Computer Oral History Collection, 1969-1973, 1977

Interviewee: Jay W. Forrester
Interviewer: Richard R. Mertz
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MERTZ:

This an interview conducted with Professor J.W. Forrester in his office on the afternoon of May 27th in Sloane School of Management at MIT. Professor Forrester, would you care to describe in general terms the stages administratively through which the Whirlwind Project proceeded roughly in the period December 1944 up until its incorporation in the Lincoln Laboratory?

FORRESTER:

Yes. First of all, I think we can divide it into two very-broad sections. The first from about December 1944 until sometime probably in the spring of 1948 was a series that I'll return to in a moment in which the program was aimed at the construction of an aircraft stability analyzer aimed at a goal of creating an instrument that would aid in the design of large aircraft. After that the objective and mission of the program shifted over to the use of digital computers in a combat information center initially with respect to interests of the Navy and later with respect to air defense.

If we go back now and detail this somewhat? the initial stage started about December 1944 with the idea that a sophisticated differential an ana1yzer wou1d be built for name1y anana1og computer which would simulate the behavior of a la rge aircraft that had not yet been physica1ly built which wou1d in corporate the aerodynamic characteristics, the control characteristics and would actually provide a place where the pilot mould be able to operate the controls, the simulated controls of the aircraft? where he would be able to get a feel for the airplane, its handling characteristics.

During the year, approximately the year 1945, we investigated analog computing techniques for this purpose and decided that the analog equipment would not be a satisfactory solution to the problem. The year 1946 represented the shift of attention toward the possibility of digital techniques and that year was the period devoted to examining serial digital computers, ending up with the decision that they were too slow, that they likewise would not serve the purpose.

Entering then the year 1947 largely devoted to exploring parallel type digital computer circuits and logic to see if this would provide necessary speed to handle the original conception of the problem. About the time when this began to look like a possibility, we

find that early in 1948 the emphasis was shifting away from the large aircraft as the goal of the study, and toward the idea that the high speed digital computer could serve to handle the data processing requirements of a military operation, and in particular that it could be used for analyzing the information in a submarine taskforce, keeping track of the relative positions of the various ships, the radar information that was available, the sonar-information and making a composite picture of what was happening out of the fragmentary information that was available from each of the many different information receptors all of
which tended to be moving relative to one another. So, from approximately the spring of '48, the shift toward what I referred to as the combat information center, took initially the form of the Navy problem and for a period of perhaps almost two years that was the focus, with however a growing shortage of funds for the Navy and a growing national feeling that the problem of the United States was largely a problem against air attack or defense against air attack.

The shift away from the Navy occurred really in two stages, one of which was embryonic, never developed, but we did have a program for awhile on the application of digital computers to the control of air traffic. The possibility of a centralized computer controlled air traffic system, which is still under discussion.

Then, beginning perhaps late in 1949 and mores especially early in 1950, the realization that the air defense problem was of growing importance and out of discussions with Jerry Weisner and George Valley who was then Head of the so-called ADSEC Committee, Air Defense Engineering Committee? I believe, we began to examine the possibility of the digital multiplicity of radar sets, using radar sets having poor, low altitude coverage; any one radar set giving a fragmentary incomplete picture. The focus began to shift to the possibility of a digital computer, gathering together the information from a number of sources, combining this into a picture of what was happening in the defense against an air attack.

Through 1950 experiments mere planned in which a radar set was interconnected with the Whirlwind computer which was then beginning to function, and this showed sufficient promise, though I don't believe actual successful experiments had yet been conducted, sufficient promise that the Air Force was essentially presented with a dilemma. The possibility of using digital computers was an extremely radical idea because no reliable high speed computer had yet functioned. On the other hand there were no alternative solutions to the air defense problem that showed any great promise. So they were faced with the alternative of no solution or one that was extremely unsure, untested, and in which no one had total confidence and only a few people even had hope.

The resolution of this dilemma took the form of setting up under the general guidance, auspices of MIT, but at the request of the Air Force, the Project Charles Study Committee that operated essentially through the first half of 1951. That Committee studied a number of aspects of air defense, but one of the outcomes was to endorse the idea of the computerized air defense system which eventually came to be called the SAGE System,

Semi-Automatic Ground Environment. It was during the time that that Committee was in session, February to March 1951, which the Whirlwind computer actually conducted successful interceptions of real interceptors against real bombers being viewed by an old radar set that the Air Force had in this vicinity.

Out of that came (out of Project Charles) the plans for the Lincoln Laboratory. One of the principle activities was to carry the work that had been started in the project Whirlwind on into a working air defense system.

MERTZ:

Would you care to comment to what extent the movement of the Whirlwind project from the Servo Lab into the digital computer lab is reflected in the administrative break-down that you have just described?

FORRESTER:

In the beginning of this sequence that eventually led to the computer in 1944 [?] was in the Servomechanisms Laboratory of which Professor Gordon Brown was the Director. At that time World War II was in sight of the end and a number of people were beginning to think what they would do next after the research work at MIT during the war. I had come to the end of the program that I had been working on immediately before this, and had begun to think of the possibility of leaving MIT or considering the alternatives. At one point as I recall I discussed this with Gordon Brown who at that time had a list of a number of things that he thought represented future possibilities for the laboratory and possibilities for the people in it. Only one of those, as I recall seemed to interest me and it was the project which had already been started between the Special Devices Center and the MIT Department of Aeronautics, aimed at the aircraft stability analyzer. The Department of Aeronautics had already prepared a first report which contained some statement of the objectives and in particular in [?] contained the set of equations which they saw as the ones which had to be solved, the ones that had to be simulated, to represent the behavior of an airplane. This set of equations obviously called for some kind of high performance computer. This was well before any general interest in digital computers so it rather automatically implied an analog computer. The Servomechanisms Laboratory was the logical MIT place for considering the instrumentation and devices. So I presume by that route it had come to Gordon Brown's attention and thereby to mine.

We began rather immediately, me and 3, or 4 or 5 who had been working with me before, to examine the question. Now to go back to your inquiry. This work continued under the Servomechanisms Laboratory up until some point when it was physically moved to the Barta Building, probably in late '47, after which time it came to be known as the Digital Computer Division of Servomechanisms Laboratory. I think it was not until almost 1952 that the name Digital Computer Laboratory as a laboratory independent of the Servomechanisms Laboratory actually began to be known by this title. It was almost simultaneous with the movement, of most of the work to the

Lincoln Laboratory.

So, if one takes the title literally, it related largely to the residue of the digital computer work that remained at MIT for the purpose of exploring scientific: computation. If one takes it in terms of the substance of the work, the digital computer work began in 1946, but the administrative relationship was one of gradual transition, gradual transition from physical work within the building of the Servomechanisms Laboratory to a separate building looked upon as a division of it, to a more or
less simultaneous process where many of the people, most of them, became associated with the Lincoln Laboratory, but to distinguish that part of the work that was Lincoln Laboratory
from that part which was still on campus for scientific computation purposes, the Digital Computer Laboratory became a separate name, at that time.

MERTZ:

That was at the time when I assume Charles Adams, for example, remained in the scientific applications?

FORRESTER:

Charles Adams had been with us for sometime, but he remained with the group associated with the scientific applications while most of the other people moved to the air defense applications. David Israel who perhaps had worked with Adams, Robert Weiser, various ones became the focal point for computer programming with respect to air defense, while Adams and some others stayed with the more scientific and academically oriented application of computers.

MERTZ:

Was there any particu1ar administrative reason why the Digita1 Computation Laboratory became a laboratory as distinct from a division of Servo Laboratory?

FORRESTER:

Well, at that particular point in time the relationships between the Office of Naval Research (ONR) and the Navy had become fairly complicated and the Navy wanted to retain its interest in mathematical computation, wanted to get its interests identified with the academic side of MIT rather than the large organized project research. I'm a little bit unclear on the details of your question, but part of the whole process was that the ONR interest in scientific computation came to be channeled through Professor Phillip Morse in the Physics Department who had had some other developing interests in computation, rather than through the Electrical Engineering side.

MERTZ:

Had most of them been trained in EE?

FORRESTER:

Same way. I would expect that Draper would feel the same way. He would give complete moral and administrative support. He would isolate complaints from government contracting officers from the projects. He would talk to contracting officers and insist on certain things and hold his ground until he got the kind of contracts and relationships and terms that he felt were necessary to run a satisfactory program, quite in contrast to the kind of administrator who follows the path of least resistance, who kind of accepts whatever the pressures on him are asking for.

MERTZ:

You have perhaps partly answered the question I was about to put to you.

[End of interview]