Theory Brief 3: Climbing and Descending

Aim:

"To be able to climb and descend the aircraft to an assigned altitude and transition to and from S&L

Objectives:

1. Climb: 1 stage of flap - 70 kts at max power
2. Climb: Clean - 80kt max power
3. Descending: Cruise descent – reduced power – 95 kts
4. Descending: 1 stage of flap – 70 kts
5. Control the rate of descent by use of power
6. Learn to transition to and from straight and level flight

3 kinds of Energy

1. **Kinetic Energy** – Velocity x Mass (When moving from S+L to climb there is little change in KE)
2. **Potential Energy** – Height x Mass. (Large change in energy)
3. **Chemical Energy** – Fuel = Heat = Power = Thrust

Climbing:

Gaining altitude is more difficult than losing altitude!

Important: We MUST use full power for a climb for ALL climbs. This is to have efficient engine cooling by richening the fuel mixture.

Energy 101. Any increase in altitude = increase in Potential Energy. To climb we need to convert chemical energy to Potential Energy.

Manoeuvring In Flight

Climbing

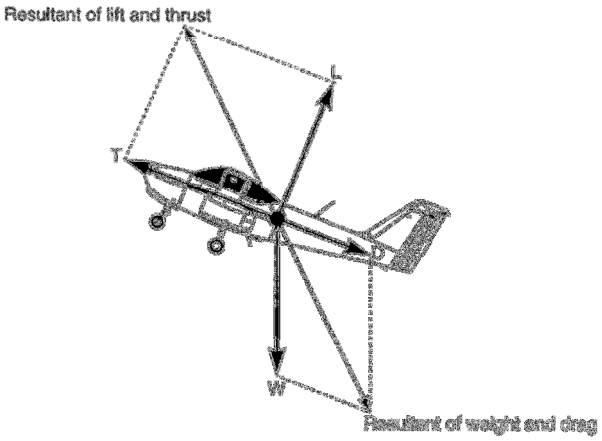
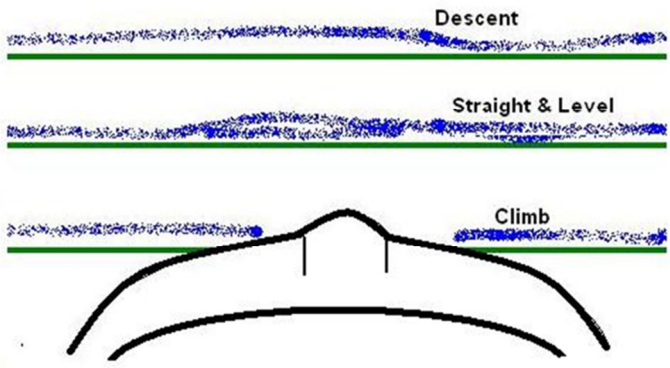
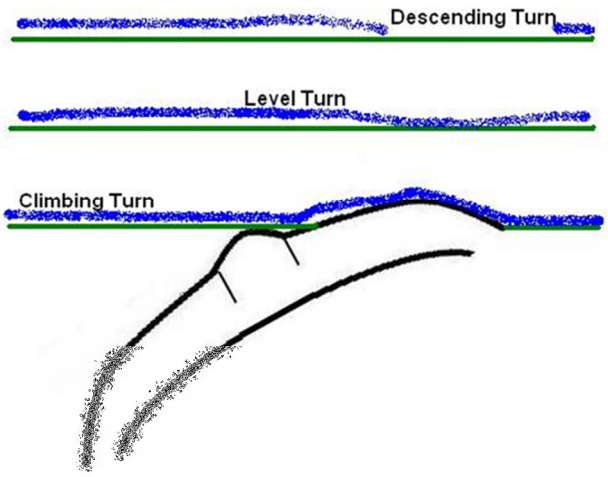


Fig. 1.61 Balanced forces in a climb

Attitudes:





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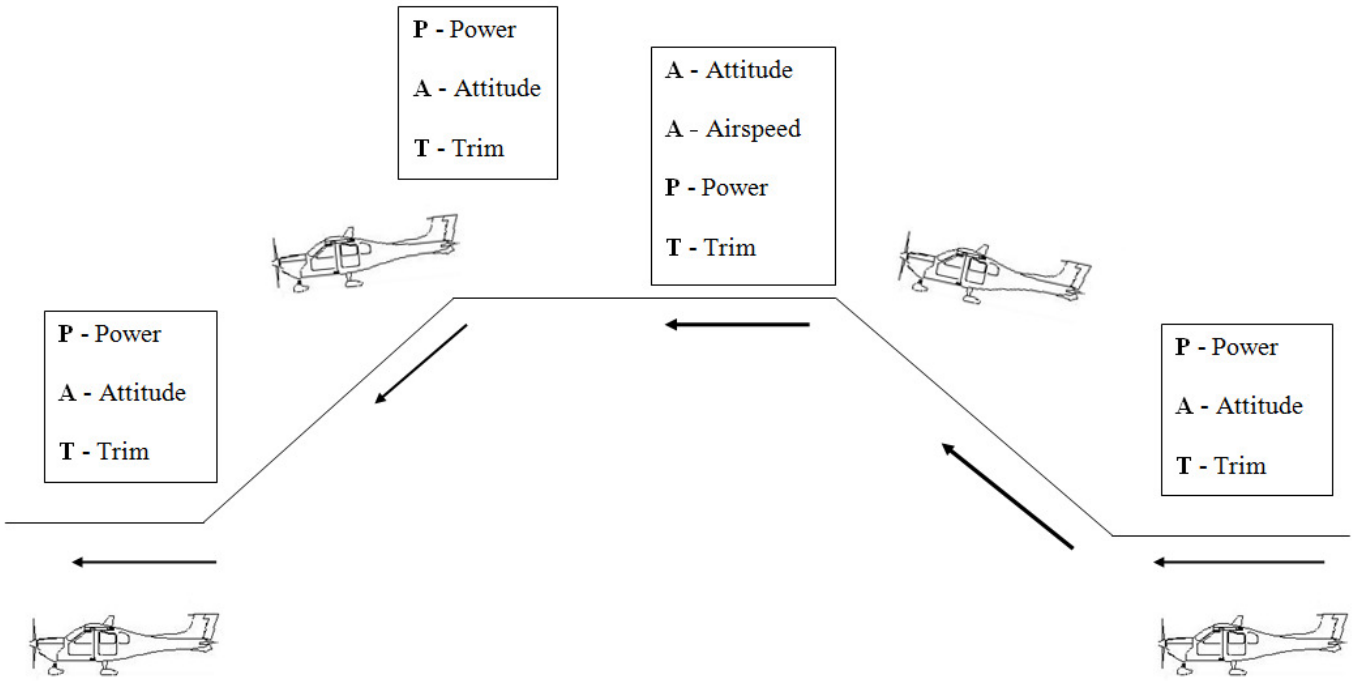
Transitions from and to "Straight and Level":

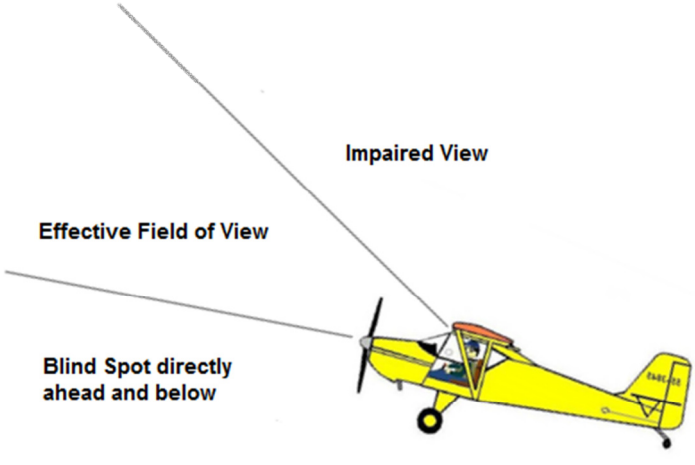


When descending for a landing:

- When we need 1 stage of FLAP. This changes the acronym to (Power – Attitude – Trim – Flap) P A T F
- Control the SPEED of the aircraft using ATTITUDE
- Control the RATE OF DESCENT using POWER

Airmanship:

1. Extended Climb:
    a. Make sure to lower the nose and/or weave in a climb and look out as when climbing you have a blind spot.
    b. As there is reduced airflow through the engine, there is a risk of exceeding max CHT therefore we:
        i. Do not exceed 5 minutes with max power
        ii. Step climb
    c. Be aware and DO NOT enter cloud a climb
    d. Be aware that Fuel burn in a climb is now 23L/h rather than the cruise 18L/h



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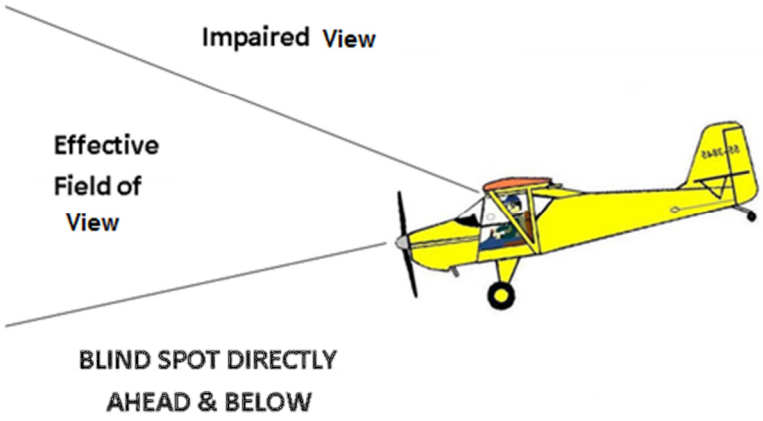
2. Descending
    a. Cruise Descent:
        i. do not exceed Va (manouvering speed) (Va = 112 kts in J160)
        ii. Make sure the CHT doesn't cool too much (below green band on gauge)
        iii. Apply carburettor heat in icing conditions (moist air and below 15 degrees C)
    b. Controlled Descent with Flap
        i. Do not exceed V_{FE} (Velocity flap elevation)
        ii. Make sure the CHT doesn't cool too much (below green band on gauge)
        iii. Apply carburettor heat in icing conditions (moist air and below 15 degrees C)
        iv. Remember there is less controllability at low airspeeds



Air Exercise:

1. To climb the aircraft with one stage of flap at 70kts.
2. To climb the aircraft "clean" at 80kts.
3. To descend the aircraft with one stage of flap at 70kts.
4. To transition from straight and level to a climb. (PAT)
5. To transition from straight and level to a descent. (PAT(F))
6. To transition from descent to straight and level. (PAT)
7. To transition from climb to straight and level (AAPT)