Defense Matters

The Beginning of the End of the U.S. Loran-C Program

31 December 1994

In late October I received an email informing me that my submission deadline for this Winter 2024 Defense Matters column was due to the ION on 31 December 2024.

Noting the date, I immediately knew what the subject would be as it was exactly 30 years ago, 31 December 1994, when the Department of Defense (DoD) requirement for the U.S. Coast Guard's (USCG) overseas Loran-C service ended.

The Birth of Loran – Fulfilling a DoD Requirement

The USCG began operating radionavigation services during World War II to meet defense related national security requirements.

The first radionavigation service operated by the USCG for the DoD was Loran-A. At the end of World War II there were over 60 Loran-A stations operated by the USCG in support of the DoD.

Loran-A, as provided by the USCG, was phased out in the late 1970's when its follow-on, the Loran-C system became more widespread as it provided greater accuracy and a larger service area. To a great extent, the adoption of Loran-C was market driven as more affordable civilian user receivers became available when compared to Loran-A receiver technology.

The first Loran-C chain was on the East Coast of the United States and initially consisted of a master station at Carolina Beach, North Carolina, and two secondary stations at Martha's Vineyard, Massachusetts, and Jupiter, Florida. This domestic chain was originally operated by the U.S. Navy but was transferred to the USCG in 1958. It was later reconfigured and expanded to meet maritime needs on the East Coast of the U.S.

The overseas Loran-C mission began with the Mediterranean Sea Chain in 1959. It originally consisted of a master station in Sellia Marina, Italy, and two secondary stations at Matratin, Libya, and Kargaburn, Turkey. The coverage area in the Mediterranean was later expanded to include a secondary station in Estartit, Spain (January 1962), and later Lampedusa, Italy (August 1972), which replaced the Libya station, which was disestablished in May 1970.

In the early 1990's, the heyday of Loran-C operations, the USCG budgeted for and operated a total of 46 transmitting stations, contributing signals to a total of 18 chains. Eighteen of the transmitting stations, and six of the noted chains, were overseas Loran-C stations operated for the DoD.

Formulating Alternatives for Ending the Overseas Loran-C Mission

Based on news of the planned Global Positioning System (GPS), the USCG was made aware of the DoD's plan to begin phase out of its requirement for overseas Loran-C operations as early as 1981.

In response, the USCG Headquarters international affairs office began to develop alternatives on how to best plan and execute the ending of the overseas mission.

Alternative 1: Walk Away

The least complicated alternative for the USCG was to continue providing Loran-C until the DoD's requirement ended, and when that date was met to simply close the sites and leave the DoD with the responsibility to dispose of the property.

This alternative was founded on the fact that all of the sites on foreign soil (some of which were at one time Loran-A sites dating back to the late 1940s) were established under various bilateral Status of Forces Agreements (SOFAs) negotiated by the DoD with each of the nations. These nations included Japan, Italy, Spain, Turkey, Germany, Iceland, Norway, and Denmark (of which Greenland is part). Note: For completeness, the USCG had used this approach to withdraw from Loran-C operations in other areas supporting DoD requirements, e.g., withdrawing from Loran-C operations in Southeast Asia following the Vietnam War in 1975.

However, the DoD rejected this alternative and placed responsibility for the disposition of the overseas stations on the USCG with the added stipulation that the DoD would not accept any mission-ending arrangement, e.g., site remediation, that could be viewed as precedent setting for any future DoD site withdrawals from the various nations.

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Alternative 2: Convince the Nations to Take Over Operations

Critical to the success of this alternative was for the USCG to motivate the nations in the various Loran-C chains to work together and establish new cooperative arrangements to keep their respective Loran-C chains operational after the USCG left.

In pursuit of this alternative, where and when it suited the desired end state, the USCG negotiators hammered home the point that the new GPS was a DoD system and it would be in the best interests of the respective nations and regions to have an alternative to the DoD-controlled system for their own national security purposes.

An example in the Pacific region was the Far East Radio Navigation Systems (FERNS) group. FERNS was established in 1992 with membership to include the USCG (as an invited observer), Japan, China, Russia, and South Korea.

In northern Europe the Northwest European Loran-C System (NELS) was established in the late 1980s. Norway was a major driving force in the standup of NELS, which originally included membership from Norway, the United Kingdom, France, The Netherlands, The Federal Republic of Germany, Denmark, Iceland, and Canada.

In southern Europe, the European Commission's Transportation Directorate and the International Association of Lighthouse Authorities (IALA) assisted the USCG in helping to convince Spain, Italy, and Turkey to work together for continuation of the Mediterranean Loran-C Chain. This initiative included a vision of bringing Russia into the mix to form a joint Loran-C/Chayka chain providing coverage in the Black Sea. This vision was modeled after the joint Russian/American Chain in the Bering Sea; an initiative resulting from the 1986 Reykjavík Summit between U.S. President Ronald Reagan and General Secretary of the Communist Party of the Soviet Union Mikhail Gorbachev.

Early on Japan made it clear that they would continue Loran-C operations with the existing four stations located on Japanese soil (Iwo Jima, Gesashi, Hokkaido and Marcus Island) in advance of the DoD's 31 December 1994 date – more on this later).

Alternative 3: Withdrawal if Alternative 2 Fails

Prudent planning required the development of an alternative if continued operations did not succeed. Although it was in direct conflict with DoD's non-precedence setting outcome, the USCG took steps to assess each of the host nations' sites and work with the Congressional Appropriation Committees to budget for the worst-case scenario if site remediation was required as a result of withdrawing from the overseas mission.

The projected costs for remediating up to nine stations in seven different countries were significant. All of the overseas Loran-C stations were located in remote regions of the northern hemisphere and consisted of many acres of land with multiple buildings and structures to include generator buildings, fuel tanks, crew quarters, large transmitting antennas and associated ground planes, and landfills (aka dumps with years of electronic equipment, transformers [PCBs], discarded vehicles, and machinery).

Programmatic Radionavigation Costs

Building the site remediation budget and having it included in the USCG's annual appropriations budget request raised eyebrows; not only among the USCG's senior leadership, but also the Congressional Committees overseeing USCG appropriations.

Questions began to be asked of the Radionavigation program. How much annual operations and maintenance (O&M) was involved in supporting the overseas mission? How many billets (Full-Time-Equivalent (FTE)) were supporting the overseas mission? What was the USCG's overall Loran-C program O&M cost? What were the total number of personnel dedicated to the USCG's overall Radionavigation mission? What were the various USCG assets that played a role in supporting the Loran-C mission, e.g., USCG aircraft supporting Alaska operations, vessels providing fuel and supplies to remote areas, civil engineering units supporting towers, etc.?

It was not lost on the USCG's leadership that these questions forecast downstream challenges to protecting overall USCG O&M as well as FTE. The internal USCG reaction to these Congressional inquiries: be careful how you answer – many are watching.

It is important to note that the USCG has always prided itself on being a small service with a big job, with personnel conducting many different duties, e.g., search and rescue, drug enforcement, port security, defense operations, etc. In contrast to this image, USCG men and women assigned to Loran-C stations (as well as Omega stations) were 100% dedicated to that single mission area. With Congress inquiring about the number of personnel assigned to Loran-C duty, it was not lost on USCG leadership that force reductions and budget reductions were real possibilities when the mission ended.

Marching Ahead - Ending the Overseas Mission (1992-1994)

On June 30, 1992, two of the three stations forming the Central Pacific Chain (comprised of Johnston Island, Kure Island and Upolo Point, Hawaii) were turned off. The station at Upolo Point, Hawaii, remained on air until 31 December 1992 to meet a continuing DoD timing need for the U.S. Navy's Pacific Missile Range Barking Sands Facility.

On October 1, 1993, four of the five stations in the western Pacific, and the control and monitoring function which formed the Northwest Pacific Chain, were turned over to the Government of Japan. The Japanese continued to operate the chain, minus the station at Barrigada, Guam (U.S. Territory) until 31 December 1994, under the terms of the final agreement and using the same parameters

employed by the USCG. This allowed the DoD to continue using Loran-C signals for its timing needs until the GPS timing receivers that were being acquired by the DoD could be installed.

Tower Failures – February 1993

On February 2, 1993, the 1350-foot Loran-C tower at Cape Race, Canada, a secondary station on the Labrador Sea Chain, collapsed as a result of fatigue failure in a structural guy wire. This Loran chain was not an overseas chain providing a DoD requirement, but the chain did contribute to the distribution of UTC synchronization from the U.S. to Europe via the Icelandic Chain and the Norwegian Sea Chain. To assist the Canadians with getting the station operational again, a spare 700-foot antenna purchased for the mid-continent Loran-C chains was provided to the Canadians.

Three weeks later, February 25, 1993, the 625-foot Loran-C tower at Kargaburun, Turkey, a secondary on the Mediterranean Sea Chain, collapsed during a snowstorm with severe icing. The DoD subsequently informed the USCG that taking steps to get the station back on-air prior to 31 December 1994 was not necessary. However, to help facilitate efforts to turn over the remaining stations in Italy and Spain for future operations, a spare 625-foot USCG tower then in storage in Yokohama, Japan, was released and shipped to Turkey. When the tower was received in Turkey, its arrival generated an offer by the Russians to help erect it so the resulting station could be dual-rated and merged with existing Chayka stations to serve the Black Sea.

Ultimately thirteen of the overseas Loran-C stations on foreign soil were successfully turned over to host nations by the 31 December 1994 date. The USCG did agree to pay Denmark to have the tower at Angissoq, Greenland, removed. The station at Sandur, Iceland, was turned over and reconfigured by Iceland as an AM broadcast station. The station in Turkey was turned over, but the tower was never replaced, and no Loran-C signals were transmitted after the tower fell in February 1993.

The Aftermath

Shortly after the end of 1994, Japan and NELS reconfigured their respective chains making existing Loran-C receivers unable to track the new chains. At the same time, GPS user equipment was being developed at costs that were comparable to Loran-C receivers. Faced with those developments, many prior Loran-C users simply made the decision to purchase GPS receivers.

USCG initiatives to automate control processes and improve the synchronization of domestic Loran-C chains using enhanced timing services, e.g., Common-View Satellite Time Transfer, a technique that would have diminished the effectiveness of GPS Selective Available (S/A) in all areas served by domestic Loran-C, was opposed by the DoD and not pursued further by the USCG.

GPS was declared operational on 17 July 1995, and a few months later, on 28 March 1996, Presidential Decision Directive NSTC-6 was released forecasting that GPS S/A would be discontinued as soon as the year 2000.

The 1994 Federal Radionavigation Plan, which was signed and released in May 1995, forecast the final coup de grâce for domestic Loran-C stating: "Current use of the Loran-C system appears to be leveling off and will most likely decrease as GPS and DGPS fill the market place. This trend is expected to continue unless user equipment is developed that will take advantage of the two systems; i.e., Loran-C and GPS have no common vulnerabilities as they would apply to jamming, spoofing and interference. However, given the expected decrease in use, the estimated time frame for continued need of Loran-C in the U.S. has been reduced to the year 2000. Accordingly, the USCG has suspended its Loran-C equipment recapitalization program. The remaining initiatives include replacement of older transmitters in Alaska, the introduction of the automatic blink system, and consolidating the control of Loran-C. It remains unclear at this time if any equipment changes necessary to automate the synchronization of Master stations to UTC will be implemented."

It took another 15 years to ultimately end the service.

In November 2009, the USCG announced that Loran-C was not needed by the U.S. for maritime navigation. This announcement left the fate of the U.S. Loran-C program with the Secretary of the Department of Homeland Security.

Later in a subsequent announcement, the USCG, in accordance with the DHS Appropriations Act, terminated the transmission of all U.S. Loran-C signals on 8 February 2010.

On 1 August 2010, the U.S. transmission of the Russian-American signal from Attu, Alaska, was terminated, and on 3 August 2010, all Canadian Loran-C signals were shut down by the USCG and the Canadian Coast Guard.