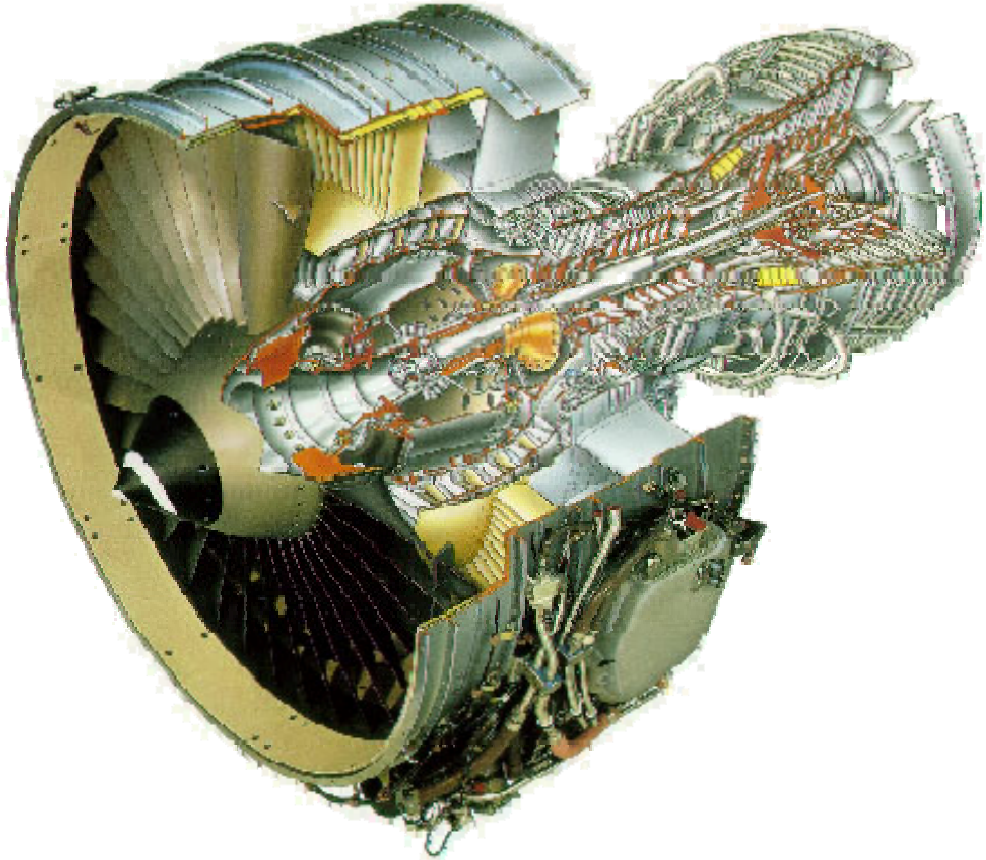
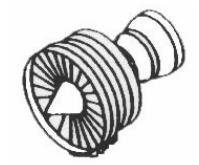
# ENGINE PERFORMANCE DETERIORATION





**ENGINE**
performance
deterioration

66 %

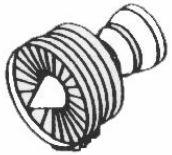
**AIRCRAFT**
performance
deterioration


↘ EGT MARGIN

↗ FUEL BURN

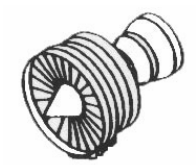
***THERMAL** Loads*

***CENTRIFUGAL** Loads*



**ENGINE**
performance
deterioration

***PRESSURE & AERODYNAMIC** Loads*

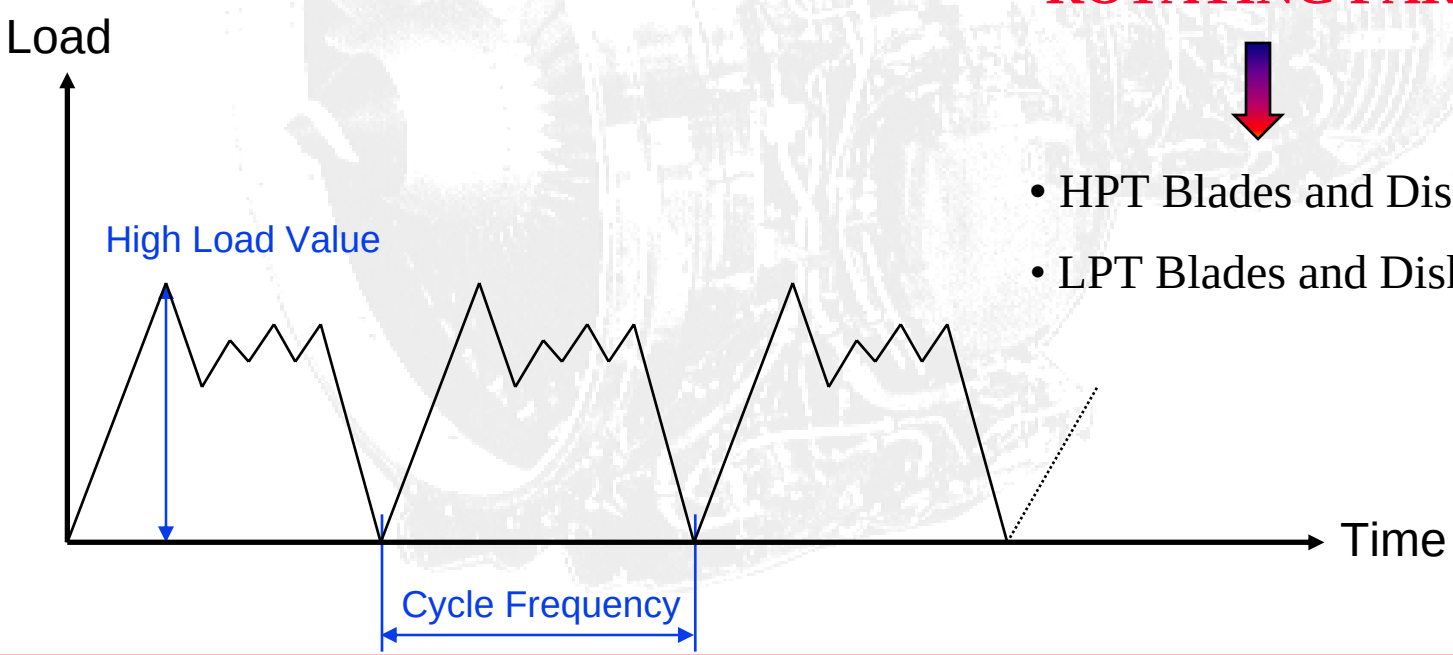


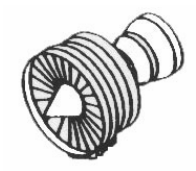
**ENGINE**
performance deterioration

**CYCLE FATIGUE**

**ROTATING PARTS**

- HPT Blades and Disks
- LPT Blades and Disks



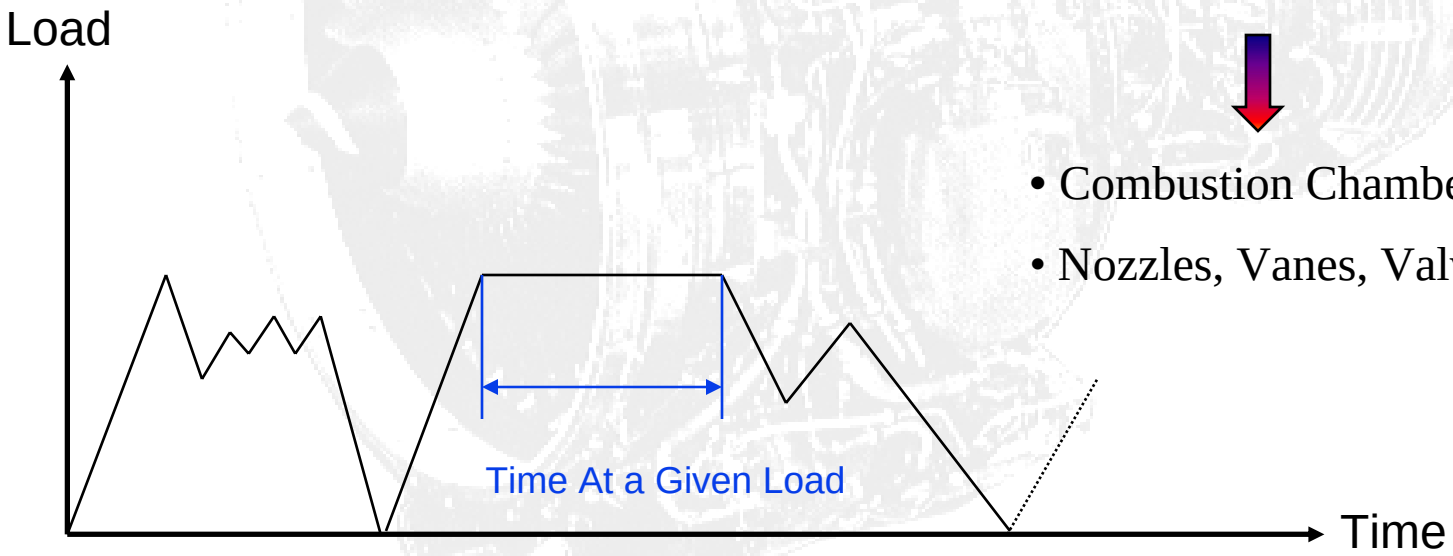


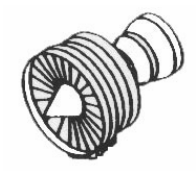
**ENGINE**
performance deterioration

**STEADY FATIGUE**

**FIX PARTS**

- Combustion Chamber
- Nozzles, Vanes, Valves





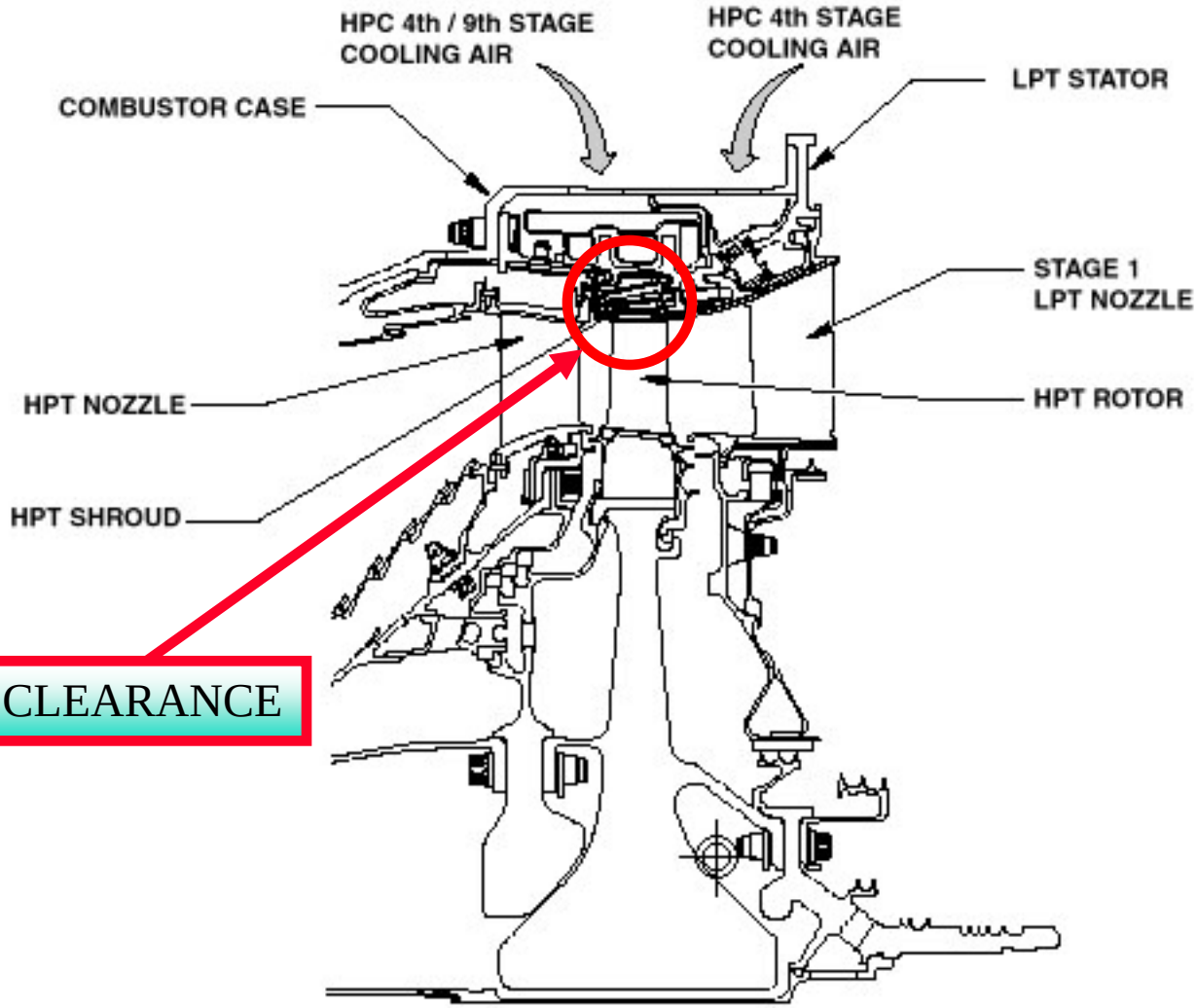
**ENGINE**
performance
deterioration

**BLADES / CASING CLEARANCES**

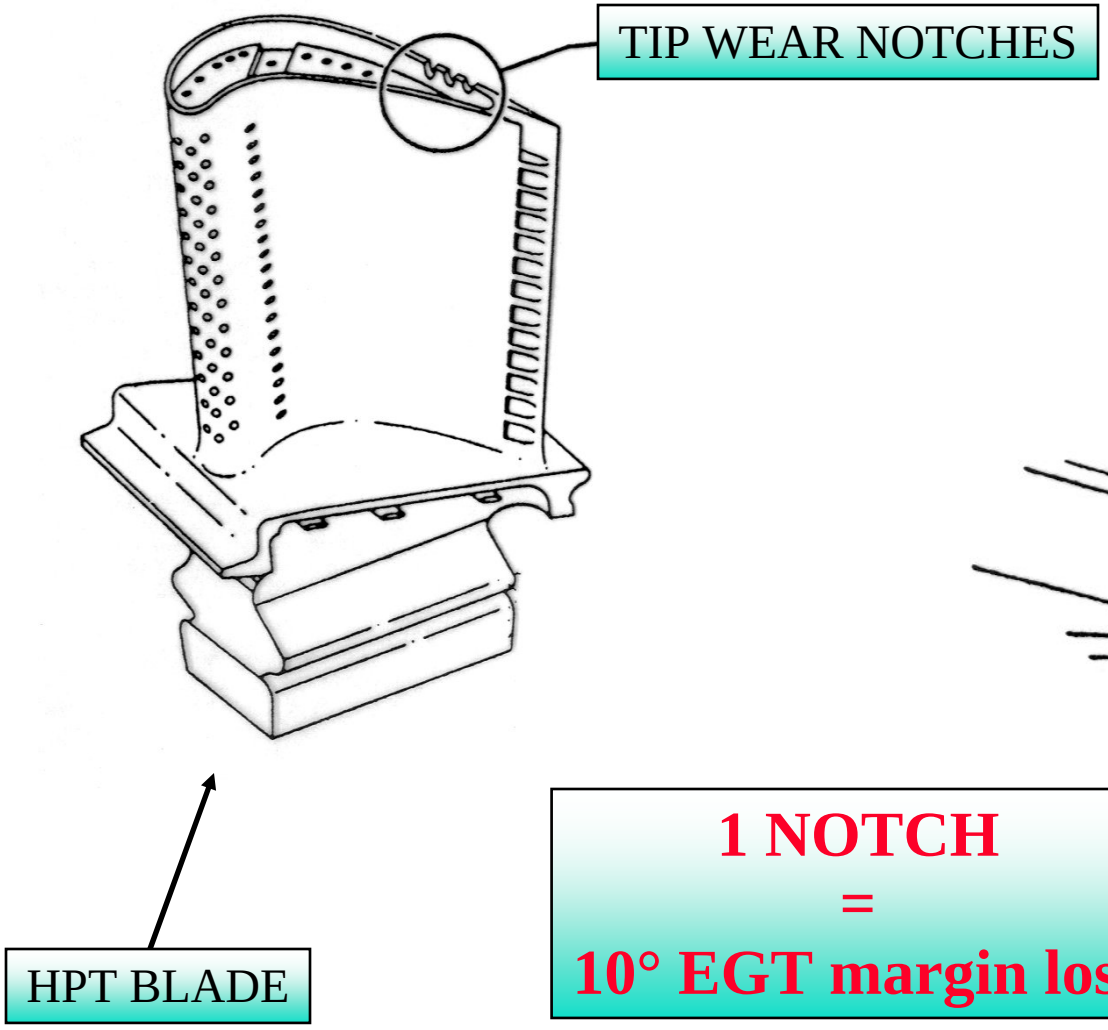
**EXCESSIVE**

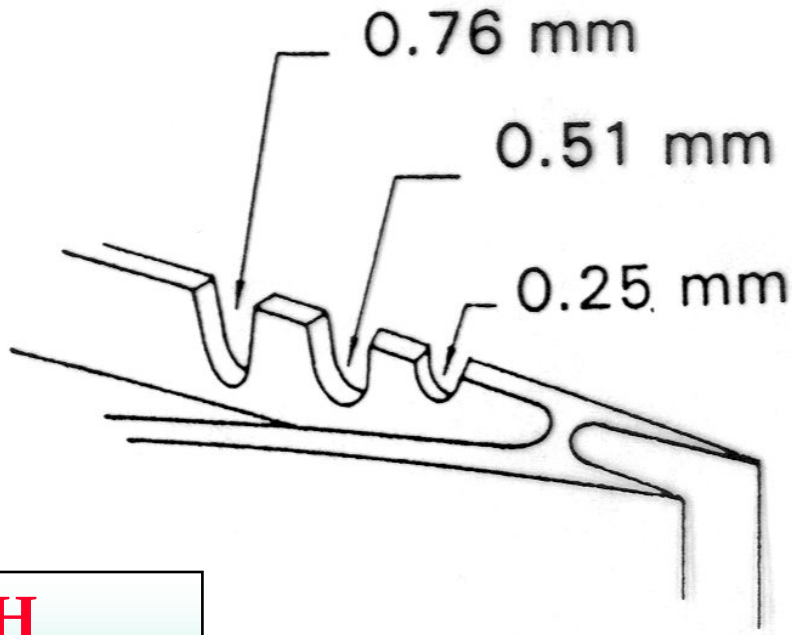
- Possible EGT over-temperature
- Fuel over-consumption

**+ 10° EGT**
**=**
**+ 0.7% SFC**

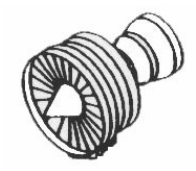



HPT BLADE CLEARANCE




**1 NOTCH**
**=**
**10° EGT margin loss**



**ENGINE**
performance deterioration

**BLEED AIR**

**AIR LEAKAGES**

- Bleed Valves
- VBV

- 1% leakage, 9Th stage **HPTCC bleed**
➔ **+ 0.5% SFC**
- 1% leakage, 9Th stage **CUSTOMER bleed**
➔ **+ 1.6% SFC**
- **VBV leakage**, open 10°
➔ **+ 0.7% SFC**

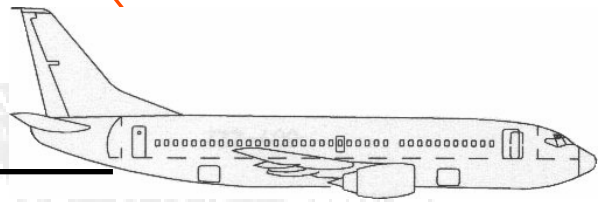
# CREW POINT OF VIEW

- ENGINE START UP MONITORING
- DERATE TAKE OFF
- BLEED OFF TAKE OFF
- ROLLING TAKE OFF
- PROGRESSIVE POWER SETTING
- AVOID SLAM ACCELERATION & DECELERATION
- AWARENESS OF WARM UP & COOL DOWN PERIODS

**TAKE CARE OF YOUR ENGINES…**

**YOU WILL SAVE MONEY …**

**AND KEEP YOUR AIRCRAFT SAFE !!!**



# THE END

**THANKS FOR YOUR ATTENTION !**