021 Airframes

021-01 System Design, Loads, Stresses, Maintenance

	MINOR	MAJOR	HAZARDOUS	CATASTROPHIC
probability	10^{-3}-10^{-5}	10^{-5}-10^{-7}	10^{-7}-10^{-9}	< 10^{-9}
crew	slight workload increase	significant workload, discomfort	excessive workload physical distress	multiple fatalities
passengers & cabin crew	some physical discomfort	physical distress, possibly injuries	serious/fatal injury to small number	
capabilities/ safety margin	slight reduction	significant reduction	large reduction	failure

Stress – caused by force applied to an object

Strain – deformation caused by stress

021-02 Airframe

	Jet A (US)	Jet A-1	Jet B	100LL	100	80
color	transparent	transparent	transparent	blue	green	red
density	0.8	0.8	0.8	0.72	0.72	0.72
freezing point	-40	-47	-60	-60	-60	
flash point	38	38	-20	-25	-25	

elevator/pitch trim	zero force position does not change
aileron/rudder trim	zero force position changes

Normalair-Garrett, Teddington	heated rod or probe & floodlight
Sangamo Weston	two heat sensors & moisture detector
Smith	small heated pipe with several holes
Rosemount	vibrating detector

Ice Detection Systems: „primary automatic“, „primary manual“, „advisory“

021-03 Hydraulics

Variable Pressure Pump

Constant Pressure Variable Displacement Pump (axial piston pump)

021-09 Electrics

$V = I \cdot R$

W = V * I

C = e * a / d (capacitance in fuel tanks)

Q = C * U

$X_C = 1 / (2 * pi * F * C)$

$I = V / X_C$

Resistance (Ohm)

- Series: $R = R_1 + R_2$
- Parallel: $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

Electric Motor: RPM = frequency in Hz * 60 / number of pole pairs

Batteries:

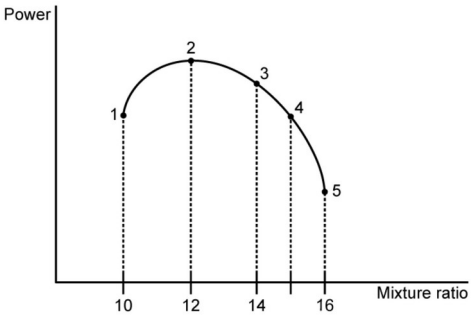
- Series: Voltage sum, Ah remains the same
- Parallel: Voltage remains the sam, Ah sum

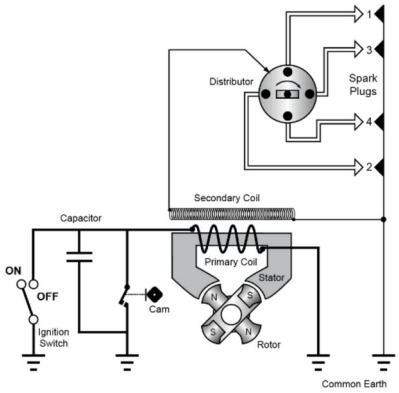
021-10 Piston Engines

Power = torque * RPM

1	10:1	rich	
2	12:1	rich	best power
3	14:1	rich	theoretical best economy on rich side
4	15:1		neither rich nor lean, chemically correct
5	16:1	lean	best economy on lean side

Effect of richness (massflow air / massflow fuel) on power at a given RPM and manifold pressure.





021-11 Turbine Engines

$T = m (V_J – V_V) + A(p_J – p_0)$

$1 Pa = 1 N/m^2 => 1 hPa = 100 N/m^2$

hung start	lights up, fails to accelerate
hot start