

# Summary as smaller aircraft do not have the

Design



Summary This case analysis evaluates the placement of the different engines that can be found in the aircraft design. As the placement of the engines has a very big impact on the aircraft performance. Therefore, this case analysis will evaluate how the placement of the engines will influence the aircraft in many ways. For instance, safety, structural weight, drag, control, maximum lift, propulsive efficiency, maintainability, and aircraft growth potential. Significance of the Problem Everyone's surely has their own view and reason on the different placement of the engines in the aircraft design. For instance, wing-mounted engines, aft fuselage engine placement, and three engine designs. Alternative Action 1 Wing-mounted engines normally can be seen using on larger aircraft.

Advantages Such engines placement will help to minimize the parasite drags and probably minimize the weight. Engines are quite heavy therefore placing them in the correct position will help to keep the balance of the aircraft, so that the aircraft won't tend to pitch down or up during flight. In a situation where the engine failure, the inboard location will help to minimize the yaw moment of the aircraft due to the asymmetric thrust. Disadvantages This kind of engine placement poses as a threat to the basic wing structure because in an event if a blade or turbine disk failure, it will result in very difficult to maximize the inlet efficiency and making accessibility for the engineers on the ground to perform the maintenance much more difficult. In an event of making improvement to the existing engine design. For instance, increase engine to larger diameter in the later date, designers and engineers will have to redesign and rebuild the whole entire wing.

The point of placing the engine at the correct position will help to keep the balance of the aircraft, therefore it is a challenge that the designers face during the design phase of the aircraft to determine the position of the engine if not it will affect the balance of the aircraft. Alternative Action 2 Aft fuselage engine placement normally can seem using on smaller aircraft. As smaller aircraft do not have the extra space for the placement of the engines under the wing and still maintain it adequate wing nacelle and nacelle-ground clearances. Therefore, the next most suitable location will be aft fuselage. Advantages This kind of engine placement will result in having higher  $CL_{max}$  due to the elimination of the exhaust-flap interference and wing-pylon that why flap cut-outs are not required. Which also minimize the drag experience that generally occurs in the critical part of the taking off climb phase due to the eliminating of the wing pylon interference. In an event of engine failure, the asymmetric yaw will be much less due to the engine close to the fuselage. Disadvantages One of the main problem for this particular type of engine placement is that the aircraft will face much more difficulty in balancing and require generally a larger tail to do so due to the center of gravity (CG) of the aircraft had been moved to aft.

Which results in the center of gravity (CG) to be well behind in its payload. Thus, this kind of engine placement aircraft will require the much high enter of gravity (CG) range. As aft fuselage mounted engines will help in the reduction of the rolling moment. Therefore, the significant rolling moment that created by the asymmetric stalling could be a disadvantage that resulting in an excessive roll rate during the stall. Alternative Action 3 Three engine designs placement is considered to be the second generation

of the jetairliners because of the innovative engine locations which include the advancement of the turbofan technology.

Therefore, we can find this type of engine placement in both middle and small size aircraft as large aircraft requires much strong engine power.

**Advantages** This kind of engine placement will be much lighter in weight due to the number of engines being used on the aircraft. This design also helps to reduce in the drag experience, effectiveness in the reverser, and give the engineers much bigger space in the maintenance of the engines.

**Disadvantages** Three engines design placement will result in a small inlet loss due to the length of the inlet and there will be an increase in fin structural weight in order to support the three engines. As fuel efficiency may be another problem in this type of design because three engines designed aircraft will normally consume much more fuel than a normal twin engine designed aircraft. **Recommendation** This case analysis shows that every single engine placement design done on the aircraft have their own possible with advantages and disadvantages. For me, I think that wing-mounted engines are the best design among the three because it helps in the balancing of the aircraft and preventing the aircraft wings from bending upwards due to the incoming winds.

However, when removing the weight of the engine from the wings, it means that much more strength and consideration has to be put into the wings structure in order to prevent it from bending upwards during flight like a piece of paper. One of the main problem I think that the design teams will face when designing this particular engine placement will be the position of the engines, if this is not done properly it will have a very big impact on the <https://assignbuster.com/summary-as-smaller-aircraft-do-not-have-the/>

aircraft balance. I will recommend that the design team to work hand in hand with the engineers to do couples of tests to find out the best position for the engines before building the real one.