

Table of Contents

1. Static and Dynamic Pressure
2. Pressure as Weight of Air Above
3. Vertical Variation of Pressure
4. Variation of Pressure – Warm vs Cold Air
5. Semi-Diurnal Variation of Pressure
6. Measurement Instruments
7. Altimeter Correction (Altcor / D Value)
8. Contours, Thickness and Pressure Gradient
9. Pressure Tendency and Isallobars
10. Altimetry — Definitions
11. Pressure Settings (QFE, QFF, QNH, QNE)
12. Relation between QNH, QFE and QNE
13. Under-Reading / Over-Reading
14. Pressure Patterns
15. Practice Q&A (41 Questions)
16. Master Reference Tables

1. Static and Dynamic Pressure

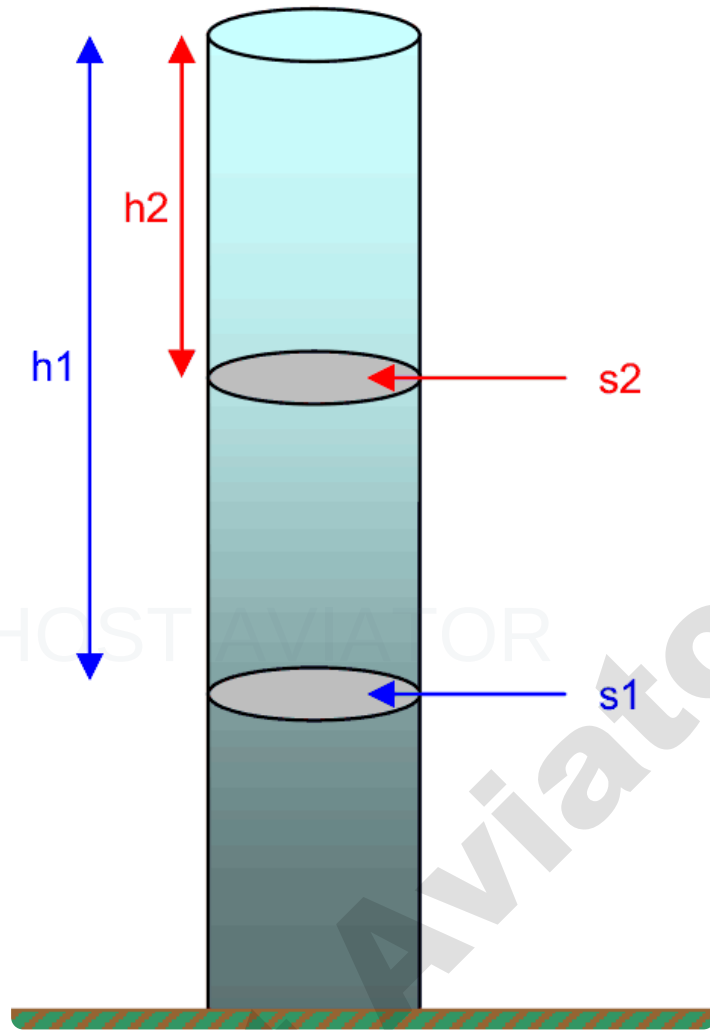
Definition: Pressure is the force per unit area exerted by molecules of air in random motion, acting uniformly in all directions. This is called *Static Pressure* or *Barometric Pressure*.

When air is in motion, an additional pressure is exerted in the direction opposite to the flow. This additional component is called **Dynamic Pressure** or **Wind Pressure**.

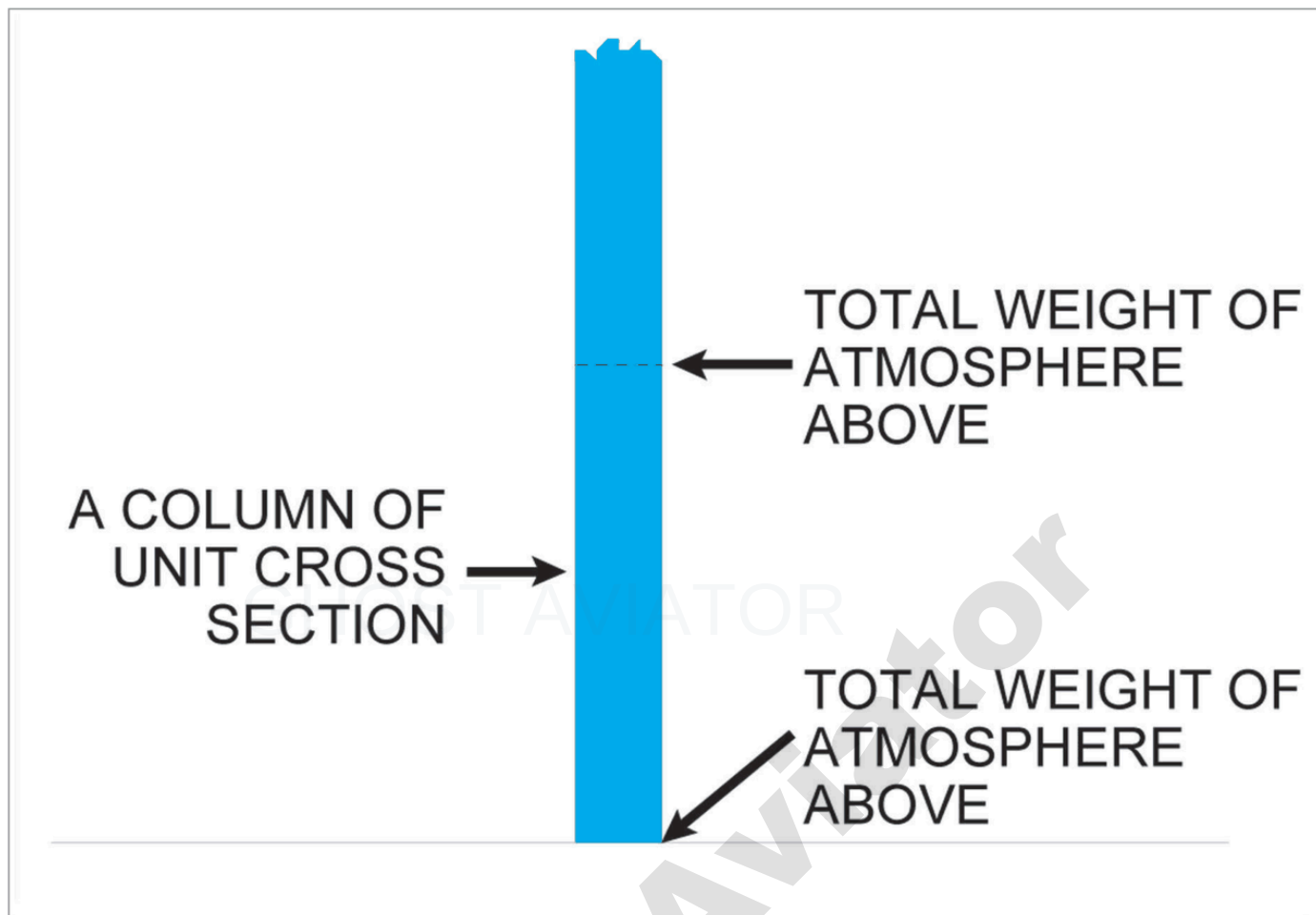
 **Exam Tip:** "Static = air at rest. Dynamic = air in motion (opposes flow)." Think: *Static Stops, Dynamic Does move.*

2. Pressure as Weight of Air Above

The atmospheric pressure at any level is the weight of the column of air of unit cross-section extending vertically to the top of the atmosphere. As the amount of air in the column decreases with height, the pressure also decreases with height.



Pressure falls with height



Pressure is the weight of the column of air above

Units adopted by ICAO: Hectopascal (hPa)

1 hPa = 1000 dyn/cm²

Unit of force is Newton (N).

Standard Sea Level Pressure:

1013.25 hPa = 760 mm = 29.92 in

Also called **1 Bar = 100,000 N/m²**

1 Bar = **1000 mb (millibars) = 1000 hPa**

Hecto = 100; so 1 hPa = 100 Pa

Conversion: hPa → Inches

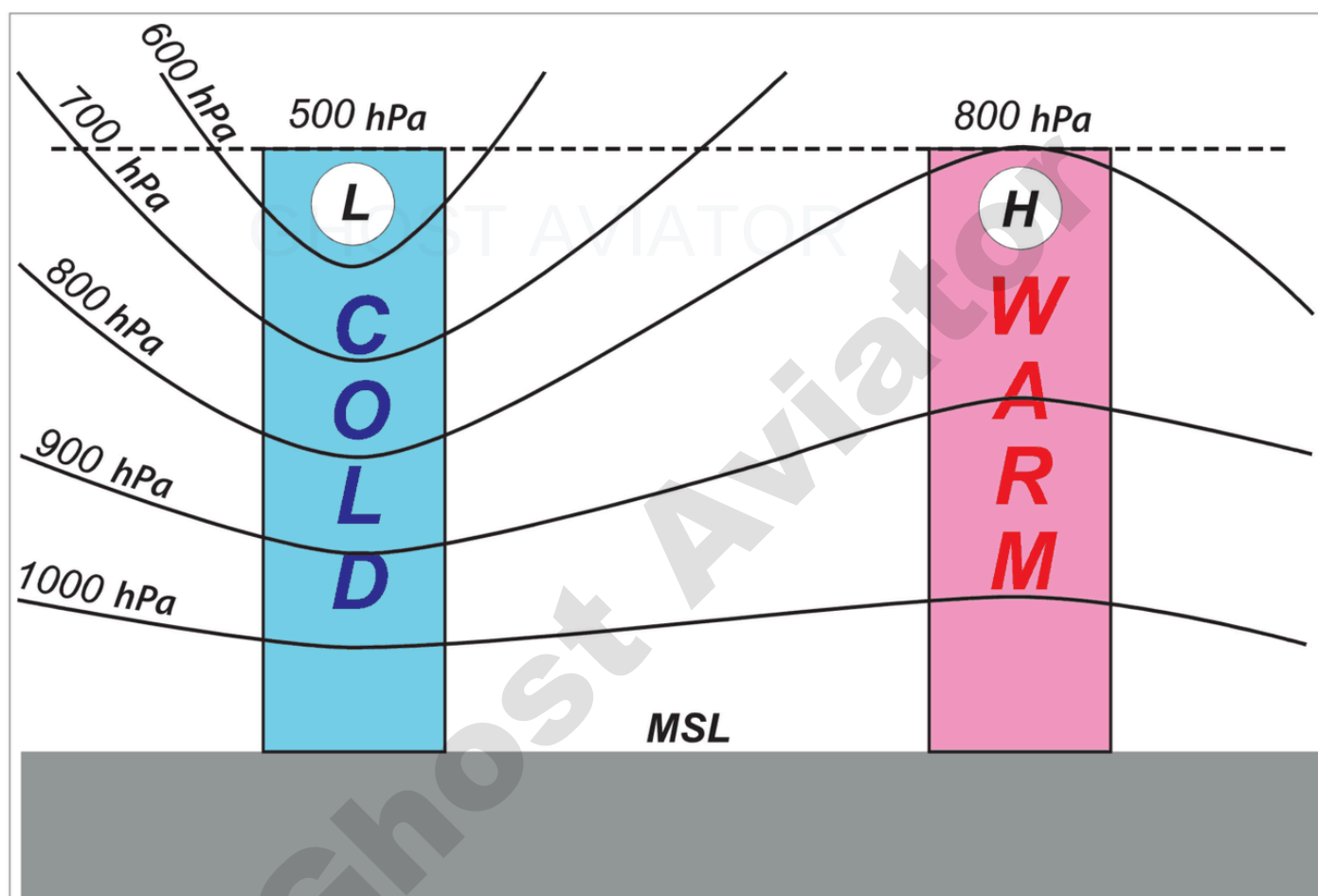
Multiply hPa value by **0.02953**

Example: 1013.25 hPa × 0.02953 = **29.92 inches**

⚠ **Important:** Air pressure changes cause ears to pop up when traveling over significantly varying topography and during rapid descent of an aircraft.

3. Vertical Variation of Pressure

The pressure decreases with height at a decreasing rate:



Height Range	Rate of Decrease per 100 m
Sea level to 600 m	4%
Up to 1.5 km	3%
Up to 3 km	2.5%
At 6 km	Reduces to half the sea level value
At 100 km	Negligible — regarded as vacuum

Join live classes for guided practice and doubt clearing.

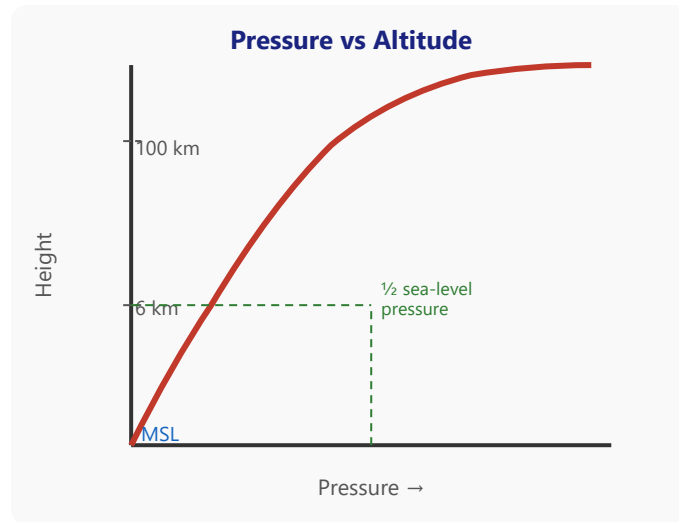


Fig 2.1: Variation of Pressure with Height

Height Difference with 1 hPa Change

Formula:

Height difference = $96 \times T / p$ feet

(where T = temperature in Kelvin, p = pressure in hPa)

Worked Example (ISA conditions):

At 1000 hPa, T = 300 K:

Height = $96 \times 300 / 1000 = 28.8$ ft

In ISA conditions, **1 hPa pressure change** corresponds to approximately:

Level	MSL	2,000 ft	20,000 ft	40,000 ft
Height equivalent	27 ft	30 ft	50 ft	100 ft

⚠ Critical Rule:

- If air is **warmer than ISA** → height change for 1 hPa will be **MORE** than above values
- If air is **colder than ISA** → height change will be **LESS** than above values

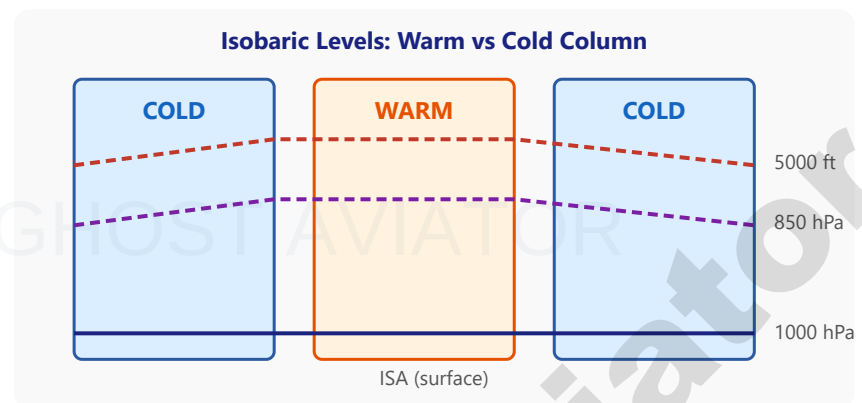
4. Variation of Pressure – Warm vs Cold Air

Cold air is denser than warm air. Pressure falls at a faster pace over a cold column of air than over a warm column.

At any given height, pressure at **850 hPa** will be at a **higher height over warm air** than over cold air.

Key Rule: Pressure at any given height will be higher over warm air than over cold air.

- **Isobars Dip** going from High to Low pressure
- **Isobars Rise** going from Low to High pressure
- **Isobar** = line joining places of equal pressure



Isobaric levels are at lower height over cold column — higher over warm column

5. Semi-Diurnal Variation of Pressure

Atmospheric pressure follows a **bimodal curve** during a day:

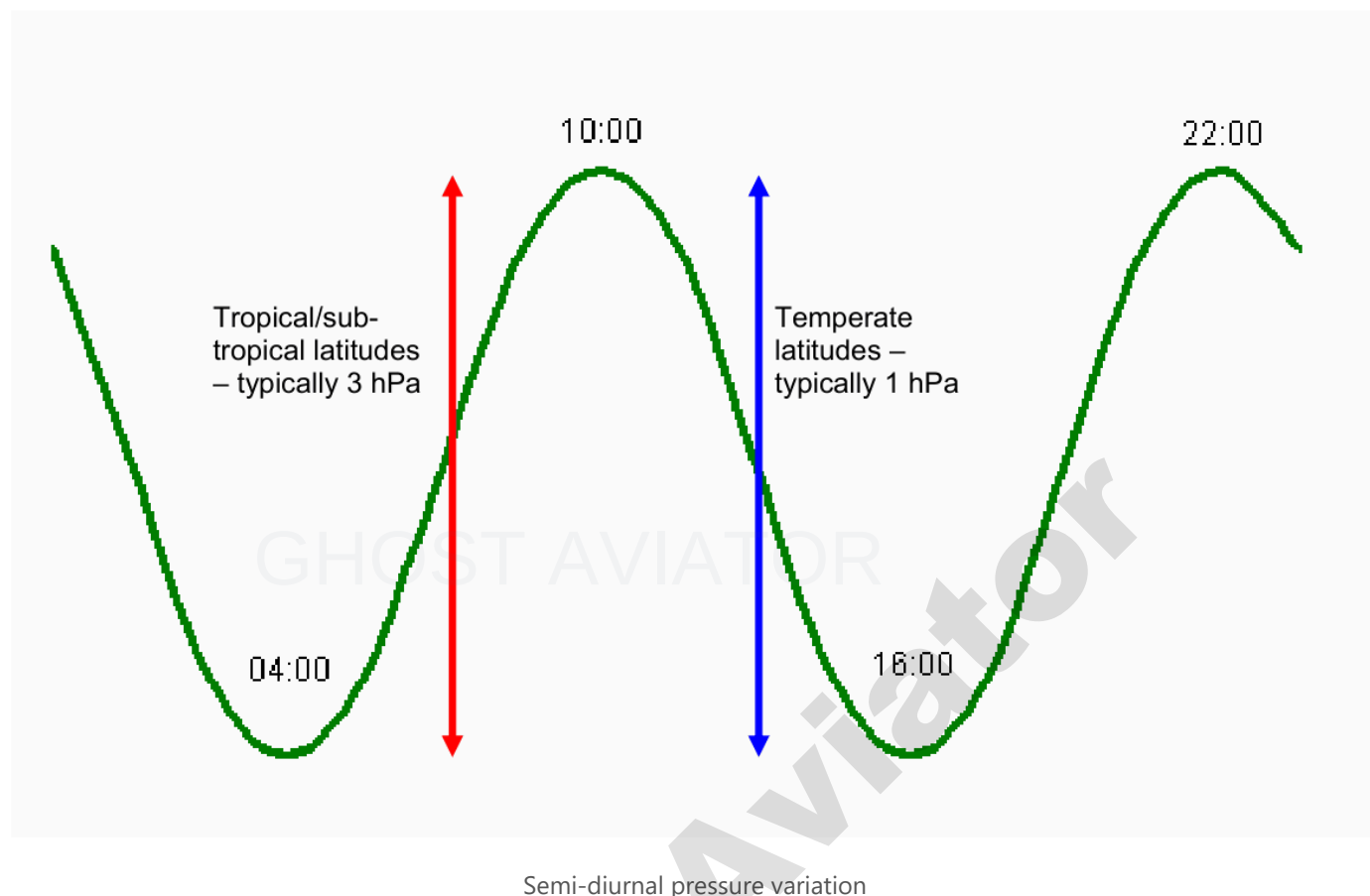
- **Maxima:** **1000 hr** and **2200 hr** (local time)
- **Minima:** **0400 hr** and **1600 hr** (local time)

This semi-diurnal variation is due to **solar influence**.

Variations are: very small at the Poles and about **3-5 hPa** at the Equator.

This is probably a natural oscillation of the atmosphere with a period of almost **12 hours**.

her, such as a tropical revolving storm.



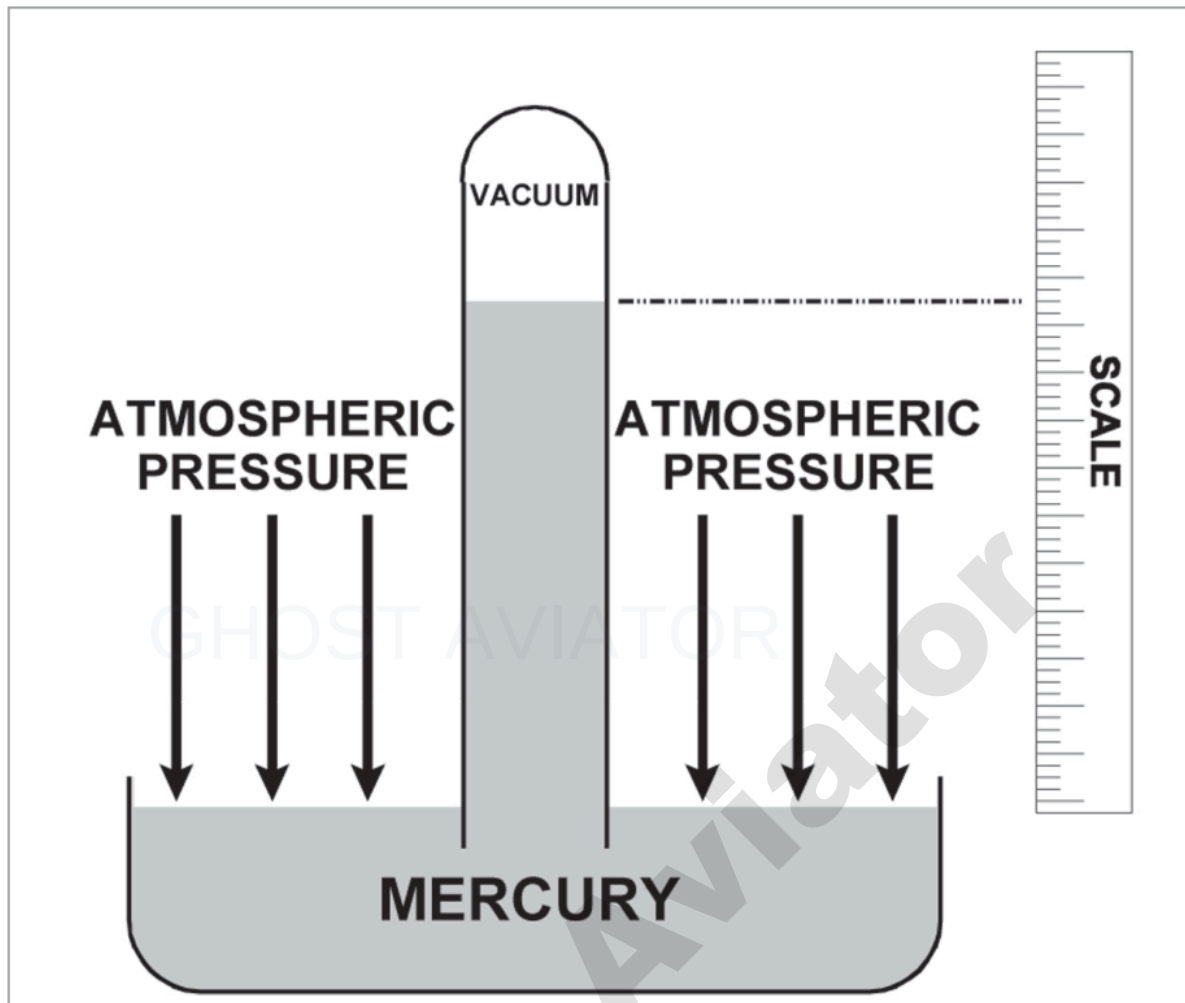
 **Mnemonic – "Max at 10 and 10" (1000 hr & 2200 hr)**

Min at 0400 (4 AM) and 1600 (4 PM). Remember: *pressure is lowest in early morning and late afternoon.*

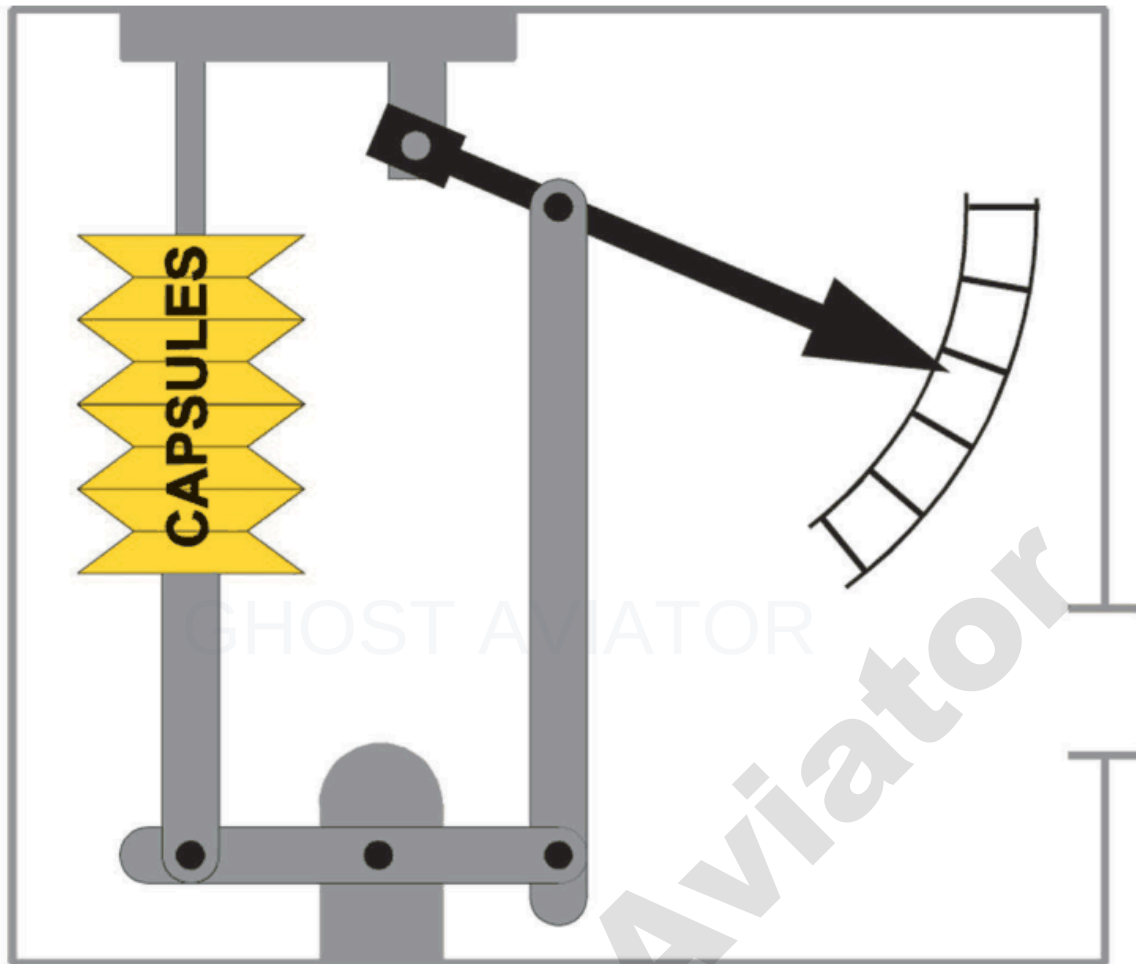
6. Measurement Instruments

Instrument	Type	Description
Mercury Barometer	Accurate	Atmospheric pressure balanced by height of mercury column
Aneroid Barometer	Practical	Uses metal capsule; not as accurate as mercury; scale graduated in pressure (replaces mercury for ease of handling)
Altimeter	Aneroid type	Aneroid barometer with scale graduated in altitude instead of pressure; can be set to desired pressure value
Barograph	Recording	Continuously records pressure; can be Daily Barograph or Weekly Barograph

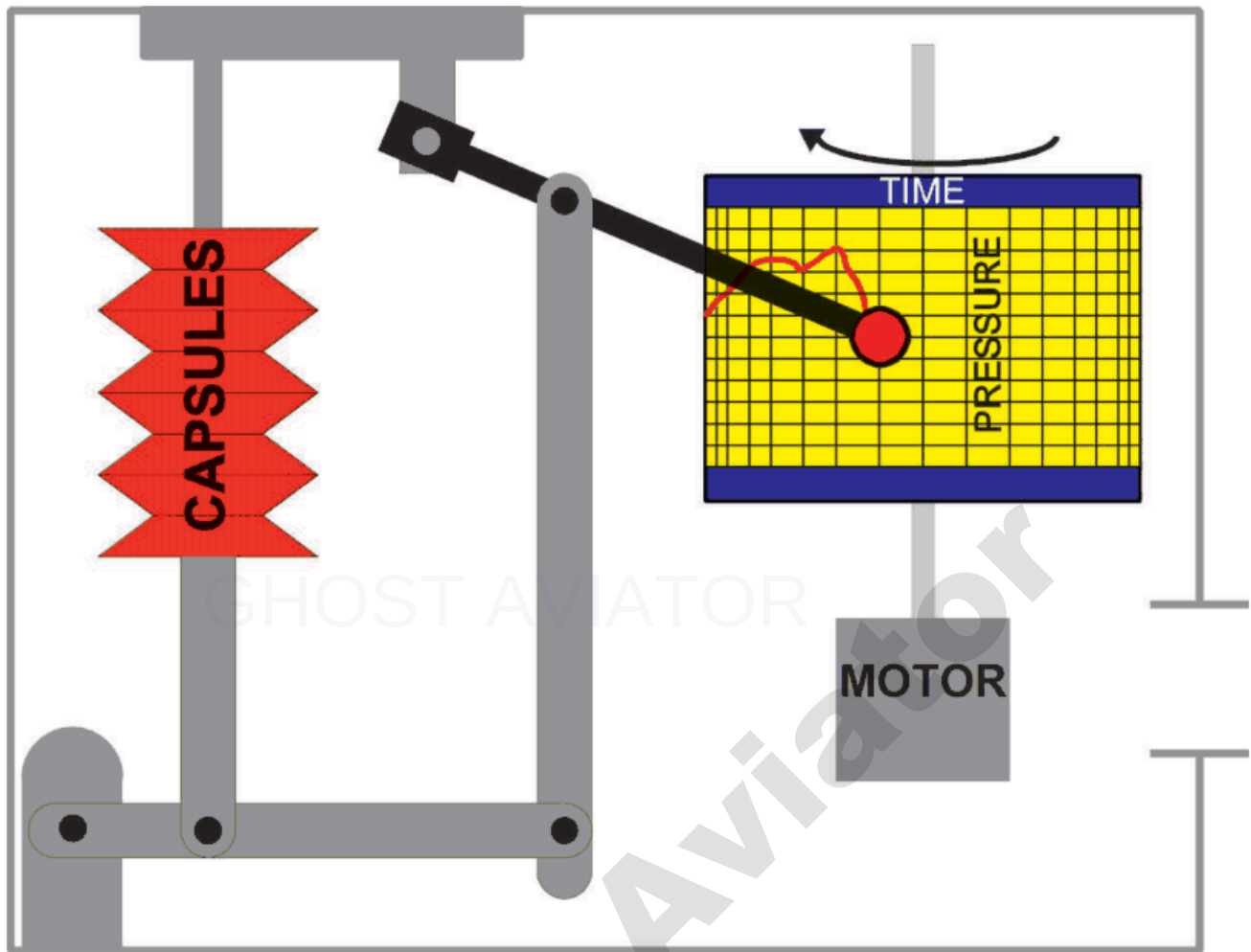
Join live classes for guided practice and doubt clearing.



The mercury barometer



The aneroid barometer



The barograph

7. Altimeter Correction (Altitor / D Value)

The correction applied to indicated altitude to obtain true altitude is called **Altimeter Correction** (also called **Altitor**).

This is frequently required for **mountain flying** and **bombing operations**.

D Value = True Altitude – Indicated Altitude

Correction to obtain true altitude = True Altitude – Indicated Altitude

D Value decreases when aircraft flies from High to Low pressure.

Rough Calculations of Alticor

(a) Pressure Correction:

Add **30 ft** for every **1 hPa** when MSL pressure is **higher than 1013.2 hPa**

Subtract **30 ft** per **1 hPa** when MSL pressure is **lower than 1013.2 hPa**

(b) Temperature Correction:

Add **1%** of indicated altitude for every **3°C** temperature is **higher than ISA**

Subtract **1%** per 3°C when temperature is **lower than ISA**

(c) Add these algebraically for final correction.

Memory Aid (H-L-H rule):

High to Low → Over Read (altimeter reads High = dangerous, you're lower than indicated)

Low to High → Under Read (altimeter reads Low; this alone does not establish terrain clearance)

Warm to Cold → Over Read | Cold to Warm → Under Read

If QNH is High → True Alt will be High

8. Contours, Thickness and Pressure Gradient

Contours

Lines joining places of equal height are called **Contours**. Contour lines may also be regarded as isobars.

In **Contour Charts**, contours are drawn at an interval of **40 gpm** (geopotential metre) in **700 hPa** and **500 hPa** level charts; and at **80 gpm** in **300 hPa** and **200 hPa** level charts.

1 gpm = 9.8 J/kg (gravitational potential energy per unit mass).

Contour lines numbered in geopotential decametres, e.g. **5280 gpm = 528**.

A geopotential height of **700 gpm** is approximately 700 m. A chart label 700 in geopotential decametres represents 7000 gpm; always check the chart units.

Centres of Low and High are marked as in surface pressure charts.

Thickness

The height interval between the lower and upper level is called **Thickness**. Low thickness = lower mean temperature; High thickness = higher mean temperature. The **isopleths of thickness coincide with the isotherms of mean temperature** of the layer.

Pressure Gradient

Pressure gradient is the horizontal rate of change of pressure perpendicular to the isobars, directed from high to low pressure.

- **Isobar** = line joining places of equal pressure.
- Steep pressure gradient → isobars are close together → **strong winds**.
- Flat/weak gradient → isobars far apart → **light winds**.

9. Pressure Tendency and Isallobars

The change of pressure with time is called **Pressure Tendency**. In India, pressure tendency is worked out for the past **24 hr** and in higher latitudes for the past **3 hours** of the current observation.

Isallobars = lines joining places of equal pressure change. At a glance, isallobars indicate areas of rising or falling pressure tendency.

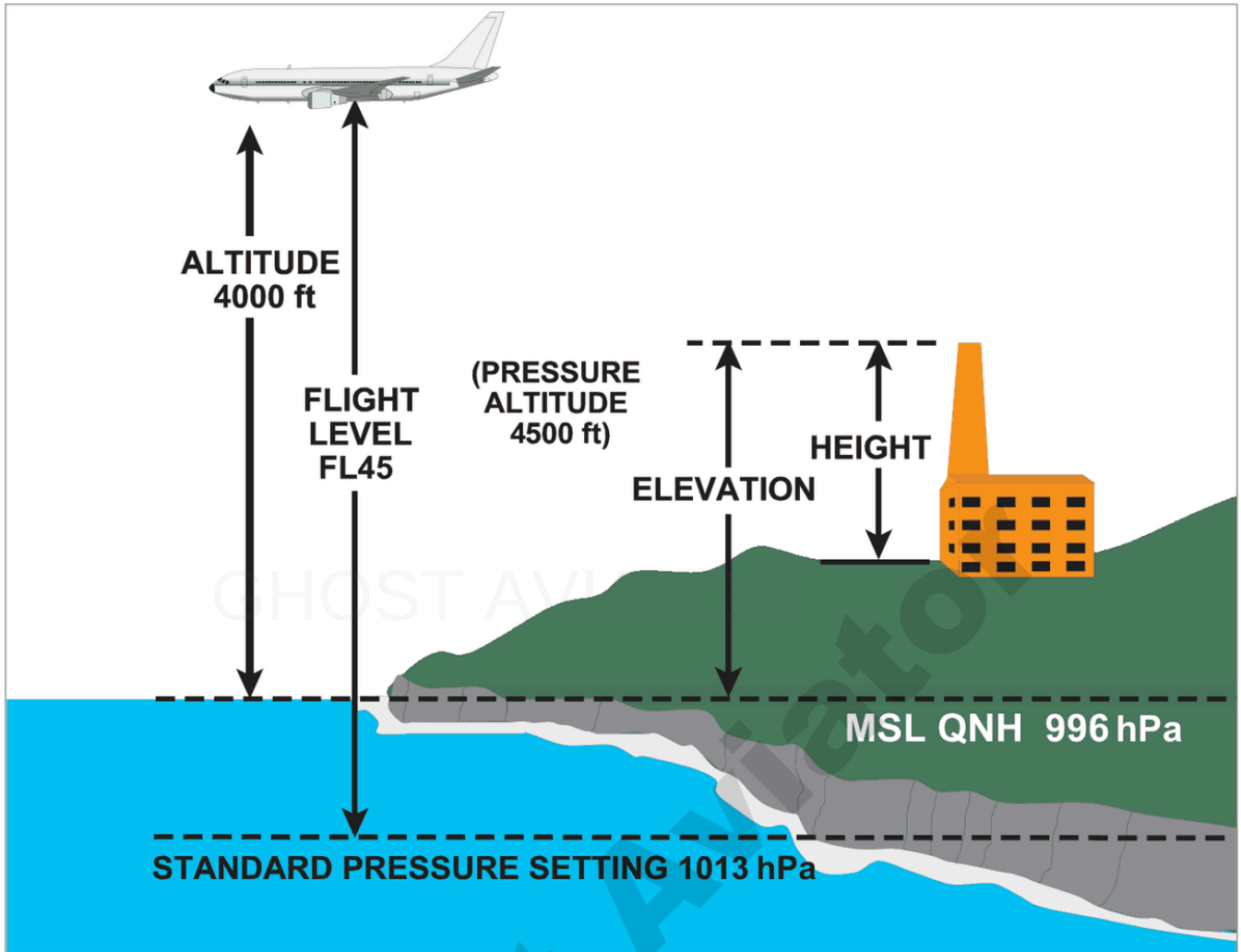
- **Isallobaric Low** = region of greatest fall enclosed by isallobars.
- **Isallobaric High** = region of highest rise.

Surface Lows tend to move towards **Isallobaric Low**.

Isallobaric High indicates **weakening** of a pressure system.

10. Altimetry — Definitions

Term	Definition
Mean Sea Level (MSL)	A reference level taking average of high and low tides.
Altitude	Vertical distance from MSL .
Height	Vertical distance from a specific datum (e.g., from the ground).
Elevation	Vertical distance of a point or level on the surface of the earth from MSL.
Transition Altitude (TA)	Highest altitude below which aircraft always fly on local QNH. Vertical position controlled with reference to height above aerodrome.
Transition Level (TL)	Lowest Flight Level above which aircraft always fly on standard QNH 1013.25 hPa . Above TL, vertical position expressed in hundreds of feet.
Transition Layer	The airspace between Transition Altitude (TA) and Transition Level (TL).
Flight Level (FL)	Levels of constant pressure at or above TL, separated by pressure intervals corresponding to MSL pressure. E.g., FL50 = 5,000 ft , FL300 = 30,000 ft , FL200 = 20,000 ft .
Pressure Altitude	When the altimeter sub-scale is set to 1013.2 hPa , the altimeter indicates Pressure Altitude. Expressed as FL35, FL190, FL400 (avoid last two zeros).

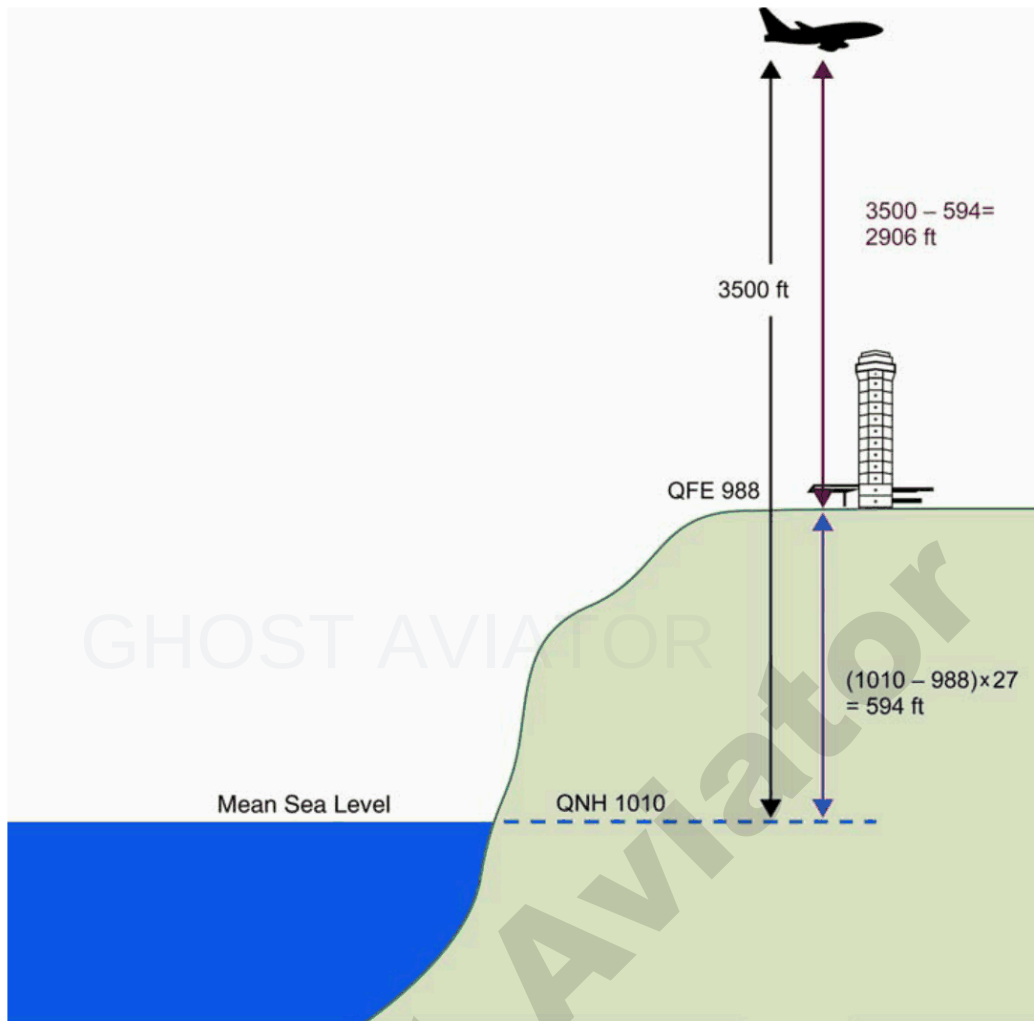


Altitude, height, elevation and flight level

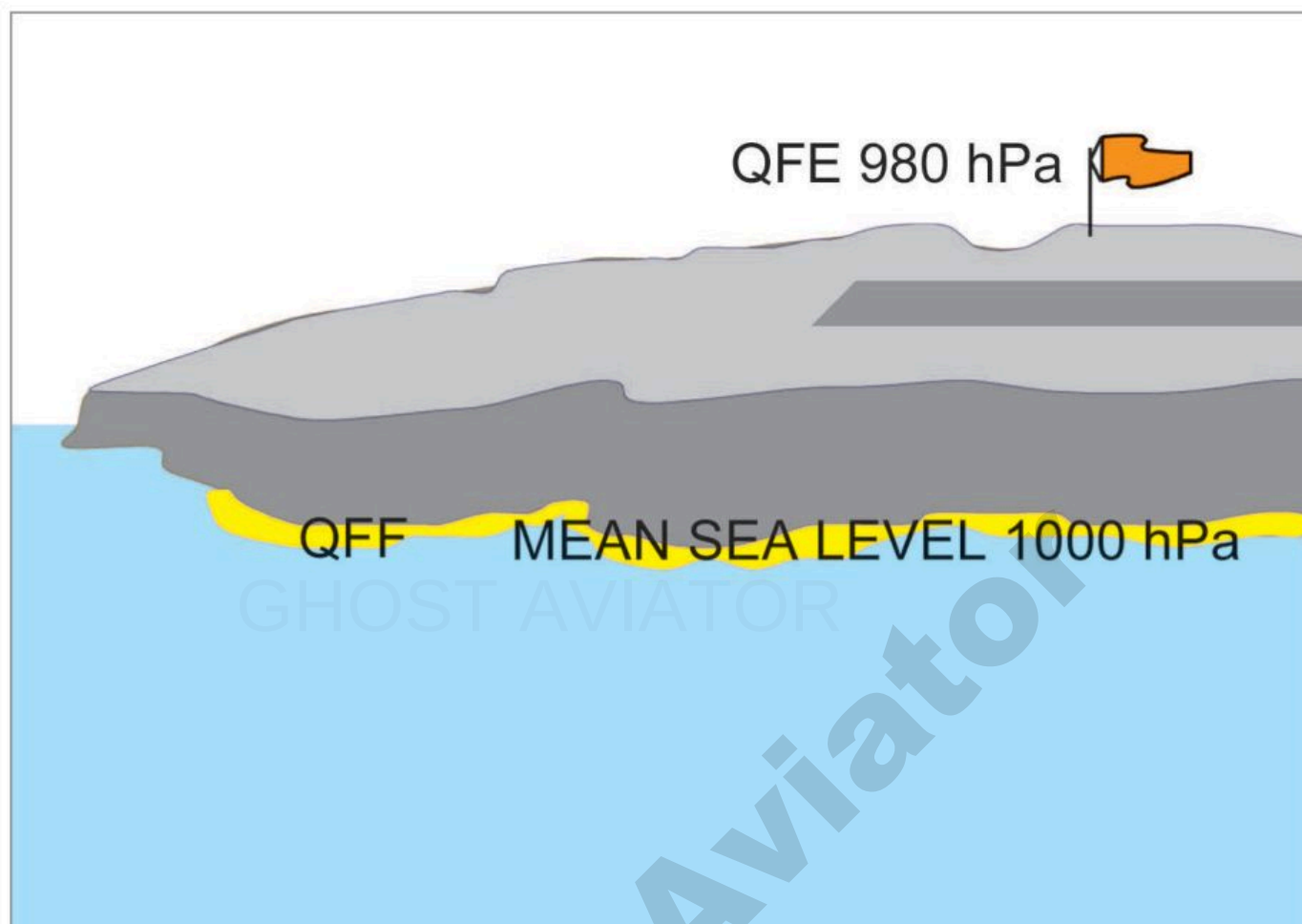
11. Pressure Settings

Corrections applied to barometer readings to reduce to a common level (MSL) are called **Pressure Setting**. The corrections are: **Index correction** (instrumental error), **Gravity correction** (varies with latitude), and **Temperature correction** (varies with temperature).

Pressure settings: **QFE**, **QFF** and **QNH**



QFE and QNH at an elevated aerodrome



Airfield pressure and mean sea level pressure

Setting	Definition	Use
QFE	Pressure at the specified aerodrome or runway pressure datum. With QFE set, the altimeter reads approximately zero at that datum.	Height above aerodrome
QFF	Barometric pressure of aerodrome reduced to MSL using the <i>actual temperature</i> of the place (column of air extending up to MSL).	Plotting synoptic charts and drawing isobars
QNH	Station pressure reduced to mean sea level using the standard atmosphere. With QNH set, the altimeter reads the aerodrome elevation at its datum. Absolute altitude means height above ground and is a different quantity.	Vertical separation of aircraft and terrain
Regional QNH	Forecast value of the lowest pressure expected in an Altimeter Setting Region (ASR). Issued every hour, valid for one hour.	Ensuring adequate terrain clearance
QNE	Altitude indicated when sub-scale set to 1013.25 hPa (29.92 in) . Used for high altitude airfields.	High altitude airfields; Pressure Altitude reference

Join live classes for guided practice and doubt clearing.

12. Relation between QNH, QFE and QNE

$$\text{Station Elevation} = (\text{QNH} - \text{QFE}) \times 30 \text{ ft}$$

Example (i): QNE > QNH → Sea level lower than MSL

QFE = 950 hPa, QNH = 1000 hPa, 1 hPa = 30 ft

$$\text{Elevation} = (\text{QNH} - \text{QFE}) \times 30 = (1000 - 950) \times 30 = 50 \times 30 = \mathbf{1500 \text{ ft}}$$

Example (ii): Altimeter set to QNE = 1013 hPa

$$\text{Station level would be} = (\text{QNE} - \text{QFE}) \times 30 \text{ ft} = (63 \text{ hPa}) \times 30 = \mathbf{1890 \text{ ft}}$$

Example (iii): QFE 970 hPa, QNH 1020 hPa

$$\text{Station elevation} = (\text{QNH} - \text{QFE}) \times 30 = (50 \text{ hPa}) \times 30 = \mathbf{1500 \text{ ft}}$$

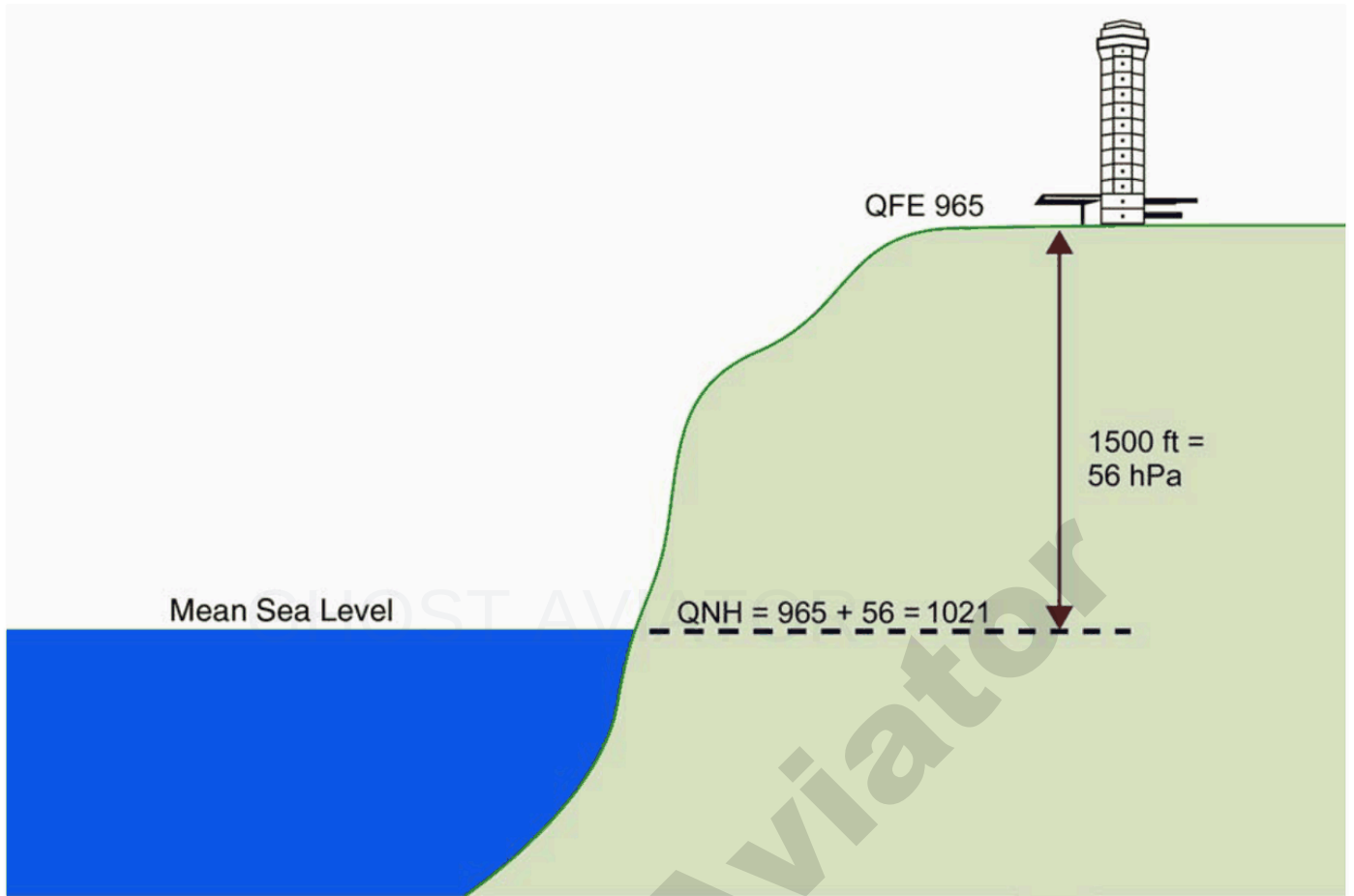
Example (iv): QNE = 1013 hPa, Station elevation = 270 ft

$$270 / 27 = 10 \text{ hPa} \rightarrow \text{QNH} = 1000 + 10 = \mathbf{1010 \text{ hPa}}$$

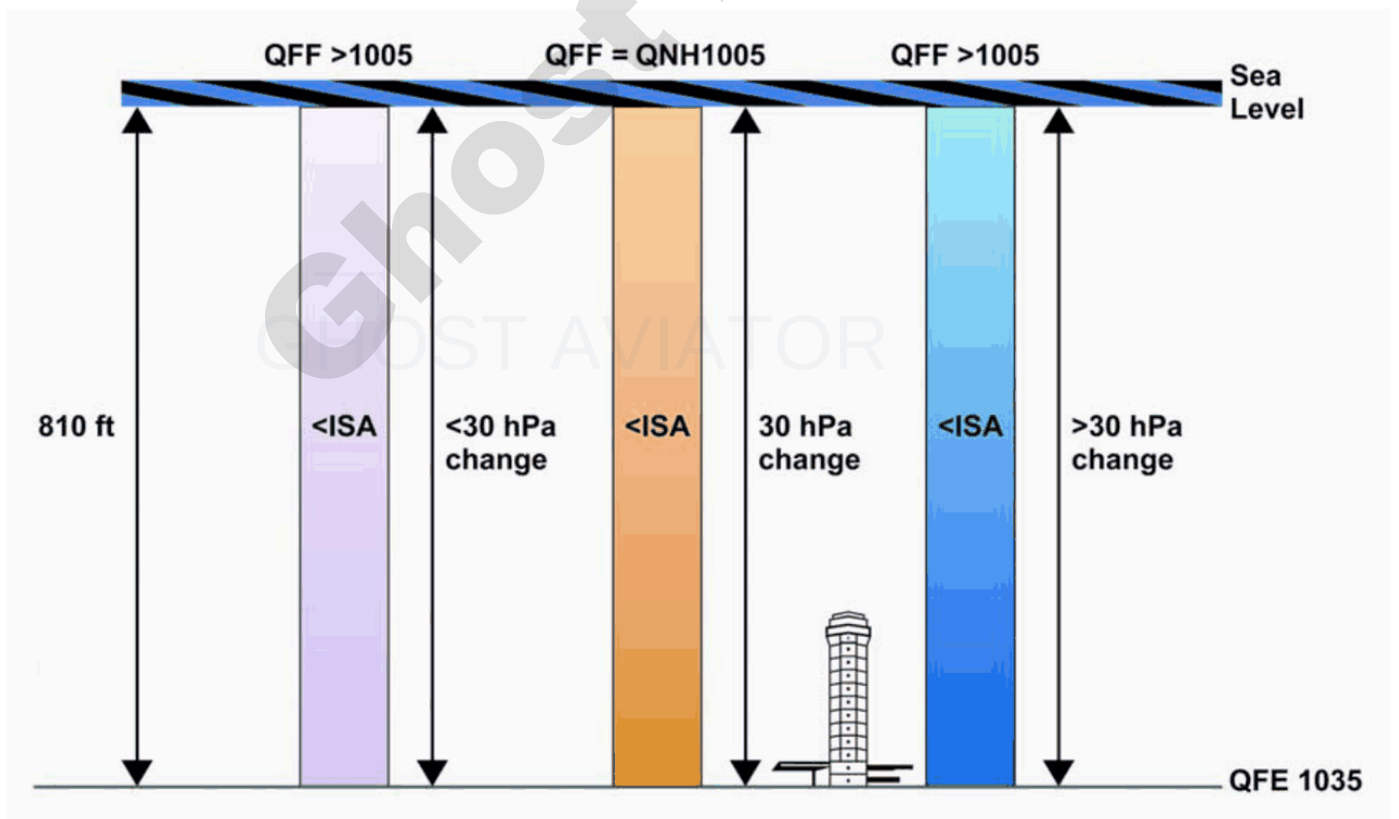
Example (v): Airfield elevation 400 ft, QNH 1010 hPa, lands at elevation 600 ft without resetting, altimeter reads 700 ft. Correct QNH at B?

$$\text{Height difference} = 700 - 400 = 300 \text{ ft} = 300/27 = 11 \text{ hPa}$$

$$\text{QNH at B} = 1010 - 11 = \mathbf{999 \text{ hPa}}$$



Finding QNH from QFE



QFF and QNH at different temperatures

L-H-L Rule for QNH/QFE Relationship

Hotter than ISA: $QFF < QNH$

At MSL: $QFF = QNH$

Pressure set on altimeter $< QNH$ → Indicated Altitude $<$ True Altitude

Pressure set on altimeter $> QNH$ → Indicated Altitude $>$ True Altitude

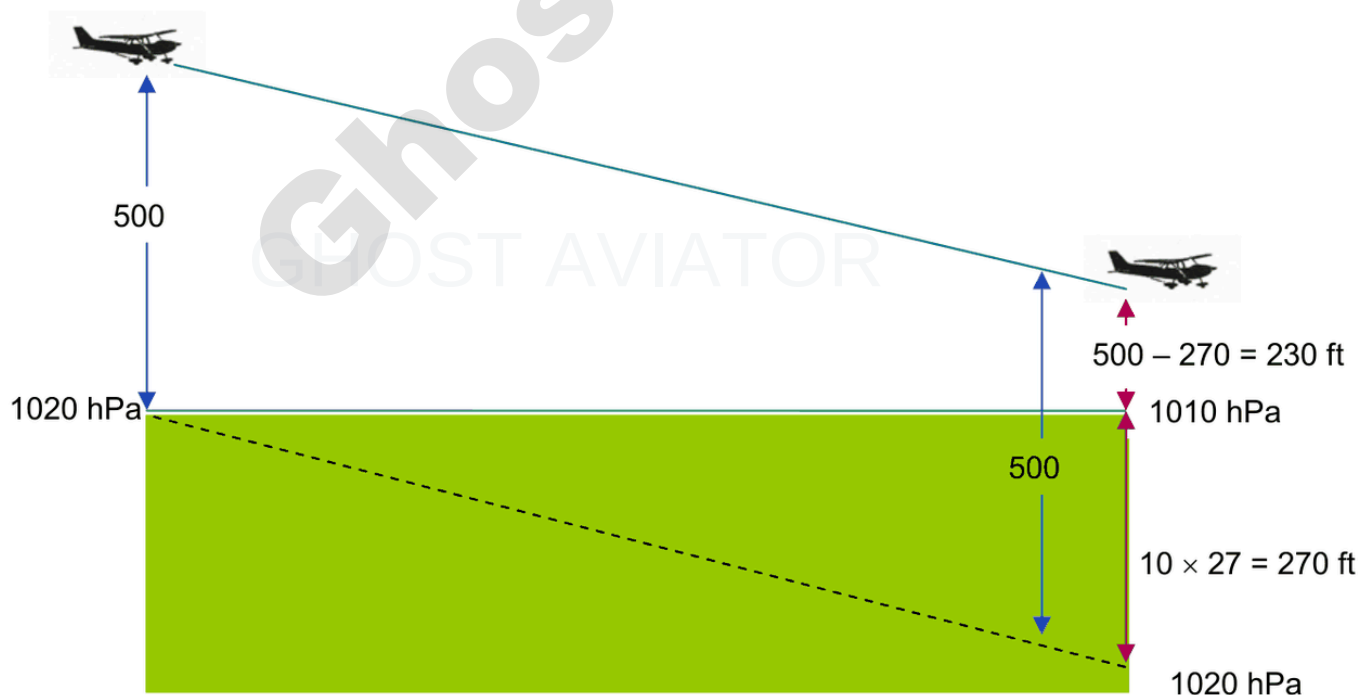
Standard Isobaric Levels

Corresponding to ISA pressure, the Pressure Altitude (Ft) and Flight Levels are:

Level (hPa)	850	700	500	400	300	200	100
Pressure Altitude (ft)	5,000	10,000	18,000	24,000	30,000	38,000	53,000
Flight Level	FL50	FL100	FL180	FL240	FL300	FL380	FL530

13. Under-Reading / Over-Reading

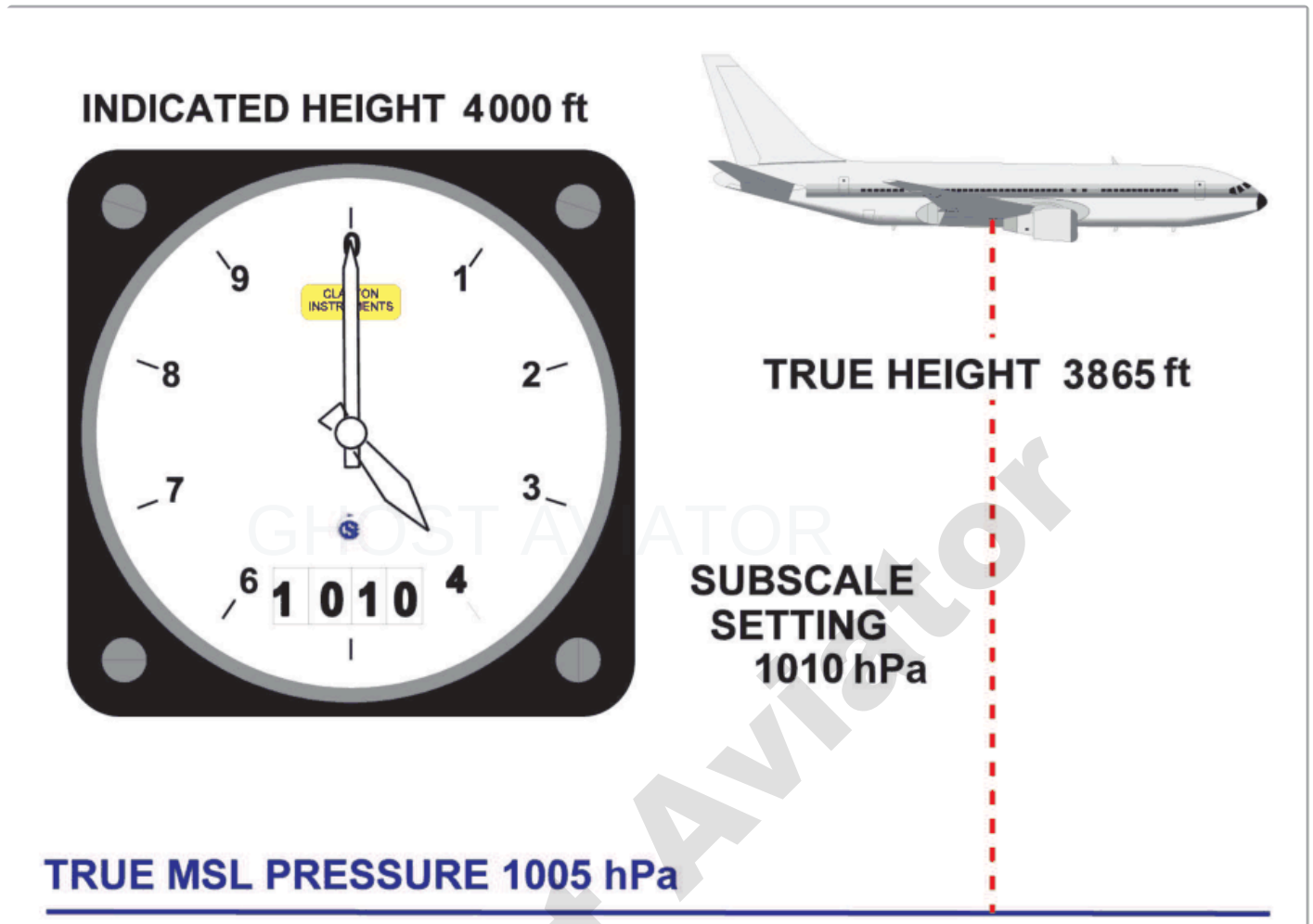
When a pressure value is set on the sub-scale, the altimeter indicates height as per ISA specifications.



When flying to an area of lower pressure the altimeter over-reads. Conversely, when flying to an area of higher pressure, the altimeter under-reads. This gives rise to the memory aid:

Join live classes for guided practice and doubt clearing.

Flying towards lower pressure the altimeter over-reads



Altimeter error when the true pressure differs from the setting

H-L-H (Over Read)

High to Low → Over Read

Warm to Cold → Over Read

If QNH is High → True Alt is High

Altimeter reads too high — you are lower than indicated!

L-H-L (Under Read)

Low to High → Under Read

Cold to Warm → Under Read

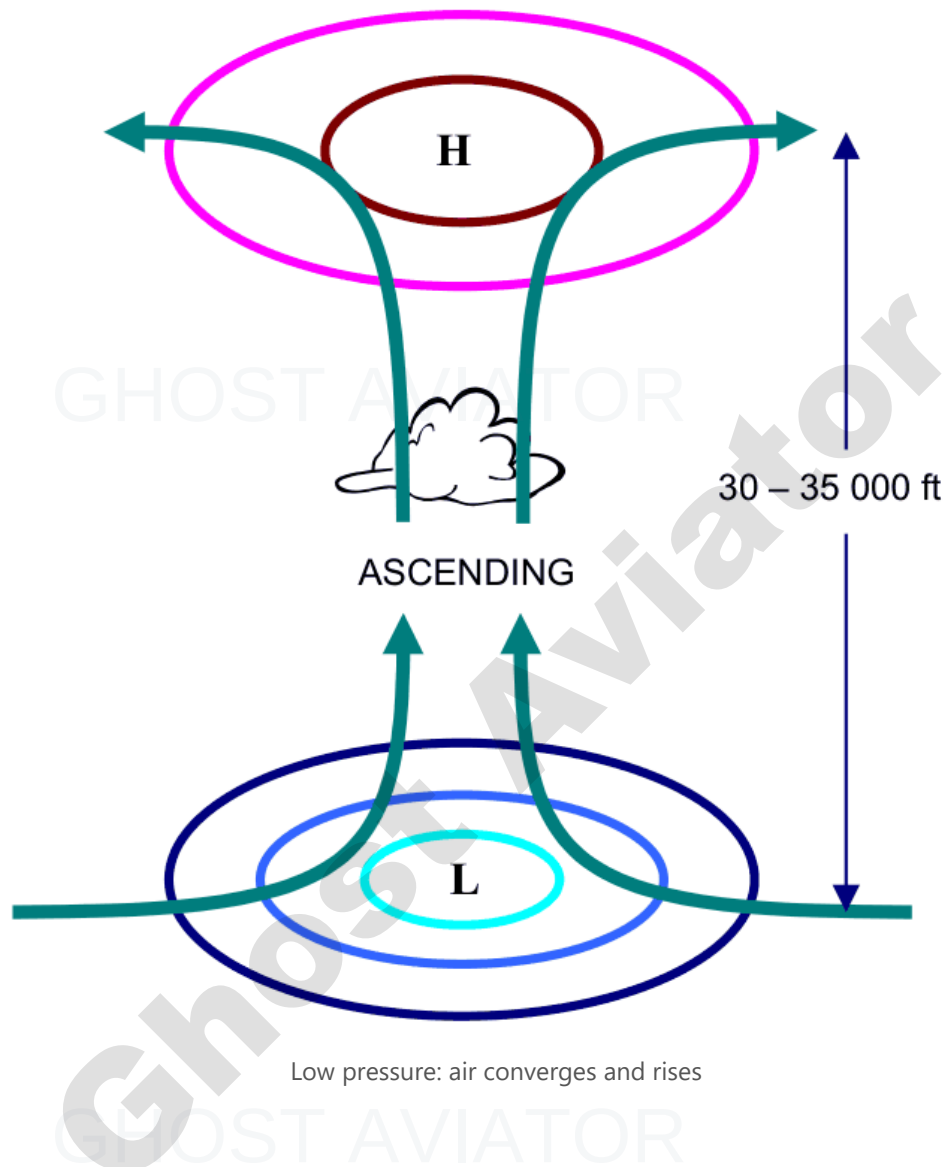
Altimeter Setting is Low → Indicated Alt will be Low

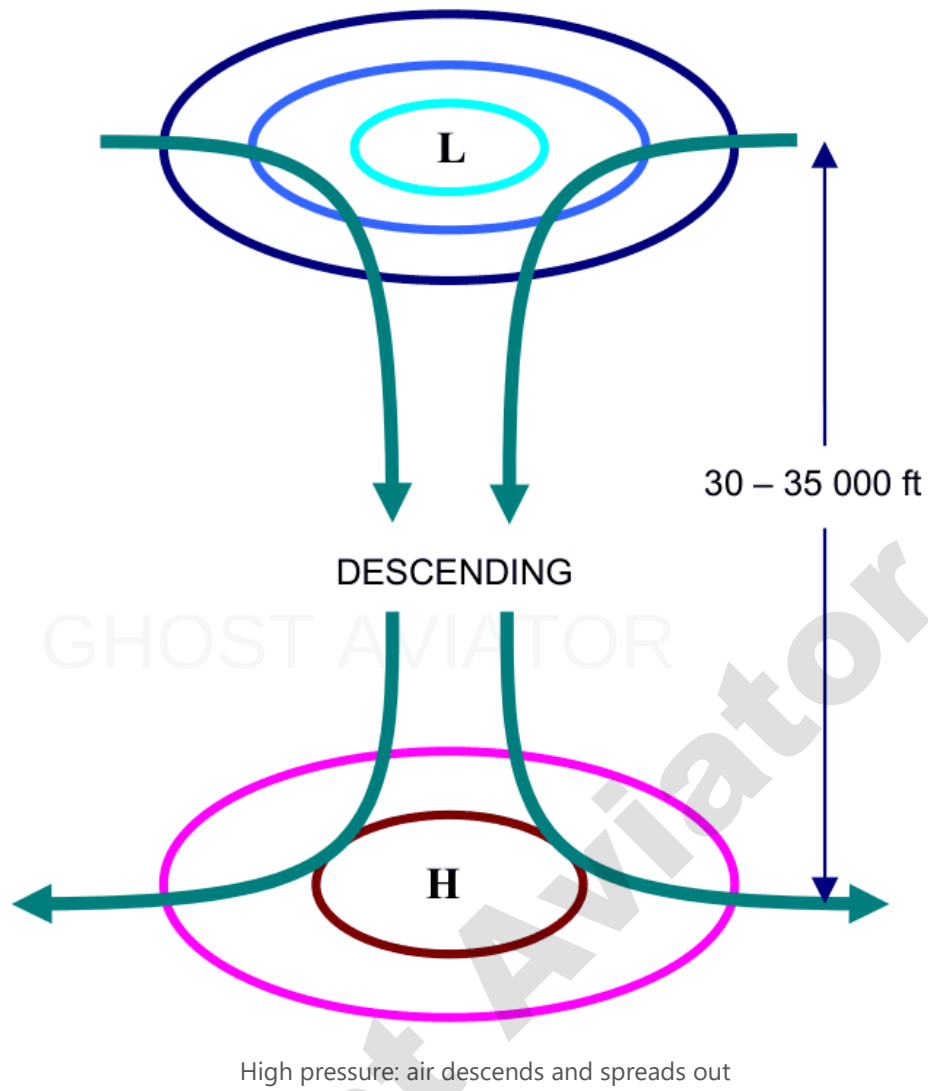
You are higher than indicated for this pressure-error comparison. Terrain clearance still requires the correct setting and other applicable corrections.

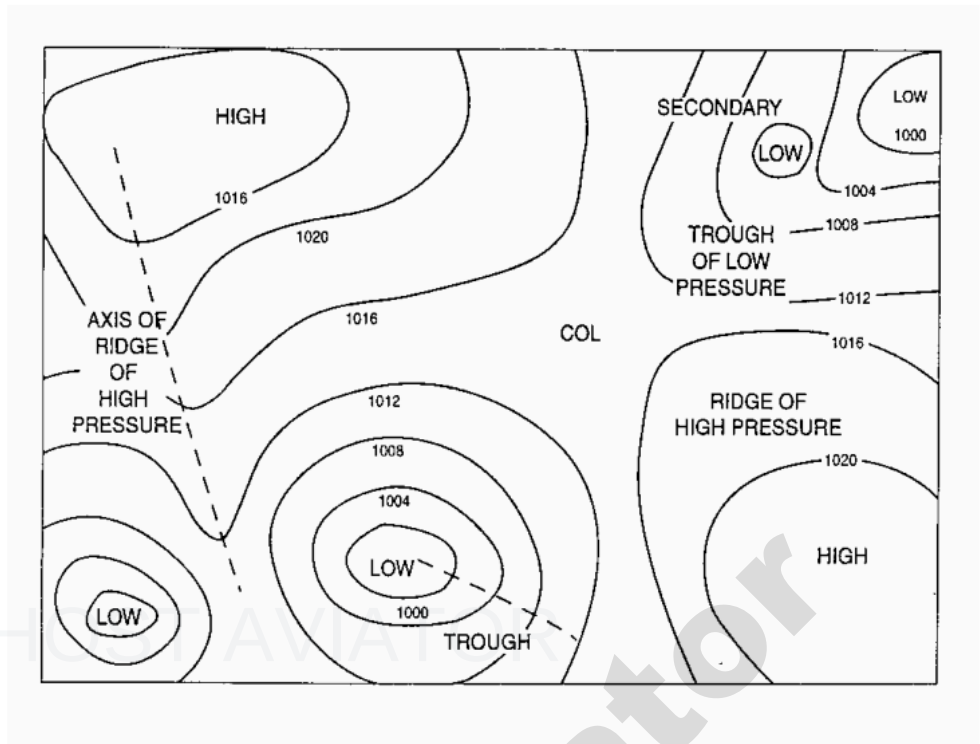
⚠ Critical: When flying with winds from port, the altimeter will **over-read**. With winds from starboard, it will **under-read**. Error increases with strength of wind and length of route. In S hemisphere the opposite is true.

14. Pressure Patterns

To represent the spatial distribution of pressure at a given time, all pressures are reduced to MSL. Pressures at stations are plotted on a chart, and isobars drawn at **2 hPa** intervals.

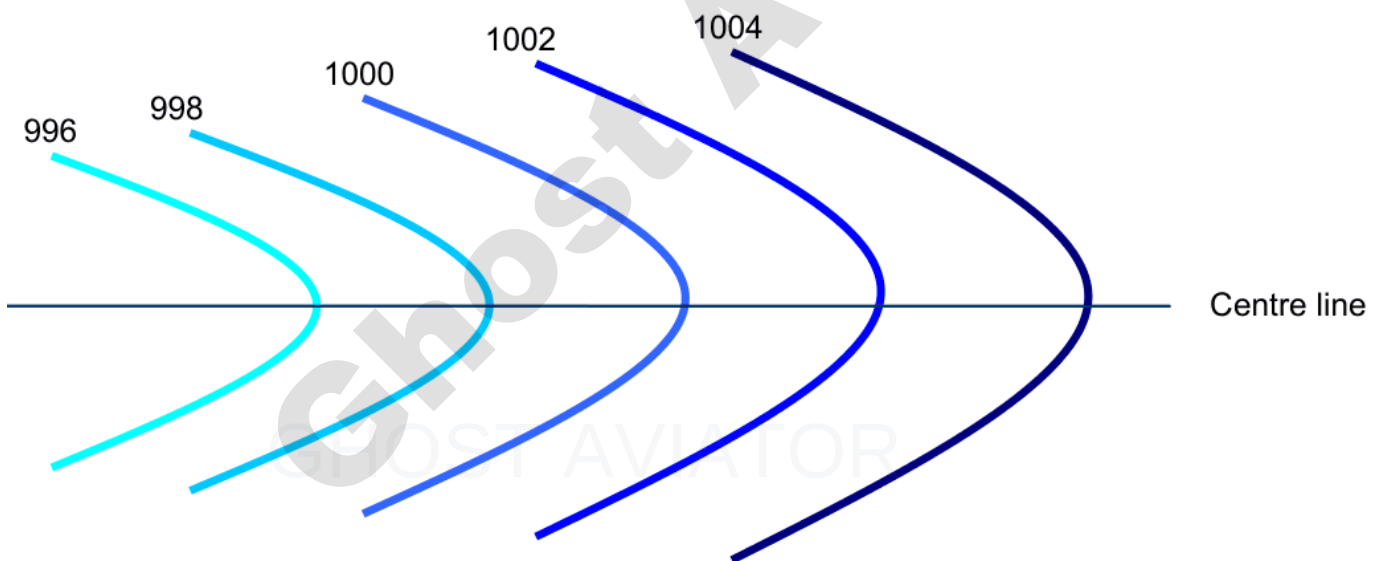




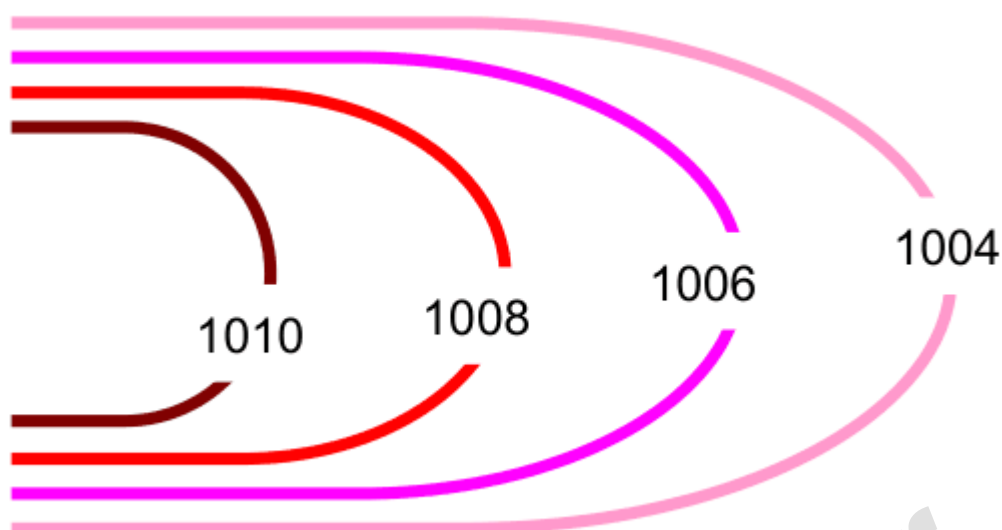


LOW, CYCLONE OR DEPRESSION, AND TROUGH

Pressure systems on a surface chart



A trough of low pressure



A ridge of high pressure

Pattern	Description	Weather	Hemisphere Note
Low (L) / Cyclone	Area enclosed by isobars with lowest pressure at centre. Two or more closed isobars = Depression . Severe = Cyclone .	Cloud and precipitation can occur with rising moist air; visibility varies	N Hemisphere: winds blow anticlockwise, converging & upward
High (H) / Anticyclone	Region enclosed by isobars with highest pressure at centre.	Fair weather but visibility may be poor	N Hemisphere: winds blow clockwise, veer and diverge outwards
Trough	"V" shaped extension of isobars from a low. Wind direction abruptly changes and backs.	Bad weather, associated with monsoon trough along Indo-Gangetic plains	—
Ridge	Wedge-like extension of isobars from high. Isobars rounded, not "V" shaped.	Fair weather; winds veer at a ridge	—
Col	Between two highs and two lows; 2 hPa higher than lows, towards highs.	Mixed — light variable winds	Winds light variable; pressure uniform
Cold Anticyclone	Forms in cold region behind a cyclone, compresses air as it moves away.	Warms up after sometimes	Blocks movement of migratory cyclones = Blocking Anticyclone

Quick Reference:

Low = Cyclone = Convergence = Rising air = Bad Wx

High = Anticyclone = Divergence = Subsidence = Good Wx (but poor vis)

Trough = V-shape = Bad Wx | Ridge = Rounded = Good Wx | Col = Uniform = Light winds

flowchart LR

A[Low/Depression] -->|winds converge| B[Upward Motion]

B --> C[Cloud & Precipitation]

C --> D[Bad Weather]

E[High/Anticyclone] -->|winds diverge| F[Downward Motion/Subsidence]

F --> G[Clear Sky]

G --> H[Fair Weather\nbut Poor Visibility]

Practice Q&A — Atmospheric Pressure

Practice questions with verified answer key.

Q1. Winds in a low pressure area

(a) Converge (b) Diverge (c) Go straight

✅ **Answer: (a) Converge**

In a Low, air flows inward (converges) and rises.

❌ (b) Diverge — This happens in a High pressure area. (c) Go straight — only in absence of pressure gradient.

💡 **Instructor's Note:** Low = Convergence = Rising air = Bad weather. High = Divergence = Subsidence = Fair weather.

Q2. Low pressure is associated with

(a) Good Weather (b) Bad Weather (c) None

✅ **Answer: (b) Bad Weather**

❌ (a) Good Weather — this is associated with High pressure areas. (c) None — wrong.

💡 **Instructor's Note:** Low → rising air → cloud & precipitation → bad weather. Classic DGCA question.

Q3. In a high pressure area winds are

(a) Normal (b) Strong (c) Weak

✅ **Answer: (c) Weak** — In a high (anticyclone) the isobars are widely spaced, so the pressure gradient is slack and the winds are light.

❌ (a) 'Normal' is not a description of wind strength. (b) Strong winds go with closely packed isobars, as in a deep low.

💡 High = light winds, sinking air, fair weather. Low = stronger winds, rising air, bad weather.

Q4. Flying from Low to High, an altimeter would read

(a) Over (b) Under (c) constant

✅ Answer: (b) Under — Flying from low towards high pressure with the subscale unchanged, the altimeter under-reads: the aircraft is higher than the altimeter shows.

❌ (a) Over-reading is the error when flying from high to low pressure. (c) The reading does not stay correct: the error grows as the pressure changes.

💡 High to Low, look out below (the altimeter over-reads). Low to High, you are higher than indicated (it under-reads).

Q5. Isallobars are lines of equal

(a) Pressure (b) Temperature Tendency (c) Pressure Tendency

✅ Answer: (c) Pressure Tendency

❌ (a) Pressure — that's an Isobar. (b) Temperature Tendency — that would be Isallotermis.

💡 **Mnemonic:** Is-ALLO-bar = Isobar that ALTERS (changes) = Isallobar = equal pressure CHANGE.

Q6. What kind of a barometer is an altimeter?

(a) Aneroid (b) Mercury (c) Alcohol

✅ Answer: (a) Aneroid — An altimeter is an aneroid barometer: a sealed, partly evacuated capsule that expands and contracts with pressure, with its scale marked in height.

❌ (b) A mercury barometer is a fixed, fragile laboratory instrument, not used in aircraft. (c) Alcohol is not used as a barometer liquid in aviation.

💡 Altimeter = aneroid capsule. Mercury barometers are the station-level standard.

Q7. A region between two Lows and two Highs is called

(a) Depression (b) Secondary Low (c) Col

✅ Answer: (c) Col

✗ (a) Depression — enclosed area of low pressure. (b) Secondary Low — a smaller low near main low.

💡 A Col is like a mountain pass in pressure topography — between two highs and two lows. Light variable winds.

Q8. Bad weather and better visibility is associated with

(a) High (b) Low

✓ Answer: (b) Low — A low brings cloud, rain and strong winds, yet the rain washes dust and haze out of the air, so visibility between showers can be good. A high gives fair weather but, with sinking air and light winds, haze and smoke are trapped under the inversion.

✗ (a) High: fair weather and often poor visibility, the opposite pairing.

💡 Low = bad weather, good visibility. High = fair weather, poor visibility.

Q9. The relationship between height and pressure is use in construction of

(a) Altimeter (b) ASI (c) V S I

✓ Answer: (a) Altimeter — The altimeter senses static pressure and converts it to height using the pressure–height relationship of the standard atmosphere.

✗ (b) The ASI works from the difference between pitot and static pressure, not from height. (c) The VSI works from the rate of change of static pressure.

💡 Altimeter: pressure to height. ASI: pitot minus static. VSI: rate of change of static.

Q10. Altimeters always measure the height of aircraft above

(a) MSL (b) ASI (c) datum of 1013.2 hPa

✓ Answer: (c) datum of 1013.2 hPa

💡 Unless set to QNH/QFE, the altimeter measures height from 1013.25 hPa datum = Pressure Altitude.

Q11. Two aircraft flying at same indicated altitude with altimeters set to 1013.2 hPa. One is flying over cold air mass, other over warm air mass. Which has greater altitude?

(a) Ac flying over warm air mass (b) Ac flying over cold air mass (c) Both

✓ Answer: (a) Aircraft flying over warm air mass — Warm air is less dense, so pressure falls more slowly with height and a given pressure level lies higher. With 1013.2 hPa set, both aircraft are on the same pressure surface, but over warm air that surface is higher, so the aircraft over the warm air mass has the greater true altitude.

✗ (b) Over cold air the pressure levels are squashed downwards, so the same indication means a lower true altitude.

💡 Warm air: true altitude above indicated. Cold air: true altitude below indicated.

Q12. Rate of fall of pressure with height in cold air mass compared to warm air mass will be

(a) Same (b) More (c) Less

✓ Answer: (b) More

Cold air is denser, so pressure falls more rapidly with height over a cold column.

💡 Cold air = denser = faster pressure decrease with height. Warm air = less dense = slower pressure decrease.

Q13. An increase of 1000 ft at MSL is associated with decrease of pressure of

(a) 100 hPa (b) 1000 hPa (c) 3 hPa (d) 33 hPa

✓ Answer: (d) 33 hPa

At MSL, 1 hPa $\approx$ 27–30 ft. For 1000 ft: $1000/30 \approx 33$ hPa.

💡 Remember: at MSL, roughly 27 ft per hPa, so 1000 ft $\approx$ 33–37 hPa change.

Q14. Lines drawn through places of equal pressure are known as

(a) Isobars (b) Isotherms (c) Isoheights (d) Isoclinic

✓ Answer: (a) Isobars

✗ (b) Isotherms = equal temperature. (c) Isoheights = equal height (contours). (d) Isoclinic = equal magnetic dip.

💡 Iso = equal; Bar = pressure (like barometer). Standard meteorological lines: Isobar, Isotherm, Isohyet (rainfall), Isoneph (cloudiness).

Q24. 300 hPa in ISA corresponds to the level

(a) 20,000 ft (b) 30,000 ft (c) 35,000 ft

✅ **Answer: (b) 30,000 ft**

Standard: 300 hPa = 30,000 ft = FL300

💡 Learn the standard isobaric levels table. 300 hPa → 30,000 ft is frequently tested.

Q36. QNH of an aerodrome 160 m AMSL is 1005 hPa. QFE? Assuming 1 hPa = 8m

(a) 1010 hPa (b) 985 hPa (c) 1005 hPa (d) 990 hPa

✅ **Answer: (b) 985 hPa** — Height difference $160 \text{ m} \div 8 \text{ m per hPa} = 20 \text{ hPa}$. $QFE = QNH - 20 = 1005 - 20 = 985 \text{ hPa}$. The aerodrome is above sea level, so the pressure at the aerodrome is lower than QNH.

❌ (c) 1005 hPa is the QNH itself; QFE equals QNH only at sea level. (d) 990 hPa would be correct for an elevation of 200 m. (a) 1010 hPa is above QNH, which cannot be right for an elevated aerodrome.

💡 $QFE = QNH - (\text{elevation} \div 8 \text{ m per hPa})$, using the 1 hPa = 8 m the question gives.

Q37. Steep pressure gradient would mean

(a) Contours far apart, weak wind
(b) Contours far apart, strong wind
(c) Isobars far apart, strong wind
(d) Isobars closely packed and strong wind

✅ **Answer: (d) Isobars closely packed and strong wind**

❌ (a) Far apart = weak gradient = light winds. (c) Far apart = weak, not strong.

💡 **Mnemonic:** "Close isobars = strong gradient = strong winds." Like contour lines on a steep mountain.

Q38. What type of inversion occurs when a stable layer lies in a high pressure area?

(a) Negative (b) Radiation (c) Subsidence (d) Airmass

✓ Answer: (c) Subsidence — In a high-pressure area the air sinks, is compressed and warms, forming a warm layer above cooler air below: a subsidence inversion. It traps haze and smoke and is a key cause of poor visibility.

✗ (a) 'Negative' is not a type of inversion. (b) A radiation inversion forms on clear nights by ground cooling, not by sinking air.

💡 High pressure + sinking air = subsidence inversion = haze and low cloud under it.

Q39. Which of the following would cause true altitude to decrease when the altimeter indicates a constant altitude? (a) Warm/Low (b) Cold/High (c) Cold/Low (d) Warm/High

✓ Answer: (c) Cold/Low — True altitude is less than indicated when the air is colder than standard (the pressure levels are squashed downwards) and when you fly into lower pressure than the subscale setting. Cold and Low together lower the true altitude.

✗ Warm and High both raise the true altitude above the indication; Warm/Low and Cold/High have one effect each in opposite directions.

💡 Cold/Low: true below indicated, the dangerous direction over high ground.

Q41. An aerodrome is at MSL. Its QNH is 1014.0 hPa. Its QFF will be (a) 1014.0 hPa (b) 1013.25 (c) Difficult to tell (d) More than QNH

✓ **Answer: (a) 1014.0 hPa**

If the aerodrome is at MSL, then $QNH = QFF = 1014.0$ hPa (no height correction needed, both reduce to the same level — MSL).

💡 At MSL: $QNH = QFF$. The difference arises only when there is elevation, because QFF uses actual temperature while QNH uses ISA.

Master Reference Tables — Chapter 2

All Numerical Values

Parameter	Value
Standard sea level pressure	1013.25 hPa = 760 mm Hg = 29.92 in
Atmospheric pressure at sea level	100,000 N/m ² = 1 Bar
1 hPa	1000 dyn/cm ²
1 Bar	1000 mb = 1000 hPa
hPa to inches conversion factor	× 0.02953
Height formula per 1 hPa	96T/p feet
At 1000 hPa, 300K: height per hPa	28.8 ft
1 hPa at MSL	27 ft
1 hPa at 2,000 ft	30 ft
1 hPa at 20,000 ft	50 ft
1 hPa at 40,000 ft	100 ft
Pressure halves at altitude	6 km
Vacuum (negligible pressure)	100 km
Semi-diurnal maxima	1000 hr & 2200 hr
Semi-diurnal minima	0400 hr & 1600 hr
Equatorial diurnal pressure variation	3-5 hPa
Altcor pressure correction	30 ft per hPa
Altcor temperature correction	1% per 3°C
Contour interval (700 & 500 hPa charts)	40 gpm

Join live classes for guided practice and doubt clearing.

Contour interval (300 & 200 hPa charts)	80 gpm
1 gpm	9.8 J/kg
Isobar drawing interval	2 hPa (surface charts)
Station elevation formula	$(QNH - QFE) \times 30 \text{ ft}$
850 hPa level	5,000 ft = FL50
700 hPa level	10,000 ft = FL100
500 hPa level	18,000 ft = FL180
400 hPa level	24,000 ft = FL240
300 hPa level	30,000 ft = FL300
200 hPa level	38,000 ft = FL380
100 hPa level	53,000 ft = FL530

Mnemonics / Memory Aids

H-L-H (Over Read): High to Low → Over Read, Warm to Cold → Over Read

L-H-L (Under Read): Low to High → Under Read, Cold to Warm → Under Read

LOW = BAD (Lows = convergence = cloud = bad weather)

HIGH = FAIR (Highs = divergence = subsidence = fair weather, poor visibility)

"Max at Ten and Ten" = Semi-diurnal maxima at 1000 & 2200 hr

TROUGH = V shape = Bad; RIDGE = Rounded = Good

COL = between 2H and 2L = Light variable winds

Quick Revision Summary

Top 10 Exam Points — Atmospheric Pressure:

1. Standard sea level pressure = **1013.25 hPa = 760 mm = 29.92 in**
2. 1 hPa = 1000 dyn/cm²; 1 Bar = 1000 hPa = 100,000 N/m²
3. Pressure halves at 6 km; vacuum at 100 km
4. Height per 1 hPa = 96T/p feet (28.8 ft at 1000 hPa, 300K)
5. Semi-diurnal maxima: 1000 & 2200 hr; minima: 0400 & 1600 hr
6. D Value = True Alt – Indicated Alt; decreases flying High → Low
7. QFE = zero on runway; QNH = ISA corrected to MSL; QFF = actual temp correction
8. Station elevation = (QNH – QFE) × 30 ft
9. 300 hPa = 30,000 ft; 500 hPa = 18,000 ft; 700 hPa = 10,000 ft; 850 hPa = 5,000 ft
10. Isobars close = strong wind; H-L-H = over-read; Low = bad weather; High = fair wx