Interviewee: Harlan Elkins
Interviewer: Robina Mapstone
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MAPSTONE:

This is Bobby Mapstone, and it is January 29, 1973 and I am talking to Harlan Elkins at North American Rockwell.

ELKINS:

Do you want me to go back and give you a little [about] ... areas that we [dealt with and] some of the, what we felt from our exposure to other systems? OK, my exposure to the VER--was mainly in the VERDAN computer area and in late 1959, when I was assigned to the program, originally assigned to support the Air Force program, the GAM 77 Hound Dog. And I was sent to Eglin Air Force Base during the flight test of that--the GAM 77 missile. At that time the computer had, from the field application, had probably one of the most advanced checkout systems--or, called methods of checking the system out. I'm talking about the computer, the black box in front of the missile, and also the missile itself. They had self-test tapes which were developed automatically to check out the different--the system at different levels.

For example, they had the tapes which you could check the air--the total system out under the wing of the airplane. And also, the missile could be removed and checked out in the, what they call a bench area. And they had equipment which you could remove, and the computer was installed in a console, the VERDAN computer was installed in an 039 console, they called it, and you could run different sections of tape to check out different black boxes. And last, the computer had self test tapes to check out itself, and this was designed to the module level. However, it was, at the time, in, I would say, in early time, they felt that this computer was going to be a little too complex for the users. The Air Force users, the blue suiters, as we called them, and the white hats, because they developed another piece of equipment called CONALOC, Continuity and Logic Checker, which was used to aid in trouble-shooting the computer. But this required installing extender cards in the place where the flip flop modules were located. And the flip flop modules were then reinstalled on the extender cards, which was a thirty minute operation and it also induced problems itself.

MAPSTONE:

By extender cards, are you talking about a sort of, like a ...

ELKINS:

This is part of the CONALOC. The computer is built in a little box about 8 by 15 by 22 inches. And they have these modules that were about 8 inches by 3 inches, and the extender card would be inserted where the flip flop modules were. And then the modules were installed on them. The computer, the CONALOC would then exercise, set and reset gates by tape program. And [it] was believed at that time that, due to the complexity of the machine, due to the time sharing and all that, that this was beyond the capability of the Air Force technicians. And that is the reason this CONALOC was developed.

MAPSTONE:

It's a terrible comment about the Air Force technicians, isn't it?

ELKINS:

Well, at that time--as you remember, most of the stuff was a servo-type thing, where you traced the signal out, and the computer relies highly on time sharing. In fact, that is one reason to condense it down to a package that size because of the time sharing they had. One circuit could work, perform many functions by virtue of the program and whatever you had in it. But anyway, going back to that, and this CONALOC was originally designed to support the maintenance of the computer.

However, it was determined that--there was also developed self test tapes. And these self test tapes finally proved out, and also the confidence and the skill of the Air Force was proven not to be as we feared. And the computer was actually maintained by using these self test tapes. Now at that--oh, a few years following that, we found that in some of the concepts that we were using, actually we had a control panel which used Nixie displays with this device. The maintenance and the concept we had of it seemed to be quite advanced over other companies which had their equipment in the field at the time. They were using scopes to get in and actually read and read the memory. We were actually going through this control panel device.

So, the computer was well, as far as the GAM program was pretty much utilized for maintenance and actually, doing the navigation problems. In that program. I later was taken off that program and put on an R&D program with Bell Arrow Systems which they were doing tests, like I say with the HYPERNESS II program. And this lasted for a year or so. From there the English redeveloped a version of the VERDAN, called the D-9-D, but the first VERDANs were regular D-9A IIs, which was the basic computer--assigned to the TSR-II program in England, where the computers actually were used to solve some of their navigation and [?] problems. And the computer also used on the RA-V(5), well at that time A-3-J program, the Vigilante Navy put the company in five eights system. I don't know if you want to go into detail with these nomenclature...

MAPSTONE:

Yes, it would help.

ELKINS:

The A-S-B-12 system, this is the system, the navigation system in the A-3-J or what is known now as the R-A-5C aircraft, strictly a recon aircraft. The computer was used in DINOSAUR program--a D-90-H computer was developed for that, for VERDAN was designed for a two taped shot in vibration--the DINOSAUR program was one that was supposed to be for the manned glider thing that the MINAC ... was developing. There was a second computer that was developed for that, called the V-9-L VERDAN. And this was extended memory. It's similar to the VERDAN 2 which is now called MARDAN, for the Navy Polaris.

MAPSTONE:

MARDAN brought it down to marine level then.

ELKINS:

The MARDAN was a marine level yes. Also, there was a MARDAN that was flown on the--with a HYPERNESS 2 system, with a program that was also do with the radar for conductors just outside of Ann Arbor, Michigan, I think, where we did some work there. But the V-9-L and the MARDAN had light memories, only the MARDAN had a double GP and a double DDA, and the V-9-L, I think, had a double GP and a single GDA.

MAPSTONE:

Okay. I think we should explain the term a double GP.

ELKINS:

Well, General Purpose section, where the VERDAN had sixteen hundred words; the MARDAN had four thousand and ninety-six words, and the Real Time Section that Bill was making reference to--that had two DDA's instead of the single one which is in VERDAN today. You had two sets of them. I think the V-9-L computer had only used the one DDA. And the four thousand and ninety-six-word memory. The VERDAN was also used by Philips Petroleum to run butane kettles at Borger, Texas. We were down there for about six months. We actually tied it in to, I think, two kettles. At that time, I think, they run at a higher efficiency than they ever had and a more pure product came out. The problem worked out that the machine was a little too expensive for their operation and they were worried about the cost standpoint. They actually controlled those kettles. Then they threw those machines out. The company actually, put money into them, too, to work that.

MAPSTONE:

Did they appreciate the state of the machines?

ELKINS:

No. The machines were pulled back out. They were company owned. And they were pulled back out. They--between Philips Petroleum and the company, they were trying to come to some agreement to go into that market. And due to the costs they were, I think most of the stuff was analog at that--that they were working in competition with. They figured they couldn't even be competitive at that. There were several small programs. Some of them were classified after VERDAN was put in. They were in the attack sub where they--a D-9-J computer was developed. This was without certain analog sections. The Navy identified it as a J. And these were put in attack boats along with the, I think this N-7-B system or something like this. They started out, right after that, the VERDANs that came and the MARDAN8s that I mentioned earlier which in the later series of Polaris submarines are in the--I think they reliability where they had three systems?

MAPSTONE:

Yes.

ELKINS:

They have two now because of reliability. I think they are exceeding five thousand miles in TDF with the MARDANs, without having control program. One VERDAN, this is in the classified program, was married to a Litton system. And I think there were--they are flying in some modified KC135s.

MAPSTONE:

Which Litton system was this?

ELKINS:

Well, LN-3, I think it is. This was done in the period 1965. And VERDAN was tied into a test program, called N-3-A quick check as we identified it. And in a B-58 out of Fort Worth area. That is the time Castro was raising trouble in the Cuba area and they mentioned they made quite a few runs down in that area. The DINOSAUR program, after it was cancelled, the VERDAN was, the Minneapolis Honeywell system was transferred to the X-15 program. And there were some VERDANs that were flown then. Some of the early problems that they were having with the computer was that aircraft power, every time that they switched from ground power to aircraft power, it always induced a transit in the system and caused the computer to go into an interrupt and it created all kinds of havoc with the program.

MAPSTONE:

How did they get around that, do you know?

ELKINS:

Put motor generators in. I know on this B-58 program they had problems like that plus the cooling problems. The aircraft systems aren't as pure a systems as some of the missile systems and they would throw water into it. You know, due to condensation they'd get water into the coolant and cause a little bit of corrosions and ... and that type of thing. So we had one case--we were having termination of flights and we finally convinced GD--and at that time GD was down on the VERDAN.

MAPSTONE:

GD is?

ELKINS:

General Dynamics. And they had a Mr. Gude which is the or was he...I think they were gearing up to--I forgot the program we were in competition with. I think it later on proved to be the J 6-J-3 which was--they were trying to shoot us down on that. But we were having flight term--been terminated due to

the VERDAN, and over ten. We found out they weren't giving us the air that we thought we were getting during the aircraft--one phase of it. Prior to takeoff, they cut the air completely off. And so, we investigated that and found out that was happening, and it was later corrected. And after that our flights were--worked out real beautifully. And on the X-15 we had some similar problems due to the power transfer. Let me see. VERDAN got around to quite a few different programs. I'm trying to think of--it is probably one of the most widely used computers in the Air Force inventory. The reason for it--it had an input-output capability over every other computer that I ran across out there. And we were involved with--in, I'd say, in almost every aspect. In fact, I was supervisor over the field during most of the two years.

MAPSTONE:

I was going to ask you that question--what was your position?

ELKINS:

I had--I was a rep and then I later became the supervisor over. And then there were quite a few classified programs at that time.

Now going beck to some of the other computers like the JUKEBOX, later became the FADAC. And the company built five of the FADACs which were to replace the JUKEBOX computer and also, I guess, take on more of the problem you might say for the Redstone Arsenal. No, Frankfurt Arsenal. We built five of the R & D types and we had very good luck with them. In fact, they dropped them out of airplanes and beat them around back of trucks and they worked like a charm. They had aluminum disk, I understand, and it so happens we were phased out of that when the production contracts were awarded to another company like Teledyne or Malco I think. Even they found it surprising when their contract was awarded to Magnavox and went on that way. But the Army I guess had somewhere in the eight hundred FADACs around. But they were designed and initially built by this time. I can remember some of the problems with the memories of those FADACs from the standpoint of Amalco when they first were awarded the contract. They came back and they found out the powerpack you use to start the motor was four or five times what ours actually started and they thought this was a little conspiracy on our part. But it was proved out that they had some problems they had to work out. From the FADAC, I guess, the next generation computer is--let's see, I've hit the MARDAN--it's the RECOMP. It started pretty much out on--I wasn't too closely involved in that program, only here lately trying to sell it for about three thousand dollars a piece.

MAPSTONE:

Now?

ELKINS:

Yea. The company essentially has written the computer off. What we have done is trying to get them to certain people that might have some use for them. And they are in the warehouse in different states of--some of them are operating and some of them are not. And in order to get them to an operating state, we tacked on a little fee to actually go to the expense of putting them out.

MAPSTONE:

When did RECOMP II come out?

ELKINS:

Oh, I think '59--yeah, '59 time period. But they were later built in early '60 and I think the RECOMP II came in by then.

MAPSTONE:

The RECOMP II-2 would be—

ELKINS:

It was probably designed in the same time period as the VERDAN, right after the VERDAN, thereabouts.

WF:

That was designed starting in '57 and '58.

ELKINS:
'58 time period.

MAPSTONE:

So, we are talking about a pretty dated technology. Radar for conductrons? Oh, yes. It was, I understand, one of the first commercial solid-state machines out. And I think they sold for about ninety-five thousand dollars.

MAPSTONE:

You are selling them now for three.

ELKINS:

Right.

MAPSTONE:

What was the competition like?

ELKINS:

On the RECOMP?

MAPSTONE:

Or on-

ELKINS:

The VERDAN? VERDAN really had no competition. We couldn't produce any more--we were putting out, I think five machines a week--tried to get five machines out. If I remember, the first one-the VERDAN opens--the modules on the outside opens out like a suitcase and the wiring is on the inside. The wiring was so thick that we couldn't shut it. And I can remember those machines they were trying to--like in a half inch--getting the thing hinged to. We finally put a night switch in where they wouldn't have to run wiring bundles across and two eighty-six pin connectors to eliminate those wires. We finally shut them at that time. But VERDAN had no competition in those early days. We had more customers than we knew what to do with.

MAPSTONE:

Within the Army or outside?

ELKINS:

Within the whole works. Everybody was trying to get one. People...

MAPSTONE:

Everybody wanted something to fly?

ELKINS:

Everybody wanted something to fly. It was the only machine of its--it was the machine at that time. Like Bill says it's--a while ago--he says it's--there is no machine been made like it. There were people turned down. In fact, I think there was clamoring in certain agencies in the government trying to obtain that machine. It was that much in demand.

MAPSTONE:

When a government agency had commissioned the machine, it was built, it was proto-typed and then it was manufactured, did you then actually work it in the field? You had to go do some kind of training?

ELKINS:

Oh, we trained on it. Well, our problem in the stages was that no one in the field really knew how to maintain it or operate it. I know when I first got on it—

MAPSTONE:

Did you have to train people?

ELKINS:

Yes, we did. We trained Bell, we trained Air Force. In fact, my first few weeks at Eglin--not Eglin, yeah, Edmund Air Force Base was to train Air Force technicians. And also, our other users. We trained them in programming, and operating, and maintaining it. The machine was unique from the standpoint that most equipment prior to that was all analog. This was one of the first digital machines out. And no one really understood that technology at the time. It was like, well, a desert absorbed with water, and you could talk all day on it. Numbering systems, you know, like is played everyday in school today wasn't that at the time. And you had to go back and teach basic numbering systems, Boolean algebra and talk about [?] diagrams and all of that. It was maintained, not from schematics necessarily, but from equations. We went back--we had quite an education ourselves from the standpoint, we were like a receiver when you--if you put a signal in here, you get a certain signal out over there. It is not that way with that computer. Things happen at a certain time. And these times are within seventy-three microseconds and if you could have a probe on a point, you'd never see it if you didn't know what you were looking for. And so, we had to reeducate people and that's what we did. It was quite a learning curve for us as well as the user. And in England, where I guess their technology was quite a few years behind us, and I took the machine around to different high-level people over there to demonstrate it. Most of the first two months there was just showing it, because they had nothing like it. They were playing with tubes while we were playing with solid state equipment. Getting it through customs was a real problem.

MAPSTONE:

I bet. Tell me about it.

ELKINS:

On some of the tests--the support equipment we--in the early, the receipt of it in England, they had right around all the little dolls and pottery and everything else that comes into the country, they had this big console. And we shipped things out by title and then we tore it down into different little boxes. And they had quite, I guess, quite a tariff on electrical--electronic equipment coming in at that time. So, we spent two days down there just breaking it up and putting it together there to show what it was to the customs people.

MAPSTONE:

Oh, before you could get it through?

ELKINS:

Right, and then it was another little problem to realize everything over there is 50 cycles and 240 and we had a 110/60. We had to do some converting of some of the power sources. Another thing, too, their scopes and what have you, at that time, I told you that the computer was in full demand here. We did not have a control panel for it--the VERDAN--so we made what you call an interim which did not have a display and we had to use a little trace scope to read memory. And obtaining a scope over there to do that was a real problem at that time. Because we steal the signals and the levels and we were having to

build a new scope for it. And the factory was a problem. So that dates back a little bit and, I guess, at that time, they themselves said they were ten years behind us in terms of technology.

MAPSTONE:

That would have only been some areas, because in other areas they were actually a few years ahead.

ELKINS:

I think in their digital--they had commercial computers of where we were at and they had tubes and mostly all tubes. They had a lot of computers that taped like we were. And they had some sharp engineers there. I'm not downgrading them because the people that we interfaced with were their best. Paul Ranier was one--he was the responsible engineer of the thing. And we actually trained them in both the hardware and the software.

MAPSTONE:

Did they buy?

ELKINS:

They bought and they also were licensed to build--to build VERDAN. The V-9-V version of the VERDAN only.

MAPSTONE:

The V-9-V.

ELKINS:

Well, see the VERDAN came out with a model number which is a D-90-1. And then most of the computers out there on the GAN are V-90-2's. And the V-9-L or V-9-H is DINOSAUR and the V-9-L is DINOSAUR. And the V-9-D would be the Elliott version model number of that machine. That is the way we identified them.

MAPSTONE:

And Elliott--what's the

ELKINS:

Elliott Brothers.

MAPSTONE:

They used to be, I think at one point they were in the calculator business, too, weren't they?

ELKINS:

Yes, they were a commercial computer, too. In fact, they sold them to Russia. You know at that time we were a little more leery--thinking that anyone dealing with the Russians were taboo. They did sell them to Russia and actually sold to Germany and sold them to France. Their own computers.

MAPSTONE:

So, in other words when the government commissioned a machine and you've got the contract to manufacture it, you also had the license to then go out and float it?

ELKINS:

Yes, but we had to get approval through the U.S. government to sell, to license. We did this on the MARDAN too.

MAPSTONE:

So, if you wanted to sell to an alien country, for instance, not an alien country, but a country that we we're not perhaps friendly with,

ELKINS:

you'd license

MAPSTONE:

conditions with, you had to get it licensed.

ELKINS:

Right. I don't think the VERDAN--actually I think it was built under government contract, which meant that we couldn't even sell it commercially without their approval.

MAPSTONE:

Within the country?

ELKINS:

Within the country, yes. I know the B-17, the memory itself would be a problem to sell out of the country, you know. The B-17 was going right along with it.

MAPSTONE:

You mean because of technology not being up to date.

ELKINS:

Right. And it was built on government money. I'm pretty sure that would be a problem. The B-17 was running along in the same time period as the MINUTEMAN computer. It had its more special purpose and all you really have to do is certain problems and have those requirements--requirements. And it grew into a D-37-B, which was a test version of the APOLLO 1, not the system but the C and the B. The B-37-D was surplus and they were using it for surplus and the Navy was using it for torpedo testing somewhere in England. We disk memorized all these machines--it started out that the JUKEBOX was an eight-inch disk, and the VERDAN was a five inch disk, and the B-37 family is a three inch disk, and still stacking more bits on. And the maintenance of these machines were about the same as far as depot you know, they are all parallel. The RECONP--no, the FADAC used the CONOLOC again, going back to the

MAPSTONE:

Checkout system.

ELKINS:

checkout. Now that was a little more successful, because the wiring circuitry was built into FADAC where you didn't have to use these extender cards. They proved out to be a real asset to Army-Navy where VERDAN--you keep the weight down and the size down, they actually used the extender cards to keep it out of the machine itself, which was detrimental to its maintenance. We had more trouble with the extender cards than we did with the computer. Going back, I guess, there is quite an education in the change of philosophy in writing the training manuals, writing TO's and the maintenance attack to actually, maintaining these computers in the early days. I have some of them,

MAPSTONE:

Oh, do you?

ELKINS:

some of the training type manuals and I find we trained too deep, trying to give too much information, and then we had to back off.

MAPSTONE:

When did you change your philosophy?

ELKINS:

Well, when I say philosophy, I'm talking about from one type of equipment to the other. You take some of the equipment that we developed that you didn't have to say automatic test routines that you could put into the machine--the TO's are a certain data that you put in like, you run flow diagrams and give descriptions. On VERDAN you couldn't do that because the thing was maintained from equations. And you had to identify to these equations, like if you once set something and it was generated by--the signal

was generated by a certain flip-flop, you had to go through your logic and you had to find out where it was generated from. It was--it all went a certain bit time, which in the VERDAN case was twenty-seven bits. That means there is only one at that bit time for seventy-eight microseconds. You couldn't see that soon time. So, you had to go back and figure out well how are you going to put this down for that technician to--and this is something, this is a digital system and we hadn't worked with that before. See that created some problems in writing all of this--in putting it out where it can be easily seen. And also training from that, too. But from that point we learned and now we, I guess, most all of our systems you know, that type...

MAPSTONE:

Furnishing experience.

ELKINS:

Well, they started out like most of our maintenances on VERDAN--someone calculated whether you have ten thousand articles of memory that's the life of the memory. That is not true though. In fact, when I was at Bell, they were worried about that little problem of ten thousand hours. Those same machines are still working whether you still have the same memories in them or not...that motor in them.

WF:

Which is a lot more than ten thousand hours.

ELKINS:

Yes. The computers that we see with five thousand hours in TBL and the same type of memories are in the B-17 which is way, way out.

ELKINS:

Right, in fact a complete missile was taken out of Elsworth here a year ago or so. I think it had a birthday at that time. It was six thousand--I've forgotten--I had better back off...

MAPSTONE:

Hours?

ELKINS:

Yes. The whole system. I'm talking about the missile system. I've been mostly here lately trying to get a home for some of these retired B-17's.

MAPSTONE:

[Laugh].

ELKINS:

I've been helping some people out at DSA.

MAPSTONE:

You talked earlier about having some notes.

ELKINS:

Oh, I have some of the old ones we tried to put out. Everything was classified. We had a page on it that was classified. Yes, I have some of the ones that were on the GAN's and some on the N-7. And the continuity is not too good, and they had to go back and pick up the basic--in fact I have some I have one on the--that came out of the JUKEBOX on that. That is an old army manual.

MAPSTONE:

These are obviously no longer classified?

ELKINS:

No.

MAPSTONE:

Is it possible to get copies of them?

ELKINS:

I guess so. I could probably give you what I have. I don't use it myself anymore. I have it you know--one of my first –

MAPSTONE:

Yes. Well, you know, if you don't want to part with them...

ELKINS:

No, that's no problem. You can give it to my friend here. Yes, it went back. What we had to do was teach about, go back and teach Boolean and all that stuff, number systems, something my fifth grader gets now.

MAPSTONE:

That's new math, isn't it?

ELKINS:

Yes. That is what they call some of it.

MAPSTONE:

They are going to make it. (Laughter) You talked earlier about competition with Sperry. This was before we turned the tape on.

ELKINS:

Yes. We were-- -e Sperry is prime system integrator on the Polaris on the 598 class, I think the company was supposed to split the systems. I think we really came in as second source. When it came time for the system then, well Sperry wasn't ready so on the 598 we put one in and we put I think four or five sub. We wound up putting all the N-7-A--called it at that time--systems into that class, and they came in and put in this 608 class, they came in and put--there were three or four there--and they put all of them in there. In the 616 we wound up putting all our systems in there. In the 624 and on up on the following. And later on when it later came to we'd been only second choice and we wound up doing their job with the 608 class and putting our systems back in. And again the reliability and all that of the--the VERDAN and the N-70 system--they dropped down the later system from three redundant systems to two redundant systems because of the reliability. And this is primarily the VERDAN and the other part is the N-70 system. Sperry was our competitor at the time.

MAPSTONE:

So, they were kind of wiped out?

ELKINS:

We wiped them out in the Polaris and the Centaur[?] But they are pretty closely knitted into the Navy. The admiral's in Sperry.

MAPSTONE:

Which division of Sperry Research?

ELKINS:

This is out at Sausi. And I guess we were competing with Hughes on some of their computers also. I know that Bell, when I was up at Bell, they were looking for an airborne system, and airborne computer that could compete with VERDAN. There wasn't anyone at that time. This was in the 60-61 time period. We were competing with quite a few people. I guess I don't remember the names over there. I know there didn't seem to be any problem. Everybody was quite concerned when they took our computers. I think there was more competition of the platform than there was in the computer area.

MAPSTONE:

Did you ever take any of your devices to any of the computer shows?

ELKINS:

I did myself once. The FADAC--some of the first R & D FADAC's were taken to New York to the different NATO conferences over there. One of the reps is in engineering now--Johnson--went over with the Frankford Arsenal people on two or three occasions. VERDAN had been over to shows over there. And I think Howie Maddox when he was over at Elliott Brothers when he was--probably could have been the early version or the V-9-V version.

MAPSTONE:

What was the reaction by your customers--the military--you know periodically you would bring out a new machine that was going to revolutionize and make the missile fly faster, easier, whichever it was--but did you find resistance to when people would sort of ..

ELKINS:

A lot of problems arose from--with a machine like this--and we had problems, there is no getting around it--we had a machine out that was voltage sensitive. It had automatic features to cut it off when it received a high voltage or low voltage, when it received a high temperature or a low temperature and no air and that type of thing. And when it received one of these things it cuts off. And here you are working a problem of theirs and all at once, they do that to you or something happens that air is cut off, or voltage is too high--you get something like this due to something, and it shuts them down. We are the nucleus of their system. And consequently, we have a problem in a lot of those cases. And that was an education. You had to get on pure power and make sure you had the right air another thing too, we found out that if they had a programming problem, we had to program in machine language--the machine--you had an essentially binary machine is easy to convert to octal--so you had to talk to it in octal. And that was an education you had to go through with. There are a lot of problems that come in and say hey, you have got a problem here. And you had to go find out and you found

MAPSTONE:

[Sneeze]. Excuse me.

ELKINS:

it wasn't your machine's problem it was a programming problem in some cases. We had problems in other cases though. But you always had to defend you machine because always. Even in our own divisions where we had NSD and DSD divisions--well, we had a Navigation and Computer division we were always defending our machine division. Even in-house. So, it's nothing uncommon. But people were more concerned with the system and we were more concerned from the computer side. So, we were--there were just things like that. I guess you might say--living with it--it took a little time to do that. To educate people. And after they had gotten educated, they were pretty much sold by it. I guess the biggest thing, they saw what the capability of the machine had been. And you look at today's standard, it is not much--but you...

MAPSTONE:

Oh, right, but that's no judge.

ELKINS:

No. You look at that time and it was quite a thing. It had an input-output that--like the B-17 had no analog...The VERDAN had that in it at that time. It was about the machine in its day, I imagine.

MAPSTONE:

What about the programming--did you package them--well we are talking about programming of a different type, aren't we?

ELKINS:

Yes. We are talking--What we did and I say we--the users, the programmers and the people that had to do it--we made little GP disks and a little DDA disk. Out of plastic and out of metal. Of each. And you fixed it where you made it easy programming. You gave a--there was a little book written first to tell them and then later on something like a slide rule and disk--tells them how to program it. When you first--had to know a little bit about it and then you use this for aid of programming and that was given to the people to use. There were eight in the program. What integrator was available and all that through the DDA. We had one for each of the GP and one for the DDA.

MAPSTONE:

Was this a service you sold that went along with the machine?

ELKINS:

Yes. We just did. There was rather a little handy thing for maintenance standpoint--little cards--like the input and output of flip flops. We would run the computer in certain routines and you would fill memory and you would check out and see what was written and you'd find out--well, the self test program was--first you check your input--output. I think twenty five percent of the machine had to be working before you could even take a tape, for example. And then you would check and see if you could write and all the memory read. And then your input--output was checked. You had to tie an I/O device onto--run you outputs back into your inputs, that type of thing. The computer was pretty much self--self test capability along with someone who knew what was going on. And there were eighteen flip flop modules which were alike, and you could move those around. And there was certain input-output modules...You have to know the trick of the trade. And we had some peculiarities about it which--that was pretty well...in fact, we were demonstrating to the Navy and the Navy has some of these computers still. And one of the modules they wanted us to demonstrate for was testing capability on another device we have is the power failure sequence model. And I happened to hand it to an engineer over here and he says, "can't you get me something a little more simple than that?" There is a lot to it because we had to have--checks the high/low voltage and the temperature and all that. He didn't want to try to tackle that one.

MAPSTONE:

[Laugh].

ELKINS:

So, some of them are pretty complex--the little modules in there. Some of them are pretty simple--the flip-flops are pretty straightforward. They had eight on a module. The logic is not too bad--you have a bit counter in there that sinks your memory with your logic. You've got certain synchronizations taking place. If you learn the basics of the machine like you learn how to understand and read Octal and talk to the machine in Octal--after you get across that it is not too bad. And I think every one of these machines that Bill was talking about had an engineer that--there was a lot of information that went out during the late fifties and early sixties--a lot of education had to be done to quite a few people. Let's see there was fifteen hundred VERDANs and there was more than a thousand B-17's out.

MAPSTONE:

What kind of a quantity of people did you have when you started on the VERDAN? In the field?

ELKINS:

Oh, gosh. Well there is forty some odd--forty-nine bases GAN bases that we had to take care of. Plus there--I would say there were five subs that were getting it system at the time and maybe--there was a batch of them--I couldn't really off the top of my head--I was out in the field when they were doing a lot of the training at the...

MAPSTONE:

Where were you located?

ELKINS:

I was at Eglin and I was with Buffalo, New York and came back in house and the A-3-J was actually going to the field which was the VIGILANTE. She was under flight test at Edwards when I was out with the A-S-12 system. See the VERDAN went into on the GAN, it was N-5-G system we had. It was later in the A-5 or A-3-J

[END OF SIDE 1]

That was a rep that went with that and stayed with it--it was a rep that maintained the word [?] itself.

MAPSTONE:

This is JUKEBOX?

ELKINS:

No, that was the one that the--what system was that? Trying to think of the total system name. You know it was one of the other machines that--prior to JUKEBOX--it went on the Nautilus. It went on the boat.

MAPSTONE:

Oh, that was the--that was one of the--DANs.

ELKINS:

Yes. MAPDAN.

MAPSTONE:

I think it was MAPDAN.

ELKINS:

Those were something like commercial--maintained commercially where a rep. was trained and he maintained it and he stayed with it and mothered the thing along. There weren't that many machines put out. The RECOMP, the JUKEBOX--they had a few JUKEBOXES out and there were the reps. that maintained those. And how they were maintained--they worked a problem and if it didn't work that problem, they went in to find out what was wrong with it, and they followed that. The only real problem as far as maintenance of the machines--where they really got into it--were with the VERDANs and the MINUTEMANs and the JUKEBOX. Those were the problems--there was where we really had problems maintaining them. The early machines didn't get to see that type of environment at all. They didn't reach the true state of being in the Air Force or Army or Navy inventory. They--the first self--now I don't know too much--you might ask Bill about this, but I don't think they were self testing those machines, early machines. VERDAN had, VERDAN had self-testing, V-17 had self and RECOMP had self test tapes.

WF:

And MARDAN...

ELKINS:

Well, MARDAN is so far back I didn't even--yes that is a VERDAN--so I don't even--like I say--the maintenance manuals have a few little things written, in fact, I have one of those--JUKEBOX. The reason I kept it is because it helped me with training my daughter on some of this numbering system different from the way the school does it. I just wanted and it also has a conversion tables in it. They talked about that and they talked more about the repair of the control panel and the tape reader, which was a mechanical type reader. It's a mechanical type. They had a paper tape with holes in it and fed it into. They talked about that and they showed the machine up and as far as the preventive maintenance of the machine--there is really none. None for the machine itself. To the tape reader there are a lot of it--because you had to make adjustments to the punches and you had to make adjustments to the readers. In fact, I went out on some trips to take care--do a little more work in that area. We did have some

problems. And you couldn't buy a reader at that time. And we had a reader--I guess it was around six hundred and fifty characters per minute and no one else that made it. The rest of them were punches, we used a psyllogram punch and it was modified for our applications. We had a--we modified--on the RECOMP we modified IBM typewriters with a program modification to work with our RECOMPs.

On VERDAN we also had a keyboard, an oscillogram keyboard which is integrated into some circuitry.

We had some twenty modules in our control panel for nixie reading and all that. We used a lot of in that time to the computer. And--this oscillogram keyboard on the. There was no other computer had that. I know that Sixty-Five Packard and Librascope was on the same market. We had a rep--one of our ex-reps that was down there maintaining their machine. And he talked about how antiquated they had to read in and out of the machine. This was on the CENTAUR program he was supporting. That was supposed to one of the later...

MAPSTONE:

Was there a lot of traffic between companies as far as employees were concerned?

ELKINS:

Not too much.

MAPSTONE:

...personnel.

ELKINS:

This one rep was trying to get back to Florida and he saw a way to do it. He was from Alabama and he wanted to get back home.

MAPSTONE:

On the whole people stayed pretty close to their--company.

ELKINS:

We had--something you might be interested in the type of program on what we had to do to maintain--I was involved pretty heavily in obtaining capable people to support the equipment. We brought engineers--people with degrees out of college--and gave them fifteen weeks on our computer. And on the MINUTEMAN program I think some of those people were given three to four months on the system. To give you some [idea of] the complexity. We gave them fifteen weeks on the computer and they went on for another ten weeks on the--this was for POLARIS--another ten weeks on POLARIS s system. You can see that they had some twenty-six odd weeks there. It was quite a major chore to staff up the capabilities.

MAPSTONE:

Yes. So, you were going to hang on to them.

ELKINS:

Yes. We did. We, at that time, had a major program and we had some real challenges. One thing about it--how to keep a rep. is on a job that keeps him interested. And that is what he did. A lot of our people we upgraded to some flight test programs and went into the later family of the machine. In fact, on the STRAM computer and the CONDOR computers we transferred our people from one place to another. We transferred off some of the Air Force type--what we call babysitter R & D type testing programs like DINOSAUR, like BELL, like MIT, like...I look in the...together.

ELKINS:

Bell Air systems.

MAPSTONE:

Oh, Bell Air. I couldn't make the connection there.

ELKINS:

It was Bell Aircraft at that time. I think they were breaking away in the sixties there. Part of them were sold to somebody else and I think the helicopters went another way. And I know there was quite an effort to continue with qualified people. The factory even had a real problem. They--out of eight hours work--they spent two hours of training.

MAPSTONE:

You kept changing--varying your machines, right? And your technology was...

ELKINS:

Well, just to meet the VERDAN requirements.

MAPSTONE:

Oh, just the VERDAN.

ELKINS:

They had for a year, I'll bet, or better, six hours of work and two hours of training. And to obtain time on hardware was a real problem even to build the machine--to train them.

MAPSTONE:

You didn't build the whole works just for training purposes.

ELKINS:

Well, when we did for the Air Force, yes. We had mockup of some of the systems and we did training on that. But they didn't require the knowledge and depth that we had to have...But they were just one of programs at that time. I have a--this little thing--on my introduction to the VERDAN. So few of those--become a surplus now. University of Miami had one and Bell had one up here. In order to get some of these people out and see if they really want one I made up this little thing.

MAPSTONE:

Oh, I see, yes.

ELKINS:

Told them where they could get the part numbers and all that. I didn't want to see those go by the wayside because they do have a lot of applications. So, I don't know if anything else to be--I pretty much...

MAPSTONE:

Let's turn this off for just a minute—

[END OF INTERVIEW]