Understanding NDB's

NDB stands for **N**on **D**irectional **B**eacon

The NDB is a type of radio navigation system for aircraft. The NDB transmits 1frequency all around. As the name implies, the signal transmitted does NOT include directional information.

NDB signals follow the curvature of the earth, so they can be received at much greater distance at lower altitudes.

Each NDB is identified by a one, two, or three-letter Morse code callsign
e.g.: DJ at Borg el Arab

<u>The NDB transmits between:</u>
530 kHz and 1700 kHz with 10 kHz interspacing in the America's
531 kHz and 1602 kHz with 9 kHz interspacing in the rest of the world

<u>The range of an NDB depends upon:</u>

- the power of the transmitter (10—200 Watt);
- the frequency of transmission; and
- atmospheric conditions during transmission — signals from an NDB can be distorted or deflected by electrical storms, as well as during the periods of sunrise and sunset.
- A relatively strong NDB with a range of 100 nm or more would be required for long-range en route navigation where no other aids are available. Some NDBs may even have a range of 400 nm when used for long distance overwater tracking, for instance in the Pacific area. In more densely populated areas, however, where routes are relatively short and there are many navigation facilities, most NDBs have only a short range.
- For maneuvering in the vicinity of aerodromes, only lower powered NDBs are required. NDBs used for approaches are referred to as Locators. If a Locator is co-located with an Outer Marker that serves to fix a position as an aircraft proceeds down an Instrument Landing System (ILS) approach, then it will be depicted on the ILS Approach Chart as LOM (Locator Outer Marker).

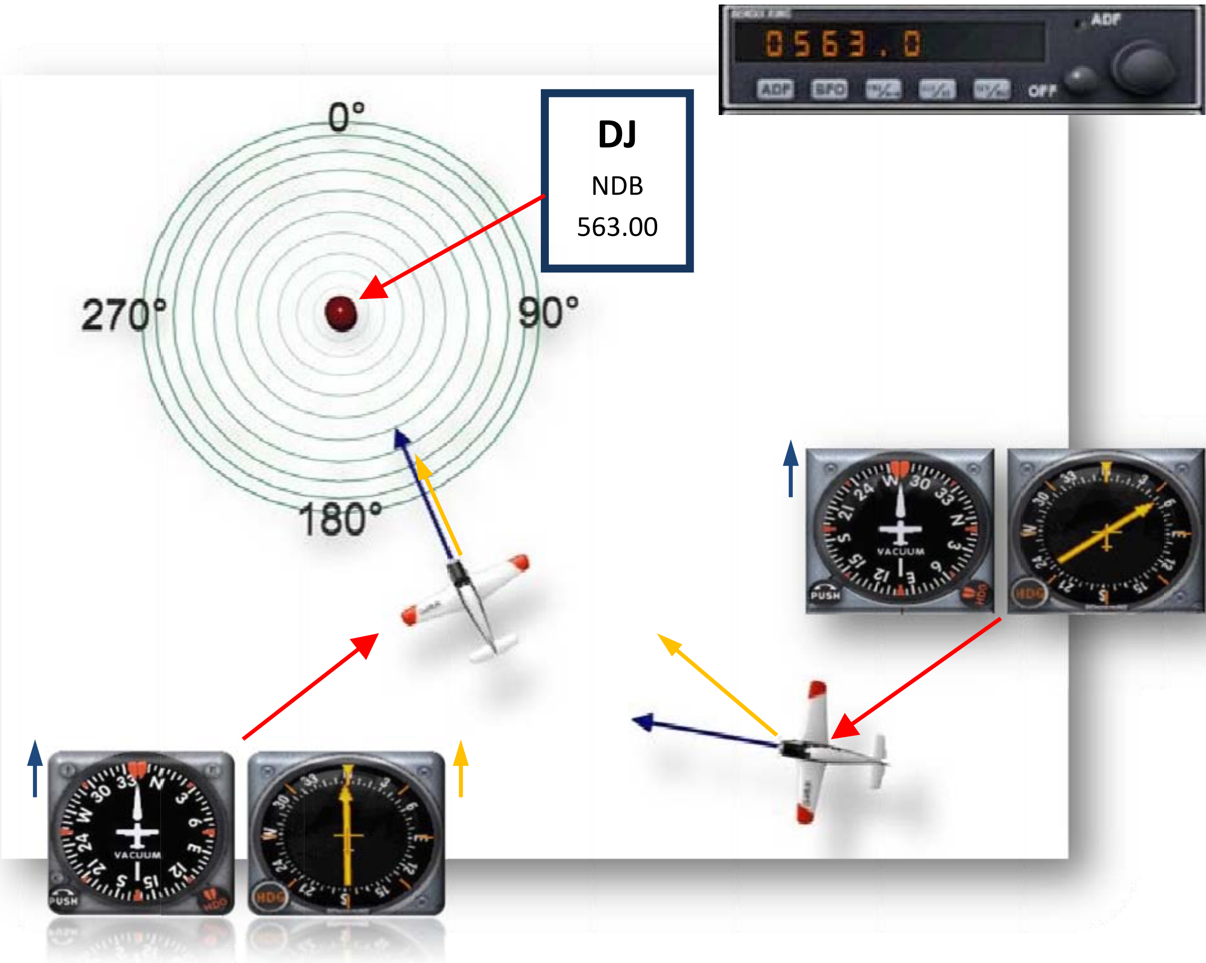
Accuracy and Errors

An ideal NDB signal received at an airplane may be accurate to +/-2º. However, there are a number of factors that may reduce this accuracy to a considerable degree. These include the following effects:

- The Thunderstorm Effect causes the ADF needle to be deflected towards a nearby electrical storm (Cumulonimbus cloud) and away from the selected NDB.
- In the Night Effect a fading signal and a wandering ADF needle (most pronounced at dawn and dusk) is observed when strong skywaves from the NDB returning to earth from the ionosphere cause interference with the surface waves from the NDB.
- Interference is possible from other NDBs transmitting on similar frequencies.
- The Mountain Effect is caused by reflections of the NDB signals from mountains.
- The Coastal Effect is caused by the NDB signal bending slightly towards the coastline when crossing it at an angle.

NOW LET's FLY

- The **Automatic Direction Finder** (**ADF**) in our radio stack determines the direction to the NDB station relative to the aircraft.



- When the NDB frequency is correctly set in our ADF the needles in the ADF indicator will point towards the NDB. By turning the heading of our aircraft we can fly directly to the NDB.

- NDB's have limited range, are not very accurate, and may not receive signal when we are on the ground.

NDB approach

Not all airports in the world have an ILS (instrument Landing System)
But how can we land there then?

Borg el Arab for instance has 2 NDBs ...they are positioned (almost exactly) in front of runway 32 . So without using ILS we can use one of those NDB stations to align with the runway.
We KNOW the runway heading is 320° so if we intercept the 320 bearing To the station (QDM) we will get pretty good aligned with runway 32 .

Note: we have to perform the descend ourselves !!!!

Determining distance from an NDB station

To determine the distance in relation to an NDB station in nautical miles, the pilot uses this simple method:

1. Turns the aircraft so that the station is directly off one of the wingtips.
2. Flies that heading, timing how long it takes to cross a specific number of NDB bearings.
3. Uses the formula:

$$Minutes\ to\ station = \frac{Time\ in\ second}{Degrees\ of\ bearing\ change}$$

Time in second = 60 x number of minutes flown

4. calculate the distance the aircraft is from the station:

$$Nautical\ Miles\ to\ station = \frac{TAS[kts] * Minutes\ flown}{Degrees\ of\ bearing\ change}$$