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Division 6 - Lincoln Laboratory
 Massachusetts Institute of Technology
 Lexington 73, Massachusetts

SUBJECT: BIWEEKLY REPORT FOR 11 MARCH 1955

To: Jay W. Forrester

From: Division 6 Staff

Approved: John B. Bennett
 John B. Bennett

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INTRODUCTION

Laboratory Personnel Training

(J. B. Goodenough) (UNCLASSIFIED)

A preliminary report has been prepared summarizing the general educational needs and various educational activities of the Laboratory under five categories: advanced-degree requirements, technician training, orientation, technical specialization, and nontechnical specialties.

College Recruiting Program

(R. J. Horn, Jr., W. Ogden, Jr.) (UNCLASSIFIED)

The following is a list of trips made during the last biweekly period:

<u>Representative</u>	<u>College</u>	<u>Date</u>
R. Walquist, F. Heart	California Tech	25 Feb.
R. Walquist, R. Mitchell	UCLA	1 Mar.
	Stanford	3 Mar.

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be set when the camera system is in operation, the AND circuit to permit branch on sense. Time pulses 1 and 5 have been extracted from the central computer, TD and RD pulses from the drum system. Frame 25 is being loaded with five more pluggable units and 15 relays. For the console that will support the camera, Corderman has devised modifications that permit the camera-control system to control intensification at bright and dim levels distinguishable on film.

The camera, if mounted in line with the Charactron, would reach 4 feet out from the console. Our mechanical engineers, working with Fairchild, have tentatively agreed on a folded-light-path mount that Fairchild would build. The camera has changed enough in meeting XD-1 requirement that Fairchild proposes to make a new set of drawings. The final tentacle of the camera system has reached the film and led Lloyd Sanford to experiment in search of a film that is satisfactory.

2.6 Vacuum Tubes

2.6.1 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

J. S. Palermo and I spent the first 2 days of this period at the Convair Charactron Tube Plant reviewing bulb-processing techniques in the production line.

The San Diego water is difficult to de-ionize and clean. The recent rainy season in the San Diego area put considerable burden on the Charactron water de-ionizing unit. In fact, the water coming from the de-ionizer was marginal for the phosphor settling. This matter is now under control but has caused Convair to fall behind schedule in the production of 19-inch Charactrons.

Convair has had considerable trouble with astigmatism and beam-center shift in the Charactron. A. Zacharias, in cooperation with F. A. Rodgers and C. L. Corderman, made some tubes to investigate the cause of astigmatism and the possible recommendations. A solution to the problem was a disc on the exit aperture of the electron gun. We supplied Convair with 54 discs so that this production section could be put immediately into their production line. A program for polycasting electron-gun display at beam-center shift has been initiated. This will be continued over the next month.

Hughes had considerable shrinkage in producing Typotron tubes with satisfactory storage assemblies. We have inaugurated a program to make Typotron tubes at MIT so that we can fully understand and evaluate the problem associated with making Typotron storage surfaces. We hope to get out of this program some suggestions for improving the production line at Hughes. L. B. Martin will conduct these studies for Group 65; C. L. Corderman and members of Group 25 will participate in these investigations.

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Considerable time was spent with IBM on a review of second-source bids for the twin triode and the pentode. In order to ascertain their production ability to meet the needs of the AN/FSQ-7 tube program, all of the companies were visited and facilities carefully studied, engineering proposals reviewed, and their production record on similar tubes investigated. Meetings will be held the week of 14 March at Kingston to make recommendations for awarding the second-source contract.

2.6.2 Tube Research and Development

(S. Twicken) (UNCLASSIFIED)

I attended a progress meeting on the Z-2177 with IBM at the General Electric Plant, Owensboro, Kentucky. Production has been doubled to meet IBM's requirements. As a result of careful planning, the production increase is well in hand. Sleeves of the present cathode-alloy melt will have run out in June. An intensive program is getting under way to find another acceptable melt sufficiently in advance of that time to forestall difficulties. Test shrinkage at the plate-current spec limits is running higher than we would like. A dual investigation is to be made. IBM-MIT will determine actual circuit requirements, and GE will determine better methods of product control and the statistical variability of the product.

Together with P. Youtz and the IBM Tube Group I visited Bendix, RCA, and Raytheon for a final review and facilities inspection prior to a decision on second sources of the low-power twin triode and gate pentode.

(D. C. Lynch, J. S. Palermo) (UNCLASSIFIED)

Two days were spent at Convair carefully reviewing their phosphor-settling and aluminizing procedures. Controlled experiments were set up in the Barta Building chemical laboratory to check Convair's Charactron tube-manufacturing specifications in an attempt to estimate the margin within the specifications. This gives some estimate of the risk and control involved in using a certain process to produce a tube to a given specification. For the past fortnight we have concentrated on the lacquering procedures that are preparatory to aluminizing. We have some estimate of the factors that might cause a margin result.

We have polycast a number of electron guns to aid the electron-gun study program.

Some phosphor-settling work was done for the big-display program.

(P. C. Tandy) (UNCLASSIFIED)

Nine 19-inch Charactrons, CHT-61, CHT-62-1, CHT-68-1, CHT-72-2, CHT-73, CHT-75, CHT-80, Convair 7-1, and Convair 0082, have completed from

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312 to 3255 hours on life test. At the last testing period there was no appreciable change in CHT-61, CHT-68-1, CHT-72-2, CHT-73, and CHT-80. Of the last three transfer characteristics made on CHT-62-1, the first and third were similar, while the second indicated that the tube was deteriorating. CHT-75 has shown some improvement near zero bias, while Convair 0082 has shown a slight drop in emission. Emission in the cathode of Convair 7-1 was poorer, while the matrix current was slightly increased; as a result there was a change in ratio of pulse-cathode current to pulse-matrix current from 77 to 45. Both ratios are greater than the usual 10 to 15 for a good tube.

A gas-ratio test was made on all available 19-inch Charactrons. The ion current of all tubes was well within the limit of 1 microampere. The leakage currents of Convair 7-1 and 0082 with the cathode cut off could not be balanced out on the ion-current meter on any scale less than 1 microampere; thus, a comparison between Convair and MIT tubes could not be obtained. We have not made any leakage tests on these tubes recently.

Life-test facilities are presently being expanded to 15 positions.

(L. B. Martin) (UNCLASSIFIED)

Ten Typotron tubes received from Hughes Aircraft were tested for leakage. Three tubes passed leakage specifications, six failed, and one was gassy.

The gain and centering ranges in the 16-position tester were inadequate for all tubes. The mounts have been modified accordingly, and nine good tubes will be started on life immediately.

The eight-position life test is temporarily shut down for metering changes.

The following is a list of tubes, their condition, and total hours on life test:

<u>Tube</u>	<u>Total Hours</u>	<u>Condition</u>
265	7685.7	marginal
280	6867.7	satisfactory
389	4265.1	satisfactory
390	5348.9	satisfactory
392	5348.9	satisfactory
394	4566.8	marginal
11521	417.0	satisfactory
11601	661.5	satisfactory

Tube 265 has been marginal for approximately 5000 hours because of ion damage to center of storage surface. Tube 394 has been marginal from the start of life. Some areas of the storage surface switch positive at collector potentials too low to store data on other areas.

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(A. Zacharias) (UNCLASSIFIED)

The first half of this period was spent on electron-gun studies. C. L. Corderman and IEM reported that astigmatism was present in the Convair Charactron tubes. A preliminary investigation showed that the electron gun might be at fault. Convair has been using Sylvania 5CP guns in the electron-optic assembly. Most of the Charactron tubes made at MIT used RCA electron guns. Using our CT type construction which has a phosphor screen at the same distance from the electron gun that the matrix is from the selection gun of the Charactron tube, RCA and Sylvania type 5CP guns were observed. All the Sylvania guns showed excessive astigmatism; the RCA guns had considerably less astigmatism. The Superior 5CP guns which Convair contemplated using were also put in CT type tubes and studied. These guns also had considerable astigmatism. F. A. Rodgers and C. L. Corderman investigated and determined that the mounting tabs on the G_2 barrel of the Sylvania and Superior guns were the cause of the astigmatism. A number of CT type tubes were made with a disc over the exit end of the G_2 barrel of the Sylvania and Superior guns. In these tubes the field distortion caused by the G_2 tabs and the resultant astigmatism were eliminated.

The second feature of the Superior and Sylvania guns, and to a lesser extent the RCA gun, has been beam-center shift with varying focus voltage. F. A. Rodgers attributed this to the misalignment of the axes of the gun parts causing the beam to enter the field of $G_2-A_1-A_2$ at a finite angle to the axis of the lens. This may result in the beam-center shift.

We inaugurated a program to imbed in thermo-setting plastic guns exhibiting beam-center shift in the Charactron tubes. The guns will be sliced and an attempt made to correlate the physical dimensions of the gun with the beam-center shift phenomena. This program has just been initiated and will continue over the next two biweekly periods.

(T. F. Clough) (UNCLASSIFIED)

In cooperation with Group 35 and the Institute Metallurgical Department, procedures are being developed to secure accurate radiographs for the determination of electron-gun grid-cathode spacings.

Work continues on the reorganization of the tube processes specifications.

2.7 Memory Test Computer

General

(W. A. Hosier) (UNCLASSIFIED)

Herb Ziegler joined the MTC staff on 7 March; his long and varied experience with WWI should be a big asset to MTC. Beside familiariz-