

~~RESTRICTED~~
UNCLASSIFIED6673
Memorandum M-2020

Page 1 of 3

Air Traffic Control Project
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, MassachusettsSUBJECT: BI-WEEKLY REPORT, OCTOBER 14, 19491.0 GENERAL

(W. G. Welchman)

Mr. Gabelman of Watson Labs paid us a visit on Thursday, October 13. His main purpose was to discuss an arrangement by which the knowledge and experience of three members of the staff of Airborne Instruments Lab could be made available to us. During a discussion of private line communications he pointed out that if the significant pulses of a transmitted signal have to be followed by inactive intervals to allow for spurious echo pulses, a pulse interval system of coding may prove more efficient than ordinary pulse coding. Mr. Gabelman also told us that the Sperry Zero Reader is associated in the minds of many people with the ILS system which he considers to be obsolescent. The point is that the Zero Reader obtains the rate information that is necessary for stabilization from the heading and bank angle of the aircraft. This would be satisfactory if the motion of the aircraft was entirely determined by the heading and bank angle, but this is not the case when conditions of turbulence have to be taken into account. It is felt that for final approach it is necessary to provide rate information that is derived from the actual motion of the aircraft.

A conference was held on Friday, October 14, to discuss Orden's work on a program for approach sequencing. In order to draw up a program, Orden had first to draw up a model of an approach system. As he was primarily concerned with investigating the computer techniques that may be needed for sequencing, he chose a simplified model that avoided the problems of horizontal lay out of approach paths, control on curved paths, and allowance for wind, all of which are important for a general study of approach control. The discussion centered on the various respects in which Orden's model seems to fall short of practical requirements and it is to be hoped that as a result of this discussion it will be possible to choose the most profitable direction for further study of approach sequencing.

Orden's program will be presented as an R report. It experiments with several interesting techniques. In particular, a single word

UNCLASSIFIED

~~RESTRICTED~~

6673
Memorandum M-2020

UNCLASSIFIED

Page 2

1.0 GENERAL

(W. G. Welchman) - continued

is used to specify a selected path through a network of approach paths, each digit of the word determining which of two possible paths an aircraft shall choose when it is a certain distance from the terminal point of the system.

(C. B. Wieser)

Air traffic reports by RCA and AIL have been studied. The work represented by these reports deals principally with interim systems in which computers and private-line coded communication are excluded. The reports on these systems show clearly that as the traffic density approaches system capacity aircraft delays increase rapidly. It is important that the maximum capacity of the traffic control system be somewhat in excess of the expected traffic density averaged over a short period.

A discussion of air traffic was held with Mr. L. J. Chu and Mr. R. B. Adler of the Research Laboratory for Electronics. They are working on the air traffic problem, and are at present studying its broad aspects such as probable future traffic density and the distribution of arrivals in an approach zone. So far, they have not devoted much time to the communications problem and its associated techniques.

(P. Franklin)

Studied the two tentative proposals for the problem of approach control. The first uses a network of fixed paths and the second a set of spirals on a right helicoid, or spiral staircase.

(A. Orden)

The report on a code for an airport approach traffic control system was completed.

Work was started on analysis of the response of aircraft to control systems. A preliminary study is being made of techniques for analysis of stability of control systems. W. G. Linvill and I also discussed the problem of selecting suitable equations of aircraft dynamics for control analysis.

UNCLASSIFIED

~~RESTRICTED~~

6673
Memorandum M-2020

~~RESTRICTED~~
UNCLASSIFIED

Page 3

1.0 GENERAL

(F. A. Foss)

It has been noted how the Sperry Airport Traffic Guidance System can be easily modified to give additional procedure turn speed control information. A speed control reference signal generator is differentially connected to the rotating antenna shaft. An airplane travelling on a circular procedure turn path about the omni-range antenna adjusts its speed to maintain a constant phase difference between the space modulated reference signal and the speed control reference signal. The movement of the constant phase difference condition along the circular path can be made to vary with time in any desired manner by the control of a variable speed motor connected to the differential.

Further consideration has been given to the type of telemetering system that would be required by 100 airplanes in a terminal area under the control of a digital computer. The attainment of a private line status by means of frequency modulation techniques is being investigated.

(D. R. Israel)

The "Introduction to Coding" is being typed and proofread in preparation for duplication and distribution. A memorandum will probably be issued at the same time in which the purpose of the "Introduction to Coding" will be explained and criticisms of the work and content requested.

The "lag" code for the private line is now being completed and prepared for typing. It will appear as an E Note.

UNCLASSIFIED

~~RESTRICTED~~