Navigational aids

Main Radar Home

RAF Radar Home

Radar Type Numbers

Chain Home Radar System

Chain Home Low

Chain Home Extra Low

Ground Controlled Intercept

Post War Planning

Rotor Radar System

Master Radar Station

Linesman Radar System

Martello

Navaids

Bloodhound

Miscellanea

Glossary

WARNING!

"Cold War" and Radar links

Contact the Editor

FAQ (Frequently Asked Questions)

Employment

Navigational Aids

Tacan

Major system characteristics

System type	Rotating beam beacon navigation system
Frequency band	962 - 1214 Mc/s

The text that follows in this section is taken from "**The Services Textbook of Radio, Volume 7, Radiolocation Techniques**" by Brig. J. D. Haigh, O.B.E., M.A., M.I.E.E., Edited by the staff of "Wireless World", H.M.S.O., London, 1960 pages 50 - 52. This volume was known to the British armed forces as Admiralty B.R.600(7), War Office 10224(7) and Air Ministry A.P.3214 (7).

"Tacan" stands for "Tactical Air Navigation" and is a system which, working in the u.h.f. band, between 962 and 1,214 Mc/s, gives to a pilot continuous information as to his range and bearing from a beacon. The airborne equipment consists of an interrogating transmitter and a receiver which includes suitable demodulating circuits to enable the information contained in the beacon's response to be extracted. The ground equipment consists of a beacon provided with a rotating aerial system. In the absence of interrogating signals the beacon transmits a series of random pulses together with groups of marker or reference pulses which are locked to the aerial rotation. Bearing information can be obtained without interrogation since the beacon is continuously transmitting.

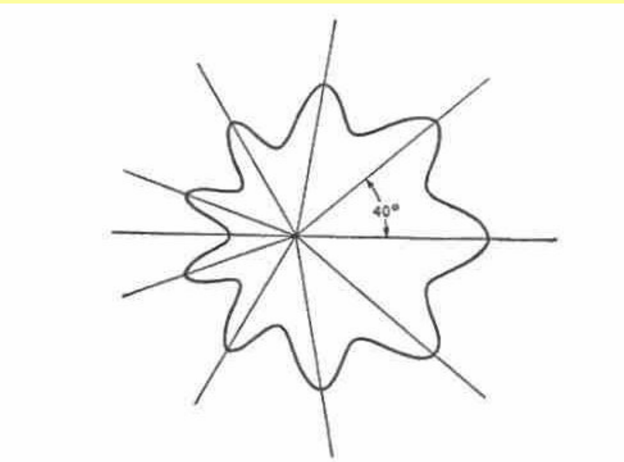

Fig. 3.13. Polar diagram of Tacan beacon aerial system.

In addition to transmitting a random series of pulses the beacon also periodically transmits a signal by which it identifies itself. To determine range the airborne transmitter radiates a series of pairs of pulses. These are received at the beacon and, after a fixed delay, are re-transmitted in place of the particular random pulses that the beacon would have transmitted in the absence of interrogation. The time delay between the emission of any interrogating pulse and the receipt of the reply is measured by one of the standard radar techniques described in Chapter 10. To avoid mistakes arising from multiple interrogation the airborne transmitter emits its pairs of pulses at random intervals. The receiver only recognises an exactly similar set of reply pulses all delayed by the same amount.

The aerial polar diagram of the beacon is of the shape shown in Fig. 3.13. This is produced by placing parasitic radiators, comprising a single radiator and a ring of nine, in the positions shown in Fig. 3.14.

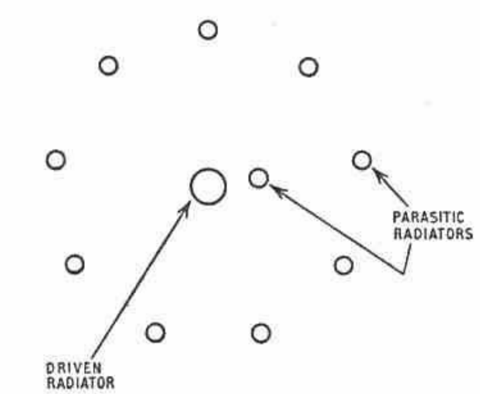

Fig. 3.14. Plan of Tacan beacon aerial system.

By rotating these parasitic elements around the radiator the polar diagram is caused to rotate in space.

The parasitic elements spin round the aerial at 900 r.p.m. so that the received signal is amplitude modulated at 15 c/s, caused by the rotation of the single radiator, and at 135 c/s caused by the rotation of the group of nine radiators. A marker signal is transmitted every time the main lobe of the polar diagram passes due magnetic East. Somewhat misleadingly this is known as the "N " or north marker. Further marker signals are transmitted after every 40^{o} of rotation of the aerial pattern. This system of markers provides reference signals at 15 and 135 c/s for phase comparison with the signals received in the aircraft. As the aircraft flies round the beacon the time of receipt of the marker signals with respect to the phase of the amplitude modulation of the received signal varies as shown in Fig. 3.15.

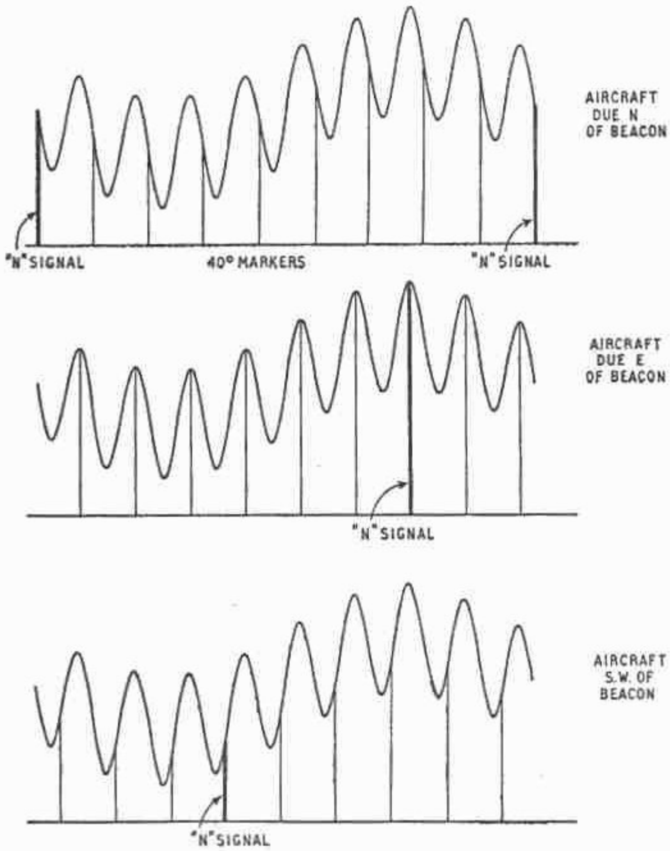

Fig. 3.15. Oscillograms of signals received by aircraft in various positions with respect to the beacon.

The airborne receiver has five detectors. The first is an envelope detector whose output consists of a composite 15 and 135 c/s signal due to the rotation of the aerial pattern. The second and third detectors are used to isolate the 15 and 135 c/s reference signals respectively. The fourth detector is used to feed the range measurement circuits and the fifth to extract the beacon identification signal.

The signal from the envelope detector is passed through filters to separate the 15 c/s and 135 c/s modulations. A phase comparison circuit is used to measure the phase difference between the 15 c/s modulation and the 15 c/s reference signal from detector number two. This circuit enables the bearing of the beacon to be measured to within $\pm 20^{o}$ A second phase comparison circuit compares the phase of the 135 c/s modulation with that of the 135 c/s reference signal from detector number three. This gives the bearing of the beacon to an accuracy of about $\pm 1^{o}$

There is no limit to the number of aircraft which can simultaneously obtain bearing information from a Tacan beacon but no more than 100 aircraft at a time can obtain distance information. The major claim of the Tacan system is that by employing an antenna pattern comprising a main lobe and "ninth harmonic" lobes a nine-fold increase in accuracy is obtained. Whether such an accuracy can be obtained in varied conditions of siting has yet to be proved.

Editors note: The black and white photographs of what the RAF called "American Tacan" are taken from the United States Air Force Communications Agency (AFCA) website at http://public.afca.scott.af.mil/index.html These excellent photographs can be found at https://public.afca.scott.af.mil/public/images/historical/menu.html The AFCA is located at Scott AFB, IL and their web site is well worth a visit.

Previous page Top of page Next page

Updated 28/11/2002

Constructed by Dick Barrett
Email: **editor**@ban_spam_**radarpages.co.uk**
(To e-mail me remove **"ban_spam_"** from my address)