IJESMR
International Journal OF Engineering Sciences & Management Research

STUDY OF NAVIGATION AND SERVILANCE IN AEROSPACE

Sanjeev Kumar Dubey*, Mr. Sunil Kumar
*Department of Electrical and Electronics Dronacharya College of Engineering.
Department of Electrical and Electronics Dronacharya College of Engineering.

Keywords:.

ABSTRACT
We have done the project over there are NAVIGATION and SURVILLANCE in Airport Authority of India(AAI).This paper deals that AAI provides CNS services at all Indian airports, including privately operated ones, and limited navigation services at defiance airfields. These include: Maintenance of CNS/air traffic management (ATM) system/equipment, calibration of flight and ground radio navigation aids, certification of CNS/ATM system/equipment, modification of operational CNS/ATM equipment, corrective maintenance, preventive maintenance; installation of CNS/ATM system/equipment, develop, review and modify CNS/ATM system/equipment, and/or maintenance procedures.

INTRODUCTION
The **Airports Authority of India** (**AAI**) under the Ministry of Civil Aviation is responsible for creating, upgrading, maintaining and managing civil aviation infrastructure in India. It provides Air traffic management (ATM) services over Indian airspace and adjoining oceanic areas and provided by navigation

Navigation
Navigation applications are essentially used to maximize the capacity of airspace by facilitating flows of traffic between airports and maximizing safe and efficient access to airports. Navigation element of CNS/ATM Systems Is meant to provide accurate, reliable and seamless position determination capability to aircrafts. It include all those instruments which are used for air craft landing ,view of Omni direction ,distance from airport and other aircrafts nearby us. There are several instruments included in this category are: -

ILS (instrument landing system)
ILS is an instrument presented, pilot interpreted, precision approach aid. The system provides the pilot with instrument indications which, when utilised in conjunction with the normal flight instruments, enables the aircraft to be manoeuvred along a precise, predetermined, final approach path.
The ILS ground facilities have been categorised by international standardisation as follows:

There are three main elements in the complete ILS:

1. LOCALIZER
2. GLIDE PATH ANTENNA
3. MARKER

GROUND EQUIPMENTS
LOCALISER
The localiser aerial is on the runway extended centreline at the opposite end to the approach end, at a distance which ensures that it lies below the runway take-off obstruction clearance plane. The transmitter building is usually located 100–120 metres to the side of the aerial.Total width in terms of degrees will depend on position of aerials and length of runway. The equipment is designed to provide a usable on-course signal at a minimum distance of 25 nautical miles from the runway at a minimum altitude of 2,000 ft above the threshold. Each localiser is identified aurally by a coded designator consisting of three letters, the first of which is the letter ‘I’.

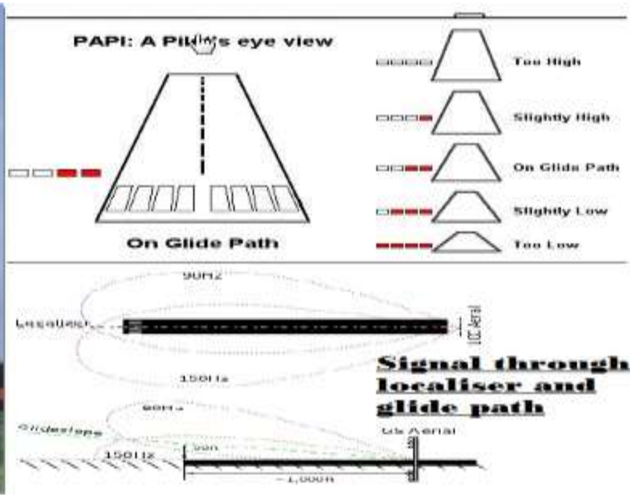
ISSN 2349-6193
Impact Factor (PIF): 2.243

IJESMR

International Journal OF Engineering Sciences & Management Research

GLIDE PATH

The transmitter buildings and glide path aerial are in close proximity and are usually located approximately 225–380 metres from the approach end and 120–210 metres to the side of the runway centreline. The field pattern radiated by the glide path equipment is illustrated , with the on path line set at an angle of 2½ to 3° from the touchdown point on the runway. The glide path 'width' as it is interpreted by the travel of the glide path needle on the aircraft cross pointer indicator from a full 'fly-up' indication to a 'fly-down' indication, varies from 1° to 1.5°. There is no sector colour identification associated with the glide path. The transmitters are duplicated, with an automatic change-over facility from primary to secondary equipment in the event of failure or malfunction.



MARKER BEACON

On some installations, marker beacons operating at a carrier frequency of 75 MHz are provided. When the transmission from a marker beacon is received it activates an indicator on the pilot's instrument panel and the tone of the beacon is audible to the pilot. The distance from the runway at which this indication should be received is published in the documentation for that approach, together with the height at which the aircraft should be if correctly established on the ILS. This provides a check on the correct function of the glide slope.

Outer marker

The purpose of this beacon is to provide height, distance, and equipment functioning checks to aircraft on intermediate and final approach.

Middle marker

The middle marker should be located so as to indicate, in low visibility conditions, the missed approach point, and the point that visual contact with the runway is imminent, ideally at a distance of approximately 3,500 ft (1,100 m) from the threshold.

Inner marker

The inner marker, when installed, shall be located so as to indicate in low visibility conditions the imminence of arrival at the runway threshold. This is typically the position of an aircraft on the ILS as it reaches Category II minima, ideally at a distance of approximately 1,000 ft (300 m) from the threshold

DME substitution

Distance measuring equipment (DME) provides pilots with a slant range measurement of distance to the runway in nautical miles. DMEs are augmenting or replacing markers in many installations. The DME provides more accurate and continuous monitoring of correct progress on the ILS glide slope to the pilot, and does not require an installation outside the airport boundary. When used in conjunction with an ILS, the DME is often sited midway between the reciprocal runways thresholds with the internal delay modified so that one unit can provide distance information to either runway threshold. For approaches where a DME is specified in lieu of marker beacons, *DME required* is noted on the Instrument Approach Procedure and the aircraft must have at least one operating DME unit to begin the approach.

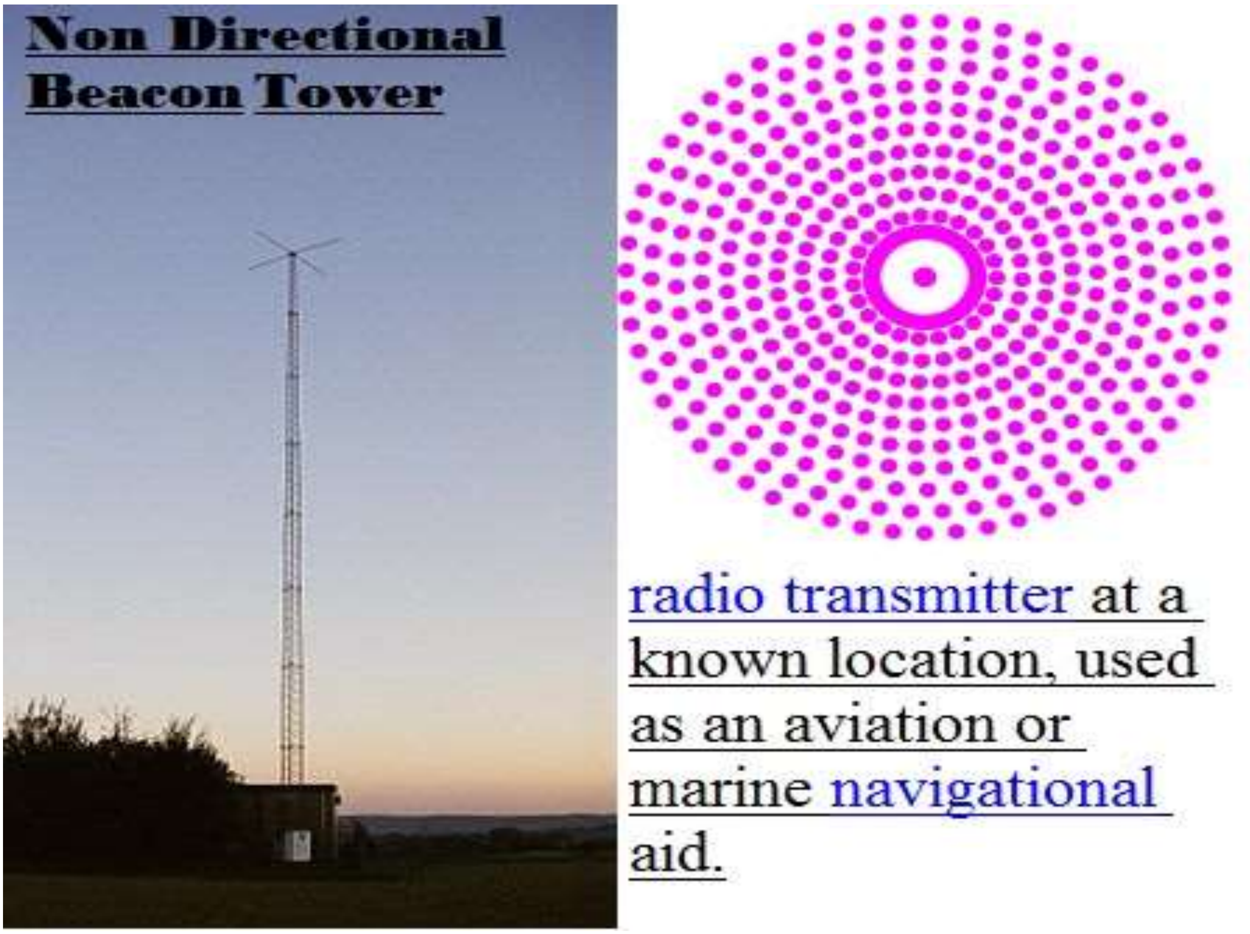
Non Directional Beacon (NDB)

A non-directional (radio) beacon (NDB) is a radio transmitter at a known location, used as an aviation or marine navigational aid. As the name implies, the signal transmitted does not include *inherent* directional information, in contrast to other navigational aids such as low frequency radio range, VHF omnidirectional range (VOR) and TACAN. NDB signals follow the curvature of the Earth, so they can be received at much greater distances at lower altitudes, a major advantage over VOR. However, NDB signals are also affected more by atmospheric conditions, mountainous terrain, coastal refraction and electrical storms, particularly at long range. NDBs used for aviation are standardised by ICAO Annex 10 which specifies that NDBs be operated on a frequency between 190 kHz and 1750 kHz.

ISSN 2349-6193
Impact Factor (PIF): 2.243

IJESMR

International Journal OF Engineering Sciences & Management Research



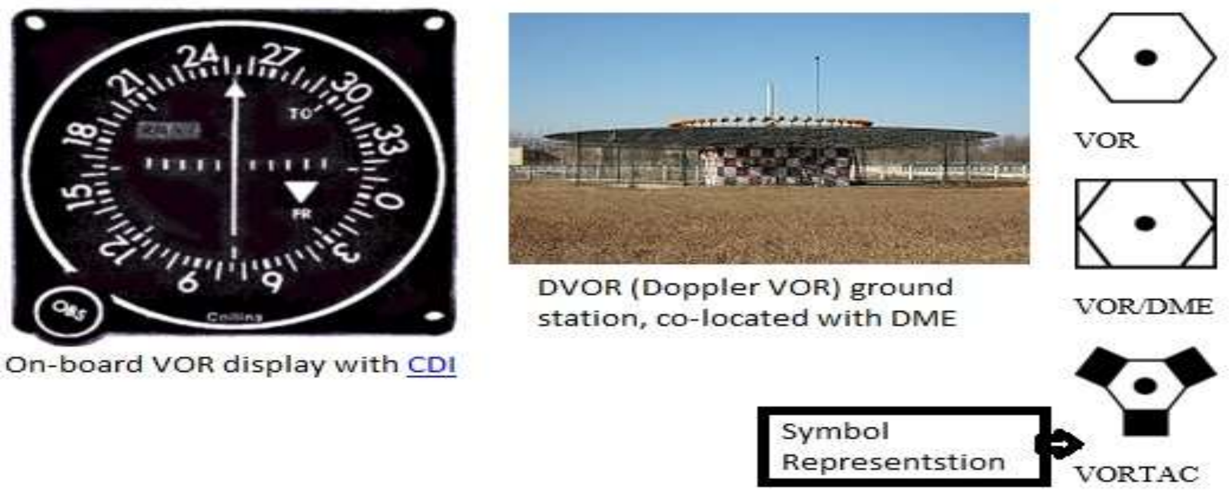
VOR/DME

VOR/DME refers to combined radio navigation station for aircraft, which consists of two radio beacons, placed together, a VHF omnidirectional range (VOR) and distance measuring equipment (DME). VOR produces an angle between the station and the receiver in the aircraft, while DME does the same for range. Together, they provide the two measurements needed to produce a navigational "fix" using a chart. The VOR system was first introduced in the 1950s, but became much more practical with the introduction of low-cost solid state receivers in the 1960s. DME was a modification of WWII-era navigation systems like Gee-H, and began development in 1946. Like VOR, it only became practical with the introduction of solid state receivers during the 1960s.VOR/DME eventually won the standardization effort, due to a number of factors. One was that the direct measurement systems like Loran were generally much more expensive to implement (and would be into the 1980s) while Decca had problems with static interference from lightning strikes because of its low 70 to 129 kHz frequency. The choice of VOR/DME as a hybrid was due largely to it being easier to measure and then plot on a map. With VOR/DME, measurement from a single station reveals an angle and range, which can be easily drawn on a chart. Using a system based on two-angles, as an example, requires two measurements at different frequencies (or using two radios) and then the angles plotted from both on a single chart, which may be difficult in a cramped cockpit.

ISSN 2349-6193
Impact Factor (PIF): 2.243

IJESMR

International Journal OF Engineering Sciences & Management Research



.

DVOR

The Doppler signal encodes the station identifier, *i*(*t*), optional voice, *a*(*t*), and navigation variable signal in *c*(*t*), an isotropic (i.e. omnidirectional) component. The navigation variable signal is A3 modulated (grayscale). The navigation reference signal is delayed, t_+, t_-, by electrically revolving a pair of transmitters. The cyclic Doppler blue shift, and corresponding Doppler red shift, as a transmitter closes on and recedes from the receiver results in F3 modulation (color). The pairing of transmitters offset equally high and low of the isotropic carrier frequency produce the upper and lower sidebands. Closing and receding equally on opposite sides of the same circle around the isotropic transmitter produce F3 subcarrier modulation, *g*(*A*t).

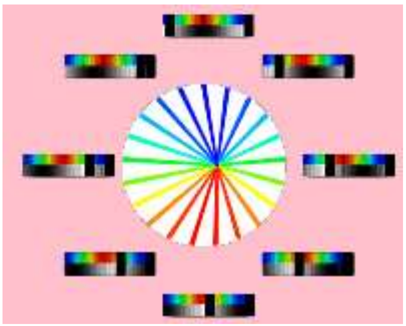


Fig. DVOR

Surveillance

The objective of the surveillance infrastructure is to enable a safe, efficient and cost-effective air navigation service. As a key player in the Single European Sky, EUROCONTROL is committed to enhancing global interoperability. The surveillance systems can be divided into two main types:- Dependent surveillance and Independent surveillance.

For Detection of objects we use: -

RADAR

Radar is an object-detection system that uses radio waves to determine the range, altitude, direction, or speed of objects. It can be used to detect aircraft, ships, spacecraft, guided missiles, motor vehicles, weather formations, and terrain. The radar dish (or antenna) transmits pulses of radio waves or microwaves that bounce off any object in their path. The object returns a tiny part of the wave's energy to a dish or antenna that is usually located at the same site as the transmitter.

.

 ISSN 2349-6193
Impact Factor (PIF): 2.243

IJESMR
International Journal OF Engineering Sciences & Management Research

Principles Radar signal

Radar system has a transmitter that emits radio waves called *radar signals* in predetermined directions. When these come into contact with an object they are usually reflected or scattered in many directions. Radar signals are reflected especially well by materials of considerable electrical conductivity—especially by most metals, by seawater and by wet ground. Some of these make the use of radar altimeters possible. The radar signals that are reflected back towards the transmitter are the desirable ones that make radar work. If the object is *moving* either toward or away from the transmitter, there is a slight equivalent change in the frequency of the radio waves, caused by the Doppler effect .Radar receivers are usually, but not always, in the same location as the transmitter. Although the reflected radar signals captured by the receiving antenna are usually very weak, they can be strengthened by electronic amplifiers. More sophisticated methods of signal processing are also used in order to recover useful radar signals. The weak absorption of radio waves by the medium through which it passes is what enables radar sets to detect objects at relatively long ranges—ranges at which other electromagnetic wavelengths, such as visible light, infrared light, and ultraviolet light, are too strongly attenuated. Such weather phenomena as fog, clouds, rain, falling snow, and sleet that block visible light are usually transparent to radio waves. Certain radio frequencies that are absorbed or scattered by water vapor, raindrops, or atmospheric gases (especially oxygen) are avoided in designing radars, except when their detection is intended.

REFERENCE

[1] https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gbng/.
[2] http://www.aai.aero/public_notices/aaisite_test/faq_cns.jsp.
[3] https://www.casa.gov.au/sites/g/files/net351/f/_assets/main/pilots/download/vor.pdf
[4] https://en.wikipedia.org/wiki/VHF_omnidirectional_range
[5] Thai Technics.Com