QUARTERLY REPORT
MICHIGAN TECHNOLOGICAL UNIVERSITY
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Visual Display of Reservoir Parameters Affecting Enhanced Oil Recovery

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EXECUTIVE SUMMARY

Five staff meetings and working sessions were held during the 3rd quarter of FY 1994:

1. J. Allan and A. Nigrini visited Michigan Technological University (MTU) for one week in April to work on the project.
2. In late April, J. Wood, W. Berry, D. Olson, J. Allan met at the UNOCAL Research Center in Brea, CA to view and sample the Union McKittrick Front Nos. 415 and 418 cores from Cymric Field. Allan spent 2 additional days there to describing and collecting 59 samples for SEM, FTIR, and XRD analysis.
3. J. Allan and A. Nigrini spent the first ten days in June at MTU working on this project and on several others.
4. From June 11 to 15, R. Berry and D. Olson of DPI and J. Allan, A. Nigrini, and D. Schueller of MTU ran a booth, featuring this DOE project, on the exhibit floor at the American Association of Petroleum Geologists (Aapg) National Meeting in Denver. During the meeting they were able to discuss project strategy and review each other's progress. The Aapg meeting also afforded the opportunity to visit all of the major vendors of PC-based petroleum geology software who were showing products at the convention, and to view demos of their software.
5. In early July, J. Allan and A. Nigrini spent two days at DPI in Bakersfield to learn the basics of operation of the Crocker Data Processing Petrolog program from D. Olson.

* Wireline logs from most of the 45 wells that penetrate the Miocene within the study area on the Pioneer Antcline were digitized by DPI. Data preparation and log calibration were completed on 6 wells and model selection and analysis were performed on the 1 cored well, Tenneco 62X-30, in Pioneer Field.
* The 59 samples collected from the McKittrick Front wells in Cymric Field were forwarded to MTU where graduate students R. Kramer and D. Popko began Fourier Transform InfraRed (FTIR) and X-ray Diffraction (XRD) analyses.
* After reviewing PC-based software from most major vendors, a consensus began to emerge that the best approach would be to link the best modules from three different systems, a wireline log analysis program, a mapping program, and a 2D and 3D visualization program, into a flexible, user-friendly unit. This would result in a product that could be used by small gas and oil companies to accomplish similar analyses.
* Finally, a multimedia shell was constructed using Macromind Director to display project results at the AAPG exhibit in Denver. This computer-visualization technical innovation, although not a principal component of our original proposal, elicited a great amount of interest from visitors to the booth.
SUMMARY OF TECHNICAL PROGRESS BY TASK

TASK 1. PROJECT ADMINISTRATION AND MANAGEMENT

1.1 THE SPATIAL DATABASE MANAGER

Decision on a final configuration for the spatial database manager is near. Extensive research was done on commercial products that are now available or will soon become available on the PC. With the availability of the new 486-100 and 586 processors, many of the major software companies that primarily supplied software for workstations are now moving into the PC environment. Zycor, Intergraph, TerraSciences, Geographics, and several other big names in the field have made major advances in porting their software down to the PC in 1994. Each system has its strengths and weaknesses. Most, fortunately, are modular. Our present thinking is that the most effective way to provide a user-friendly, state-of-the-art package to the independent producers who are our primary clients is: 1) select the best modules from three different types of systems - a wireline log analysis program, a mapping program, and a 2D and 3D visualization program; 2) build data links between these systems with a database manager, if links do not come pre-installed. The database management program that we choose should compatible with the selected applications programs. Therefore, we intend to acquire the applications programs before choosing our final database manager. In the interim, we will continue to use QuattroPRO for our database needs.

The Crocker Data Processing (Crocker) Petrolog program provides comprehensive log evaluation capabilities and is currently used in-house by DPI. DPI is thus very familiar with the package and it will be the primary vehicle for analysis of log data for the project. Since Petrolog is modular, only a core package of modules need be purchased by most small independents. We are currently attempting to determine what that core configuration should be. Software packages by Terrasciences and Geographix are also being evaluated. We point out that DPI is a vendor for Petrolog.

Petropec Computer Co.'s PCMS mapping package (a derivative of Landmark's flagship Zycor mapping system) appears to be the best available for petroleum geology applications. It can handle faults and the detailed mapping necessary for reservoir volumetric calculations, while many other programs cannot. During the last quarter A. Nigrini evaluated TECHBASE by MINsoft Ltd. and J. Allan, A. Nigrini, and D. Olson visited TECHBASE's office in Denver while attending AAPG. Although TECHBASE is a very flexible program, it uses somewhat archaic formats and databases, is not mouse-driven, and since it was designed for use in the mining industry, may not address all of the needs of the petroleum industry. Additional software packages by Terrasciences and Geographix are still being considered in this area.

Intergraph is in the process of porting their software down to the PC. Their 2D and more basic 3D applications are currently operational on the PC. They expect to have their 3D volume visualization program functioning on the PC by year end. Intergraph is attractive because the company has always been a leader in the field, provides good customer support, and has a reputation for producing turnkey programs which require a minimum of debugging. A 3-D
visualization software system from Spyglass, Inc. was obtained for evaluation, but proved inadequate in its present form because of its inability to handle faults and other geological discontinuities. Because of the low cost of Spyglass software, we will continue to monitor and try to influence their direction in software improvements.

Additional meetings and discussions were held with Reservoir Characterization and Research Consultants Inc. (RC){\textsuperscript{2}} to further examine their software capabilities for geostatistical analysis of reservoir properties, discuss the potential to port their software from workstation to PC-based systems, and review opportunities to incorporate their technology into the project. (RC){\textsuperscript{2}} plans to produce a PC-based version of the software and is interested in the possibility of using a project such as ours to test and demonstrate their software. We are continuing to pursue this opportunity. Although the basic reservoir evaluation software that we envision as the product of this DOE project will consist of a log evaluation package, a mapping package, and a 2D and 3D visualization package, we will continue to evaluate the RC{\textsuperscript{2}} geostatistical analysis package.

1.1.1 DATABASE INITIALIZATION

Individual databases were set up in Lotus spreadsheets by Kramer and others at MTU to archive and display XRD, FTIR, and mineralogical data. Macros and templates were developed to display data in LOTUS graphs and charts. Data from analysis of samples from the Gary Drilling Co., KLC 44, Well No. 315 in Pioneer Field were used to develop and test the programs. Development and use of these databases and macros continued during this period.

1.1.2 DATABASE MANAGEMENT

Every manager and site now has a high-end PC (486-based computer or better) with which to access the database and run the visualization applications programs. These computers have been networked and linked to a common server at MTU. Data and files are being regularly transferred between MTU, Bakersfield, CA, and La Habra, CA. During early June this capability was utilized by all three sites simultaneously to help prepare a Class III proposal to DOE.

1.2 ORGANIZATION AND MANAGEMENT

Dr. Wood will take a 9 month leave of absence from MTU to teach at the University of South Florida in Tampa Florida. He will continue his duties on this project and has asked DOE to approve several changes in the management structure to accommodate this leave.

A proposal to add Dr. Wayne Pennington to the project as a Co-PI has been approved and Dr. Pennington will begin work on the project this fall. Dr. Pennington is leaving Marathon Oil Company after 8+ years and will begin duties as a Professor of Geology at MTU this fall.
Also, Mr. Mark Gruener has been offered a part-time position as a Research Project Coordinator in the Geology Department and he will assist Drs. Wood and Pennington in coordinating several large research projects, including this one. Mr. Gruener has 22 years experience as a Army officer, including 4 years as the commanding officer for the MTU ROTC. He brings experience in handling federal contracts to the project as well as managing staff and budgets.

1.2.1 PROJECT COORDINATION

Five meetings and working sessions of project personnel were held during this quarter:

J. Allan and A. Nigrini visited Michigan Technological University (MTU) from April 18 to 23 to work on the project. During this time software options were reviewed, D. Schueller and A. Nigrini agreed upon the structure and content of the multimedia presentation shell in MacroMind Director (see Subtask 5.2), and research priorities for the FTIR and XRD work were discussed.

1. On April 25 and 26, J. Wood, R. Berry, D. Olson and J. Allan met at the UNOCAL Research Center in Brea, CA, to view and sample the UNOCAL McKittrick Front Nos. 415 and 418 cores from Cymric Field. Allan spent 2 additional days there and collected 59 samples for SEM, FTIR, and XRD analysis.

2. J. Allan and A. Nigrini spent the first ten days in June at MTU working on this project and on several others. A. Nigrini, D. Olson, J. Allan, and D. McDowell completed the figures and text for the AAPG exhibit poster display and Schueller completed the multimedia presentation, which was an integral part of the AAPG exhibit.

3. From June 11 to 15, R. Berry and D. Olson of DPI and J. Allan, A. Nigrini, and D. Schueller of MTU ran a booth, featuring this DOE project, on the exhibit floor at the American Association of Petroleum Geologists (AAPG) National Meeting in Denver. During the meeting they were able to discuss project strategy and review each other's progress. The meeting also afforded the opportunity to visit all of the major vendors of PC-based petroleum geology software who were showing products at the convention, and to view demos of their software.

4. On July 7 and 8, J. Allan and A. Nigrini spent two days at DPI in Bakersfield to learn the basics of the Crocker Petrolog program from D. Olson. Petrolog is a very powerful yet user-friendly log evaluation program used by DPI in all of their work. Its utility lies in the way that it allows the user to graphically perform many log correction, evaluation, and correlation functions.

1.2.2 BUDGET MANAGEMENT AND QUARTERLY REPORTS

S. Milligan has responsibility for the project budgets and accounting and has completely reprogrammed the project budgets and has set up a system for logging, recording and archiving all invoices related to this project. All expenses are now tracked as they occur and are allocated to the proper tasks. She has also developed a convenient way to visualize the project budgets by
monthly expenditures, cumulative expenditures, and projected expenditures using LOTUS graphics. This has been a considerable aid to managers trying to track and control their budgets.

**TASK 2. DATA COLLECTION**

2.1 WELL LOGS AND WELL DATA

During the last reporting period, the Munger maps covering the Pioneer Anticline were scanned into the Canvas (Deneba) drafting program and digitized into several "layers" by D. McDowell. Preliminary results were given to D. Schueller to incorporate into the project multimedia database. During this period, D. McDowell extended the Munger basemap northward to include the McKittrick Front area of Cymric Field.

2.1.1 LOG DATABASE MANAGEMENT

During 1st quarter FY 1994, DPI staff constructed a Quattro Pro spreadsheet to collect well location and depth, well-log, and sample data during the interim period until a database management system is chosen. Data can be exported easily from this Quattro Pro inventory file to the database manager of choice. Tops of the Miocene were picked in each of the 45 wells on the Pioneer Anticline, their X-Y locations at the appropriate depths were calculated for each well, and both were placed in the spreadsheet. From there they can be exported to any mapping or visualization program. Digital log databases are too large for conventional databases and will be stored in standard interchange formats (ASCII or LIS) within the log evaluation applications program - in this case the Crocker Petrolog program - for exchange with other programs.

2.1.2 LOG DIGITIZATION

Considerable progress was made on this subtask during the 3rd quarter, FY 1994. More than 75% of the wireline logs from the 45 wells which penetrate the Miocene on the Pioneer Anticline (i.e., the same wells contained in the Quattro PRO spreadsheet described in Subtask 2.1.1) have now been digitized.

2.2 CORE AND SAMPLE ACQUISITION

2.2.1A CORE AND CUTTINGS

In late April, J. Wood, R. Berry, D. Olson and J. Allan met at the UNOCAL Research Center in Brea, CA to view and sample the cores from the UNOCAL McKittrick Front Nos. 415 and 418 wells in Cymric Field. J. Allan spent 2 additional days there describing and collecting 59 samples for SEM, FTIR, and XRD analysis. The samples represent 13 different lithotypes that affect reservoir quality and log character. The samples were forwarded to graduate students R. Kramer and D. Popko at MTU where they will be analyzed by SEM, XRD, and FTIR. They will be used by R. Kramer as calibration samples to develop FTIR as a quantitative analytical technique in
diatomite reservoirs. The results of these analyses will be integrated with the extensive petrophysical data sets collected on these cores by UNOCAL.

2.2.1B ARCO CORE

Project members will approach ARCO and attempt to acquire additional core and cuttings samples from several ARCO wells in the vicinity of Pioneer Field. As wells elsewhere on the Pioneer Anticline are inventoried, other operators will also be contacted.

DPI will approach ARCO and/or Western Geophysical to request access to several seismic lines shot over the Pioneer Anticline. If access can be arranged, picks on the top of the Miocene and on other stratigraphic markers will be used to further improve control on the structure of the anticline for the visualization package.

Initiation of this subtask will be postponed until the log and core data already acquired is analyzed and incorporated into the project.

2.2.2 FLUIDS

Fluid sampling has not yet begun. Wood has scheduled a trip to Bakersfield in August to pick up some samples for FTIR work at MTU.

TASK 3. DATA ANALYSIS AND MEASUREMENT

3.1 PETROPHYSICS

This subtask is not scheduled to begin until the second half of FY94. Extensive petrophysical data was acquired from UNOCAL on the cores from the Union McKittrick Front wells.

3.1.1 KPF MEASUREMENTS

This subtask is not scheduled to begin until the second half of FY94.

3.1.2 FTIR SPECTRA

This subtask is not scheduled to begin until the second half of FY 1994, but Popko has performed FTIR analyses on selected samples of sidewall core and cuttings from Gary Drilling, KLC 44, Well No. 315 as part of his masters thesis. Samples collected from the Union McKittrick Front wells were forwarded to MTU where Popko entered the sample descriptions into a spreadsheet. D. Popko and R. Kramer began preliminary XRD and FTIR analyses.

3.2 PETROLOGY

This subtask is not scheduled to begin until the second half of FY94.
3.2.1 XRD

This subtask is not scheduled to begin until the second half of FY 1994 but R. Kramer and D. Popko have performed XRD analyses on selected samples of sidewall core and cuttings from Gary Drilling, KLC 44, Well No. 315 and have begun preliminary analyses of samples from the Union McKittrick Front wells.

3.2.2 SEM/IMAGE ANALYSIS

This subtask is not scheduled to begin until the second half of FY 1994. However, it is part of R. Kramer's Ph.D. thesis and she has begun image analysis work on cuttings from one of the Pioneer wells. IMP plans to purchase a camera for making slides and prints directly from video images.

3.2.3 PETROLOGY

This subtask is not scheduled to begin until the second half of FY94.

3.3 LOG CALIBRATION

R. Berry has acquired a modern log suite and conventional core data from Union McKittrick Front Well Nos. 415 and 418 from UNOCAL. This information will be used to calibrate well-log data to rock properties in Pioneer Field. The core, which is currently stored in the UNOCAL Research Center in Brea, CA, was examined and sampled by J. Allan, R. Berry, D. Olson, and J. Wood in late April.

During the 3rd Quarter FY 1994 log calibration and data preparation were performed on the 2 McKittrick Front wells and on 4 wells from Pioneer Field. Preliminary analyses necessary for model selection were performed on 1 well from Pioneer Field.

3.3.1 DATA PREPARATION

Most of the wireline logs from the 45 wells on the Pioneer Anticline were hand-digitized during this quarter. Data preparation was completed for 6 wells - the two McKittrick Front wells and 4 wells from Pioneer Field. Data preparation includes building a log database for each well, depth-shifting and baseline-shifting each log, correcting for hole deviation, digitally repairing bad spots in the logs, etc. Data preparation is done within the Crocker Petrolog program, is rather time-consuming, and must be done by an experienced professional. D. Olson has handled all of the data preparation to date.

3.3.2 MODEL SELECTION

Model selection involves use of the Crocker Petrolog program to calculate parameters, such as porosity, $S_w$, % clays, and matrix properties, from a well-log suite. The resultant product consists
of logs of calculated parameters that are adjusted to the same scale and used to zone the reservoir. This information is the primary input to the reservoir visualization program.

During this quarter D. Olson constructed comparative plots of core and log data for the two McKittrick Front wells in Cymric Field. These plots were used in conjunction with core descriptions and core photos to guide sampling of the core.

One well in Pioneer Field, Tenneco 62x-30, was cored. Olson completed the model selection and log analysis for this well. Plots showing variation with depth in measured and calculated log parameters core-property data were prepared for each cored interval in the well and were later presented in the poster display at AAPG.

**TASK 4. MODELING**

**4.1 GEOCHEMICAL MODELING**

The geochemical modeling program CHILLER will be used to model fluid-rock interaction. This has very practical significance because of active steamflooding of the Monterey and Etchegoin Formation elsewhere in the southern San Joaquin Valley. Geochemical modeling is scheduled to begin in late FY 1995. B. Watkins has completed a new Windows interface. He has begun to simplify data input and to work on a graphical output interface for rapid visual display of output.

**4.1.1 GEOCHEMICAL MASS TRANSFER**

This subtask is not scheduled to begin until the last quarter of FY95.

**4.1.2 THERMODYNAMIC DATABASE**

This subtask is not scheduled to begin until the last quarter of FY95.

**SUBTASK 4.2 BASIN MODELING**

This subtask is not scheduled to begin until the last quarter of FY95.

**4.2.2 2D AND 3D BASIN MODELS**

This subtask is not scheduled to begin until the last quarter of FY95.

**4.2.1 GEOHISTORY**

This subtask is not scheduled to begin until the last quarter of FY95.
TASK 5. TECHNOLOGY TRANSFER

5.1 REPORTS

At this stage of the project, the main technical reports prepared and distributed have been quarterly technical reports to DOE.

5.2 WORKSHOPS

Denver AAPG

On June 11-15, 1994, representatives of MTU and DPI ran a booth on the exhibit floor at the AAPG National Meeting in Denver to publicize and promote the project. During the four-day convention, J. Allan, A. Nigrini, and D. Schueller of MTU; and R. Berry and D. Olson of DPI operated the booth. A sign-up list was prominently displayed to capture the names of people and organizations interested in receiving a newsletter from our group and/or attending future workshops.

The exhibition-hall booth included a poster display describing project goals and progress to date and two computer demonstrations. The first computer demo featured Crocker Data Processing's Petrolog program, the log evaluation program which we are using as our workhorse. The second featured a multimedia shell, recently implemented by D. Schueller, which is being used to present and archive our maps, logs, and data.

All data and information associated with the project are stored on hard disk and will be accessible via an interactive shell program created with the multimedia program Macromedia Director. The shell will serve several purposes: (1) archive all project reports, tables, maps, photographs, animations, etc., either within the Director itself or as files opened from other applications that can be launched from Director (e.g., Lotus 1-2-3, Excel); (2) provide tutorials and manuals to help less knowledgeable users access and interpret each type of information; (3) provide user-defined pathways to, and sample data files for, some commonly used spreadsheet applications so users can integrate their own data within the shell. At the end of the project, all data, graphics, tutorials, manuals, etc., will be stored on CD ROM for distribution to DOE and to our target audience within the petroleum industry.

At AAPG the Macromedia Director display attracted the attention of independent oil companies and consultants who were presenting plays for investor consideration in the "Prospect Gallery" on the exhibit floor. Several were very interested in the ability to place map, well-log, seismic, and text displays into a multimedia package which could be sent out on CD ROM to potential investors for review. This would eliminate the necessity and expense of office visits and presentations and would increase the number of potential investors who could be approached with a play concept. Thus, as it turned out, one of the more popular aspects of our project was in this computer-visualization technical innovation, spearheaded by one of our project members, that was not a principal component of our original proposal.
Tampa Workshop/Conference

Plans are under way to hold a 3-day workshop/conference in Tampa, Florida sometime during the last two weeks of January, 1995. This conference will focus on results from this project as well as preliminary results from the DOE Class II project which involves characterization and a field trial at Crystal Field in Michigan. The plan is to have two days of technical discussions on progress and results on the current projects, followed by a half day of critiques and suggestions for improvement.

We will also discuss what should be done following the conclusion of the current DOE contracts. We now have a unique research team assembled with skills and experience that can be matched at very few companies or universities. This team is a resource and we should think about not only successfully fulfilling the current contracts, but keeping the team intact and even more deeply involved in the country's long-range energy problems.

The problems related to declining production in the U. S. will remain and intensify, and we should begin now to develop long range (5 and 10 year?) plans to keep the project teams intact and working on these problems. We can discuss possible funding from future federal and state programs, but we should also consider the possibility that the universities can develop a program that will allow them to directly benefit from any enhanced recovery programs in which they are involved. In other words, devise a plan whereby some of the cash flow from gas and oil recovery is used to continue and build the program.

We would like to have the DOE project managers as well as senior university personnel present for this meeting, particularly the last half-day of discussions on project improvements and future strategies.
APPENDIX A

MEMORANDUM

To: J. R. Wood

From: D. Schueller

Re: Progress on Multimedia Guide for DOE project

Date: 7-17-94

During the past quarter A. Nigrini sent me reports, logs, and core descriptions for the McKittrick Front 415 well, which is the calibration well for this project, and color core photos for the 418 well. I scanned in most of the reports using OmniPage Professional OCR software; other documents had to be completely retyped owing to the poor quality of the Xeroxes or the format. The color core photos (~80 photos) were scanned using a MicroTek ScanMaker 6002 scanner connected to a DOS machine. The TIFF files were then transferred to a Macintosh machine in order to reformat and adjust them and to make backups. Quite a bit of postscan adjustment to each file is necessary to replicate the original photo, and lack of consistency is a problem. Both the OCR and the color scanning were done in the CCLI computer lab in the Humanities Department. The text files and some example core photo files were then incorporated into the existing Director knowledge base as part of the calibration well option within the Wells menu.

I had difficulty creating the scripting that would allow multiple open windows in Director, so I hired Scott Sherrill, system administrator for the CCLI, to set this up. After 12 hours of work, he had no success. However, since development of the guide will continue in DOS/Windows platform using different software (see below), this is no longer a problem.

For the AAPG meeting exhibit, I created a color mock-up of a sample calibration well screen and printed it using the Tectronix TekColor Printer in the CCLI. I also took my Macintosh to the meeting and demonstrated the program. Viewer response was positive, but I feel that the interface will have to be reworked to make program more accessible to users, especially those who want to use it as a tutorial. A copy of the report I sent to A. Nigrini following the AAPG meeting is attached to this memo.

Since DOS/Windows is the most popular platform in the petroleum industry, I have decided to switch to developing the program in a Windows environment rather than remaining in the Macintosh environment and then creating a player of the program for Windows. Although this means I will have to learn another piece of software (probably ToolBook or Visual Basic 3.0, available in the CCLI), I think much time will be saved and much frustration will be avoided.

Early in the next quarter a DOS machine will be purchased in order to continue development. We hope to have a fairly complete prototype version of the guide on CD at the end of 6 months.
time and to present this CD at AAPG next year. The hardware and software necessary for writing to CDs will also be purchased. Because we expect to use this same kind of technology transfer for the Michigan and possibly next California contracts, the expense of buying a CD-ROM writer is justifiable. A high-end color scanner that may help end the problems connected with color scans will also be purchased.
MEMORANDUM

To: A. Nigrini

From: D. Schueller

Re: Clarification of content of proposed CD for DOE Calif. project

Date: 6-26-94

The demo of the proposed CD shown at AAPG generated some comments and suggestions and was useful in helping me define more exactly what this particular program will and will not do.

Many people went away with the impression that the program would link all their files (regardless of which software generated them) into one big program from which all files could be accessed, modified, and linked. This program will NOT do this, nor was it ever intended to do this. Such a program would require much more programming experience than I have or am willing and able to devote. If this is the direction we want to take, then now is the time to find someone else to take over.

My idea of the program is that it will serve as an archive and tutorial of this particular project, including all the data maps, reports, etc. connected with the Pioneer Field and the techniques that can be applied to finding more oil. To this end, it will show the user how standard software packages such as Excel, Lotus 1-2-3, etc. can be used to manipulate the data associated with the field. By this example, then, the user will be able to apply the same techniques to his own field(s) of interest. Our program will have sample files of the same data available in different formats so that the user will be able to use whatever software he currently has to view the examples. He will not be able to import any new data into the Director program itself, nor will he be able to change anything within the Director shell. He could generate or modify any files that used his own software and then access these files through Director; however, I don't see much point in this unless he were using the tutorial mode and wanted to practice by accessing his own data.

One user at AAPG mentioned that this type of multimedia presentation would be very useful as a sales tool. Instead of meeting personally with every potential buyer, the seller would send out CDs detailing the history of the field, production, location, geology, etc. Then both parties could bring up the CD on their own computers and discuss the sale over the phone before investing time and money in a personal visit. This has potential, especially as the price of pressing and duplicating CDs continues to go down. Of course, our DOE project will be distributed at no cost, but this sales idea has commercial possibilities. Now would be the time to start sending out feelers and finding a company willing to foot at least part of the cost of development of a standard interface and prototype product. I hope that this memo has cleared up some questions regarding the program. If you have an entirely different concept or think I am heading in the wrong direction, please let me know.
DATE
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10/5/94
END