (ΜΕΤΑΦΡΑΣΗ)

a. Read the text below and decide whether the following statements are true (T) or false (F).

1. The electricity moving through a wire consists of its voltage, friction and resistance.
2. The tungsten filament in a light bulb not only does it conduct electricity, but has low resistance as well.
3. A DC circuit is necessary for DC electricity to exist.
4. A battery is used to provide alternating current (AC) electricity.
5. Electricity flows in a loop from one end of the battery to the other in a circuit.

A direct current (DC) electrical circuit consists of a source of DC electricity with a conducting wire going from one of the source terminals to a set of electrical devices and then back to the other terminal, in a complete circuit. A DC circuit is necessary for DC electricity to exist. DC circuits may be in series, parallel or a combination. Understanding DC circuits is important for learning about the more complex alternating-current (AC) circuits, like those used in the home.

If you take a continuous source of DC electricity, such as a battery, and connect conducting wires from the positive and negative poles of the battery to an electrical device such as a light bulb, you have formed an electric circuit.

In other words, the electricity flows in a loop from one end of the battery (or source of electricity) to the other end in a circuit. The concept of electric circuits is the basis for our use of electricity.

One nice feature of an electrical circuit is that you can install a switch in the circuit to turn the power on or off when you want.

A DC circuit requires a source of power. Typically, a battery is used to provide continuous DC electricity. A DC generator is another source of energy. Alternating current electricity can be modified through a rectifier or adapter to create DC electricity. The common adapter used for some of your small DC-powered devices will transform 110V AC house current into 12V DC current for your device.

The electricity moving through a wire or other conductor consists of its voltage (V), current (I) and resistance (R). The voltage or potential energy of a source of electricity is measured in Volts. The current or amount of electrons flowing through the wire is measured in Amperes or Amps. The resistance or electrical friction is measured in Ohms.

The wire and electrical devices must be able to conduct electricity. Metal such as copper is a good conductor of electricity and has a low resistance. The tungsten filament in a light bulb conducts electricity, but it has high resistance that causes it to heat up and glow.

b. Read the text again and continue the sentences.

1. **a.** Volts measure
- b.** Amperes (or Amps) measure
- c.** Ohms measure
2. If you want to turn the power on and off in an electrical circuit, you can
.....
3. DC circuits may be in series,
4. A good conductor of electricity such as copper has
5. Alternating current (AC electricity) can be modified through a
6. The concept of electric circuits is the basis

Word Study 4

Match the terms on the left with their definitions on the right.

1. maintain	a. Opposition that a material or electrical circuit offers to the flow of electric current.
2. current	b. The rotating member of a machine or device, especially the armature of a motor or generator.
3. rotor	c. Keep in proper or good condition.
4. transformer-rectifier	d. Lighting for illuminating the runway or taxiway when the aircraft is on the ground.
5. generator	e. A safety device that protects an electric circuit from becoming overloaded.
6. battery	f. An instrument for indicating the amount of current being consumed.
7. fuse	g. A device which stores electrical energy.
8. resistance	h. Flow of electricity through a circuit.
9. taxi lights	i. A combination of two electrical devices that allows input AC to be varied and then rectified into DC.
10. load meter	j. An engine-driven device for producing electricity.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
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Vocabulary Review – Series and Parallel DC Circuits

Fill in the gaps of the following text using the words below.

resistor	bulbs	wiring	parallel	appliances
schematic	motor	circuit	series	switch

Series DC circuit

In an electrical **1.**, several electrical devices such as light bulbs can be placed in a line or in series in the circuit between the positive and negative poles of the battery. This is called a series circuit. One problem with such an arrangement is if one light bulb burns out, then it acts like a **2.** and turns off the whole circuit. Every device in a DC circuit -whether a light bulb or electric **3.**- can be represented by an electrical resistance or **4.** Usually, when drawing a circuit diagram or **5.**, you use certain symbols for the battery and resistors.

Parallel DC circuit

Devices can also be arranged in a parallel configuration, such that if any **6.** go out, the circuit is still intact. Not only is a parallel circuit useful for holiday lighting, but it is also useful for the electrical **7.** in homes. In this way lights and **8.** can be turned on and off at will. Otherwise if you turned one light off -or one burned out- all the other lights in the house would go off too. If either light bulb would go out, the other would still shine. You could add other bulbs or even appliances such as electric motors in **9.** to this circuit, and they would remain independent of each other. You could also replace a bulb with a series circuit of bulbs or add bulbs or devices in **10.** between parallel items. There are many combinations possible.



A basic electric circuit, with switch, battery, and lamp

Reading 2 – Electrical Power System Components and their Functions (ΜΕΤΑΦΡΑΣΗ)

a. Match the terms on the left with their definitions on the right.

1. conductor	a. A metal ring mounted on a rotating part of a machine to provide a continuous electrical connection through brushes on stationary contacts.
2. actuate	b. Supply with something essential for operation.
3. slip ring	c. The stationary part of a rotary machine or device, especially of a motor or generator.
4. polyphase	d. A unit consisting of components that have been fitted together.
5. assembly	e. A substance or medium that conducts an electric charge.
6. stator	f. Put into action or mechanical motion.
7. feed	g. Having, generating, or using two or more alternating voltages of the same frequency, the phases of which are cyclically displaced by fractions of a period.

1.	2.	3.	4.	5.	6.	7.
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1- AC Generator: A machine used to change mechanical energy into electrical energy. It operates on the principle of electromagnetic induction. When a conductor passes through a magnetic field, a voltage is induced across the ends of the conductor. The generator is simply a mechanical arrangement for moving the conductor and leading the current produced by the voltage to an external circuit, where it actuates devices that require electricity. In the simplest form of generator the conductor is an open coil of wire rotating between the poles of a permanent magnet. During a single rotation, one side of the coil passes through the magnetic field first in one direction and then in the other, so that the induced current is alternating current (AC), moving first in one direction, then in the other. Each end of the coil is attached to a separate metal slip ring that rotates with the coil. Brushes that rest on the slip rings are attached to the external circuit. Thus the current flows from the coil to the slip rings, then through the brushes to the external circuit. In any generator, the whole assembly carrying the coils is called the armature, or rotor, while the stationary parts constitute the stator. An AC generator is called an alternator. To ease various construction problems, alternators have a stationary armature and rotating electromagnets. Most alternators produce a polyphase AC, a complex type of current that provides a smoother power flow than does simple AC.

2- Constant Speed Drive: The purpose of the Constant Speed Drive (CSD) is to take rotational power from the engine and, no matter the engine speed, turn the generator at a constant speed. This is necessary because the generator output must be 400Hz.

CSD Operation: The engine turns the CSD which uses a differential assembly and hydraulic pumps to turn the generator.

3- Integrated Drive Generator: Another method of regulating the generator speed is with the use of an Integrated Drive Generator (IDG). An IDG is simply a CSD and generator combined into one unit.

4- Transformer Rectifier Unit: Transformer Rectifier Units (TRUs) are utilized to 115 VAC, 400Hz into 28 VDC. A transformer is used to reduce the voltage from 115 volts to 28 volts. At this point the 28 volts is still AC current. To change the current from AC to DC, a rectifier is used. Each aircraft AC bus feeds a TRU which feeds a DC bus.

5- Generator Control Unit: A Generator Control Unit (GCU), or voltage regulator, is used to control generator output.

Function of System Components

The basic functions of the electrical system's components are to:

- | | |
|-----------------------------------|---|
| a. Generate power. | b. Control electrical power. |
| c. Protect the electrical system. | d. Distribute electrical power throughout the aircraft. |

b. Find terms in the text to complete the following definitions.

1. A(n) refers to an electric conductor, especially one made of carbon, that conveys current between stationary and rotating parts of a generator, motor, etc.
2. A variable output hydraulic pump driving a hydraulic motor, which, in turn, drives the generator is called a
3. A(n) is a central part of a machinery that controls its operation.
4. A point where electric or magnetic force appears to be concentrated is called a(n)