Loran System Summary—Adrienne Oakley

Loran-C navigation signal is “a carefully structured sequence of brief radio pulses on a carrier wave centered at 100 kHz.” The signals are sent from the Master station which radiates pulses in groups of 9 and secondary stations that send pulses in groups of 8. The time interval between the Master pulse group and the answering pulses from the secondary stations, followed by a repetition of the original pulse, determines the Group Repetition Interval (GRI) which identifies a unique Loran-C chain. The frequency of 100 kHz was chosen for the carrier wave to take advantage of the long-distance propagation of the stable ground wave. To reduce the effects of interference and noise on time difference measurements, and to help distinguish between Master and secondary stations, a phase shift of 180 degrees is introduced to the transmitted pulses in a predetermined pattern. The pattern is repeated every two GRI cycles.

Loran-C receivers measure the difference in the time-of-arrival between the Master signal and the signals from the secondary stations. Each time-of-arrival is measured to a precision of 100 nanoseconds, corresponding to ~30 meters.

Loran-C transmitters are fully automatic and can be operated at unmanned stations (with caretakers). These stations are equipped with caesium atomic clocks to achieve high precision accuracy (error of 1 second in 317,000 years).

The absolute accuracy of Loran-C navigation varies from 185 meters to 463 meters (0.1–0.25 nautical miles) depending on where the observer is within the coverage area. Absolute accuracy is a measure of the user’s true geographic position (Lat/Long). Repeatable accuracy is defined as the ability of the user to return to a previously visited position using the same navigation system. The repeatable accuracy of the Loran-C system is 18-100 meters. Needless to say, GPS is a vast improvement over the Loran Navigation systems.