

AE-332 :Engine Mounting methods

The arrangement of engines influences the aircraft in many important ways. Safety, structural weight, flutter, drag, control, maximum lift, propulsive efficiency, maintainability, and aircraft growth potential are all affected.

Engines may be placed in the wings, on the wings, above the wings, or suspended on pylons below the wings. They may be mounted on the aft fuselage, on top of the fuselage, or on the sides of the fuselage. Wherever the nacelles are placed, the detailed spacing with respect to wing, tail, fuselage, or other nacelles is crucial.

Wing-Mounted Engines

Engines buried in the wing root have minimum parasite drag and probably minimum weight. Their inboard location minimizes the yawing moment due to asymmetric thrust after engine failure. However, they pose a threat to the basic wing structure in the event of a blade or turbine disk failure, make it very difficult to maximize inlet efficiency, and make accessibility for maintenance more difficult. If a larger diameter engine is desired in a later version of the airplane, the entire wing may have to be redesigned. Such installations also eliminate the flap in the region of the engine exhaust, thereby reducing C_{Lmax} .

For all of these reasons, this approach is no longer used, although the first commercial jet, the deHavilland Comet, had wing-root mounted engines.

Aft Fuselage Engine Placement

When aircraft become smaller, it is difficult to place engines under a wing and still maintain adequate wing nacelle and nacelle-ground clearances. This is one reason for the aft-engine arrangements.

Disadvantage: The center of gravity of the empty airplane is moved aft - well behind the center of gravity of the payload. Thus a greater center of gravity range is required. This leads to more difficult balance problems and generally a larger tail. There are many more disadvantages listed for this arrangement in the link provided.

Three-Engine Designs

A center engine is always a difficult problem. Early McDonnell Douglas DC-10 studies examined 2 engines on one wing and one on the other, and 2 engines on one side of the aft fuselage and one on the other, in an effort to avoid a center engine. Neither of these proved desirable

Detailed expansion:

<http://adg.stanford.edu/aa241/propulsion/engineplacement.html>

.....by Bhavya Senwar

Engine Mount Designs in Jet Aircraft, Engine Locations in Jet Aircraft

In helicopters, it is about the concept of countering torque which earned most helicopter designs their distinction from the rest. In jet aircraft, it is about the location of the engines which give them their characteristic appearance which becomes the design signature of its manufacturers. In this post, I have selected the widely used engine locations we could observe from famous aircraft of the past and the present.

Engine Pylons Under Wing

Boeing learned so much from the failures of the DH Comet that it stuck on this engine configuration for decades. Other aircraft manufacturers who wish not to risk so much in research funds and loss of lives trying new engine location designs began to adopt this configuration as well. From the early Boeing airliners, the 707, 757, 747, 737, 767 to the latest 787 this design is evident.

Twin Turbojets under Wing

Introduced in 1952 at the first flight of the B-52 Stratofortress which incorporated this engine design, it probably was the only aircraft type to utilize this engine configuration concept. Note that this aircraft has 8 engines each, 4 engines each side attached in pairs under the wing pylons. With 744 units built, how many engines does it make? At present only 76 B-52s remain in active service.

source: <http://airplanes-aircraft.knoji.com/engine-mount-designs-in-jet-aircraft-2/>

..... by Ravindra Khare