

FLIGHT DYNAMICS



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- Aircraft Performance
- Stability and Control

Unit 1

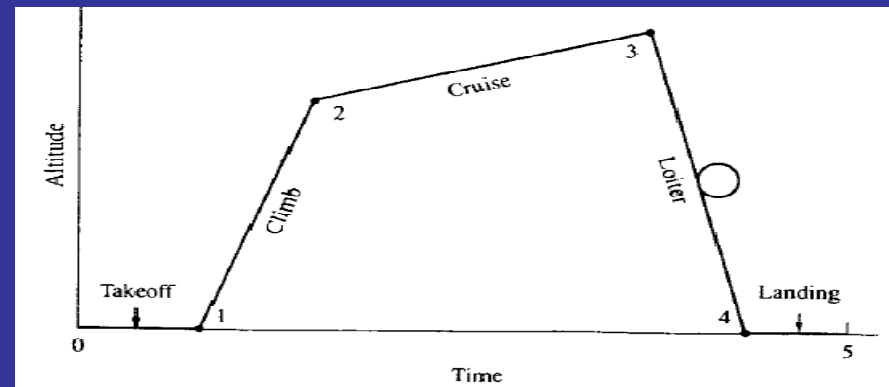
CRUISING FLIGHT PERFORMANCE

- International Standard Atmosphere
- Forces and moments acting on a flight vehicle
- Different types of drag - Drag polars equation
- Thrust
 - Thrust available and Thrust required curves.
- Power
 - Power available and power required curves.

Unit 2

MANOEUVERING FLIGHT PERFORMANCE

- Performance of airplane in level flight
- Range and endurance
- Climbing and gliding flight (Maximum rate of climb and steepest angle of climb, minimum rate of sink and shallowest angle of glide)



- Turning performance (Turning rate turn radius).
- Bank angle and load factor - Limitations of pull up and push over
- V-n diagram and load factor.

STABILITY

- **STATIC STABILITY**

- LONGITUDINAL
- LATERAL
- DIRECTIONAL



STICK FIXED

STICK FREE

- **DYNAMIC STABILITY**

- LONGITUDINAL
- LATERAL
- DIRECTIONAL



STICK FIXED

STICK FREE

Unit 3

STATIC LONGITUDINAL STABILITY

- Degree of freedom of rigid bodies in space - Static and dynamic stability Purpose of controls in airplanes - Inherently stable and marginal stable airplanes Static, Longitudinal stability - Stick fixed stability
- Basic equilibrium equation - Stability criterion
- Effects of fuselage and nacelle - Influence of CG location
- Power effects - Stick fixed neutral point
- Stick free stability-Hinge moment coefficient - Stick free neutral points Symmetric maneuvers - Stick force gradients - Stick _ force per 'g' Aerodynamic balancing.
- Determination of neutral points and maneuver points from flight test.

Unit 4

LATERAL AND DIRECTIONAL STABILITY

Static lateral stability

- Dihedral effect
- Lateral control
- Coupling between rolling and yawing moments
- Adverse yaw effects
- Aileron reversal

Static directional stability

- Weather cocking effect
- Rudder requirements
- One engine inoperative condition
- Rudder lock

Unit 5

DYNAMIC STABILITY

- Dynamic longitudinal stability: Equations of motion
- Stability derivatives - Characteristic equation of stick fixed case
- Modes and stability criterion - Effect of freeing-the stick
- Brief description of lateral and directional.
- Dynamic stability - Spiral, divergence, Dutch roll,
- Auto rotation and spin.

TEXT BOOK / REFERENCE BOOK

- Anderson, “Aircraft performance and design”
- Perkins, C.D., and Hage, R.E., “Airplane Performance stability and Control”, John Wiley & Son:, Inc, New York, 1988.
- Anderson, “Introduction to flight”
- Nelson, “Flight Stability and Automatic Control”

That's all folks!!!

