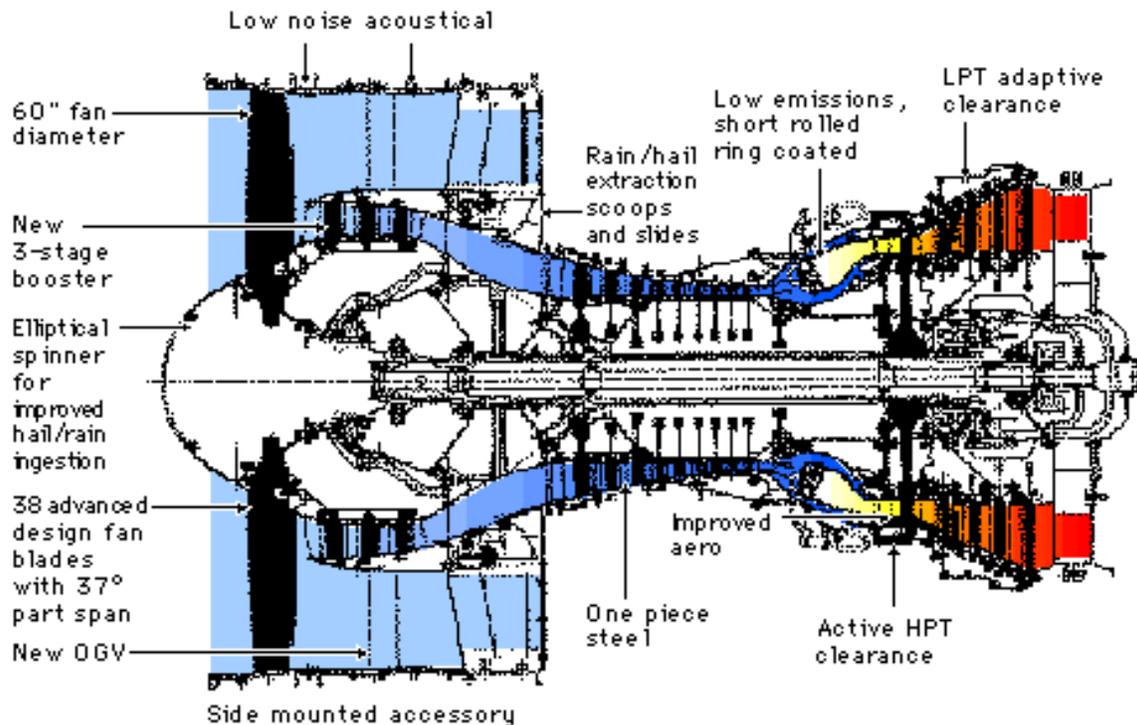**Unified Engineering Spring Term 2004**

Problem P8. (Propulsion) **(L.O. G)**

To answer this question, it will be necessary to make some estimates from the CFM56-003 engine

Measure the inlet and exit blade angles near the root of the fan and the inlet blade angle of the first stator blade on the 3-stage low pressure compressor (the "booster" as labeled above).

a) Based on these measurements and assuming that the axial flow Mach number is 0.5, how fast does the low-speed/low pressure spool rotate? Please give your answer in RPM's (revolutions per minute). Make two estimates, one based on the flow angle into the fan and one based on the flow angle into the stator.

b) At this rotational speed, what is the relative Mach number at the tip of the fan blade?

[*Note: If you did not attend one of the lectures where we discussed the engine, the low-speed spool is the shaft that holds the fan blades and the first three stages of the compressor along with the low pressure turbine. The high-speed spool is on a concentric shaft outside of the low speed shaft. It holds the high pressure compressor and the high pressure turbine. You can see which parts are attached to the low speed spool by gently moving the fan back and forth.*]