#1.

S. This is a continuation of Interview TC-24 with Ralph Mork, on January 10, 1968, at Harrison.

M. Well let's see, you want to know where I was related to the WWAM and so forth.

S. Right.

M. Well I guess in about '55 or early '56, I can't remember which, the management of engineering in IBM and I guess this was Wally McDowell and Ralph Palmer, had an idea that the accounting machine conventional punched card equipment side of the business wasn't being given enough attention. So they tried an experiment. That was to take one man in engineering and set him up as the over-all boss man for the accounting machines in the total company. This was the existing accounting machines and new programs to go in that direction. And I was the one they put in that job, being located in the Endicott laboratory and I had a very interesting title which I had never heard. I know it was never used before and I don't know that it has ever been used since and the title was Executive Engineer. In any event, my job was to worry about the health of the accounting machine side of our business, not only in the domestic company but in whatever activities were going on overseas as well. So one of the first things that I had worked on was to get on board with the WWAM

which is spelled Q Q A M, the initials standing for World Wide A counting Machine. Now that project had been started over a year before I was involved in any way with it. They had had a task force over in Germany. I think it was held out in Sindelfingen. There were lots of people from the World Trade laboratories and some people from the domestic laboratories to try to find a solution to the application of electronics to upgrading the accounting machine function. As I understand it, the original impetus to this came from the French company, where the head of IBM France, Christian de Waldner, was complaining bitterly to anyone who would listen, including the people back here in the States, that he did not have a satisfactory machine to compete with the machine that the Bull Company in France was marketing, particularly used in banks. That consisted of an accounting machine and what would be today called low powered but in those days fairly good power, electronic calculator, attached to the .... directly coupled to the accounting machine. Bull was making substantial inroads in the banking activities in France and to some degree in public utilities, where the users found that they could accomplish a great deal more thruput and get their jobs done just a lot easier by having the two machines coupled together in this fashion.

S. May I interrupt and ask you if the CPC was ever sold in Europe?

M. I don't know whether the CPC ever got sold in Europe or not. I know the machine you're talking about. We used to have it in our labs but I have no idea whether they sold them overseas. But it wouldn't have done this job anyway. The problem arose from the fact that these French banks handled their bank accounts differently than we did in this country. You have a checking account in which you are allowed to go negative and in fact you have a line of credit built into your checking account and they charge you interest kikely when you go negative. It had to be recomputed on a daily basis every time that there is a transaction. That is for each day that there's any transaction on your account, they have to recompute the interest. That led to an awful lot of calculation and therefore in handling all these bank accounts, having a reasonably capable little computer tied right in with the accounting machine was a natural. So as a result of that, eventually de Waldner made enough noise around the company and I understand to A. K. Watson in particular, to attract the attention and finally this task force was pulled together. I have trouble thinking of the names of the task force because I wasn't part of it. I just sort of heard about it afterwards. But I believe Joe Fernbach was one of them and I .... Joanie Deyger....and the others on the task force were people from the European laboratory, Walter Sharer, John Bergman and there were several others that I don't know. I'm sure you can find that out easily enough. In any

event they held a task force type operation for some days or weeks and looked at the various possibilities of building a machine which had the classical accounting machine capabilities such as card reading and printing and that but it had electronics internally so that you could do calculations at a good speed. They looked at the possibilities of the stored program and concluded, based on all the input that they could get at the time, that it was too expensive. That the machine involving a stored program was just out of the ball park on the price that was required. So they elected to go with the plugboard as the control over the machine and once that sort of general decision had been made, they went further and decided to pursue the ideas that were initially embedded, if you want to call it that, by Jean Estrenz and Maurice Papol. Now these two fellows were in the French lab at the time and then came over here. They both came over and lived up at Endicott for at least a summer around 1955 or '6 with the object of getting up-to-date with the latest development in the printer side of things, carriages and the like, and trying to coordinate the work that could be done in Endicott with that to be done in the European lab. So when .... finally when the program got off the ground over in Europe and the French lab was given the electronics responsibility, and the German lab had the responsibility for the electro-mechanical equipment because primarily the job was

involved with the printer because we needed a faster printer than the conventional accounting machines had. It was about at that time when both of these things had probably been going at both laboratories for maybe a year, when I first got involved in this job of being boss of the accounting machine business in the company. The approach being followed by the French lab as I say, was the use of the plugboard but the internal circuitry was all transistorized and this led to considerable complications because the plugboard by its very existence required large numbers of transistors to power the signals through the plugboard and required many diodes and the like to protect the hubs on the plugboard. That is to say, to protect the internal electronics of the machine from being damaged if an operator put a plug in the wrong place on the plugboard. It had to be kind of foolproof as far as blowing up transistors and so on. So it slowly became apparent because we were beginning to get some cost estimates on this thing and all, that that electronic box was very, very expensive.

S. May I ask considering the decision that had been made and I don't know who had made it this time or after, on the Wooden Wheel, which was a plugboard computer and therefore was a precedent for turning down plugboard computers in the company.....

M. Yeah....

M. I don't know the relation. I would assume that during the time that they had the task force held in Germany, that there was probably some cross-talk between the Poughkeepsie at Poughkeepsie in the Wooden Wheel kind of thing and these guys. But as I say, I can't tell you who all the people were on this thing. I don't know about that.

S. I was just curious about whether you knew why they were going ahead in World Trade with the plugboard machine.

M. Well it was the finding of the task force, which was a domestic/World Trade joint task force..... they concluded that the only way they could get there from here on an economic basis was through the use of plugboards.

S. Was the Machine Bull competitive machine plugboard also?

M. Yes. But of course you know our machines were going to do more and were going to be fancier than any Bull machine. The Bull machine was kind of the equivalent of taking a 604 multiplier anf directly tying it to an accounting machine. The thing was that the computer Bull had been tying in was the thing called the Gama III, and that computer was substantially more powerful, with more compute power than a 604.

S. So basically it was a card controlled program calculator.....

M. Well the French company had been trying to react to the bank competition from Bull with 604's hooked up to an accounting machine and not meeting

with much success, the main reason being that the 604 wasn't powerful enough. In fact they cranked up some more powerful versions of the 604 with more storage in them and so on. But this machine's power was somewhere halfway let's say between a 604 and a 650. It was a pretty hot machine in terms of compute power. Well in any event, after some year and a half I suppose of effort on the WWAM, it began to be apparent that the thing was going to cost too much, too much cost in the transistor circuitry, the electronic box, so to speak. So I had gotten some facts and figures together while I was up in Endicott to find out what it really was costing us to have this plugboard. I got the cost of the plugboard and the mounting for the plugboard and the cost of the assembly of a plugboard into a machine, including the hand connection of all the hundreds of leads to the back of the plugboard and so on. And I got information from the French lab that showed the cost of the diodes and other things that were on the plugboard, just to protect against operator mistakes and the like. You had to power signals through it. And it came out that we had just because there was a plugboard in the machine, we were spending something like three thousand dollars. So this caused me to begin to say well maybe the world is changing a little bit and we under-estimated what this plugboard really cost. Let's finally take a crack at a stored program machine because maybe for that three thousand bucks you know, we could get our stored program. Now since

Now since the French lab was fully dedicated to this machine and it was charged down the road, I decided that rather than just order them to change horses in mid-stream, that it would be worth to do a little more serious study. And at that point I was able to get transferred to me three people from within the Endicott laboratory. The key one I would say was Fran Underwood, who is now out in Los Gatos in ASD and the other two were Jim Ingram, who is I think now down in Raleigh and Russ Rowley, who is in the San Jose lab. In any event, I was able to get these three people and set up what you could call a department and those three guys were charged with determining how we could make a stored program machine. That was the first major point of the charge and the second point was to retain in the machine the print/edit formatting approach that had been originally conceived of by Estrenz and Papol, because that seemed like a very valuable sort of thing for the accounting machine field where the customer would want to be easy to understand and easy to establish his print out format and all that.

S. Was this a printing device or a logic form?

M. To control logic. Now that was being used in the WWAM in the French lab and they were doing it by means of this plugboard. The key point of the idea that Estrenz and Papol had is that instead of the usual plugboard

machine where you want to wire the whole field to print and read from card positions from column so and so to so and so, and print in printer positions, so and so and so and so, where you take if you are going to print ten characters or ten columns, you take ten wires and wire them on a one for one basis, their idea provided a means by which you just mark at the beginning and the end with a so-called word mark and you'd mark the beginning of a field and the end of a field and you didn't have to put in all those what came to be considered redundant wires. And they had a scanning technique which scanned forward and backwards across the printed line before printing it in order to suppress 0's and float dollar signs and insert comman .... commas and that kind of thing automatically. So it was a very elementary ... a very elegant scheme. It was a very understandable and very easy to use from a customer's view point. So the name of the game as I say, was for Fran Underwood and Ingram and Rowley to see how it could be done to make a stored program machine and to retain insofar as what the customer saw the simplicity and elegance of this editing scheme that Paopl and Estrenz had come up with. So that was set up and... yes?

S. Could I ask you whas.. what was your real objective in setting this up?

M. To see whether we had an alternative approach which we could follow to achieve the initial purpose of the WWAM. Because it was becoming increasingly

evident that we weren't going to get there from here with the WWAM primarily from a product cost view point.

S. Well actually your little task force eventually came up with the 1401. Right? They were pointing at a European market.

M. Well the 1401 is directly because of that European market. The whole object was to find another way to get there for what was at that point mainly a European requirement although there was interest in the U. S. of course. That's why it was called the World Wide Accounting Machine. But we had all kinds of problems. There's no question. We had trouble with the printer. It was a stick printer. High performance mechanism and difficulties and so on. And as I say, the over-all machine cost and particularly the electronic cost looked like it was in trouble.

S. This was on the French WWAM?

M. The French WWAM and the German printer for the WAWM. So these fellows started touring down the road and they in fact did succeed in showing the feasibility of reducing product cost back to a reasonable amount to something we could more or less live with.

S. Which guys were these?

M. These were the three guys I had up in Endicott. Now we did not, at that point in time, we kept going for some while with the WWAM in both the

German and French labs in order to make darn sure that there weren't some obvious things that could be done that would cost reduce the machine and save the ball game, because there were two problems. One was to get the machine and the other one was to get it on schedule and the work at the European laboratories was reasonably well on the schedule we had to have, whereas if we dropped those and immediately picked up the stored program thing, there would be a big wrench in the schedule that was kind of intolerable too. So in fact, you know in hind sight you look back and say well we should have done it anyway and not in effect pouring more and more money down the drain on the WWAM. But that wasn't all that obvious at that time. There was a tremendous pressure to get this thing out.

S. What year was this now?

M. This was in '56. So in any event, we kpet the thing going up in Endicott and it started to grow and toward the end of '56, I was suddenly and unexpectedly appointed to be in charge of engineering for the World Trade Corporation. That was in the Fall of '56. So now I was on the other side of the fence and had direct control over the laboratory and of course including this WWAM program.

S. Did that have something to do with your employment?

M. Oh I suppose it might although I don't know. I suppose so.

S. That's one way to lay it on the line.

M. I knew the people down in World Trade. Dick Watson and others had been looking for somebody to take charge of their laboratories. There hadn't been anybody before. The lab had been there but there was no central management of it. I gather that they got to know me a little bit because they used to call me down there to find out how the WWAM was coming because of my job in the over-all accounting machine business. And I guess they finally decided well it would be a good ieda to have me in there. So in any event, the WWAM was sort of in death throes and the group in Endicott were seeing more and more sunlight in terms of the feasibility of doing the thing. But by my moving into World Trade, I kind of lost touch with what went on in Endicott and I can't give you a very good history of the 1401 , as it turned out to be the 1401 program. Chuck Branscomb acted as the over-all boss man on the thing but I don't know just when he started in that capacity. I don't whether he was put in there shortly after I left or not. But I've always sort of looked at the 1401 as though I were the father and Branscomb was the mother and had to carry it nine months and all that kind of stuff. I had the fun and the gleam in the eye, you sde. Now there were two things that made that machine feasible, the 1401.

..... the first was the stored program and the Estrenz-Papol editing feature was certainly an invaluable contributor also. But the other thing was the availability of the chain printer. It was sort of serendipity I guess that the chain printer was sort of on the horizon at just the right time to be chosen as the printer for that machine.

S. Was the chain printer developed at Endicott?

M. Yes the chain printer was an Endicott development. The chain printer was developed by a guy named Fred Demer, who was in the Endicott lab at the time in a kind of ad tech operation up there. He was playing with ideas for a printer and he kind of logically reached the conclusion that if you want to make a fast printer it has to be on the fly, printers that is. The type is not stopped when you hit it with the hammer. Now this requires a number of things. There were printers of that type in the market place. Sperry-Rand had had a printer of that type at several hundred lines a minute. So had others. But the logic that Fred followed was to decide well you can only make the firing time of the hammers accurate to within a certain degree and therefore the hammer doesn't always strike the character exactly right and it causes the chafacter to be slightly displaced from where you desire to have it. So he concluded that the way to have a character displaced is to have the minimum

impact on the general appearance of the printed page. The character displacement is lateral rather than vertical because then at least the lines read straight across and all you see is little variations in spacing between characters very much like the proportional spacing given you on an Executive typewriter. But of course these are more random now. But at least the general esthetics of the printing and the readability and all are better. So that led him to pursue this chain printer idea and he got up a late model with a few print hammers and characters going around it that could demonstrate printing at speeds of a thousand lines a minute. So at the time the 1401 really got going, they were casting about for a printer to go with this stored program electronic box and there was this printer, far from being completely developed. It had to be carried from the design feasibility lab model stage to the product. But that was done by giving the actual product development responsibility to the group with Joanie Deyger. So they carried forward the printer and the group with F an Underwood and those guys built on up to the point where they finally had the over-all thing that was announced was the 1401 and the thing was embellished and improved over a period of time. I don't know what else to say about the 1401.

S. Well I'd like to know about the WWAM and what was going on with the WWAM when decisions were being made about the 1401.

M. When I was in World Trade.....

S. How did that evolve?

M. It took a while but it was a long, slow process. Because you had.... you know the whole French laboratory was dedicated practically speaking to the furtherance of the WWAM and their ideas and their developments. And we did it finally by switching the French lab around into a mission which had to do with communications. This was one of the things that I did in World Trade at the laboratroies and that was to try to give each one of the laboratories a mission in the general area of technology, product and function to pursue. And the one we chose for the French laboratory was communications, data transmission, multiplexers, turbos and the like. And although it happened after I was back in the domestic side of things, I assume that because of the existence of that mission and the way it got off the ground and the capabilities that they developed, that the so-called Carnation Program got its start over there. This is a telephone central exchange switching system, automatic computer control transistorized and all that sort of thing.

S. When did that come into being, lately?

M. Well it's still not an announced product, although they had a model of it and I understand they've been making some tests with telephone companies. So I can't tell you when it started because I wasn't in World Trade

any more when that really got off the ground. But what I am trying to say is the French lab was given this communications mission and started to develop capabilities in equipment competence and data transmission and in the general problem of switching and handling signals over phone lines, modems (?) and the like. I'm sure that the reason they eventually wandered off into this Carnation Program was that they had built up a base of competence and interest in that thing and they could make ot .....

S. France doesn't have an equivalent of AT & T?

M. No. The European countries in general do not. First of all, their telephone systems are not privately owned like the Bell System. They are government-owned. That's why you'll see the term PT & T. It's Postal Telegraph & Telephone. Every government over there has an organization called PT & T and it is in there that they operate the telephone system and telegraph system and overseas telephone and all that, radio and everything else I presume. But they buy their equipment from private industry and they are not particularly beholden to any one supplier. There's a whole bunch of them. There's Erickson up in Sweden. There's Semans and IT & T and a whole string of companies over there that are like the Automatic Electric Company in this country, which is a typical example. It sells to any and all the private and

independent phone companies here. So they buy equipment . . . they buy whole systems. They buy exchanges and everything else on the basis of going out for bids and that's why a thing like Carnation is feasible to even the private market there as compared to here. Well . . . .

S. When was the decision on the WWAM made?

M. To kill it?

S. Yes.

M. Well I guess we probably finally screwed up enough courage of our convictions probably within the end of '57 would be my best guess. It might have been '58. I don't know.

S. Was that based on the feasibility of the 1401?

M. It was more on the unfeasibility of the way we'd been going.

S. Had the market situation changed?

M. No, we were still in trouble and still needed it. We took an interim step which helped save the ball game, when we saw that we weren't going to get there. Or let's say that if we were to get there at all, we weren't going to get there . . . we weren't going to get there at all we weren't going to get there on the original schedule. We started casting about for some stop gap measure, some RPQ or custom systems or whatever approach we could make

to give the French company something to sell, to fend off the Bull Company until such time as we had a real good solution. Then we looked around the company to find where we could grab hold of a calculator or computer of some sort and we finally ran into a machine which was in the back room up at the Endicott laboratory called the 628. Well it was called the 608 originally and it was a pretty powerful little machine, not as powerful as the 650 but considerably more powerful than the 604 and it had run amuck because there had been an edict made just about at that time that there was going to be no more development of machines with tubes. This was the edicts from on high and by gosh, all new machines to be announced henceforth in the computer field were going to use transistors. So this thing was built with tubes. It was called the tube 608. And interestingly enough, there were one or two dedicated type guys in the back room who had kind of kept that thing cooking along.

S. Do you remember who they were?

M. That's the trouble, I can't. I don't remember who those guys were. A guy like Ernie Hughes could certainly tell you but I don't remember. But in any event, after looking around at all the possible alternatives, we concluded that that was the right machine. So in order to get this thing on the air, we had to get the French laboratory to take it on because the domestic company wasn't

about to do anything with it. So we got the only model of the machine that existed, and we got one of these guys who was a technician and a good one, to go with the machine for some months over to Paris to the French lab and we got a guy to run the thing who was Max Paley. He brought with him his practically traditional lieutenant, a fellow named Eddie di Cambio. And those two guys lived over there in France for something over a year. They got the thing into production in what I considered apple pie order and in record time, using .... in effect acting as department manager over a bunch of guys in the French lab. Now you can say why the heck should we do that? Why weren't the French able to do it? Well we'll never know for sure you know, whether they could have done it without Paley and di Cambio. But the fact is that Paley is a pretty hard driving, tough guy and was not to be browbeaten at all by executives in the French company who had to do with say the manufacturing side. It took a lot of negotiating and a lot of table pounding to get the factory to establish vendors and things for the parts and things we didn't have and just somehow you know bulldoze the damn thing through. And Paley did that and the machine was a success. I understand they sold considerably more than we thought. We had expected we might sell fifty of them. I gather they sold something over 100 or 150.

S. Did they call it the 628?

M. They called it the 628. That's the number on the computer box and of course there's the accounting machine cabled up to it.

S. An accounting machine?

M. They used the 405, the classical accounting machine. It didn't have a high speed print. Well interestingly enough, I heard it was last year I guess, that there are still some two or three dozen of them out in the field on rent in the public utilities, electric power. And that's pretty interesting because that means those machines have been out there now for seven, eight years, maybe nine years. I don't know.

S. Is this mainly in banks?

M. They are sold in two places, public utilities, the Electricitat of France is one place for the billing operations. This was kind of cute. The thing could figure these complex rate tables. They charged so many bucks for day rates and night rates and power, you know, and in the banks. So I guess in those places where the work load was not too great, this machine could do the job and they like them and they keep them, an old vacuum tube gadget. So that kind of gave us a little breather, by getting that machine out, getting it announced at a price that was attractive, the heat was off the WWAM and the 1401 kind of thing in terms of the problem. That machine held them off and

the Endicott lab was able to proceed with doing a real good job of getting the 1401 out.

S. Was it after the solution for the marketing problem in France of the 628 was established that the WWAM was killed?

M. Yes. The final, final death knell was after we had that program going.

S. Well one of the things that I also wanted to find out is to what extent if any, the features of the WWAM went into the 1401?

M. Well as I say, the primary features that went into that machine were this Papol-Estrenz print and edit technique.

S. I see.

M. That was the obvious main thing. I think some of the general market requirements of the WWAM also showed up. In other words, the WWAM had certain specitifications requiring certain arithmetic capability which the old accounting machines never had. Accounting machines didn't do arithmetic except for just plain add, subtract, that kind of thing. But this thing could perform all the other arithmetic operations like the computer. So I guess the two main things that the WWAM contributed to the 1401 program was (a) the need for such a machine and (b) a lot of specifications of what it had to be able to do and then this Papol-Estrenz print/edit business.

W. That's a rather interesting tale for a machine that really put the computer as a mass market product on the map.

M. Yes that's right.

S. Did they sell a lot of 1401's in France?

M. Oh yes. World Trade sold a hell of a lot of 1401's. I don't know the number but it was big. It is still a very popular machine all over the world. The 360 has not completely dynamited the 1401. Everybody has predicted on a regular basis that the 1401 .... that we'd be warehousing them by the thousands for the 360.

S. Yes.

M. But I gather that sure it is happening to some degree, but it is later and at a lesser rate than they thought. It is just a good example of the fact that if you've got a good machine that has a good function and a good price, the tendency is for those machines to stay out. The customers understand and they know what they will do.

S. Especially when you get out in the big money range, people are always making management decisions to go with the most advanced technique.

M. The guy that has got a bread and butter job to do must watch his money. Admittedly the customers don't want to switch programs. They continue

to keep the emulators and stuff like that going. They made up the Model 30 and they like them on the 1401 so they are going to continue their programs. Well the 1401 has had a tremendous impact on the whole computer community, if you will in terms of the widespread use.

S. What was going on there in the French lab when you were there? Was it mainly the shaping up of the mission business?

M. Well we had a series of things going on. We had another guy who was living over there. He was there when I got there. They had somehow arranged it, a fellow by the name of Roy Harper. He is now in San Jose. He's I guess a good example of what Tom Watson calls a wild duck, in that he's an independent electronics type guy who is always getting new ideas and is in fact the inventor of several valuable circuits that are used in IBM. And he was over there trying to get a little machine. My memory fails me but it involved an electronic box mounted underneath a key punch and as a result of doing key punching, this machine could do certain computations and punch them right back into the card. I can't remember the number of the darn thing. Anyway he had had this idea and the French company again needed this thing in the market place, or thought they did. They got Harper and he bundled up his model that he had been fooling with in the labs here and got him over to the French lab and so

there was a project there involving a dozen or so people working with Roy Harper trying to get that machine up to a product and get it announced and so on. It never flew, as I remember. They had several good models but I don't think they ever got it announced. Then in parallel with that we were getting started in this communications and data transmission kind of a mission for the French lab. We finally got that up there to the point where we had portable test generators and test receivers operating on a so-called pseudo-random bit pattern principle that we had in cooperation with the phone companies, the government phone companies in several of the European countries under their auspices and their encouragement. We had been allowed to run data transmission tests on a whole variety of their communications networks. Some even over radio systems. We were to try to find out what were the technical characteristics of their phone lines for data transmission. What kind of speech you could get, what kind of noise was on these lines and all that kind of thing. We were gathering all this information and just to show you that you can't stop something completely, the WWAM computer electronic box that the French lab had developed was a computer that they were using to process the test data that they got by going around and running these data transmission experiments and they could count errors and count all the noise pulses and put statistical reports that said, the telephone

line that goes from Geneva to Paris has an error rate of so much doing transmission by this or that technique, noise signals and all that kind of thing. And they would take these results and give them back not only for our own use but also give them to the telephone company that was charged with a particular line that they had tested. Then in the CCITT which is the International Committee on telephone and telegraph standards.... they set them and such things for the world, there was a committee on data transmission and all these different PT & T's would go there with under their arms the reams of data that we had generated for them. They were doing it themselves, whether for lack of interest in spending the money or whether it was lack of the right technical people, but they were using all that data that we were feeding them to in fact try to negotiate agreements on standards for data transmission across the European phone lines and so on. And of course we had a representative on that too. So it was all sort of amusing because our representative there had access to all the data and each of these individual phone company guys only had his own data plus whatever the others might or might not show him, because they were very secretive about it. They didn't want us to give the stuff to other people because they didn't know whether they would be embarrassed or not by the fact that maybe the French phone lines would look lousy compared to the German phone lines.

So everybody wanted to keep his own. But that got to be a fairly substantial effort and we had to build several sets of this test equipment. We had a bunch of guys doing the data reduction and as I say, using the WWAM electronic box prototype to do the computations. They had it and of course they were interested in keeping it running.

S. I take it it was running well.

M. They had the electronic box running pretty well at that point, yes. The cost was the problem on the electronic box. The printer on the other hand was the problem of getting it through Product Test. This was a very high performance multiple stick printer. I think we could have gotten there. We had plenty of trouble with the chain printer getting it through Product Test too but the chain printer seemed to have more promise so we put naturally more of the effort into getting it developed and getting it through test and getting it tooled right and all the rest where the German effort was never given that impetus and I think probably we did the right thing. I think the potential for further speed improvement and all with the chain printer was there, whereas this multiple stick printer kind of pressed the sound barriers of mechanism.

S. Well I was going to ask you a question about the 3000. I'd like to know what the impact was on the European laboratories with the defeat of things like

. . . . . .

M. Well that's a problem all right. You see, especially the French lab and the Gefman lab, they were the two labs that had been there for some long while. They had had little development groups, not really called laboratories I guess since this was before the war in these two companies and nowhere else. None that I know of. So when I came on the scene in World Trade these were by far the biggest of the laboratories. The Dutch lab was just in its infancy. The British lab again consisted of thirty or forty people. The Nordic lab was not there at all. But these two laboratories were a good size, three or four hundred people if I remember the numbers right, each one. So .... and a lot of the people in those labs were quite a long time in the business. They were a lot of old school mechanical, electro-methed....electro-mechanical people and it was like one time as we used to have in the Endicott lab or similar to this. There were a lot of non-college graduate people up through the ranks and practical engineers. And they were just at that time starting of course to bring in ....to recruit in guys with engineering degrees quite heavily in the field of electronics in which they didn't have much background. But they had always consistently been in the problem that the American management tended to kind of ignore them. Not the World Trade American management .... they didn't have a guide until I .... or a leader as we had here in the States. But the domestic company

had a tendency to whenever it needed something done, it would rather than to try to tap one of these laboratories to take up some project, they would just take off and do it themselves here. They would just pretty much ignore that these things existed I guess you would say. And I guess the first time they really got their hands on something which was of high importance to the company, was this WWAM. Prior to that time they had done some modifications to existing products. They had made some further model versions of the 604, for example to give it more power and they had made modifications to some of the accounting machines and the dual feed carriage was one of their things on accounting machines over there and I guess there's probably a long list which I'm not really able to talk to, of things which could be called modifications to available hardware. But a complete from the ground up program hadn't existed. So naturally there was a tremendous enthusiasm for the WWAM and there was a considerable morale problem when the WWAM went away. Now probably one reason that this morale problem wasn't disasterous was the fact that they hadn't succeeded to get where they thought they could get. Because they had been participants in let's do it this way which used the plugboard .... they were given every doggone opportunity in the world to do it. So that's one of the reasons the program maybe stayed alive longer than it might have. Because it was always, well gee whiz, if you just give us another couple of months, we've got

a couple of things here that we see can cut some cost. So we tried to give them every benefit of the doubt and I think because they had that opportunity and it was their own doing in effect, and it was unsuccessful, if it had been the other way around, if their program had been looking pretty good and we started up a thing like the 1401 over here and just said, oh well, we've got something over here. To hell with you guys. We'll go ahead with the 1401. That would put a different atmosphere on the whole thing. And in fact that was one of the things that we were always worried about on any program. Because there had essentially been some examples of World Trade people who would get going on some particular area of endeavor and the next thing you know, somebody in the States would hear about it and more or less start up a parallel competitive project .....

S. In the old tradition.

M. Yes. And then there would be a big battle back and forth across the ocean because the guys in World Trade thought they were kind of being snookered you know. So I know Dick Watson and of course m self were very concerned about that in World Trade. That general subject is still a subject of some interest. I know Dick Watson is always on the lookout for evidence of that type of thing happening and trying to act a little bit to protect World Trade labs' interest you know. So the German lab of course, we changed the management of the German laboratory. It was under Walter Scharer. He was there when I

came. He had been running it for a long time. And in fact he had been at the Endicott laboratory for some years before the war and then went back to Germany I gather just before the war started. He was the lab manager there. He had this printer fot the 1401 and the card reader and also a separate program which was entirely a German lab project. This was a split between two or three labs. That was what then was called the Tiny Project which eventually got to be officially known as the 3000. But everybody just called it Tiny at the time. And that program, as I understand it, was originally kind of kicked off by Mr. Watson, Sr., who had for years been trying to find a way to get the machines simple enough, small enough and cheap enough to be interesting to a smaller and smaller segment of the business community than we were able to attack with what we had today. And of course that has been a subject of conversation and interest since I can remember. We do a lot for the bigger guy but it really doesn't help the small guy. So as a result of his I believe personal discussions with Walter Scharer, this would be several years before I was in World Trade, some time in the early 50's I gather, the German lab had cranked up this 3000 series and one of the hopes was that there would be economic savings by virtue of using a smaller than standard card, much smaller. This would save the cost of the card stock but there was a good cost saving in the mechanisms in that something that is smaller and automatic has got to be cheaper. That

kind of thing. ..... but the card feeds and the handling of the smaller piece of apparatus... of paper, it essentially being less flimsy of course by virtue of its size and all..... So they had this set of equipment which involved a key punch and a verifier and a sorter and an accounting machine. The accounting machine contained within it a punch so it could punch output cards and it had a printer and a card reader. And it had some interesting system features. It had a multiple card path, two hoppers and it could merge cards and so on in the course of reading them and punching. I guess if there's one thing that came out of the 3000 series that found use in the company it's the multi-feed card machine and so-called MFCU, multi-function card machine. MFCM I guess they called it. I think it is a 2560 but .... 25 something in the 360 line. It is a direct descendant of that idea and it turned out to be extremely popular and it was a fairly expensive machine and when they announced it, I vaguely remember that they forecast only maybe 15 per cent of the Model 20 customers would be willing to pay the price to have this multi-function utility. So the forecast was one out of twenty customers. It turned out the other way around completely. Some 85 or 90 per cent of the guys buy that at a pretty good price. So they had a systems idea there which was proved out later to be very attractive. So we had nothing but problems with that damn thing. Over a period of time we were getting closer and closer to being able to announce

....of being able to announce product test and all the rest. There were two kinds of trouble I guess you could say. One of them was on the financial and marketing side and the other was technical. Well there were a number of technical problems really. But the financial side was that in order to ever get the thing out at a price which the forecaster or product planner and the like people insisted it had to be in order to ever hit the market the thing was intended for, that it had to be sub-normal in profit, quite substantially sub-normal. Maybe one-third normal profit kind of a thing.

S. The market was the very small business man.

M. It was the small businessman, the small bank, that kind of thing. So if you're going to put out a system of this magnitude, well with all new cards, that meant all new electro-mechanical equipment and to get the cost and all the rest, it even had things like the counters were mid-developed. The printers had new mechanisms, the whole business. Well in order to do that of course, you can imagine there are more than usual opportunities for trouble in terms of (a) the cost over-all, (b) just making the model. But we finally got to the point where Dick Watson decided he wanted to go ahead with the program regardless of these questions about profitability and he did so, because he felt and I think rightly so, and people still pursue the same principle, that

End of Track #1.