

THANK YOU RAY, LADIES AND GENTLEMEN. IT IS INDEED A PLEASURE FOR ME TO BE HERE TODAY. *When chair and table asked me to repeat the* ~~RAY ASKED ME TO TALK TO YOU~~ ABOUT IBM SAN JOSE AND SOME OF THE DEVELOPMENTS THAT HAVE FUELED ITS GROWTH FOR THE PAST 32 YEARS, *at Abuzzynoad's mgr meeting - I was delighted to accept because I think it is important that you all have some feeling for your rich tech heritage in San Jose* FOR THOSE OF YOU WHO HAVE BEEN HERE FOR A LONG TIME I HOPE TO CREATE A LITTLE NOSTALGIA FOR YOU. FOR THOSE OF YOU WHO HAVE COME LATER I HOPE TO GIVE YOU A BETTER INSIGHT INTO YOUR RICH MANAGEMENT AND TECHNICAL HERITAGE. IF YOU ARE NOT ASLEEP BY THE TIME I CONCLUDE WITH MY WAR STORIES I WILL MAKE A FEW REMARKS THAT ATTEMPT TO CONVEY MY OPTIMISM FOR YOUR FUTURE.

INTRODUCE THE MOVIE "THE SEARCH AT SAN JOSE"

FIRST I WOULD LIKE TO SHOW YOU AN OLD MOVIE CALLED "THE SEARCH AT SAN JOSE." THERE ARE TWO REASONS THAT I HAVE CHOSEN TO SHOW THIS 25 YEAR OLD MOVIE. (ACTUALLY A VIDEO TAPE MADE FROM A 16MM MOVIE AND THUS ITS QUALITY IS LESS THAN DESIRABLE.)

THE FIRST REASON THAT I WANTED TO SHOW THE MOVIE IS THAT IT PORTRAYS A MYTHICAL DEVELOPMENT PROCESS THAT IS LOGICAL, ORGANIZED, HIGHLY STRUCTURED, AND FUNCTIONALLY COMPARTMENTALIZED. I WANT TO CONTRAST THAT WITH THE ACTUAL REALITY OF THE CONFUSED, MANY TIMES ILLOGICAL, AND HIGHLY UNSTRUCTURED ENVIRONMENT THAT ACTUALLY EXISTED IN THE EARLY DAYS AT SAN JOSE.

THE SECOND REASON IS THAT THE MOVIE SHOWS A 350 DISK DRIVE IN ACTION AND AND IT MAY BE THE FIRST TIME THAT MANY OF YOU HAVE SEEN ITS RATHER AMAZING MECHANICAL MOTIONS AS THE PAIR OF ARMS ARE TRANSPORTED FROM DISK-TO-DISK AT ABOUT 100 INCHES PER SECOND, STOPPED, AND THE INSERTED IN THE STACK OF ROTATING DISKS. FOR YOU OLD TIMERS, IT WILL BRING BACK SOME MEMORIES OF WHAT A REAL HDI WAS LIKE.

THE CAST FOR THE MOVIE ARE, I BELIEVE, ALL IBMER'S. I'M SURE THAT YOU WILL ALL RECOGNIZE AT LEAST ONE OF THE PROMINENT PLAYERS AS JACK KUEHLER, IBM SENIOR VICE PRESIDENT AND IS&TG GROUP EXECUTIVE. AT THE TIME, HE WAS A NEW EMPLOYEE IN THE RESEARCH LABORATORY. OTHERS THAT MIGHT BE RECOGNIZED ARE THE LATE HAL MARTIN, JIM SMITH, AND JIM ALLEN. THE REALLY OLD TIMERS WILL ALSO RECOGNIZE EX-IBMER JIM HEYWOOD AND DICK COWDEN, BOTH OF WHO HAD KEY ROLES IN THE RAMAC DEVELOPMENT, AND RETIRED IBMER RALPH THOMAS.

SHOW MOVIE.

LET ME COMMENT ON SEVERAL BLATANT ERRORS IN THE THE MOVIE. FIRST, NOTHING WAS READY WHEN REY ARRIVED, ALTHOUGH SOME SPADE WORK HAD BEEN DONE IN LOOKING AT ALTERNATIVE SITES I KNOW THAT REY, JIM HOOD AND HAL MARTIN, WHO HAD COME FROM ENDICOTT WITH REY, AND JACK POOLE WHO HAD COME FROM THE CARD PLANT, WERE VERY BUSY DURING THOSE FIRST WEEKS AND MONTHS SETTING UP SHOP AT 99 NOTREDAME. SECOND, PLANNING PEOPLE DID NOT EXIST IN SAN JOSE UNTIL VERY MUCH LATER AND THEN THE PLANNERS WERE A VERY INTEGRAL PART OF THE TEAM -

## PART OF THE TEAM.

### 1. PLANT SITE ... OPEN FIELDS

NOW TRY IF YOU WILL TO ENVISION SAN JOSE AS IT WAS IN THE EARLY 1950'S. THE SITE OF THIS PLANT WAS A PRUNE AND WALNUT ORCHARD. THE EXTENSION OF BLOSSOM HILL ROAD TO THE EAST OF ALAMADEN AVENUE WAS THEN KNOWN AS DOWNER AVENUE, A TWO LANE COUNTRY ROAD THAT PROVIDED ACCESS TO A NUMBER OF DAIRY FARMS BETWEEN ALAMADEN AND COTTLE.

### 2. ORCHARD IN BLOOM

AND THIS TIME OF THE YEAR THE ORCHARDS ALL OVER THE VALLEY WERE IN FULL BLOOM. INSTEAD OF SILICON VALLEY IT WAS THEN KNOWN AS THE VALLEY OF "HEARTS DELIGHT" AFTER A FAMOUS... AT THAT TIME ... BRAND NAME OF A SANTA CLARA COUNTY CANNERY.

THE IBM CORPORATION HAD ANNUAL REVENUES OF ABOUT \$400 MILLION --100 TIMES LESS THAN IN 1983. WITH PLANTS AND LABORATORIES IN ENDICOTT AND POUGHKEEPSIE, PRIMARILY MANUFACTURING ELETRO-MECHANICAL PUNCHED CARD MACHINES. YOU COULD NOT GO THROUGH AN IBM PLANT WITH OUT GETTING CHIPS ON YOUR SHOES. OUR FIRST LARGE ELECTRONIC COMPUTER, THE IBM 701, WAS BEING RELEASED TO MANUFACTURING IN POUGHKEEPSIE FOR QUANTITY 18.

3. 99 NOTRE DAME

IN DOWNTOWN SAN JOSE, IBM HAD JUST OPENED ITS NEW LABORATORY AT 99 NOTRE DAME AVENUE AND BEGUN TO RECRUIT STAFF.

4. NEWSPAPER AD

THIS AD WAS PLACED IN NEWSPAPERS UP AND DOWN THE WEST COAST AND RECEIVED AN OVERWHELMING RESPONSE. AS I RECALL THERE WERE SOMETHING OVER 400 RESPONSES. BUT REMEMBER, THERE WERE NOT A LOT OF PLACES FOR ENGINEERS TO GET WORK ON THE WEST COAST IN THOSE YEARS. WELL OVER 50% OF THE GRADUATING CLASS OF THE LOCAL UNIVERSITIES HAD TO GO EAST TO FIND JOBS WITH SUBSTANTIVE ENGINEERING CONTENT AS I HAD DONE A FEW YEARS BEFORE.

5. RBJ AT MEETING OF LAB

IBM'S CHOICE OF REY JOHNSON TO HEAD THE NEW SAN JOSE LABORATORY WAS JUST RIGHT. REY'S MANAGEMENT STYLE SET A TONE OF INQUISITIVENESS AND OPENNESS. HE WAS ALWAYS READY TO DISCUSS A NEW IDEA WITH ANYONE. OFTENTIMES MAKING A BAD IDEA INTO A GOOD ONE. HE FREQUENTLY HELD LABORATORY MEETINGS WHERE HE WOULD COMMUNICATE THE FOLLOWING THREE GUIDING PRINCIPLES. I QUOTE REY....

- IT IS ESSENTIAL THAT EACH ENGINEER BE FAMILIAR WITH THE PURPOSE, FUNCTION AND ENVIRONMENT OF THE MACHINE OR MACHINE COMPONENT ON WHICH HE IS WORKING.
- IT IS THE RESPONSIBILITY OF EVERY ENGINEER TO BE CONVERSANT WITH ALL OF THE OTHER PROJECTS GOING ON IN THE LABORATORY.
- IT IS THE MOST IMPORTANT ASSIGNMENT OF EVERY ENGINEER TO GIVE ASSISTANCE, IN THE FORM OF CONSULTATION, EXPERIMENTATION, OR SUGGESTIONS, WHEN ASKED TO BY ANOTHER ENGINEER; AND THE SECOND MOST IMPORTANT ASSIGNMENT IS THAT OF CARRYING FORWARD THE PROJECT TO WHICH HE IS ASSIGNED.

REY ARRANGED FOR MANY GUEST SPEAKERS, BOTH IBMERS, AND OTHERS TO VISIT IN THE LABORATORY. AND HE ENCOURAGED AND ARRANGED FOR GROUPS OF ENGINEERS TO VISIT CUSTOMERS AND UNDERSTAND THEIR PROBLEMS.

6. \*\*\*BLACK

DURING THE FIRST YEAR THERE WERE A NUMBER OF PROJECTS IN THE LABORATORY, RANGING FROM COHERER STORAGE TO NON-IMPACT PRINTING. THE LATTER USING A NEW TECHNOLOGY FROM A COMPANY THEN KNOWN AS HALOID XEROX. ABOUT HALF OF THE LABORATORY EFFORT WAS INITIALLY DEVOTED TO DEVELOPING ANALOG-TO-DIGITAL CONVERSION SYSTEMS FOR CONVERTING WIND TUNNEL STRAIN GAGE INFORMATION TO PUNCHED CARDS.

ANOTHER "SOURCE RECORDING" PROJECT HAD THE OBJECTIVE OF INCREASING THE PRODUCTIVITY OF KEY PUNCH OPERATORS IN THE TASK OF RECORDING FIXED AND REPETITIVE INFORMATION SUCH AS ITEM DESCRIPTIONS, COSTS, NAMES AND ADDRESSES, ETC INTO PUNCHED CARDS FOR LATER PROCESSING ON IBM PUNCHED CARD ACCOUNTING MACHINES.

THIS WAS A NATURAL PROJECT FOR REY SINCE HE HAD LONG BEEN INVOLVED IN SOURCE RECORDING. HE DEVELOPED THE PREDECESSOR TO THE 026 PRINTING KEY PUNCH IN ENDICOTT AND WAS VERY FAMILIAR WITH THE PROBLEM. HE WAS ENCOURAGED BY THE LATE ED PERKINS, AN IMAGINATIVE AND DISTINGUISHED IBM SALESMAN, WHO WAS A FREQUENT VISITOR TO THE LABORATORY.

IT WAS CLEAR EARLY ON, THAT SOME FORM OF MAGNETIC STORAGE DEVICE ATTACHED TO A KEY PUNCH WOULD BE THE ANSWER. THE QUESTIONS WERE WHAT DEVICE, HOW BIG, HOW FAST, AND AT WHAT COST. MAGNETIC DRUMS AND MAGNETIC DISKS WERE THE MOST LIKELY CANDIDATES BUT MANY OTHER GEOMETRIES WERE INVESTIGATED INCLUDING WIRES, RODS, TAPES AND PLATES. ALTHOUGH MAGNETIC DISKS WERE THE FRONT RUNNER FROM A FUNCTIONAL POINT OF VIEW NO ONE KNEW HOW TO SOLVE THE PROBLEM OF MAINTAINING THE CLOSE SPACING REQUIRED BETWEEN THE MAGNETIC HEAD AND THE DISK SURFACE. ALTHOUGH NO ANSWER TO THIS PROBLEM WAS IN HAND REY DECIDED IN APRIL 1953 TO GO AHEAD WITH DISKS AND DISCARD ALL OTHER ALTERNATIVES. BILL GODDARD WAS ASKED TO DEVELOP A DISK FILE MODEL AND DAVE KEAN WAS ASKED TO DEVELOP THE LOGIC TO ATTACH THE FILE TO A KEY PUNCH. THE PROJECT WAS

GIVEN THE IMAGINATIVE NAME OF THE FILE-TO-CARD MACHINE.

THE DECISION WAS NOT POPULAR. I RECALL JACK HARKER ADVISING REY THAT IT WAS A MECHANICAL FOLLY. REY PERSISTED HOWEVER.

BY JUNE OF 1953 THERE WAS GOOD NEWS. THE USE OF A HYDROSTATIC AIR BEARING TO MAINTAIN THE CLOSE SPACING BETWEEN THE MAGNETIC HEAD AND A DISK HAD BEEN DEMONSTRATED. THE ATTITUDE IN THE LABORATORY CHANGED TO ONE OF ENTHUSIASM.

#### 7. FIRST AIR HEAD TEST

A PHOTO OF THAT HISTORIC TEST SET UP IS SHOWN HERE. OTHER PROBLEMS OF BUILDING A DISK FILE WERE NOW ADDRESSED. THE MAGNETIC COATING FOR EXAMPLE WAS COMPOUNDED BY JAKE HAGOPIAN USING THE SAME PAINT BASE AS THAT USED TO PAINT THE GOLDEN GATE BRIDGE. JAKE WAS ALSO RESPONSIBLE FOR USING SPIN COATING TO APPLY THE PAINT. JIM DAVIS, WES DICKINSON, AND JOHN LYNOTT DEvised A CLEVER SERVO WITH MECHANICAL MULTIPLEXING, USING THE SAME DRIVE MECHANISM, TO DRIVE A CARRIAGE FROM DISK-TO-DISK AND THEN MOVE THE ARM RADIALY TO A TRACK LOCATION. AND THE FIRST DISK DRIVE MODEL BEGAN TO TAKE SHAPE.

#### 8. FIRST DISK DRIVE

HERE YOU SEE A PHOTO OF THAT FIRST DISK DRIVE. IT CURRENTLY RESIDES IN THE HALLWAY OF BUILDING 10.

9. FTCM

AND HERE YOU SEE A PICTURE OF THE FILE-TO-CARD MACHINE. IT HAS BEEN MERCIFULLY SENT TO REST.

10. \*\*\*BLACK

THROUGH OUT THE REST OF 1953 WORK CONTINUED ON THE EARLY FILE DEVELOPMENT AND THE FILE-TO-CARD MACHINE. FINALLY ON FEBRUARY 10, 1954 THE FIRST SUCCESSFUL TRANSFER OF DATA FROM CARDS-TO-DISK AND BACK AGAIN TO CARDS TOOK PLACE.

HOWEVER, BY NOVEMBER OF 1953 IT WAS CLEAR TO ALL OF US IN THE LAB THAT DISK STORAGE MIGHT BE AN IMPORTANT NEW PRODUCT FOR IBM BUT THE CREAKY OLD FILE WAS NOT GOING TO CONVINC ANYONE ELSE. IT WAS TIME FOR A FRESH PIECE OF PAPER. AND REY ASKED ME TO TAKE ON THE TASK OF BUILDING A NEW MODEL. IT WAS HIS PLAN TO MAKE 5 FILES AND PLACE THEM IN FIVE DIFFERENT APPLICATIONS. AN AMBITIOUS TASK FOR A SMALL LABORATORY THAT NOW CONSISTED OF ABOUT 70 PEOPLE INCLUDING 44 ENGINEERS, 2 MANAGERS, (JOHNSON AND HOOD) 8 MODEL MAKERS, 5 TECHNICIANS, 5 SECRETARIES, 3 PURCHASING AND ADMINISTRATIVE (JACK POOLE AND ART ROBINSON), 1 PATENT ATTORNEY, 1 LIBRARIAN, AND 1 JANITOR. AND PROBABLY A DOZEN OTHER PROJECTS.

A TEAM CONSISTING OF TRIG NOYES, JOHN LYNOTT, JACK HARKER, NORM VOGEL, DON JOHNSON, AND WES DICKINSON BEGAN WORK ON THE FILE DESIGN. WITH NOYES HANDLING THE LAYOUT, LYNNOTT THE



CARRIAGE AND WAYS, HARKER THE SERVO DRIVE, DON JOHNSON THE DISK AND DISK COATING, WES DICKINSON THE SERVO ELECTRONICS, AND NORM VOGEL THE AIR HEAD AND ARM ASSEMBLY. WHILE ALL ELEMENTS OF THE DESIGN WERE IMPORTANT NORM'S AIR HEAD AND ARM DESIGNS WERE A VITAL INGREDIENT FOR A SUCCESSFUL FILE. THAT HEAD IS SHOWN ON THE NEXT SLIDE.

11. 350 HEAD .. NOTE AIR AND BLEED HOLES.

DISCUSS THE HEAD OPERATION.

12. CLOSE UP OF HEAD WITH COVER OFF

HERE THE OTHER SIDE OF THE HEAD IS SHOWN WITH THE COVER OFF. THE THREE SMALL PINS ACT AS PISTONS (THE HEAD BODY IS A MANIFOLD) TO LOAD THE HEAD AGAINST THE DISK.

13. 350 ARM

14. ACCESS MECHANISM ON TEST STAND

FILE WAS VERTICAL TO MAKE DISK CHANGING EASIER AND TO PROVIDE ROOM FOR MULTIPLE ACCESS MECHNAISMS.

15. \*\*BLACK

BY NOVEMBER 1954 THE FIRST MOD II FILE WAS OPERATIONAL AND BEING TESTED AROUND THE CLOCK. THE NEXT SLIDE SHOWS...

16. TRIGG NOYES AT FILE

17. WES DICKINSON AND FILE

18. CLOSE UP OF CARRIAGE AND ARM ASSEMBLY

19. \*\*BLACK

IN PARALLEL WITH THE DEVELOPMENT OF THE FILE, SYSTEMS DESIGN AND APPLICATION WORK HAD BEEN UNDER WAY BY THE LATE JOHN HAANSTRA. WITH SOME HELP FROM AN UNSUSPECTED SOURCE, WORLD HEADQUARTERS, AS CHQ WAS KNOWN AS IN THOSE DAYS. A KEY EXECUTIVE OF THE ERA, THE LATE L. H. LAMOTTE, HAD ASKED HIS EXECUTIVE ASSISTANT FRANK WESLEY TO REVIEW THE PROJECT AND WESLEY HAD RECOMMENDED THAT IBM PROCEED WITH THE DEVELOPMENT OF SEVERAL FIELD TEST MACHINES. THE NUMBER VARIED FOR 10 TO 50 AND ENDED UP TO BE 14. TO ASSIST IN THIS TASK ERNIE FRIEDLI A PRODUCTION ENGINEER FROM POUGHKEEPSIE, AND FRANK PAUL A MANUFACTURING MANAGER FROM ENDICOTT CAME TO SAN JOSE TO HELP. THEY SET UP SHOP IN A WAREHOUSE ON SOUTH 10TH STREET NOT FAR FROM THE PRESENT FACILITY. JON WISEMAN AND SHRYL BAILY FROM THE ENDICOTT TESTING LABORATORY CAME TO HELP WITH THE TESTING WORK. THE FIRST FIELD TEST MACHINE CALLED THE 305A WAS SHIPPED, SIX MONTHS BEHIND SCHEDULE, TO ZELLERBACH PAPER COMPANY IN JUNE OF 1956.

THE NEXT SLIDE SHOWS ONE OF THOSE EARLY 305A FIELD TEST MACHINES. THE 305A MACHINE.

20. 305A CONSOLE

IT CONSISTED OF A DRUM UNIT, LOGIC, BUFFER, PRINTER, CONTROL PANEL CARD PUNCH, CARD READER, AND CONSOLE THAT HID THE AIR COMPRESSOR.

21. SHIPPING 305A TO ZELLERBACH

22. \*\*BLACK

QUESTIONS OF WHAT TO DO ABOUT MANUFACTURING SHOULD THE FIELD TEST MACHINES PROVE SUCCESSFUL, OCCUPIED MUCH OF THE LAST HALF OF 1955. A MANUFACTURING ENGINEERING STUDY HAD SHOWN THAT SAN JOSE WAS AT A SIGNIFICANT COST DISADVANTAGE COMPARED TO POUGHKEEPSIE. MOST POTENTIAL CUSTOMERS WERE IN THE EASTERN STATES. AND A TENTATIVE DECISION WAS MADE TO ESTABLISH ONLY A DISK FILE MANUFACTURING FACILITY IN SAN JOSE AND BUILD A NEW-MID WEST FACILITY TO MANUFACTURE THE REST OF THE SYSTEM. THERE WAS EXTENSIVE DEBATE ON THE ISSUE AND IT WAS NOT RESOLVED UNTIL AUGUST OF 1955 WHEN IBM ANNOUNCED THE PURCHASE OF THIS PLANT SITE AND THE APPOINTMENT OF GAVIN CULLEN AS THE NEW GENERAL MANAGER OF SAN JOSE. AS A PART OF THAT DECISION THERE WAS TO BE NO PRODUCT DEVELOPMENT LABORATORY IN SAN JOSE. JUST PRODUCT ENGINEERING AND IT WOULD REPORT TO CULLEN. JOE FERNBACH, A PRODUCT ENGINEER FROM EN-

DICOTT BECAME MY NEW BOSS.

23. FERNBACH, JOHNSON, STEVENS

HERE YOU SEE JOE FERNBACH, REY JOHSON AND I AROUND THE 305A

24. \*\*BLACK

IT WAS CLEAR BY LATE 1955 THAT THE DESIGN OF THE 305A WAS NOT SUITABLE FOR RELEASE TO MANUFACTURING AND THE DESIGN OF A PRODUCTION VERSION OF THE 305 WAS BEGUN, AFTER CONSIDERABLE DEBATE AS TO WHETHER IT SHOULD BE DONE WITH TRANSISTORS OR VACUUM TUBES. THE FINAL DECISION TO USE VACUUM TUBES WAS PROBABLY A MISTAKE, BUT IT SEEMED RIGHT AT THE TIME. WE HAD ENOUGH PROBLEMS, IN GETTING THE NEW SAN JOSE OPERATION UNDERWAY WITH OUT THE ADDED BURDEN OF ANOTHER NEW TECHNOLOGY.

BY THIS TIME THE RAMAC EFFORT HAD GROWN SO LARGE THAT REY JOHNSON HAD TO MOVE FROM 99 NOTREDAME TO MAKE ROOM FOR THE EFFORT. HE MOVED TO A LARGE OLD BARN-LIKE WAREHOUSE NOT FAR AWAY ON JULLIAN STREET AND CONTINUED HIS ADVANCED DEVELOPMENT WORK WHICH I WILL SPEAK TO LATER. 99 WAS NOW DEVOTED TO SUCH MUNDANE TASKS AS....

25. GIRLS DOING ASSEMBLY AT 99

26. DRAFTING ROOM AT 99

27. CABRI, BOWDLE, FILE

HERE YOU SEE JOHN CABRI, RAY BOWDLE, AND SOMEONE THAT I DON'T RECOGNIZE LOOKING OVER A 350 FILE.

MEANWHILE DOWN AT THE NEW PLANT SITE CONSTRUCTION WAS UNDERWAY.

28. BUILDING 13

HERE YOU SEE THE CONSTRUCTION OF BUILDING 13, DESTINED TO BE THE NEW HOME OF FERNBACH'S PRODUCT ENGINEERING ORGANIZATION. IN THE BACKGROUND IS THE ALMOST COMPLETE BUILDING 05.

29. JULIAN STREET

HERE YOU SEE REY'S JULIAN STREET LABORATORY WHICH EVERY ONE IS ANXIOUS TO LEAVE FOR NEW QUARTERS ANT THE PLANT

30. 025 SLAB

AND HERE THE SLAB WORK FOR HIS NEW HOME IN BUILDING 025

31. \*\*BLACK

FINALLY, IN SEPTEMBER OF 1956 THE 305 RAMAC AND THE RAMAC FILE ATTACHED TO THE IBM 650 WERE ANNOUNCED. TOM WATSON, JR. WAS FEATURED ON THE COVER OF BUSINESS WEEK.

32. BUSINESS WEEK ANNOUNCEMENT

AT THE TIME OF ANNOUNCEMENT TOM WATSON SAID "THIS IS THE GREATEST NEW PRODUCT IN THE HISTORY OF IBM AND, I BELIEVE IN THE HISTORY OF THE OFFICE EQUIPMENT INDUSTRY ... ENGINEERS AT THE SAN JOSE LABORATORY DESERVE MUCH OF THE CREDIT FOR THESE SIGNIFICANT ADVANCES"

33. RAMAC PEGGY

HERE IS A PICTURE THAT MANY OF YOU ARE FAMILIAR WITH.

34. PEGGY CLOSE UP

AND HERE IS ONE FROM MY PRIVATE COLLECTION. I THINK YOU CAN SEE WHY I HAVE KEPT IT.

35. RAMAC PRODUCTION IN 05

FIRST CUSTOMER SHIP OF THE 305 FROM SAN JOSE WAS IN SEPTEMBER 1957 TO UNITED AIRLINES, A DUAL PROCESSOR SYSTEM, WORKING ON COMMON FILES. HERE YOU SEE 305 PRODUCTION IN BUILDING 05 BILL HALL, HARRY WISDOM, BOB MULLER.

36. RAMAC PRODUCTION IN BLDG 5 - LOOKING THE OTHER WAY.

37. CEF, JEH, LOOK LIKE JDK AT CONSOLE

IN THE SPRING OF 1957, GAVIN CULLEN ASKED FOR HELP IN GETTING THIS NEW PRODUCT INTO HIS NEW PLANT. HE CALLED UPON CLARENCE FRIZZELL, WHO HAD BEEN RESPONSIBLE FOR THE RELEASE OF THE 701 IN POUGHKEEPSIE. HERE YOU SEE FRIZ, JIM HEYWOOD, ERNIE FRIEDLI AND OTHERS LOOKING OVER THE CONSOLE WITH SOMEONE SEATED THERE WHO LOOKS LIKE JACK KUEHLER BUT IS NOT.

#### 38. HYDRO GYRO

IN DECEMBER 1956, FOLLOWING A CORPORATE REORGANIZATION, THE LOCALLY UNPOPULAR DECISION NOT TO HAVE A PRODUCT DEVELOPMENT LABORATORY IN SAN JOSE WAS REVERSED. AND THE FUTURE GROWTH OF THE SAN JOSE OPERATION WAS THEREBY ASSURED. IT WAS A SMART MOVE BY IBM AS THE SUCCESS OF SAN JOSE PRODUCTS HAS PROVEN.

#### 39. \*\*BLACK

I WOULD LIKE NOW TO QUICKLY FLIP THROUGH SOME SLIDES THAT SHOW THAT PROGRESS. I HAVE CHOSEN THE HEAD AND SLIDER AS THE KEY COMPONENT TO ILLUSTRATE THIS PROGRESS. THOUGH THERE ARE MANY OTHER IMPORTANT ELEMENTS IN A DISK FILE THE HEADS AND DISK ARE THE TRUE HEART OF IT. MAJOR PROGRESS HAS BEEN MADE EACH TIME WE HAVE BEEN ABLE TO RELIABLY REDUCE THAT SMALL SPACING BETWEEN THE HEAD AND DISK.

#### 40. RING OF HEADS

HERE YOU SEE A COMPARISON OF THE HEADS FOR ALL OF OUR PRODUCTS. ONE OF THOSE HEADS THE, FIRST HYDRODYNAMIC SLIDER DESERVES SPECIAL MENTION. JAKE HAGOPIAN, WORKING AT JULIAN STREET, HAD REALIZED THAT THE HYDROSTATIC AIR HEAD WOULD LIMIT DISK STORAGE ACCESS TIME BECAUSE IT WAS NOT PRACTICAL TO HAVE A LOT OF THEM IN A PARALLEL COMB BECAUSE OF THE AIR COMPRESSOR REQUIREMENTS, EACH AIR HEAD CONSUMED ABOUT 1/2 CUBIC FT PER MIN. HAGOPIAN Began TO EXPERIMENT WITH A HYDRODYNAMIC SLIDER.

#### 41. HAGOPIAN SLIDER TEST STAND

#### 42. 1301 HEAD PAIR

HAGOPIANS SLIDERS WERE NOT ALWAYS PREDICTABLE, AND A NEW YOUNG ENGINEER KEN HAUGHTON FIRST ASSIGNMENT AFTER JOINING IBM WAS TO WORK WITH BILL GROSS, WHO REY HAD BROUGHT IN TO PUT SOME SCIENCE INTO THE TECHNOLOGY. THEIR WORK LED TO A MORE FUNDAMENTAL UNDERSTANDING OF THE PHENOMENA AND THE RESULTIN DESIGN FORMED THE BASIS FOR THE 1301 HEAD.

#### 43. ADF TEST BED

THE PROTOTYPE FOR THE 1301 WAS DONE BY THIS BRAVE BAND CONSISTING OF AL OSTERLUND, RUSS BRUNNER, SAM BAIO, PAUL GILOVICH, AND THEIR LEADER JACK HARKER.

#### 44. 1301 FILE OPEN



HERE YOU SEE A 1301 WITH THE COMB OF HEADS AND ARMS.

45. 1301 FILE CLOSE UP

46. \*\*BLACK

DISK STORAGE STILL DID NOT COMPETE WITH MAGNETIC TAPE, BECAUSE OF CAPACITY, COST AND RELIABILITY SHORTCOMINGS. IT WAS NOT UNTIL THE DEVELOPMENT OF THE REMOVABLE DISK PACK AND THE 360 SYSTEM ARCHITECTURE THAT DISK STORAGE BECAME A REALLY IMPORTANT INGREDIENT IN IBM'S PRODUCT LINE.

47. DISK PACK

*Britten*

48. 1311 BOX -- MENTION VIC WITT, JIM CAROTHERS, BOB PATTISON

49. 1311 HEAD

50. 2311 BOX

51. 2311 HEAD

52. 2311 HEAD CLOSE UP

53. \*\*BLACK

CAPACITY LIMITATION STILL MADE DISK STORAGE A RARE RESOURCE UNTIL THE DEVELOPMENT OF THE WALL-TO-WALL FILE THE 2314.

54. 2314 FILE FACILITY

55. 2314 HEAD AND ARM

56. 2314 HEAD CLOSE UP

57. \*\*BLACK

THE 2314 WAS OUT DONE BY THE FIRST FILE TO USE A TRACK FOLLOWING SERVO, AND OF COURSE AN IMPROVED HEAD DESIGN.... THE 3330 I @ 100 MB PER SPINDLE

58. 3330 BOX

59. 3330 HEAD AND ARM

60. 3330 HEAD CLOSE UP

61. \*\*BLACK

IMPROVEMENTS IN TMR WERE POSSIBLE WITH THE WINCHESTER FILE THAT PUT THE HEADS AND ARM INTO THE DATA MODULE.

62. 3340

63. DATA MODULE

64. WINCHESTER HEAD

THE REAL MAGIC OF THE 3340 WAS ITS HEAD. OUR FIRST LOW LOAD SLIDER. IT HAS ITS ROOTS IN AN IMAGINATIVE COMBINATION, BY MIKE WARNER, OF THE LOW LOAD - LUBE DISK TECHNOLOGY JOE MA DEVELOPED IN LOS GATOS FOR A SPECIAL DISPLAY BUFFER, AND THE TAPER FLAT DESIGN BY ERIC SOLYST OF THE 2305 HEAD.

65. WINCHESTER HEAD

66. 3340 BOX

67. \*\*BLACK

BOB FRIESEN LED THE TEAM THAT TOOK THE HEAD OUT OF THE DATA MODULE AND MADE THE 3350.

68. 3350 BOX

69. 3350'S AT AMERICAN AIRLINES

WHICH FOUND SIGNIFICANT APPLICATION SUCH AS THIS "FARM" OF 3350'S AT AMERICAN AIRLINES

70. \*IBM LOGO

THE REST IS FAMILIAR TO YOU ALL.

71. 3375 HDA

72. 3380 HDA

73. SLIDER AND SUSPENSION

74. THINFILM HEAD CLOSEUP OF ELEMENT END

75. \*\*BLACK

THE INDUSTRY WILL BE GROWING TO 22 BILLION BY 1986, ALTHOUGH BEST KNOWN FOR DISK STORAGE SAN JOSE HAS HAD OTHER PRODUCTS THAT HAVE MADE MAJOR IMPACT. THERE IS THE 3 BILLION DOLLAR BUSINESS IN FLOPPY DISKS AND DRIVES THAT WERE FIRST DEVELOPED IN SAN JOSE.

76. DISKETTE

77. 3614

AND AUTOMATED TELLER MACHINES THAT IMPACT EACH OF OUR DAILY LIVES WERE STARTED FIRST DEVELOPED IN SAN JOSE

78. 3800

AND OF COURSE NON-IMPACT PRINTING HAS A GENESIS IN SAN JOSE.

79. PLANT SITE TODAY

YOU HAVE ALL OF THE RESOURCE AND THE SKILL FOR AN EVEN MORE IMPRESSIVE FUTURE. THE TECHNOLOGY IS ENDURING AND THE MARKET IS INFINITE. I HOPE SOME ONE OF YOU WILL BE HERE TELLING ABOUT THE GOOD OLD DAYS 25 YEARS FROM NOW.

80. LOU ON DECK READING