Area of Operation **VI** - Task **F**

Magnetic Compass Timed Turns

Content

westflying

Key References:
- Instrument Flying Handbook

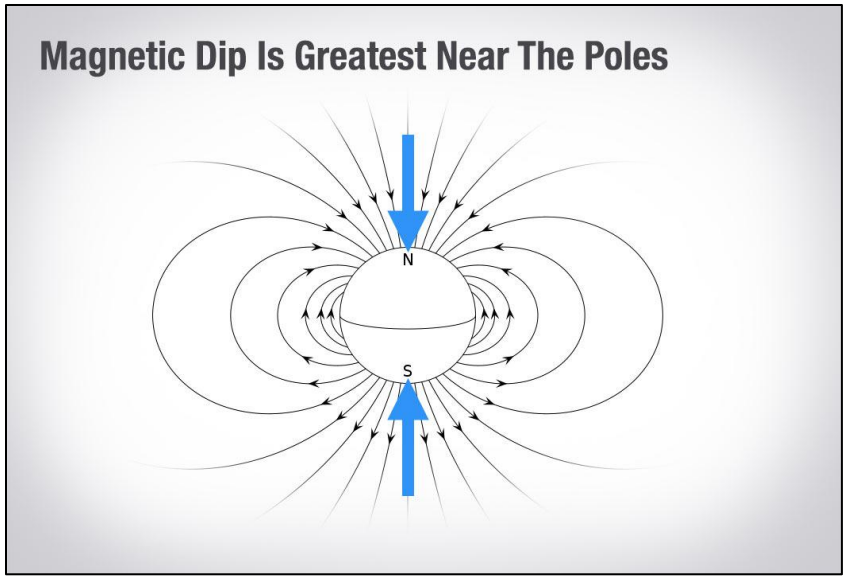
1. Introduction

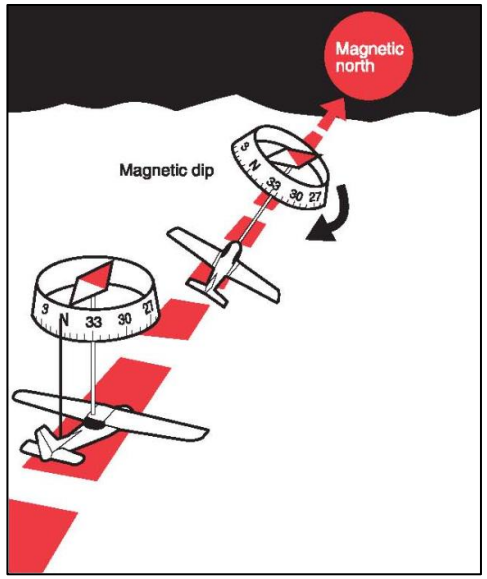
- **What**: Operation of the magnetic compass and its innate errors
- **Why**: The compass provides heading information in the case of a heading indicator and / or gyro system failure
- **How does the Magnetic Compass work**:
  - 2 magnets attached to a metal float in a clear fluid
  - Compass card wrapped around the float
  - Magnets align with the Earth's magnetic field
  - Lubber line: Reference line from which heading is read
  - Pilot sees the compass card from the backside
    - *This means the compass will turn in the direction of the turn*
    - *Pilot must turn OPPOSITE to the heading they see*
  - The card stays stationary, and the pilot turns around it

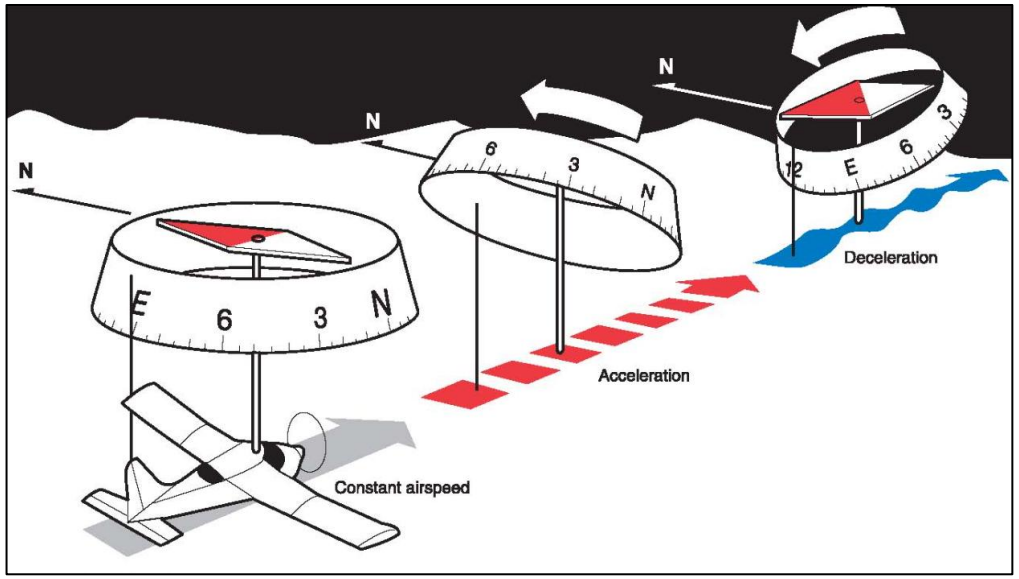
1 Pilot turns RIGHT to heading **030**

2. Magnetic Compass Errors

- **Compass Errors**
  - Variation: difference between magnetic north (compass) and true north
  - Deviation: interference w/ aircraft's equipment. Corrected by the compass card.
  - Magnetic dip: earth's magnetic flux is 3D, so the compass will try to dip to align
  - Turning: to the N (compass lags), to the S (it accelerates). UNOS → **15^0 + Half of the Latitude**
  - Acceleration: when flying on **E/W heading**, compass needle points towards the North when accelerating. ANDS
  - Oscillation: float assembly bouncing around
  - *NOTE: limitations – steep bank (>18^0) shows erratic readings*







3. Timed Turns Concept

- **Why We Use Them**
  - Used to change heading a specific number of degrees in a given time
  - Simpler than compass turns
- **How to Use Them**
  - Standard rate turn over a specific time
  - Clock + Turn Coordinator
  - Time to Turn = Degrees to Turn ÷ 3
- **Primary Instruments**
  - Bank: Turn Coordinator
  - Pitch: Altimeter
  - Power: Airspeed Indicator

Example:

- Change heading from N to 060
- 60/3 = 20 seconds
- If about 100 kts, bank for standard turn ~15-18º
- After 20 seconds, level off and wait for the compass to stabilize

4. Calibration of the Turn Coordinator

- **How to determine the Turn Coordinator accuracy**
  - Note heading & establish a standard rate turn
  - Hold standard rate shown on the instrument & note heading changes every 10 seconds
  - Adjust bank to obtain standard rate

  - *10 seconds should mean 30º if Standard rate is accurate*

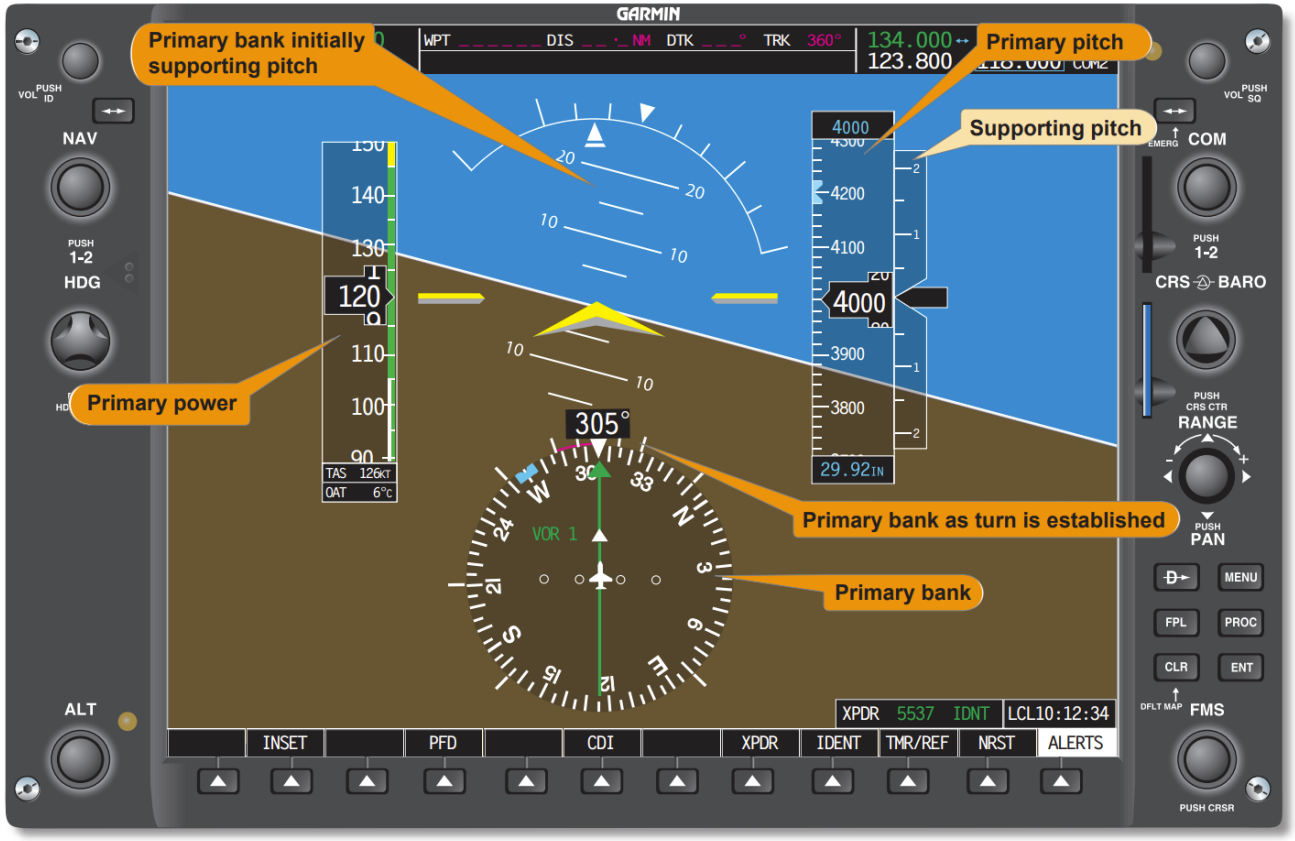


Figure 7-67. *Standard rate turn—constant airspeed.*

5. Timed Turns | Full Panel

- **Note the clock & roll to standard rate**
- **Crosscheck & Adjust**
  - Keep the clock in the crosscheck
- **Roll-out at required time**
  - If the roll-in & roll-out are at the same rate, the time for entry/recovery can be ignored
- **Verify desired heading**
  - Make small adjustments as required
  - Trim

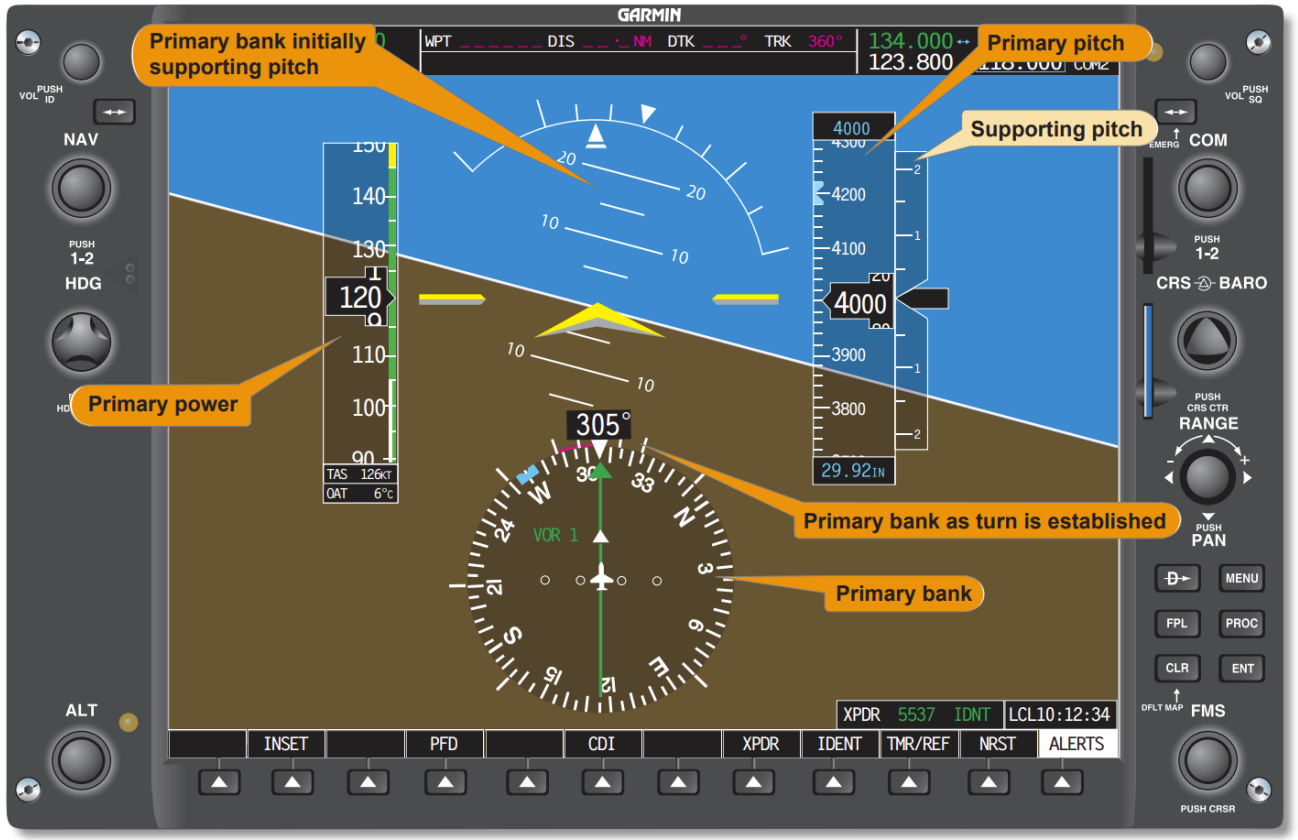


Figure 7-67. *Standard rate turn—constant airspeed.*

6. Timed Turns | Partial Panel

- **No Attitude or Heading Indicators**
- **Note the clock and roll to standard rate**
- **Crosscheck and Adjust**
  - Accelerated crosscheck
  - Keep the clock in the crosscheck
- **Roll-out at the required time**
- **Verify heading on Magnetic Compass**

7. Common Errors

1. Incorrect calibration procedures
2. Improper timing
3. Uncoordinated use of the controls
4. Improper trim control
5. Fixation

Questions?