Cold temperature altitude corrections

ICAO APAC ATM/MET Seminar

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Background

- Vertical position is determined by barometric altimeters
- Vertical position is ***derived***, not ***measured***, by comparing two atmospheric pressures – at position and at datum
- Altimeters are calibrated with the international standard atmosphere (ISA)
- The ISA includes:
  - a standard temperature of 15° C at sea level
  - a standard pressure of 1013.25 hPa at sea level.

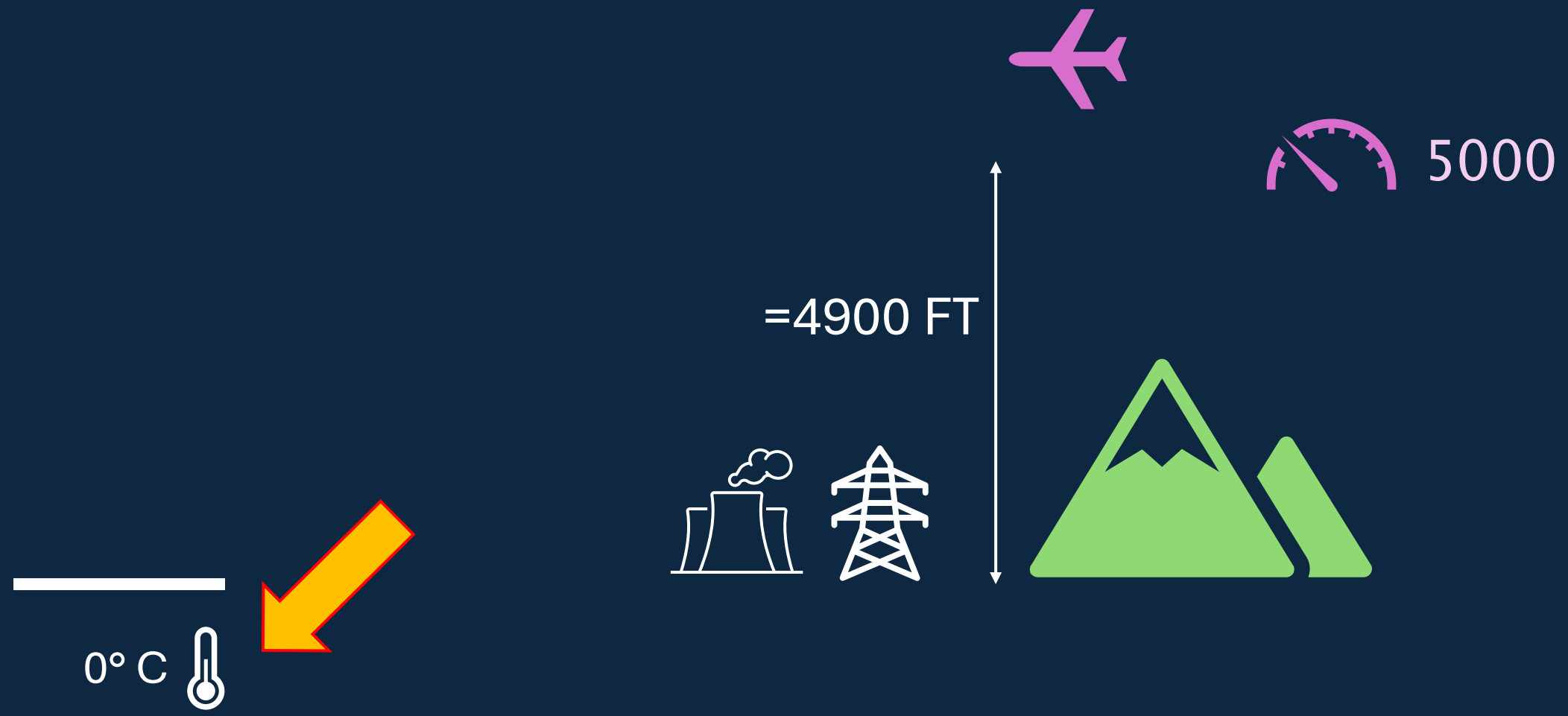
The problem

- Air pressure decreases with increasing vertical position
- Air pressure also decreases with decreasing temperature
- Decreasing air pressure is interpreted by the altimeter as increasing vertical position.

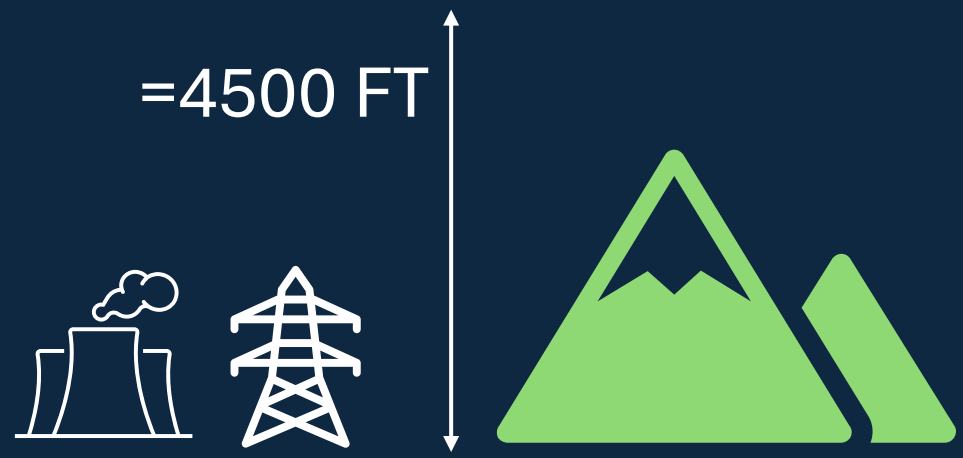
So, when ***atmospheric pressure*** decreases, the altimeter shows the pilot an ***increasing vertical position***.

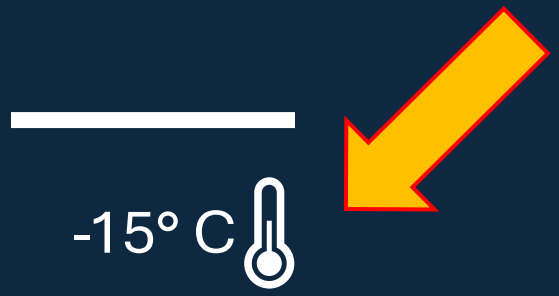
Imagine an aircraft approaching a sea-level aerodrome at 5000 ft height

If the temperature is colder than ISA, the altimeter will read higher.
To achieve the same indicated level of 5000 ft, the aircraft will be lower than 5000 ft.

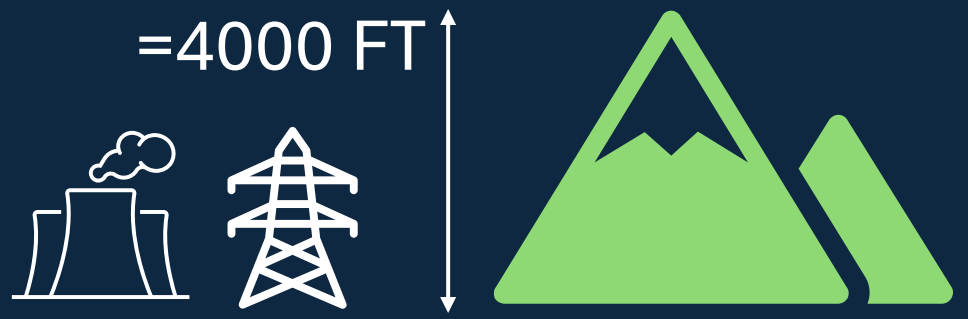


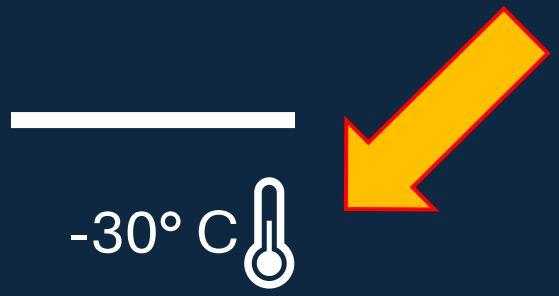
As temperature decreases, the discrepancy between true and indicated vertical position gets greater





If the temperature is cold enough, ***the aircraft might not achieve sufficient terrain and obstacle clearance***





How is it fixed?

- Cold temperature corrections:
  - Vertical corrections added to published minimum levels
  - Added by the pilot or the ATC unit, or incorporated by the flight procedure designer
- The aircraft is flown at or above the corrected minimum level to ensure terrain and obstacle clearance.

The cold temperature-corrected minimum level achieves terrain and obstacle clearance

Existing SARPs & PANS

- The Procedures for Air Navigation Services –
  - Air Traffic Management (PANS-ATM, Doc 4444)
  - Aircraft Operations (PANS-OPS, Doc 8168), Volume I and Volume III

- Annexes to the Convention –
  - 6 – Operation of Aircraft
  - 11 – Air Traffic Services

Future changes

- The ICAO Air Traffic Management Operations Panel and the Flight Operations Panel are working to introduce additional clarity to the provisions
- Focus areas:
  - stakeholder responsibilities
  - integrating cold temperature and altimetry
  - terrain and obstacle clearance
  - vectoring
  - techniques for correcting.

ATM system needs

- What are our altimeter setting sources?
- Do we measure temperature at the altimeter setting source?
- Is the temperature available to Operators and pilots? ATC units and controllers?
- Does it ever get cold enough at the altimeter setting source to necessitate the application of corrections?
- Are our minimum vectoring altitudes corrected for the possible cold temperatures?
- What are our procedures for Operators, pilots, ATC units and controllers if it’s cold enough to necessitate the application of corrections?

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