Considerations
Relative to the Disclosure of Certain
Classified Loran C Information to the
British Admiralty, and Others

SECRET

PROBLEM:

1. To determine the proper security classification of the precise geographic locations of all Loran C station antenna locations.

2. To determine the proper security classification of secondary phase factor corrections.

3. To determine policy for the Coast Guard with respect to release of certain classified, or unclassified information, involving the Loran C system, (including a and b above) to (1) The British Admiralty (2) other foreign governments and (3) U.S. civilian companies or contractors.

ASSUMPTIONS:

1. The Coast Guard is the designated agency for the establishment, maintenance, operation and calibration of the Loran C system in support of Department of Defense requirements as specified by the Joint Chiefs of Staff. The security classification of the many features and applications of Loran C is therefore a responsibility of, and is to be determined by, the Department of Defense.

2. The Coast Guard because of its day to day association with Loran, beginning with inception of plans for a particular station to its completion, including contacts, negotiations and agreements for sites, discussions and demonstrations on use of loran, is generally regarded
by all as the expert in this field. The Coast Guard therefore has a primary interest in the degree to which information may be revealed. Likewise certain aspects of the problem may be known to the Coast Guard not otherwise readily available which might effect determinations of classification as may pertain to U.S. policy.

**ACCURACIES:**

1. The precise classified geographic position of transmitting antennas is carried to the third decimal, in seconds, of a Lat-Long position. The unclassified published positions are indicated to the nearest tenth of a minute.

2. The average maximum secondary phase factor correction is in the order of plus or minus 2 microseconds. A microsecond on the base line is 492 feet. In extremes of the operating areas a ± 2 microseconds can be as much as 2 - 5 miles.

3. The tolerance of error in a Loran C transmitted signal as observed from the monitor station is .03 microseconds. At 0.10 microseconds the station blinks.

4. The tolerance of error in a Loran C receiver is normally zero. Under the most adverse noise conditions a maximum error for simple instantaneous readout is 0.35 microseconds.

**ELEMENTS:**

1. The elements involved in the operation of Loran C can be defined. In general these are:
   a. Radio regulatory aspects governing frequency usage, spectrum utilization, interference and other considerations having national and international implications.
b. Principles of Loran C operation - hyperbolic pulsed system, cycle matching, repetition rates, signal characteristics, ground and sky wave ranges, system accuracy, monitoring and calibrating operations.

c. Charts, tables and corrections. Corrections applied for sky-wave, transmissive delays, conventional corrections and special corrections.

d. Components. Ground station equipment, user equipment.

e. Additional uses of Loran C. Location of geographic positions, distance measuring, timing, homing, communications, alerting, atomic burst detection.

f. System planning and implementation. Initial studies, site physical considerations, antenna considerations, site ownership and acquisition, site survey, calibration, monitor station.

g. Systems users, military for special purposes, and commercial.

PUBLICATIONS ON THE SUBJECT OF LORAN:

1. Publications, newspaper articles, scientific papers, manufactures instructions, and periodicals covering the subject of Loran uses, and related studies, are too numerous to list accurately. However, representative perhaps are the following:

   The Loran System of Navigation - Jansky and Bailey

   Engineering Evaluation of the Loran C Navigation System - Jansky and Bailey

   Timer Synchronizer AN/FPN-38, Simplified Functional Description - U.S.C.G.

   Northern Europe Loran C System, Instruction Book - U.S.C.G.

   Phase of Low Radio Frequency Ground Wave - Bureau of Standards

   Electronics Engineering Report No. L-23 (CONFIDENTIAL)

   Loran C Summary of Stability and Accuracy - U.S.C.G.
DISCUSSION:

1. The secondary phase factor is a correction applied to observed Loran C readings which compensates for retardation of propagated signals due to conductivity of land masses and thereby reduces the readings to a salt water sphere equivalent. These corrections correlate electronic grid positions to geographic positions. Application of these corrections to plotted readings from a series of stations should reduce crossing lines of position to a point fix. In a sense this parallels the procedure in celestial navigation wherein corrections are applied, such as for the index error of a sextant, to reduce errors in crossing lines of position.

2. The secondary phase factors can be determined by any observer to a high degree of accuracy using a Loran C receiver by determination of the error (secondary phase factor) in a series of readings from different stations. Similarly, if one knows the electronic distances to a series of stations, as can be obtained by reading a loran receiver, on the base line extension, their precise geographic positions can be determined.
3. Much of the information required to determine secondary phase factors is contained in an unclassified pamphlet published by the U.S. Bureau of Standards.

4. The current security classification of precise geographic positions of Loran stations, ranges from UNCLASS for the East Coast chain to TOP SECRET for the Targaraban, Turkey station in the Mediterranean. These positions are not revealed to foreign nations, including those which are hosts to the station.

5. The security classification of precise geographic positions is determined by the Oceanographic Office of the Navy, which office does the work involved in determining these positions. The U.S. Air Force?

6. The publications L-30 and L-34 heretofore listed, contains precise geographic coordinates and secondary phase factors involving the North Atlantic chain.

7. There is currently no security classification to Loran C transmitting or receiving equipment. These have been manufactured by several concerns, including Sperry, IT&T, Collins and Decca. Nor could the classification, if assigned, be maintained without compromise, since all Northern European stations are operated by host nation personnel; all equipment and technical publications are available to them.

8. The use of Loran C as a supplemental navigational aid by Polaris submarines, and its use in determining the position of nuclear explosions has been discussed in several trade magazines, the latest of which is Aviation Week, 14 October 1963. Nevertheless, because these subjects are classified, they are not discussed at briefings outside of the Services by the Coast Guard.
9. On the diplomatic level when the initial approach is made to a foreign government by the State Department for a Loran C site, only a few high level officials are advised of the special tie-in of Loran C to Polaris submarines. Subsequent discussions on the technical level in which the Coast Guard participates are unclassified.

10. Government to government agreements for Loran C sites vary from station to station. They are included in "Agreed Areas" in bilateral agreements, negotiated under Status of Forces Agreements, under NATO auspices, or purely bi-lateral government to government without other considerations. The security classification of these vary from UNCLAS to SECRET. They do not however disclose precise antenna locations.

11. Many publications discuss the accuracy of Loran C, and refer to the secondary phase factors inferring that these are commonly available corrections. Inasmuch as press releases to the public by host nation stress Loran C as an aid available to commercial users, it would follow that the public would expect to have such corrections furnished them.

12. Our tenure at many Loran C sites is not assured. In some instances a three to twelve months notification is all that is necessary for shut-down of the station. Originally, Loran C stations were to be temporary in nature; however, JCS policy now provides for indefinite continued operation. Though host nations are paid by the U.S. for Loran C station operation, a change in national attitude could be disastrous to the continued operation of certain stations and the service they provide.

13. The Decca system of Navigation is a British system, and sponsored, Decca management has tremendous influence
with the British government. Decca has for years been attempting to establish its system in the U.S. The Coast Guard has fought establishment of Decca in the U.S. as being unnecessary and a duplication of the existing Loran A system. However, a Decca system was installed in the New York area licensed by the FAA as an experimental aid to navigation. A compromise with Decca to permit its use as a Marine Aid was subsequently necessary to remove British objection and permit conditional operation of Sylt and the operation of Estartit which had been off the air for over a year. Thus disfavor with the British could again force the two stations off the air with resultant effect to Loran C service coverage.

14. Loran C operates in the radio frequency band 90 – 110 kc/s. In Europe and Asia (Regions 1 and 3), Loran C has no prior rights by Radio Regulatory International Agreements, and it was necessary to arrange with most of the countries of Europe a series of bi-lateral agreements to remove their operations from the 90 – 110 kc/s band. The action on their part was voluntary, not compulsory, and in the case of the Sylt and Estartit stations operation is still conditional.

CONCLUSIONS:

1. The existence of secondary phase factors is publicly known. The values of these can be developed but with difficulty under favorable conditions by a government having an interest.

2. The precise geographic positions of Loran C station antennas should remain classified as being in the best interest of the U.S. Government.
RECOMMENDATIONS:

1. Restrain action, or non performance of action, with respect to the United Kingdom, to insure that a feeling will not generate leading to retaliatory action which could prejudice operation of existing Loran C stations.

2. Retain the security classification (CONFIDENTIAL) of secondary phase factors. Dissemination of this information will be made only by the Navy. Requests by governments or individuals to the Coast Guard will be referred to the Navy.

3. The precise geographic position of Loran C station antennas remain classified, except for the East Coast chain, which positions have been previously unclassified. Revelation of classified geographic positions is a prerogative of the Department of Defense only.

4. In addition to the above specifics, the following elements involved in the operation of Loran C as a navigational system, remain classified:

   a. The additional use of Loran C for atomic burst detection (SECRET).

   b. System planning and implementation (SECRET if referring to the entire plan; CONFIDENTIAL if referring to a particular proposed station).

   c. The subject of the special tie-in of Loran C to Polaris submarines remains SECRET.

   d. The specific use of Loran C, its performance, and characteristics underwater or installed on submarines, and any reference whatsoever to performance and operation of Polaris submarines remains SECRET.