Air Traffic Control Project
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1.0 GENERAL

(C. R. Wieser)

The block schematic, A-45018 in M-2047, has been changed to improve the method of reading radar data into WWI. A register panel has been added to ensure correct operation in the event that a WWI pulse and a radar timing pulse arrive simultaneously. The flip-flop storage register can now be read into from either WWI or the radar data, and the read-in of radar data is initiated by TP1 from WWI, which prevents the computer from reading into or out of the register while the radar data are being read in. Also, the register is reset from the computer by the program.

Further study of the radar set and associated data transmission equipment has brought to light the following properties which may be of interest in computer coding:

1. The azimuth resolution of the radar is relatively poor, and a single target may be seen as two targets in adjacent azimuth blocks.

2. The range resolution is much better, and a target seen in an azimuth block should never be transmitted in two range blocks. A target exactly on the dividing line between adjacent range blocks may not be seen at all, although this is improbable because this condition exists only about ±50 feet either side of the dividing line.

3. The digits received for range measurement will express the target range in nautical miles. However, these numbers will not be referred to zero range. Each number representing a range will have to have a constant added in computation in order to get true range. The size of the constant will be determined experimentally after the radar and associated equipment have been installed. It is estimated that the constant will be less than one mile and probably negative.

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4. All timing signals in the radar relay coders and storage tubes are synchronized with the pulses transmitted from the radar. These in turn are not synchronized with the antenna. As a result, after a target is detected by the radar there may be a delay of 0 to 1/25 second in interrogating the azimuth coder. Since 1/25 second corresponds to 1^{o} at the antenna, this delay produces an uncertainty of 1^{o} in the azimuth data.

(P. Franklin)

A series of memoranda have been issued on the determination of a course from several observations. The course is assumed to be a straight line and the velocity is constant.

E-330 treated three observations of a horizontal course from a single station, each observation giving an azimuth, range rate, and time. E-331 treated a horizontal course observed once for azimuth, time, and range rate by three different stations. E-334 treated three observations of a horizontal course from one station, each giving an elevation, time, and range-rate. These determined the course except for azimuth, which could be found by one additional observation from a second station.

E-339 gave a simplified form of the problem of E-330, including consequences of the assumption that azimuth differences are small.

E-341 treated an inclined course, found from three observations like those treated in E-330 and E-339.

(D. R. Israel)

Some preliminary consideration has been given to a program for finding the sine and cosine of azimuth signals, these trigonometric functions to be used in the conversion of the radar data from R-θ to rectangular coordinates. Such a program must not make excessive demands upon the storage capacity of the computer (256 registers) or the available time between input signals from the radar (1/50 of a second).

There are two main aspects to the problem; the first is to reduce the angle to the appropriate acute angle and to associate the proper sign with the trigonometric functions, the second is to actually evaluate the sine and cosine. As for this latter task, there seem to be two main lines of approach--either the evaluation of several terms of the appropriate power series or the use of interpolation

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(linear or higher order) upon a stored table of values. The optimum solution seems to require the use of the series as is illustrated in C-70. This method would require a permanent allotment of about 40 storage registers and would entail 30-32 operations.

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