

# UNIT SPECIFIC FOR FIXED-WING REPLENISHMENT CARGO (VRC) Enlisted Aviation Warfare Specialist (EAWS) Tutorial



Welcome to the C-2 Specific PQS questions and answers. This study guide was designed to aid instructors and students alike. All of the questions were answered from instructions and directives found in NAVEDTRA 43902-17, Personnel Qualification Standard (PQS), Enlisted Aviation Warfare Specialist (EAWS), Unit Specific Fixed-wing Replenishment Cargo(VRC). All study information were provided by AMS1(NAC) Starr.

**Good luck and study hard!**

**ENLISTED AVIATION WARFARE SPECIALIST  
(EAWS), UNIT SPECIFIC FOR FIXED-WING  
REPLENISHMENT CARGO (VRC)**

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# 101: Safety Fundamentals

## 101.1 Discuss the basic requirements for each of the following Navy Occupational Safety and Health NAVOSH Programs:

**a. Respiratory Protection** - Many of the repair and maintenance activities performed at naval facilities generate air contaminants which can be dangerous, if inhaled. The best means of protecting personnel from exposure to such potentially hazardous materials is through the use of accepted engineering control measures, such as local exhaust ventilation. However, the use of engineering control measures may not always be technologically or economically feasible, due to the nature and location of the activities. In these situations, appropriate respiratory protection shall be used to ensure personnel protection.

Whenever respiratory protection is required, a respiratory protection program shall be established and maintained per the requirements of this chapter and reference 15-2. A trained Respiratory Protection Program Manager (RPPM) shall be appointed in writing, by the commanding officer or officer in charge. The RPPM shall be responsible for implementing program requirements. Minimum RPPM training requirements are contained in Section 1512.

Respirator Use for Documented Health Hazards. Command programs shall only permit the issuance of respiratory protection for the following personnel:

- (1) Workers in areas known to have contaminant levels requiring the use of respiratory protection or in which contaminant levels requiring the use of respiratory protection may be created without warning (e.g., emergency purposes such as hazardous material spill responses).
- (2) Workers performing operations documented to be health hazardous and those unavoidably required to be in the immediate vicinity where similar levels of contaminate are generated.
- (3) Workers in suspect areas or performing operations suspected of being health hazardous but for which adequate sampling data has not been obtained.
- (4) Systems Command technical manuals sometimes list respirators as required PPE for use. These manuals are written for the worst case scenario, and respirators shall be used as recommended by the RPPM.

Types of Respirators: The three basic types of respirators are the air purifying, supplied-air, and self-contained breathing apparatuses are sometime grouped together as atmospheric supplying respirators.

## **b. Hearing Conservation**

Historically, noise exposure has been recognized as an occupational hazard related to certain trades such as blacksmithing and boilermaking. Modern technology has extended the risk to many other activities, such as using presses, forging hammers, grinders, saws, internal combustion engines, saws, internal combustion engines, or similar high speed, high-energy processes.

Exposure to high intensity noise occurs as a result of either impulse or blast noise (i.e., gunfire, rocket fire, etc.) or from continuous or intermittent sounds such as jet or propeller aircraft, marine engines, and a myriad of noise sources in industrial activities.

The proliferation and power of modern naval weapons and propulsion systems produces intense hazardous noise environments. In such environments, Navy personnel must hear well enough for adequate communication without falling victim to the acoustic danger of the powerful systems they operate. Noise control and hearing conservation measures contribute to operational readiness by preserving and optimizing auditory fitness for duty in Navy personnel.

Hearing loss has been and continues to be a source of concern within the Navy, both ashore and afloat. Hearing loss attributed to occupational exposure to hazardous noise, the high cost of related compensation claims, and the resulting drop in productivity and efficiency have highlighted a significant problem which requires considerable attention.

Introduction. The goal of the Navy Hearing Conservation Program is to prevent occupational hearing loss and ensure auditory fitness for duty in the military and civilian workforce. The program includes the following:

Work environments shall be surveyed to identify potentially hazardous noise levels and personnel at risk.

Environments that contain or equipment that produces potentially hazardous noise shall, whenever it is technologically and economically feasible, be modified to reduce the noise level to acceptable levels. Reduction of noise at the source is in the best interest of the Navy and its personnel. Section 1803 of this chapter provides specific guidance on noise abatement. The use of personal hearing protective devices to limit noise exposure is considered to be an interim protective measure while engineering control methods are being implemented. Where engineering controls are not feasible, administrative controls and/or the use of hearing protective devices shall be employed.

Periodic hearing testing shall be conducted to monitor the effectiveness of the hearing conservation program. Early detection of temporary threshold shifts allows further protective action to be taken before Permanent hearing loss occurs. Follow-up evaluation shall be provided to ensure appropriate referral, treatment, and early return to duty.

Education of individuals exposed to hazardous noise, their supervisors, and people providing hearing conservation services (i.e. training, monitoring, hearing protection, etc.) to these individuals is vital to the overall success of a hearing conservation program. An understanding of the permanent nature of noise-induced hearing loss, its negative effects on operational readiness and individual fitness for duty, the command's hearing conservation program, and the individual's responsibilities under the program are all essential for Program effectiveness. Also, all Navy employees shall be encouraged to use hearing Protective devices when they are exposed to hazardous noise during off-duty activities, e.g., from lawn mowers, chain saws, firearms, etc.

### **c. Sight Conservation**

Navy Policy requires that Navy personnel exposed to eye hazardous areas or operations be provided adequate eye protection at government expense. Employees Shall be required to wear appropriate eye protective equipment when performing eye hazardous operations such as:

1. Pouring or handling molten metals of corrosive liquids and solids
2. Cutting and welding
3. Drilling
4. Grinding
5. Milling
6. Chipping
7. Sand blasting or other dust producing operations.

Any persons entering a Posted eye hazard area, including other workers, supervisors, or visitors shall also be required to wear eye protective equipment. All Navy activities with personnel exposed to eye hazardous operations shall implement a sight conservation program per the guidance established in this chapter. The activity sight conservation program shall include, but not be limited to, the following program elements:

1. Identification and evaluation of eye hazardous areas, processes, and occupations.
2. An employee vision screening program.
3. Effective equipment maintenance program.
4. AN effective employee training, promotion and emphasis program.
5. Effective program enforcement.

In order to establish a sight conservation program, eye hazardous exposures including areas, occupations, equipment, and processes shall be identified and appropriate controls implemented. Survey. A complete survey (hazard assessment) of all activity work areas, equipment, and processes shall be conducted to determine which are eye hazardous, which personnel require eye protection, and the type of eye protection required. In addition to the common eye hazards, such as flying objects resulting from certain cutting and drilling operations, the survey shall also consider the eye hazards associated with exposures to various forms of electromagnetic radiation (e.g., laser, ultra-violet, infrared, and microwave radiation). The hazard assessment may be a part of the workplace inspection program outlined in Chapter 9. The activity occupational safety and health (OSH) manager shall maintain a list of all areas, processes, and occupations that require eye protection.

To meet OSHA requirements in reference 19-3, the following additional action is required:

There shall be written certification that the hazard assessment has been made; The written certification shall identify the name of the person making the certification; The date of the hazard assessment shall be included on the certification document; The certification document shall clearly be identified as such.

All areas designated, as eye hazardous shall be posted with an appropriate warning sign. Such signs shall be consistent with the requirements of reference 19-4 and shall be located at all entrances to designated areas, as practicable.

### **Emergency Eyewash Facilities.**

Emergency eyewash facilities meeting the requirements of reference 19-5 shall be Provided in all areas where the eyes of any employee may be exposed to corrosive materials. All such emergency facilities shall be located where they are easily accessible to those in need. Plumbed eyewash units shall be activated weekly, for a minimum of 3 minutes, to flush the line and to verify proper operation. Pressurized and non-pressurized self-contained eyewash self contained eyewash units be serviced quarterly or per the manufacturer's recommendations, whichever is less. Quarterly maintenance shall include cleaning of the unit, replacement of water, and checking for proper operation. Where an additive is used in a self-contained eyewash unit, the type of additive chosen shall be per the recommendations of the eyewash manufacturer, and the periodicity of changing the fluid shall be per the recommendation of the manufacturer of the additive. A written, dated, and signed maintenance record shall be maintained.

All personnel exposed to eye hazardous processes or operations shall be scheduled for sight screening examination at the cognizant Navy or government medical treatment activity, or where such Navy or government support is not available, at an appropriate local vision screening organization prior to assignment and annually thereafter.

### **d. Personnel Protective Equipment**

Under the requirements of Chapter 5 (Prevention and Control of Workplace Hazards), engineering controls shall be the primary methods used to eliminate or minimize hazard exposure in the workplace. When such controls are not practicable, personal protective equipment (PPE) shall be employed to reduce or eliminate personnel exposure to hazards. However, PPE is not a desirable substitute for administrative or engineering controls.

It is Navy policy that PPE be provided, used, and maintained when competent authority has determined that its use is required and that such use will lessen the likelihood of occupational injuries and/or illnesses. Activities shall provide necessary protective equipment where there is a reasonable probability that the use of the equipment will prevent or reduce the severity of injuries or illnesses. PPE procurement and enforcement of proper use and maintenance is the responsibility of the activity.

It must be recognized that personal protective devices do nothing to reduce or eliminate the hazard itself. They merely establish a last line of defense, and any equipment breakdown, failure, or misuse immediately exposes the worker to the hazard. Many protective devices, through misapplication or improper maintenance, can become ineffective without the knowledge of the wearer and can have potentially serious consequences. For this reason, proper equipment selection, maintenance, employee training and mandatory enforcement of equipment use are key elements of an effective PPE program.

Each activity shall assess all workplaces to determine if hazards are present that necessitates the use of PPE. If such hazards are present, or likely to be present, the following actions shall be accomplished: a. Select and have each affected employee use the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment. b. Communicate selection decisions to each affected employee. c. Verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated; the person certifying that the evaluation has been performed; the date(s) of the hazard assessment; and which identifies the document as a certification of hazard assessment.

### **Eye and Face Protection**

Approved eye and face protection shall be worn when there is a reasonable probability that wearing such equipment can prevent an injury. Eye protection shall be worn at all times in a designated eye hazard area. Eye and/or face injury can be caused by flying particles and chips; splashes from liquids such as acids, caustics, and solvents; operations that generate hot slag or molten metal, welding glare; etc. The activity is responsible for providing the required approved protective equipment and enforcing its use.

## **Respiratory Protection**

Respiratory hazards may occur through exposure to harmful dusts, fogs, fumes, mists, gases, smoke, sprays, and vapors. The best way to protect personnel is through the use of engineering controls, e.g., local exhaust ventilation. Only when engineering controls are not practical or applicable shall personal respiratory protective equipment be employed to reduce personnel exposures. However, in no case shall respiratory protection equipment be used as a substitute for engineering controls. Ashore respiratory protection guidance is provided in Chapter 1 5. Respiratory protection requirements for forces afloat is contained In reference 20-3, Chapter B6.

## **Foot Protection**

It is Navy policy that all employees (military and civilian) occupationally exposed to foot and toe hazards be furnished appropriate safety shoes/boots at government expense. The activity commander, based on advice from the activity occupational and safety (OSH) office, shall designate local foot/toe hazardous operations/areas and the type of foot protection required. Foot and toe protection shall be worn at all times in a designated foot hazard area.

# 102: Training Fundamentals

## 102.1 Discuss the following turnaround training evolutions:

### a. Carrier Qualification

The overall training objective is to establish and maintain a sustained, high level of combat readiness. Training readiness is continuous and the goals established must direct effort toward increasing readiness. Air wing commanders and squadron commanding officers shall focus their efforts to ensure squadrons attain the highest possible levels of readiness in all primary mission areas and monitor unit progress in relation to planned training. Prior to the commencement of squadron training, aircrews should be flight refreshed and current in order to begin training without delay. Available training facilities will be utilized to regain those qualifications which may have lapsed during deployment and require specialized ranges and/or equipment. At sea training opportunities generally include independent ship exercises, Carrier Qualifications and TSTA periods.

### b. Tailored Ship Training Assessment (TSTA)

The primary objective of TSTA is ship's training. A secondary objective is refresher carrier landings for air wing pilots. It is imperative that the ship/air wing team develops basic shipboard skills prior to commencing normal cyclic operations. TSTA constitutes a large portion of the Basic Training Phase. The air wing is embarked to conduct carrier qualification, receive training in vital shipboard survival and damage control skills and to help the ship complete training exercises, which require air services.

### c. Competitive Training Unit Exercise (COMPTUEX) / Intermediate Training Assessment (ITA)

The purpose of the ITA is to provide a measurement of the ability of the carrier and air wing to operate as a coordinated and combat ready unit. Additionally, the ITA will determine the level of the ship/air wing operational readiness and potential for integration into battle group operations. Using established measures of effectiveness, the air wing will be evaluated on number of qualified aircrew, aircraft MC/FMC rates, sorties data, flight hours, landing averages and exam results for TACMAN, NATOPS, RECCE and OPORDERS. Specific warfare areas will be evaluated to include Conventional Strike Warfare, Anti-Submarine Warfare, Close Air Support and Electronic Warfare. Also evaluated will be cyclic and flex deck operations, EMCON flight operation and strike rescue operations.

The ITA will consist of 72 hours of day and night simulated combat operations. The tempo of operations will be sufficient enough to realistically assess the ability of the carrier and embarked air wing to conduct offensive and defensive primary missions of the type anticipated in actual combat.

### d. Fleet Exercise (FLEETEX)

This nominal 21-day underway period will emphasize carrier/air wing integration into the battle group. Operational control of the carrier / air wing during the advanced training phase belongs to the deploying battle group commander. The fleet commander will continue to monitor and assist the training until deployment. The final phase of the turnaround training includes full battle group operations culminating with the FLEETEX.

# 103: Aircraft Handling Fundamentals

## 103.1 Identify the personnel required to move the C-2A:

**a. Ashore:** · One person with whistle as a qualified director. · Three wing walkers: one at each wingtip equipped with whistle and carrying a wheel chock and one at the tail equipped with whistle. · One qualified brakerider in cockpit at pilot station. · One qualified and licensed tow-tractor driver.

**b. Afloat:** · Directors shall be equipped with whistles that they will hold in their mouths while controlling aircraft movement. · The cockpit is manned by a qualified brakerider · Safety men are posted as required to ensure clearance if in close proximity to other aircraft, bulkheads or obstructions. · During periods of high winds or when the deck is unsteady, chock men shall closely tend each main wheel.

## 103.2 State when the aircraft and engine protective covers shall be installed:

Install plugs and covers if the aircraft is idle for more than a day or over night.

## 103.3 Discuss the proper installation of a TD-1A or TD-1B tie-down chain:

There are fourteen tiedown fittings on the aircraft: two each on the fuselage nose and tail section, two on each engine nacelle and three on each main landing gear. Remove two access panels to gain access to tiedown fitting on nacelle. All tiedown lines must be installed approximately 45 degrees to the tiedown point.

## 103.4 State the purpose of the ground safety locks:

External ground safety locks are provided to protect maintenance personnel and prevent damage to the aircraft while the aircraft is on the ground.

## 103.5 State the following C-2A aircraft characteristics:

· Horizontal length: 56'10" · Wing span: 80'7" · Maximum catapult takeoff weight: Maximum catapult takeoff weight is 57,500 pounds.

# 104: Airframe Fundamentals

## 104.1 Explain the purpose of the wing fold system.

The combined hydraulic power system supplies hydraulic power to the wing fold and automatic jury strut system. Hydraulic power operates actuation cylinders that unlock, fold spread and lock the outer wing panels. Mechanically actuated timer valves also control this sequence of events in the fold and spread cycles. Hydraulically operated check valves, priority valves, lock valves and flow regulators aid in the control of the system. The wing fold selector valves solenoid or manually controlled, directs hydraulic fluid to the system components to fold and spread the wings. Before selection, the flaps shall be in the 20-degree position. All this occurs to save space on the aircraft carrier and allow easier movement on the deck.

## 104.2 Explain the term artificial feel as it applies to the flight control system.

The hydraulic portions of the flight control system are incapable of being reversed. Hydraulic cylinders (actuators) move in response to pilot or copilot input to move the actuators and thus move the pilot or copilot control column or pedals. Because of this, the aerodynamic forces that exist on the control surfaces are not fed back to the cockpit controls. To compensate for this, an artificial feel system in the control system produces a simulated force on the cockpit controls.

## 104.3 Explain the purpose of the tailskid.

The tailskid is lowered and raised in conjunction with the landing gear and is used to prevent damage to the aircraft.

## 104.4 State the purpose of the main gear extender system.

An internal main gear extender system provides additional deck clearance during catapult launching operations by extending the main gear struts.

## 104.5 State the purpose of the landing gear emergency extension system.

If a combined or flight hydraulic system failure occurs, the landing gear and tailskid must be extended with an emergency pneumatic system. The system consists of a 3,000-psi nitrogen bottle, a nitrogen release valve, two pressure operated dump valves, and shuttle on the gear and tailskid actuators. Nitrogen is released from the bottle by actuating the emergency landing gear handle that is linked mechanically to the release valve. The released nitrogen positions the dump valves to open the uplines of the landing gear and door cylinders and the tailskid lift actuator to return fluid to the reservoir. At the same time, nitrogen enters the down side of the cylinders through shuttle valves and extends the cylinders. The system lowers the landing gear only once because the nitrogen cannot be recharged in flight.

## 104.6 State the purpose of a hydraulic patch test.

Contamination analysis is used to determine the particulate level of a hydraulic system and the Presence of free water or other foreign substances. The methods used to identify and measure contamination is patch testing, electronic particle count analysis, and halogen testing. Patch testing is the primary contamination measurement method used at all levels of maintenance. The P/N57L414 contamination analysis kit (fig. 4-3) is used to perform patch testing. In the patch test method, a fluid sample of known volume is filtered through a filter membrane of known porosity. When the fluid passes through the filter, all particulate matter in excess of a size determined by the filter characteristics is retained on the surface of the membrane. The retention of particulate matter causes the membrane to discolor proportionally to the particulate level of the fluid sample. Free water will appear either as droplets during the fluid sample processing or as a stain on the test filter. The typical color of contamination in any given system is usually uniform. The degree of filter membrane discoloration correlates to a level of particulate contamination. By visually comparing the test filter with contamination standards that represent known contamination levels, the contaminant level of the system can be determined.

#### **104.7 Identify the location of the bail out hatch.**

The bailout hatch is at the forward end of the cabin floor, immediately aft of the cockpit. The hatch consists of a floor panel, a T-handle, and a drop-away hatch faired with the underside of the fuselage. To open the bailout hatch, the T-handle must be lifted to unlock the floor panel. The floor panel may then be pivoted upward by means of a track and roller arrangement and moved forward with a forward lifting motion. The forward edge of the panel strikes two hatch releases that unlock the dropaway hatch and permit it to fall free of the aircraft because of slipstream. When the floor panel is in the full vertical position at the forward side of the hatch opening, it protrudes below the underside of the fuselage to provide a wind block to facilitate bailout.

#### **104.8 State the hazards associated with the following :**

**a. Movable surfaces** - is a hazard to personnel, GSE, and any other equipment placed in the way. Items placed in the path of the moveable surfaces are in risk of being crushed, punctured, dented, cracked or just scratched. All of which can be either replaced or repaired. Personnel trapped between movable surfaces face a much bigger risk. Serious injury or even death can occur.

**b. Foreign Object Damage** - is a hazard to the operation of turboprop engines. Damage can occur in parking, storage area and maintenance procedures and during engine installation and engine ground operation. Perform frequent and periodic inspection of engine nacelles, inlet ducts and storage areas.

#### **104.9 State the purpose of the cargo cage.**

The cargo cage provides a means of securing cargo for carrier operation. The cage consists of a series of stanchions between the overhead rails and corresponding floor tracks; horizontal bars closing of ends of the cage; and adjustable-length vertical side posts fitted between the stanchions to form the sides.

#### **104.10 Define the term corrosion.**

Corrosion is the electrochemical deterioration of a metal because of its chemical reaction with the surrounding environment. This reaction occurs because of the tendency of metals to return to their naturally occurring states, usually oxide or sulfide ores. When a water solution containing soluble salts is present, corrosion of many alloys can occur easily at ambient temperatures.

#### **104.11 Discuss the following types of corrosion:**

**a. Uniform surface** - Uniform surface corrosion results from a direct chemical attack on a metal surface and involves only the metal surface. On a polished surface, this type of corrosion is first seen as a general dulling or etching of the surface and if the attack is allowed to continue the surface becomes rough and possibly frosted in appearance.

**b. Pitting** - The most common corrosion on aluminum and magnesium alloys is called pitting. It is first noticeable as a white or gray powdery deposit, similar to dust, which blotches the surface. When the deposit is cleaned away, tiny pits or holes can be seen in the surface. Pitting corrosion may also occur in other types of alloys.

**c. Exfoliation** - Exfoliation is an advance form of intergranular corrosion where the surface grains of a metal are lifted up by the force of expanding corrosion products occurring at the grain boundaries. The lifting up or swelling is visible evidence of exfoliation corrosion. Exfoliation occurs on extruded, rolled, wrought and forged high strength aluminum and magnesium parts.

# 105: Propulsion Fundamentals

## 105.1 State the type and model of the engine used on the C-2A aircraft.

Two ALLISON T56-A-425 turboprop engines power the aircraft with Hamilton-Standard constant speed propellers. The engines each develops a maximum of 4,600 indicated horsepower at takeoff.

## 105.2 State the five forces acting on a propeller.

**Centrifugal Force** - The greatest force acting upon the propeller blade is centrifugal force. This force tends to pull the blade of a spinning propeller out of its hub. To prevent the blades from breaking into fragments or flying off into space, the blade is thicker near the hub. The hub is made from a strong steel forging.

**Thrust Bending Force** - Thrust bending force causes a rotating propeller to try to pull away from the aircraft. Because it is held back by the hub and the load of the aircraft it is pulling, the blade tips, which are thinner and lighter than the blade shank, bend forward. The sum of these bending forces on the blades is carried at or near the hub. Hence, the section of the blade at the hub must be proportionately thicker. Centrifugal force counteracts thrust-bending force by its tendency to pull the blades in a straight line.

**Torque Bending Force** - Torque bending force is the tendency for a blade to bend backwards, throughout its length, in a direction opposite rotation. The density of the air creates this bending force.

**Aerodynamic Twisting Force** - Aerodynamic twisting force tries to rotate the blades in the hub to an increased blade angle. The point at which this force is exerted most strongly on the chord of the airfoil is known as the center of pressure. During normal cruise conditions, this center of pressure is nearer the leading edge of the propeller, so the force tends to rotate the blades to a higher pitch.

**Centrifugal Twisting Force** - The centrifugal twisting force on the blades tends to twist them to a lower pitch angle. This occurs because all parts of the propeller try to remain in a plane parallel to the plane of rotation .

# 106: Avionics / Electrical Fundamentals

## 106.1 Define the following acronyms:

- a. **AACS** - Aircraft approach control system
- b. **ACLS** - Automatic Carrier Landing System
- c. **ADF** - Automatic direction finding
- d. **AFCS** - Automatic flight control system
- e. **AOA** - Angle of attack
- f. **CAINS** - Carrier aircraft inertial navigational system
- g. **GPS** - Global positioning system
- h. **AHRS** - Attitude heading reference system
- i. **ICS** - Intercommunication system
- j. **VOR** - VHF omnidirectional range

## 106.2 State the purpose of a thermocouple.

A junction of two dissimilar metals that produce a voltage when heated.

## 106.3 State the purpose of the following test equipment:

### a. Multimeter:

Used for troubleshooting to measure voltage, current, and resistance. The multimeter contains circuitry that allows it to be a voltmeter, an ammeter, or an ohmmeter. A multimeter is often called a volt-ohm-millimeter (VOM).

### b. Megohmmeter:

A test instrument that applies high voltage to the component under test and measures the current leakage of the insulation. The megger consists of a portable hand-operated dc generator and an indicating meter. It measures resistances of many megohms.

### c. Time domain reflectometer:

You will use the TDR test set to check and trouble shoot aircraft wiring, transmission lines and antenna systems for shorts, opens, bad couplings, etc. To do this, you will monitor TDR reflected waveforms. TDR's operate on the same principal as radar; that is they send pulses of energy into a system to see what, if anything, is reflected. The amplitude of the reflected signal corresponds directly to the impedance of the discontinuity. (Discontinuity is any abnormal resistance or impedance that interferes with normal signal flow) You can find the distance to the discontinuity by measuring the time required for the pulse to travel down the line to the reflecting impedance and back to the monitoring oscilloscope.

## 106.4 State the difference between alternating current (ac) and direct current (dc).

Direct current (dc), that is, current which does not change direction. A coil rotating in a magnetic field actually generates a current, which regularly changes direction. This current is called ALTERNATING CURRENT or ac.

## AC AND DC

Alternating current is current which constantly changes in amplitude, and which reverses direction at regular intervals. Direct current flows only in one direction and that the number of electrons flowing past a point in a circuit in one second determines the amplitude of current. If, for example, a coulomb of electrons moves past a point in a wire in one second and all of the electrons are moving in the same direction, the amplitude of direct current in the wire is one ampere. Similarly, if half a coulomb of electrons moves in one direction past a point in the wire in half a second, then reverses direction and moves past the same point in the opposite direction during the next half-second, a total of one coulomb of electrons passes the point in one second. The amplitude of the alternating current is one ampere.

## **DISADVANTAGES OF DC COMPARED TO AC**

When commercial use of electricity became widespread in the United States, certain disadvantages in using direct current in the home became apparent. If a commercial direct-current system is used, the voltage must be generated at the level (amplitude or value) required by the load. To properly light a 240-volt lamp, for example, the dc generator must deliver 240 volts. If a 120-volt lamp is to be supplied power from the 240-volt generator, a resistor or another 120-volt lamp must be placed in series with the 120-volt lamp to drop the extra 120 volts. When the resistor is used to reduce the voltage, an amount of power equal to that consumed by the lamp is wasted. Another disadvantage of the direct-current system becomes evident when the direct current (I) from the generating station must be transmitted a long distance over wires to the consumer. When this happens, a large amount of power is lost due to the resistance (R) of the wire. The power loss is equal to  $I^2R$ . However, this loss can be greatly reduced if the power is transmitted over the lines at a very high voltage level and a low current level. This is not a practical solution to the power loss in the dc system since the load would then have to be operated at a dangerously high voltage. Because of the disadvantages related to transmitting and using direct current, practically all modern commercial electric power companies generate and distribute alternating current (ac). Unlike direct voltages, alternating voltages can be stepped up or down in amplitude by a device called a TRANSFORMER. (The transformer will be explained later in this module.) Use of the transformer permits efficient transmission of electrical power over long-distance lines. At the electrical power station, the transformer output power is at high voltage and low current levels. At the consumer end of the transmission lines, transformer steps down the voltage to the value required by the load. Due to its inherent advantages and versatility, alternating current has replaced direct current in all but a few commercial power distribution systems.

### **106.5 State the purpose of a battery.**

The battery is a reserve source of electrical power for select electrical systems. The battery converts chemical energy into electrical energy. Provides features such as engine starting, aircraft servicing, auxiliary and emergency power.

### **106.6 Explain the term static as it pertains to the Pitot Static system.**

The pitot-static system in an aircraft includes some of the instruments that operate on the principle of the barometer. It consists of a pitot-static tube and three indicators, all connected with tubing that carries air. The three indicators are the altimeter, the airspeed indicator, and the rate-of-climb indicator. Each operates on air taken from outside the aircraft during flight. Static means stationary or not changing. The static port introduces outside air, at its normal outside atmospheric pressure, as though the aircraft were standing still in the air.

# 107: Aviation Life Support System (ALSS) / Utilities Fundamentals

## 107.1 Discuss the basic operation of an Air Cycle Air Conditioning system.

The air-conditioning system uses an air cycle refrigeration unit and supplies bleed air to provide heating and cooling. Bleed air entering the air cycle refrigeration unit passes through the heat exchanger and is cooled by a flow of ram air. The ram, air enters through the ram air scoop and the left side of fuselage, is circulated around the fins of the heat exchanger and then dumped overboard.

The cooled bleed air passes through the mass flow control valve and is ducted to the cooling turbine. Energy is extracted as the air expands and drives the turbine, resulting in further cooling of the air. The cooling turbine drives the ram air exhaust fan, which is mounted on a common shaft.

In other words, the engine bleed air is further compressed as it is passed to the cooling turbine. From there it is rapidly expanded, this rapid expansion is what cools the air.

A water separator in the system is used to extract entrained moisture from the refrigerated air discharged from the cooling turbine. Water is collected in a sump and drained overboard.

## 107.2 Discuss the basic operation of a Cabin Pressurization system.

The cabin pressurization control system consists of two outflow safety valves operated by an outflow control valve through two pneumatic relays. Pressurization starts when an altitude of 4000 feet is attained. Pressure in the aircraft is maintained until pressure differential of 6.5 psi exists the aircraft and the atmosphere. Cabin pressure is automatically dumped upon touchdown by the air /ground safety switch and NO.4 AIR/GND SAFETY RELAY.

## 107.3 Discuss the effects of ice accumulation on the aircraft.

- a. Increased liftoff speed and increased stalling speed
  - b. Higher takeoff, landing, and minimum flight speeds than are normally required
  - c. Reduced rate of climb
  - d. Increased power requirements, thus causing increased fuel consumption and decreased range and endurance
  - e. Reduced engine power caused by obstruction of the engine inlet air duct
- \* The biggest danger caused by ice accumulation is the reduced aerodynamic efficiency of the aircraft. Increased drag and diminished lift because of lowered propeller efficiency and engine power are typical results.

# 108: Administration/Operational Fundamentals

## 108.1 Discuss the administrative chain of command.

Per OPNAVINST 3111.14 series, the CNO assigns ships and units to the administrative organization of the operating forces of the U.S. Navy. All changes to these assignments will be made by the CNO only. Administrative responsibilities of superiors and subordinates are effective on the date specified or, in the absence thereof, on the date contained in advance change to OPNAVINST 3111.14 series. Commanding officers of squadrons administratively assigned to an air wing (CVW) will report to the Type Wing commander having cognizance over their permanent duty station.

OIC - Commanding Officer – Commodore – AIRPAC – CINCPAC

## 108.2 Discuss the operational chain of command

Operational control of NAVAIRPAC units operating in the Western Pacific (WESTPAC) is normally vested in Commander Seventh Fleet. · Carriers operating in the Eastern Pacific (EASTPAC) or Middle Pacific (MIDPAC) is normally assigned to the operational command of Commander Third Fleet. · Carrier air wings are under the operational control of the CARGRU to which they are assigned. · Carrier squadrons assigned to an air wing commander are under the operational control of air wing commander.

OIC – CAG – Commander Carrier Group – CINCPAC

## 108.3 Define the following terms:

**a. Instrument Flight Rules - (IFR)** Rules governing the procedures for conducting instrument flight. Pilots must comply with IFR procedures when operating their aircraft in weather conditions that are less than VFR minimums. Additionally, navy pilots are encouraged to use IFR procedures when their flight is conducted within the Federal Airway System. Other factors requiring adherence to IFR procedures are when flights are conducted along jet routes (operations parallel to and within 10 miles of the established centerline are considered to be along the route), anytime aircraft are operated in established positive control zones, flight to and from targets or operating areas when practicable or when performing instrument approaches. When VFR conditions exist, pilots may waive any of the above four requirements for a specific flight when necessary to circumnavigate or otherwise avoid severe weather, or when dictated by an in-flight emergency.

**b. Visual Flight Rules - (VFR)** Rules that govern the procedures for conducting flights under visual conditions. A pilot operating in accordance with VFRs is flying in accordance with the see-and-avoid concept. This means a pilot is responsible for his own separation from other aircraft under most circumstances. Such operations eliminate the need for specific route clearances from air traffic control agencies. Certain weather minimums are required for such flight. While flying in weather conditions equal or better than those required for VFR flight, the pilot has the primary responsibility of avoiding a collision. A flight in minimum or near-minimum weather conditions is only undertaken on a VFR clearance when absolutely necessary. The minimum distance from clouds that a pilot must maintain during VFR flight depends upon altitude and whether or not the flight is within controlled or uncontrolled airspace.

108.4 Discuss the responsibilities of the following:

**a. Aircraft Commander -** Shall be in command of the aircraft and responsible for the safe and orderly conduct of the flight. The term “safe conduct” includes but is not limited to the following:

- Proper briefing of passengers and crewmembers as to safety and mission.
- Proper utilization and filing of required documents.
- Procurement and use of adequate survival equipment for all embarked personnel.
- Demonstration of sound judgment and proficiency during flight.
- Compliance with all military and civil regulations and rules of flight.
- Responsibility for decisions made in carrying out assigned missions.

Aircraft commander responsibility exists from the time preflight planning begins until relieved from duty by proper authority. The authority and responsibility of the aircraft commander for flight is independent of the presence of other persons senior to him in the crew or passengers except as stated in OPNAVINST 3710.7. He shall be thoroughly familiar with this manual, squadron directives, and all other directives from higher authority. The aircraft commander has the authority to delay or continue a flight when, in his opinion, conditions are unsafe.

**b. Copilot** - shall assist the pilot in preparing the crew for flight and in ascertaining readiness for flight of the aircraft and aircraft systems. The copilot function is specifically patterned as a safety backup for the pilot throughout the entire flight. In this capacity he shall offer constructive comments and recommendations as necessary throughout the mission in order to maintain the safest possible and most effective flight environment.

**c. Crewchief**- has the following responsibilities as directed by the aircraft commander

- Verify fuel loads and comply with any special instruction from the aircraft commander.
- Check aircraft logbooks for previous discrepancies, noting corrective action.
- Procure necessary maintenance documents (fuel packet).
- Conduct proper preflight and postflight inspections in accordance with current NAVAIR publications and maintenance requirement cards.
- Ensure support equipment is available and correctly positioned and the aircraft is ready for start.
- As necessary, perform/assist with prestart and poststart procedures and checks.
- In flight, perform frequent integrity checks of the aircraft to include reservoirs, filters, selector valves, lines, and fittings for any fuel, hydraulic, or bleed air leaks; security of overhead equipment and hatches; and circuit breaker panels. All visible exterior portions of the aircraft shall be checked for visible leaks and panel security. Results shall be reported to the pilot.
- Keep a record of discrepancies as they occur.
- Ensure that the aircraft is ready for flight in every respect
- Ensure the aircraft is in the proper configuration and that adequate safety and survival equipment is on board.
- Prepare or check weight and balance forms.
- Ensure that all passengers, cargo, and mail are properly manifested.
- Supervise loading, unloading, and securing of cargo. Loadmaster shall brief pilot in command.
- Give emergency instruction to passengers.
- Ensure passenger comfort during flight.
- Complete necessary forms (logistic flight records, customs)
- Maintain aircraft cleanliness during and after flight.
- Provide training to the second crewman.

**d. Second Crewman** - As directed by the aircraft commander and/or crewchief, the second crewman shall perform the duties as outlined for the Crewchief. Additionally, the second crewman shall train to achieve further qualifications as CTCC (Carrier Transport Crew Chief).

### **108.5 State the purpose of the Scheduled Removal Card (SRC) and Equipment History Card (EHC).**

a. The SRC card is a two-page form used to record maintenance history, installation, and usage data. It is maintained as part of the logbook, AESR, or MSR as long as the component is installed. When the component is removed from the aircraft or equipment, the SRC card accompanies the component. Continuity of this maintenance history is paramount. NAVAIRINST 4790.3 establishes policy and assigns responsibilities for the planned removal/replacement of selected aeronautical components designated as SRC items.

b. The E HR card is a two-page form that provides a method of monitoring specific maintenance data on designated aeronautical components and equipment that do not qualify for an SRC card. This record provides the means of recording maintenance history on designated items. An individual E HR card is maintained for each serialized item as part of the aircraft logbook, AESR, or MSR while the component is installed. When the component is removed from the aircraft or equipment, the E HR card will be attached to and accompany the component to its final destination.

### **108.6 Discuss the purpose of the following log book pages.**

#### **a. Structural Life Limits**

General Information. This form, is used to monitor structural life limited components designated for depot replacement, which do not require SRC or ASR documentation. In addition, this form also provides a means for documenting basic life limitations, for example, maximum flight hours, catapults, arrestments, and landings, which must be properly managed to ensure safety and structural integrity throughout the service life of each T/M/S aircraft. Aircraft shall not exceed structural life limits specified in applicable PMICs without prior approval from the COMNAVAIRSYSCOM. Such approval shall be requested via the chain of command. Ensuring aircraft structural components never exceed life limits is the responsibility of all persons involved with the program (b) Purging. None. This page is a permanent part of the logbook.

## **b. Monthly Flight Summary/Equipment Operating Record**

General Information. The reporting custodian maintains this record. This form is designed to permit the monthly compilation of significant flight operational data throughout the service life of an aircraft. Reporting custodians will ensure all monthly totals have been entered on this form prior to induction of the aircraft into rework. (1) This form is used for recording landing and special information, for example, catapult shots that may be useful to a reporting custodian. (2) The ferry pilot is responsible for providing aircraft ferry flight data to the receiving activity. (3) Months will be accounted for in chronological order. Purging. None. This page is a permanent part of the logbook.

## **c. Inspection Record**

This form used in the logbook and the AESR provides a record of all scheduled and conditional inspections performed on the aircraft during each period and on equipment for which an AESR is required. Accurate inspection records prevent instances of wasted effort due to the failure of logbook custodians to make proper entries. Questionable or incomplete records leave receiving activities no alternative but to assume previous noncompliance and reinspect per existing directives or refuse acceptance of the aircraft/equipment until corrective action has been taken. b. Logbook Requirements (1) Phase inspection and conditional inspection records are maintained on separate pages. The form provides space at the top of the page for identifying the type of inspection. The left column of the form is titled "Type or Description of Inspection" to facilitate proper descriptive entries for individual inspections. (2) Phase inspections are logged sequentially, for example, Phase A/(time), Phase B/(time). The sequence is not interrupted or resequenced by SDLM, unless the performance of a phase inspection is certified by the activity performing the SDLM. All phases performed on the aircraft during a period and the flight hours on the aircraft are entered in the "Type or Description of Inspection" column. (3) Phase inspection induction and completion dates are entered in the applicable columns of the inspection record. (4) Routine turnaround, daily, special, servicing, engine wash, and oil sampling are not logged. (5) Conditional inspections are conducted as a result of a specific overlimit condition or as a result of circumstances or events which create an administrative requirement for an inspection, for example, hot start, overtemp, hard landing, precarrier, predeployment, ASPA, acceptance, or transfer. A logbook entry is required for conditional maintenance requirements, which prescribe inspections to determine equipment condition. Conditional requirements which specify servicing or fluid sampling need not be logged. Compass calibration is entered in the miscellaneous/history section and need not be logged on the Inspection Record. Any inspection directed by higher authority, not directed by a TD, shall be logged. Due to operational circumstances, conditional inspections may be required on a recurring basis. Relief from the repeated logging of these inspections may be requested from the cognizant Wing, COMFAIR, CVW, or aviation combat element commander. Purging. During SDLM the rework activity will screen this section of the aircraft logbook. The I-level activity during first degree repair or D-level activity during rework screens this section of the AESR. The old Inspection Record pages for scheduled maintenance will be removed and a new record containing the data necessary for determining when the next inspection is due will be initiated. The I-level or D-level activity also screens the Conditional Inspection pages for items of historical or maintenance value and transcribes them to a new page. A minimum of 2 years data will be maintained at all times on the Conditional Inspection page.

## **d. Repair/Rework Record**

General Information. This form, used in the logbook and the AESR, contains a complete record of all repair, reconditioning, SDLM, conversion, modification, modernization, and ASPA inspections performed on the aircraft by a repair activity or on the equipment by any I-level or D-level activity. When an aircraft is inducted into a NAVAVNDEPOT or contractor activity for rework, the logbook accompanies the aircraft and is updated as necessary by the activity performing the work. This applies even though there is no change in reporting custodian. In all cases where an item requires an AESR it will accompany the equipment through the maintenance action required and will be updated by the activity accomplishing that action. Purging. None. This page is a permanent part of the logbook or AESR. At the time of rework, outdated forms may be consolidated onto new forms.

## **e. Technical Directives**

General Information This form, used in the logbook and the AESR, contains a record of TDs affecting the airframe structure and its integral parts. Separate pages are required to record each type of TD on equipment and its integral parts. TDs concerning equipment other than engines present no special problems in recording because the quantity of these TDs is relatively small. PPCs and PPBs, however, are issued in greater numbers and require careful screening to ensure the AESR reflects the actual configuration of the equipment. (2) Preparation. To provide uniformity throughout the system for all aircraft and equipment, all changes and bulletins, including revisions, are recorded in this section of the logbook or AESR. (3) TDs that affect a component for which an MSR, ASR, EHR, or SRC card is required are also recorded in the TD part of that record as well as the logbook or AESR (multiple entry). In this instance, the TD identification is entered and a notation to refer to the applicable MSR, ASR, EHR, or SRC card is entered in the title/remarks column, for example, see (component nomenclature) SRC card. No other information or signature is required. The complete information regarding the change is

then entered, with authenticating signature, in the appropriate section of the MSR, ASR, EHR, or SRC card. (4) When documenting TDs on ASR, EHR, and SRC cards, only those TDs that apply to the respective component nomenclature are recorded, such as an accessory bulletin that applies to a hydraulic pump need not be recorded on a generator SRC card. Likewise, a PPC that applies to an afterburner module need not be recorded on an accessory MSR. If the TD is applicable only to a specific part number or range of part numbers, enter the directive in the TD identification blocks, enter "NA" in the status block and the statement, "NA this PN," in the title/remarks block. (5) For airframe TDs requiring one time or continuing inspections, the initial, or one time inspection, is logged on the TD page of the logbook. Subsequent or continuing inspection requirements are added to the MRCs as required in the basic TD. When this action has been completed, no further logbook entry is required for that TD. Purging. Upon completion of SDLM, MCAPP, PACE, and PDM the rework activity will purge the AESR. Consolidate this section of the aircraft logbook using block entries on new pages. The depot activity, upon completion of repair or rework, will consolidate this section of the AESR using block entries on new pages.

#### **f. Miscellaneous History**

General Information. This form is used to record significant information affecting the aircraft for which no other space is provided in the logbook. This information shall include abnormal flight characteristics, peculiar troubles of an undetermined nature, damage to the aircraft, major component changes not logged elsewhere in the logbook (struts, control surfaces, and tail sections) historical data, authorization for service period extension, PED and OPSERMOS adjustment as a result of an ASPA inspection, verification of flight hours in period and since new on acceptance and transfer, and exposure to large quantities of salt water, fire extinguishing agents, or other corrosive elements. This section may also be used to record serial number information concerning research and development and bailment aircraft, for example, special modifications or special testing.

#### **g. Preservation/Depreservation**

General Information. This form, is used in the aircraft logbook, AESR, and MSR. An entry is required any time preservation, reprereservation, or depreservation is performed on that item (aircraft or equipment). (1) Installed Equipment. Entries are required in the AESR or MSR if the applicable preservation MRCs or NAVAIR 15-01-500 specify a preservation requirement. No entry will be made if the equipment is not preserved as part of an aircraft preservation action. Purging. During SDLM the rework activity will initiate a new page for the aircraft logbook. The I-level activity during first degree repair or D-level activity during rework will initiate a new page for the AESR. Old pages may be destroyed

#### **h. Explosive Devices**

General Information. This section of the logbook and AESR contains a record of all explosive devices, for example, initiators and canopy releases installed in the aircraft or major assemblies. Explosive devices installed in major assemblies or equipment, for example, ejection seats and in-flight refueling stores, shall be recorded in the Installed Explosive Device Record (OPNAV 4790/26A) of the appropriate AESR. Explosive devices installed in personnel parachutes are recorded on the Parachute Record (OPNAV 4790/101). When installed in other safety and survival equipment, they shall be recorded on the Seat Survival Kit Record (ONAV 4790/137) or Aircrew Systems Record (OPNAV 4790/138). All other explosive devices shall be recorded on the Installed Explosive Device Record (OPNAV 4790/26A) of the aircraft logbook or AESR. Documentation Requirements. A single line entry is required for each installed explosive device and a new record shall be generated. Removal/Replacement of Devices. When a device is removed, and a like item is not reinstalled, a single red line shall be drawn through the entire old device line entry and ICAPS database updated to reflect changes (a new record should not be generated). When like items are reinstalled, the ICAPS database shall be updated to reflect changes and a new record shall be generated. To report changes, refer to Chapter 12. Purging. During SDLM/PDM, the rework activity shall verify all information and generate a new record (if applicable).

#### **i. Inventory Record**

General Information. This form, is used in the logbook and the AESR. It is used to maintain a current inventory of all equipment, components, and assemblies requiring an MSR, ASR, EHR, or SRC card. Mission configuration items, for example, multiple ejector racks and triple ejector racks, are not required to be maintained on this record. It is impractical to include a standard list of components since requirements vary according to aircraft model/equipment. However, all airframe components/assemblies requiring an ASR, EHR, or SRC card and items that require an MSR will be recorded in this section of the logbook/AESR. Purging. During SDLM the rework activity removes all the old inventory record forms from the aircraft logbook and inserts new forms. All items that remain installed and all newly installed items will be listed.

**108.7 Explain the purpose of the Technical Directive List 02 and 04.**

- (a) List No. 02, directives applicable to a specific bureau/serial number (but not incorporated), and List No. 04, directives applicable to a specific bureau/serial number (and reported as incorporated), are prepared by COMNAVAIRSYSCOM under the TDSA Program and distributed to reporting custodians. TDs on a List No. 02 that are not logged must be researched to determine their incorporation status. The verification process shall be to the degree afforded by the maintenance being performed and should not hinder the normal maintenance process.
- (b) When initial Lists Nos. 02 and 04 are received, verify against the TD page in the logbook. After verification the TD page may be destroyed at the discretion of the reporting custodian (aircraft only). Thereafter, Lists Nos. 02 and 04 will be used to log all applicable AFCs and AFBs.

# 201: Airframe System

**201.1 SYSTEM COMPONENT AND COMPONENT PARTS** - Referring to a standard print of this system or the actual equipment, identify the following system components and component parts and discuss the designated items for each:

- A. What is its function?
- B. Where is it located?
- C. What are the emergency modes of operation?

## 201.1.1 Main entrance hatch

A. The main opens outward and downward, it has four integral steps. It can be opened or closed from inside or outside the aircraft. An inflatable seal around the door keeps pressurization leakage to a minimum. A valve in the door operation mechanism shuts off the engine bleed air to the seal when the door is opened. The door is secured in the locked position by six retractable lockpins located on the sides and top of the door. Two hinges secure the bottom of the door. The main entrance door may be used as an emergency exit on the ground

B. The main entrance door is on the forward left side of the fuselage.

## 201.1.2 Fuselage midsection

### Main cabin

A. Transport high priority cargo and/or passengers. The aircraft is capable of carrying 10,000 pounds of cargo payload or 26 passengers and two aft compartment crewmembers. A combination of passengers and cargo may be carried, providing that the combined payload does not exceed 10,000 pounds.

B. Located from fuselage station 143.7 to 500.5 C. Main entrance hatch forward left side F/S 157.1, Two overhead ditching hatches located on the left and right section of the fuselage overhead, aft of the wing. (Hatches are removed by turning the T-handle clockwise to the UNLOCK position and pulling the hatch inward. A handhold on the edge opposite the T-handle facilitates its removal)

**Bailout hatch** - forward end of the cabin floor, immediately aft of the cockpit. The hatch consists of a floor panel, T-handle, and a drop-away hatch faired with the under-side of the fuselage. To open the bailout hatch, the T-handle must be lifted to unlock the floor panel. The floor panel may then be pivoted upward by means of a track and roller arrangement and moved forward with a forward lifting motion. The forward edge of the panel strikes two hatch releases that unlock the dropaway hatch and permit it to fall free of the aircraft because of slipstream. When the floor panel is in the full vertical position at the forward side of the hatch opening, it protrudes below the underside of the fuselage to provide a windblock to facilitate bailout.

## 201.1.3 Fuselage aft section

### Cargo ramp

A. Provides cargo compartment access at the rear of the aircraft. The ramp opens to a level position and stops, but may be further lowered to contact the ground or deck for loading.

B - Aft section of cabin from fuselage station 500.5 to 608.8

## 201.1.4 Flight control system

### Aileron

A – Lateral control of the aircraft is provided by means of two semifowler-type ailerons

B – One on the trailing edge of each wing outer panel

## **Flaps**

A – Flap and ailerons droop system provides additional lift during takeoff, loiter, and landing.

B – There are two flaps on each wing, one on each side of the wing fold joint.

C –(1) if hydraulic system pressure to operate the flap drive hydraulic motor is lost, normal flap operation is not possible.

The system must then be operated electrically.

(2) During an in-flight emergency or ground maintenance, it may be necessary to operate the flap and aileron droop system without using aircraft or external electrical power. The system is then operated by depressing the FLAPS UP or FLAPS DOWN manual override button on the flap selector valve. This procedure is to be considered emergency operation only.

Using this mode there is no automatic intermediate stops. The flaps will continue, up or down, until the up or down stops are contacted. Contacting either stop will cause the load limiters to lock. Excessive system operation in this mode will cause the load limiters to become less reliable. When using the override button as soon as the flaps start to move.

## **Rudders**

A - Directional control of the aircraft is provided by rudders (YAW)

B – Attached to the outboard fins and the right inboard fin. Each outboard rudder consists of an upper and lower assembly interconnected by a common torque tube. (aft end of A/C vertical)

## **Elevators**

A – Longitudinal control of the aircraft (Pitch)

B - On trailing edge of the fixed horizontal stabilizer.

## **201.1.5 Landing gear system**

### **Nose gear**

A - Forward section of aircraft (under cockpit)

B – If a combined or flight hydraulic system failure occurs, the landing gear and tailskid must be extended with an emergency pneumatic system. The system consists of a 3,000 psi nitrogen bottle, a nitrogen release valve, two pressure operated dump valves, and shuttle on the gear and tailskid actuators. Nitrogen is released from the bottle by actuating the emergency landing gear handle that is linked mechanically to the release valve. The released nitrogen positions the dump valves to open the uplines of the landing gear and door cylinders and the tailskid lift actuator to return fluid to the reservoir. At the same time, nitrogen enters the down side of the cylinders through shuttle valves and extends the cylinders. The system lowers the landing gear only once because the nitrogen cannot be recharged in flight.

### **Main gear**

A - Mid section of aircraft outboard of fuselage. (one under each engine)

B - If a combined or flight hydraulic system failure occurs, the landing gear and tailskid must be extended with an emergency pneumatic system. The system consists of a 3,000 psi nitrogen bottle, a nitrogen release valve, two pressure operated dump valves, and shuttle on the gear and tailskid actuators. Nitrogen is released from the bottle by actuating the emergency landing gear handle that is linked mechanically to the release valve. The released nitrogen positions the dump valves to open the uplines of the landing gear and door cylinders and the tailskid lift actuator to return fluid to the reservoir. At the same time, nitrogen enters the down side of the cylinders through shuttle valves and extends the cylinders. The system lowers the landing gear only once because the nitrogen cannot be recharged in flight.

### **c. Wheel/brake**

A – Each main landing gear wheel has a trimetallic, self adjusting, disk-type hydraulic brake ( wheel and brake are located on the strut mounted to the axle)

B – The emergency brake handle is a black and yellow striped T-handle immediately below the power lever friction lock on the control pedestal. Pulling the handle out positions a rotary selector valve that directs emergency brake accumulator pressure directly to the brakes; this applies the force necessary for emergency stopping or for parking. Squeezing the handle releases a lock and permits the handle to be pushed in; this releases the brakes. The emergency brake is either on or off dependent on handle position. If the handle is locked in any position other than full out or full in, actual brake position can not be determined.

**Caution – The emergency brake is not a function of system pressure. Once the pressure has been depleted on the brake accumulator, it can be restored by use of the auxiliary handpump.**

### **Nose wheel steering**

A – Unstowing the handle when weight is on the wheels activates the nose wheel steering system. Moving the unstowed handle to the left or right turns the nosewheel to the left or right.

B - Nose wheel steering handle is a pistol grip on the forward end of the pilot side console.

### **Main Gear Strut Extender system**

A – The main gear strut extender system is incorporated into the landing gear system to provide sufficient clearance between the aircraft tailskid and deck hardware during catapult launch by means of extending the main gear shock struts from their normal position.

B – Two electric solenoid in overhead forward of landing gear selector valve and aft of AHRS #2 ECU.

## **201.1.6 Hydraulics**

### **Flight**

A – Supplies power to the primary flight controls ONLY! (Ailerons, Elevators, Rudders)

### **Combine**

A - Supplies power to the primary flight controls and to the rest of the hydraulically operated subsystems. Operates when engines are operating.

11 sub systems: Arresting hook, cargo doors and ramp, emergency generator, landing gear, main gear strut extender, nosewheel steering, tailskid, wheelbrakes, windshield wipers, wing flaps, wing fold and jury strut.

## **201.1.7 Wings**

### **Spread**

A – For aircraft to fly. When wings are up and locked you are able to control the flaps and ailerons for flight

### **Fold**

A – The outer wing panels can be folded to obtain the required clearance to permit stowage aboard carrier hangar decks.

B - If a primary electrical failure occurs, the wings can be moved by actuating the wing fold selector valve manual override buttons (extend or retract) after ensuring that the flaps are sent to 20 degrees. The selector valve is located on the right side of the fuselage on the hydraulic servicing panel. (Use of this override button will fold the wings even if the wings are not set to 20 degrees)

### **Jury strut**

A – The jury strut latch engages the probe on the outboard fin. This support link then locks the wing in the folded position.

B – The actuating cylinder retracts to retract the jury strut, and stows it in the wing outer panel.

## **201.1.8 Arresting gear**

A – To land on the Carrier and for emergency field landings

B – Bottom aft end of aircraft under ramp.

C – The emergency arresting hook release system is completely independent of the normal system and is used when the hook cannot be lowered by normal means. System operation is initiated by the EMER ARG HOOK handle on the copilot's right console. The handle is marked with yellow and black stripes. When the handle is pulled fully aft, it is engaged and held in that position by a tab. Simultaneously, the arresting hook uplock is released and the arresting hook emergency dump valve is positioned to port return fluid from the arresting hook lift actuator. Dashpot air pressure is then able to force the hook down.

Note: The emergency system cannot be used to retract the hook after it is extended if no combined system pressure is available. However, the EMER ARG HOOK handle should be returned to its full forward position by pushing the PUSH TAB TO RESET tab to unlatch the handle and pushing it forward.

### **201.1.9 Nose-Tow Catapult system**

A&B – All mechanical components necessary for a catapult launch are on the nose gear, they are retracted into the nose wheelwell when the landing gear is raised. A tow link mounted forward of the nose gear is used to guide the aircraft to the shuttle from the lead-in track and to attach the aircraft to the shuttle. A trail bar bellcrank aft of the nose gear strut attaches the aircraft to the catapult through a release element designed to fail at 53,000 pounds of tension. A lifter spring is compressed by the bellcrank to engage the tow link and shuttle as a thrust moment is exerted by the aircraft. After the release element is broken, the spring applies a force to a lifter pushrod through the trail bar bellcrank, thereby repositioning the tow link when the aircraft clears the shuttle. To store the launch mechanism within the nose wheelwell doors after landing gear retraction, a second retraction is used to raise the tow link to the fully up position. This is all done by mechanical linkage from the nose gear drag brace to the tow link. When the gear is extended, the linkage is moved out of the way and the toe link drops to its intermediate position. If the tow link does not reach its intermediate position after launch, retraction of the landing gear moves the tow link through the second retracting stage to a position where it engages the tow link uplatch.

### **201.3 Parameters/operating Limits**

#### **201.3.1 State the proper tire pressure for the following:**

##### **a. Nose wheel**

1. land - 140 psi
2. carrier based - 260 psi

##### **b. Main wheel**

1. land - 235 psi
2. carrier based - 290 psi

#### **201.3.2 State the normal operating pressure of the hydraulic systems**

- a. 3,000 psi

### **201.5 Safety Precautions**

#### **201.5.1 What safety precautions must be observed when jacking a C-2A on a carrier underway?**

- a. Do not jack aircraft on wing and fuselage jack points aboard ship if wind exceeds 15 knots and/or pitch, roll, or heel of ship is expected to exceed 3 Degrees.
- b. Ensure that equipment and personnel are clear of aircraft before jacking.
- c. Ensure that electrical power is off except when performing landing gear operational check.
- d. Do not jack aircraft when gross weight exceeds 50,060 pounds (22,707 kg), except for wheel jacking.
- e. Do not bypass the AIR/GROUND SAFETY relay unless the ENGINE AIR CYCLE switch is in the OFF position.

# 202: Propulsion System

**202.1 System components and component parts Referring to a standard print of this system or the actual equipment, identify the following system component parts and discuss the designated items for each:**

## **202.1.1 State the function of the Propeller system**

Comprises that portion of the powerplant that converts engine torque into usable thrust.

## **202.1.2 State what part of the propeller system has electrical anti/de-ice components.**

Spinner and blades – embedded in the plastic material of the front and rear spinners and in rubber heater pads adhered to the leading edges of the blade.

## **202.1.3 The six major (components) subassemblies of the propeller.**

- \* Hub
- \* Dome
- \* Four blades
- \* Electrical contact ring assembly
- \* Low pitch stop assembly
- \* Pitch lock regulator assembly.

## **202.1.4 State the function of the following major engine components**

**a. Reduction gearbox** – The reduction gear assembly reduces the high-speed, low torque energy of the propeller section. The energy is reduced to the low-speed and high-torque required for efficient propeller operation. The speed-reduction is accomplished in two stages. The first stage reduction is accomplished by a spur gear set in a ratio of 2.882 to 1. The second stage reduction is accomplished by a planetary gear set in a ratio of 4.333 to 1. The overall reduction is 12.490 to 1. When the engine rpm is 100%, reduction gear rpm is 1,106, power section rotor rpm is 13,820 and propeller shaft is 1,106.

**b. Torquemeter** – The torque-meter assembly measures the shaft horsepower output of the power section assembly. Two concentric shafts make up the drive shaft between the power section assembly and the reduction gear assembly. The inner (torque) shaft carries the load and produces the twist to be measured. The outer (reference) shaft is rigidly connected to the torque shaft at the drive-input end. The drive output end transfers the output for measuring purpose.

**c. Compressor assembly** – Compresses air, air then passes through the successive stages of the compressor toward the combustion section. Under certain operating conditions, such as starting and rpm accelerations/decelerations below 94 percent, this pressure buildup in the compressor can reach a value sufficient to cause compressor stall. To prevent compressor stall, bleed air valves are installed at the 5th and 10th stages to unload the compressor, thereby greatly improving airflow characteristics at critical engine speeds.

**d. Accessory drive housing** – The accessory drive housing assembly is mounted on the bottom of the compressor air inlet housing. Mounting pads for the fuel control fuel pump and external scavenge oil pump are on the rear face of the housing. Mounting pads for the speed-sensitive control and speed-sensitive valve and main oil pump and filter are on the front face of the housing. The housing has gear trains for driving all the power section gear-driven accessories at their proper speed. Power for driving the gear trains is taken from the compressor extension shaft by a vertical accessories main drive gear shaft.

**e. Combustion section** - As compressor air passes into the combustion section, it is mixed with fuel supplied by the engine fuel system. Igniter plugs in No. 2 and No. 5 combustion liners fire the fuel-air mixture. The fuel-air mixture in the other 4 liners is ignited through crossover tubes

**f. Turbine section** - The hot gases from the combustion section impinge on the four-stage turbine that converts the heat energy to torque and transmits torque back to the compressor and through the interconnecting Torquemeter shaft to the reduction gear assembly.

### **202.1.5 State the function of the following fuel system components**

**a. Boost pumps** – Two electrically operated boost pumps are submerged in each tank: one mounted forward and one aft. The boost pumps provide uninterrupted fuel flow to both engines, down to 1 % fuel remaining, at all normal landing altitudes. The aft pump is a dual impeller pump in a separate chamber within the tank. It provides a sustaining fuel flow during limited period of negative-g flight. Each of the four boost pumps can sustain two-engine operation at military power up to the service ceiling of the aircraft. Below 6,000 feet with all tank boost pumps inoperative, the engine-driven fuel pumps can provide the fuel necessary to operate the engines.

**b. Fuel tank vent** – The tanks are vented through a common vent line that is open to the atmosphere, on the right side of the aircraft. The vent valves are float-type that close to prevent fuel spillage out of the vent line.

**c. Fuel quantity probes** – Four probes are in each tank in positions that provide maximum probe submergence for all fuel loads and aircraft attitudes. One probe in each tank supports a compensator that compensates for fuel density fluctuations because of temperature changes or to the use of different types of fuel. The probes transmit signals to the fuel quantity indicators.

**d. Fuel jettison (dump)** – A gravity fuel dump system permits emergency in-flight weight reduction. The system permits jettisoning fuel from both tanks to approximately 20 percent fuel remaining (1,212 pounds per tank), depending on the aircraft attitude. With the fuel tanks full, jettisoning to the 20 percent fuel-remaining level is accomplished at approximately 1,300 pounds per minute.

### **202.1.6 State the maximum fuel capacity**

a. 1,824 gallons, 12,400 lbs. Note: weights are based on 6.8 pounds per gallon of JP-5 fuel for standard day conditions.

# 203: Avionics/Electrical System

## 203.1.1 Discuss the purpose of the following navigation systems

**a. Attitude Director Indicator (ADI)** – The ADI on the pilot and copilot instrument panel is the primary attitude reference in all phases of flight. Pitch and roll indicators are displayed by a sphere in relation to a fixed miniature aircraft symbol displays indications. The sphere is light colored above the artificial horizon bar, black below the bar, and is marked in 5-degree pitch increments in both directions. Roll indications are given by two markers 180 degree apart that move around the periphery of the sphere. Ten degree bank increments to 30 degree, then 30-degree increments to 90 degree are marked on the bottom of the increment. Magnetic heading indications are also provided around the sphere's horizon. The ADI has unlimited freedom of movement about the pitch and roll axes.

**b. Standby Attitude Indicator** – A backup attitude indicator is on the pilot instrument panel for use should the ADIs become unreliable.

**c. Computer Aided Inertial Navigation System (CAINS)** - The inertial Navigation Set, commonly termed Carrier Aircraft Inertial Navigation System, provides primary long-range navigation data. The CAINS, through the Inertial Navigation Control Group, commonly termed Inertial Navigation System Interface (INSI) interfaces with other aircraft navigation systems. The CAINS and INSI are integrated in a complete functioning Inertial Navigation System (INS) that provides aircraft velocities, attitudes, and positions to associated aircraft systems.

**d. Attitude Heading Reference System (AHRS)** – Two identical AHRSs provide roll, pitch, and heading information for display on the pilot and copilot ADI, BDHI, and CI. The AFCS, weather radar, Doppler antenna, and Omega receiver also use information from the system selected by the pilot. AHRS No. 1 is ordinarily selected by the pilot while AHRS No. 2 is ordinarily selected by the copilot. Each pilot may select either AHRS No. 1 or AHRS No. 2 through the use of the two AHRS select switches.

**e. Tactical Air Navigation (TACAN)** – The tactical air navigation set is a UHF navigation receiver-transmitter that is used to provide navigation information by determining slant range and relative bearing to a selected tacan station. The tacan station can be surface (land-based or shipborne) or airborne. Surface stations can be either tacan or vortac. An airborne station supplies only slant-range distance unless the aircraft is specially equipped with a bearing transmitter and a rotation antenna.

**f. Global Positioning System (GPS)** – The C-2A GPS navigation set is a worldwide all weather navigation aid that receives and processes navigation information from NAVSTAR GPS satellites. GPS is a space-based radio positioning system that provides its users with highly accurate position, velocity, and time data. This service is provided globally, continuously, and under all weather conditions to users. GPS receivers operate passively, thus allowing an unlimited number of simultaneous users. The GPS has features that can deny accurate service to unauthorized users, prevent spoofing, and reduce receiver susceptibility to jamming.

## 203.1.2 Discuss the purpose of the following communication systems

**a. Intercommunication System (ICS)** – The ICS provides voice communication among four primary ICS stations (pilot, copilot, and forward cabin left side and aft cabin right side), and two auxiliary ICS stations (nose wheelwell and aft cabin left side.) The ICS also connects with the radio equipment. At each of the four primary ICS stations, control panel switches permit the operator to select the desired operation mode. Each ICS station operator may listen to any or all of the radios and to audio from the tacan, LF, ADF, VIR-31 navigation receivers, IFF Mode 4 interrogations and replies, and the public address system.

**b. Ultra High Frequency (UHF) Radio** – The aircraft is equipped with two UHF communication radios. The ARC-159A has frequency range of 225.000 to 399.975 MHz and can be manually tuned in 25-kHz steps, making 7,000 channels available. Twenty channels can be preset. There is a guard receiver tuned to 243.0 MHz that can be operated simultaneously with the main receiver. The radio has an ADF capability in conjunction with the OA-8697/ARD.

**c. High Frequency (HF) Radio** – The HF communications radio has a frequency range of 2.0000 to 29.9999 MHz and can be manually tuned in 100-Hz increments making 280,000 channels available. Thirty channels may be preset. The radio has six operation modes: voice upper sideband, voice lower sideband, amplitude modulation equivalent, continuous wave, data upper sideband, and data lower sideband.

**d. Very High Frequency (VHF)** – The ARC-175/VHF-20 (B) has a frequency range from 116.000 MHz to 151.975 MHz and can be tuned in 25-kHz steps providing 1,440 channels. There is no preset channel capability and each frequency is tuned manually. There is no direction finding capability.

**e. Public Address** – The PA system permits crew-to-passenger voice communication, provides a tie-in with the LF ADF receiver for passenger entertainment, and signals with distinctive chiming tones whenever a passenger advisory light is turned on by the crew. Volume of speaker output is automatically adjusted for ramp/flight operation and for cabin depressurization.

### 203.1.3 Discuss the purpose of the following systems

**a. Identification Friend or Foe (IFF)** – The AN/APX-72 transponder provides coded identification and altitude signals in response to interrogations from surface or airborne stations so that the stations can establish aircraft identification, control air traffic, and maintain vertical separation. The system has five operating modes: 1,2,3/A, C and 4. Modes 1 and 2 are IFF modes, mode 3 (civil mode A) and C (automatic altitude reporting) are primary air traffic control modes, and Mode 4 is the secure (encrypted) IFF mode.

**b. Weather Radar** – The weather radar provides weather avoidance information out to a range of approximately 240 miles by means of a three-color map display showing increasing levels of rainfall intensity in green, yellow, and red, with red being the most intense. Blue is used for range circles and for the azimuth line, which are displayed as dotted lines, and for the alphanumeric. A track cursor is displayed in yellow. In addition to its primary weather function, the radar can be used for ground mapping. A Doppler derived display of navigation information can be superimposed on either the weather or the mapping display, or displayed alone. If the aircraft incorporates AFC 150 (GPS), the navigation information is supplied by the CDNU.

**c. Radar Altimeter** – The AN/APN-194 radar altimeter is a pulsed, range-tracking radar that measures the height of the aircraft over the surface, operating in a range of from 0 to 5,000 feet. Altitude is continuously presented on an indication that has the only operation control. When the aircraft exceeds 5,000 feet AGL or loss of signal is experienced, an OFF flag is displayed and the pointer is rotated behind a mask to prevent use of the information.

**d. Crash Survivability Flight Incident Recorder (CSFIR)** – The Flight Recorder Set (FRS) acquires selected flight data and records a minimum of 2 hours of this information into crash – protected memory. The flight data being recorded in Time, Day, Year, Latitude, Longitude, Velocity East, Velocity North, Velocity Up, Pressure Altitude, Indicated Airspeed, Magnetic Heading, Normal Acceleration, Pitch Attitude, Roll Attitude, Elevator Position, Aileron Position, Rudder Position, Left Engine Torque, Right Engine Torque, Left Engine Tach, Right Engine Tach, and Weight On Wheels. When the flight data portion of crash – protected memory becomes full, the newest information is recorded over the oldest information so that the most recent information is available. The FRS also records 30 minutes of the following audio information: Pilot Intercom, Copilot Intercom, Cargo Door Intercom, and Cockpit Wide – Area Audio. When more than 30 minutes of audio is recorded, the newest audio is recorded over the oldest audio so that the most recent 30 minutes of audio from each position is available.

### 203.1.4 Discuss the purpose of the following landing aids

**a. Automatic Carrier Landing System (ACLS)** – The term ACLS applies to aircraft equipped with ASW-25 data-link receivers using carrier- or – shore – based AN/SPN – 10, SPN-42, or MPN-T1 ACLS facilities. Four modes of approach are available, depending on aircraft equipment. In Mode 1 approaches, data-link-transmitted ACLS signals are coupled to the autopilot after ACLS radar lock-on and control the aircraft until touchdown. Mode 1A approaches differ from Mode 1 approaches in that data-link ACLS signals are uncoupled at ½ mile (approximately 200 feet altitude) from touchdown. Mode 2 approaches the pilot-controlled using data-link needles information displayed on the ADL or CI. A Mode 3 approach is a controller talk-down approach using no special equipment on the aircraft. The C-2A has a capability Mode 2 and 3.

**b. Aircraft Approach Control System (AACS)** – The AACS receiver-decoder is an ILS receiver used with carrier-based SPN-41 (C-scan) transmitters for manual instrument approaches and landing or for an independent monitor during an ACLS approach. The system operates in the range between 15.4 and 15.7 GHz on any of 20 channels selected by the copilot. Channel selection is made on the ARA-63 control panel in the right console.

### 203.1.5 Discuss the purpose, location, and color of the following exterior lights

**a. Wing and tail position** – There are three position lights: one on each wingtip and one at the aftmost fuselage station. The left wingtip light is red, the right is green, and the taillight is white. The lights provide a visual indication of aircraft attitude and direction.

**b. Anti-collision** – There are two dual lamp unit anticollision strobe lights: one on the right outboard vertical stabilizer and one on the lower fuselage aft of the nose wheel well. The lights can be selected to flash either red or white. The white strobe lights are disabled when the aircraft is on the deck, but may be tested on the deck using the approach lights test switch.

**c. Landing/taxi** – The taxi/landing light is on the forward nosewheel door, and is used to illuminate the area in front of the aircraft.

**d. Approach** – An approach light assembly on the nose gear fairing indicates aircraft AOA to the LSO during a carrier or field carrier or landing approach. The approach light assembly contains three individually controlled lights: red, green, and amber to indicate low, high, or optimum AOA, respectively. The approach light system operates when the landing gear is locked down and the hook is extended. The approach lights can be checked while the aircraft is on deck by setting the approach light switch on the center overhead console from NOR to Test. This causes the light corresponding to the AOA pointer position to come on. If the ANTICOLLISION light switches are at WHT and Both or Upper, the white strobe lights will also come on regardless of the position of the exterior lights master switch.

#### **203.1.6 Discuss the purpose of the following lights**

**a. Advisory** – The advisory lights panel on the lower right of the center instrument panel consists of the 23 advisory lights and 1 spare (24 advisory lights for aircraft incorporating AFC 150). The panel is visible to both the pilot and the copilot. The advisory lights provide information on system operation or malfunctions of which the pilots should be aware. Pressing the LIGHTS MASTER TEST button tests all lights on the panel.

**b. Caution** – The caution lights panel is on the upper left of the center instrument panel visible to the pilot and copilot. The panel composed of 22 caution lights and 2 spares. Each caution light provides an indication of a malfunction or system condition requiring corrective action. When a caution light comes on, the two MASTER CAUTION lights also come on. The caution lights remain on until the cause has been eliminated; the MASTER CAUTION lights can be reset. All lights on the caution lights panel is tested by pressing the LIGHTS MASTER TEST button.

#### **203.1.7 Discuss the purpose of the following flight reference system**

**a. Pitot Static** – The Pitot-static system provides Pitot (impact) and static (ambient) pressure as needed to the airspeed indicators, vertical speed indicators, SCADC, and the standby function of the servoed barometric altimeters. Pitot pressure is admitted through two electrically heated Pitot tubes forward of the windshield. The left tube directs pressure to the pilot airspeed indicator and the SCADC; the right tube directs pressure to the copilot airspeed indicator and the impact pressure transducer (q-feel monitor). The two Pitot systems are completely independent of each other and the static system. Static pressure comes through six static ports, three on each side of the fuselage. The two forward ports supply the pilot airspeed indicator, vertical speed indicator, the SCADC, and the standby function of this altimeter. The two aft static ports supply the impact pressure transducer, the copilot airspeed and vertical speed indicators, and the standby function of the altimeter. The two static ports between the pilot and the copilot ports (one on each side of the fuselage) supply static pressure to the cabin pressurization system pressure regulator sensor. The cabin pressurization port is below the pilot/copilot ports on the left side and above them on the right side. Pitot anti-icing power is provided by setting the two position PITOT toggle switch on the ANTI-ICING, DE-ICING, DE-FOG panel to ON. This provides 115 VAC power for heating the Pitot tubes and the total temperature probe, and 28 vdc for heating the AOA transmitter probe.

**b. Angle of Attack (AOA)** – The AOA system measures the angle between the longitudinal axis of the aircraft and the relative wind. The system is threefold in operation and provides a visual indication of aircraft angle of attack, a physical indication through the rudder pedal shakers that the aircraft is approaching a stalling angle of attack requiring corrective flight control action, and a visual indication to both the pilots and the LSO during a field or carrier landing approach of approach speed and altitude. The AOA system is powered by warning bus No. 1 and consists of five major units: an AOA transmitter, an AOA indicator, an approach light, an approach indexer, and a rudder pedal shaker. During flight, the system is completely automatic. AOA indications are only accurate during balanced flight. Unbalanced flight conditions will give widely varied airflow direction in the vicinity of the probe.

### **203.1.8 Discuss the function and purpose of the following alternating current (ac) power supply and control system components**

- a. AC generators** – The primary power supply system consists of two direct, engine-driven, 90/60 kVA, ac generators. The generators supply 115/200 vac, 400 Hz, three-phase power or two separate, non-paralleled systems. In addition to a generator, each system contains a voltage regulator, two differential current transformers, a supervisory panel, and a main line contactor. Each generator is on the reduction gear section of its respective engine and is maintained at the proper operating frequency by the constant-speed characteristics of the engine.
- b. Supervisory panels** – The generators are protected against undervoltage, feeder fault, underfrequency, overvoltage, and phase current unbalance by protective devices in the circuit and automatically trip off the line when one of these conditions occurs. When this happens, a caution light in the cockpit comes on to indicate which generator system is inoperative. If the generator trips off the line because of an underfrequency condition, and if the cause of that condition is rectified, the supervisory panel will automatically reconnect the generator to the system as soon as the frequency is within limits. If the generator trips off the line because of any other fault and discrepancy is corrected; the generator can be reset with the generator control switches in the cockpit. Resetting the generator causes the caution light to go out. If the generator cannot be reset, the remaining generator system can supply the entire aircraft electrical power requirements through ac bus tie circuitry when the AC BUS TIE switch is at ON.
- c. Voltage regulators** – The regulator controls generator output by adjusting the power to the exciter field winding, and regulates output voltage to +/- 1% under fixed ambient or fixed load conditions. This automatically compensates for excessive change in generator line voltage.
- d. Emergency generator** – The emergency generator is continuous duty and self cooled. It provides 115-200 vac, three phase, 380 to 420 Hz power, rated at 10 kva while turning at 7600 to 8400 rpm. The generator supports its drive motor and is self excited. It uses a control unit mounted beneath the generator to control the operation of the generator.
- e. Transformer rectifier** – The transformer rectifier receive ac power from left and right generator buses and feed systems that are independent of each other. If a transformer rectifier fails, the systems can be integrated so that the operating transformer rectifier supplies the entire dc load. When a transformer rectifier fails, it is automatically tripped off the line and a caution light in the cockpit informs the pilot. If both transformer rectifiers fail, operation of the emergency generator is automatically initiated.

### **203.1.9 Discuss the purpose of the Automatic Flight Control System (AFCS)**

The AFCS provides directional stability augmentation, three-axis attitude control, and automatic flightpath control of the aircraft. The AFCS receives manual inputs from the pilot and copilot control wheels and from the switches on the AFCS control panel. Automatic aircraft sensor inputs are from the SCADC and the AHRS. AFCS outputs are sent to the elevator, aileron and rudder actuators for all axis control, to the elevator and rudder trim actuators for automatic trim, and the q-feel actuator for pitch force gradient adjustments.

# 204: Aviation Life Support System (ALSS) Utilities System

## 204.1.1 State the purpose of the following utility systems:

**a. Air Conditioning-** the air-conditioning system uses an air cycle refrigeration unit and supplies bleed air to provide heating and cooling. The solenoid operated environmental control system bleed air shutoff valve controls the flow of bleed air to the air cycle refrigeration unit. The ECS valve is opened and closed by a switch on the TEMP CONTROL panel. Feathering either propeller closes the valve automatically, preventing a power loss of approximately 600 ihp on the operation engine. The valve is also automatically closed during engine start. If the ECS valve has closed because of the propeller feather, it can be reopened from the TEMP CONTROL panel.

**b. Cabin Pressurization** - The cabin pressurization system automatically maintains air pressure in the cabin. Pressurization starts at an altitude of 4,000 feet and is maintained at 4,000 foot cabin altitude until pressure differential of 6.5 psi exists between cabin and atmosphere pressure. The 6.5-psi differential occurs at approximately 22,000-foot altitude at a constant differential of 6.5 psi.

**c. Liquid Oxygen** - The liquid oxygen system converts liquid oxygen to gaseous oxygen for use by the pilot, copilot, and passengers.

**d. Passenger Oxygen** - Each passenger service unit contains two masks behind a door that unlatches and opens when system pressure is applied, allowing the masks to drop out. By pulling the mask toward him for use, the passenger pulls an attached lanyard that extracts a pin, opening the mask valve and allowing oxygen to flow to the mask. When the door is open, a supplemental oxygen lever marked SUP is accessible. Flipping this lever down provides a supplemental flow of 70 to 90 percent more than a single outlet and is available at the mask connected to the tee.

**e. Walkaround Oxygen Bottle** - A low-pressure emergency portable walkaround bottle with diluter demand regulator is stowed in the cargo compartment port side at fuselage station 500.5. With the regulator set to 100 percent oxygen and with the user experiencing little or no physical exertion, approximately 20 minutes of oxygen is available. Tasks requiring moderate exertion will reduce use time to approximately 5 to 10 minutes. Under conditions requiring pressure breathing, use time is significantly reduced.

**f. Side Window Defogging** - Side window defogging control is a thumbwheel control on the De-fog portion of the ANTI-ICING, DE-ICING, DE-FOG panel with an arrow marking the direction of INCREASE FLOW. The thumbwheel has positions marked OFF and 1 to 7. Setting the control to OFF secures airflow to the defogging diffusers. Rotating the thumbwheel toward 7 increases airflow. If air is secured because of over temperature, turning the thumbwheel to OFF, then toward 7 may restore it.

**g. Windshield Anti-icing** - The windshield anti icing system consists of two dual temperature controllers that direct 115 vac, 400 Hz, three phase power to two heating bus bars embedded in each front and side windshield. Sensing elements within each windshield and side panel controls the heat generated by the bus bars. The system is energized with the cockpit windshield anti icing switch on the overhead console. When energized, the system prevents ice formation on windshields and side panels by heating and maintaining them to 32.2 degrees C. (90 degrees F)

**h. Wing and Tail Deicing** - The wing and tail system uses pulsating rubber boots to eliminate ice formation. The boots are bonded to the leading edges of the wings, stabilizer, and fins. A timer, energized by the wing tail deicing switch in the cockpit, controls three distributor valves, energizing them in sequence to apply air pressure (18 psi) and then suction (6 inches Hg) to the deicer boots. The engine bleed air through a pressure regulator and relief valve supplies air pressure, and suction is supplied from an ejector and regulated by a relief valve.

**i. Engine Fire Extinguishing** - Two independent, electrically actuated, high rate of discharge fire extinguishing systems combat fires in the engine nacelles. Each system consists of an extinguishing agent (bromotrifluoromethane) container, emergency cutoff handle, fire extinguisher switch, and the necessary tubing to route the agent to the fire.

### **204.1.2 State the location and purpose of the aircraft portable fire extinguishers**

There are two portable fire extinguishers: one mounted on the back of the pilot seat and one in the aft cabin. They are charged with approximately 2 ¾ pounds of monobromotrifluoromethane vaporizing liquid and are nonrefillable. Instructions for use are on a decal on the extinguisher. For use in an emergency.

### **204.1.3 Explain the proper operation of the cockpit and passenger seat adjustment handles:**

**Cockpit seats** – the normal reclining range is from 8 degrees to 18 degrees. It is controlled with a recline handle at the rear of the seat base. An extra recline adjustment of 29 degrees can be obtained when the seat is in the sixth hole forward of the aft stop. Fore and Aft adjustment – made through a range of 10 inches is provided with a fore and aft handle directly below the recline handle. Fore and aft adjustment is automatically located out when the seat is in the 29 degree recline position. Vertical adjustment – A 4 inch vertical adjustment is available by positioning the two-position vertical adjust (VERT ADJ) handle on the forward right side of the seat bucket. Pulling the handle up the UNLOCK initiates the adjust operation. Pushing the handle down to LOCK prevents the seat from the selected height. Passenger seats – Can be tilted back 16 degrees from the normal position, in two increments of 4 degrees and one increment of 8 degrees. The seat adjustment lever on the outboard side of each seat permits the seat back to be adjusted to five individual positions. Moving the lever upward toward the stop position, the seat may be positioned to any one of four reclining positions. When the seat is being stowed, a lockpin above the seat-adjusting lever is depressed to permit the lever to be moved to the full up position. This permits the seat back to be pushed full down to the stowed position.

### **204.1.4 Discuss the purpose and location of the underwater acoustic beacon**

The beacon emits pulses of sound at one pulse per second after being actuated by immersion in either fresh or salt water. Design life of the beacon is 30 days. It is located on the CSFIR box between AHRS (ECU) No. 1 and the GPS Box overhead aft of cockpit.

### **204.1.5 State which installed components fall under the Conventional Ordnance Handlers Certification Program**

CADS, Pyrotechnics, and smoke flares.

### **204.1.6 Discuss the sequence of events after manual operation of the NB-8 parachute:**

- a. Manually pulling the ripcord handle removes the ripcord pins from the container locking cones, permitting grommets and locking cones to separate.
- b. The container spring opening assemblies pull the side flaps apart allowing the pilot parachute to spring from the container and inflate.
- c. The aircrewmember falling away from the inflated pilot parachute causes the canopy to be extracted from the container followed by the suspension lines. The canopy begins to inflate during this operation.
- d. The connector link tacking breaks as load is applied. The risers are then pulled from the container, the canopy inflates. This permits the aircrewmember to descend suspended in the harness.
- e. By manually actuation the four line release system the aircrewmember may reduce oscillation and maneuver parachute to a less hazardous landing site.
- f. Upon landing, the aircrewmember releases the canopy by actuation of the harness quick fit ejector snaps.

### **204.1.7 State the items contained within the Standard Soft Pack (SSP) equipment container:**

- (2) Dye Markers
- (2) Distress Signal, MK-13 MOD 0 or Distress Signal, MK-124 MOD 0
- (1) Emergency Radio Beacon
- (1) Battery Power Supply
- (2) Water, Drinking, Bagged, Emergency
- (1) Opener, Can, Hand
- (1) Cord, Nylon, Utility 50 ft
- (1) SRU-31/P Individual Survival Kit  
(Part 1 – Medical, Part – 2 General)
- (1) Ground Air Emergency Code Manual
- (1) Combat Casualty Blanket type II, 3 oz.
- (1) Bailing sponge
- (1) Personnel Lowering Device (optional)

**204.1.8 Discuss the protective features provided by the Mask Breathing Unit (MBU) series oxygen mask:**

Pressure demand type masks used in conjunction with the lightweight helmet assemblies used aboard fixed wing aircraft. The oxygen mask are designed to be worn over the face, forming a seal to the cheeks over the bridge of the nose and under the chin. The mask is designed for use with a regulator which provides breathing gas (100% oxygen or oxygen diluted with air) upon demand at a pressure schedule dependent on the altitude. The mask can also be used with continuous flow bailout or walkaround oxygen source. The mask provides facial protection from projectiles and fire as well as being qualified for depths of 16 feet under water. A properly fitted oxygen mask is essential to helmet retention in high speed ejections. The face piece permits utilization of the valsalva maneuver to equalize pressure in the middle ear during descent.

**204.1.9 Explain the air/water temperature requirements for mandatory wearing of anti-exposure assemblies:**

- a. Water temperature is 50 degrees F or below.
- b. Outside air temperature is 32 degrees F (wind chill factor corrected) or below.

**204.1.10 State the minimum buoyancy in pounds provided by the LRU-21 life preserver:**

The minimum buoyancy is 65 pounds

**204.1.11 State the items contained within the LRU-13A liferaft and the number of survivors it can hold:**

- (3) Desalter Kit, sea water, MK2, Type II
- (4) Sea Dye Marker
- (5) Distress Signal, MK-13 MOD 0 or Distress Signal, MK-124 MOD 0
- (2) Water Storage Bag (size A)
- (18)(7) Water, Drinking, Bagged, Emergency
- (1) First Aid Kit, Size A
- (1) Opener, Can, Hand
- (1) Desalinator, manual Reverse Osmosis
- (1) Sunburn Preventative Cream (8) or Sunburn Preventative Preparation
- (7) Food Packet
- Liferaft
- (1) Bailing Sponge
- (1) Hand pump
- (1) Combat Casualty Blanket Type I
- (1) Hand Generated Flashlight A-9
- Packet in Supply Pocket:
- (1) Flare Gun, MK-79 MOD
- (1) Signal light (strobe) SDU-5/E
- (2) Light, ChemiLuminescent
- (1) Signal Mirror, Type I or Signal Mirror, Type II
- (as required) Survival Radio and or Radio Beacon AN/URT-33A
- (1) Battery
- (1) Code Card
- (1) Whistle, Type II
- (1) Compass, Pocket, Type MC-1 or Compass, Wrist
- (1) Pocket knife
- (1) Cord, Nylon, Utility, and 50 feet.
- ( 7 man life raft)

**204.5.1 State the special safety precautions as they apply to LOX system handling/servicing:**

- a. Never store or handle liquid oxygen in a poorly ventilated area or close to flammable materials. When splashed with liquid oxygen, organic materials such as clothing, cigarettes, and oils burn violently if ignited within several minutes after exposure. Flames, sparks, burners, heaters, and exhausts must be kept away from storage vessels, portable units, and the aircraft, when liquid oxygen is being transferred.
- b. Never seal liquid oxygen in an unventilated container. If sealed off at room temperature, the liquid can develop a pressure of more than 12,000 psi. (82,740 kPa)

- c. Do not substitute for approved equipment that is provided for handling liquid oxygen. The physical properties of many materials differ greatly at  $-297$  degrees F ( $-183$  degrees C) and room temperature. Rubber shatters like glass; some metals get brittle and lose their strength.
- d. The extreme cold of liquid oxygen instantly produces painful burns if it contacts the skin. Protective equipment, consisting of a suitable face shield, apron, and gloves, must be worn when handling liquid oxygen.
- e. Avoid touching bare metal lines that contain liquid oxygen because bare skin freezes instantly to the extremely cold metal.
- f. When completely empty system is serviced, the liquid oxygen must be added slowly to cool the system equipment to the  $-297$  degrees F ( $-183$  degrees C) temperature. The equipment may be damaged by thermal shock of excessive pressure if the liquid oxygen is forced in too rapidly.

# 205: Warfare Mission Area

## 205.1 MISSION STATEMENT

### 205.1.1 State your commands mission statement

Provide Fleet Logistic, Operational, and Special Warfare Support in the United States/Atlantic/Caribbean/Mediterranean/Red Sea/Near-Mid East Theaters from fixed land-bases, and aircraft carriers, and be capable of providing self-sustaining detachments to operate from fixed land-bases, aircraft carriers, and remote, out-of-theater, land-bases for periods of up to 6 months.

## MOBILITY (MOB)

### 205.2 Define the term MOB

Mobility (MOB). The ability of naval forces to maneuver and maintain themselves in all situations over, under, or upon the surface.

### 205.3 Discuss the role of the C-2A in a MOB mission.

Support/provide safe, flyable aircraft for all –weather operations. Prevent and control damage. Maintain security against unfriendly acts. Self – lift from staging site to departure site. Transfly in all weather conditions. Maneuver in formation. Navigate under all conditions of geographic location, weather and visibility. Provide lifeboat raft capacity in accordance with unit's allowance. Operate day and night and under all weather conditions. Operate from an aircraft carrier. Monitor the health and well being of the crew to ensure that ability is consistent with approved habitability procures and standards. Operate in climate extremes ranging from cold weather to tropical desert environments. Conduct peacetime activation, mount, and movement exercises of selected personnel and equipment to ensure capability of contingencies involving naval forces short of general war. Conduct tactical static line parachute delivery of personnel and equipment. Conduct tactical free fall parachute delivery of personnel and equipment. Conduct administrative parachute demonstration.

## COMMAND, CONTROL, and COMMUNICATION (CCC)

### 205.4 Define the term CCC

Command, Control and Communications (CCC). Providing communications and related facilities for coordination and control of external organizations or forces, and control of own unit's capabilities.

### 205.5 Discuss the role of the C-2A in a CCC mission.

Function as on-scene commander for a Search and Rescue Operation. Provide all necessary personnel, services, programs and facilities to safeguard classified material and information. Carry out emergency destruction of classified matter and equipment rapidly and efficiency. Maintain tactical voice communications. Maintain visual communications. Process message traffic. Plan, coordinate and control implementation of OPSEC measures. Execute Navy operational deception actions using tactics, operations, exercises or physical means.

## FLEET SUPPORT OPERATIONS (FSO)

### 205.6 Define the term FSO.

Fleet Support Operations (FSO). Naval forces and designated shore facilities provide supporting services other than logistics replenishment to fleet units.

**205.7 Discuss the role of the C-2A in a FSO mission.**

Provide support services to other units. Provide aircraft ferry services. Conduct towing, search, salvage and rescue operations. Support, conduct combat /non-combat Search and Rescue operation by fixed wing aircraft. Conduct general surveillance. Report situation assessment. Coordinate SAR operations. Conduct combat SAR operations in support of battle force operations by special warfare forces in a hostile environment. Provide cargo-handling training to assigned personnel and designated augmenters. Provide air services for ships and aircraft. Provide team training to conduct EOD parachute operations.

**NON-COMBAT OPERATIONS (NCO)**

**205.8 Define the term NCO**

Noncombat Operations (NCO). Selected operations of a noncombat nature not clearly categorized in any other warfare mission area. Included in this category are the necessary support requirements and/or special missions that are required of a unit but not directly related to the other Warfare Mission Areas.

**205.9 Discuss the role of the C-2A in a NCO mission.**

Provide supply, clerical and post office services. Provide personnel for living space maintenance, area command security and for fuels support. Serve as a platform for operational test and evaluation of systems, equipment and tactics. Provide disaster assistance and evacuation. Support/provide for the evacuation of noncombatant personnel in areas of civil or international crisis. Assist and support the operating forces in the planning and conduct of cover and deception.

**LOGISTICS (LOG)**

**205.10 Define the term LOG.**

Logistics (LOG). The resupply of combatant consumables to combatant forces in the theater of operations.

**205.11 Discuss the role of the C-2A in a LOG mission.**

Provide scheduled Carrier Onboard Delivery flights and associated receipt/distribution of material, mail and passengers. Provide the facilities and personnel for material, mail and passenger handling at non-military fields. Support ships and other aircraft in supplies, ordnance and other services. Provide scheduled/response airlift of cargo, mail and personnel. Provide COD and Medical Evacuation services.

**NAVAL SPECIAL WARFARE (NSW)**

**205.12 Define the term NSW.**

Naval Special Warfare (NSW). Naval operations generally accepted as being nonconventional-- in many cases clandestine-- in nature. NSW includes special mobile operations, unconventional warfare, coastal and river interdiction, beach and coastal reconnaissance, and certain tactical intelligence operations. .13 Discuss the role of the C-2A in a NSW mission area.

Deliver, support and recover elements of SEAL and SDV Teams. Clandestinely or covertly infiltrate/exfiltrate equipment, operators, agents, evaders and escapees into/from contested or denied coastal zones. Conduct immediate reaction operations in response to special tactical intelligence. Provide logistic support and facilities for raiding parties. Permissive environment only.