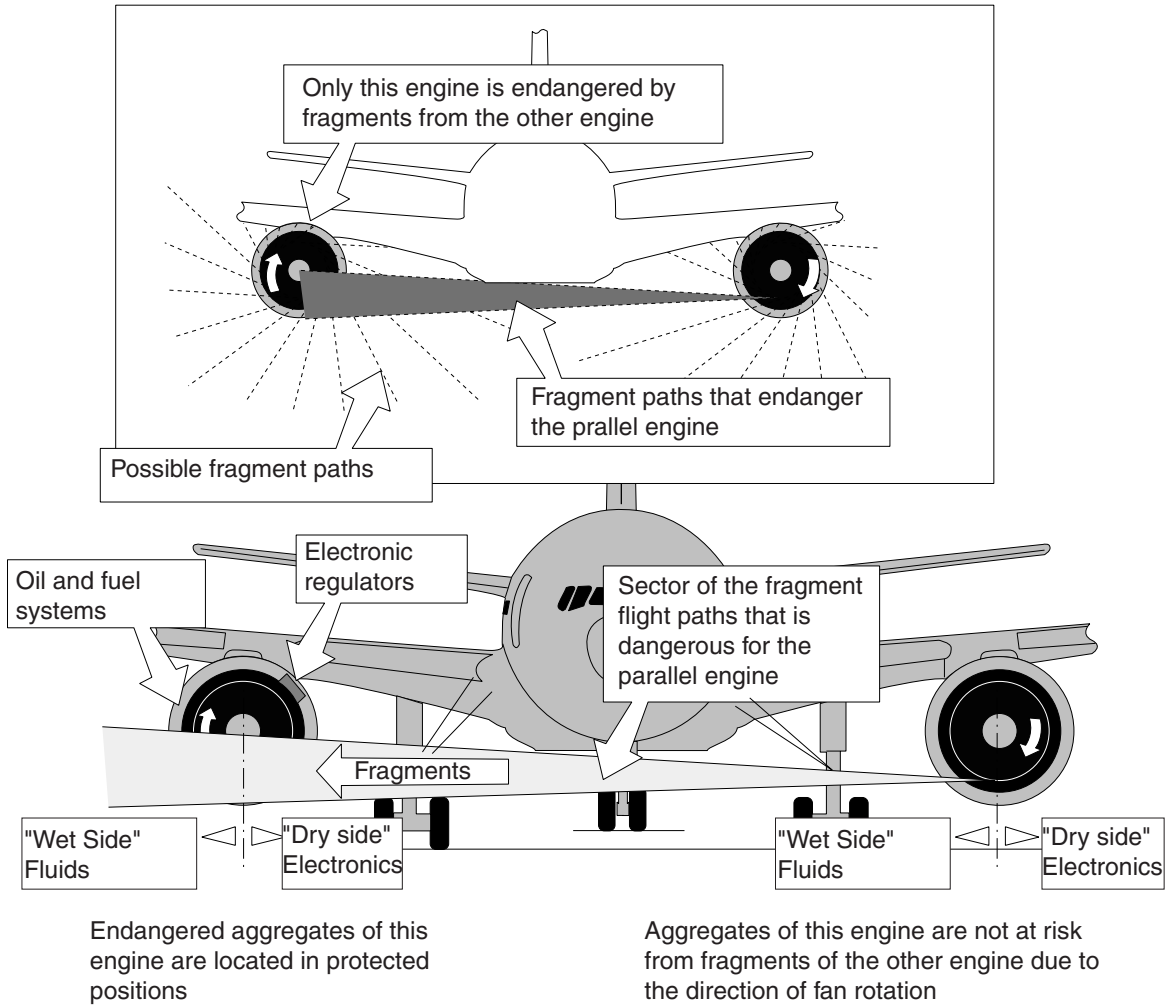


Safe positioning of the auxiliary components depends on the direction of rotation of the fan.



### III. 8.2-3.2

*Illustration 8.2-3.2: In order to avoid failure of both engines the **mounted components, such as electronic regulators and oil and fuel systems on the side of the engine**, should if possible be mounted on the engine in such a way that the probability of them being damaged by fragments from the parallel engine is minimized (see ETOPS, Volume 1 Chapter 3). To this end, it is important that in twin-engine aircraft, **only one of the two wing-mounted engines** has the potential to damage the other due to possible fragment trajectories (top diagram). The fact that only one of the engines can damage the other is due to the direction of rotation of the shafts being the same and the parallel arrangement of the engines. This makes it possible to position the ancillary equipment suitably (bottom diagram).*

**Example 8.1-1.1 (Ref. 8.2-19):**

**Excerpt:** “A turbine disk failed during the ground maintenance run...

The disk burst occurred...1,675 cycles after fluorescent dye inspection... (by the OEM) showed it was okay. About **one-third of the disk**, or 45 lb., **cut through the ...(aircraft’s) front span, penetrated a fuel tank and exited through the top of the wing** and started a fire. The engine case was severed but held together by the fan shaft. ‘this is the only time this has happened in 15 years of service and we don’t have a cause yet,’ ...(a OEM) official said.

Inspection of the removed disk pieces showed a **radial crack starting from fatigue at the bottom rear of a blade root slot**. The NTSB found two prior cases of cracks at that location, both possibly related to **damage stemming from mechanics prying off a shrink-fit thermal shield** that runs by the rear of the slot. ‘The cracks in (these) disks very likely would have propagated to catastrophic failure,’ the NTSB said.“

**Comment:** Even though, as in this case, engines in modern commercial aircraft are mounted in front of the wing (Ill. 8.2-1) in order to minimize the risk of tank damage or destruction of supporting frame structures, the turbine’s location relatively far back in the engine puts it in a position to cause the aforementioned types of damages if fragments are created.