Abstract

Enhanced Loran (eLoran) is a radio navigation system which uses groundwave signals transmitted from a network of terrestrial transmitters synchronized in a time division multiplexed manner. eLoran is of two forms: eLoran for maritime harbor entrance and eLoran for aviation. For each mode of eLoran transport, four system performance parameters are assessed at any location in the coverage area. These are accuracy, availability, continuity and integrity. The maintenance of all the Loran transmitters in North West European Loran System (NELS) is regulated at LORAN Control Centre in Brest, France (CBB). The Control Centre keeps all the records of the off air times, blink times and times taken to restore the transmitters back in service. These off-air times are useful for calculating the mean time to repair (MTTR) and mean time between failures (MTBF). The problem of eLoran coverage in Europe is that there is poor coverage to the west coast of the United Kingdom. Poor coverage means that the results of the system performance parameters fall below the standard set by regulation bodies. The system performance parameter that has been tested previously is only accuracy. There is no eLoran continuity and availability work so far that has been done in the NELS coverage area. This paper develops an algorithm for calculating availability and continuity in eLoran for maritime and harbor entrance and approach employing MTTR and MTBF obtained from transmitter off-air statistics. This research attempts to find out if the current scheduled repair times taken by the Control Centre are long or not, and if they are; then to suggest an optimum time taken to repair an eLoran transmitter. Too many scheduled maintenance times leads to low availability and continuity figures and hence to the disruption of the eLoran service. The availability and continuity results are useful in accessing if the scheduled maintenance times are too many per year or not. This work is useful to authorities overseeing the movement of ships into their harbors as they may want to warn mariners on which geographical area of the coverage, the continuity and availability service is poor. This work is also useful in radio planning of the coverage area. This research produces continuity and availability plots and attempts to find out if there will be an improvement in continuity and availability results to the west coast of the Isle of United Kingdom if two transmitters are installed in the republic of Ireland. The results of this work suggest that continuity and availability are dependent on the off-air and on-air transmitter times. This work proposes that the Control Centre should resort to short scheduled maintenance times of eLoran transmitters. This will increase availability and continuity figures across the coverage area. Better availability of eLoran service means Fishermen are able to do fishing at given time. This paper suggests an installation of two new transmitters at specific location in Ireland in order to increase the availability and continuity figures in the coverage area. The results of this work are useful for authorities regulating traffic at sea as well as harbor entrance and approach.

Keywords: eLoran, Availability, Continuity, Accuracy, Integrity