AIRCRAFT PERFORMANCE- GENERAL

DEFINITIONS

CLASS B AIRCRAFT

- Propeller aircraft with
- MOPSC 9 or less AND
- MTOW 5700 kgs or less

CLASS C AIRCRAFT

- Propeller aircraft with
- MOPSC more than 9 OR
- MTOW more than 5700 kgs

CLASS A AIRCRAFT

- All turbo-jet aircraft

AND any multi engine aircraft which are:

- Turbo-propeller driven
- MOPSC more than 9 OR
- MTOW more than 5700 kgs

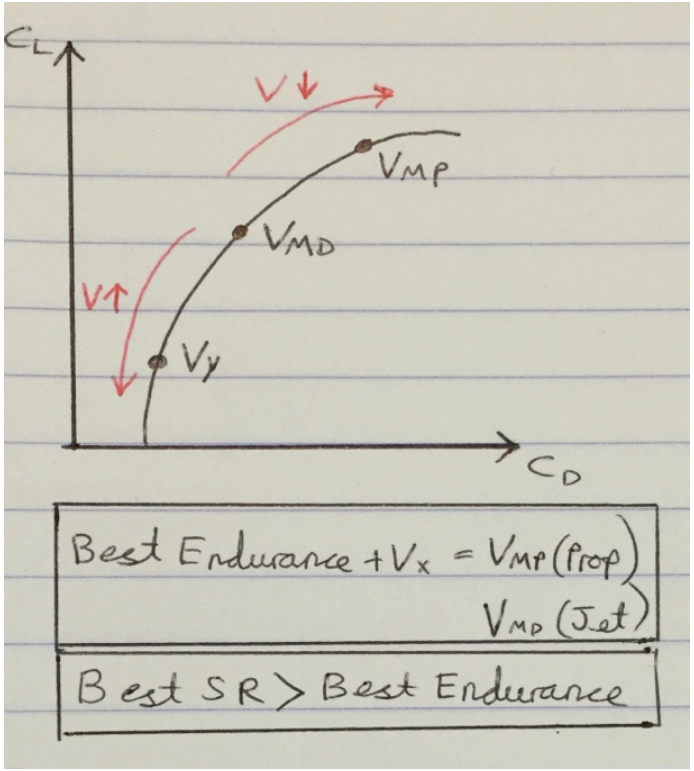
SERVICE CEILING

- **Prop:** 100 fpm
- **Jet:** 500 fpm

MINIMUM V_{REF}

- **Class B:** 1.3 V_{SO}
- **Class A:** 1.23 V_{SO}

SPEEDS

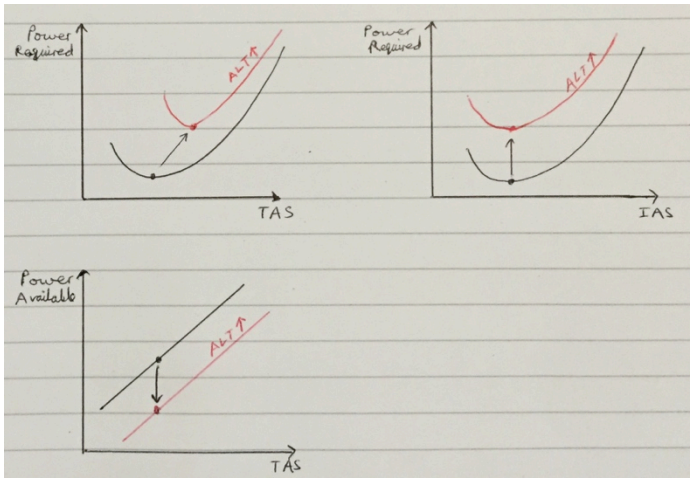


	Prop	Jet
Endurance	V_{MP}	V_{MD}
V_X	V_{MP}	V_{MD}
Specific Range	V_{MD}	1.32 V_{MD}
V_Y	V_{MD}	> V_{MD}

V_X & V_Y WITH ALTITUDE

	IAS JET	IAS PROP	TAS
V_X	•	↑	↑
V_Y	↓	↓	↑

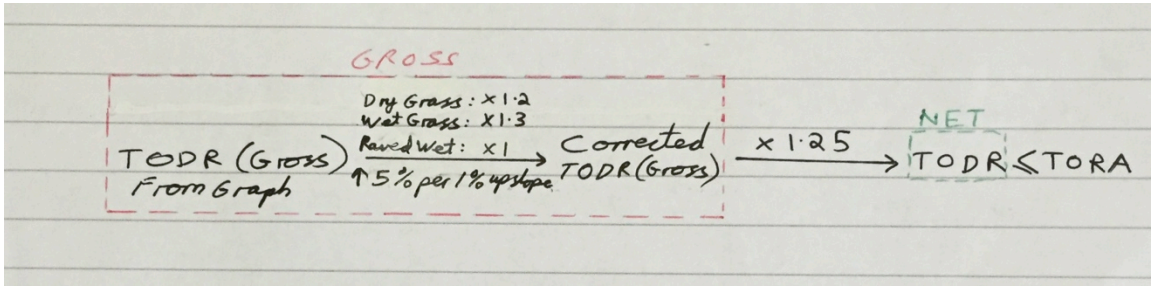
POWER REQUIRED & AVAILABLE CURVES



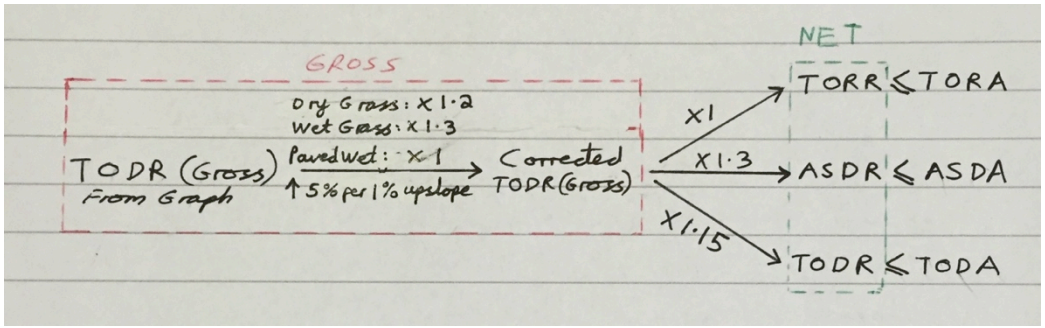
AIRCRAFT PERFORMANCE – CLASS B

CLASS B (SEP + MEP) TAKEOFF AND LANDING FACTORS

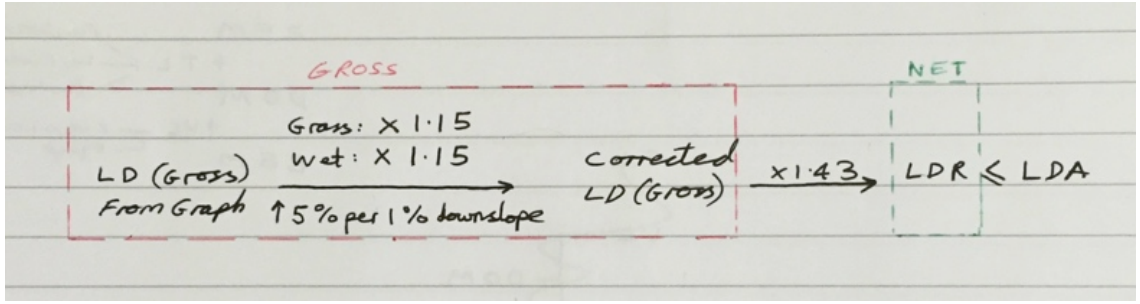
TAKEOFF CLACULATIONS (BALANCED FIELD)



TAKEOFF CLACULATIONS (UNBALANCED FIELD)



LANDING CLACULATIONS



CLASS B

CLASS B – FLIGHT PHASES

- **Takeoff:** BRP → 50 ft screen height
- **Climb:** 50 ft → 1500' AGL
- **Landing:** 50 ft → Full Stop

CLIMB GRADIENT & ROC FORMULAE

$$CG_{SA} = \frac{HG}{HD_{SA}}$$

$$CG_{WE} = \frac{HG}{HD_{WE}}$$

$$ROC = TAS \times \sin\theta$$

$$ROC = TAS \times GC_{SA} = GS \times GC_{WE} \quad \text{*UNITS*}$$

$$HD_{WE} = \frac{GS}{ROC} \times HG \times \frac{6080}{60}$$

EN-ROUTE MIN CLIMB GRADIENT

- **Class B:** 300 fpm all engines

DRIFTDOWN

- Net Gradient = Gross increased by 0.5%

AIRCRAFT PERFORMANCE – CLASS A

TAKEOFF DISTANCE

	All Engines	OEI	TODR
Dry	BRP -> 35 ft X 1.15	BRP -> 35 ft	<-- Greatest Of
Wet	*Greatest of that for dry runway*	BRP -> 15 ft	<-- Greatest Of

TAKEOFF RUN

	All Engines	OEI	TORR
Dry	BRP -> Halfway between V_{LOF} and 35 ft X 1.15	BRP -> Halfway between V_{LOF} and 35 ft	<-- Greatest Of
Wet	BRP -> Halfway between V_{LOF} and 35 ft X 1.15	BRP -> 15 ft	<-- Greatest Of

ACCELERATE STOP DISTANCE

	All Engines	OEI	ASDR
Dry (Reverse Inop)	BRP -> Full Stop V_1 + 2 sec	BRP -> Full Stop V_{EF} + 2 sec	<-- Greatest Of
Wet (Reverse Ok)	BRP -> Full Stop V_1 + 2 sec	BRP -> Full Stop V_{EF} + 2 sec	Greatest of all 4 distances

AIRCRAFT PERFORMANCE – CLASS A

CLASS A V SPEEDS

V_R (ROTATE) MINIMUMS

- V1
- 1.05 V_{MCA}
- Speed such that V_2 is attained at 35 ft
- 1.1 V_{MU} (All Engines) / 1.08 (Geometry Lim)
- 1.05 V_{MU} (OEI) / 1.04 (Geometry Lim)

V_{2MIN} (MIN SAFETY SPEED) MINIMUMS

- **1.13 V_{SR}**
  - 2 / 3 Engine Turboprop
  - Turbojet with no provision for changing stall speed as a result of OEI
- **1.08 V_{SR}**
  - 4 Engine Turboprop
  - Turbojet with provision for changing stall speed as a result of OEI
- **1.1 V_{MCA}**

CLASS A TAKE-OFF CLIMB

4 SEGMENTS

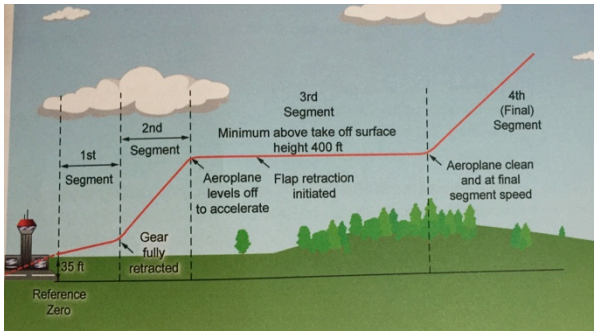
1. From 35 ft to gear retraction

2. Till level off for acceleration
   - Min 400' AGL
   - Equivalent gradient 1.2%

3. Till thrust reduction to MCT

4. Till 1500 ft min / obstacles clear

- Throughout the takeoff climb, **35 ft obstacle clearance** is provided.



NET VS GROSS CLIMB PATH

- 2 Engine Net = Gross x 0.8%
- 3 Engine Net = Gross x 0.9%
- 4 Engine Net = Gross x 1.0%

MAX BANK ANGLE

- **Below 50':** 0^0
- **Up to 400':** 15^0
- **Above 400'**: 25^0

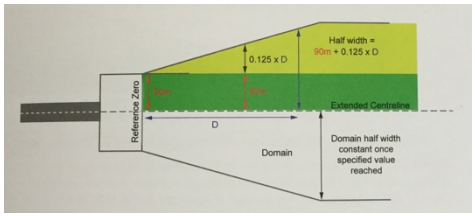
OBSTACLE ACCOUNTABILITY AREA

- If wingspan is **less than 60 m:**

$$60\ m + \frac{1}{2} Wingspan + 0.125D$$

- If wingspan is **more than 60 m:**

$$90\ m + 0.125D$$



- The point at which the sector parallels and stops increasing depends on the conditions
  - Good Vis – 300 m
  - Poor Vis / Track Change – 600 m
  - Poor Vis & Track Change – 900 m

AIRCRAFT PERFORMANCE – CLASS A

DRIFTDOWN

OBSTACLE CLEARANCE

- **Obstacle clearance:** 2000 ft

LANDING

APPROACH CLIMB

- OEI (Rest at TOGA thrust)
  Approach Flaps
- Gear Up

LANDING CLIMB

- All Engines (TOGA thrust)
- Landing Flaps
- Gear Down

LANDING FACTORS

- **LD X 1.67 = LDR – Turbojet (60%)**
- **LD X 1.43 = LDR – Turboprop (70%)**

- **Wet Runway:** x 1.15 (If not specified)

CONTAMINATED RUNWAY

- 25% of runway surface covered by 3 mm of water or its equivalent depth (by use of SG) in:
  - Slush
  - Loose snow
  - Compacted snow
  - Ice

- **Max Crosswimd:** 10 KTS

Coefficient	Braking Action
≥ 0.4	Good
-	Medium / Good
0.35 – 0.30	Medium
-	Medium / Poor
≤ 0.25	Poor
9	Unreliable

GENERAL FORMULA

LOAD FACTOR (TURN)

$$n = \frac{1}{\cos\theta}$$

FUEL MILEAGE

$$\frac{NEW\ SFC}{OLD\ SFC} = \frac{New\ Fuel\ Mileage}{Old\ Fuel\ Mileage}$$

STALL SPEED & WEIGHT

$$\sqrt{\frac{W_1}{W_2}} = \frac{V_1}{V_2}$$

CLIMBING

$$sin\,\theta = \frac{T - D}{W}$$

$$CG\ \% = \frac{T - D}{W} \times 100$$

AIRCRAFT PERFORMANCE – CLASS A

GRAPH ANSWERS

SEP

- 465m (+18)
- 1850ft (+27)
- 2375ft (+30)
- 4150ft (+38)
- 19500ft (+30)

- 3200 lbs (ISA)
- 3500 lbs (+40)

- 1140 / 10.6%

MEP

- 2000 ft (+24)
- 3450 ft (+20)

- 3450 lbs (+10)
- 4500 lbs (+5)

MRJT

- 5500ft (-7)
- 3100m (2000 ft)