

*W. G. Welchman*

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Memorandum M-1137

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CLASSIFICATION APPLIED TO:
By: <i>DD 254</i>
By: <i>RK EUGETT</i>
Date: <i>12/21/9</i>

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SUBJECT: BI-WEEKLY REPORT, PROJECT 6782, December 8, 1950.

To: J. W. Forrester

1. GENERAL

(R. A. Nelson)

Much of the effort during this period has been devoted to planning. This is appropriate at this point because Dodd has completed most of the Mk 47 coding, Katz has established present-day gun-drive data requirements, and I have been collecting ideas from my reading (especially on Mk 65). The result of the planning was a memo to Mr. Forrester listing and explaining fifteen categories of work (covering points prescribed in our contract and also other questions suggested in our discussions and reading) and recommending a program through June 1951.

Dodd is finishing up work on Mk 47. His goal now is to evaluate his coding of the past weeks and to draw relevant conclusions. Katz is starting to study as a separate topic ways of making ballistic data available to a digital computer. He is first attempting to find a suitable approximating surface for one quantity in terms of two others, such that only a few constants would have to be stored. Other approaches involve the generation of the data as needed, starting with fundamental relations, and the possibility of using an external medium to augment the storage. I am starting on target-path prediction, which will involve both the coding of various kinds of prediction laws and a study of how conveniently one can change from one law to another in accordance with criteria dependent on the particular, instantaneous tactical situation.

2. THE FIRE CONTROL PROBLEM

2.2 Ballistic Considerations

(A. Katz)

As a result of discussions with R. A. Nelson and J. M. Dodd, I have redirected my efforts from a study of smoothing to an attempt to convert the AA firing tables into a form suitable

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2.2 Ballistic Considerations (Continued)

for storage in WWI. I hope to do this by representing each of twelve functions by a curved surface whose equation is

$$f(x,y) = f_1(x) + f_2(x)f_3(y)$$

I have begun to convert a table of superelevation angle ( $Vfn$ ), which is a function of ballistic position angle ( $E_2$ ) and ballistic range ( $R_2$ ). For this particular function I shall use

$$f_1(R_2) = \sum_{m=0}^3 a_m P_m(R_2)$$

$$f_2(R_2) = \sum_{m=0}^3 b_m P_m(R_2)$$

$$f_3(E_2) = \sum_{m=0}^2 c_m P_m(E_2)$$

where  $P_m(s)$  is a Legendre polynomial of degree  $m$ . If all terms of the approximating function are retained, this method will yield twelve constants and represent a table of about 450 empirical data.

3. CODING

A final check is being made on the Mk 47 code. This revision involves:

- a) Checking the validity of the equations and approximations used, revising and reorganizing them when necessary.
- b) Introducing the order "qs" wherever its use shortens or simplifies the code.
- c) Rearranging assigned storage to facilitate reading the code and to maximize the efficiency of storage utilization.
- d) Substituting more reasonable scale factors throughout.
- e) Correcting any errors in earlier versions of the code.

When this revision has been completed, a note discussing the code and listing its limitations will be written.

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