ATPL FORMULA SHEET

Radio Aids to Navigation

VHF/UHF reception range =	$1.23 \times \sqrt[2]{\text{Height above station}}$
Time to a navigation facility in minutes (NDB or VOR) =	$\dfrac{\text{Time to pass station (seconds)}}{\text{Degrees of bearing change}}$
Distance from a navigation facility in nautical miles (NDB or VOR) =	$\dfrac{\text{Groundspeed (knots)} \times \text{Time to station (minutes)}}{60}$
Distance from DME station =	$\sqrt[2]{\text{Slant range}^2 - \text{Height above station}^2}$

High Speed Flight

Local Speed of Sound (knots) =	$39 \times \sqrt[2]{\text{OAT (Kelvin)}}$
Temperature in Kelvin =	Temperature in Celsius +273
Mach number =	$\dfrac{\text{True airspeed (knots)}}{\text{Local speed of sound (knots)}}$

Point of Equal Time (PET) or Critical Point (CP)

Distance to Point of Equal Time =	$\dfrac{\text{Total Distance of Flight (nm)} \times \text{Ground speed return (knots)}}{\text{Groundspeed return (knots)} + \text{Groundspeed continue (knots)}}$
Time to Point of Equal Time =	$\dfrac{\text{Distance to point of equal time (nm)}}{\text{Groundspeed in cruise}}$

Point of No Return (PNR)

Distance to Point of No Return =	$\dfrac{\text{Fuel endurance (hours)} \times \text{Ground speed return (knots)} \times \text{Groundspeed outbound (knots)}}{\text{Ground speed return (knots)} + \text{Groundspeed outbound (knots)}}$
Time to Point of No Return =	$\dfrac{\text{Distance to Point of No Return (nm)}}{\text{Ground speed outbound (knots)}}$

Specific Range

Specific air range =	$\dfrac{\text{True airspeed (knots)}}{\text{Fuel flow (pounds or gallons per hour)}}$
Specific ground range =	$\dfrac{\text{Ground speed (knots)}}{\text{Fuel flow (pounds or gallons per hour)}}$