

LORAN SITE SURVEY REPORT

AUTO 3 - CAPE SAN JUAN, PUERTO RICO

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PART II - ELECTRONICS ENGINEERING

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The vicinity of Cape San Juan, Puerto Rico, was selected for survey in connection with the proposed AUTO Loran Chain station AUTO 3. The Electronics Engineering portion of the Loran Site Survey Report AUTO 3 is contained below:

A. Site

1. The area close to and westward from the lighthouse at Cape San Juan was selected as the proposed site of AUTO 3. Analysis of the available propagation data and computed values has resulted in this site being considered suitable as a permanent Loran station not only as paired with either Grand Turk (AUTO 2A) or Cape Vieje Frances (AUTO 2B), but also as paired with St. Kitts (AUTO 5) should this latter be considered desirable. In view of the considerations cited below, it is recommended that the frequency and basic pulse repetition rate (3L-) be assigned for permanent operation, and that the electronic plant be housed in a permanent type of signal building in lieu of trailers.

2. The proposed site consists mainly of the longest finger of the cape jutting out to northward, and the continuation of the ridge back to the main hill on which the lighthouse is located. The sides of the ridge are steep with a flat saddle portion on which the signal building will be located. The transmitting antenna is on top of the highest point of the ridge about 600 feet from the water to either side of the ridge, and about 900 feet from the tip of the finger; distance to the lighthouse is about 1,000 feet. The Loran coverage sector extends from 280° T 5 miles total land interspersed with water path; to 288° T (azimuth to Cape Vieje Frances, AUTO 2B) 600 feet overland; to 302° T (azimuth to Grand Turk, AUTO 2A) 500 feet overland; to 111° T (azimuth to St. Kitts, AUTO 5), 1200 feet overland; to 130° T 1,500 feet overland; to 180° T 2 miles overland; from 180° T to 280° T is over Puerto Rico.

3. The transmitting antenna ground system is planned with 350 foot radials, larger size to compensate for the fact that the antenna will be located on top a fairly steep sided hill. The Loran remote receiving antenna will be located 500 feet out along the ridge from the transmitting antenna at 074° T, making antenna factors on the order of 0.6 and 0.5 us for the baselines Grand Turk (or Cape Vieje Frances) -- Cape San Juan and Cape San Juan -- St. Kitts respectively. The communications receiving antenna will be located 200 feet further out along the ridge from the Loran remote receiving antenna, at 020° T and 700 feet from the transmitting antenna.

4. The lack of natural shelter and the location of the building on top of the flat saddle between the main finger and the main hill of the cape indicate the desirability of utilizing a permanent type signal building rather than trailers. The winds are prevailing northeasterly of considerable force,

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A. Site (Contd.)

5. The proposed station deployment would permit high power (megawatt) operation; however, such is considered not necessary except to extend the range considerably beyond the Virgin Islands area and to increase the signal strength near Hobe Sound. It is considered that little advantage would be gained in regard to the main desirable coverage area.

B. Propagation Data Observed and Computed (80% radiation efficiency, sea water path)

1. Cape San Juan - Grand Turk (AUTO 2A)	360 miles 302° T (approx)
Cape San Juan - Cape Viejo Frances (AUTO 2B)	255 miles 288° T (approx)
Cape San Juan - St. Kitts (AUTO 5)	175 miles 111° T (approx)
2. Cape San Juan - San Salvador (AUTO 1)	600 miles
3. Calculated field strength received from 128 KW Grand Turk (AUTO 2A)	365 uv/m
Measured ditto (present installation) daytime	260 uv/m
4. Calculated field strength received from 128 KW Cape Viejo Frances (AUTO 2B)	1180 uv/m
5. Calculated field strength received from 160 KW San Salvador (AUTO 1)	23 uv/m
Measured ditto, daytime	20 uv/m
6. Calculated field strength received from 128 KW St. Kitts (AUTO 5)	2990 uv/m
7. Noise Level per Figs 5-28 to 5-32, Chap. 5, CG-281	60 uv/m
Measured long crash variable 1100 - 1200	5-20 uv/m
Measured long crash variable evening and nitetime	40-60 uv/m
NOTE: Yearly variation Jan: 35; Apr: 50; Jul: 60; Oct: 50 uv/m	
8. Calculated potential interference to 1900 kc Loran (above noise level average)	none
Measured ditto daytime	none
Measured ditto nitetime	very little

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B. Propagation Data Observed and Computed (80% radiation efficiency, sea water path)

9. 1900 kc interference to other facilities:

- a. Communications: some possibility of interference to the VHF link relay system installed at the lighthouse, distance 1000 feet. Loran antenna is about 45° from the directional line of the link antenna to San Juan, and behind the other.
- b. Navigation: None contemplated.
- c. Amateur: FCC Office is cognizant and will take necessary steps in the event of any interference either to or from.
- d. Commerical Reception: None contemplated.

10. Observations of traffic:

- a. 1700-1850 kc: somewhat crowded level of mixed commercial, amateur, communications, mostly all Spanish, some English origin.
- b. 1850-1950 kc: Loran signals; only one amateur (?) heard of.
- c. 1950-2000 kc: Increasing level of mixed noise, communications.
- d. 2000-3500 kc: Moderate to heavy traffic; noise conditions increasingly bad; propagation overland is sporadic.
- e. 3500-11000 kc: Generally crowded with all types; moderate in daytime, heavy at night.
- f. 550-1650 kc: Crowded reception, far points New Orleans, Florida, British West Indies. 24 hour reception; numerous of Spanish origin; crowding occurs 950 - 1150 kc.

C. Propagation Systems in Vicinity

1. USN -- VHF relay link USN operated, housed in the present lighthouse at Cape San Juan; distance 1000 feet: Interference problems are not anticipated inasmuch as the terminal end at Ramby AFB is a similar distance and orientation from the Loran transmitting antenna at LORSTA Aguadilla, and no interference presently is experienced. If necessary, USN can install appropriate shielding in the Cape San Juan lighthouse installation.

2. USN -- Roosevelt Roads Navy Base, Communications; distance 6 miles: Ship to shore, point to point A1, A3, RAT; traffice on need arising and 24 hour guard basis. No interference is contemplated.

3. USN -- Roosevelt Roads Navy Base VHF link terminal; distance 6 miles: No interference is contemplated.

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C. Propagation Systems in Vicinity (Contd.)

4. USN -- Roosevelt Roads Navy Base ATC and Radio Beacon systems; distance 6 miles; LF, HF, and VHF aircraft communication frequencies and beacon frequencies. No interference is contemplated.

5. USCG -- Point Tuna lighthouse radiobeacon; distance 20 miles: Type TB-142 installation; no interference is contemplated.

D. Officials and Cognizant Persons

1. LTCOL M. J. MRAKAVA, USA (Consulted)
Antilles Signal Officer, San Cristobal Signal Office
2. MAJ E. J. SMITH, USA
(Prospective) Antilles Signal Officer
3. CAPT J. N. SLATER, USA (Consulted)
Assistant to the Antilles Signal Officer
4. THOMAS RAMIREZ
Wire Engineer, Fort Buchanan Communications Division, Antilles Signal Office
5. LCDR Z. T. HAMPTON, USN
Executive Officer, Communications Station, San Juan Naval Base
6. LTJG L. B. PAROWER, USN (Consulted)
Communication Center Officer, Communications Station, San Juan Naval Base
7. LTJG C. DERSIN, USN (Consulted)
Communications Officer, Roosevelt Roads Naval Base
8. LTJG C. E. RUSSEL, USCG (Consulted)
Commanding Officer, LORSTA Aguadilla
9. GILBERTO MOLO EN2, USCG (Consulted)
Officer-in-Charge, Lighthouse, Cape San Juan
10. A. BURGUS EM3, USCG (Consulted)
Lighthouse, Cape San Juan
11. A. T. CLINE, JR. (Consulted)
Engineer-in-Charge, FCC Office, San Juan
12. F. W. WILHELM (Consulted)
Superintendent, RCA Communications, Inc., San Juan
13. E. J. BRENNAN (Consulted)
Commercial Representative, RCA Communications, Inc., San Juan

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E. Communications Facilities Available

1. U. S. Naval Base, Roosevelt Roads (12 miles distance by road from site)

a. Radio: A1, A3, RAT to San Juan, and through to Grand Turk, San Salvadore, Eluthera, Mayaguana, Patrick AFB; 2500-7500 kc bands on tentative basis only. Present frequencies are not satisfactory in the Caribbean and Bahamas network and will be changed in the near future. Operation is on operational requirement use with 24 hour guard; the Roosevelt Roads Communications Office can provide Class 3 shore allowance cryptoguard. Present and future plans are for OPERATIONAL IMMEDIATE or DEFERRED traffic only. This facility is considered not suitable for Loran interstation requirements, but may prove suitable for DEFERRED administrative traffic only should direct radio telephone communication from LORSTA to San Juan be unrealizable; this latter can be expected to occur at twilight.

b. VHF Link: Simplex FM VHF frequencies voice link, end stations at Roosevelt Roads and Ramey AFB. This facility is not available except for OPERATIONAL IMMEDIATE traffic; it is considered not suitable both for Loran interstation operation and ROUTINE administrative traffic.

2. U. S. Army Signal Corps Cable No. 211: Several pairs are available for use, USN has several in use at the present time. Arrangements for use can be made through the Antilles Signal Officer, Base San Cristobal, San Juan. This facility is considered suitable only for traffic to COMGANTS as a direct switchboard connection can be made to COMGANTS; there is no direct link to the USAF guided missile cable which will run through San Juan, Grand Turk, San Salvadore, and other points on to Patrick AFB. The cable No. 211 will not become available for dependable use until spring 1956 due to road construction problems. The closest point to Cape San Juan is near the town of Fajardo (distance 5 miles); opinion was expressed that it would be possible to tap in with no difficulty.

3. Telephone: Commercial island telephone available at Fajardo; this system is considered not suitable for traffic to COMGANTS because of reported extreme unavailability of service to San Juan.

F. Conclusions

1. The proposed site is considered suitable for the permanent station AUTO 3.

2. The site will permit pairing with either Grand Turk (AUTO 2A) or Cape Vieje (AUTO 2B); in addition, the station can be paired to St. Kitts (AUTO 5).

3. A permanent signal building should be provided to house the electronic plant.

4. Shift to high power is possible but would serve only to extend the range into the Atlantic and to increase the signal strength beyond San Salvador (AUTO 1).

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