Airplanes Essay, Research Paper

email: mojo\_73@yahoo.comairplanesAirplanes One of the first things that is likely to be noticed during a visit to the local airport is the wide variety of airplane styles and designs. Although, at first glance, it may be seen that airplanes look quite different from one another, in the long run their major components are quite similar. These similarities lie in the fuselage, wing,empennage, landing gear, and powerplant. The four forces off light which all planes have in common are lift, weight, thrust, and drag. The fuselage serves several functions. Besides being a common attachment point for the other major components, it houses the cabin, or cockpit, which contains seats for the occupants and the controls for the airplane. The fuse lageusually has a small baggage compartment and may include additional seats for passengers. When air flows around the wings of an airplane, it generates a force called “lift” that helps the airplane fly. Wings are contoured to take maximum advantage of this force. Wings may be attached at the top, middle, or lower portion of the fuselage. These designs are referred to as high-, mid-,and low-wing, respectively. The number of wings can also vary. Airplanes with a single set of wings are referred To as monoplanes, while those with two sets are called biplanes. To help fly the airplane, the wings have two types of control surfaces attached to the rear, or trailing, edges. They are referred to as ailerons and flaps. Ailerons extend from about the midpoint of each wing outward to the tip. They move in opposite directions – when one aileron goes up, the other goes down. Flaps extend outward from the fuselage to the midpoint of each wing. They always move in the same direction. If one flap is down, the other one is also down. The impinge consists of the vertical stabilizer, orphan, and the horizontal stabilizer. These two surfaces are stationary and act like the feathers on an arrow to steady the airplane and help maintain a straight path through the air. The rudder is attached to the back of the vertical stabilizer. Used to move the airplane’s nose left and right. Actually, using the rudder and ailerons in combination during flight to initiate a turn. The elevator is attached to the back of the horizontal stabilizer. During flight it is used to move the nose up and down to direct the airplane to the desired altitude, or height. Most airplanes have a small, hinged section at the back off the elevator called a trim tab. Its purpose is to relieve the pressure it must be held on the control wheel to keep the nose in the desired position. In most small airplanes, the trim tab is controlled with a wheel or a crank in the cockpit. Some empennage designs vary from the type of horizontal stabilizer. They have a one-piece horizontal stabilizer that pivots up and down from a central hinge point. This type of design, called a stabilator, requires no elevator. Move the stabilator using the control wheel, just as in an elevator. When you pull back, the nose moves up; when you push forward, the nose moves down. An antiservo tab is mounted at the back of the stabilator, to provide a control “feel” similar to what you experience with an elevator. Without the antiservotab, control forces from the stabilator would be so light that it might might be “over controlled” the airplane or move the control wheel too far to obtain the desired result. The antiservo tab also functions as a trim tab. The landing gear absorbs landing loads and supports the airplane on the ground. It typically is made up of three wheels. The two main wheels are located on either side ofthe fuselage. The third may be positioned either at the nose or at the tail. If it is located at the tail,it is called at ail wheel. In this case, the airplane is said to have conventional landing gear. Conventional gear is common on older airplanes, as well as on some newer ones. It is desirablefor operations on unimproved fields, because of the added clearance amid the propeller and theground. However, airplanes with this typeof gear are more difficult to handle during groundoperations. When the third wheel is located on the nose, it miss called a nose wheel. This design isreferred to as tricycle gear. An airplane with this type of gear has a steerable nose wheel, whichyou control through use of the rudder pedals. Landing gear can also be classified as either fixedorretractable. Fixed gear always remains extended, while retractable gear can be stowed for flightto reduce air resistance and increase airplane performance. Just as shock absorbers are needed ona car, some shock absorbing device is needed on the landing gear. Shock struts are designed forthis purpose. They absorb bumps and jolts, as well as the downward force of landing. Airplanebrakes operate on the same principles as automobile brakes, but they do have a few significantdifferences. For example, airplane brakes usually are located on the main wheels, and are appliedby separate pedals. Because of this, operating the brake on the left independently of the brake onthe right, or vice versa is possible. This capability is referred to as different braking. It is important

during ground operations when you need to supplement nose wheel steering by applying the brakeson the side toward the direction of turn. In fact, differential braking is extremely important onconventional gear airplanes, since some do not have a steerable wheel. In small airplanes, thepowerplant includes both the engine and the propeller. The primary function of the engines toprovide the power to turn the propeller. It also generates electrical power, provides a vacuumsource for some flight instruments, and, in most single-engine airplanes, provides a source of heatfor the pilot and passengers. a firewall is located between the engine compartment and thecockpit to protect the occupants. The firewall also serves a mounting point for the engine. Duringflight, the four forces acting on the airplane are lift, weight, thrust, and drag. Lift is the upwardforce created by the effect of airflow as it passes over and under rate wings. It supports theairplane in flight. Weight opposes lift. It is caused by the downward pull of gravity. Thrust is theforward force which propels the airplane through the air. It varies with the amount of enginepower being used. Opposing thrust is drag, which is a backward, or retarding, force that limits thespeed of the airplane. Lift is the key aerodynamic force. It is the force that opposes weight. Instraight-and-level, unaccelerated flight, when weight and lift are equal, an airplane is in a state ofequilibrium. If the other aerodynamic factors remain constant, that airplane neither gains nor losesaltitude. When an airplane is stationary on the ramp, it is also in equilibrium, but the aerodynamicforces are not a factor. In calm wind conditions, the atmosphere exerts equal pressure on theupper and lower surfaces of the wing. Movement of air about the airplane, particularly the wing,is necessary before the aerodynamic force of lift becomes effective. During flight, however,pressures on the upper and lower surfaces of the wing are not the same. Although several factorscontribute to this difference, the shape of the wing is the principal one. The wing is designed todivide the airflow into areas of high pressure below the wing and areas of comparatively lowerpressure above the wing. This pressure differential, which is created by movement of air about thewing, is the primary source of lift. The weight of the airplane is not a constant. It varies with theequipment installed, passengers, cargo, and fuel load. During the course of a flight, the totalweight of the airplane decreases as fuel is consumed. Additional weight reduction may also occurduring some specialized flight activities, such as crop dusting, fire fighting, or skydiving flights. Incontrast, the direction in which the force of weight acts is constant. It always acts straight downtoward the center of the earth. Thrust is the forward-acting force which opposes dragand propelsthe airplane. In most airplanes, this force isprovided when the engine turns the propeller. Eachpropellerblade is cambered like the airfoil shape of a wing. Thisshape, plus the angle of attack ofthe blades, produces reduced pressure in front of the propeller and increasedpressure behind it. Asis the case with the wing, thisproduces a reaction force in the direction of the lesserpressure. Thisis how a propeller produces thrust, the forcewhich moves the airplane forward. To increase thrustby using the throttle to increase power, thrust exceeds drag, causing the airplane toaccelerate. This acceleration, however, is accompanied by acorresponding increase in drag. The airplanecontinues toaccelerate only while the force of thrust exceeds the force of drag. When drag againequals thrust, the airplane ceasesto accelerate and maintains a constant airspeed. However,thenew airspeed is higher than the previous one. When the thrust is reduced thrust, the force ofdragcauses the airplane to decelerate. But as the airplaneslows, drag diminishes. When drag hasdecreased enough toequal thrust, the airplane no longer decelerates. Once again, it maintains aconstant airspeed. Now, however, it isslower than the one previously flown. As it has been seen,drag is associated with lift. Itis caused by any aircraft surface that deflects or interfereswith thesmooth airflow around the airplane. A highlycambered, large surface area wing creates more drag(andlift) than a small, moderately cambered wing. If theairspeed is increased, or angle of attack,the drag and liftincreases. Drag acts in opposition to the direction offlight, opposes theforward-acting force of thrust, andlimits the forward speed of the airplane. Drag isbroadlyclassified as either parasite or induced. In conclusion, the basic construction of planesarereally quite similar and all planes need the four forces offlight so that they are able to fly. Thesethings are quiteunique in their own way but without these things the planeswould never be able tofly or even be built.