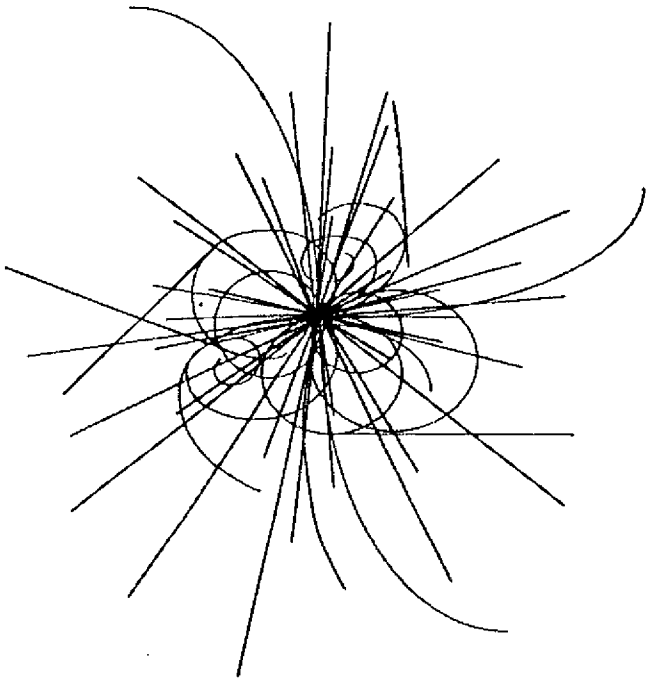
SSC-242

SSC PROJECT

MONTHLY PROGRESS REPORT

SEPTEMBER 1989



SSC LABORATORY

SSC PROJECT

MONTHLY PROGRESS REPORT

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EXECUTIVE SUMMARY

Extensive preparations were underway during the month for the Conference on Supercollider Physics and Experiments that began at the end of the month. This meeting was very well attended and provided a wide-ranging view of the SSC Laboratory. Early in the month an important meeting was arranged by the Department of Energy when the first semi-annual review of the Laboratory was held. This meeting was chaired by DOE and included personnel from Washington, Chicago and the Area Office in addition to the numerous invited guests. The status of the design concepts for the accelerator and experimental facilities were presented and discussed. There were extended discussions about the magnet program and other technical systems. Emphasis was placed on the administrative and project management systems that are being put into place. The laboratory reported that 305 persons were on board at the end of August.

Accelerator design has proceeded through the efforts that are being devoted to the Site-specific Conceptual Design (SCDR). A major feature of the design concerns the "footprint", a term that describes the impact of the entire project design upon the land. Meetings were held with the Texas National Research Laboratory Commission to study the SSC requirements. Eventually, the TNRLC will assist with the acquisition of the land. Important activities in conjunction with the siting studies include the environmental impact of the current machine configurations. One of the primary topics concern the planned disposal of spoils from the tunnel and chamber excavations. Numerous meetings are underway that include participation from the Laboratory, TNRLC and DOE.

The Conventional Construction Division (CCD) has supported the footprint work by refining the project survey requirements. The survey information was used in acquiring additional rock material samples to verify the geotechnical information base used in siting the SSC facilities. Design work has been done with respect to the Magnet Prototype Development Laboratory (MPDL). A decision was made to locate this facility at the Central Campus. A considerable amount of work has been done by the CCD in area of project controls and in preparing text and tabular information for the SCDR. The provision of office and laboratory space in the new Stoneridge Building No. 4 is being managed and coordinated by the Technical Services Division. Personnel in that division are also acquiring a VAX computer for use with accounting and management systems of the Project.

The Magnet Division has devoted considerable attention to the establishment of engineering and management support within their division. A focus of this effort has been the plans for the MPDL to be used in conjunction with the Magnet Test Laboratory (MTL). For the latter facility, a request for proposal document for the cryogenic system has been formulated. This will allow for testing of superconducting magnets at the Texas site. Currently, the magnet testing continues at Fermilab where magnet DD0019 was successfully tested during September. All quenches for that magnet were above the intended operating current.

In comparing FY89 costs and commitments vs. funding, the SSC Laboratory realized a net carryover (underrun) of $2,641.339. See comparison of operating and equipment funds by division in cost/schedule data section of report.

ACCELERATOR SYSTEMS (WBS 1.1)

- ## ACCELERATOR MANAGEMENT (1.1.1)

Work has continued on the CDR now that the overall parameters of the machine have been more closely defined. Work on the project schedule and cost estimate has continued. A review of the buildings required to house the technical components is underway.

- ## LINAC (1.1.2)

The linac energy has been established at 600 Mev. TAC, Texas Accelerator Center, are continuing with work on the main elements of Linac hardware under a cost sharing contract with the laboratory. Simulations of beam dynamics are presently being undertaken at LANL.

- ## LEB (1.1.3)

The injection and extraction energy of the machine has been established @ 600 Mev to 12 Gev . The space charge tune shift for the LEB has been calculated at 0.3.

- ## MEB (1.1.4)

The lattice for the MEB has been established. A design for the beam transport from the LEB to the MEB has been completed. The design energy of this machine has been fixed at 200 Gev.

- ## HEB (1.1.5)

Studies of the extraction and beam transfer from the HEB to the collider have been continuing during the month.

- ## COLLIDER (1.1.6)

A revised collider lattice and corresponding footprint and land acquisition needs have been established. The collider design now includes diamond bypasses to permit collider operations while detectors are being built.

MAGNET SYSTEMS (WBS 1.2)

• ENGINEERING

Two of three 14" billets have been successfully extruded in the continuing efforts to finalize the wire design and scale up the manufacturing process. This wire is being processed to final wire size and samples are being provided to the University of Wisconsin for detailed study. The third billet has been delayed until the end of October due to difficulty with the copper metallurgical integrity. This problem appears to be resolved, but requires modification of certain specifications.

There are indications that improvements in the strand current density may be possible if the Nb barrier were thickened and an alternate higher temperature heat treatment were used. This possibility is being aggressively pursued since a higher current density would favorably affect the ongoing evaluation of design reliability.

Cable continues to be in scarce supply which will result in magnet production delays. This supply deficiency is a direct consequence of a funding shortage in FY88. It is anticipated that sufficient quantities of cable will be available by mid-November.

Drafting capabilities have continued to grow through the addition of two (2) more workstations and three (3) new drafters. The near term goal is to have all dipole magnet drawings available on the CAD network by early December. This effort was started at the CDG on the cold mass. As a result of many inconsistencies in the original drawings, the cold mass completion is delayed until the end of October, at which time, the fifth and last workstation will be transferred to the Texas site.

A joint MSD/ASD review of the interconnect region and the spool piece was held during which key interface questions were aired. These two closely related activities remain one of the more crucial elements to both the magnet reliability issue and magnet installation plan.

• MAGNET SUPPORT FACILITIES

Planning for the Magnet Prototype Development Laboratory, Magnet Test Laboratory and the Magnet Acceptance and Storage Facility continued during the month. The plan to temporarily locate the MPDL in the MAAS on the county farm site was killed due to the disruption that would occur when the MPDL was moved to its permanent campus site. The latest plan now calls for all three buildings to be built on the county farm property and this site will become the Central Campus. Additional delineation of the MPDL is in process. Once completed, we will meet with the State of Texas to begin the construction process.

We have completed the RFP for the cryogenic system for the MTL. We expect that it will be listed in the CBD shortly.

Recruiting and training of personnel continues to be a high priority in the Production Group. We currently have three (3) people training at BNL and four (4) at FNAL. At the end of September, the production group had a total of thirteen (13) people

MAGNET SYSTEMS (WBS 1.2)

(Continued)

• MAGNET SYSTEMS QUALITY ASSURANCE

Development of quality systems is underway. Formulation of the in-house QA elements for each group in Magnet Systems Division has been completed. Three out of four groups have provided concurrence with those elements with the final group input to be received shortly. The QA plan for MSD has been started. Revision of the NbTi Alloy specification was started in September. Revision of specifications for wire and cable was also started. These specification revisions are being accomplished concurrently with an overall transfer of documentation previously developed and maintained by other labs. Additional quality system requirements under these specifications are being emphasized. Further development took place on the collider dipole QA contract requirements.

The QA Group has begun the task of compiling a database called an "Inspection Spreadsheet" of all required inspections and tests for each type of magnets. This will be a very extensive undertaking as it will document the purpose, test method and tolerance of each required inspection. It is intended that each inspection will be referenced to an SSC drawing number and grouped by magnet subassembly.

Discussion with BNL on inter-lab QA coordination has taken place; additional discussion is to take place in October. The initial meeting revealed BNL limitations in hiring additional personnel to QA activities due to a hiring freeze at BNL.

• MAGNET SYSTEMS TEST

Quench tests and warm magnetic measurements were performed on 16.6m dipole magnet DD0019 at the Fermilab Magnet Test Facility in September. DD0019 is the most recent magnet in the R&D sequence and incorporates some design modifications which include: a directed helium flow scheme in the yoke blocks to increase the cooling of the coil, mechanically seated coil shims, and collars made of high manganese content Kawasaki stainless steel. The coils for DD0019 were fabricated with the new BNL molding tooling: the coil dimensional tolerances were not quite as good as the previous three magnets (DD0016-18) but slight adjustments are in progress.

The run plan for magnet DD0019 was based on the recommendations of the Training/Re-training Working Group which met in August. The magnet was conditioned (ramped to currents above the nominal operating current of 6500A and back down without a quench several times) at 3.5K and then quench tested at 4.35K. The first quench at 4.35K occurred at 6581A, above the SSC operating current. The next three quenches were consistent with short sample behavior, slightly above the predicted currents, the highest current reached was 6757A.

MAGNET SYSTEMS (WBS 1.2)

(Continued)

- **MAGNET SYSTEMS TEST**
  (Continued)

The first thermal cycle was limited to low current checkout quenches and the 4 spontaneous quenches at 4.35K. It was warmed to ambient temperature and then recooled. The interval between cool tests was about eight days. The second test cycle repeated the first: DD0019 was first conditioned at 3.5K and then quench tested at 4.35K. The first quench of the second cycle was at 6747A, consistent with the short sample behavior of the first cycle. The second quench was at a lower current, 6620A, and in a different location, turn 13 of the lower inner coil. The remaining quenches were consistent with short sample behavior.

The test data from magnet DD0019 are still being analyzed but at least preliminary conclusions can be drawn. First, no quenches occurred below the operating current of 6500A. This is a significant success. Secondly, the first quench of the second thermal cycle (following conditioning) appears to be a short sample quench indicating that retraining can be avoided. While the initial training quench at 6581A was not expected (the magnet having reached current above the value during conditioning), it indicates that the associated mechanical disturbances are not overwhelmingly large.

The third test cycle of DD0019 will follow the first tests of magnet DD00256 at the Fermilab MTF which will take place in late October. In the third cycle, quench tests will be performed at lower temperatures to explore the mechanical stability of the magnet at higher forces levels and a series of cold magnet measurements will be performed.

The modest conditioning program outlined by the working group will be continued with the next several magnets.

CONVENTIONAL CONSTRUCTION DIVISION

- ## SURVEY ACTIVITIES

Coordination efforts between SSC division continued in order to refine project survey requirements. Draft aerial mapping coverage and scale requirements were developed in CADD.

- ## SEIS SUPPORT AND SPOILS MANAGEMENT

Activities in September included coordination of SEIS data requirements on final footprint location, surface transportation, and off-site utilities studies to meet ANL data needs and began analysis of SSC construction planning to meet ANL's SEIS data requirement for levels of construction activity (i.e., air and noise evaluation).

- ## GEOTECHNICAL

The Underground Technology Advisory Panel (UTAP), in conjunction with the Conventional Construction Division, conducted a two-day meeting September 18th and 19th in DeSoto, Texas. In other geotechnical activities, CCD supervised the geotechnical characterization program at the east and west hall clusters and provided geotechnical support for development of the SCDR.

- ## PROJECT CONTROLS

Schedule/Cost Tracking

Continued development of Project Master Schedule and refinement of the Magnet Division Schedule.

CSCS Reporting

The Organization Breakdown Structure (OBS) was formalized and submitted. Training and support for Cost Account Managers (CAM's) who have work scheduled in early FY'90 was initiated. Reviewed Cost Account Planning Sheets (CAPS), prepared Work Authorizations, and opened charge number accounts.

Baseline Cost Estimate

Work on the second cut cost estimate continued. Prototype cost models for underground construction are being developed.

CONVENTIONAL CONSTRUCTION DIVISION

(Continued)

- **PROJECT PROCEDURES MANUAL**

Development of Books 3 (Design Management) and 4 (Construction Management) continued.

- **MAGNET DEVELOPMENT FACILITIES**

Magnet Development Facilities

It has been determined that the Magnet Laboratory will be located on the County work farm site as a permanent campus. The design criteria development has been changed to expedite the MDL criteria document for submittal the week of October 16, 1989.

The MDL program is being reviewed with the aim of reducing the cost of the facility.

With the completion of the MDL criteria document, the team will concentrate on the MTL criteria documents.

Campus Area Development

Programming meetings have continued with the divisions to finalize the master program for staff and facilities. The campus master plan is in a temporary holding plan pending finalization of the programming facilities issue. Several schemes of the campus master plan have been prepared and will be modified based on the above programming effort.

- **CONFIGURATION MANAGEMENT & INTERFACE CONTROL**

The second draft of CADD system guidelines for the Conventional Construction Division was begun. Development of Configuration Management and Interface Control project procedures and maintenance of system file backups continued.

CONVENTIONAL CONSTRUCTION DIVISION

(Continued)

• MISCELLANEOUS/SPECIAL STUDIES

Work continued on the Surface Transportation Plan. Activities included site visits to verify locations of remote site access, traffic analysis to project volumes on area roads, and cost estimates of recommended improvements. The draft report on these activities is expected to be completed the second week in October.

Collection and organization of data needed for the SEIS, especially in the area of air quality, was begun. Data collected is planned to be transmitted to ANL the second week in October.

Portions of the SCDR relating to existing site conditions,water and sewer, and infrastructure were drafted.

The study on water and sanitary sewer services for operation of the SSC continued. Water requirements were redefined and sanitary sewer flows were determined. The costs of water and sewer infrastructure systems for two alternatives were estimated. A draft report on the findings is being written and is expected to be issued by mid October.

The following activities have been completed during the month of September:

- CCD input to Footprint Characterization Document
- Refinement of data for infrastructure cost estimate for water, sewer, roads and electrical
- Roads and routes study for detector components
- Final land boundaries for SSC footprint

The following tasks were completed by the electrical section of the design group during the month of September:

- Preliminary size and layout including public utility space requirements for the East and West substations
- Electrical riser diagram scope was increased to show main tunnel distribution
- Final electrical load flow calculations
- Cost comparisons between 13.8 KV and 4160 V systems in the tunnel were presented to the tunnel development group.
- Utility to distribution transformation option report written
- Electrical design criteria document for Magnet Prototype Development Laboratory was written
- Load survey form developed and given to Tim Toohig for review
- Rough draft of 34.5 KV and 69 KV tunnel distribution option written

PROJECT MANAGEMENT (WBS 3.1)

• PROJECT MANAGEMENT OFFICE (3.1.1)

Primary effort early in the month of September centered around the first DOE semi-annual review. This review was held on September 7-8, 1989, in DeSoto, Texas. The review was attended by DOE personnel from Headquarters and Chicago Operations Office. During this review, the SSC Laboratory presented details of management activities including the progress of the project management systems, first draft of the proposed project management plan, and financial status. Additional presentations centered around the proposed changes in the ongoing work of the site-specific conceptual design. These discussions included the proposed changes to the accelerator design, conventional facilities (including the proposal for the magnet R&D laboratories), and the status of the magnet collider dipole R&D effort and procurement plans. In the conventional facilities discussion, a summary of the new recommended footprint was made.

Several other major activities during the month of September included review of the project management plan, initiation of the documentation control system and engineering standards committee, and review of preliminary topics for inclusion in the site-specific conceptual design report. During the month suggested changes to the project management plan were received from DOE and Divisions Directors within the Laboratory. These changes are currently being incorporated and the next draft is anticipated to be forwarded to DOE by mid-October. The Documentation Control Manager was hired and will start in early October. The first activity will be to establish the Document Control Plan and procedures. Along with this activity we will start the procedures and plans for the Laboratory Engineering Standards. Preliminary review of topics for inclusion in the site-specific conceptual design report included installation responsibilities and equipment and definition of the magnet parameters. In the installation, we reviewed topics of the surveying and aligning requirements, types and design of magnet stands and transporters, and the requirements for the necessary support and test equipment. Not yet finalized, but the discussions have thus far indicated that the CDR shimming scheme may be replaced by using a screw and jacking arrangement, and the top magnets will be supported directly instead of being placed on the bottom magnets. To allow for a separate support arm the center-to-center distance of the two rings has changed. Other parameters currently being reviewed include the number of magnets per cell, type and details of quench protection, bore tube size, and dipole magnet length. At this writing, these parameters have not changed from the CDR but are being investigated.

PROJECT MANAGEMENT (WBS 3.1)

(Continued)

- **PMRS DEVELOPMENT (3.1.2)**

For the month of September, much progress was made on the implementation of the EASYTRAK system for C/SCSC. The Graneda Graphics package was made fully functional and several charts and graphs were prepared to offer better graphics menu for SSCL managers and staff. The final award of the EASYTRAK software was approved by DOE-CH. A draft outline of the PMRS procedures manual was written and approved and work on the procedures plan was started. The first cost account manager training sessions were held and practically all of the SSCL cost account managers have now attended at least one of the sessions. Additionally, all of the major divisions have at least one of the PMRS staff assigned to them to assist with the cost planning and budgeting exercise. By the end of the month, most of the work authorization sheets and cost account planning sheets were completed and entered into the EASYTRAK system for the FY90 budgeting and planning process.

The first monthly report, for August, was issued by this office after approval by the SSCL project managers. This format is intended to remain the same throughout the life of the project. However, starting with the October report C/SCSC data will be included in this report. Format examples of this data is included in the August report for reference.

- **QA MANAGEMENT SYSTEM (3.1.3)**

The posting was written for the Project and Laboratory Quality Assurance Officer. We anticipate that the interviewing will begin in two weeks and we should make an offer by the end of October. Our initial goal was to have the Quality Assurance Officer on board by January. We should meet that requirement.

PROJECT MANAGEMENT (WBS 3.1)

(Continued)

- ## CONSTRUCTION CONFIGURATION MGMT. SYSTEM (3.1.4)

The major effort early in the month was the completion and release of the SSC Footprint Characterization Document. This document specifies the land requirements for the Superconducting Super Collider with definitive configuration to accommodate the parameters of the SSC as defined by the SSC Laboratory. Variances in these requirements from those offered in the Site Proposal from the State of Texas arise from developments in the design of the accelerator and the evolution of the requirements for the experimental program since the Invitation for the Site Proposal (ISP) by the Department of Energy over 3 years ago. Other variances arise from further investigation of the geotechnical regime at the site conducted by the SSCL. The specific technical changes from the ISP design which modify the land area requirements are accommodation of higher injection energies into the collider, modification of the lattice design to improve focusing, inclusion of bypasses to provide flexibility in the experimental program. Analysis of detailed geotechnical data has lead to a slight shift and rotation of the placement of the facility on the site compared to the Texas Site Proposal.

Since the completion of the aforementioned document, work has centered on continuing the footprint definition details and site-specific conventional construction. Footprint definition has included specific details with the E and F-type areas and other areas where the site specific location may have to be changed slightly to accommodate flood regions and/or specific property boundaries. Work on reviewing the cost estimate details has centered on the tunneling in the three different soil types and conventional building requirements for Laboratory personnel and experimental sites.

- ## COST ESTIMATING (3.1.5)

Work has continued on the site-specific cost estimate. The work has been completed on the new Work Breakdown Structure Definition, and this will be incorporated into the next revision of the Project Management Plan. Major emphasis for the estimating for the month of September has been in relating the current estimates with those of the 1986 CDR work breakdown structure. Once this was accomplished, first internal reviews of changes were started. Internal reviews for the month centered around project management and tunneling. For project management, the details of what should and should not be included were defined. Things that were not included in project management (like division management) will be included in the cost estimate under the appropriate WBS element. Details of the tunneling estimates for the three types of soil were studied and initially reviewed. The current estimate agrees favorable with estimates of consultants used also for this work. The review will continue on the tunnel inside diameter. The diameter in the 1986 CDR was 10-feet. We are looking at both a 10-foot and 12-foot diameter tunnel at the present time.

SYSTEM ENG. & INTEG . (WBS 3.2)

No work was performed under this WBS element since the contract for Systems Engineering and Integration has not yet been awarded.

ADMINISTRATION SYSTEMS & SUPPORT

(WBS 3.3)

In accordance with the Procurement Management Systems Implementation Plan, all branch managers have been selected and key contract administrator positions filled. The policy and procedures manual was completed and submitted to DOE-CH for review and approval. The Deltek Purchasing Module of the integrated financial system has been installed and is now operational.

Finance Department activities included management of the FY89 fiscal closing and preparations for the FY90 budget and spending startups.

Overall, Administration is making substantial progress in completing its personnel staffing and in implementation of systems support. Examples: a permanent Director of Personnel and a Compensation Manager were named in September while on the systems side, the Deltek system was brought in for 1 October initialization.

SSC LAB DIRECTORS OFFICE (WBS 3.5)

In September, the Directorate established an office of External Affairs. The first meeting of the Citizens' Advisory Committee was held, establishing a means for community input to the Laboratory Director. Planning and coordination of the October 2-4 symposium continued.

Major activities in October will include:

- The Symposium on SSC Physics and Experiments.
- Participation in meetings of the URA Board of Overseers and the DOE High Energy Physics Advisory Panel.
- Participation in the DOE conference on education programs and DOE facilities.
- Coordination of announcement of final footprint with DOE and TNRLC.

LAB OPERATIONS
TECHNICAL SERVICES (WBS 4.2)

• FACILITIES ENGINEERING (4.2.2)

The finish-out of the 108,500 square feet of office and laboratory space of Stoneridge Building No. 4 was completed on schedule September 30, 1989, with scheduled move-in dates of October 13, 20, and 27. This building will be the main Interim SSC Laboratory site housing the Directorate, Physics Research, Accelerator Division, Conventional Construction, and Laboratory Technical Services. The building also houses laboratories for cryogenic, mechanical, instrumentation, control systems, and other development work, the computing center, library, cafeteria, and auditorium.

A vendor was selected to supply four trailer office buildings.. These trailers will be delivered on October 26, and scheduled for occupancy by November 15th.

The Thermo-Serv company vacated Stoneridge Building No. 2 and finish-out started on the new warehouse facilities.

The SSC Interim Campus is now largely completed, pending construction of permanent facilities. The following figure shows the location of the various facilities occupied by the SSC Laboratory. The total space available as of 30 September 1989 was 185,189 square feet.

• GENERAL COMPUTING (4.2.5)

A proposal to purchase a Vax 6310 computer system to support the SSC Administrative requirements was approved by DOE. The system has been ordered and delivery is expected in October. The DELTEK Financial Software and the EASYTRAK Project Management Software packages have been approved by DOE. Both applications are currently installed on the Engineering/Scientific Vax and will be transferred to the administrative Vax when it is delivered.

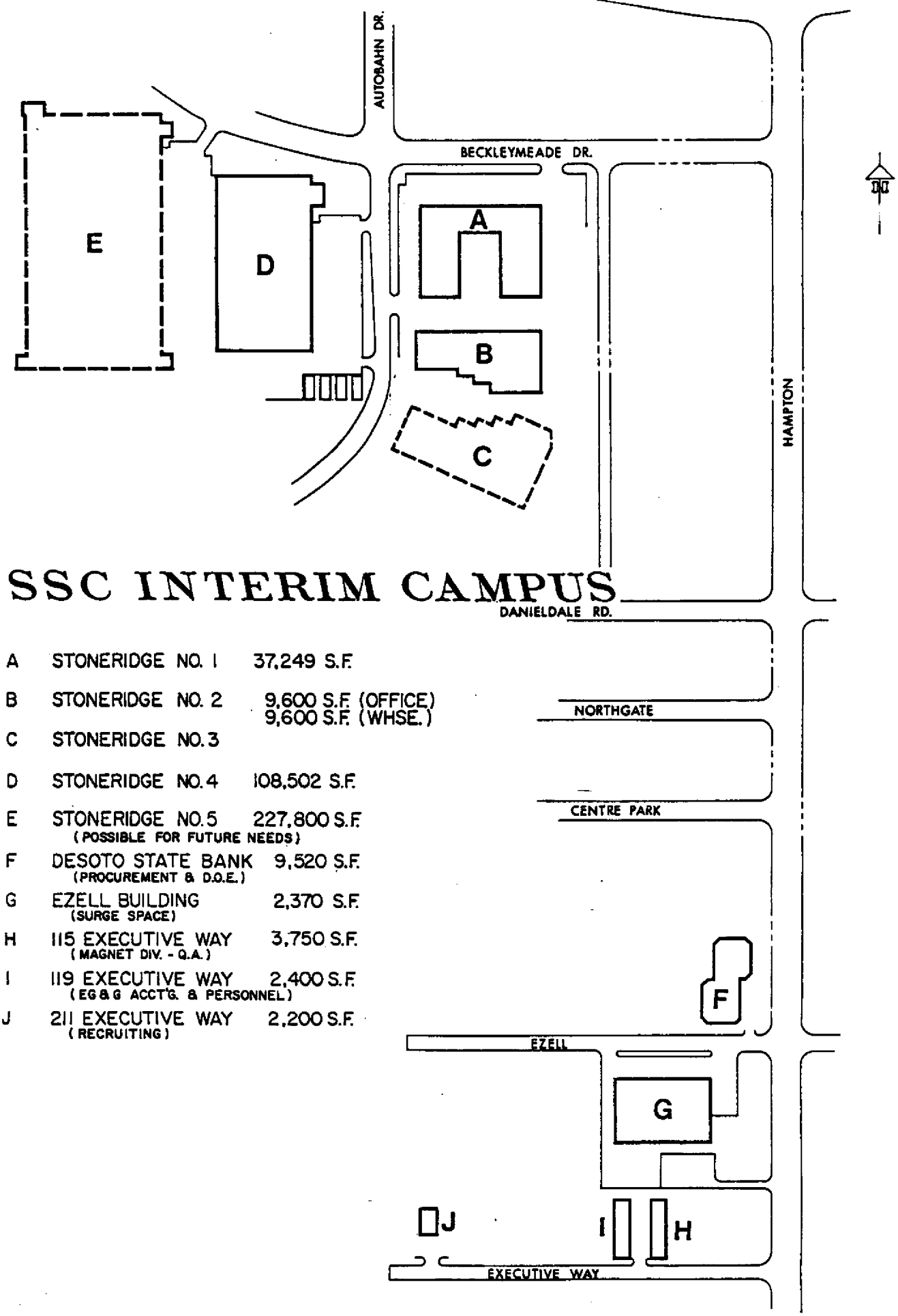
• DESIGN SUPPORT (4.2.6)

CAE/CADD acquisition of hardware and software is currently under evaluation and review. Recent technical evaluations have revealed that several systems will be able to meet the requirements of mechanical design.

A new Xerox 5080 drawing copier complete with folding attachment was installed in September.

• COMMUNICATIONS (4.2.7)

A new PBX switch system has been installed in the DeSoto Bank building to support personnel located in that facility. The switch is linked with the SSC Laboratory main PBX system. Cabling between Stoneridge No. 1 and Stoneridge No. 2 has been initiated to provide LAN and Telecommunications service to Stoneridge No. 4.



SSC INTERIM CAMPUS

A	STONERIDGE NO. 1	37,249 S.F.
B	STONERIDGE NO. 2	9,600 S.F. (OFFICE) 9,600 S.F. (WHSE.)
C	STONERIDGE NO. 3	
D	STONERIDGE NO. 4	108,502 S.F.
E	STONERIDGE NO. 5 (POSSIBLE FOR FUTURE NEEDS)	227,800 S.F.
F	DESOTO STATE BANK (PROCUREMENT & D.O.E.)	9,520 S.F.
G	EZELL BUILDING (SURGE SPACE)	2,370 S.F.
H	115 EXECUTIVE WAY (MAGNET DIV. - Q.A.)	3,750 S.F.
I	119 EXECUTIVE WAY (EG&G ACCT'G. & PERSONNEL)	2,400 S.F.
J	211 EXECUTIVE WAY (RECRUITING)	2,200 S.F.

10/4/89

LAB OPERATIONS

PHYSICS RESEARCH (WBS 4.5)

- ## DIVISION OFFICE (4.5.1)

The WBS for physics activities was established. The appropriate planning and budgeting activities for FY90 were completed for the new fiscal year beginning October 1.

- ## THEORY (4.5.2)

No activities are anticipated in this group until 1990.

- ## EXPERIMENTAL PHYSICS AND FACILITIES (4.5.3)

Planning for the October conference on Supercollider physics and experiments was completed.

A meeting of the task force on detector cost estimates was held at Fermilab on September 27. A unit price matrix for cost estimating purposes was developed and new detector configurations were presented. A follow-on meeting was scheduled for October 13 and 14 at SLAC.

- ## COMPUTING AND DATA ANALYSIS (4.5.4)

Work continued to provide operational support to Scientific Computing Systems and Networks. Personnel attended the HepNet Technical Coordinating Committee, EsNet Steering Committee Meetings this month. Our participation at these meetings represents the importance of wide-areas networking to the SSC Project.

A second VAX operator was hired which provides extended 12-hour coverage for scientific systems. The LAN has been extended from Stoneridge 2 to Stoneridge 4 in preparation of moving personnel in October.

The status of computing at the SSC Laboratory was presented at the SSC DOE Review held at the laboratory on September 8 and the Workshop on Computational Requirements for the SSC held at HARC on September 29.

- ## LIBRARY SERVICES (4.5.5)

A manager for Library Services was selected and will be brought on board in mid-October. Requisitions for the necessary equipment and supplies were prepared in preparation for the move to the new building also in mid-October.

LAB OPERATIONS

PHYSICS RESEARCH (WBS 4.5)

(Continued)

- **TECHNICAL INFORMATION AND PUBLICATIONS (4.5.6)**

A manager for Technical Information and Publications was selected and brought on board. The space planning for the new building was finalized. The group assumed responsibility for a Reprographics Center to support the laboratory requirements. Planning and work on the baseline documents continued.

EXPERIMENTAL SYSTEMS WBS 5.0)

- **EXPERIMENTAL SYSTEMS (WBS 5.0)**

The SSC Laboratory received 38 proposals to perform R&D on large detector subsystems. These proposals are from multi-institutional collaborations requesting support for all projects totalling $42M in FY1990. These proposals will be reviewed by an international review committee on detector R&D organized by the SSC Laboratory at a meeting to take place November 13 through 15 at the laboratory.

SAMPLE ONLY - NOT ACTUAL DATA

SUMMARY COST/SCHEDULE NARRATIVE

LEVEL 2 WBS

1.0 **TECHNICAL SYSTEMS**

ACCELERATOR SYSTEMS

MAGNET SYSTEMS

SAMPLE ONLY

2.0 **CONVENTIONAL FACILITIES**

3.0 **MANAGEMENT AND SUPPORT**

4.0 **LAB OPERATIONS**

5.0 **EXPERIMENTAL SYSTEMS**

SAMPLE ONLY - NOT ACTUAL DATA

MANAGEMENT CONDITION SUMMARY

MAGNET SYSTEMS	CURRENT PERIOD COST	CURRENT PERIOD SCHEDULE
HEB MAGNETS	G	G
COLLIDER MAGNETS	G	G
INDUST. PROGRAM	G	G
INSTALLATION	G	G

ACCELERATOR SYSTEMS	COST	SCHEDULE
MANAGEMENT	G	G
LINAC	G	G
LEB	G	G
MEB	G	G
HEB	G	G
COLLIDER	G	G

CONVENTIONAL FACILITIES	COST	SCHEDULE
INFRASTRUCTURE	Y	Y
CAMPUS	Y	Y
INJECTOR	Y	Y
COLLIDER RING	R	Y
EXPERIMENTAL FACILITIES	R	Y
PROGRAM MANAGEMENT	G	G

MANAGEMENT AND SUPPORT	COST	SCHEDULE
PROJECT MANAGEMENT	G	G
SYSTEMS ENGR. & INTEG.	Y	Y
ADMIN SYST. & SUPPORT	G	G
TECHNICAL SUPPORT	G	G
SSC LAB DIRECTORS OFFICE	G	G

NOT ACTUAL DATA
SAMPLE ONLY

SAMPLE ONLY - NOT ACTUAL DATA

MANAGEMENT CONDITION ANALYSIS

DIVISION: **MAGNETS**

LEVEL 3 WBS: HEB MAGNETS

CURRENT ASSESSMENT: COST: **RED**
SCHEDULE: **RED**

	VARIANCE COST	VARIANCE SCHEDULE
CURRENT	(167)	(98)
PRIOR 1 MO. (cum)	(1768)	(1433)
PRIOR 2 MO. (cum)	(1555)	(1159)
PRIOR 3 MO. (cum)	(1266)	(798)

PROBLEM:

CAUSE/EFFECT:

CORRECTIVE ACTION:

CURRENT STATUS:

CONTACT/PHONE EXT.:

NOT ACTUAL DATA
SAMPLE ONLY

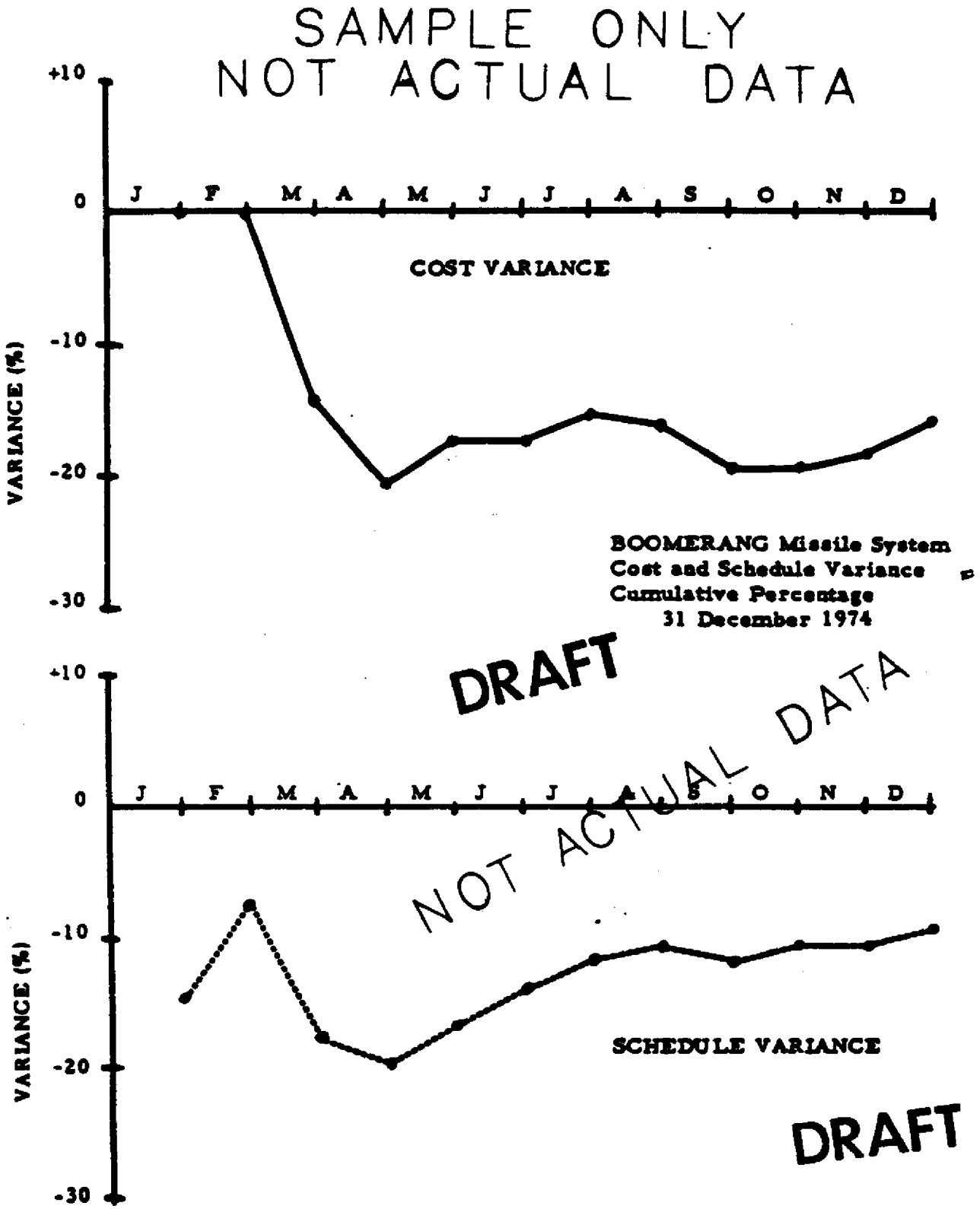
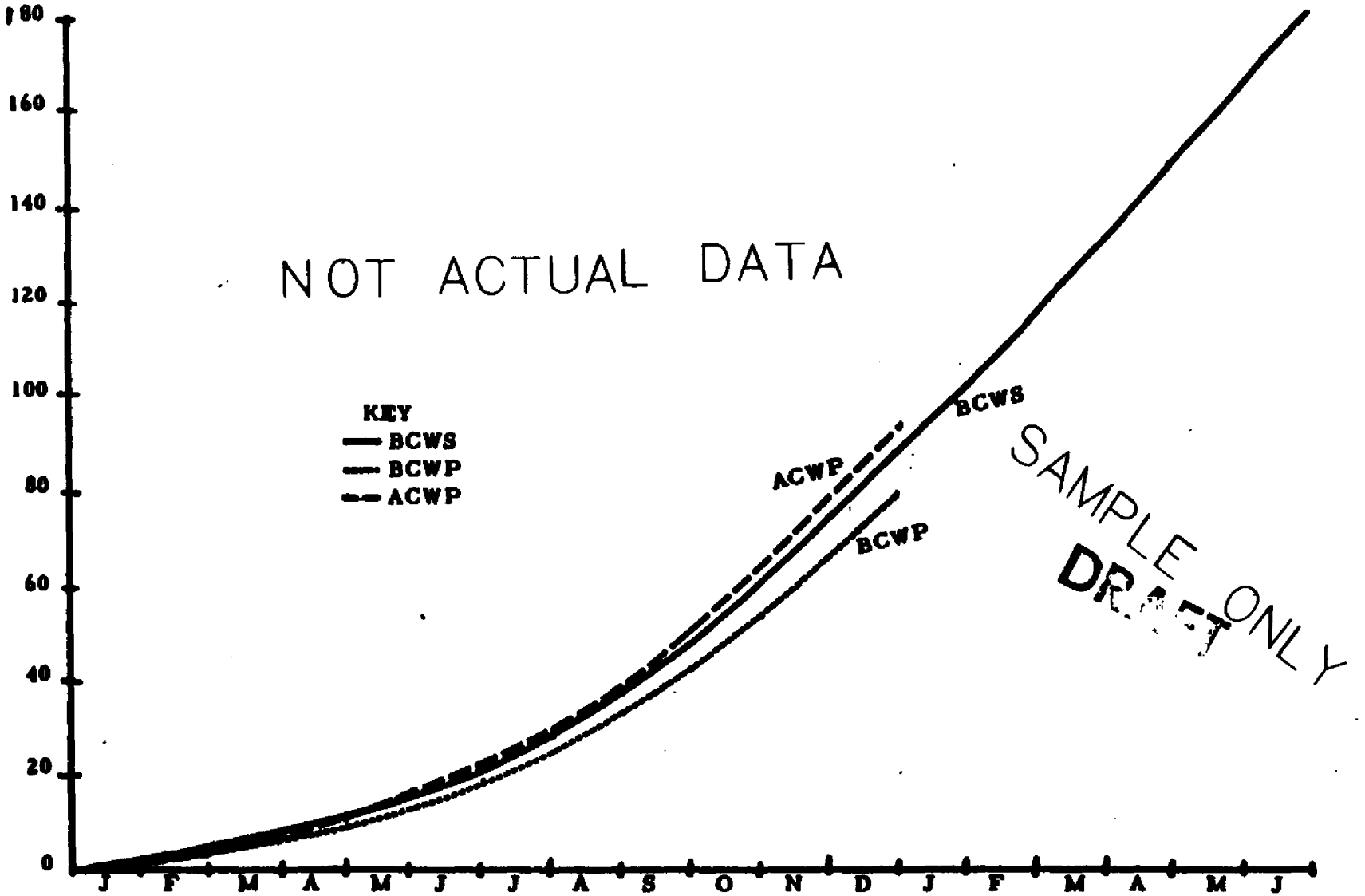


FIGURE VIII. 5
PERCENTAGE VARIANCE TREND CHARTS



LEVEL 3 WBS

PERFORMANCE MEASUREMENT CHART

SAMPLE COST PERFORMANCE REPORT (FORMAT 1)

DRAFT

CLASSIFICATION

COST PERFORMANCE REPORT - BY WBS — PAGE: 1

CONTRACTOR: ABC COMPANY	CONTRACT TYPE/NO:	PROGRAM NAME/NUMBER:	REPORT PERIOD:	SIGNATURE, TITLE & DATE:
LOCATION: ALEXANDRIA, VA. 22314	ANN LARSON 001	ZORAD PROJECT 2330	FROM: 1 JUN 87 TO: 27 JUL 87	
REPAIR ____ PRODUCTION ____				

QUANTITY:	NEGOTIATED COST	EST COST AUTH.	UNPRICED WORK	TGT PROFIT/FEE	TGT PRICE	EST PRICE	SHARE RATIO	CONT CEILING	EST CONT CEILING
500	250			15	300	330	80/20	350	380

WORK BREAKDOWN STRUCTURE ITEM	CURRENT PERIOD: BUDGETED COST WORK SCHED	CURRENT PERIOD: BUDGETED COST WORK PERF	CURRENT PERIOD: ACTUAL COST WORK PERF	CURRENT PERIOD: VARIANCE SCHED	CURRENT PERIOD: VARIANCE COST	CUMULATIVE TO DATE: BUDGETED COST WORK SCHED	CUMULATIVE TO DATE: BUDGETED COST WORK PERF	CUMULATIVE TO DATE: ACTUAL COST WORK PERF	CUMULATIVE TO DATE: VARIANCE SCHED	CUMULATIVE TO DATE: VARIANCE COST	REPROGRAMMING ADJUSTMENTS: COST VAR	REPROGRAMMING ADJUSTMENTS: BUDGET	AT COMPLETION: BUDGET BASE	AT COMPLETION: LATEST REVISED EST	AT COMPLETION: VAR
1.1	2.0	2.0	0.0	0.0	2.0	2.0	2.0	0.0	0.0	2.0			2.0	4.0	-2.0
1.2	6.0	0.0	2.0	-6.0	-2.0	6.0	0.0	2.0	-6.0	-2.0			6.0	6.0	0.0
1.3	3.4	0.0	2.0	-3.4	-2.0	3.4	0.0	2.0	-3.4	-2.0			17.0	17.0	0.0
1.4	5.1	5.1	2.0	0.0	3.1	5.1	5.1	2.0	[illegible]	[illegible]			17.0	11.9	5.1
1.5	5.0	2.0	0.0	-3.0	2.0	5.0	2.0	[illegible]	[illegible]	2.0			12.0	16.0	-4.0
1.6	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0			8.0	15.0	-7.0
1.7	5.1	0.0	4.0	-4.2	-3.2	5.1	[illegible]	4.0	-4.2	-3.2			17.0	20.1	-3.2
1.8	8.5	0.0	4.0	-8.5	-4.0	8.5	0.0	4.0	-8.5	-4.0			17.0	21.0	-4.0
TOTAL DIRECT COSTS	34.1	11.0	[illegible]	-23.1	-3.0	34.1	11.0	14.0	-23.1	-3.0			96.0	113.0	-17.0
INDIRECT COSTS	72.2	21.9	100.0	-50.3	-78.1	72.2	21.9	100.0	-50.3	-78.1	-78.1		192.0	270.1	-78.1
COST OF MONEY	343.1	93.4	280.0	-249.6	-186.5	343.1	93.4	280.0	-249.6	-186.5	-186.5		876.0	1062.5	-186.5
G&A & ADMIN	72.2	21.9	100.0	-50.3	-78.1	72.2	21.9	100.0	-50.3	-78.1	-78.1		192.0	270.1	-78.1
UNDIST BUDGET													1.0	1.0	
SUBTOTAL	523.6	148.2	494.0	-373.4	-345.8	523.6	148.2	494.0	-373.4	-345.8			1357.0	1716.0	-359.0
MGMT RESERVE													10.0	10.0	
TOTAL	523.6	148.2	494.0	-373.4	-345.8	523.6	148.2	494.0	-373.4	-345.8			1367.0	1726.0	-359.0

RECONCILIATION TO CONTRACT BUDGET BASE

VARIANCE ADJUSTMENT															
TOTAL VARIANCE															

CLASSIFICATION

NOT ACTUAL DATA

COSTS AND COMMITMENTS VS. FUNDING
FY 89

DIVISION	COSTS	COMMIT.	TOTAL	FUNDING	CARRYOVER
OPERATING FUNDS:					
DIRECTORATE	7,072,159	190	7,072,349		
PROJECT MANAGEMENT	2,312,553	792	2,313,345		
ACCELERATOR	5,030,596	99,403	5,129,999		
CONSTRUCTION	3,953,887	415,000	4,368,887		
MAGNET	5,179,816	940,654	6,120,470		
PHYSICS	1,127,436	22,163	1,149,599		
ADMINISTRATION	5,611,242	116,021	5,727,263		
TECHNICAL SERVICES	2,590,584	46,847	2,637,431		
TOTAL LAB	32,878,273	1,641,070	34,519,343	34,740,500	221,157
EQUIPMENT FUNDS:					
DIRECTORATE	34,279	0	34,279		
PROJECT MANAGEMENT	69,013	0	69,013		
ACCELERATOR	355,437	0	355,437		
CONSTRUCTION	53,727	0	53,727		
MAGNET	717,215	834,655	1,551,870		
PHYSICS	1,008,113	0	1,008,113		
ADMINISTRATION	827,989	0	827,989		
TECHNICAL SERVICES	818,709	1,984,681	2,803,390		
TOTAL LAB	3,884,482	2,819,336	6,703,818	9,124,000	2,420,182

TABLE C-1
CENTRAL DESIGN GROUP
Sep-89

	PROGRAM ELEMENT	LABOR	MAT'L & SERVICES	G & A	MONTH TOTAL	YEAR TO DATE	ANNUAL BUDGET
1.1	ADMINISTRATION	2482.2	2842.0	113.0	5437.2	14823.1	6246.0
1.2	PROGRAM PLANNING & MANAGEMENT	245.8	416.3	21.4	683.5	2400.5	1190.0
1.3	ACCELERATOR R & D	945.9	-833.2	415.4	528.1	11625.0	17004.0
1.4	CONVENTIONAL SYSTEMS DEVELOPMENT	585.5	-530.1	58.7	114.1	4029.0	1740.0
	PROGRAM COSTS	4259.4	1895.0	608.5	6763.0	32877.6	26180.0
1.41	RTK COSTS	0.0	52.1	0.0	52.1	720.1	750.0
	CDG/RTK COSTS	4259.4	1947.2	608.5	6815.1	33597.7	26930.0
	COMMITMENTS					1622.1	
	DELTA COMMITMENTS					-550.6	
	EQUIPMENT COSTS		2692.3			3884.5	
	EQUIPMENT COMMITMENTS					2819.3	

TABLE C-2
BROOKHAVEN NATIONAL LABORATORY
Sep-89

	PROGRAM ELEMENT	LABOR	MAT'L & SERVICES	G & A	MONTH TOTAL	YEAR TO DATE	ANNUAL BUDGET
2.1	MAGNET DESIGN	88.1	492.0	345.0	925.1	3655.6	3348.0
2.2	17-M COLD MASS FABRICATION	88.1	137.6	134.3	360.0	4425.8	4134.0
2.3	TOOLING & FIXTURES	0.0	26.8	15.9	42.7	957.2	640.0
2.4	BEAM TUBE DEVELOPMENT	8.8	16.6	15.1	40.4	582.5	538.0
2.5	1.8-M DIPOLE FABRICIATION	17.6	0.0	10.5	28.1	347.2	633.0
2.6	TRIM COIL DEVELOPMENT	17.6	46.9	38.4	102.9	604.0	752.0
2.7	MAGNET MEASUREMENT	127.8	55.5	109.0	292.4	2301.4	3341.0
2.8	INDUSTRIALIZATION	8.8	0.8	5.7	15.2	238.7	316.0
	MAGNET TOTALS	356.8	776.2	674.0	1807.1	13112.2	13702.0
2.9	ACCELERATED LIFE TESTS	35.3	40.7	45.2	121.2	959.1	898.0
	BNL R & D TOTALS	392.1	816.9	719.2	1928.3	14071.3	14600.0
	COMMITMENTS					796.0	
	DELTA COMMITMENTS					-326.0	
	EQUIPMENT COSTS	0.0	62.5	0.0	62.5	1810.4	2947.0
	EQUIPMENT OPEN COMMITMENTS					368.0	

TABLE C-3
FERMI NATIONAL ACCELERATOR LABORATORY
Sep-89

	PROGRAM ELEMENT	LABOR	MAT'L & SERVICES	G & A	MONTH TOTAL	YEAR TO DATE	ANNUAL BUDGET
3.1	GENERAL	0.0	13.9	3.3	17.2	245.2	222.0
3.2	LONG MAGNET FABRICATION	29.6	455.9	110.3	595.8	2267.1	1891.0
3.3	MAGNETIC MEASUREMENTS	84.1	59.8	122.1	266.0	1811.1	2168.0
3.4	COLD MASS FABRICATION	101.5	240.9	273.7	616.1	3729.0	3845.0
3.5	INDUSTRIALIZATION	0.2	1.3	6.2	7.7	164.9	417.0
3.6	CELL TESTS	0.0	0.0	0.0	0.0	0.0	0.0
3.7	ACCELERATOR STUDIES	1.3	0.0	1.0	2.3	93.0	71.0
3.8	HALF-CELL TESTS SUP. (REE)	0.0	298.0	113.9	411.9	463.7	466.0
3.9	CRYOGENIC R & D (RAC)	41.0	46.9	53.8	141.7	845.9	1009.0
3.10	GENERAL MAGNET R & D (RAE)	27.5	80.3	60.0	167.8	561.1	1384.0
3.11	MTF MODIFICATION (RAI)	20.6	21.0	23.4	65.0	515.5	278.0
3.12	DIPOLE TOOLING R & D (RAJ)	55.3	41.9	69.3	166.5	1344.3	417.0
	PROGRAM COSTS	361.1	1259.9	837.0	2458.0	12040.8	12168.0
	COMMITMENTS					1425.3	
	DELTA COMMITMENTS					443.1	
	EQUIPMENT COSTS	0.0	114.3	0.0	114.3	772.5	1640.0
	EQUIPMENT OPEN COMMITMENTS					859.2	

TABLE C-4
LAWRENCE BERKELEY LABORATORY
Sep-89

	PROGRAM ELEMENT	LABOR	MAT'L & SERVICES	G & A	MONTH TOTAL	YEAR TO DATE	ANNUAL BUDGET
4.1	GENERAL	15.6	6.5	11.5	33.6	326.6	350.0
4.2	SUPERCONDUCTOR & CABLE	12.7	146.8	23.5	183.0	887.1	1340.0
4.3	CABLE SHORT SAMPLE TEST FACILITY	0.0	0.0	0.0	0.0	431.3	50.0
4.4	DIPOLE MAGNET DEVELOPMENT	5.4	2.8	7.4	15.6	1180.0	760.0
4.5	QUADRUPOLE MAGNETS	23.6	1.1	12.7	37.4	336.7	260.0
4.6	COIL PROPERTIES	0.0	0.0	0.0	0.0	26.9	200.0
4.7	TECHNOLOGY TRANSFER TO INDUSTRY	0.0	0.0	0.0	0.0	50.0	50.0
	MAGNET R & D TOTALS	57.4	157.2	55.1	269.8	3238.4	3010.0
4.8	ACCELERATOR THEORY SUPPORT	14.9	0.8	7.5	23.2	332.6	410.0
	R & D COST TOTAL	72.3	158.0	62.6	293.0	3571.0	3420.0
	COMMITMENTS					417.0	
	DELTA COMMITMENTS					-138.0	

TABLE C-5
PROGRAM SUMMARY - SUPERCOLLIDER
Sep-89

	PROGRAM ELEMENT	LABOR	MAT'L & SERVICES	G & A	MONTH TOTAL	YEAR TO DATE	ANNUAL BUDGET
1.	CDG PROGRAM	4259.4	1895.0	608.5	6763.0	32877.6	26180.0
1.41	RTK PROGRAM	0.0	52.1	0.0	52.1	720.1	750.0
2.	BNL SSC PROGRAM	392.1	816.9	719.2	1928.2	14071.3	14600.0
3.	FNAL SSC PROGRAM	361.1	1259.9	837.0	2458.0	12040.8	12168.0
4.	LBL SSC PROGRAM	72.3	158.0	62.6	292.9	3571.0	3420.0
	TOTAL SSC PROGRAM COSTS	5084.8	4182.0	2227.3	11494.1	63280.8	57118.0
	COMMITMENTS					4260.4	
	DELTA COMMITMENTS					-571.5	
	EQUIPMENT COSTS					6467.4	4587.0
	EQUIPMENT OPEN COMMITMENTS					4046.5	

TABLE C-6

MONTHLY AND CUMULATIVE SUMMARY
OF PLANNED AND ACTUAL COSTS AND COMMITMENTS

1.0 CENTRAL DESIGN GROUP - SUPERCOLLIDER

MONTH	MONTHLY PLANNED COSTS	FY PLANNED CUMULAT	MONTHLY ACTUAL COSTS	FY ACTUALS CUMULAT	MO ACT+ DELTA COMMITS	CUM ACT + COMMITS	CURRENT COMMITS	DELTA COMMITS
OCT	1158.0	1158.0	236.1	236.1	1027.3	2035.9	1799.8	791.2
NOV	1238.8	2396.8	1365.0	1601.1	1473.9	3509.8	1908.7	108.9
DEC	1319.6	3716.3	1105.8	2706.9	943.5	4453.3	1746.4	-162.3
JAN	1400.4	5116.7	1180.3	3886.9	1145.9	5598.9	1712.0	-34.4
FEB	1588.9	6705.6	1263.2	5150.1	1626.7	7225.6	2075.5	363.5
MAR	1831.2	8536.8	1848.2	6998.3	1931.7	9157.3	2159.0	83.5
APR	2154.4	10691.2	2406.8	9405.1	2430.5	11587.8	2182.7	23.7
MAY	2477.6	13168.8	2720.1	12125.2	3063.8	14651.6	2526.4	343.7
JUN	2827.7	15996.4	3978.3	16103.5	3741.0	18392.6	2289.1	-237.3
JUL	3177.7	19174.2	4820.5	20924.0	4789.1	23181.7	2257.7	-31.4
AUG	3608.6	22782.8	5862.9	26786.9	5777.9	28959.6	2172.7	-85.0
SEP	4147.2	26930.0	6815.1	33602.0	6264.5	35224.1	1622.1	-550.6

2.0 BROOKHAVEN NAT'L LAB - SUPERCOLLIDER

MONTH	MONTHLY PLANNED COSTS	FY PLANNED CUMULAT	MONTHLY ACTUAL COSTS	FY ACTUALS CUMULAT	MO ACT+ DELTA COMMITS	CUM ACT + COMMITS	CURRENT COMMITS	DELTA COMMITS
OCT	1216.7	1216.7	1033.8	1033.8	3502.9	3502.9	2469.1	2469.1
NOV	1216.7	2433.3	1017.1	2050.9	557.0	4059.9	2009.0	-460.1
DEC	1216.7	3650.0	1173.8	3224.7	1227.8	5287.7	2063.0	54.0
JAN	1216.7	4866.7	1355.4	4580.1	1316.4	6604.1	2024.0	-39.0
FEB	1216.7	6083.3	1147.9	5728.0	913.9	7518.0	1790.0	-234.0
MAR	1216.7	7300.0	1401.6	7129.6	1902.6	9420.6	2291.0	501.0
APR	1216.7	8516.7	973.6	8103.2	830.6	10251.2	2148.0	-143.0
MAY	1216.7	9733.3	1000.5	9103.7	743.5	10994.7	1891.0	-257.0
JUN	1216.7	10950.0	1071.4	10175.1	825.4	11820.1	1645.0	-246.0
JUL	1216.7	12166.7	823.3	10998.4	678.3	12498.4	1500.0	-145.0
AUG	1216.7	13383.3	1132.1	12130.5	754.1	13252.5	1122.0	-378.0
SEP	1216.7	14600.0	1928.3	14058.8	1602.3	14854.8	796.0	-326.0

3.0 FERMI NAT'L ACCEL LAB - SUPERCOLLIDER

MONTH	MONTHLY PLANNED COSTS	FY PLANNED CUMULAT	MONTHLY ACTUAL COSTS	FY ACTUALS CUMULAT	MO ACT+ DELTA COMMITS	CUM ACT + COMMITS	CURRENT COMMITS	DELTA COMMITS
OCT	1014.0	1014.0	366.1	366.1	1178.9	1178.9	812.8	812.8
NOV	1014.0	2028.0	670.2	1036.3	488.4	1667.3	631.0	-181.8
DEC	1014.0	3042.0	613.1	1649.4	593.5	2260.8	611.4	-19.6
JAN	1014.0	4056.0	787.2	2436.8	807.2	3068.2	631.4	20.0
FEB	1014.0	5070.0	829.0	3178.7	931.7	3912.8	734.1	102.7
MAR	1014.0	6084.0	921.9	4100.8	1095.7	5008.7	907.9	173.8
APR	1014.0	7098.0	1013.4	5114.4	1073.6	6082.5	968.1	60.2
MAY	1014.0	8112.0	1157.3	6271.9	999.1	7081.8	809.9	-158.2
JUN	1014.0	9126.0	1360.2	7632.3	1428.5	8510.5	878.2	68.3
JUL	1014.0	10140.0	896.3	8528.8	880.5	9391.2	862.4	-15.8
AUG	1014.0	11154.0	1055.0	9584.0	1174.8	10566.2	982.2	119.8
SEP	1014.0	12168.0	2458.0	12042.2	2901.1	13467.5	1425.3	443.1

4.0 LAWRENCE BERKELEY LAB - SUPERCOLLIDER

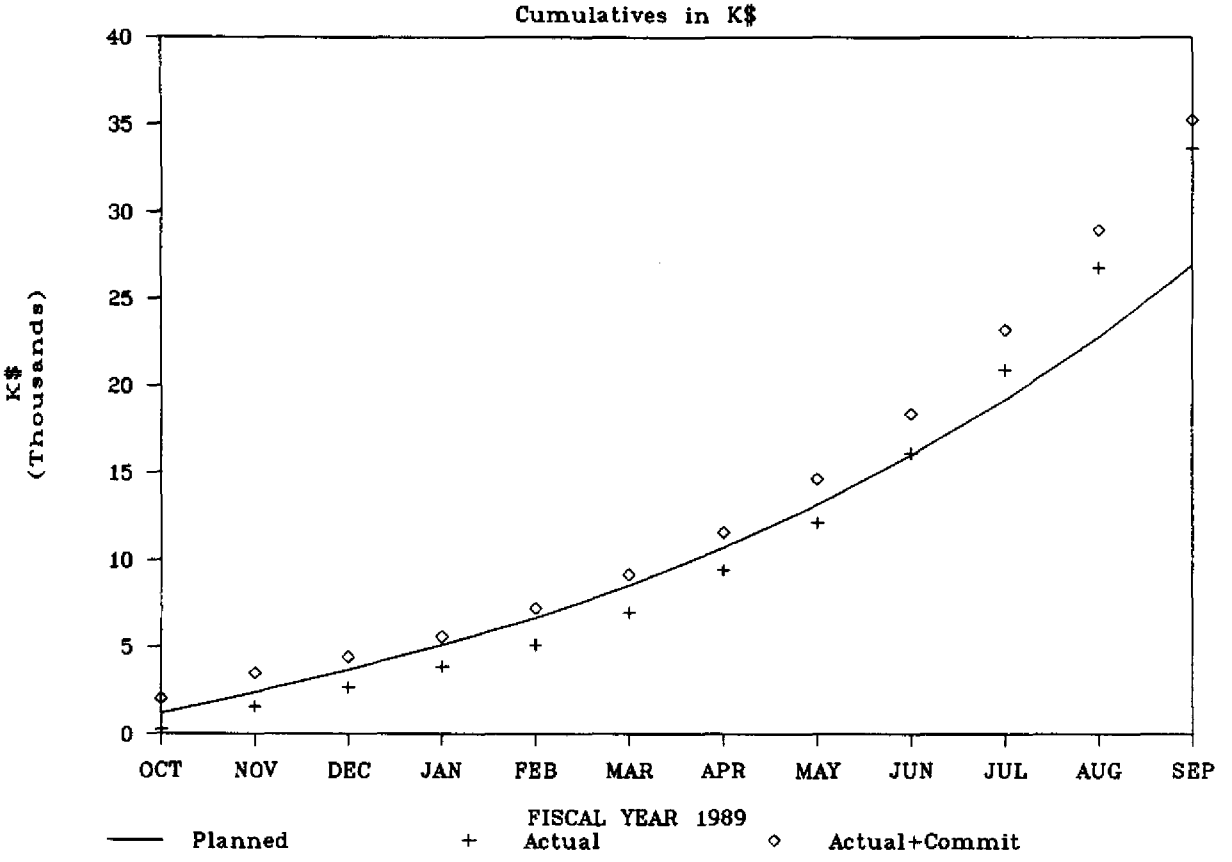
MONTH	MONTHLY PLANNED COSTS	FY PLANNED CUMULAT	MONTHLY ACTUAL COSTS	FY ACTUALS CUMULAT	MO ACT+ DELTA COMMITS	CUM ACT + COMMITS	CURRENT COMMITS	DELTA COMMITS
OCT	285.0	285.0	244.6	244.6	-5.4	339.6	95.0	-250.0
NOV	285.0	570.0	212.2	456.8	215.2	554.8	98.0	3.0
DEC	285.0	855.0	208.8	665.6	206.8	761.6	96.0	-2.0
JAN	285.0	1140.0	343.9	1009.5	508.9	1270.5	261.0	165.0
FEB	285.0	1425.0	273.2	1282.7	377.2	1647.7	365.0	104.0
MAR	285.0	1710.0	373.5	1656.2	525.5	2173.2	517.0	152.0
APR	285.0	1995.0	258.8	1915.0	268.8	2442.0	527.0	10.0
MAY	285.0	2280.0	480.5	2395.5	578.5	3020.5	625.0	98.0
JUN	285.0	2565.0	305.2	2700.7	314.2	3334.7	634.0	9.0
JUL	285.0	2850.0	320.3	3021.0	274.3	3609.0	588.0	-46.0
AUG	285.0	3135.0	321.8	3342.8	288.8	3897.8	555.0	-33.0
SEP	285.0	3420.0	293.0	3635.8	155.0	4052.8	417.0	-138.0

0.0 PROGRAM SUMMARY - SUPERCOLLIDER

MONTH	MONTHLY PLANNED COSTS	FY PLANNED CUMULAT	MONTHLY ACTUAL COSTS	FY ACTUALS CUMULAT	MO ACT+ DELTA COMMITS	CUM ACT + COMMITS	CURRENT COMMITS	DELTA COMMITS
OCT	3673.7	3673.7	1880.6	1880.6	5703.7	7057.3	5176.7	3823.1
NOV	3754.4	7428.1	3264.5	5145.1	2734.5	9791.8	4646.7	-530.0
DEC	3835.2	11263.3	3101.5	8246.6	2971.6	12763.4	4516.8	-129.9
JAN	3916.0	15179.4	3666.8	11913.3	3778.4	16541.7	4628.4	111.6
FEB	4104.5	19283.9	3513.3	15339.5	3849.5	20304.1	4964.6	336.2
MAR	4346.9	23630.8	4545.2	19884.9	5455.5	25759.8	5874.9	910.3
APR	4670.1	28300.9	4652.6	24537.7	4603.5	30363.5	5825.8	-49.1
MAY	4993.2	33294.1	5358.4	29896.3	5384.9	35748.6	5852.3	26.5
JUN	5343.3	38637.4	6715.1	36611.6	6309.1	42057.9	5446.3	-406.0
JUL	5693.4	44330.8	6860.4	43472.2	6622.2	48680.3	5208.1	-238.2
AUG	6124.3	50455.1	8371.8	51844.2	7995.6	56676.1	4831.9	-376.2
SEP	6662.9	57118.0	11494.4	63338.8	10922.9	67599.2	4260.4	-571.5

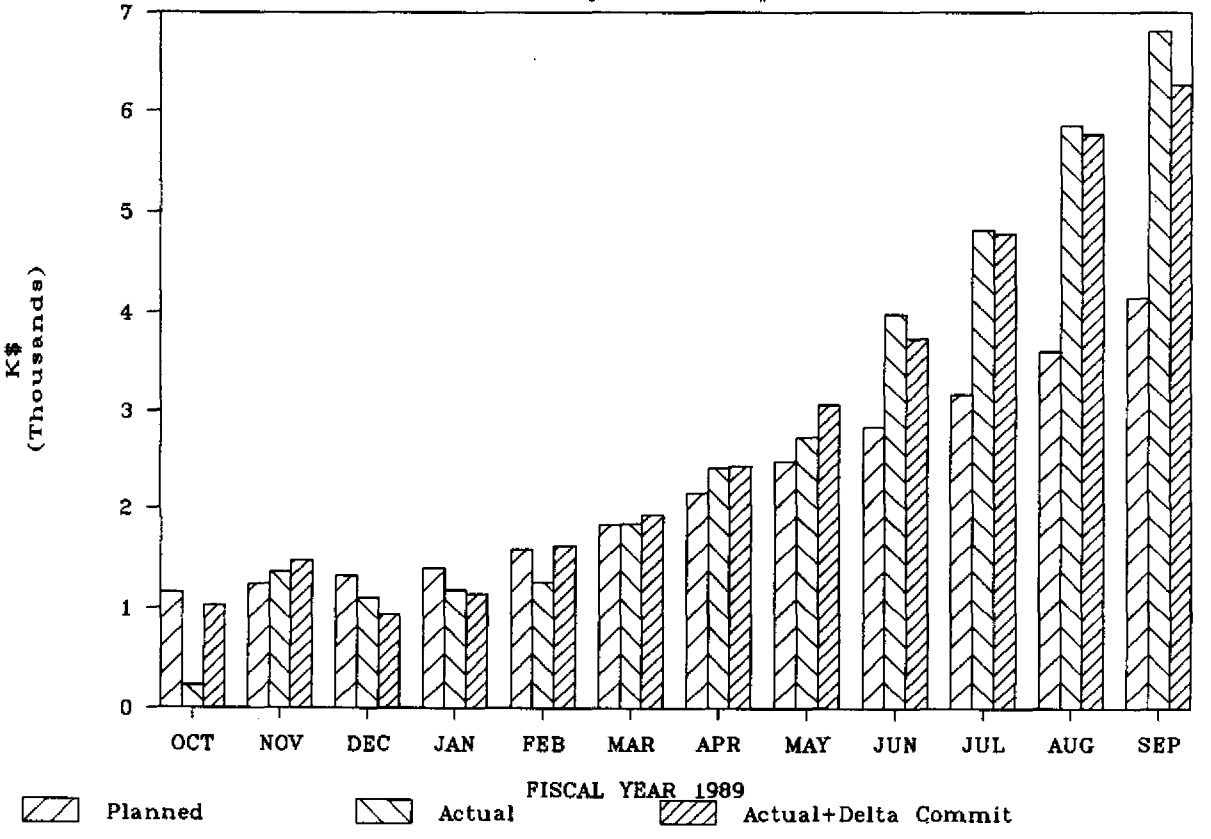
1.0 CENTRAL DESIGN GROUP

Cumulatives in K$



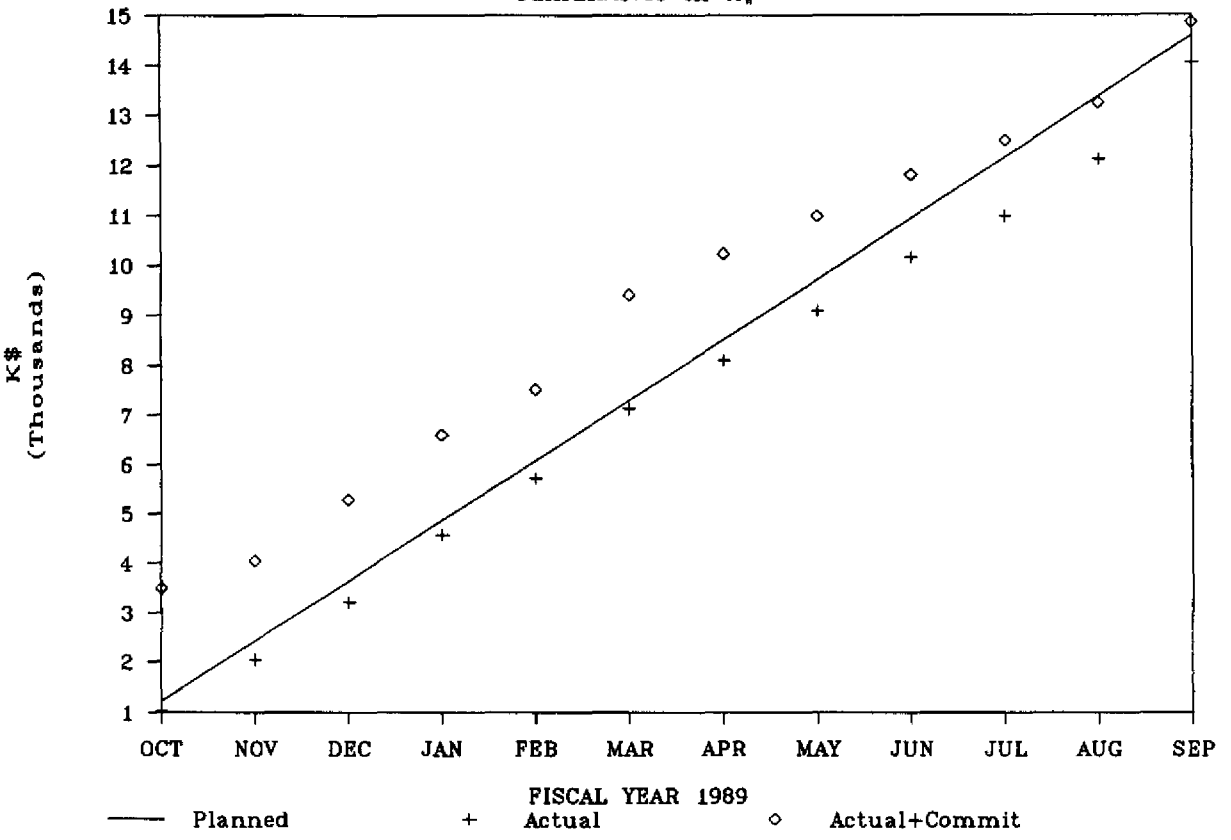
1.0 CENTRAL DESIGN GROUP

Monthly Costs in K$



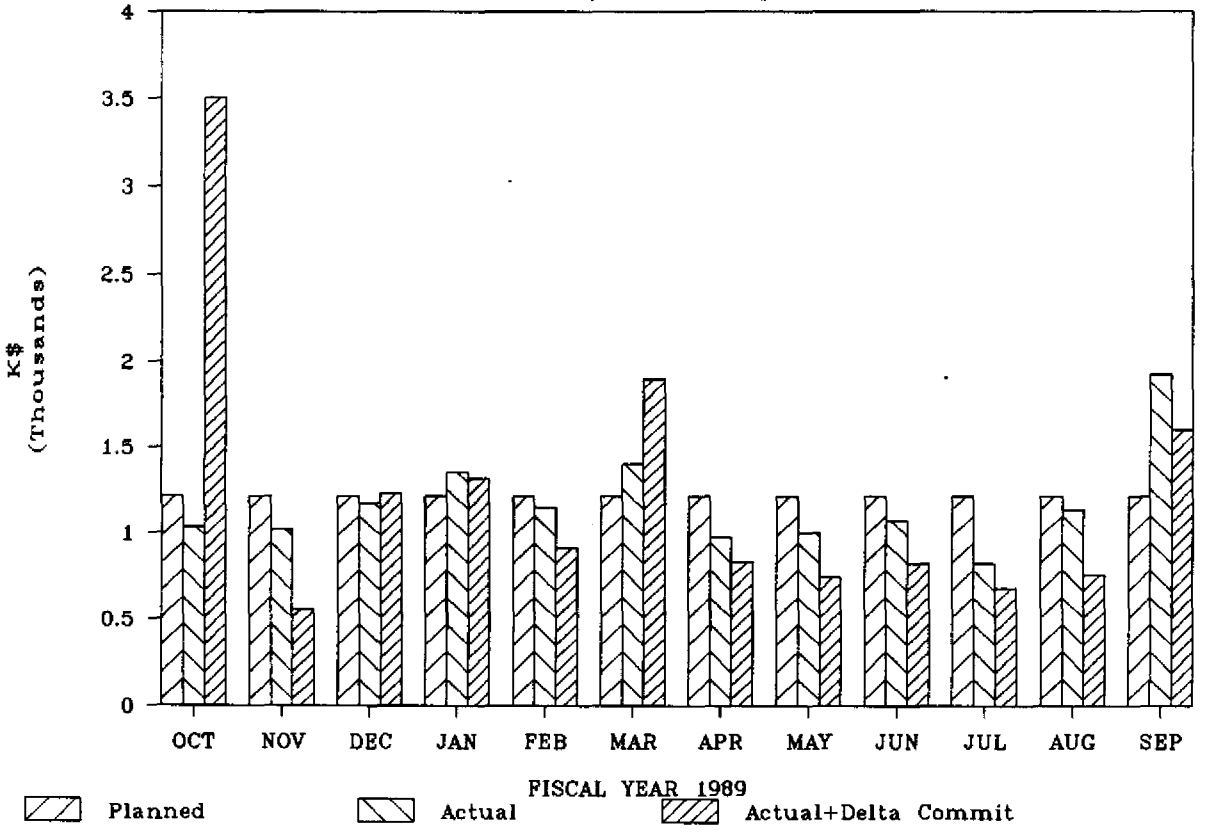
2.0 BROOKHAVEN NAT'L LAB

Cumulatives in K$



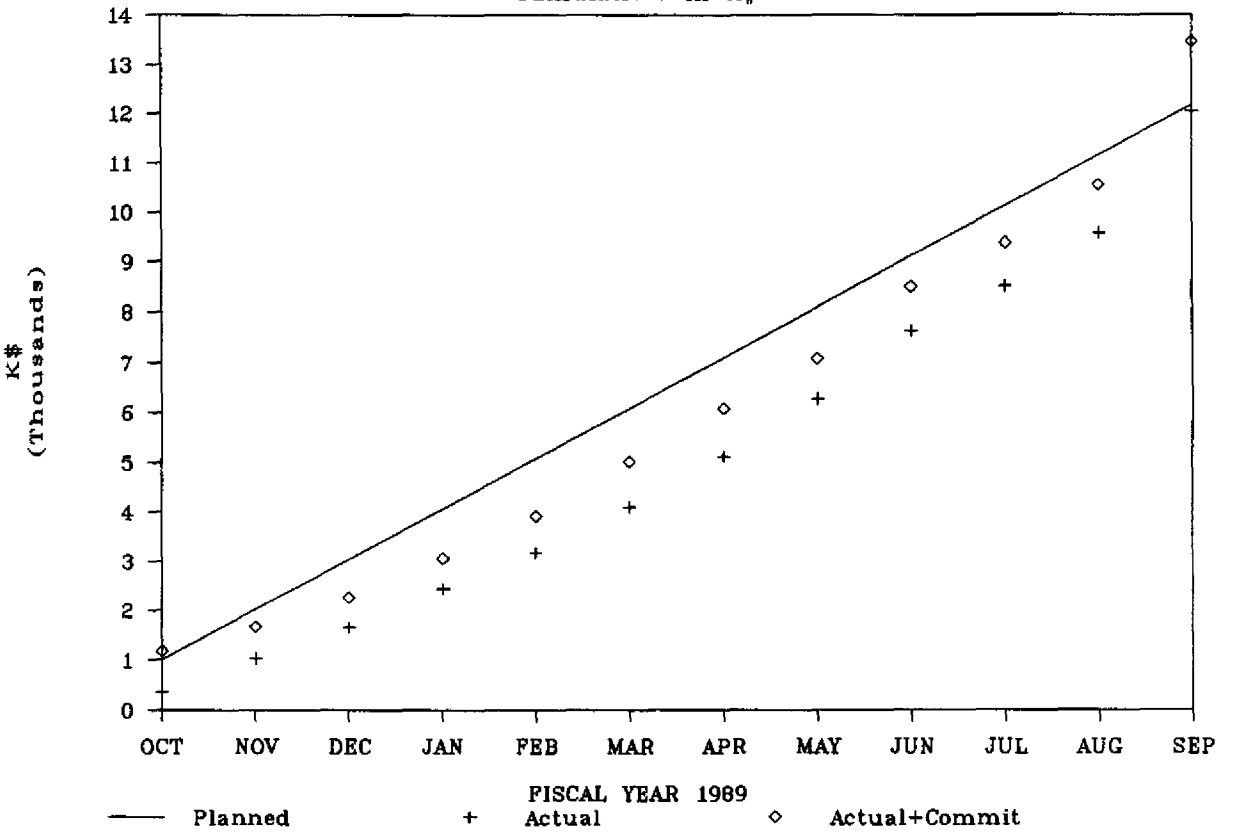
2.0 BROOKHAVEN NAT'L LAB

Monthly Costs in K$



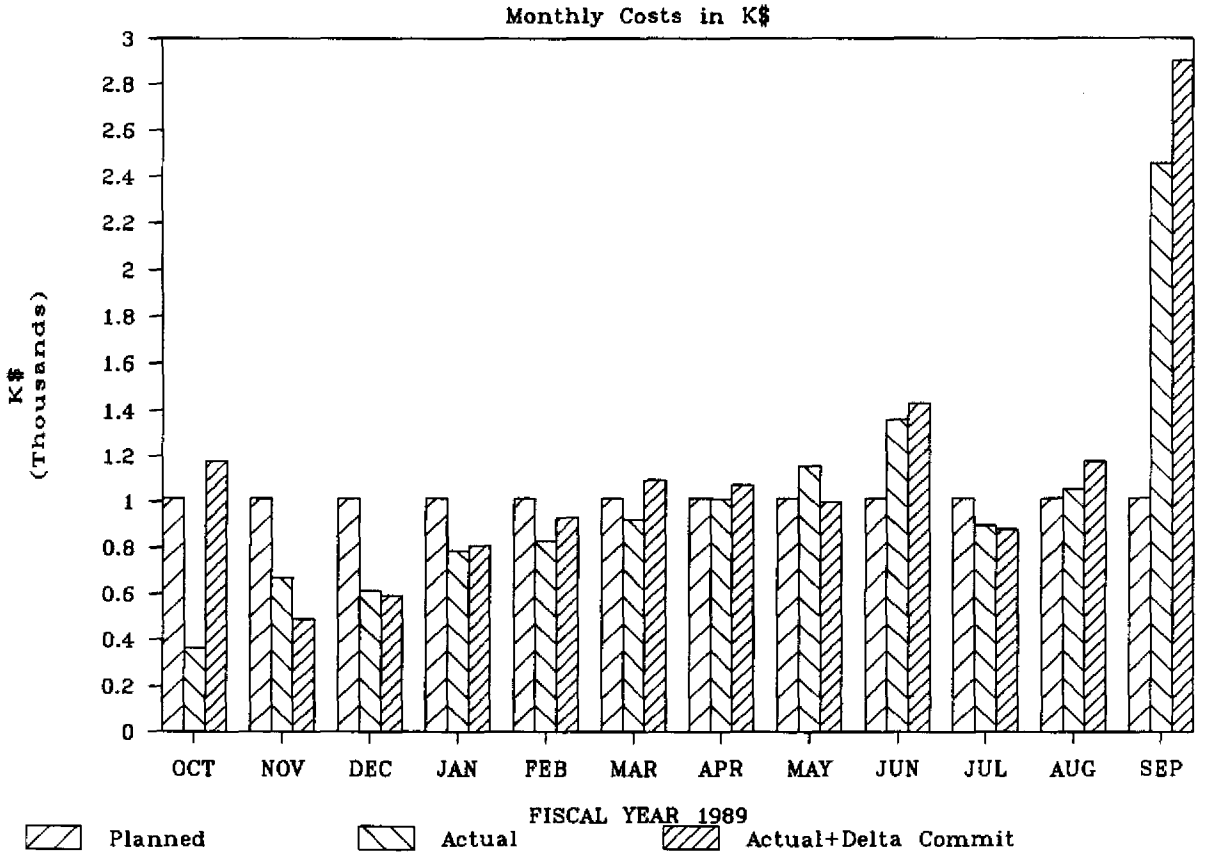
3.0 FERMI NAT'L ACCEL LAB

Cumulatives in K$



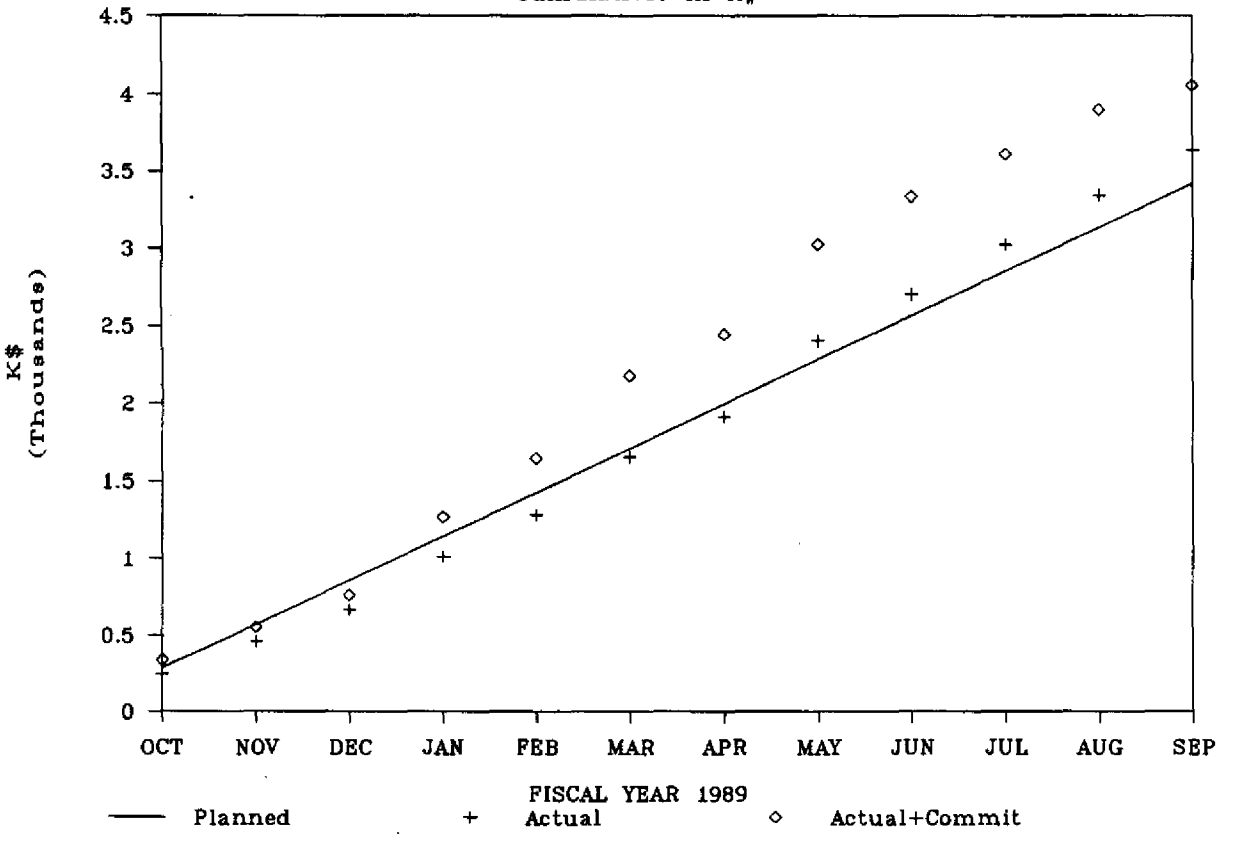
3.0 FERMI NAT'L ACCEL LAB

Monthly Costs in K$



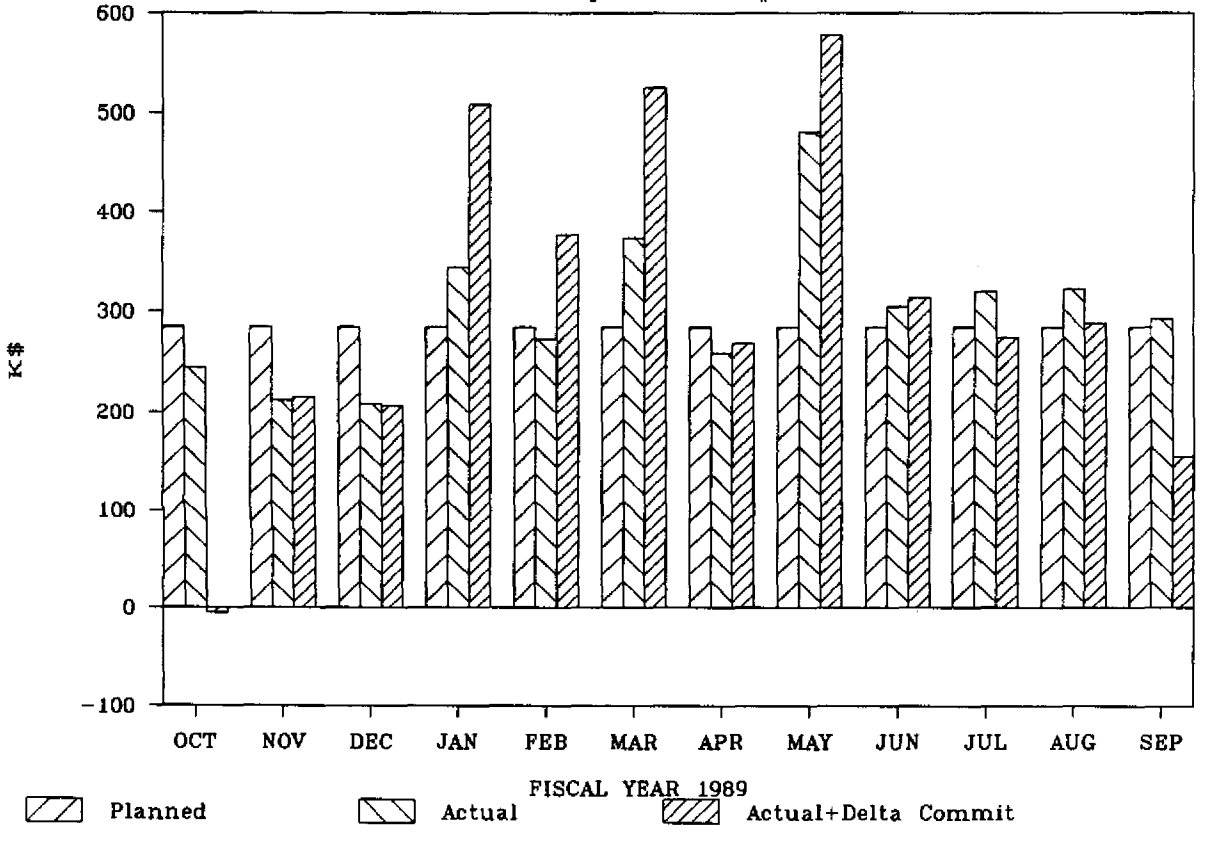
4.0 LAWRENCE BERKELEY LAB

Cumulatives in K$



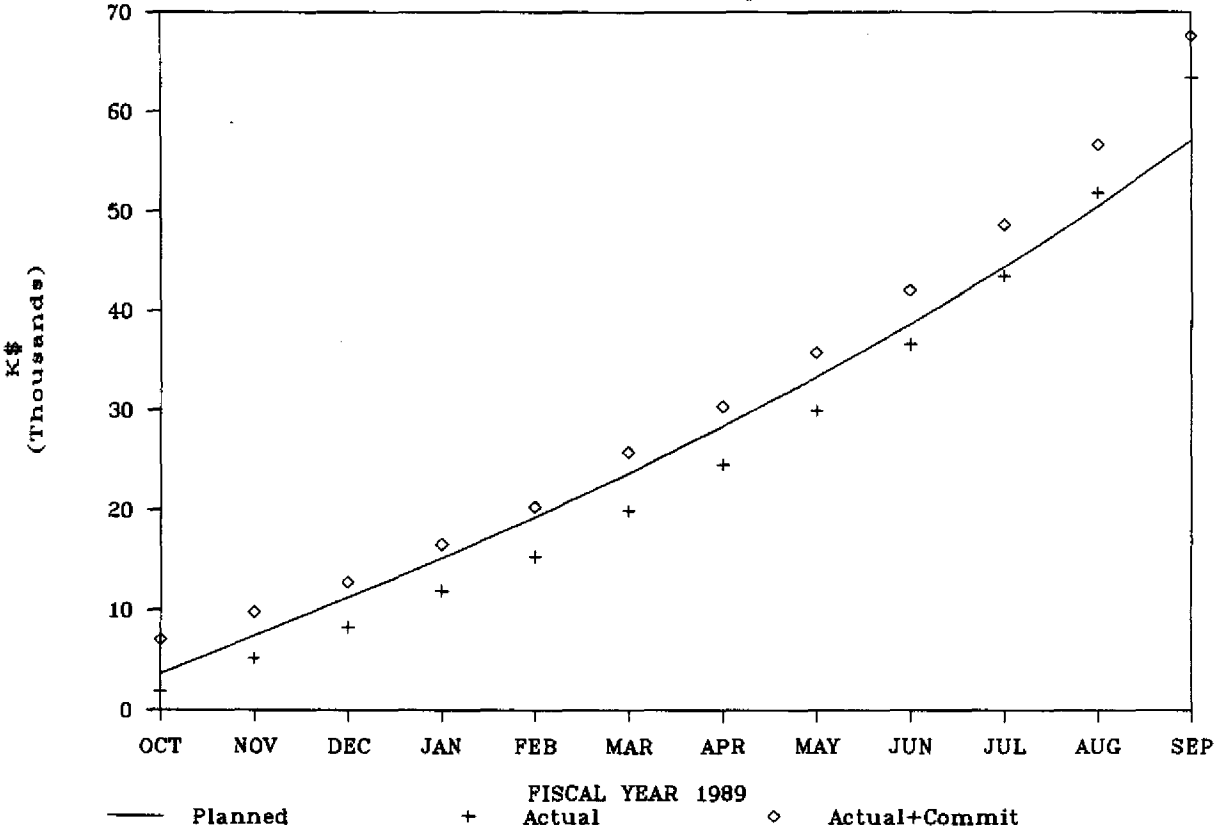
4.0 LAWRENCE BERKELEY LAB

Monthly Costs in K$



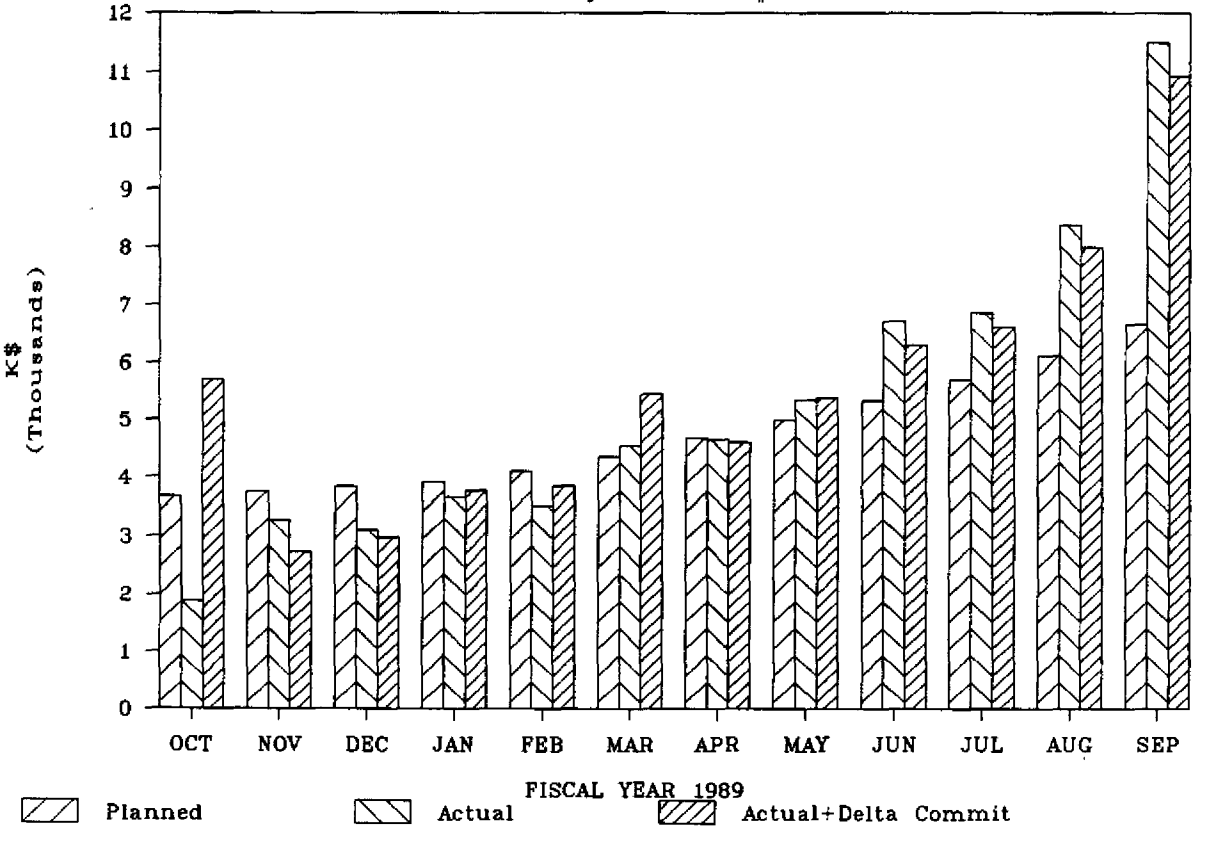
0.0 PROGRAM SUMMARY – SUPERCOLLIDER

Cumulatives in K$



0.0 PROGRAM SUMMARY – SUPERCOLLIDER

Monthly Costs in K$



SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

MIL NO.	WBS NO.	MILESTONE DESCRIPTION	COMPLETION DATE PLAN	COMPLETION DATE ACTUAL	COMMENTS
1	2.0	AE/CM Criteria	3/89	4/89	
2	2.0	Start Geotech	5/89	6/89	First Phase Complete
3	3.0	SE/I RFP Issued	6/89	6/89	
4	2.0	Footprint Fixed	8/89	8/89	
5	3.0	SE/I Contract Award	8/89	- -	Anticipate October Contract Award
6	3.0	First Draft PMP Issued To DOE	8/89	8/89	Subject of Semi Annual Review
7	4.0	DOE Approval To Proceed With In-House Design For Early Critical A-E/CM Activities	8/89	8/89	Official 10/2
8	2.0	Land Acquisition Footprint Specification Documentation Complete	8/89	9/89	
9	1.0	MIP RFP	9/89	- -	TBD
10	3.3	Key Finance Staff Hired	9/89	9/89	
11	2.0	First Tunnel Section Location Set	9/89	9/89	
12	1.0	Tunnel Cross Section Defined	9/89	- -	Expected to Finalize October 9
13	3.0	First DOE Semi Annual Review	9/89	9/89	

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

MIL NO.	WBS NO.	MILESTONE DESCRIPTION	COMPLETION DATE PLAN	COMPLETION DATE ACTUAL	COMMENTS
14	3.3	SSCL Accounting System In WBS Format Shown in August Monthly Report	9/89		To Be In October Report
15	3.3	Deltek Accounting System Operational	9/89	9/89	October 1 Initialization
16	3.3	Key Procurement Staff Hired	9/89	9/89	All Key Positions Filled
17	3.3	Procurement Policies Procedures Manual Complete and Issued	9/89	9/89	Submitted To DOE-CH For Review And Approval
18	3.3	Deltek Purchasing Module Operational	9/89	9/89	
19	3.4	SSCL Vax Delivered	9/89	- -	Delivery Expected In October
20	3.1	PMRS Software Installed and Tested	9/89	9/89	
21		Eng. Mgmt. System Plan - Final Draft Issued	9/89		
22	2.0	SEIS Draft Issued	10/89		
23	2.0	AE/CM Contract	10/89		[60 day slip]
24	3.1	PMRS Implementation Complete	10/89		
25	3.4	MIS Hardware Operational	10/89		
26	3.1	Config. Mgmt. Plan Complete	10/89		
27	3.4	Draft Document Control Plan Issued	10/89		

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

MIL NO.	WBS NO.	MILESTONE DESCRIPTION	COMPLETION DATE PLAN	ACTUAL	COMMENTS
28		AE/CM-SSC Performance Objectives & Syst. Requirements Revisions Complete	10/89		
29	3.0	Issue First Directive	10/89		
30	3.0	First C/SCS Report Test	10/89		
31	1.0	Collider Dipole Criteria Established	10/89		
32	3.0	Initial Baseline Issued	11/89		
33	3.1	First Monthly Report With Automated PMRS	11/89		
34	3.1	Baseline Cost Estimate Complete	11/89		
35	3.2	SEMP Approved and Issued	11/89		
36	3.1	PMP - Final Draft Issued	11/89		
37	3.1	Key QA Staff Hired	11/89		
38	3.5	ES&H Management Plan	11/89		
39	3.5	ES&H Final Draft Issued	11/89		
40	3.1	SSC WBS/WBS Dictionary Complete and Issued	11/89		
41	1.0	Prototype Dipole Specification Complete	11/89		
42	1.0	Magnet Criteria Complete	11/89		

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

MIL NO.	WBS NO.	MILESTONE DESCRIPTION	COMPLETION DATE PLAN	ACTUAL	COMMENTS
43	3.3	Deltek Procurement Interface Program Implemented	12/89		
44	3.1	Configuration Management Policy Statement Issued	12/89		
45	3.4	Document Control Policy Statement Issued	12/89		
46	2.6	CCD-Procedures Manual Second Draft Issued	12/89		
47	3.0	Supplemental Site Specific CDR Issued	12/89		
48	3.0	State Baseline Validation	1/90		
49	3.1	QA Policies and Procedures Complete	1/90		
50	3.1	QA Data Base Requirements Document Issued	1/90		
51	2.1	AE/CM-Complete Near Term Work Authorization Packages	1/90		
52	4.0	First Land Tract Available	1/90		
53	1.0	Award Magnet Prototype Contract	1/90		
54	2.0	Award MTL/MDL Facilities Cold Test Fabrication Contract	1/90		
55	3.3	Final AAAP Approved and Issued	2/90		
56	3.1	DOE/CSCSC Readiness Review	2/90		

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

MIL NO.	WBS NO.	MILESTONE DESCRIPTION	COMPLETION DATE PLAN	ACTUAL	COMMENTS
57	3.1	PMP Approved and Issued	2/90		
58	2.6	CCD-Procedures Manual Issued	2/90		
59	3.0	Baseline Validation Complete	2/90		
60	4.0	Supplemental Environmental Impact Statement Issued	2/90		
61	2.0	A-E/CM On Board	2/90		

MEETINGS/CRITICAL EVENTS

Date	Meeting Subject	Participants	Location
11/13	Detector R&D Advisory Board	15 International Reviewers	SSC
11/13	URA Board of Trustees		Adolphus Hotel, Dallas
11/13-17	Theory Group Research Funding	15-20 people	
11/13-17	Detector R&D Advisory Panel	20 people	
11/30-12/2	EMPACT Experimental Collaboration		
12/15-16	SSCL Science Policy Committee Meeting		SSC

MODEL MAGNETS

Long Magnets

DD0019 underwent its initial test sequence in the Magnet Test Facility at FNAL with good results this month. This was the first long SSC Magnet for which "conditioning" was attempted to eliminate or minimize training. The Magnet was, accordingly, first ramped several times to high currents (6700-6800A) at 3.5K without quenching. The temperature was then raised to the standard operating temperature of 4.35K where, following one minor training quench, a quench plateau was reached in fair agreement with the short sample limit of the conductor. Magnetic measurements were also obtained.

Bore tube and coil assembly operations were performed on DD0020. Collars were received and collar packs assembled using the new collar pack length adjustment shims. Yoke blocks were fabricated as well.

Shell welding was completed on DD0027, and interconnect assembly steps came next. The cold mass is slated to be shipped to FNAL on October 9. Repairs were started on DDA010, following the cold mass support column buckling failure noted in last month's report. A new compact post was obtained from FVNAL and installed in the cold mass; all heat shields and layers of thermal insulation were installed in the cryostat, thermal straps were rewelded, piping reinstalled, and the cold mass was reinstalled in the cryostat. The first long SSC Magnet to be tested at BNL will be either DDA010 or DD0020--probably the former magnet to "shake down" the test stand before testing DD0020.

Samples of fineblanked quarter-inch yoke laminations are undergoing evaluation, with an order having been placed for 23 tons of additional thick yoke steel from Inland Steel--sufficient for two more long magnets. Simultaneously, additional quantities of 16 gauge and 18 gauge steel has been ordered as reserve and also to supplement the quarter-inch material. Meanwhile, an order is being placed for H and J Tool and Die Co. for a new die plate and pun ch for stamping 16 gauge yoke laminations for use with "anti-ovalizing" collars.

Shell strain gauge data taken during the welding of DD0019, 26 and 27 were analyzed in detail and correlated against expected shell behavior. The data clearly show the increased shell strain due to ovalized collars, as well as the effects due to the relatively large weld root gaps.

SHORT MAGNETS

An 1.8-m assembled with anti-ovalizing collars, SV016, was tested with good results this month, as discussed under tests and measurements, below.

Collar packs were prepared for DSS19 and DSS20, and the end of the month saw DSS19 fully assembled, including welded shell. End gauging was completed on DSS21. All three of these magnets will have anti-ovalized collars and revised quarter-inch yoke laminations.

Beam Tubes and Trim Coils

The trim coil for DD0028 has been completed. A trim coil/beam tube assembly for use in DSS19 has been received, and the corresponding assembly earmarked for DSS20 is being prepared. Silvex has plated one beam tube with the new anode, with good adhesion. New end boxes are being produced; they are expected to improve the fluid solution flow in the tube ends. About 50% of the plating strongback design has been approved and submitted to the shop. Two vendors interested in bidding on the beam tube liner have been located. Meanwhile, assembly is continuing of components for the trim coil test facility.

TOOLING AND EQUIPMENT

Coils

Two inner and two outer coils were wound and cured to test the new 1.8-m curing press which became operational this month. Results were excellent, exhibiting good size uniformity.

The coil tooling demagnetizer design has been checked and released to the shops.

Collars

The collar pack assembly fixture has been released to the shops.

Cold Mass Insertion

The insertion fixture performed well after changing the drive ratio. Motion was smooth and predictable.

Test Equipment

An order has been placed with a vendor for environmentally testing all future mole encoders.

The wiring of mole DI has been completed, and final assembly and testing has begun. Meanwhile, the new mold D connector was approved and submitted to the shops. The coil form gas bypass was also approved and submitted to the shops. Finally work is progressing on the assembly of Mole DII.

SUPERCONDUCTOR

Cable Procurement

During the month of September, a lot of outer cable was received. It appears that a quantity of this lot is "out of spec," and no mechanical measurements have yet been made on this cable.

Tooling

Two commercial insulation wrapping line shaft modules, ordered to upgrade BNL's wrapping line, were received. Installation of these devices will be scheduled so as not to interfere with the planned wrapping of SSC cable.

Miscellaneous

The insulting films test program is moving forward within the group with the modification of the wrapping line to wrap two layers (each overlapped(of film. The new film requires no fiberglass and adheres to itself when given the proper treatment. The modifications seem successful with only minor problems to overcome. The film is wrapping quite well with no wrinkles or imperfections.\

The test of DuPont's "Step Pac" Kapton proved successful and future orders of Kapton will b e in this form. The "Step Pac" reduced the soft edges and pays off the spool much better.

A new clear plastic film (Ethylene Vinyl Acetate) has been successfully tested as a cable spool cover/seal. This film provides a barrier to moisture and contamination and will protect the cable while in storage. It is now standard practice for all cable to have this protective seal.

TESTS AND MEASUREMENTS

As noted earlier, a 1.8-m dipole assembled with reduced ovality collars, DSV016, was tested with good results this month. The collars were designed so that the shape of the collared coil would be more nearly round than is the case with coils assembled in standard collars. The coils of the magnet were previously tested in DSS16, where they exhibited excellent quench performance. The quench performance of DSV016 was also excellent. The magnet reached a plateau quench current of 6.95KA after two training quenches at 4.35K. The additional training needed to reach a 8.1KA plateau at this temperature was modest. After a thermal cycle the magnet did not return at 4.35K. Multipole data are being analyzed.

PROGRESS REPORT ON FERMILAB SSC R & D ACTIVITIES

SEPTEMBER 1989

SUMMARY

Magnet DD0019 was cooled down for the second test cycle. After three "conditioning" ramps to 6800 amps at 3.5K, the magnet was quenched five times at 4.35K. All of the quenches were close to short sample limit of 6740 A. Magnet DD018 was returned complete to BNL. DD0026 will be complete and ready for testing on October 13.

The first full-length inner coil using practice conductor was wound and cured on the new tooling. The systems worked very well.

Dipole Cryostat

The Heat Leak Test Facility is being reconfigured for 80K to 4.5K MLI measurements.

Work is continuing on alignment. The initial stretched wire bench is under construction and will be tested using DD0019. We are also beginning an investigation of laser alignment devices. A demonstration measurement using a laser device is planned for the coming weeks.

Modifications to the soft magnet mounts on the non-extendable trailer were completed.

Magnet DD0018 was successfully shipped to Brookhaven for testing. The soft mount trailer was used to ship the magnet in its cryostat. The trailer, vacuum vessel, and cold mass were instrumented with accelerometers. Data was recorded for analysis of the shipping environment. An air conditioning system was devised to ensure that the cold mass temperature not exceed 85 F. The highest temperature measured at the cold mass skin during the trip was 79 F.

Magnetic Measurements

A new system for monitoring quenches which occur in the superconducting leads was successfully tested on Stand 4 using magnet DD0017. The result should be safer, more trouble-free test operation of magnets in the future. The magnet was then warmed to room temperature and measurements of the magnetic field were made at 10 amps with the B2 Mole for harmonics and the Kuchnir Field Angle Probe for the vertical field plane. Magnet DD0017 was then removed from the test stand and preparations for magnet DD0026, expected to arrive in the Magnet Test Facility in the second week of October, were begun.

Magnet DD0019 was cooled down for the second test cycle and "conditioned" at 3.5 K by powering to 6800 amps three times without quenching. The temperature was then raised to 4.35 K and quench

testing was performed. Of the five quenches performed, all were at or near the short sample limit (approximately 6740 amps) except for the second in the series, which occurred at 6625 amps in lower inner turn 13. While this is well above the 6500 amp operating current of the accelerator, it occurred in an area, turn 13, where occasional quenches of earlier magnets have occurred, suggesting that design improvements may be considered here. Magnet DD0019 was then warmed to room temperature and the harmonics and vertical field plane were measured at 10 amps. The warm bore, removed from DD0017, was inserted into DD0019 to permit cold measurements during its next cold cycle, expected to occur at the end of October.

Long Magnet Fabrication

Cryostat Area

DD0018

Magnet DD0018 was shipped to BNL fully assembled on 9/26/89. A technician from the Engineering Laboratory followed the truck to BNL.

DD0017

A vertical plane measurement was performed on DD0017 while on the test stand at MTF on 9/27/89.

DD0026

DD0026 arrived from BNL on 8/30/89; the expected completion date is now 10/13/89.

DSHIP

DSHIP was loaded and unloaded at various times during the month for further shipping tests and surveying.

Miscellaneous

Another vacuum vessel was received from the vendor for use on DD0026. It had a number of vacuum leaks, which had to be repaired.

Cold Mass Area

Curing Press

Protective splash guards are now installed around the major hydraulic areas. Parts for chain drives for the insertion table have not arrived. Relief valves on the press have been reset to the latest values.

Collaring Press

The collaring mold is complete except for the side pusher hydraulics, which are now being installed. This work is about 50% complete; completion is expected by 10/20/89.

Yoke/Skinning Press

The welding system is still not complete. MagnaTech has encountered more technical problems with the wire feeds, which they are working on. The system may not be completed until the third week of October. They have requested us to install extra grounding cables, which is now in progress. This should be completed by 10/13/89.

Winding Table

The first inner coil was packaged and cured on 9/14/89. All of the systems worked very well. The coil was unpackaged the next day. We are waiting for the measurement tooling to arrive. The coil looks very good visually. The key bars for the inner mandrel have been sent out for slight modification - they should be back on 10/5/89.

Miscellaneous

The assembly of the outer coil mold manifolds was completed.

The guide rail for the outer coil mold on the transfer table was installed.

The safety chains around the curing press area were installed.

The "mole" table was grouted.

The hydraulics and pushers from the mold stacking table were removed. These parts have been boxed and will be stored.

Magnet Development

Preparations are under way at Lab 2 for the test of the 1 m model F5. This NC9 cross section magnet has 29 voltage taps, 6 strain gage load cells and 6 capacitor load cells for measuring coil prestress and "deflectometers" for measuring horizontal deflection of the coil and radial deflection of the end clamp structure. The multiple voltage tap electronics was successfully used to test a heavily instrumented low beta quadrupole during the month of September. The electronics for the capacitor gages is currently being installed. Tests of F5 are scheduled to begin by the middle of October.

Work continues on evaluating the relative merits of vertically versus horizontally split yokes. The analysis involves comparison of DSS012 performance with both yoke configurations with data from other recent magnets and with results of finite element calculations. Parametric

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studies are also being done of design variations on both the horizontal and vertically split cases using magnet data and finite element calculations as inputs.

F Series Model Program

F5 has been instrumented for testing. Testing is expected to begin by October 9.

F6 inner coils are wound. One outer coil was completed by using a "sheathed" mandrel to protect the inside of the coil from the laminated surface. Problems developed with the sheathing. The problem has been corrected but requires new parts. They are expected to arrive by 10/15/89. Outer coil winding will resume at that time.

DS0307 (F7) inner coils have been wound. They will be measured this month. DS0307 is expected to be collared by 11/3/89. After collaring, it will be potted and sectioned. The return ends of both inner and outer coils will also be potted and sectioned to examine conductor placement.

Some aluminum end parts for a C358 dipole have been coated with an insulating material. They will be tested for mechanical properties, electrical properties and radiation resistance this month.

Two outside vendors are pursuing other materials suitable for molding end parts.

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A die to stamp collar laminations for use with a coil insulation scheme which does not include collaring shims and shoes is complete. Laminations are being stamped for inspection.

FERMILAB SSC R&D
COST AND OBLIGATION REPORT
REPORT PERIOD - SEPTEMBER, 1989

PROGRAM ELEMENTS	COST LABOR MO	COST LABOR YTD	COST MATERIAL MO	COST MATERIAL YTD	COST OVERHEAD MO	COST OVERHEAD YTD*	COST TOTAL MO	COST TOTAL YTD	OPEN COMMIT	COST PLUS COMMIT	BUDG.	% OF BUDG. OBGTD
GENERAL (RAA)	0.0	2.9	13.9	174.6	3.3	67.7	17.2	245.2	5.8	251.0	222	113.1%
LONG MAGNET FAB. (RAF)	29.6	322.8	455.9	1432.6	110.3	511.7	595.8	2267.1	537.4	2804.5	2137	131.2%
MAGNETIC MEAS. (RAD)	84.1	907.4	59.8	405.2	122.1	498.5	266.0	1811.1	38.8	1849.9	2168	85.3%
COLD MASS FABRICATION (RAH)	101.5	1062.7	240.9	1637.3	273.7	1029.0	616.1	3729.0	740.5	4469.5	3845	116.2%
INDUSTRIALIZATION (RAK)	0.2	91.2	1.3	28.0	6.2	45.7	7.7	164.9	0.3	165.2	417	39.6%
CRYO SYS. (REG, REI, REJ)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	
ACCEL. STUDIES(REF, REA)	1.3	61.6	0.0	5.7	1.0	25.7	2.3	93.0	0.3	93.3	71	131.4%
HALF-CELL TEST SUP. (REE)	0.0	20.9	296.0	315.1	113.9	127.7	411.9	463.7	0.0	463.7	466	99.5%
CRYO R&D (RAC)	41.0	470.5	46.9	142.1	53.8	233.3	141.7	845.9	16.8	862.7	1009	85.5%
GENERAL MAGNET R&D (RAE)	27.5	210.6	80.3	196.0	60.0	154.5	167.8	561.1	34.3	595.4	638	93.3%
MTF MODIFICATION (RAI)	20.6	136.8	21.0	236.8	23.4	141.9	65.0	515.5	3.5	519.0	278	186.7%
DIPOLE TOOLING R&D (RAJ)	55.3	648.6	41.9	324.1	69.3	371.6	166.5	1344.3	47.6	1391.9	917	151.8%
TOTAL	361.1	3936.0	1259.9	4897.5	837.0	3207.3	2458.0	12040.8	1425.3	13466.1	12168	110.7%
									FY 89 CHANGE IN COM.	FY 89 OBGTD.		
EQUIPMENT (CRQ)	0.0	8.3	114.3	764.2	0.0	0.0	114.3	772.5	859.2	1631.7	1640	99.5%

*This report reflects the correct G&A Distribution for the SSC for FY 1989.

LBL - SSC MAGNET R&D REPORT

September, 1989

I. PROGRAM REPORT

II. FINANCIAL REPORT

III. MANPOWER SUMMARY

LBL - SSC MAGNET R&D REPORTING

September, 1989

I. PROGRAM REPORT

GENERAL

This category includes all administrative activities, purchasing, planning, and travel expenses.

SUPERCONDUCTOR AND CABLE

Dour Cable Machine

The tooling improvements designed to correct the Turkshead deflection and mandrel rotation on the Dour cabler were installed during September 11-15, and a short length of cable was produced. This cable was examined for the flashing or abrasion which had been found on the RHIC cable and none was found. During the week of September 18, a cabling run using OST strand was prepared. Approximately 4100 ft. of cable was made the following week and again, no flashing or abrasion was observed.

Two additional lots of practice cable (50,000 ft. of outer and 19,000 ft. of inner) will be made in October as a final check before the production runs are resumed.

An alteration was made on the Turkshead of the Dour cabling line at NEEW so that the stability of the rollers under pressure is now ±0".003 instead of ±0".020 before. A test cable run on CuNi wire was performed satisfactorily.

The emergency wire brakes parts were manufactured; the completion of the new system is scheduled for the first week of November.

CABLE TEST FACILITY

Cable Test Facility Magnet

We completed the winding and curing of the first inner layer coil for the 5 cm. bore 1 m dipole D16B1; the curing cavity appeared to be properly sized, based on our observations of press closure during the curing cycle. However, the insulation was damaged on the inner radius of each end; this was probably due to the edge of the conductor scuffing and scraping the winding mandrel, probably both during winding where the conductor is forced axially in towards the pole pieces and during curing where the conductor is probably forced axially outwards in the curing press. After some trial windings, we feel that the problem can be reduced or eliminated by replacing the G-10 strips between turns on the end with a wrap of Kapton film which as a thin layer of B-stage epoxy facing outward. This will allow the end turns to bond during the cure cycle. Also, a Kapton sheet with mold release agent is applied to the winding mandrel to act as a slip plane. Also we have added tooling which will force the conductor to be radially closer to winding mandrel to reduce the conductor bundle motion in the curing cavity.

The modifications to the outer layer cavity are complete, so once we have solved the inner layer problems we will return to the outer layer.

The stainless steel pole pieces for assembly are complete, and work continues on the iron yoke pieces.

LBL - SSC MAGNET R&D REPORTING
September, 1989

(Continued)

Magnet analysis is in progress to generate a high field close-in-iron magnet. A 4 layer coil set is being designed as a candidate to replace the coils of the 2 layer design. This will permit a reduction in cable size and increase in the number of turns, resulting in a lower operating current.

CABLE TEST SAMPLE HOLDER

Sample Holder

We have done some tests on drawing the octagonal tube through the sizing die and are establishing the dependence of the residual compressive load on the amount of interference between final tube inner diameter and initial sample size.

DIPOLE MAGNETS

Dipole 15B-2

This dipole model is ready for collaring. Beam type gage packs are assembled and calibrated. Collaring and final assembly will be determined by the test schedule.

QUADRUPOLE MAGNETS

Quadrupole QA-2

Various repairs to the cryostat and refrigeration system took the month of September, and the last third of August to complete. At the end of September, QA-2, the second model SSC quadrupole of the original high gradient design, was completed. Installation of alignment of the bore tube is now taking place.

Quadrupole QA-3

The coils are complete and assembly will start in October.

Quadrupole Design QC

The QC Quad design effort is currently concentrating on finishing the drawings of the coil end filler pieces, which should be completed in time for winding of our first coils. 1m tooling parts are approximately 50% complete with the remaining parts expected to be completed by the end of October. Winding mandrels and curing cavities are scheduled to be assembled and ready by mid November. Coils should then be wound and ready for assembly by early December. All outside vendor orders have been placed with due dates to meet our schedule. In our current schedule, the first long quadrupole 1m model magnet will be completed in mid February.

Long Quadrupole Tooling

Design of the 5-m main press, the coil mandrels, and the curing cavities is underway and in general follows the FNAL style of doing things. Since the funds for the yoking and skinning press were deleted from the budget, we are considering the possibility of using a common press for both curing and coils and welding yoke skins; this looks promising so far. An internal preliminary design review of these items were conducted in September.

LBL SUPERCONDUCTING MAGNET REPORT

SEPTEMBER 1989

SSC LBL ACTIVITY	LABOR	MATERIAL	OVER HEAD	SEPT TOTAL	YEAR TO DATE	ANNUAL BUDGET
I. Magnet Program Related SSC R&D						
1. General	15.6	6.5	11.5	33.6	326.6	350
2. Superconductor & Cable						
a. Superconductor Cable R&D	0.0	127.4	12.6	140.0	242.2	830
b. Cable Development	7.6	2.0	5.5	15.2	321.7	160
c. Cable Procurement & Fabrication	5.1	17.4	5.4	27.9	323.2	350
3. Cable Short Sample Test Facility	0.0	0.0	0.0	0.0	431.3	50
4. Dipole Magnet Development*	5.4	2.8	7.4	15.6	1180.0	760
5. Quadrupole Magnets						
a. Arc Quad	23.6	1.1	12.7	37.3	331.5	200
b. IR Quad	0.0	0.0	0.0	0.0	5.2	60
6. Coil Properties	0.0	0.0	0.0	0.0	26.9	200
7. Technology Transfer to Industry	0.0	0.0	0.0	0.0	50.0	50
Magnet R&D Totals	57.4	157.1	55.1	269.6	3238.6	3010.0
II. Accelerator Theory Support	14.9	0.8	7.5	23.2	332.6	410
R&D Cost Total	72.3	157.9	62.5	292.8	3571.2	3420.0
Commitments					417	

*Adjustment made in Year to Date Costs due to error in August reporting

III. MANPOWER SUMMARY

GENERAL

C. TAYLOR
J.A. ZELVER

SUPERCONDUCTOR & CABLE

S. GRAHAM
R. HANNAFORD
J. ILER
J. ROYET
R. SCANLAN

MAGNET MODELS

R. ALTHAUS
R. ARMER
P. BARALE
E. BENJAMINE
R. BENJEGERDES
J. BOEHM
S. CASPI
S. DARDIN
D. DELL'ORCO
W. GILBERT
M. A. GREEN
M. I. GREEN
M. HELM
H. HIGLEY
D. KEMP
D. JONES
R. LAFEVER
J. O'NEILL
R. OORT
F. PERRY
C. PETERS
W. POPE
J. REMENARICH
H. SMITH
A. WANDESFORDE
J. ZBASNIK
J. S. ZELVER