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CRYSTAL CONFERENCE

Headquarters, Signal Corps Inspection Agency

7 - 8 May 1944

I The following Inspection Agency Headquarters and Inspection Zone Representatives were present on 7 May 1944:

- Headquarters, SCIA - Colonel Lester J. Harris
Major R. F. Hawley
Major J. E. Glackin
Capt. H. S. Benowitz
1st Lt. K. K. Miller
1st Lt. L. J. Jacobson
Miss Leota Hooker
- Newark SCIZ - Mr. Paul Wiegert
- Chicago SCIZ - Mr. Nick Laub
Mr. Wayne Scheppele
- Dayton SCIZ - Mr. Hugh M. Smallwood
- Philadelphia SCIZ - Mr. Raymond Feldman
- San Francisco SCIZ - Mr. Lynne Stanley

The following organizations were represented in addition to those listed above in the sessions on 8 May 1944:

- OCSigO - Major A. W. Swinnerton
Dr. K. S. Van Dyke
- Headquarters, SCIA - Lt. Col. G. L. Schnable
Lt. Col. C. J. McBrearty
Major C. R. Brearty
1st Lt. E. N. Carlson
- Camp Coles Signal Laboratory - Capt. E. F. Mitchell
1st Lt. R. L. Snyder
Mr. V. Botton
Mr. L. Balter
- Signal Corps Ground Signal Agency - Mr. K. A. West
Mr. Jack Burke
- Fort Monmouth Signal Laboratory - Capt. P. J. Carswell
Mr. B. C. Stauffer
- Aircraft Radio Laboratory - Major H. B. Yarbrough
Capt. W. E. McDonald
2d Lt. R. C. Gyles
Mr. Neil Nelson
Mr. Hugh Waesche
- Philadelphia SCPD - Mr. Robert McKinley
- Dayton SCSA - Mr. A. H. Dicke

Mr. L. Balter

II The crystal conference was called by Colonel Lester J. Harris, Director, Signal Corps Inspection Agency, for the purpose of discussing the various problems that have presented difficulty in the inspection of crystal units. Representatives of the Laboratories were present to help expedite an early solution to those problems arising from the various interpretations of contracts, specifications and inspection instructions.

III Brief Summary of Minutes

1. Lt. Jacobson presented an analysis of the sampling procedures contained in the existing specifications. After pointing out the inadequacies of current sampling methods, a proposed plan based upon formal Quality Control technique was presented for consideration. A discussion was held on the advantages that would be derived if sampling methods such as proposed were to be made applicable to the inspection of crystals. Both Laboratories concurred with the analysis that the existing sampling procedure was ineffective. The Inspection Agency proposed that the preparation of acceptance procedures would be a function solely of the Inspection Agency, whereas the preparation of inspection instructions is a function of either the Laboratory or the Inspection Agency, depending on whether or not the equipment is in a pilot run. The Inspection Agency further submitted that inspection instructions should not contain any reference to detailed acceptance procedures. Major Yarbrough of the Aircraft Radio Laboratory agreed with the principles of the foregoing provisions and no objections were offered by the Monmouth group.

2. In reply to the questions raised by the assemblage at the conference, the Inspection Agency stated:

a. The caliber of the Signal Corps Inspection Agency personnel available to maintain this quality control is considered adequate.

b. The pilot run engineer throughout the pilot run will not be affected by the proposed sampling procedure.

c. With respect to minor defects, the Inspection Agency, in the application of the proposed sampling plan, will give appropriate weight to major and minor defects.

3. It was agreed by both Laboratories that it is not necessary in testing crystal samples under either the present sampling procedure or the proposed sampling procedure to use the same individual crystal sample lot for all acceptance tests. In other words, every individual unit in a sample lot will be given the same test but all required tests need not be given to all sample lots. (Example: Assume that 1,000 FT-243 crystals are presented for inspection. Assume further that specifications require that 9 acceptance tests be applied to a sample lot of 30 crystals out of each 1,000 to be accepted. Proper interpretation of the foregoing parts of this paragraph mean that 9 different lots of 30 crystals each may, if the

inspector desires, be selected and one of the required acceptance tests may be applied to each one of the 9 lots, and no one of the 9 lots must necessarily be subjected to all 9 of the acceptance tests.)

4. In substance, it was explained that under the sampling plan contained in existing specifications, results of the tests on samples selected do not give an adequate picture of the quality of the lot of crystals represented by those samples.

5. It was pointed out that the proposed sampling plans were based on the assumption that the acceptable quality levels for crystals submitted for inspection are represented by 1% defective for any one test and 2% for all tests combined. This, however, is an assumption in view of the lack of a definite statement from the Laboratories as to acceptable quality requirements.

6. The Laboratories and the Inspection Agency agreed to initiate action along the following lines:

a. Captain Mitchell of Camp Coles Signal Laboratory and Major Yarbrough of Aircraft Radio Laboratory will confer in the near future to arrive at an estimate of AQL's for crystals. These AQL's may not be the same for each crystal but may vary for each type due to varying performance requirements.

b. Simultaneously, the Inspection Agency will make an analysis of inspection records at several crystal plants to determine the approximate AQL of crystals being submitted for inspection at these plants. This approximate figure will then be furnished the Laboratories as a check upon their estimated AQL. The Inspection Agency will make a determined effort to complete this analysis as soon as possible.

7. Upon receipt of AQL's from the Laboratories, the Inspection Agency will prepare a sampling plan designed to insure acceptance of crystals of the desired quality. Further, the proposed sampling plan will be forwarded to the Laboratories for analysis and review, after which a conference will be held to discuss the most appropriate methods of application.

8. It was agreed that the responsibility for maintaining standard test set AN/TSM-1 is charged to the Camp Coles Signal Laboratory. Such standard test sets as required by Aircraft Radio Laboratory will be furnished them by the Camp Coles Signal Laboratory. Inspectors will arrange for manufacturers to forward test sets requiring correlation to Camp Coles Signal Laboratory, except in those instances where the contractor's plant is located closer to the Aircraft Radio Laboratory. In the latter case, the standard test set will be correlated by Aircraft Radio Laboratory.

9. The Camp Coles Laboratory stated that a schedule has been established whereby the Laboratory will automatically send test sets to prime and sub-contractors' plants and request that units on hand at these plants

be returned to the Laboratory for correlation. Such standard test set correlation will not depend solely upon requests by inspectors; the correlations will be initiated by the Laboratory in accordance with their pre-determined test schedule. This, however, will not preclude the possibility of between-schedule correlations.

10. Captain Mitchell of the Camp Coles Laboratory, which is responsible for the test set in question, stated that as soon as possible one AN/TSM-1 will be furnished each prime contractor and each sub-contractor manufacturing CR-1 crystals for the Signal Corps. Captain Mitchell stated that 18 new test sets now on hand, plus approximately 25 more expected to arrive at the Laboratory within the following week, will be sent to Aircraft Radio Laboratory. Aircraft Radio Laboratory will, in turn, send these test sets to contractors furnishing CR-1 crystal units.

11. It is understood that the new test set is considerably more rugged and reliable than the present TS-39. It was agreed by all present that the present TS-39 is not suitable for the purpose intended.

12. It was agreed by both Laboratories that no further altering or changing of the primary standards carried by the Laboratory engineers will be accomplished in the future.

13. The Laboratories claimed that differences in design of standard test sets for the DC-34 and DC-35 crystal units should not be made an issue unless they are not correlated against the standard. It is understood that it is not within the jurisdiction of the Laboratories to insist on a standardization of one test set for various contractors.

14. The changes (permissible adjustment) of standard test sets by Signal Corps inspection personnel will be limited to changing the oscillator tube when necessary after the issue of the new test units. A spare oscillator tube will be supplied with the standard test set AN/TSM-1 and it will be permissible for the Signal Corps inspector to effect this change if necessary. The use of a uniform type of oscillator for testing CR-1 crystal units is desirable only when the tuned plate type and the Pierce oscillator type cannot be correlated. It was agreed that it was hardly possible to correlate these two types in RF current and activity readings with the same amount of capacity shunting the crystals. Therefore, unless reasonably accurate correlation can be accomplished by the two referenced oscillators, the Laboratories will be requested by the Signal Corps Inspection Agency to decide which unit shall be the criterion for standard test sets in the field.

15. The crystal coordinators from the various Zones gave specific examples of approvals by Laboratory field engineers on "homemade" equipment that was inadequate, unreliable and would not maintain correlation

over a sufficiently long period of time to assure good production quality. This condition has resulted in an extremely large amount of unnecessary rejections by the prime contractors to the sub-contractors. The Laboratories stated that it is hardly within their jurisdiction to condemn "homemade" equipment, and that the field engineers should be aware of the differences between good and poorly constructed "homemade" equipment. Field engineers will take suitable precautions to avoid approving "homemade" equipment which is not adequate.

16. It was called to the attention of the Laboratories that in many instances the field engineer would complete a pilot run and leave with a proviso that the pilot run would be completed on condition that a certain piece of test equipment was replaced. In some instances the resident Signal Corps Inspector-in-Charge was unaware of the provision. The Laboratories agreed that in the future, upon the completion of a pilot run, the representative of the contractor, the Inspector-in-Charge, the Zone coordinator (if possible) and the field engineer will hold a conference, at which the entire inspection and production procedures will be analysed and agreed upon.

17. Captain Mitchell agreed to have field engineers correlate the standard test sets for the DC-34 and DC-35 crystal units at the Galvin Manufacturing Corporation and the Hallicrafters Company in the very near future. This action is very seriously needed at the present time because of the great differences existing between testing equipment at these two plants.

18. It was agreed by the assemblage that aging of crystals prior to test is beneficial and desirable, but at the present time the desired aging period is unknown. Mr. Botton explained that the phenolic compounds now used in the crystal holders often cause a loading effect on the surface of the crystal. The characteristic of phenolic compound that allows the entrance of water vapor which affects the surface of the crystal presents a problem that has not been completely solved at the present time.

19. The best solution, under the circumstances, for providing stable crystals without an aging period is to request all contractors to make use of the etching procedure. A recommended amount of etching for an 8-megacycle crystal was given as 25 KC, providing this etching followed a good lapping procedure. Mr. Botton made it very clear that the first wash, or scrub, after the crystal was etched to frequency would still allow a frequency change. This was attributed to an insoluble silicate left deposited on the surface of the crystal by the etching solution. It therefore appeared that the solution to the aging problem is to etch the crystal to frequency. The Laboratories stated that in the near future all contractors would be informed that they must utilize the etching procedure in their final finishing positions.

20. After several apparently contradictory letters from the Fort Monmouth Signal Laboratory, with reference to the standardization of

"nut-well" locking devices, were presented, the Fort Monmouth representatives came to the conclusion that both lock washers and glyptol would be required on all crystal holders applicable to this situation. The exceptions to this rule were the RCA and Monitor Piezo crystal holders, wherein no "nut-wells" are used. In these instances glyptol will be applied to the heads of the screws. Captain Mitchell agreed to inform all Zones of the above decision.

21. Both Laboratories agreed to caution the pilot run engineer to refrain from instituting any inspection procedures that are not required in the specifications. The Quality Control Division will take steps to insure that inspection procedures for crystals written by their field engineers will not conflict with applicable specifications and Inspection Instructions 9A unless corresponding changes are made in the applicable contract requirements or inspection instructions.

22. It was agreed that the Laboratories will make an effort to word technical decisions in correspondence to the Inspection Zones in such a manner as to avoid the possibility of misunderstanding or misinterpretation. On the other hand, the Zones will attempt to make their requests for technical information clear and concise.

23. The question on limits of drifting crystals (creepers) was discussed and resulted in agreement by the Quality Control Division that the paragraph in Inspection Instructions Manual 9A referring to erratic crystals will be amended. The paragraph will be rewritten to state that crystals may drift in activity providing they do not go below minimum activity requirements.

24. It was agreed that inconsistency of interpretation of the vibration frequency (excursion of vibration equipment) requirement, Paragraph F-6 (a), Specification 71-1695, was causing considerable confusion. Inspection instructions written by field engineers allowed one contractor to vibrate his product at one frequency and another to cover the range of frequencies. Due to the fact that all vibration equipments do not have an automatic frequency changing device incorporated into the equipment, it was difficult for the field engineer to stipulate a uniform vibration procedure at all plants. The Laboratories requested that the procedures now in use be tolerated until the new specifications are issued.

25. The resistance test after immersion test proposed by the Inspection Agency in lieu of Paragraphs F-15 and E-11 of Specification 71-3046 was not acceptable to the Laboratories because the existing procedure was used primarily to gather data and information and will be modified after it has served its purpose.

26. The minimum activity and maximum frequency limits on drop test proposed by the Inspection Agency in lieu of the procedure in letter dated 2 May 1944 from the Aircraft Radio Laboratory were discussed. It was discovered that the letter mentioned above was not thorough or explicit. Major Yarbrough stated that the letter was intended primarily to be forwarded

by the Galvin Manufacturing Corporation to the Monitor Piezo Company only. The Laboratory promised a follow-up letter explaining in detail the intended meaning.

27. The status of Specification 71-3046, dated 18 December 1943 and 6 March 1944, could not be determined. The Fort Monmouth Specification Division forwarded the document to the contracting officer and it was issued to the contractors to be used in procurement on new contracts. This document was not to be put into effect for contracts existing as of the date this specification was made valid. The representatives from the Philadelphia Procurement District will review the files to determine whether Galvin has been authorized to apply the new specification to Orders 8558-PHILA-44-1 and 15025-PHILA-43-1.

28. It was agreed by all representatives concerned that the word "re-work" as it applies to the repair of crystals means the making of physical changes in the crystal, its holder or other parts of the crystal unit which will effect permanent improvement of the condition which caused the rejection. This will frequently necessitate complete disassembly of the crystal unit.

29. It was agreed by members of the Laboratories that on visual and mechanical inspection, an unlimited number of mechanical defects may exist in any given sample lot without requiring rejection of the crystals represented by that lot, provided that no one specific defect occurs more than one time within the sample lot. The presence of any given defect more than one time within a sample lot automatically requires rejection of the crystals represented by that lot.

30. The Laboratories' representatives said that a wash test procedure on plated crystals as requested by the inspection group was not necessary. They further stated that although a frequency shift is encountered during the wash test on plated crystals, these crystals are much better than the unplated units.

31. The procurement of commercial crystals will be accomplished in accordance with Memorandum Serial No. 11, OCSigO, dated 19 January 1944, subject: Purchase and Inspection of Commercial Items, file SPSMD 400.12 Proc. Instructions. The representatives of the Philadelphia and Dayton Procurement Districts informed the group that difficulty will be encountered in obtaining bids for commercial type crystals, should the requirements of the above directive be rigidly enforced.

32. Both Laboratories agreed that in the future all sample crystals (tested by Laboratories) and which are to be used by the Signal Corps inspection force as guides in the future inspection and acceptance of crystals will be sent directly to the Signal Corps inspector at the plant where the crystals actually are being manufactured.

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