

Engineer-in-Chief

OAN
12 October 1956
A1/1

Chief, Office of Operations

Caribbean Loran coverage

1. During the recent deliberations on the United States position for the special limited Caribbean Regional Air Navigation Meeting (ICAO), the following comment was transmitted to the ACC by the U. S. ICAO representative:

" * * * this meeting may fail in its allotted task unless:

(i) The United States will release to States, before the meeting, its plans for Loran including charts showing accuracy of fixing coverage;"

2. An official request has been sent to the Air Force and Coast Guard for this information. This Office does not believe that coverage based on stations remaining classified in the Central American Area should be given the ACC prior to Department of Defense authorization, but coverage based on the present stations plus the coverage from AUTO 1, 2, 3, 4, and 5, and OMAN 1, 2, 3, 4, 5, and 6 can be furnished.

3. Therefore, it is requested that a chart displaying the requested information based on the above stations be prepared as soon as possible. In view of the fact that site acquisition at most of the sites is not complete, the final prepared chart should only show coverages and not actual station locations; although it is realized that the location of the stations may be derived from the information displayed.

Copy to
OSU
OC



F. T. KENNER

OAN	OC	OSU	O
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Typed 10-12-56
Station 7-8
RTNorris/h

Perf

site, too?
Who, what, why
where, when
say what?

On the other hand, the operational requirement for fixing coverage can, in areas of high traffic density, be met by implementing in such areas properly located CONSOL station. Most CONSOL lines of position have an accuracy between .4 degrees and 1.0 degrees with occasional readings up to 1.25 degrees or 1.5 degrees. This is contrasted with the error spread for NDBs of 7.5 degrees. One degree is seven miles at 400 miles distance and is consistent with lateral separation ATC needs in areas such as the Caribbean. CONSOL, of course, does operate as an NDB in all directions from the facility including the small sectors off the base line station where line of position data from CONSOL is deteriorated by lack or ability to discriminate the equi signal zone. For example, CONSOL stations located in southern Florida and Cuba will provide fixing capabilities of plus or minus 10 to 15 nautical miles within their significant coverage area over the congested routes in the area. NDB, on the other hand, would provide fixing capabilities of plus or minus 35 to 55 nautical miles over the same portions of the routes in the area.

How does this compare with Loran?
Yes - 400 miles
3-4 miles
1-2 miles

As shown above, there is, therefore, if the operational requirement is to be met, a conclusive need for CONSOL as a long distance navigational aid to supplement both the existing and the planned expanded LORAN coverage in the Caribbean as well as the expanded and planned VOR and NDB coverage. The factors discussed above are considered to justify the additional expense of CONSOL stations in certain locations in this specific area.

Although over-all area fixing service in the area or complete route fixing service cannot at this time be economically obtained for the CAR region, it appears that a significant improvement in the safety and efficiency of air traffic control can be obtained for the most congested areas of the CAR region. This area is defined roughly by a triangle, New Orleans, San Juan and a point west of Jamaica encompassing the Miami-Panama route. While it is not considered feasible at this time to provide complete fixing service in the over-all area or in fact along all of the travelled routes of the Caribbean due to many limiting factors, such as high noise area, cost and lack of an international standard long distance aid, it is, however, feasible to substantially improve ATC in some of the more difficult high density areas. The highest density routes are:

- Miami - Havana *boat chart, long aids suffice.*
- Miami - Puerto Rico
- Miami - Panama
- New York - Puerto Rico (that portion in CAR)

Routes to the southeast from New Orleans fan out as they proceed south to such places as Barranguilla, Maracaibo, Aruba, Curacao, Caracas, Port of Spain and the Windward Islands.

Routes over the mainland through Mexico and Central America and along the islands from St. Thomas to the Barbados can be served by short distance aids and NDBs.

It is clear that a major improvement in ATC can be achieved by obtaining good fixing in the convergence area triangle outlined by New Orleans, San Juan and Montego Bay. A 10 kw CONSOL station located in the Florida Keys area with best line of position coverage east and west would provide good route lines from Miami to each of the following important places; New Orleans, Houston, Dallas, San Antonio, Brownsville and Mexico City. Progress along the routes in the Gulf area could be obtained by cross checks with NDBs in service and programmed along the U. S. Gulf Coast. In addition, all flights which must skirt military restricted areas along the U. S. Gulf Coast could use the south Florida CONSOL lines to establish the southern boundaries of such areas.

only during day

An additional CONSOL located on the eastern tip of Cuba and oriented to provide fixing in the area north and west of San Juan also would provide good fixing service in the area south of the Jamaica-Puerto Rico line.

The efficiency of the recommended CONSOL locations is good since they are in that part of the region having the greatest traffic density and the lowest noise level (i.e. best CONSOL range). The area east of the Florida coast on the San Juan to U. S. mainland routes is particularly good and will give CONSOL fixing for Miami-New York, Nassau-New York, Ciudad Trujillo-New York and San Juan to New York, so as to avoid traffic delays which will occur in the absence of a good navigational fixing service available for all aircraft.

The two CONSOL stations as proposed above would replace the high-powered NDB anticipated for Miami and South Caicos, and would not necessitate an additional frequency service allocation.

The two CONSOL stations, as stated above, to cover areas of high traffic density, are being recommended at the Special Meeting for inclusion in the CAR navigational aid plan, whereas, as discussed at the III CAR RAN Meeting, CONSOL states were proposed throughout the region. Because of the limiting factors on CONSOL, such as high noise area, cost and lack of an international standard long distance aid, CONSOL is being proposed only in areas of high traffic density where accuracy is essential for ACT and navigational purposes. Because of the lower traffic density in other areas of the region, the accuracy requirement, though still a basic operational requirement, is not as essential at this time as it is in the areas of high traffic density.

14. During the discussion by the meeting on CONSOL, the delegation should be guided by the discussion contained in paragraph 10 and should discourage any attempt to solve the over-all problem with a CONSOL network system, but, to alleviate the critical area fixing problem now existing in the areas of high traffic density, the United States should indicate to the meeting that in reviewing the requirements of long distance aids in the Caribbean region, the U. S. has concluded that implementation of a CONSOL facility in southern Florida and Cuba would materially aid in achieving the stated operational requirement for area fixing coverage.

The United States should propose or support inclusion in the regional navigational aid plan of the two CONSOL facilities referred to in paragraph 10.

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Frequency Problem

10. An examination of the radio navigational aid plan developed by the III CAR RAN Meeting indicates that with full implementation of this plan there remains certain routes having gaps which are not covered. The III CAR RAN Meeting recognized this fact that the special requirement for over-all fixing coverage in the Caribbean could not be met by the short distance navigational aid plan developed at the meeting and concluded there was a requirement for long distance navigational aids in the region to complete the navigational aid plan. In this regard, the need has been stressed for ICAO agreement on a long distance navigational aid system that will satisfy a requirement which applies to all routes in the region not adequately covered by short distance navigational aids. This requirement is for a single system capable of use by all aircraft covering all such routes with a maximum degree of reliability. Though an ICAO standard long distance aid has not been agreed upon, and appears unlikely for several years, ICAO has recognized as interim long distance aids LORAN, high-powered NDBs and CONSOL. It is considered there is a need for immediate action to meet, as far as possible, the urgent special requirement in the region and to overcome the serious navigational and air traffic control deficiencies now existing in the Caribbean.

not stated!

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The United States stated in the III CAR RAN Meeting that certain LORAN coverage is now available in the Caribbean and complete LORAN coverage is to be made available in the region by 1958. ~~Although a certain part of the LORAN chain is in full operation in the Caribbean and complete coverage will be available by 1958,~~ the traffic congestion is steadily increasing and becoming more complex due to the introduction of more modern and high speed aircraft. Part of the complication results from the fact that many civil and military aircraft either do not or cannot effectively use LORAN in their operations. For economic and other reasons, ^{not at all they?} it is not practicable even to require all transport aircraft to be so equipped. This is especially true of non-scheduled executive and other transient aircraft which fly the Caribbean. It appears further that for all practical purposes it is impossible, impracticable or economically not feasible to achieve full LORAN equipment on all aircraft which may operate in the Caribbean. Therefore, as a long distance aid, the installation of high-powered NDBs or CONSOL stations at certain locations appears to be a better interim solution, ~~because of their technical suitability and ready availability.~~ They would be capable of use by all aircraft flying the Caribbean and capable of installation at locations where they can provide positive fix information.

Not true

in fact as request.

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Does't follow!

Although the installation and operation of NDBs in the Caribbean will be continued where needed, long distance NDBs, however, are not adequate to meet the operational requirement of over-all fixing coverage for ATC purposes as they do not provide sufficient accuracy for use in position fixing necessary for ATC purposes. Although NDBs are a necessary adjunct to the Caribbean air navigational plan, they are considered unsatisfactory, in and of themselves, in meeting the ATC operational requirement. In general, NDBs with ADF are convenient and useful for homing purposes along a stepping stone type of route. In practice, however, ADF/NDBs lines of position for area fixing have about plus or minus 7.5 degree error spread due to aircraft calibration errors, magnetic compass errors, instrumental inaccuracies, and propagational irregularities. Such a spread is not of sufficient accuracy to provide fixing capabilities for necessary lateral separation required by ATC, particularly in areas of high traffic density.

NORRIS

FREQUENCIES

~~Due to the acute interference difficulties being experienced in the LF/MF band, it may be necessary for the Meeting to review the present deployment of navigational aid facilities and frequencies, and modify the existing plan based on operational requirements in terms of specified radio navigational facilities at particular locations.~~

The Meeting should recognize that frequency assignments for LF/MF aids, including CONSOL, are the responsibility of the individual States in coordination with all other States concerned. The radio-navigation aids plan developed by the Meeting should indicate coverage required in nautical miles against NDB and long range nav aid facilities.

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