Avionics Technology

B31353551

— *Attitude & Heading*

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III. Attitude & Heading

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（1）Some concepts

（2）Introduction to gyros

（3）Gyro artificial horizon

（4）Gyro compass

(4) Gyro compass

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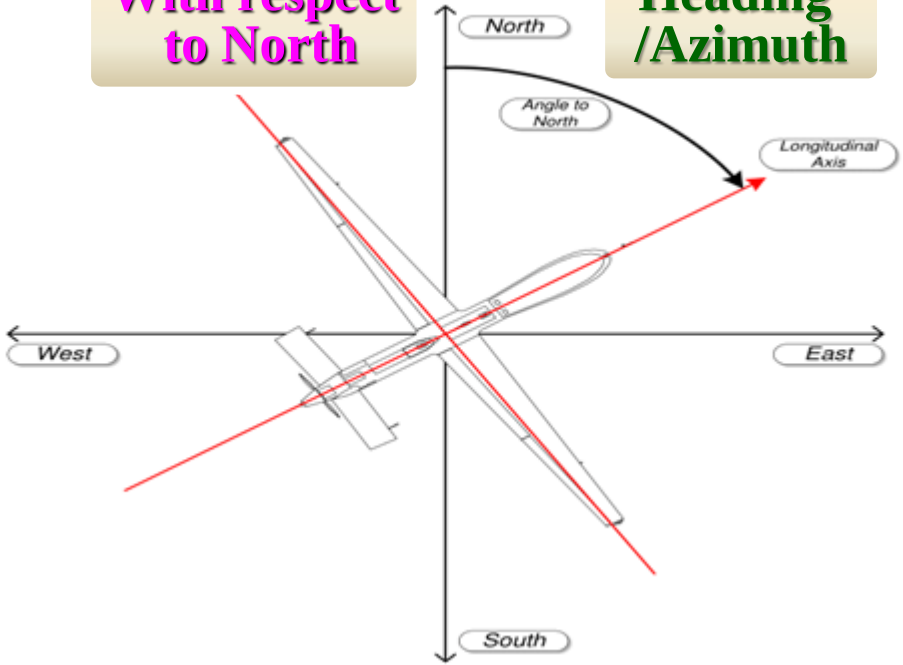
- The heading indicator when set with a compass senses the aircraft's movements and displays the heading (direction) in 0 ~ 360 degrees.

Heading indicator

With respect to North

Heading /Azimuth



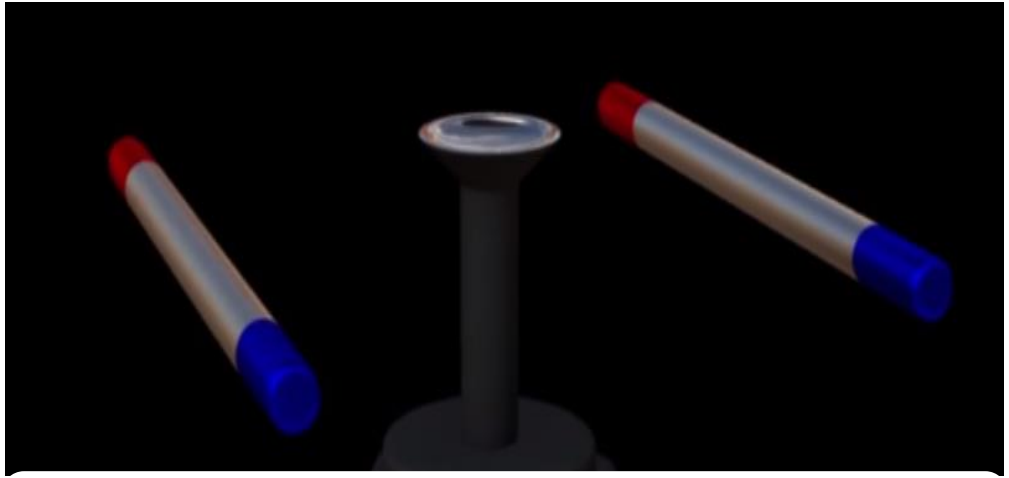
（4）Gyro compass

- The magnetic compass based on geomagnetic sensitive sensor is normally used as a backup source of heading information, which suffers from several types of errors. In fact, any flight condition (such as in a roll attitude, or during acceleration or deceleration) other than unaccelerated, straight and level will make the magnetic compass difficult to use.

Magnetic compass with the lateral scale

（4）Gyro compass

- The heading indicator is based on gyro compass. It is a combination of two important components: gyro and geomagnetic sensitive sensor.



Magnetic north and south poles mounted in a float full of kerosene

Outer gimbal mounted along the longitudinal axis in the horizontal plane

（4）Gyro compass

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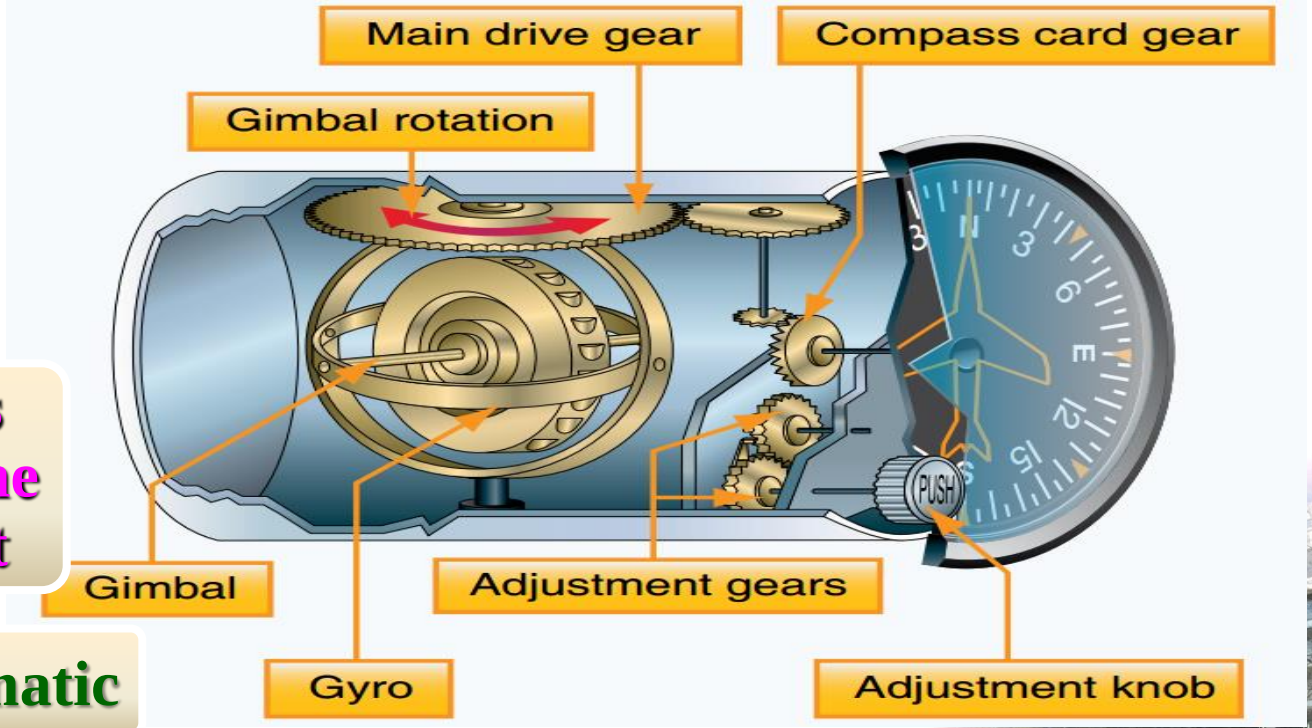
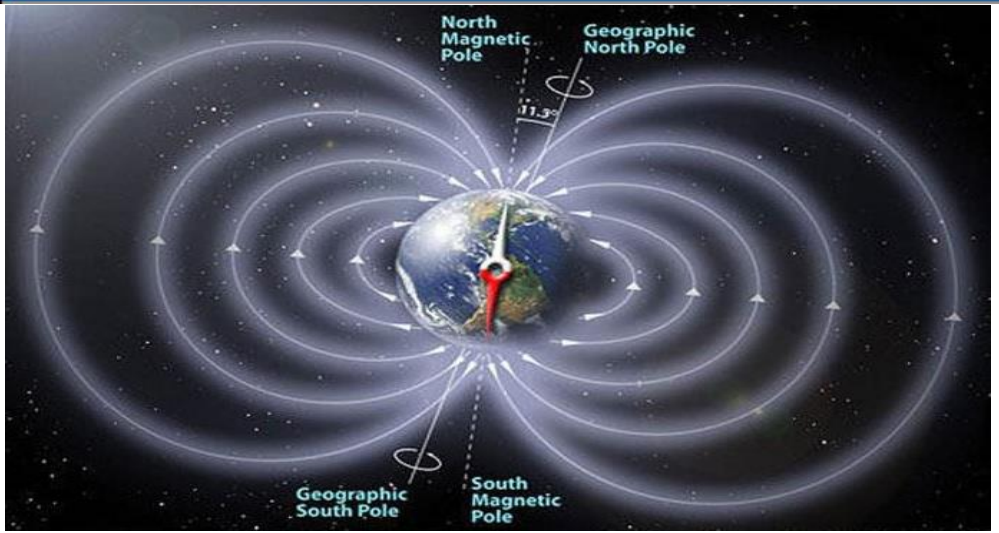
- The gyro compass is the primary heading instrument for an aircraft. The gyro in it maintains the heading reference axis in the horizontal plane.

That the spin axis is in the horizontal plane should be done first



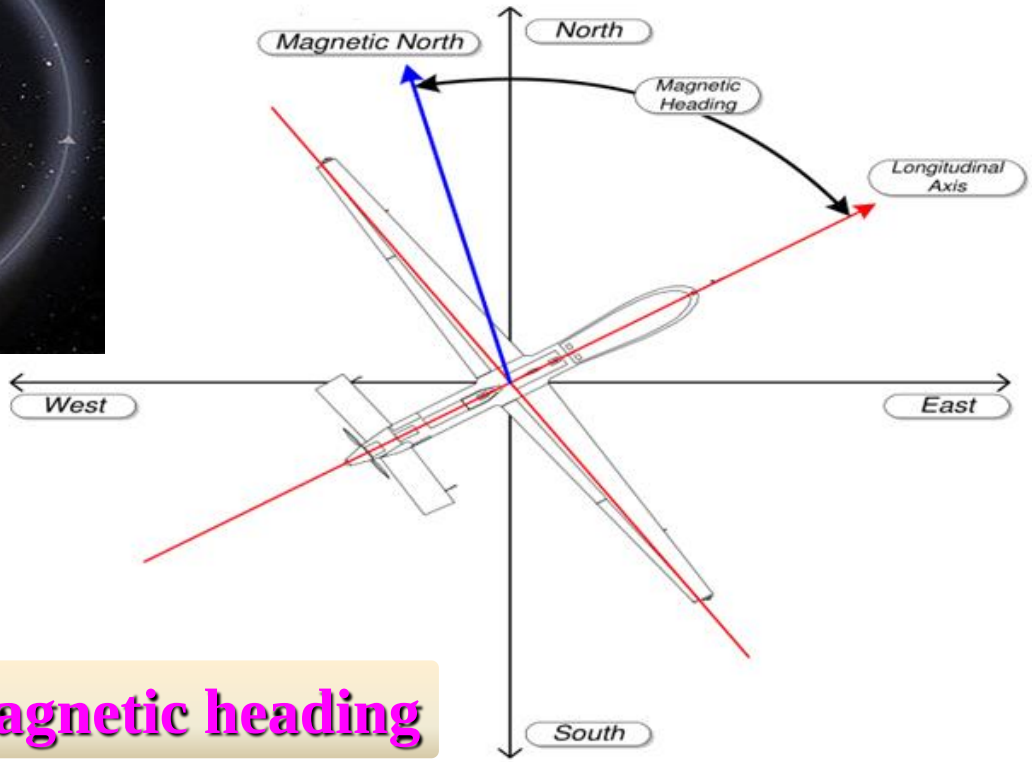
Gyro compass schematic

（4）Gyro compass



Magnetic North differs from true North

The Earth's magnetic poles are offset from the Earth's polar axis



Magnetic heading

(4) Gyro compass

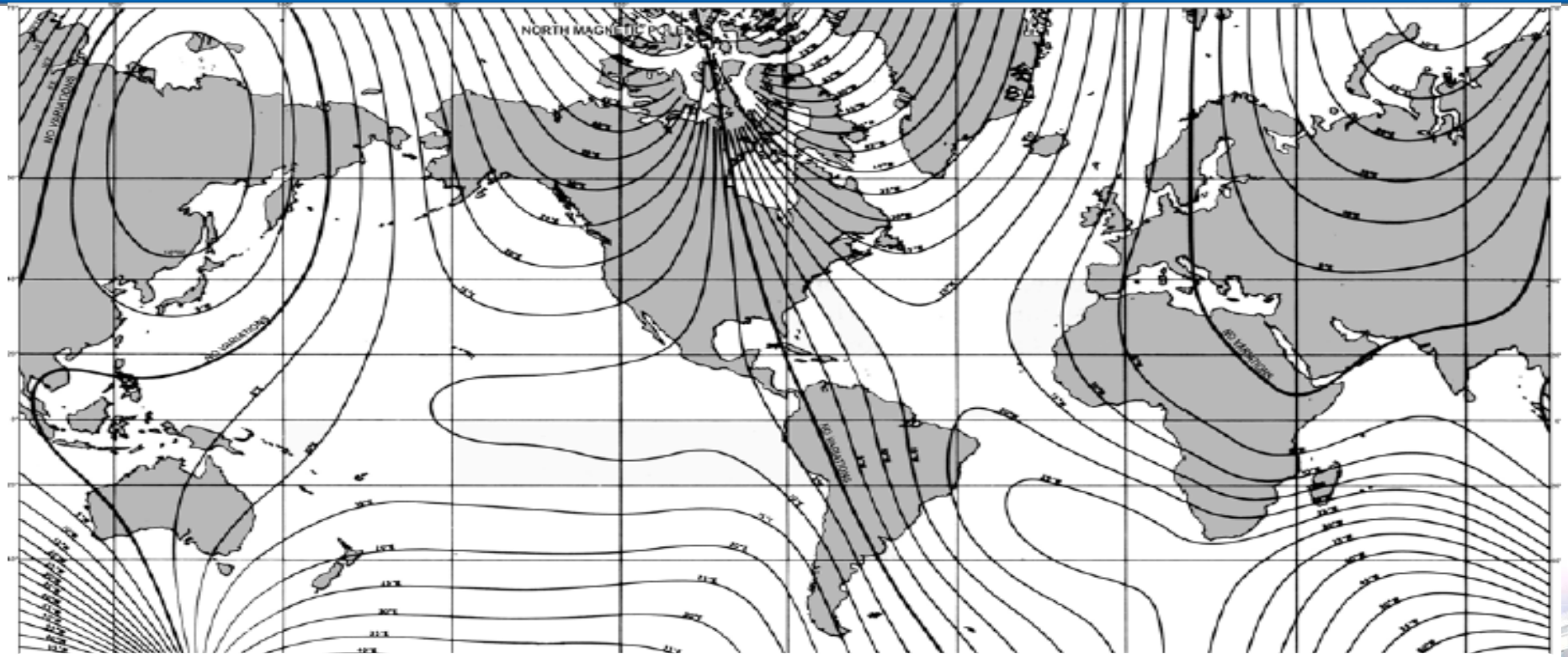
- Since aviation charts are orientated to geographic north and the aircraft compasses orientated to magnetic north, we must convert a magnetic heading to true heading, i.e. True heading = Magnetic heading + Variation.

- The amount of variation we need to apply is dependent on the position upon the Earth's surface.

Magnetic	Variation	True
-> +E, -W		
003°	6°E	009°
119°	3°E	122°
186°	8°W	178°
235°	7°W	228°

Examples of heading correction (correcting add East, subtract West)

（4）Gyro compass

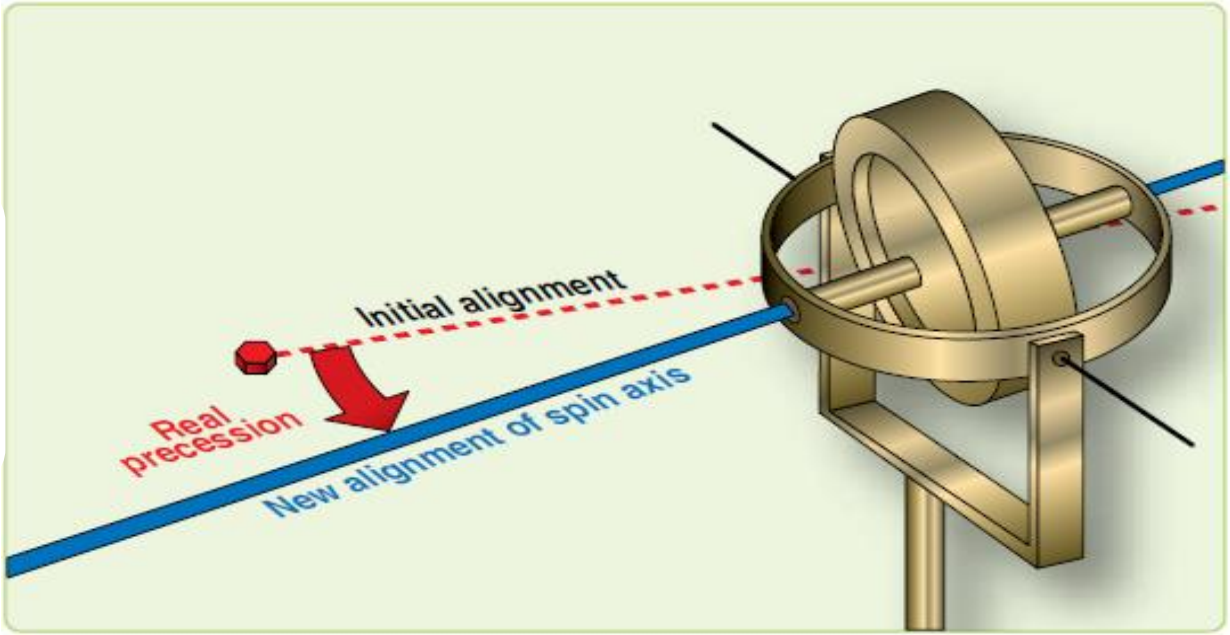


Magnetic variation (the angle between the magnetic meridian and the true meridian at a given position) for the world

（4）Gyro compass

- For the gyro in the gyro compass, it maintains the initial orientation, and then its spin axis should be realigned periodically according to the variation of the local horizontal plane.

New alignment of spin axis relies on the geomagnetic sensitive sensor



(4) Gyro compass

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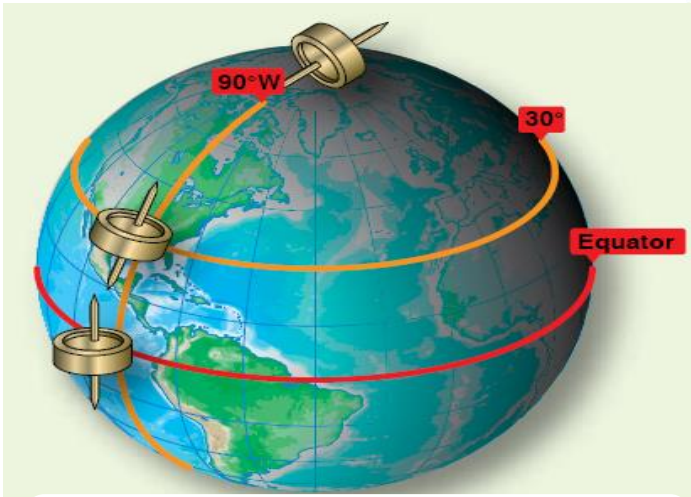
- Since gyros maintain their orientation in relation to inertial space rather than any position on Earth, any gyro not having its spin axis parallel to the Earth's axis of rotation will have an apparent drift (results from Earth's rotation) to be corrected.



Spin axis realignment dependent on latitude

At equator apparent drift / precession = 0°

（4）Gyro compass

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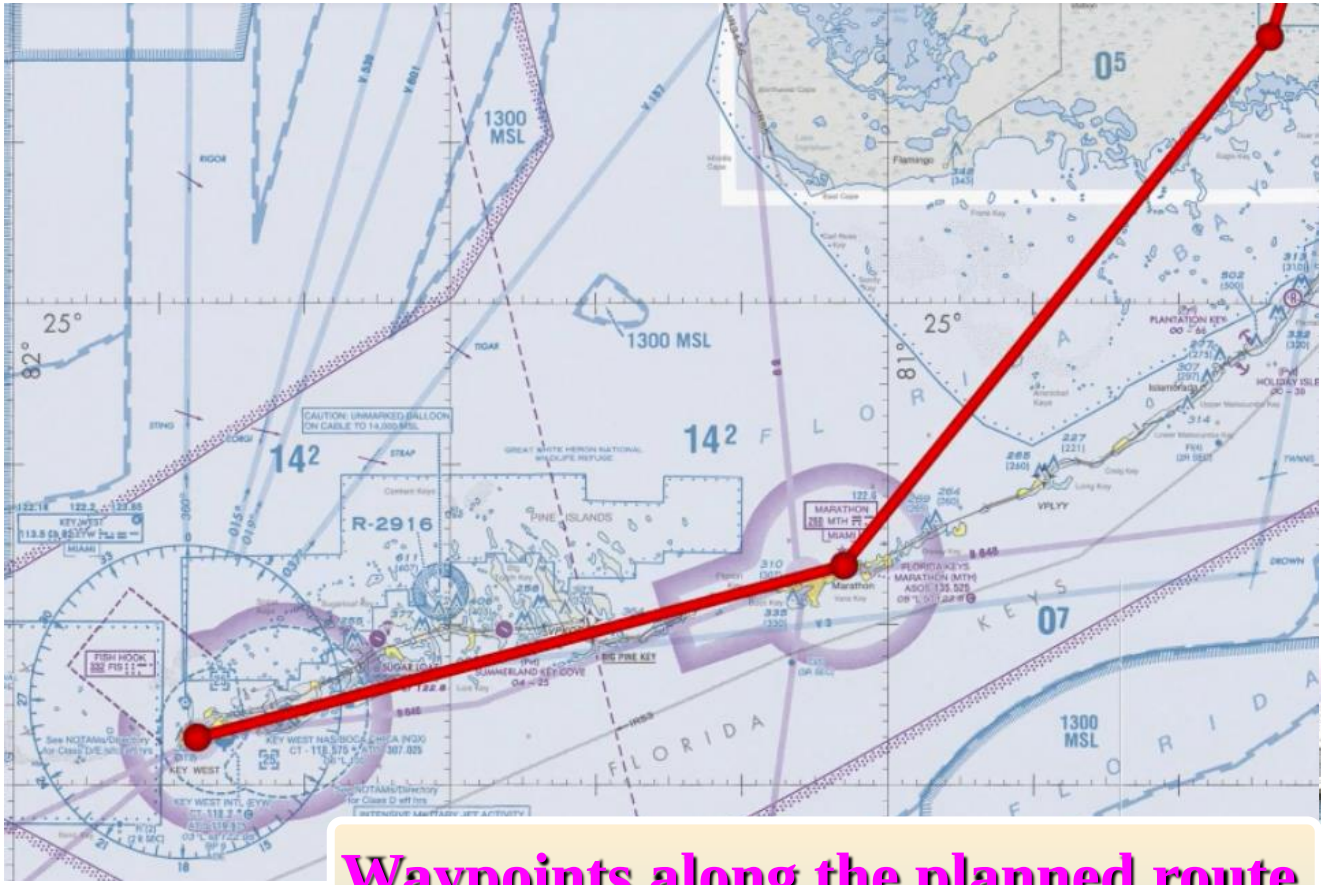
- With referring to the compass for heading, the aircraft can navigate on the planned flight route until landing at the airport of destination.



The end of *Attitude & Heading*