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Effect of Change in Role of an Aircraft on Engine Life

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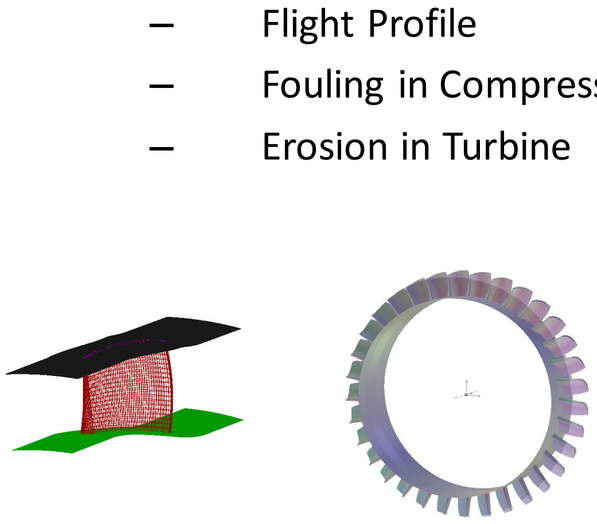
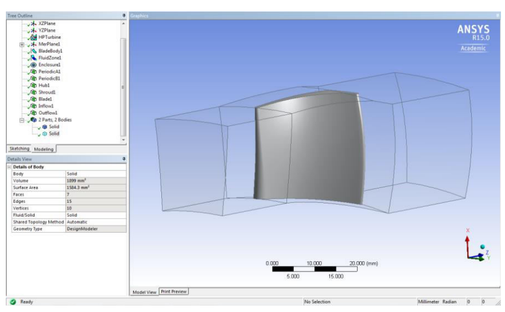
Aim:

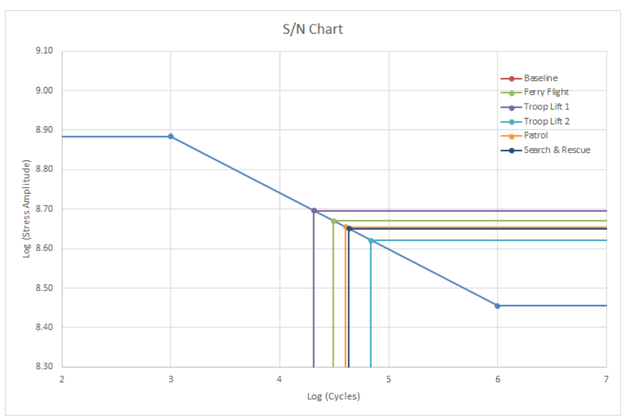
- To investigate the impact, if any, of role changes in aircraft on the life of the engines.

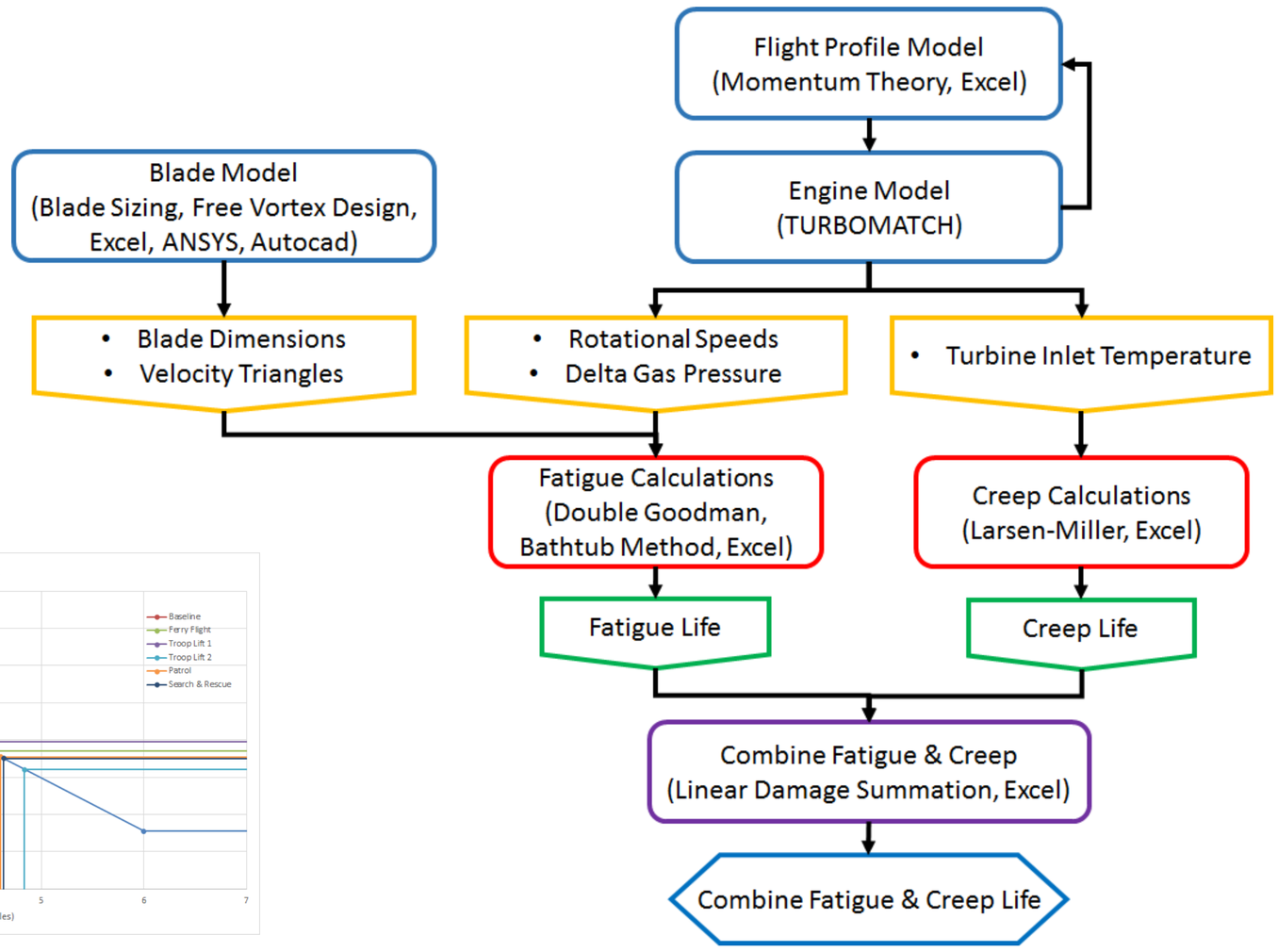
Methodology:

- Quantify the impact of the following on fatigue, creep and combined fatigue and creep life:
  - Ambient Temperature
  - Flight Profile
  - Fouling in Compressor
  - Erosion in Turbine









Effect of Operating Environment:

- Ambient temperature reduces total engine life by approximately half.
- Fouling and erosion (corresponding to environmental damage due to dusty or salt laden environment) can reduce creep life by up to 80%. Effect on total life is only pronounced in warmer climates.

		ISA			ISA +20		
		Fatigue Life	Creep Life	Combined	Fatigue Life	Creep Life	Combined
Clean Engine	Ferry Flight	31008	18237003	30956	16476	138338	14723
	Troop Lift 1	20617	3197536	20485	11268	27998	8034
	Troop Lift 2	52756	77629184	52720	28535	532942	27085
	Patrol	40312	51321518	40280	22387	392347	21179
	SAR	43153	67688361	43126	24005	499804	21436
3% Comp Fouling	Ferry Flight	34355	3051652	33973	18211	26310	10762
	Troop Lift 1	22927	590387	22070	12524	6384	4229
	Troop Lift 2	57798	12453362	57531	31804	109053	24623
	Patrol	43631	8920458	43418	24418	80613	18741
	SAR	47547	11067173	47344	26550	101624	21050
3% Turbine Erosion	Ferry Flight	35209	5494232	34985	19401	51740	14110
	Troop Lift 1	24452	1066041	23904	13437	10699	5956
	Troop Lift 2	59617	23037370	59463	33142	193112	28288
	Patrol	47094	15156561	46948	25829	146000	21946
	SAR	50313	19736793	50185	28144	176669	24276

Effect of Flight Profile:

- Different flight profiles contribute very different to engine damage.
- Poor planning of aircraft utilisation can result in almost 100% difference in engine life consumption.

Reference

1. Newman, S. (2001), *The foundations of helicopter flight*, Halsted Press.
2. Seddon, J. M. and Newman, S. (2011), *Basic helicopter aerodynamics*, John Wiley & Sons.
3. Wu, F. (1994), Aero engine life evaluated for combined creep and fatigue, and extended by trading-off excess thrust. (PHd thesis), Cranfield University, Cranfield, UK.

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