



## NRC Publications Archive Archives des publications du CNRC

### **Visit to U.S. Army Air Force Establishments and RCA Factory in connection with Shoran developments: 10-17 April, 1948** Neale, M.J.

For the publisher's version, please access the DOI link below./ Pour consulter la version de l'éditeur, utilisez le lien DOI ci-dessous.

#### **Publisher's version / Version de l'éditeur:**

<https://doi.org/10.4224/21272585>

*Report (National Research Council of Canada. Radio and Electrical Engineering Division : ERB), 1948-04*

#### **NRC Publications Record / Notice d'Archives des publications de CNRC:**

<https://nrc-publications.canada.ca/eng/view/object/?id=38ddd598-7c81-4cf1-a7d7-1e1b3c87ab31>

<https://publications-cnrc.canada.ca/fra/voir/objet/?id=38ddd598-7c81-4cf1-a7d7-1e1b3c87ab31>

Access and use of this website and the material on it are subject to the Terms and Conditions set forth at

<https://nrc-publications.canada.ca/eng/copyright>

READ THESE TERMS AND CONDITIONS CAREFULLY BEFORE USING THIS WEBSITE.

L'accès à ce site Web et l'utilisation de son contenu sont assujettis aux conditions présentées dans le site

<https://publications-cnrc.canada.ca/fra/droits>

LISEZ CES CONDITIONS ATTENTIVEMENT AVANT D'UTILISER CE SITE WEB.

**Questions?** Contact the NRC Publications Archive team at

PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca. If you wish to email the authors directly, please see the first page of the publication for their contact information.

**Vous avez des questions?** Nous pouvons vous aider. Pour communiquer directement avec un auteur, consultez la première page de la revue dans laquelle son article a été publié afin de trouver ses coordonnées. Si vous n'arrivez pas à les repérer, communiquez avec nous à PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca.



Ser  
QC1  
N21  
ERB-200  
c. 2  
E.E.

18289/10

REPORT NO. ERB-200

~~UNCLASSIFIED~~

ANALYZED

CONFIDENTIAL

LABORATORIES  
OF  
THE NATIONAL RESEARCH COUNCIL OF CANADA  
RADIO AND ELECTRICAL ENGINEERING DIVISION

VISIT TO USAAF ESTABLISHMENTS AND RCA FACTORY  
IN CONNECTION WITH SHORAN DEVELOPMENTS

Declassified to:  
OPEN

Authority: \_\_\_\_\_

Date: JUL 11 1985

OTTAWA

APRIL, 1948

NRC # 21874

CONFIDENTIAL  
Unclassified

VISIT TO U.S. ARMY AIR FORCE ESTABLISHMENTS AND RCA FACTORY  
IN CONNECTION WITH SHORAN DEVELOPMENTS

M.J. Neale (with F/L Card, R.C.A.F.) 10 - 17 April, 1948.

WRIGHT FIELD, DAYTON, OHIO.

Shoran Group - Mr. Sennert and Mr. Zmeskal.

High-Precision Shoran.

Shoran equipment work there is in charge of a very small staff and they are only able to control certain tests and generally supervise the development of a new Shoran equipment. We obtained from them some fairly general information on the new Shoran equipment. It is being designed to cause the minimum of modification work on the change-over from systems employing the old equipment. A much wider bandwidth for both video and I.F. are being used and the goniometer distance-measuring system now has a goniometer at five times (one mile) frequency. An additional dial has been added to the veeder system.

The ground equipment is little changed, but a new, very accurate method of adjusting and setting ground delay, has been incorporated. We found no attempt to incorporate a better wavemeter on the ground equipment, any wavemeter at all on the airborne equipment, nor any access points on the r-f system, such as a directional coupler would provide.

General Remarks on Shoran.

They anticipated no difficulty from our suggested technique of tuning all the stages of the receivers of the Shoran system to one frequency, except perhaps regeneration troubles due to increased gain. At this point we mentioned the consideration being given to other radial deflection cathode-ray tubes and the use of P11 screens. They reported no knowledge of development along these lines, mentioning that greatly higher gun voltages are required for full utilization of P11 screen tubes.

Radar Altimeter.

Considerable re-design had been employed to give much more accurate results but the auto-following system was considered to be sufficiently sluggish so that a technique of photographing the c-r tube was to be employed. It is a pulsed X-band system, with a  $1.3^\circ$  beam, achieved with a 5' paraboloid.

Photographic Group - Mr. Henry and Mr. Deeg.

Straight-Line Flight-Line Computer.

From these people we got complete information on the straight-



line computer of which rumours have been heard. It appears to be very similar to ours with less refinement and incorporating a mechanical error take-off rather than our resistor strip system. We understand fifty are on order by the U.S. Government. Mr. Henry laid much emphasis on the importance of survey-control systems which cause the overlaps in the direction across the lines of flight to be reasonably accurately aligned. Their straight-line computer can be modified to use a contactor system operated by the moving intersection to trip the aerial camera and the intervals can be altered to provide for several different terrain clearance heights. This equipment, in effect, is a Shoran intervalometer.

Methods of Discrimination of Tip and Tilt Errors.

Mr. Henry very casually indicated the general theory of a method of nadir point determination and indicated its strengths and weaknesses.

WILMINGTON, OHIO - CLINTON COUNTY AIR BASE.

Col. Taylor and Col. Gillespie.

The routing of Mr. Card and myself to this establishment was obviously an error, either by the R.C.A.F. or the U.S. Army Air Corps. They have no Shoran and deal only with radar equipment and other devices for all weather flying.

We were shown all their equipment, the most interesting part being a moderate range (30 - 50 miles) S-band primary radar, with the choice of additional features superimposed on all displays. These included moving target indication (available over first 10 miles, first 20 miles, etc. or all the display); runway bearings and positions of radio range legs, fan markers etc; V.H.F., D.F. or A.D.F. bearing; and cross-band (S to L) coded beacon identification system.

CAMDEN, N.J. - RCA.

On arrival at the RCA plant we found that our clearances had not, as yet, arrived and most of the first day was devoted to an attempt to straighten up this matter, firstly in the plant, and secondly by a call to Canadian Joint Staff, Washington; and finally waiting for the authority.

High Precision Shoran - Mr. McLamore

He confirmed and amplified the information we had obtained at Wright Field. Our questions regarding the desirability of an air-borne wavemeter and directional couplers for all r-f outlets were considered as being in regard to things of little importance. The high precision Shoran program in the RCA plant is rapidly approaching the stage of producing a design prototype which will be delivered to the U.S. Army authorities, who will conduct evaluation tests thereof. The final changes to the design will be made and a production order will then be placed. It is obviously a long time before equipments could be available to us.

Radar Altimeter.

Mr. McLamore apparently had considerable information on this project and we would report the following. The range system is essentially Shoran with mechanical servo follow-up controlled from the pip misalignment. The inertia of this system is the reason that they suspect the thing to be sluggish and have incorporated a recorder which photographs the c-r tube at the same time as the mechanical dial showing the indicated terrain clearance. Mr. McLamore stressed his opinion on one point not commonly accepted by people at NRC, that a radar altimeter should have considerable peak pulse power. He suggested 5 kw peak as an utter minimum for 40,000 feet operation. He pointed out that results of tests made by RCA showed purely specular reflection resulting from any terrain or water surface at frequencies of 1600 mc upwards.

Recorders, Computers and Automatic Following Shoran - Mr. Palaya, Mr. Eaton and Dr. Minett.

Mr. Palaya is apparently in charge of recorder development. Mr. Eaton (shortly to be replaced by Dr. Minett) is the sales engineering representative. The revision of the new recorder system under development by RCA is irrevocably tied to an automatic following system, no effort being made to provide smooth and easy manual laying controls. They are reasonably confident that the automatic following system, as developed, has accuracies of the order of 25 feet, but for super-accuracy propose a blown-up portion of the Shoran cathode-ray tube sweep on the camera record being made for each reading. The mechanical layout of their recorder will have a dissociation of the control elements used by the Shoran operator and the devices being registered on the photographic film. A rather new and ingenious system incorporating a commutator-like device, hanging on a starwheel mechanism and a battery of neon bulbs operated by a short pulse are used instead of springy transmissions to veeder counters. The light system used as a counter employs 65 lights to display up to 999 miles with the last figure to two 10-thousandths of a mile. The drive system incorporates a servo aided-laying system, i.e. a servo motor drive on both direct lay and rate operating from their synchronization error signal chassis. They agree with our ideas on the fundamental pooriness of the Honeywell-Minneapolis system.

Production of several of these control units for design tests by RCA and evaluation tests by the U.S. Army is expected to begin in September and we were given the impression that RCA would be willing to increase the number being produced by one, two or three to provide units for our operational program. They indicated that they could be delivered early in 1949.

Mr. Palaya and ourselves discussed our particular problems and he offered several helpful suggestions as to possible sources of error in our present system and methods by which we might rush together units to satisfy our next few months requirements.