

Θέμα 2^ο

Aircraft Electrical Systems II

Pre-reading Activity

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

1. bus bar	a. A fitting connected to a power supply and equipped to receive a plug.
2. circuit breaker	b. An instrument for measuring the rate of flow of electricity, usually expressed in amperes.
3. output	c. Flashing lights fitted on the vertical fin and belly of an aircraft to increase its visibility to other aircraft.
4. ammeter	d. A protective device that opens a circuit upon sensing a current overload. Unlike a fuse, it can be reset.
5. receptacle	e. A thick strip of copper or aluminum that conducts electricity within a switchboard, distribution board, substation or other electrical apparatus.
6. anti-collision lights	f. The power, voltage, or current delivered by a circuit or component.

1. 2. 3. 4. 5. 6.

b. Complete the following statements. Use information learned, as well as background knowledge.

1. A basic airplane electrical system consists of
.....
2. Aircraft batteries provide
.....
3. Equipment that uses the electrical system for its source of energy generally includes
.....

Reading 1 (ΜΕΤΑΦΡΑΣΗ)

Now read the text below and check your answers to the Pre-reading Activity.

Basic Airplane Electrical System Components, a Brief Analysis – Part I

Airplanes are equipped with either a 14- or 28-volt direct-current electrical system. A basic airplane electrical system consists of the following components:

- a) **Alternator/generator.**
- b) **Battery.**
- c) **Master/battery switch.**
- d) **Alternator/generator switch.**
- e) **Bus bar, fuses, and circuit breakers.**
- f) **Voltage regulator.**
- g) **Ammeter/load-meter.**
- h) Associated electrical **wiring.**

Engine-driven alternators or generators supply electric current to the electrical system. They also maintain a sufficient electrical charge in the battery. Electrical energy stored in a battery provides a source of electrical power for starting the engine and a limited supply of electrical power for use in the event the alternator or generator fails.

Most direct current generators will not produce a sufficient amount of electrical current at low engine r.p.m.¹ to operate the entire electrical system. Therefore, during operations at low engine r.p.m., the electrical needs must be drawn from the battery, which can quickly be depleted.

Alternators have several advantages over generators. Alternators produce sufficient current to operate the entire

electrical system, even at slower engine speeds, by producing alternating current, which is converted to direct current. The **electrical output** of an alternator is more constant throughout a wide range of engine speeds.

Some airplanes have **receptacles** to which an external ground power unit (GPU) may be connected to provide electrical energy for starting. These are very useful, especially during cold weather starting. The electrical system is turned on or off with a **master switch**. Turning the master switch to the ON position provides electrical energy to all the electrical equipment circuits with the exception of

“Engine-driven alternators or generators supply electric current to the electrical system.”

the **ignition system**. Equipment that commonly uses the electrical system for its source of energy includes:

- a) **Position lights.**
- b) **Anti-collision lights.**
- c) **Landing lights.**
- d) **Taxi lights.**
- e) **Interior cabin lights.**
- f) **Instrument lights.**
- g) **Radio equipment.**
- h) **Turn indicator.**
- i) **Fuel gauges.**
- j) **Electric fuel pump.**
- k) **Stall warning system.**
- l) **Pitot heat.**
- m) **Starting motor.**

¹ *Revolutions (or rotations) per minute.*

Reading Activity 1 – Comprehension Questions

Read the text again and answer the following questions.

1. According to the text, what are the advantages of alternators over generators?
2. What are the receptacles used for?
3. What is the function of the master switch?
4. How many kinds of aircraft lights are mentioned in the text? Name these aircraft lights.

Reading Activity 2 – Photo Identification

Match the aircraft electrical system components pictured below with the appropriate labels provided in the box. Note that there are more labels than required.

Interior cabin lights	Aircraft fuses	Aircraft alternator	Taxi light
Aircraft switches	Digital ammeter	Electric fuel pump	DC starter-generator



1.



2.



3.



4.



5.



6.

Word Study

Read the text on page 2 again and choose the words in bold that mean the following.

1. is a heating element that prevents the pitot tube from becoming clogged with ice during flight.
2. An indicator of the amount of fuel remaining is called a
3. A(n) is a device that controls or maintains the voltage of an electrical circuit.
4. A(n) is a set of devices for detecting the onset of a stall and warn the pilot.
5. The refers to the means used in an internal combustion engine for initiating the chemical reaction between fuel and air in the cylinder charge by producing a spark.

Vocabulary Review – Load-Meter and Voltage Regulator

Skim the passage quickly and select the appropriate word for each blank from the choices provided in the box.

Two other electrical system components are the load-meter and the voltage regulator.

The load-meter is an electrical monitoring indicator. This type of ...(1)... has a scale beginning with ...(2)... and shows the load being placed on the alternator / generator. The load-meter ...(3)... the total percentage of the load placed on the generating capacity of the electrical system by the electrical accessories and ...(4)... When all electrical components are ...(5)... it reflects only the amount of charging ...(6)... demanded by the battery.

The voltage regulator controls the rate of ...(7)... to the battery by stabilizing the generator or alternator electrical ...(8)... The generator / alternator voltage output should be ...(9)... than the battery voltage. For example, a 12-volt battery would be fed by a generator/alternator system of approximately 14 volts. The ...(10)... in voltage keeps the battery charged.

- | | | |
|-----|--------------------|---------------|
| 1. | a. gauge | b. switch |
| | c. button | |
| 2. | a. ten | b. one |
| | c. zero | |
| 3. | a. controls | b. reflects |
| | c. monitors | |
| 4. | a. circuit breaker | |
| | b. battery | c. wiring |
| 5. | a. turned on | b. turned in |
| | c. turned off | |
| 6. | a. regulator | b. capacity |
| | c. current | |
| 7. | a. charge | b. liquid |
| | c. speed | |
| 8. | a. input | b. amount |
| | c. output | |
| 9. | a. higher | b. lower |
| | c. poorer | |
| 10. | a. distinction | b. difference |
| | c. similarity | |

Pre-reading Activity

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

1. install	a. To protect from loss or harm; to use carefully or sparingly, avoiding waste.
2. deflection	b. The strength of an electric current expressed in amperes.
3. malfunction	c. A notice placed in plain sight of the appropriate aircrew that gives information, usually regarding aircraft operation.
4. placard	d. To place (machinery, equipment, etc.) in position and connect and adjust for use.
5. amperage	e. The deviation of an indicator of a measuring instrument from zero or from its normal position.
6. conserve	f. A faulty performance or a faulty process.

1.	2.	3.	4.	5.	6.
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Reading 2 (ΜΕΤΑΦΡΑΣΗ)

Now read the text below and check your answers.

Basic Airplane Electrical System Components, a Brief Analysis – Part II

Many airplanes are equipped with a battery switch that controls the electrical power to the airplane in a manner similar to the master switch. In addition, an alternator switch is installed which permits the pilot to exclude the alternator from the electrical system in the event of alternator failure. With the alternator switch in the OFF position, the entire electrical load is placed on the battery. Therefore, all non-essential electrical equipment should be turned off to conserve battery power.

“Fuses or circuit breakers are used in the electrical system to protect the circuits and equipment from electrical overload.”

Spare fuses of the proper amperage limit should be carried in the airplane to replace defective or blown fuses. Circuit breakers have the same function as a fuse but can be manually reset, rather than replaced, if an overload condition occurs in the electrical system.

A bus bar is used as a terminal in the airplane electrical system to connect the main electrical system to the equipment

Placards at the fuse or circuit breaker panel identify the circuit by name and show the amperage limit.

An ammeter is used to **monitor** the performance of the airplane electrical system. The ammeter shows if the alternator/generator is producing an adequate supply of electrical power. It also indicates whether or not the battery is receiving an electrical charge.

Ammeters are designed with the zero point in the center of the face and a negative or positive indication on either side. When the **pointer** of the ammeter on the left is on the plus side, it shows the charging rate of the battery.

A minus indication means more current is being drawn from the battery than is being replaced. A full-scale minus **deflection** indicates a **malfunction** of the alternator/generator. A full-scale positive deflection indicates a malfunction of the regulator. Not all airplanes are equipped with an ammeter. Some have a warning light that, when lighted, indicates a **discharge** in the system as a generator/alternator malfunction.

Reading Activity 1 – Comprehension Questions

Read the text again and answer the following questions.

1. What is a bus bar used as?
2. What are fuses and circuit breakers used for?
3. What is the function of the ammeter?
4. According to the text, how is a malfunction of the alternator/generator indicated?
5. What does a full scale deflection of the ammeter show?

Word Study 1

Rearrange the bold capital letters to form words which appropriately complete the statements below. The first one has been done for you.

Example:

1. One important aspect of aircraft electrical systems is **FAILURE** detection. Computer monitoring systems have been developed for the evaluation of electrical equipment on aircraft systems. (UFALIER)
2. Lightning strikes and electrostatic are two of the leading causes of reported weather-related aircraft accidents and incidents. (SCHARGIDES)

3. A competent aircraft maintenance technician must be able to repair or replace engine parts as well as to reassemble and install the engine.
(EFFECTED)
4. There are several companies specialized in the supply of aircraft parts and accessories to fulfill industry needs.
(SAPER)
5. Fuses or circuit breakers are used in the electrical system to protect the circuits and equipment from electrical
(ROADLOVE)

Word Study 2

Circle the answer choices that best complete the following statements.

1. Most small aircraft are a 28 volt direct current electrical system.
a. consisted of b. equipped with c. involved with
2. In many airplanes, an alternator switch is installed which permits the pilot to the alternator from the electrical system in the event of alternator failure.
a. exclude b. include c. motivate
3. An aircraft electrical power/data distribution is designed to minimize and electrical wiring on aircraft and its installation effort.
a. complicate b. confuse c. simplify
4. Aircraft power systems generate, regulate and power throughout an aircraft.
a. attribute b. distribute c. delay
5. Circuit breakers have the same function as a fuse but can be manually, rather than replaced, if an overload condition occurs in the electrical system.
a. reset b. inset c. preset
6. Large commercial and military aircraft are equipped with numerous sensing systems which constantly the condition of the aircraft.
a. overlook b. discard c. monitor