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DOE/NASA CONTRACTOR REPORT

DOE/NASA CR-150587

SYSTEM INTEGRATION OF MARKETABLE SUBSYSTEMS
(A Collection of Progress Reports)

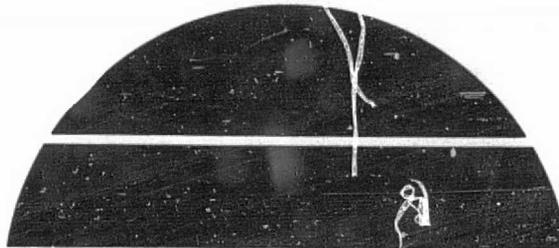
Prepared by

IBM Corporation
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Under Contract NAS8-32036 with

National Aeronautics and Space Administration
George C. Marshall Space Flight Center, Alabama 35812

For the U. S. Department of Energy



(NASA-CR-150587) SYSTEMS INTEGRATION OF
MARKETABLE SUBSYSTEMS: A COLLECTION OF
PROGRESS REPORTS Contractor Report, Jan.
1977 - Jan. 1978 (IBM Federal Systems Div.)
207 p HC A10/MF A01 _____

N78-2159*

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U.S. Department of Energy



Solar Energy

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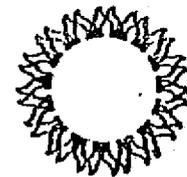
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16. ABSTRACT These monthly reports, covering the period January 1977 through January 1978, reflect the IBM Corporation effort on the NASA/MSFC Systems Integration of Marketable Subsystems Contract NAS8-32036. This activity calls for work in five major areas: Systems Integration of Marketable Subsystems Development, design, and building of Site Data Acquisition Subsystems Development and operation of the Central Data Processing System Operation of the MSFC Solar Test Facility Systems Analysis All cost information has been removed from these reports. Because some monthly and all quarterly reviews are presented by IBM to MSFC, some of these reports are in presentation format (charts).			
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SECTION A
MONTHLY STATUS REPORT

January 1977

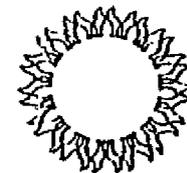


SYSTEMS INTEGRATION OF MARKETABLE SUBSYSTEMS

JANUARY 26, 1977

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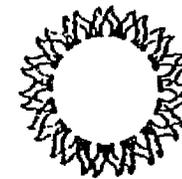
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AGENDA

- SYSTEM INTEGRATION
- SITE DATA ACQUISITION SUBSYSTEM
- CENTRAL DATA PROCESSING SYSTEM
- SYSTEM ANALYSIS
- TEST FACILITY

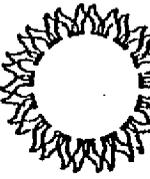
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SYSTEMS INTEGRATION

CONTRACT SCOPE

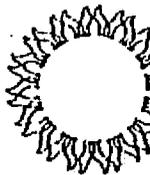
- EVALUATE 37 DIFFERENT GFE SUBSYSTEMS
- PERFORM COST AND TRADE-OFF STUDIES
- INTEGRATE (2) EACH OF (7) DIFFERENT SYSTEMS
- CONDUCT SYSTEM TEST AT MSFC
- OBTAIN INDEPENDENT AGENCY CERTIFICATION
- TRAIN TRADESMAN, INSTALL, MAINTAIN SYSTEMS
 - INSTALLATION/MAINTENANCE COSTS NEGOTIATED BY SPECIFIC CASE
- RECOMMEND NEW TECHNOLOGY



PRESENT STATUS

- SUBSYSTEM DATA AND SITE DEFINITION NOT AVAILABLE ON SCHEDULE
- CHANGE PROPOSAL IN PROGRESS FOR
 - IBM PROCUREMENT OF ADDITIONAL SUBSYSTEMS
 - SCHEDULE REVISIONS
- SYSTEM STATUS
 - 1A (SF-H/HW) DELIVERED
 - 1B INSTALLED ON TEST STAND
 - 2A DESIGN REVIEW DATA PACKAGE SUBMITTED
REVIEW SCHEDULED 2/7
- SITE ACTIVATION STATUS
 - 1A SITE DESIGNATED - CONTRACT MOD RECEIVED
 - 1B SITE DESIGNATED - ROM PROPOSAL SUBMITTED 1/24
 - 2A SITE INFORMALLY DESIGNATED - NO ACTIVITY

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PRESENT STATUS (CONTINUED)

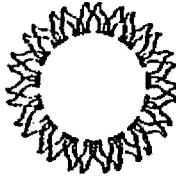
- COMPLETED FEASIBILITY STUDY FOR FAIRBANKS FEDERAL BUILDING
- OTHER PLANNING/SUPPORT ACTIVITIES ADDRESSED
 - PYRANOMETER CALIBRATION
 - PHOTOVOLTAIC SYSTEM INTEGRATION
 - ERDA HEADQUARTERS BUILDING INSTALLATION

FUTURE ACTIONS

- DELIVER SYSTEMS 1B AND 2A
- ACTIVATE TEST SITES 1A, 1B AND 2A
- INITIATE DESIGN ON SYSTEM 3
- REVISE INTEGRATION PLAN FOR ALL SYSTEMS
- COMPLETE SYSTEM PACKAGING

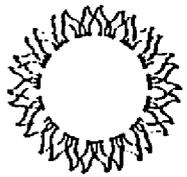
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FUTURE ACTIONS (CONTINUED)

- COMPLETE/SUBMIT PROPOSALS FOR
 - 1A ACTIVATION
 - 1B ACTIVATION
 - SUBSYSTEM PROCUREMENT/SCHEDULE REVISIONS



COMMERCIAL DEMONSTRATION PROGRAM SUPPORT

CONTRACT SCOPE

- TECHNICAL SUPPORT TO MSFC COMMERCIAL PROGRAM
- 32 DEMONSTRATION SITES; PON 75
- LEVEL OF EFFORT
 - 3,500 MAN-HOURS JANUARY, FEBRUARY AND MARCH 1977

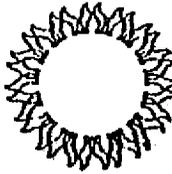
8-V

PRESENT STATUS

JANUARY

FEBRUARY

- | | | |
|-------------------------------------|---------------|-----------------------|
| ● PRELIMINARY DESIGN REVIEWS | 19 COMPLETED, | 3 SCHEDULED |
| ● FINAL DESIGN REVIEWS | 15 COMPLETED, | 17 SCHEDULED |
| ● BASELINE INSTRUMENTATION
LISTS | 25 COMPLETED, | 3 CONTRACT DIRECTIVES |



COMMERCIAL DEMONSTRATION PROGRAM SUPPORT (CONTINUED)

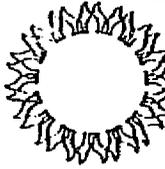
FUTURE ACTIONS

- PLANNED SITE INSTALLATIONS
 - RADIAN 31 JAN 1977
 - TRINITY 1st WEEK IN FEB
 - KALWALL 2nd WEEK IN FEB

- CONTINUE TECHNICAL SUPPORT AS REQUIRED

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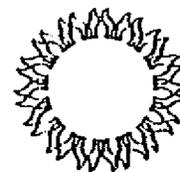


SITE DATA ACQUISITION SUBSYSTEM

CONTRACT SCOPE

- ESTABLISH DATA REQUIREMENTS TO DETERMINE PERFORMANCE
- DETERMINE REQUIREMENTS, PERFORM TRADES AND COMPLETE DESIGN
- FAB, TEST, OBTAIN INDEPENDENT AGENCY CERTIFICATION, DELIVER 60 UNITS WITH BASELINE SET OF SENSORS
- COORDINATE WITH 22 ASSOCIATE CONTRACTORS
- PROVIDE SUPPORT AND MAINTENANCE FOR 60 SYSTEMS
 - ASSOCIATE CONTRACTORS
 - OPERATIONAL TEST SITES

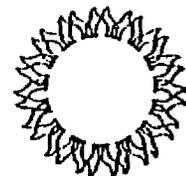
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PRESENT STATUS

- UNIT 1 INSTALLED AT TOWNS SCHOOL AND DATA BEING COLLECTED
- UNITS 2 AND 3 HAVE SUCCESSFULLY COMPLETED ACCEPTANCE TESTING
- UNITS 4-7 HAVE BEEN ASSEMBLED AND ARE IN VARIOUS PHASES OF TEST
- TARGET DELIVERY FOR JANUARY (11 UNITS) APPEARS DOUBTFUL DUE TO SLOWNESS OF POPULATED SUBASSEMBLIES AND TEST
- SITE PERSONALIZATION BEING WORKED UNDER TD-30X
- QUALIFICATION TEST PROCEDURE SUBMITTED FOR MSFC REVIEW ON DECEMBER 21, 1977

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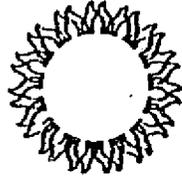
FUTURE ACTIONS

- COMPLETE DELIVERY OF JANUARY QUANTITY (11 UNITS)
- DELIVERY SCHEDULED TARGET FOR FEBRUARY (20 UNITS)
- CONDUCT QUALIFICATION TESTING AND GENERATE REQUIRED REPORT

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ON-SITE MONITOR (OSM)

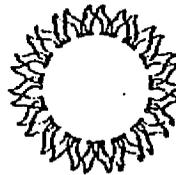
CONTRACT SCOPE

- DESIGN, BUILD, TEST AND DELIVER 25 OSM'S
- INITIAL 10 UNITS WITHOUT ON-SITE DISPLAY INTERFACE
- LAST 15 UNITS WITH GOVERNMENT OPTION FOR ON-SITE DISPLAY INTERFACE

PRESENT STATUS

- ECP WAS APPROVED 12/14/76 WITH GOVERNMENT DIRECTED CHANGES
 - AUTO/MANUAL SCAN SWITCH MOVED TO FRONT PANEL
 - ADD 2 MORE (TOTAL 3) LED'S TO FRONT PANEL
 - DOCUMENTATION REDUCED

A-18



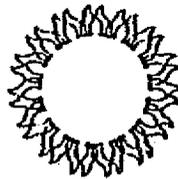
PRESENT STATUS (CONTINUED)

- DIRECTED DESIGN CHANGES ARE BEING IMPLEMENTED
- OSM PERFORMANCE SPECIFICATION AND VERIFICATION MATRIX GENERATED AND SUBMITTED TO MSFC ON JANUARY 21, 1977
- DESIGN REVIEW SCHEDULED AT IBM ON JANUARY 27, 1977

FUTURE ACTIONS

- COMPLETE DESIGN AND DEVELOPMENT TESTING PHASES
- FINALIZE PRODUCTION SCHEDULE

A-14



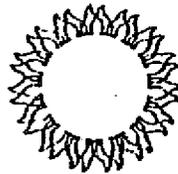
DATA SYSTEM SUPPORT - TD NO. 29X

CONTRACT SCOPE

- CONTINUE TO SUPPORT MSFC WITH ANALYSIS AND IMPLEMENTATION PROCESSES FOR THE DATA SYSTEM PLAN

- AREAS OF ACTIVITY INCLUDE
 - INSTRUMENTATION
 - COMMUNICATIONS
 - SITE DATA ACQUISITION
 - ON-SITE DISPLAY
 - ON-SITE MONITOR
 - CENTRAL DATA PROCESSING SYSTEM

- TD IS ACTIVE THROUGH MARCH 15, 1977



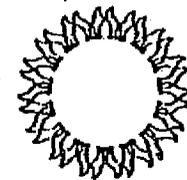
PRESENT STATUS

- TRADE STUDIES HAVE BEEN COMPLETED
 - LOW COST ON-SITE DISPLAY OPTIONS
 - IMPACT OF A TWO-SDAS SITE ON THE CDP'S
- DATA COLLECTION (TASK 2) TASK DESCRIPTION AND COST ESTIMATES HAVE BEEN COMPLETED
- PRELIMINARY SYSTEM ANALYSIS (TASK 4) TASK DESCRIPTION & COST ESTIMATES HAVE BEEN GENERATED
- FIVE ERDA COMMERCIAL SITES HAVE BEEN ANALYZED AND INSTRUMENTATION IDENTIFIED
- IP&CL TYPE DOCUMENT (EXAMPLE) HAS BEEN GENERATED AND SUBMITTED FOR REVIEW

FUTURE ACTIONS

- UPDATE TASK 4 DESCRIPTION AND COST ESTIMATES
- SUPPORT TASK 2 REVIEW
- FINALIZE IP&CL DOCUMENT FOR SITE UTILIZATION

ON-SITE DISPLAY (OSD) CONCEPTUAL DESIGN STUDY -
TD NO. 22X

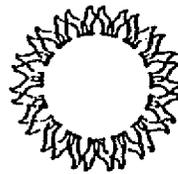


CONTRACT SCOPE

- RE-EVALUATION OSD REQUIREMENTS
- PERFORM CONCEPTUAL DESIGN FOR
 - "DESIGN TO COST" CONCEPT
 - STANDARDIZED DESIGN BASED FOR ON SYSTEM APPLICATION
- RECOMMEND DESIGN CONCEPT SELECTED FROM STUDIES
- TD WAS ACTIVE THROUGH DECEMBER 17, 1977

PRESENT STATUS

- TRADE COMPLETED AND CONCEPTUAL DESIGN PERFORMED FOR LOW-COST OSD
- CONCEPT ELIMINATED INTERFACE TO OSM AND SDAS
- RESULTS DISCUSSED WITH BOTH MSFC AND ERDA
- ECP WAS SUBMITTED TO MSFC ON 12/22/76 TO BUILD 30 UNITS BASED ON SELECTED CONCEPT



ON-SITE DISPLAY (OSD) CONCEPTUAL DESIGN STUDY -
TD NO. 22X (CONTINUED)

FUTURE ACTIONS

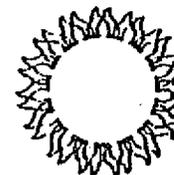
- NONE - TD EFFORT HAS BEEN COMPLETED, AWAITING APPROVAL OF ECP

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SITE PERSONALIZATION - TD NO. 30X



CONTRACT SCOPE

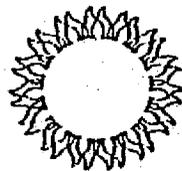
- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE INITIAL 7 MSEC DIRECTED PROGRAM INSTALLATIONS
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL & CHECKOUT
- TD IS ACTIVE THROUGH MARCH 15, 1977

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PRESENT STATUS

- PERSONALIZATION ACTIVITY IS IN PROCESS FOR 1) RADIAN, 2) TRINITY, 3) IBM SYSTEM 1A, 4) KALWALL AND 5) OLYMPIC
- SENSORS AND J-BOX SHIPPED TO RADIAN 12/22/76
 - SDAS INSTALLATION SCHEDULED FOR 1/31/76

IBM



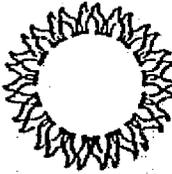
SITE PERSONALIZATION - TD NO. 30X (CONTINUED)

- TRINITY SENSORS SHIPPED ON 12/22/76 AND 12/27/76
 - J-BOXES TO BE SHIPPED 1/21/77
 - SDAS(S) TO BE INSTALLED FIRST WEEK OF FEBRUARY

FUTURE ACTIONS

- COMPLETE INSTALLATIONS FOR RADIAN AND TRINITY
- PERSONALIZATION ACTIVITIES WILL CONTINUE FOR THE REMAINING SITES, KALWALL SCHEDULED AS THE NEXT INSTALLATION

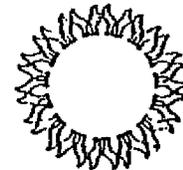
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CENTRAL DATA PROCESSING SYSTEM

CONTRACT SCOPE

- PERFORM ANALYSIS AND TRADE STUDIES TO OPTIMALLY CONFIGURE A CDPS
- PROCESS DATA FROM 60 SITES
- DESIGN AND VALIDATE THE CDPS
- RECOMMEND DATA BANK PARAMETERS
- OPERATE AND MAINTAIN THE CDPS
- EVALUATE PERFORMANCE FROM 36 SITES
- FURNISH REPORTS



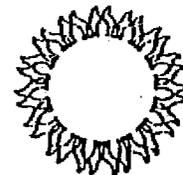
PRESENT STATUS

- CDPS IS OPERATIONAL AND COLLECTING DATA FROM TOWNS SCHOOL
- MODIFICATION TO CDPS TO PROCESS DATA FROM A 2-BOX INSTALLATION IS IN WORK
- MAJOR EFFORTS HAVE BEEN IN GENERATION OF TOWNS SCHOOL MONTHLY REPORTS AND SITE PERSONALIZATION ACTIVITIES

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FUTURE ACTIONS

- COMPLETE 2-BOX MODIFICATION
- CONTINUE DATA COLLECTION AND REPORT GENERATION
- CONTINUE SITE PERSONALIZATION ACTIVITIES



SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

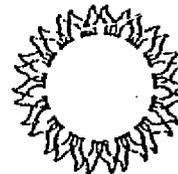
PRESENT STATUS

- DETERMINING CLIMATIC REGIONS FOR COOLING
- ESTABLISHING COMFORT CRITERIA
- GENERIC SYSTEM DESCRIPTIONS

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION

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COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE

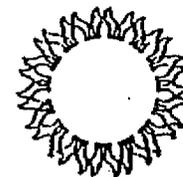
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FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

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CHANGE INTEGRATION SUPPORT - TD NO. 14



CONTRACT SCOPE

- ASSIST IN PREPARATION AND MAINTENANCE OF PROJECT OFFICE POLICY AND PROCEDURES
- PERFORM REQUIRED CHANGE MANAGEMENT SYSTEM ACTIVITIES TO SUPPORT CHANGE CONTROL, PROCESSING AND DISTRIBUTION
- LEVEL OF EFFORT THROUGH MARCH 31, 1977

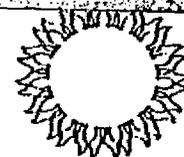
A-25

PRESENT STATUS

- ACTIVITY HAS BEEN STAFFED
- PROCESSING OF CHANGES AND SUPPORT TO PROJECT OFFICE HAS OCCURRED ON A CONTINUING BASIS

FUTURE ACTIONS

- CONTINUE TO SUPPORT PROJECT OFFICE A CURRENT LEVEL OF EFFORT



TEST FACILITY OPERATIONS

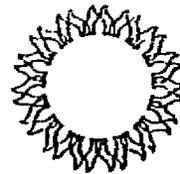
CONTRACT SCOPE

- PROVIDE 173,000 MAN-HOUR LEVEL OF EFFORT
- ACTIVATE THE TEST FACILITY DATA SYSTEM
- REFURBISHMENT OF SOLAR HOUSE
- TEST FACILITY MATERIALS AND EQUIPMENT

PRESENT STATUS

- STAFFING PER PLAN
 - LEVEL OF EFFORT: 28
 - DATA SYSTEM: 10

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PRESENT STATUS (CONTINUED)

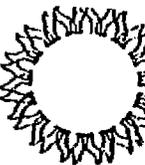
- AREAS OF LEVEL OF EFFORT SUPPORT
 - SOLAR HOUSE
 - SOLAR SIMULATION
 - SUBSCALE FACILITY
 - BREADBOARD TEST FACILITY
 - O-I COLLECTOR TEST SUPPORT

- TEST FACILITY DATA SYSTEM ACTIVATION
 - HARDWARE ACTIVATION COMPLETE 1/4/77 FOR AVAILABLE CONFIGURATION
 - SOFTWARE BY 1/31/77

- PLAN SUBMITTED FOR CONTINUING OPERATION AND REFINEMENT OF TEST FACILITY
 - CONTRACT COVERAGE REQUIRED

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FUTURE ACTIONS

- COMPLETE INSTALLATION OF NEW CONTROL SYSTEM FOR SOLAR HOUSE
- COMPLETE INSTALLATION OF DECOM'S, PDAS'S AND SIGNAL CONDITIONING AS FACILITIES BECOME AVAILABLE
- INITIATE AND PERFORM TESTS ON PROTOTYPE SYSTEMS AS FACILITY STATUS ALLOWS
- CONTINUE LEVEL OF EFFORT SUPPORT

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SECTION B
MONTHLY STATUS REPORT

February 1977

DATA PROGRAM

Sensors

- o Eight sensor specifications were submitted and approved by MSFC. This completes the first phase of T.D. 21X task on Sensor Procurement Plan.
- o Ten prototype gas meters are in process of being modified at local vendor.
- o Fuel oil flowmeter prototype sensor complete.

Junction Boxes

- o All J-Boxes are complete and in stock.

SITE DATA ACQUISITION SUBSYSTEM

- o SDAS Deliveries - The fourth unit was accepted by the government on 1/28/77. Seven units were accepted during the month of February.
- o Site Personalization - Released packages have been distributed for Radian Corporation, Kalwall and IBM System iA. Preliminary definitions have been completed and forwarded for J-Box wire list generation for five sites (Trinity, Olympic, Charlotte, Rademaker and Scattergood).
- o Sensors and J-Boxes have been shipped to four sites (Radian, Kalwall, Trinity and Charlotte). Sensors have also been shipped to two sites (Rademaker and Iris Images) and a partial shipment to Bell Telephone Work Center.
- o SDAS S/N 004 was installed at Radian Corporation (Austin, Texas) on 1/31/77; however, due to the incomplete status of sensor installation, the SDAS checkout was not completed. We estimate Radian will be completed in March.
- o Mod 37 authorizing build of two SDAS sensor input simulators was received on 2/15/77.

CENTRAL DATA PROCESSING SYSTEM

- o Towns School - Monthly report for January 1977, was generated on 2/3/77. Because of Towns system problems (broken pipe), little significant data was collected and processed.

Telephone problems, encountered during early February, have impacted collection from Towns this month. Problems have been resolved, and collection is now normal.

- o MSFC Data Base Interface - Magnetic tapes containing Towns School operational data have been provided to MSFC for compatibility testing. No problems were encountered. Meetings are being held to define data content and delivery frequency requirements.
- o Data Base Plots - Enhancements of the plot capability have been identified and are being implemented. These enhancements provide increased flexibility to the site analyst in identifying and resolving site problems.

INTEGRATION

The MSFC formal design review on System 2 was conducted on February 7 with the design concept informally accepted.

Trade studies on System 3 have been completed with recommendation of a water, drain-down type system concept. The design review data package is in process.

A proposal has been submitted for installation of System 1B (CP-028).

A proposal for prototype system maintenance (CP-029) will be submitted in early March.

A proposal is in process to restructure the integration statement of work and to provide for IBM purchase of subsystems which were originally to have been GFE. This proposal will also address prototype system delivery changes necessitated by unavailability of GFE and by test facility availability problems.

CP-030 which proposes replenishment of WBS 1.5.2 System Analysis hours to provide coverage for future Development Program T.D. Tasks was submitted to MSFC on 2/25/77.

Mod 37 which provides continuity to complete installation effort on System 1A was approved by MSFC and in process to IBM as of 2/28/77.

ERDA Headquarters Feasibility Study was authorized by Mod 36 received 2/28/77. This activity is scheduled for completion by early April 1977.

MSFC TEST FACILITY

Accomplishments

Subscale Test Facility

- o SEPCO single collector test continued.
- o Work continued on setting up the program and troubleshooting the SEPCO single collector performance test setup link to the data acquisition system.
- o Revision A to the SEPCO single collector test procedure was completed.

Solar Simulator

The Solar Simulator Facility supported the testing of the Owens-Illinois collector for February. Originally scheduled work for this month will be rescheduled upon completion of the Owens-Illinois test program.

Solar House

The Solar House was operated in the manual mode several times to prevent build up of high stagnation temperatures and to accommodate MSFC conducted tours for visiting dignitaries. In addition, work continued on updating systems documentation and preparation of the ARKLA test procedure. Fabrication of the new controller was completed and functional checkout started in preparation for final installation.

Breadboard Test Facility

Preparation continued for the first prototype system test as follows:

- o Completed insulation of all ducting.
- o Started grading and washing and installation of rocks for pebble storage bed. Instrumentation and fill is approximately 70% complete.
- o Prepared technical memorandum detailing testing required to confirm facility operational status.
- o Submitted work order to MSFC for installation of required data system conduit lines.
- o Completed initial draft of facility component description for test bed one.

Data Acquisition System

Preparation for data system end-to-end checks continued with the following major milestones being achieved:

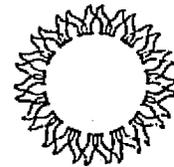
- o The MRTDL was connected to the DDP-224's and IBM 1800 and functional checks completed.
- o The data display program was modified and is undergoing checkout.

PROBLEM AREAS

Current problem areas are as follows:

- o Lack of operational teletype units continue to hamper progress on Data Acquisition System.
- o Lack of sufficient work and storage space at the Breadboard Facility Site continues to adversely impact work schedules.
- o Office areas in Buildings 4646 and 4639 are still in need of repairs. Partitions requested in May 1976 have still not been delivered.

- o Status of test facility sensors and the completion data and turn over of the Breadboard Test Facility is delaying initiation of the first prototype system test.
- o Resolution of the cost and manpower problems associated with operation of the Data Acquisition System is being worked. (These problems are addressed in IBM CP-027, "MSFC Solar Test Facility DAS Operational Tasks".)
- o The delay in availability of GFE materials and facilities required to complete Data Acquisition System tasks covered by Mod 34 is expected to delay completion of that activity beyond the 3/15/77 scheduled date.



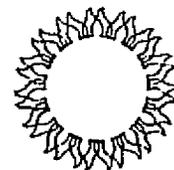
SENSOR PROCUREMENT PLAN - TD NO. 21X

CONTRACT SCOPE

- DEVELOP SENSOR SPECIFICATIONS AND FORMULATE SENSOR PROCUREMENT PACKAGE
- OBTAIN QUOTES FROM VENDOR CANDIDATES
- ESTABLISH QUALIFIED SENSOR LIST
- RELEASE EXPANDED APPROVED SENSOR LIST
- FINALIZE AND EXPAND PRESENT SENSOR PROCUREMENT PLAN FOR APPROXIMATELY 400 TEST SITES
- IDENTIFY SENSORS FOR TEST AND EVALUATION

PRESENT STATUS

- SENSOR SPECIFICATIONS COMPLETED
- FOLLOW-ON SENSOR PROCUREMENT PLAN BEING IMPLEMENTED

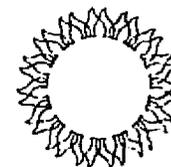


SENSOR PROCUREMENT PLAN - TD NO. 21X (CONTINUED)

FUTURE ACTIONS

- EFFORT BEING DIRECTED TO ACCOMPLISHING THE FOLLOWING TASKS:
 - OBTAINING QUOTES FOR CANDIDATE VENDORS
 - ESTABLISHING A QUALIFIED SENSOR LIST
 - RELEASING AN EXPANDED APPROVAL SENSOR LIST
 - EXPANDING THE SENSOR PROCUREMENT PLAN FOR ADDITIONAL SITES
 - IDENTIFYING SENSORS FOR TEST EVALUATION

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

- DETERMINING CLIMATIC REGIONS FOR COOLING
- ESTABLISHING COMFORT CRITERIA
- GENERIC SYSTEM DESCRIPTIONS
- RESTRUCTURED MINI-SHAC TO ACCEPT COOLING MODIFICATIONS

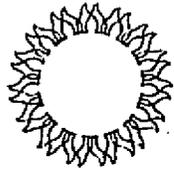
FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION

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COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24

CONTRACT SCOPE

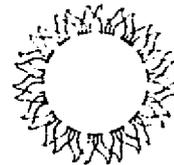
DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS



CDPS SOFTWARE MODIFICATION - TD NO. 26X

CONTRACT SCOPE

- 0 MODIFY THE CDPS SOFTWARE TO ACCOMMODATE DATA COLLECTED FROM A SITE WITH TWO SDAS'S

PRESENT STATUS

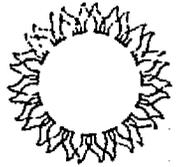
- 0 CDPS SOFTWARE MODIFICATION TO SUPPORT TWO SDAS UNITS AT A SITE WERE COMPLETED AND DEBUGGED WITH SIMULATED INPUT

FUTURE ACTIONS

- 0 FINAL CHECKOUT WILL BE PERFORMED WHEN TRINITY UNIVERSITY (FIRST SITE WITH TWO UNITS) IS BROUGHT ON-LINE

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SOLAR SYSTEMS PRE-PACKAGING TRADE STUDY - TD NO. 27



CONTRACT SCOPE

- 0 DEVELOP PACKAGING CONCEPTS TO PREASSEMBLE SOLAR SYSTEM COMPONENTS TO REDUCE ON-SITE ASSEMBLY
- 0 IMPROVE SYSTEM AESTHETICS AND REDUCE CHECKOUT TIME

PRESENT STATUS

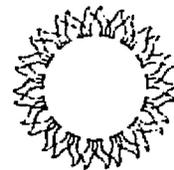
- 0 ENGINEERING STUDY COMPLETED
- 0 DOCUMENTATION IN PRESENTATION FORMAT SUBMITTED TO MSFC ON 2/15/77

FUTURE ACTIONS

- 0 MAKE PRESENTATION TO MSFC (MARCH 9)

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COMMERCIAL DEMONSTRATION PROGRAM SUPPORT TD 28X



CONTRACT SCOPE

- o TECHNICAL SUPPORT TO MSFC COMMERCIAL PROGRAM
- o 32 DEMONSTRATION SITES; PON 75
- o LEVEL OF EFFORT

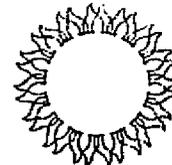
PRESENT STATUS

FEBRUARY

ITD

o	PRELIMINARY DESIGN REVIEWS	0 COMPLETED	19
o	FINAL DESIGN REVIEWS	8 COMPLETED	17
o	BASELINE INSTRUMENTATION LISTS	3 COMPLETED	26
o	TD 28X AUTHORIZATION EXPIRES WEEK OF MARCH 7-11		

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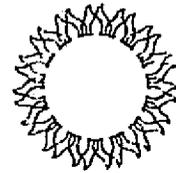
DATA SYSTEM SUPPORT - TD NO. 29X

CONTRACT SCOPE

- CONTINUE TO SUPPORT MSFC WITH ANALYSIS AND IMPLEMENTATION PROCESSES FOR THE DATA SYSTEM PLAN
- AREAS OF ACTIVITY INCLUDE
 - INSTRUMENTATION
 - COMMUNICATIONS
 - SITE DATA ACQUISITION
 - ON-SITE DISPLAY
 - ON-SITE MONITOR
 - CENTRAL DATA PROCESSING SYSTEM

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DATA SYSTEM SUPPORT - TD NO. 29X (CONTINUED)

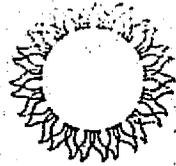
PRESENT STATUS

- TRADE STUDIES HAVE BEEN COMPLETED
 - SALISBURY HOUSE ASSESSMENT
 - BELL TELEPHONE OFFICE ASSESSMENT
- DATA COLLECTION (TASK 2) TASK DESCRIPTION AND COST ESTIMATES HAVE BEEN COMPLETED
- PRELIMINARY SYSTEM ANALYSIS (TASK 4) TASK DESCRIPTION & COST ESTIMATES HAVE BEEN GENERATED
- TEN HUD DATA PACKAGES HAVE BEEN REVIEWED AND ASSESSMENTS MADE FOR 1) MEASUREMENTS SELECTED, 2) COMPLETENESS OF REQUIRED DATA, 3) COMPATIBILITY TO MSFC DATA SYSTEM
- IP&CL TYPE DOCUMENT (EXAMPLE) HAS BEEN REVIEWED AND ACCEPTED FOR DATA CONTENT AND FORMAT.

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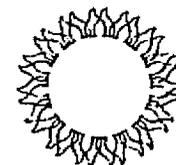
SITE PERSONALIZATION - TD NO. 30X

CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE INITIAL 7 MSFC DIRECTED PROGRAM INSTALLATIONS
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL & CHECKOUT

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IBM

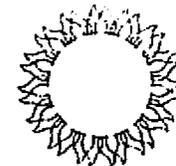


SITE PERSONALIZATION - TD NO. 30X (CONTINUED)

PRESENT STATUS

- PERSONALIZATION ACTIVITY IS IN PROCESS FOR 1) RADIAN, 2) TRINITY, 3) IBM SYSTEM 1A, 4) KALWALL, 5) CHARLOTTE, 6) IRIS IMAGES AND 7) SALISBURY HOUSE
- SDAS AND J-BOX PERSONALIZATION DEFINITIONS HAVE BEEN COMPLETED FOR FOUR ADDITIONAL SITES
- RADIAN CORPORATION
 - SDAS CHECKOUT DELAYED DUE TO SENSOR INSTALLATION WAS COMPLETED ON 3/9/77.
 - CDPS DATA COLLECTION AND CHECKOUT CURRENTLY BEING WORKED.
- KALWALL
 - SENSORS AND J-BOX INSTALLED AND WIRED
 - SDAS INSTALLATION SCHEDULED 3/17/77

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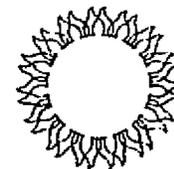


SITE PERSONALIZATION - TD NO. 30X (CONTINUED)

- o SALISBURY HOUSE
 - SENSORS AND J-BOX INSTALLED AND WIRED, 3/9/77
 - SDAS INSTALLATION SCHEDULED, 3/15/77
- o TRINITY UNIVERSITY
 - CHANGES APPROVED IN INSTRUMENTATION
 - J-BOX AND SDAS RESULTANT MODS ARE IN WORK

FUTURE ACTIONS

- o COMPLETE CDPS CHECKOUT FOR RADIAN
- o COMPLETE INSTALLATION AND CHECKOUT FOR KALWALL AND SALISBURY HOUSE
- o COMPLETE TRINITY MODS AND INSTALL



SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- TWO SITES ADDRESSED
 - CARLSBAD, N.M.
 - LARAMIE, WYOMING

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

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SECTION C
MONTHLY STATUS REPORT

March 1977

INTEGRATION PROGRAM

Prototype Systems

- o Submittal to MSFC of the data package for System 3 was accomplished. The design review was held on March 29. Design and quality problems of the selected collector have been assessed and recommended fixes provided to MSFC.
- o ERDA Headquarters solar energy/energy conservation feasibility study was completed and the presentation to ERDA is scheduled for April 7, 1977.

GFE Repair Technical Directives

Word charts on the two T.D.'s under paragraph 4.1H active during March are attached. They are:

TD Title

- 32 Ying Collector Repair
- 37 SEPCO Collector Repair

MSFC TEST FACILITY SUPPORT

Solar Simulator

- o Owens-Illinois Test Program was completed on 12 March 1977.
- o The Libbey-Owens-Ford (LOF) Test Procedure was prepared and published.
- o Test setup for the LOF test was completed.
- o A work order was submitted to provide a permanent water and air source to the simulator.
- o The simulator lamps were replaced and new field maps were completed in support of both of the above test programs.
- o Tie-in of the simulator to the Test Facility Data System was delayed due to non-receipt of GFE items.

Subscale Facility

- o The SEPCO single collector test program is being continued.
- o Testing was delayed due to non-receipt of GFE to fully utilize the data system.

Solar House

- o Work is continuing to get this facility to full automatic operation.

- o The new controller was installed and programmed to operate the heat collection system and data display. Mechanical and electrical checkout has been completed; software checkout is in progress.
- o Completed balancing of the flow through all 31 collectors and installed flashing on upper manifold.
- o Developed and published Test Procedure for the new ARKLA air conditioning unit.
- o Continued work on updating documentation.
- o Tie-in to the data system was delayed due to non-receipt of GFE items.

Breadboard Test Facility

- o The IBM System Mode #1 test setup was completed, including:
 - Completion of pebble heat storage bed.
 - Acquiring and installing required instrumentation.
 - Fabricating, installing and connecting all instrumentation cables to the data acquisition system.
 - Functional checkout of control systems.
- o The data system has been connected to the sensors in the IBM Prototype System #1 and system validation is underway. Some data has been collected and is being evaluated. Additional checkout of the data system will continue into April.
- o Facility Component descriptions of Test Beds 1 and 2 were completed and work began on calibration and checkout of instrumentation connections to the data acquisition system. A review of facility instrumentation requirements was conducted which revealed numerous deficiencies concerning the number, location and existence of sensor ports, gauges and control probes. A detailed list of these deficiencies was prepared and forwarded to the SHAC Program Office on 28 March 1977.
- o Data system tie-in to the test facility is delayed due to non-receipt of required GFE.
- o Operation of the test facility and test of System 1 are delayed pending completion of the test facility by the Corps of Engineers.
- o Overall sensor status is still open and MSFC's inability to provide sensors is expected to cause further delays in test facility activation.
- o Installation of prototype System 2 into the test facility was initiated.
- o PCM/Decom station hook-up delayed due to non-receipt of conduit to protect cooling (NASA work order).

- o Lack of operational teletype units continue to hamper progress on Data Acquisition System.
- o Office areas in Buildings 4646 and 4639 are still in need of repairs. Partitions requested in May 1976 have still not been delivered.

DATA PROGRAM

SDAS Deliveries

- o Twenty units were acceptance tested and delivered during the month of March. Total deliveries to date is 31 units. The production schedule contains 20 units to be delivered in April and 9 units in May. This will complete the production phase for the SDAS, Mod 1.

Sensor Shipments

- o Sensors have been shipped to Mosley, Salisbury House; Lake Valley, Scattergood, Alabama Power, Rademaker and Iris Images. April projected shipments are: Flamboyant, Decade 80, S. D. School of Mines, Irvine, Reedy Creek, State of Florida, Kirtland AFB and Randolph AFB.

Site Instrumentation and Personalization

- o A number of activities were performed under WBS 1.7.1 (T.D. #35). Information on these activities is contained in the attached T.D. #3, word chart.

CHANGE INTEGRATION SUPPORT

- o Conducted major revisions in all areas of the SCIT Report. Detailed procedures are being prepared for all inputs into the SCIT System.
- o The first MIRAD's Baseline Sensor List was published.
- o A Financial Summation Report of Marshall-ERDA responsibilities was created and published.
- o Supported 3 Design Reviews along with the Review of Prototype Design Review Packages.
- o A dedicated reproduction machine is still required for the Change Integration Department in Building 4471.

TECHNICAL DIRECTIVES

Word charts for the Technical Directives active during March are attached.
They are:

<u>TD</u>	<u>Title</u>
21X	Sensor Procurement Plan
23	Solar Cooling-Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
26X	CDPS Software Modification
27	Solar System Pre-Packaging Trade Study
28X	Commercial Demonstration Program Support
31	Site Selection Analysis for IBM locations
32	GFE Repair Plan
35	Site Instrumentation and Personalization
36	Data System Support
37	Repair GFE SEPCO collectors

SENSOR PROCUREMENT PLAN - TD NO 21X

CONTRACT SCOPE

- o DEVELOP SENSOR SPECIFICATIONS AND FORMULATE SENSOR PROCUREMENT PACKAGE
- o OBTAIN QUOTES FROM VENDOR CANDIDATES
- o ESTABLISH QUALIFIED SENSOR LIST
- o RELEASE EXPANDED APPROVED SENSOR LIST
- o FINALIZE AND EXPAND PRESENT SENSOR PROCUREMENT PLAN FOR APPROXIMATELY 400 TEST SITES
- o IDENTIFY SENSORS FOR TEST AND EVALUATION

PRESENT STATUS

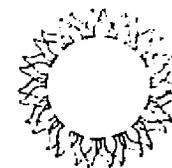
- o SENSOR SPECIFICATIONS HAVE BEEN PROVIDED TO VENDORS

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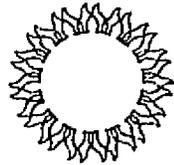
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SENSOR PROCUREMENT PLAN - TD NO. 21X (CONTINUED)



FUTURE ACTIONS

- o CLOSE CURRENT WBS 1.5.2 T.D. AND ESTABLISH NEW T.D. UNDER WBS 1.7.1 TO ACCOMPLISH THE FOLLOWING TASKS:
 - OBTAINING QUOTES FOR CANDIDATE VENDORS (EXPECTED APRIL 15)
 - ESTABLISHING A QUALIFIED SENSOR LIST
 - RELEASING AN EXPANDED APPROVED SENSOR LIST
 - EXPANDING THE SENSOR PROCUREMENT PLAN FOR ADDITIONAL SITES
 - IDENTIFYING SENSORS FOR TEST EVALUATION
- o DRAFT WBS 1.7.1 T.D. TO MSFC FOR APPROVAL BY APRIL 18



SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

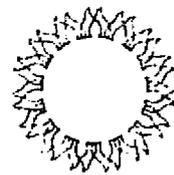
PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

- DETERMINING CLIMATIC REGIONS FOR COOLING
- ESTABLISHING COMFORT CRITERIA
- GENERIC SYSTEM DESCRIPTIONS
- RESTRUCTURED MINI-SHAC TO ACCEPT COOLING MODIFICATIONS

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

CDPS SOFTWARE MODIFICATION - TD NO. 26X

CONTRACT SCOPE

- 0 MODIFY THE CDPS SOFTWARE TO ACCOMMODATE DATA COLLECTED FROM A SITE WITH TWO SDAS'S

PRESENT STATUS

- 0 CDPS SOFTWARE MODIFICATION TO SUPPORT TWO SDAS UNITS AT A SITE WERE COMPLETED AND DEBUGGED WITH SIMULATED INPUT

FUTURE ACTIONS

- 0 NO FURTHER ACTION WILL BE PERFORMED UNDER THIS T.D.
- 0 FINAL CHECKOUT WILL BE PERFORMED WHEN TRINITY UNIVERSITY SITE (FIRST SITE WITH TWO UNITS) IS BROUGHT ON-LINE. THIS EFFORT WILL BE PERFORMED UNDER WBS 1.7.1 TD #35

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SOLAR SYSTEMS PRE-PACKAGING TRADE STUDY - TD NO. 27

CONTRACT SCOPE

- o DEVELOP PACKAGING CONCEPTS TO PREASSEMBLE SOLAR SYSTEM COMPONENTS TO REDUCE ON-SITE ASSEMBLY
- o IMPROVE SYSTEM AESTHETICS AND REDUCE CHECKOUT TIME

PRESENT STATUS

- o ENGINEERING STUDY COMPLETED
- o ORAL PRESENTATION GIVEN TO MSFC ON 3/9/77
- o NO FURTHER ACTION PROJECTED UNDER TD

COMMERCIAL DEMONSTRATION PROGRAM SUPPORT TO 28X

CONTRACT SCOPE

- o TECHNICAL SUPPORT TO MSFC COMMERCIAL PROGRAM
- o 32 DEMONSTRATION SITES; PON 75
- o LEVEL OF EFFORT

MARCH ACTIVITY

	<u>MARCH</u>	<u>ITD</u>
o PRELIMINARY DESIGN REVIEWS	0 COMPLETED	19
o FINAL DESIGN REVIEWS	3 COMPLETED	20
o BASELINE INSTRUMENTATION LISTS	1 COMPLETED	27

PRESENT STATUS

- o T. D. AUTHORIZATION EXPIRED MARCH 11, 1977
- o NO FURTHER ACTION PROJECTED UNDER THIS T. D.
- o MINIMUM SITE INSTRUMENTATION ON SUPPORT CONTINUED FOR SPECIFIC SITES UNDER T. D. 35.

SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- o PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- o PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- o PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- o THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- o COMPLETE SITE ASSESSMENT

REPAIR OF GFE YING COLLECTORS - TD#32

CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

PRESENT STATUS

- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77

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IBM

REPAIR OF GFE YING COLLECTORS - TD#32 (CONTINUED)

FUTURE ACTION

- REPAIR ONE COLLECTOR AT IBM (BUY MATERIAL, PREPARE PROCEDURE, PERFORM REPAIR)
- EVALUATE REPAIR OF COLLECTOR BY 4/8/77
- REQUIRE TD FROM MSFC TO CONFIRM VERBAL DIRECTION AND INCREASE AUTHORIZED HOURS TO 180

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SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35

CONTRACT SCOPE

- 0 PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED SITE INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)

PRESENT STATUS

- o PERSONALIZATION ACTIVITY HAS BEEN AUTHORIZED FOR 26 COMMERCIAL SITES, 5 ERDA OTHER SITES AND MSFS OTS SITES

- o SENSOR SHIPMENTS
 - NINE SITES DURING MARCH
 - EIGHT SITES PROJECTED FOR APRIL

- o J-BOX SHIPMENTS
 - FIVE SITES DURING MARCH
 - SEVEN SITES PROJECTED FOR APRIL

- o RADIAN CORPORATION
 - NOISY DATA COLLECTED FROM SDAS DETERMINED TO NON-TERMINATED MICROBOARD BRIDGE CIRCUITS (NO TEMPERATURE SENSORS INSTALLED)
 - NOISE CONDITION FIXED 3/31/77 BY REPLACING MICROBOARD BRIDGE CIRCUITS WITH SHORTING CIRCUITS
 - CDPS NOW COLLECTING VALID DATA

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)

o KALWALL

- SDAS INSTALLED ON 3/17/77
- DATA SYSTEM CHECKOUT PHASE IN PROCESS

o SALISBURY HOUSE

- SDAS INSTALLED ON 3/15/77
- NOISY DATA COLLECTED, NON-TERMINATED BRIDGE CIRCUIT (NO SENSOR) HAS BEEN VERIFIED
- TERMINATING RESISTOR FOR J-BOX INSTALLATION WILL BE SHIPPED 4/5/77

o TRINITY UNIVERSITY

- CHANGES APPROVED IN INSTRUMENTATION
- J-BOX, SDAS, AND CDPS RESULTANT MODS ARE COMPLETE

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SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)

FUTURE ACTIONS

- o COMPLETE DATA SYSTEM CHECKOUT FOR RADIAN (4/15/77) AND KALWALL (4/17/77)
- o VERIFY TERMINATING RESISTOR FIX FOR SALISBURY
- o COMPLETE INSTALLATIONS FOR TRINITY (4/8/77), SHENANDOAH (4/18/77),
FLAMBOYANT (4/29/77)
- o SCHEDULE AND INSTALL RADEMAKER AND IRIS IMAGES SUPPORT OF THE THREE
ABOVE LISTED PRIMARY SITES

DATA SYSTEM SUPPORT - TD NO. 36

CONTRACT SCOPE

- o CONTINUE TO SUPPORT MSFC WITH ANALYSIS AND IMPLEMENTATION PROCESSES FOR THE DATA SYSTEM PLAN
- o AREAS OF ACTIVITY INCLUDE
 - COMMUNICATIONS
 - SITE DATA ACQUISITION
 - DATA PROGRAM PLANS AND ESTIMATES
 - SDAS SITE SELECTION
 - PERFORMANCE EVALUATION COMMITTEE SUPPORT

DATA SYSTEM SUPPORT - TD NO. 36 (CONTINUED)

PRESENT STATUS

- o SENSOR AVAILABILITY STUDIES HAVE BEEN COMPLETED
 - KIRTLAND AFB SENSOR ASSESSMENT
 - RANDOLPH AFB SENSOR ASSESSMENT
 - SHENANDOAH SENSOR ASSESSMENT
 - DECADE 80 INSTRUMENTATION REVIEW AND SENSOR ASSESSMENT
- o FINAL DESIGN REVIEWS HAVE BEEN SUPPORTED DURING MARCH
 - INGRAM COUNTY
 - K. C. FIREHOUSE
 - LUTZ-SOTIRE (PRELIMINARY)
 - RKL CONTROLS

FUTURE ACTIONS

- o FOLLOWING DESIGN REVIEWS ARE SCHEDULED FOR APRIL
 - TELEX
 - LUTZ-SOTIRE
 - LSU

GFE REPAIR - TD NO. 37

CONTRACT SCOPE

- o REMOVE GLAZING SPLINES FROM SEPCO COLLECTORS
- o REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- o 27 SEPCO COLLECTORS ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- o 65 SEPCO COLLECTORS REMAIN TO BE REPAIRED

FUTURE ACTIONS

- o COMPLETE REPAIR BY 4/8/77 OF 58 IN STOCK
- o THOSE CURRENTLY AT MSFC TEST SITE TO BE REPAIRED UPON RETURN TO IBM
- o REVISED ESTIMATE OF EFFORT IS 226 MANHOURS

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SECTION D
MONTHLY STATUS REPORT

April 1977

INTEGRATION PROGRAM

Prototype Systems

- o Submittal to MSFC of the data package for System 3 was accomplished. The design review was held on March 29. Answers to the resulting System 3 RID's and action items have been completed. Design and quality problems of the selected collector have been assessed. Design work has stopped pending MSFC collector problem resolution.
- o ERDA Headquarters solar energy/energy conservation feasibility study was completed and presented to ERDA on April 7, 1977.
- o Collectors have been installed at Site 1A and duct installation has begun.
- o Design of System 4 has been initiated.

GFE Repair Technical Directives

Word charts on the two T.D.'s under paragraph 4.1H active during April are attached. They are:

<u>TD</u>	<u>Title</u>
32	Ying Collector Repair
37	SEPCO Collector Repair

MSFC TEST FACILITY SUPPORT

Solar Simulator

- o The Libbey-Owens-Ford (LOF) collector performance test was completed, except for the time constant and incident angle modifier portions. The requirements for these two tests was not received until after the test set up had been disassembled.
- o Tie-in of the simulator to the Test Facility Data System has been completed.

Subscale Facility

- o The SEPCO single collector performance test has been completed. The test report is being prepared.

Solar House

- o Programming and functional checkout of the new controller has been completed, and the facility is now operational in the fully automatic mode.
- o The work on updating documentation of all facility systems continued.
- o Tie-in to the data system was completed.

Breadboard Test Facility

- o An instrumentation location and calibration verification plan was prepared.
- o The SEPCO System Test Procedure has been developed.
- o Data system tie-in to the test facility has been completed.
- o Operation of the test facility and test of System 1 are delayed pending completion of the test facility by the Corps of Engineers.
- o Overall sensor status is still open and is expected to cause further delays in test facility activation.
- o Installation of prototype System 2 into the test facility continues.

DATA PROGRAM

Site Data Acquisition Subsystem

- o Site Personalization - The following table defines the current status of site personalization efforts.

<u>Site</u>	<u>Sensors</u>	<u>J-Box</u>	<u>SDAS</u>	<u>On-Line</u>
Towns	--	X	X	X
Radian	X	X	X	X
Trinity	X	X	X	X
IBM 1A	(May)	(May)	(May)	(May)
Kalwall	X	X	X	X
Olympic				
Charlotte	X	(May)		
Rademaker	X	X	X	(Apr)
Scattergood	X	X	(May)	(May)
Iris Images	X	X	(Apr)	(May)
Lake Valley	X	X	(May)	
Flamboyant	X	X	(Apr)	(May)
Blakedale	X	(May)		
Moseley	(May)	(May)		
S.D.S. of M.	(May)	(May)		
Irvine	(Apr)	(May)		
Alabama Power	X	X		
Reedy Creek	(Apr)	(May)		
Salisbury	X	X	X	X
Bell Telephone	X	(May)		
Shenandoah	--	X	(Apr)	(May)
Decade 80	X	(May)	(May)	
State of Florida	(Apr)	(May)		
Kirkland AFB	(Apr)	(May)		
Randolph AFB	(Apr)	(May)		

A number of activities were performed under WBS 1.7.1 (TD #35). Information of these activities is contained in the attached TD #35 word chart.

On-Site Monitor (OSM)

- o OSM Deliveries - The first OSM was built, tested and sold to the Government in March. After acceptance, the unit was assigned to IBM for site installation usage. This device greatly enhanced our site installation and checkout capability.

Central Data Processing System

The contract effort for the CDPS is summarized below.

- o CDPS Site Personalization - The following table defines the current status of CDPS site personalization.

<u>Site</u>	<u>SDAS IMPL</u>	<u>PERF EQ IMPL</u>
Towns	X	X
Radian	X	X
Trinity	X	X
IBM 1A		
Kalwall	X	X
Olympic		
Charlotte		
Rademaker	X	(May)
Scattergood		
Iris Images	X	(May)
Lake Valley		
Flamboyant	X	(May)
Salisbury	X	X
Shenandoah	X	(May)

SDAS Deliveries

- o Eight SDAS units were acceptance tested and delivered during the month of April resulting in a total of 39 units. Unavailability of tape recorder subassemblies prohibited sell off of additional units. Due to the tape recorder shortage, the remaining SDAS's scheduled for delivery in April will be delivered the first of May.

Sensor Shipments

- o Sensors have been shipped to Moseley, Salisbury House, Lake Valley, Scattergood, Alabama Power, Rademaker, Iris Images, Flamboyant, Decade 80, and Reedy Creek. May projected shipments are: S.D. School of Mines, Irvine, State of Florida, Kirkland AFB, and Randolph AFB.

CHANGE INTEGRATION SUPPORT

- o A dedicated reproduction machine has been received in Building 4471 for the Change Integration Department.

TECHNICAL DIRECTIVES

Word charts for the Technical Directives active during April are attached. They are:

<u>TD</u>	<u>Title</u>
21X	Sensor Procurement Plan
23	Solar Cooling-Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
31	Site Selection Analysis for IBM locations
32	GFE Repair Plan
35	Site Instrumentation and Personalization
36	Data System Support
37	Repair GFE SEPCO collectors

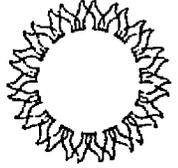
SENSOR PROCUREMENT PLAN - TD NO 21X

CONTRACT SCOPE

- 0 DEVELOP SENSOR SPECIFICATIONS AND FORMULATE SENSOR PROCUREMENT PACKAGE
- 0 OBTAIN QUOTES FROM VENDOR CANDIDATES
- 0 ESTABLISH QUALIFIED SENSOR LIST
- 0 RELEASE EXPANDED APPROVED SENSOR LIST
- 0 FINALIZE AND EXPAND PRESENT SENSOR PROCUREMENT PLAN FOR APPROXIMATELY 400 TEST SITES
- 0 IDENTIFY SENSORS FOR TEST AND EVALUATION

PRESENT STATUS

- 0 SENSOR SPECIFICATIONS HAVE BEEN PROVIDED TO VENDORS
- 0 DRAFT WBS 1.7.1 T.D. SUBMITTED TO MSFC FOR APPROVAL
- 0 WBS 1.5.2 T.D. CLOSED



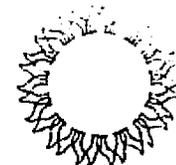
SENSOR PROCUREMENT PLAN - TD NO 21X (CONTINUED)

FUTURE ACTIONS

- o ESTABLISH NEW T.D. UNDER WBS 1.7.1 TO ACCOMPLISH THE FOLLOWING TASKS:
 - OBTAIN QUOTES FOR CANDIDATE VENDORS (EXPECTED MAY 13)
 - ESTABLISH A QUALIFIED SENSOR LIST
 - RELEASE AN EXPANDED APPROVED SENSOR LIST
 - EXPAND THE SENSOR PROCUREMENT PLAN FOR ADDITIONAL SITES
 - IDENTIFY SENSORS FOR TEST EVALUATION

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

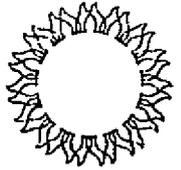
PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

- DETERMINING CLIMATIC REGIONS FOR COOLING
- ESTABLISHING COMFORT CRITERIA
- GENERIC SYSTEM DESCRIPTIONS
- RESTRUCTURED MINI-SHAC TO ACCEPT COOLING MODIFICATIONS

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

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SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- o PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- o PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- o PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- o FOUR SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE
 - CRYSTAL SPRINGS, MISSISSIPPI

FUTURE ACTIONS

- o COMPLETE SITE ASSESSMENT

REPAIR OF GFE YING COLLECTORS - TD#32

CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

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PRESENT STATUS

- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77

FUTURE ACTION

- REQUIRE TD FROM MSFC TO CONFIRM VERBAL DIRECTION

IBM

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35

CONTRACT SCOPE

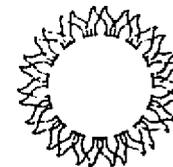
- 0 PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED SITE INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

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SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)



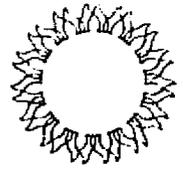
PRESENT STATUS

- o PERSONALIZATION ACTIVITY HAS BEEN AUTHORIZED FOR 26 COMMERCIAL SITES,
5 ERDA OTHER SITES AND MSFC OTS SITES
- o SENSOR SHIPMENTS
 - EIGHT SITES SHIPPED DURING APRIL
 - FIVE SITES PROJECTED FOR MAY
- o J-BOX SHIPMENTS
 - SEVEN SITES SHIPPED DURING APRIL
 - SEVEN SITES PROJECTED FOR MAY
- o RADIAN CORPORATION
 - CDPS IS COLLECTING DATA; HOWEVER, TWO PROBLEMS EXIST
 - o FLOWMETER (W400) IS BAD, I.E., OPEN BRIDGE CIRCUIT IN SENSOR
 - o WATT TRANSDUCERS ARE ERRATIC
 - DIRECTION HAS BEEN REQUESTED SINCE RADIAN BOUGHT THEIR OWN SENSORS

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SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)



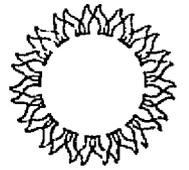
- o KALWALL
 - CDPS IS COLLECTING DATA, WATT TRANSDUCERS ARE ERRATIC AND WILL BE MODIFIED AS SALISBURY

- o SALISBURY HOUSE
 - NOISE LEVEL ELIMINATED BY PROPERLY TERMINATING OPEN TEMP BRIDGE CIRCUIT
 - ERRATIC WATT TRANSDUCER CORRECTED BY A MOD TO THE SENSOR BASED ON IBM TESTING AND VENDOR AGREEMENT

- o TRINITY UNIVERSITY
 - CHANGES APPROVED IN INSTRUMENTATION
 - J-BOX, SDAS, AND CDPS RESULTANT MODS ARE COMPLETE
 - SDAS INSTALLED ON 4/6/77 BUT CHECKOUT TERMINATED DUE TO SENSOR INSTALLATION DELAYS
 - DATA SYSTEM POWER-ON SCHEDULED FOR 5/11/77

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SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)



o RADEMAKER

- SDAS INSTALLED ON 4/27/77. TELEPHONE COUPLER HAD TO BE REPLACED
- SITE CHECKOUT HAS BEEN COMPLETED AND CDPS IS COLLECTING DATA
- SENSOR INSTALLATION AND WIRING WAS AN EXCELLENT JOB BY THE SITE CONTRACTOR

o IRIS IMAGES

- SDAS INSTALLED ON 5/5/77, TELEPHONE COUPLER WAS NOT CONNECTED TO TELEPHONE LINE
- SITE CHECKOUT HAS BEEN COMPLETED AND CDPS IS COLLECTING DATA

FUTURE ACTIONS

- o COMPLETE DATA SYSTEM CHECKOUT FOR CURRENT SITES
- o COMPLETE INSTALLATIONS FOR SHENANDOAH (5/6/77), FLAMBOYANT (5/15/77)

DATA SYSTEM SUPPORT - TD NO. 36

CONTRACT SCOPE

- o CONTINUE TO SUPPORT MSFC WITH ANALYSIS AND IMPLEMENTATION PROCESSES FOR THE DATA SYSTEM PLAN

- o AREAS OF ACTIVITY INCLUDE
 - COMMUNICATIONS
 - SITE DATA ACQUISITION
 - DATA PROGRAM PLANS AND ESTIMATES
 - SDAS SITE SELECTION
 - PERFORMANCE EVALUATION COMMITTEE SUPPORT

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DATA SYSTEM SUPPORT - TD NO. 36 (CONTINUED)

PRESENT STATUS

- o SENSOR AVAILABILITY STUDIES HAVE BEEN COMPLETED
 - KIRTLAND AFB SENSOR ASSESSMENT
 - RANDOLPH AFB SENSOR ASSESSMENT
 - SHENANDOAH SENSOR ASSESSMENT
 - DECADE 80 INSTRUMENTATION REVIEW AND SENSOR ASSESSMENT
- o FINAL DESIGN REVIEWS HAVE BEEN SUPPORTED DURING MARCH
 - INGRAM COUNTY
 - K. C. FIREHOUSE
 - LUTZ-SOTIRE (PRELIMINARY)
 - RKL CONTROLS

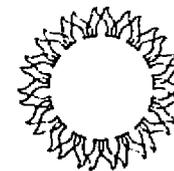
FUTURE ACTIONS

- o FOLLOWING DESIGN REVIEWS ARE SCHEDULED FOR APRIL
 - TELEX
 - LUTZ-SOTIRE
 - LSU

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GFE REPAIR - TD NO. 37



CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEPCO COLLECTORS
- REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- 56 SEPCO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEPCO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION

FUTURE ACTIONS

- REQUIRE TD CONFIRMING HALT TO REPAIR OPERATION

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SECTION E
MONTHLY STATUS REPORT
May 1977

INTEGRATION PROGRAM

Prototype Systems

- o System 3 design work continues to be stopped pending MSFC collector problem resolution.
- o Support to the installation of the solar system at Site 1A continued.
- o Initial system design of System 4 was completed and preparation of the data package began. The System Verification Test Plan and the Performance Specification were submitted. The Design Review has been scheduled for June 17.
- o MSFC was provided with technical concepts for the reorientation of design approaches for Systems 4, 5, and 6. The intent was to make these systems more innovative and more useful to the needs of the national solar energy program.
- o GFE 408-buy hardware has been transferred from IBM to MSFC storage facilities.
- o Subsystem test plans for all 408-buy collectors are being revised to add additional tests at the request of MSFC.

GFE Repair Technical Directives

Word charts on the two T.D.'s under paragraph 4.1H active during May are attached. They are:

<u>TD</u>	<u>Title</u>
32	Ying Collector Repair
37	SEPCO Collector Repair

MSFC TEST FACILITY SUPPORT

Solar Simulator

- o The Libbey-Owens-Ford (LOF) collector performance test was completed.

Subscale Facility

- o The SEPCO single collector performance test and the test report will be completed in early June.

Solar House

- The work on updating documentation of all facility systems continued.

Breadboard Test Facility

- o The SEPCO System Test is in process.
- o Operation of the test facility is delayed pending completion of the test facility by the Corps of Engineers.
- o Overall sensor status is still open and is expected to cause further delays in test facility activation.
- o Installation of prototype System 2 into the test facility continues.

DATA PROGRAM

Site Data Acquisition Subsystem

- o Site Personalization - The following table defines the current status of site personalization efforts.

<u>Site</u>	<u>Sensors</u>	<u>J-Box</u>	<u>SDAS</u>	<u>On-Line</u>
Towns	--	X	X	X
Radian	X	X	X	X
Trinity	X	X	X	X
IBM 1A	X	(June)	(Aug)	(Aug)
Kalwall	X	X	X	X
Olympic				
Charlotte	X	X	June	June
Rademaker	X	X	X	X
Scattergood	X	X	(June)	(June)
Iris Images	X	X	X	X
Lake Valley	X	X	(June)	
Flamboyant	X	X	X	(June)
Blakedale	X	X		
Mosely	X	X		
S.D.S. of M.	X	(June)		
Irvine	(June)			
Alabama Power	X	X		
Reedy Creek	X	(June)		
Salisbury	X	X	X	X
Bell Telephone	X	(June)		
Shenandoah	--	X	(June)	(June)
Decade 80	X	X	(June)	(June)
State of Florida	X	(June)		
Kirkland AFB	X	(June)		
Randolph AFB	X	(June)		
Ferguson	(June)	(July)		
Work Wear	(June)	(July)		
Troy	(June)	(July)		

A number of activities were performed under WBS 1.7.1 (TD #35). Information of these activities is contained in the attached TD #35 word chart.

On-Site Monitor (OSM)

- o OSM Deliveries - The first OSM was built, tested and sold to the Government in March. After acceptance, the unit was assigned to IBM for site installation usage. This device greatly enhanced our site installation and checkout capability. Units 2 & 3 are scheduled for acceptance testing the first week in June.

Central Data Processing System

The contract effort for the CDPS is summarized below.

- o CDPS Site Personalization - The following table defines the current status of CDPS site personalization.

<u>Site</u>	<u>SDAS IMPL</u>	<u>PERF EQ IMPL</u>
Towns	X	X
Radian	X	X
Trinity	X	X
IBM 1A		
Kalwall	X	X
Olympic		
Charlotte		
Rademaker	X	X
Scattergood	X	(June)
Iris Images	X	X
Lake Valley		
Flamboyant	X	(June)
Salisbury	X	X
Shenandoah	X	(June)

SDAS Deliveries

- o Seventeen SDAS units were acceptance tested and delivered during the month of May resulting in a total of 56 units. The four remaining SDAS's will be delivered in early June.

Sensor Shipments

- o Sensors have been shipped to Kirtland AFB, Randolph AFB, State of Florida, and S.D. School of Mines. June Projected shipments are Ferguson, Work Wear, Irvine and Troy.

TECHNICAL DIRECTIVES

Word charts for the Technical Directives active during May are attached.
They are:

<u>TD</u>	<u>Title</u>
21X	Sensor Procurement Plan
23	Solar Cooling-Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
31	Site Selection Analysis for IBM Locations
32	GFE Repair Plan
35	Site Instrumentation and Personalization
36	Data System Support
37	Repair GFE SEPCO collectors

SENSOR PROCUREMENT PLAN - TD NO 21X

CONTRACT SCOPE

- DEVELOP SENSOR SPECIFICATIONS AND FORMULATE SENSOR PROCUREMENT PACKAGE
- OBTAIN QUOTES FROM VENDOR CANDIDATES
- ESTABLISH QUALIFIED SENSOR LIST
- RELEASE EXPANDED APPROVED SENSOR LIST
- FINALIZE AND EXPAND PRESENT SENSOR PROCUREMENT PLAN FOR APPROXIMATELY 400 TEST SITES
- IDENTIFY SENSORS FOR TEST AND EVALUATION

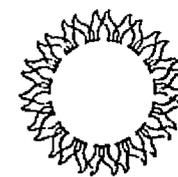
PRESENT STATUS

- SENSOR SPECIFICATIONS HAVE BEEN PROVIDED TO VENDORS
- DRAFT WBS 1.7.1 T.D. SUBMITTED TO MSFC FOR APPROVAL
- GOVERNMENT DECISION HAS BEEN MADE TO COMPLETE THIS EFFORT UNDER THE ERDA CONTRACT
- WBS 1.5.2 T.D. CLOSED

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SENSOR PROCUREMENT PLAN - TD NO 21X (CONTINUED)

FUTURE ACTIONS (TO BE COMPLETED UNDER ERDA CONTRACT)

- ESTABLISH NEW T.D. UNDER WBS 1.7.1 TO ACCOMPLISH THE FOLLOWING TASKS:
 - OBTAIN QUOTES FOR CANDIDATE VENDORS (COMPLETED)
 - ESTABLISH A QUALIFIED SENSOR LIST
 - RELEASE AN EXPANDED APPROVED SENSOR LIST
 - EXPAND THE SENSOR PROCUREMENT PLAN FOR ADDITIONAL SITES
 - IDENTIFY SENSORS FOR TEST EVALUATION

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

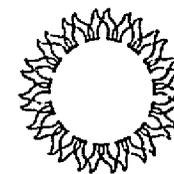
- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING - TD NO. 24

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

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SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

REPAIR OF GFE YING COLLECTORS - TD#32

CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

PRESENT STATUS

- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77
- EVALUATED MATERIALS AND CONSULTED WITH MSFC ON COLLECTORS REPAIRED BY YING AND SHIPPED TO SPACE MUSEUM

FUTURE ACTION

- REQUIRE TD FROM MSFC TO CONFIRM VERBAL DIRECTION

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35

CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED SITE INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)

PRESENT STATUS

- PERSONALIZATION ACTIVITY HAS BEEN AUTHORIZED FOR 26 COMMERCIAL SITES, 5 ERDA OTHER SITES AND MSFC OTS SITES
- SENSOR SHIPMENTS
 - FOUR SITES SHIPPED DURING MAY
 - FOUR SITES PROJECTED FOR JUNE
- J-BOX SHIPMENTS
 - THREE SITES SHIPPED DURING MAY
 - SEVEN SITES PROJECTED FOR JUNE
- RADIAN CORPORATION
 - CDPS IS COLLECTING DATA
 - NO OUTSTANDING PROBLEMS

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)

- KALWALL
 - CDPS IS COLLECTING DATA
 - LARGE BCH (COMMUNICATIONS) ERRORS ARE OCCURRING FROM THIS SITE

- SALISBURY HOUSE
 - CDPS IS COLLECTING DATA
 - NO OUTSTANDING PROBLEMS

- TRINITY UNIVERSITY
 - NUMEROUS PROBLEMS EXIST
 - SDAS #1 WAS RETURNED TO IBM DUE TO 115 VAC CONNECTED TO INPUT CHANNEL
 - COMPLETION OF CHECKOUT WILL BE RE-SCHEDULED

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SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35 (CONTINUED)

- RADEMAKER
 - CDPS IS COLLECTING DATA
 - NO OUTSTANDING PROBLEMS
- IRIS IMAGES
 - CDPS IS COLLECTING DATA
 - NO OUTSTANDING PROBLEMS

FUTURE ACTIONS

- COMPLETE DATA SYSTEM CHECKOUT FOR CURRENT SITES
- COMPLETE INSTALLATIONS FOR SHENANDOAH (JUNE), FLAMBOYANT (JUNE) AND SCATTERGOOD (JUNE)

DATA SYSTEM SUPPORT - TD NO. 36

CONTRACT SCOPE

- o CONTINUE TO SUPPORT MSFC WITH ANALYSIS AND IMPLEMENTATION PROCESSES FOR THE DATA SYSTEM PLAN
- o AREAS OF ACTIVITY INCLUDE
 - COMMUNICATIONS
 - SITE DATA ACQUISITION
 - DATA PROGRAM PLANS AND ESTIMATES
 - SDAS SITE SELECTION
 - PERFORMANCE EVALUATION COMMITTEE SUPPORT

DATA SYSTEM SUPPORT - TD NO. 36 (CONTINUED)

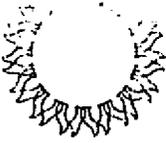
PRESENT STATUS

- o SENSOR AVAILABILITY STUDIES HAVE BEEN COMPLETED
 - KIRTLAND AFB SENSOR ASSESSMENT
 - RANDOLPH AFB SENSOR ASSESSMENT
 - SHENANDOAH SENSOR ASSESSMENT
 - DECADE 80 INSTRUMENTATION REVIEW AND SENSOR ASSESSMENT
- o FINAL DESIGN REVIEWS HAVE BEEN SUPPORTED DURING MAY
 - TELEX

FUTURE ACTIONS

- o THIS TD HAS BEEN CLOSED AND SUPPORTING ACTIVITIES TERMINATED

GFE REPAIR - TD NO. 37



CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEPCO COLLECTORS
- REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- 56 SEPCO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEPCO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION

FUTURE ACTIONS

- REQUIRE TD CONFIRMING HALT TO REPAIR OPERATION

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SECTION F
MONTHLY STATUS REPORT

June 1977

This was a Quarterly Review Presentation
and the information presented is contained
in the previous monthly reports.

SECTION G
MONTHLY STATUS REPORT

July 1977

INTEGRATION PROGRAM

Prototype Systems

- o System 3 design work is being held, pending MSFC collector problem resolution. IBM recommended that the Sunworks liquid collector replace the Ying Collector, thereby maintaining the drain-down system design.
- o Support to the installation of the solar system at Site 1A continued. Site contractor anticipates occupancy by mid-August.
- o A change proposal for rescoping of the SIMS integration program was submitted to MSFC on July 29. The stop-work order for Systems 3 through 6 was removed, provided that the innovative features proposed for Systems 4 through 6 were not addressed until proposal approval.

GFE Repair Technical Directives

Status charts on the two active Technical Directives under paragraph 4.1H for July are attached. They are:

<u>TD</u>	<u>Title</u>
32	Ying Collector Repair
37	SEPCO Collector Repair

TD's are required to confirm the halt of repair operations.

MSFC TEST FACILITY SUPPORT

Solar Simulator

- o The Daystar collector test data was evaluated and a test report was prepared and issued.
- o Testing of the SEPCO collector was initiated and completed this month. Data analyses on the collector have been collected and a test report is being prepared.

Solar House

- o Modems have been installed in the Solar House. Checkout has been delayed due to faulty teletype equipment.
- o A purchase order for sodium chromate (used in the thermal storage system) will be delayed until MSFC medical center selects an alternate chemical.

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Breadboard Test Facility

- o The acceptance tests have been completed. Corrections are being made to the systems/component discrepancies.
- o Test procedures for Systems 1 & 2 and the LARGO hot water system were completed. Functional checkout tests were performed on Systems 1 & 2. Installation of the LARGO system hardware on Test Bed #1 continues. Instrumentation for flowrate and power measurements on the LARGO system is required from MSFC.

Data Acquisition System

- o Data was collected from the System 1 tests currently being performed. Primary Data Acquisition Systems (PDAS) malfunctions experienced this month were caused by lightning.
- o Software modifications for the operating system continues.

DATA PROGRAM

- o Site Personalization - The Operational Test Sites (OTS) currently number 48 of which 19 have specific locations identified. Site personalization effort for 11 of these sites has progressed to hardware status as outlined in the following table. Dates are completed/ (planned) with an "x" noted for completions prior to status month.

<u>Site</u>	<u>Sensors Ordered</u>	<u>Sensors Shipped</u>	<u>J-Box Shipped</u>	<u>SDAS Shipped</u>	<u>SDAS On-Line</u>
DECADE 80	x	x	x	x	x
SEMCO-GA	x	July	July	July	(Aug)
SEMCO-FL	x	July	July	July	(Aug)
ELCAM-TEMPE	x	July	July	July	(Aug)
WORMSER-SC	July	(Aug)	(Aug)	TBD	TBD
SEECO-EL RENO	x	July	July	July	(Aug)
FERN-LANSING	x	(Aug)	(Aug)	TBD	TBD
COLT-YOSEMITE	July	(Sept)	(Sept)	(Sept)	(Sept)
IBM-1A	x	x	July	(Aug)	(Aug)
IBM-2A	x	(Aug)*	(Apr 78)	(May 78)	(June 78)
IBM-1B	x	(Aug 78)	(Aug 78)	(Sept 78)	(Oct 78)

- o On-Site Monitor (OSM) - 4 OSM units were delivered in July and 8 units are projected for delivery in August. The 2 remaining units are projected for delivery in September.
- o The SDAS & OSM spares proposal was submitted to MSFC on 7/22/77. Immediate go ahead is needed to maintain operational status of deliverable hardware.
- * Partial shipment to MSFC test breadboard

TECHNICAL DIRECTIVES

Word charts for the Technical Directives active during July are attached.
They are:

<u>TD</u>	<u>Title</u>
23	Solar Cooling-Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
31	Site Selection Analysis for IBM Locations
32	GFE Repair Plan
35	Site Instrumentation and Personalization
37	Repair GFE SEPCO Collectors

CHANGE INTEGRATION SUPPORT

- o A summary was analyzed and prepared on all Development contracts concerning the establishment budget versus the actual and proposed costs.

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

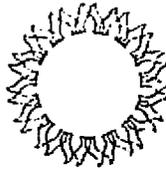
PRESENT STATUS

- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

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SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

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IBM

REPAIR OF GFE YING COLLECTORS - TD#32

CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

PRESENT STATUS

- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77
- EVALUATED MATERIALS AND CONSULTED WITH MSFC ON COLLECTORS REPAIRED BY YING AND SHIPPED TO SPACE MUSEUM

FUTURE ACTION

- REQUIRE TD FROM MSFC TO CONFIRM VERBAL DIRECTION

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35

CONTRACT SCOPE

- ① PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED OPERATIONAL TEST SITE (OTS) INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

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SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS

- FORTY-EIGHT OTS SITES ARE IDENTIFIED
- PERSONALIZATION ACTIVITY INITIATED FOR 11 SITES
- SENSOR SHIPMENTS
 - FOUR SHIPMENTS DURING JULY
 - THREE SITES PROJECTED FOR AUGUST
- J-BOX SHIPMENTS
 - FIVE SITE SHIPMENTS DURING JULY
 - TWO SITE SHIPMENTS PROJECTED FOR AUGUST
- SDAS SHIPMENTS
 - FOUR SITES SHIPPED DURING JULY
 - ONE SITE PROJECTED FOR AUGUST
- SDAS INSTALLATION AND CHECKOUT
 - NONE DURING JULY
 - FIVE SITES PROJECTED FOR AUGUST

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IBM

SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS (CONTINUED)

• DECADE 80

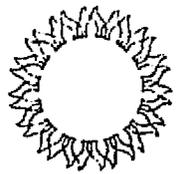
- "NO ANSWER" PROBLEM ISOLATED TO SDAS 7-14-77
- ON SITE REPAIR ATTEMPTED 7-25-77
- SDAS RETURNED TO IBM---RECEIVED 8-1-77
- FAILURE ASSESSMENT UNDERWAY

• SEMCO-GA

- SDAS INSTALLATION & C/O SCHEDULED 8-3-77
- INSTALLATION TEAM AT SITE 8-3-77
- NUMEROUS SENSOR INSTALLATION PROBLEMS ENCOUNTERED
- TEAM AWAITING RESOLUTION AS OF 8-4-77 PM

G12

YEM



GFE REPAIR - TD NO. 37

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CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEP CO COLLECTORS
- REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- 56 SEP CO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEP CO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION

FUTURE ACTIONS

- REQUIRE TD CONFIRMING HALT TO REPAIR OPERATION

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SECTION H
MONTHLY STATUS REPORT

August 1977

II-1

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INTEGRATION PROGRAM

Prototype Systems

- o A System 3 "Mini-Design Review" is scheduled for September 8, 1977 to present data on the recommended Sunworks liquid collector to replace the Ying Collector, thus maintaining the drain-down system design. Upon receipt of MSFC letter of August 13, 1977 removing the hold status on System 3, effort is continuing.
- o Phases 1 and 2 of System 1B Testing have been satisfactorily completed at the MSFC Test Facility. Remaining Phase 3 tests are scheduled for completion by September 15, 1977.
- o System 2A Testing - Completed installation at MSFC breadboard on August 23, 1977. The system has been changed with silicone fluid and is working properly.

GFE Repair Technical Directives

Status charts on the two active Technical Directives under paragraph 4.1H for August are attached. They are:

<u>TD</u>	<u>Title</u>
32	Ying Collector Repair
37	SEPCO Collector Repair

TD's are required to confirm the halt of repair operations.

MSFC TEST FACILITY SUPPORT

Solar Simulator

- o Thermal data as accumulated from indoor performance tests of the SEPCO collector were evaluated and a test report was prepared.
- o Two turbine flowmeters were replaced when they became inoperative during the MSFC hot air collector tests and two heater controllers developed amplifier failures. Differential thermocouple measurements of air temperature across the collector were replaced with thermopile instrumentation.
- o A limited amount of retesting may be required since it was evident that air leakage occurred from the collector flow channel past the collector absorber plate. This was a consequence of the collector modifications necessary to devise the air flow channel depth variations and the resulting pressure differentials experienced during testing. Flow visualization tests will be initiated upon completion of the thermal performance evaluations.

Solar House

- o Checkout of the Solar House Primary Data Acquisition System was continued during August.
- o A technical memorandum, which describes the Solar House Control System, was prepared and issued.

Breadboard Test Facility

- o Three operational solar system tests are being performed on the breadboard facility, including Systems 1 and 2 and the LARGO System. Functional check-out procedures have been performed on all three systems and operational tests were continued in System 1. All instrumentation has been obtained and installed on System 2 and LARGO Systems, and checkout of data is underway on the PDA'S prior to operational performance testing.
- o Weathering tests are continuing on Test Bed #4. During August, the Solargenics and Sunworks Air and liquid collectors were installed and the Ying collector was removed from the Test Bed.
- o A final draft of breadboard facility subsystem documentation and drawings was completed and will be issued after final reviews.

Data Acquisition System

- o Data is being collected on Systems 1 and 2 and the LARGO System through the PDAS. Maintenance/repair of the PDAS multiplexer and driver cards were performed on 30 Multiplexer and 2-line driver printed circuit cards.
- o Investigation of excessive parity errors on magnetic data from System 1 test tapes revealed that several new tapes contained bad shots. All new tapes will be verified prior to use on the PDAS.

DATA PROGRAM

- o Site Personalization - The Operational Test Sites (OTS) currently number 48 of which 19 have specific locations identified. Site personalization effort for 11 of these sites has progressed to hardware status as outlined in the following table. Dates are completed/(planned) with an "x" noted for completions prior to status month.

<u>Site</u>	<u>Sensors Ordered</u>	<u>Sensors Shipped</u>	<u>J-Box Shipped</u>	<u>SDAS Shipped</u>	<u>SDAS On-Line</u>
DECADE 80	x	x	x	x	x
SEMCO-GA	x	Aug	Aug	Aug	Aug
SEMCO-FL	x	Aug	Aug	Aug	Aug
ELCAM-TEMPE	x	Aug	Aug	Aug	Aug
WORMSER-SC	(Aug)	(Sept)	(Sept)	TBD	TBD
SEECO-EL RENO	x	Aug	Aug	Aug	(Sept)
FERN-LANSING	x	(Sept)	(Sept)	TBD	TBD
COLT-YOSEMITE	(Aug)	(Oct)	(Oct)	(Oct)	(Oct)
IBM-1A	x	x	Aug	(Sept)	(Sept)
IBM-2A	x	(Sept)*	(Apr 78)	(May 78)	(June 78)
IBM-1B	x	(Aug 78)	(Aug 78)	(Sept 78)	(Oct 78)

- o On-Site Monitor (OSM) - No units were delivered in August; eight units are scheduled for delivery in September. The two remaining units are projected for delivery in October.
- o Approval of our SDAS and OSM Spares proposal is still needed to maintain operational status of deliverable hardware.

TECHNICAL DIRECTIVES

Word charts for the Technical Directives active during August are attached. They are:

<u>TD</u>	<u>Title</u>
23	Solar Cooling-Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
31	Site Selection Analysis for IBM Locations
32	GFE Repair Plan
35	Site Instrumentation and Personalization
37	Repair GFE SEPCO Collectors

CHANGE INTEGRATION SUPPORT

- o Change Integration began support of MSFC Data Dissemination. Support involves compilation of documents, abstract writing, routing for approvals and submittal to the ERDA Technical Information Center. Material currently in process involves Collector Test Reports and Design Data Brochures

* Partial shipment to MSFC test breadboard.

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

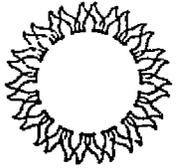
PRESENT STATUS

- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

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IBM

REPAIR OF GFE YING COLLECTORS - TD#32

CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

PRESENT STATUS

- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77
- EVALUATED MATERIALS AND CONSULTED WITH MSFC ON COLLECTORS REPAIRED BY YING AND SHIPPED TO SPACE MUSEUM

FUTURE ACTION

- REQUIRE TD FROM MSFC TO CONFIRM VERBAL DIRECTION

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 35

CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED OPERATIONAL TEST SITE (OTS) INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

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IBM

SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS

- FORTY-EIGHT OTS SITES ARE IDENTIFIED
- PERSONALIZATION ACTIVITY INITIATED FOR 11 SITES
- SENSOR SHIPMENTS
 - TWO SHIPMENTS DURING AUGUST
 - TWO SITES PROJECTED FOR SEPTEMBER
- J-BOX SHIPMENTS
 - ONE SITE SHIPMENT DURING AUGUST
 - TWO SITE SHIPMENTS PROJECTED FOR SEPTEMBER
- SDAS SHIPMENTS
 - TWO SITES SHIPPED DURING AUGUST
 - TWO SITES PROJECTED FOR SEPTEMBER
- SDAS INSTALLATION AND CHECKOUT
 - TWO SITES INSTALLED IN AUGUST
 - THREE SITES PROJECTED FOR SEPTEMBER

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SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS (CONTINUED)

- DECADE 80
 - SDAS RETURNED TO IBM 8-1-77
 - FACTORY REPAIR COMPLETE 8-10-77
 - SDAS REINSTALLED AT SITE 8-13-77
 - DATA COLLECTION UNDERWAY 8-13-77 TO DATE

- SEMCO-GA
 - SDAS INSTALLED 8-6-77
 - DATA WRING OUT UNDERWAY
 - SITE CONTRACTOR CHANGED PUMP 8-23-77

- SEMCO-FLA
 - SDAS INSTALLED 8-24-77
 - DATA WRING OUT UNDERWAY
 - TWO SENSORS REPLACED 9-12-77

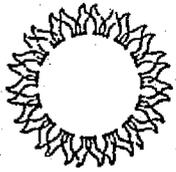
- ELCAM-TEMPE
 - SDAS INSTALLED 8-12-77
 - DATA WRING OUT UNDERWAY

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GFE REPAIR - TD NO. 37



CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEP CO COLLECTORS
- REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- 56 SEP CO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEP CO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION

FUTURE ACTIONS

- REQUIRE TD CONFIRMING HALT TO REPAIR OPERATION

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SECTION I
MONTHLY STATUS REPORT

September 1977

INTEGRATION PROGRAM

Prototype Systems

- o Open house for System 1A is tentatively scheduled for October 20, 1977.
- o Phase 3 of System 1B testing was completed on September 16, 1977. No major problems were identified and data evaluation continues. IBM will compare test data and design data with Wyle's September report on test activity to reconfirm performance predictions. Site installation remains scheduled for December 1977.
- o Completion of performance testing of System 2A was rescheduled to October 6, 1977, due to bad weather. No change in hardware shipment scheduled on October 21 is anticipated as a result of this testing schedule slippage.
- o A "Mini-Design Review" for System 3A was held September 8 and the recommended collector change from Ying to Sunworks was conditionally approved. The condition was dependent upon the results of a stagnation temperature test held later in the month on the solar simulator. These stagnation temperature test results indicated no temperature problems (approximately 310°F was reached, 350°F solder melt point). Purchase orders have been submitted for all major hardware purchases.

GFE Repair Technical Directives

Status charts on the two active technical directives under paragraph 4.1H for September are attached. They are:

<u>TD</u>	<u>Title</u>
32	Ying Collector Repair
37	SEPCO Collector Repair

TD's are required to confirm the halt of repair operations.

MSFC TEST FACILITY SUPPORT

Solar Simulator

- o Indoor performance tests were completed for the MSFC hot air collector and the performance parameters were evaluated. The test report will be prepared after the flow visualization testing is conducted by MSFC personnel.
- o A test procedure was prepared and issued for the Sunworks liquid collector. The liquid test loop and instrumentation necessary for testing the Sunworks liquid collector were assembled consistent with the PDAS No. 3 requirements. Solar simulator lamps were replaced which required that a new heat flux contour map be performed. Although stagnation testing of the Sunworks liquid collector was completed, thermal performance tests are continuing.

Solar House

- o The Solar House was operated with data being collected on the Primary Data Acquisition System and recorded on magnetic tape.
- o The Solar House Control System Microprocessor Program was updated.

Breadboard Test Facility

- o System 1 tests were completed during September. Data accumulated during the tests is being evaluated and a test report is in preparation.
- o Operational tests are continuing on System 2 and the LARGO System. Testing revealed that the three-way solenoid valve on the LARGO system restricted liquid flow through the collector to less than desirable flows. LARGO Solar Systems recommended removing this valve from the system. Satisfactory flow rates were achieved when the valve was removed.
- o System 2 operational testing has been completed to evaluate performance with Heat Exchanger Number 1. The second and final heat exchanger to be evaluated in System 2 has been installed and operational tests are in progress.
- o Collector weathering tests are still continuing on Test Bed #4. An outdoor collector test setup was assembled adjacent to Test Bed #4 for performance evaluation of air collectors that show evidence of deterioration during weathering tests. One of the Solaron air collectors was removed from Test Bed #4 to be utilized for performance testing during October.
- o A permanent weather shelter unit was installed at the breadboard facility to be used for ambient climatic measurements.

Data Acquisition System

- o Currently, data is being collected from the breadboard facility, simulator facility and solar house. Eproms for PDAS #2 and PDAS #3 were evaluated from signal conditioning on the simulator and solar house applications.
- o Computer programs are being prepared to generate the Instrumentation Program (IP) and Component List (CL) for PDAS #2 and PDAS #3. Computer programs were also written to be used for post-test evaluation of Systems 1 and 2 test data.

DATA PROGRAM

- o Site Personalization - The Operational Test Sites (OTS) currently number 48. Site personalization effort for 11 of these sites has progressed to hardware status as outlined in the following table. Dates are completed/(planned) with an "x" noted for completions prior to status month.

<u>Site</u>	<u>Sensors Ordered</u>	<u>Sensors Shipped</u>	<u>J-Box Shipped</u>	<u>SDAS Shipped</u>	<u>SDAS On-Line</u>
DECADE 80	x	x	x	x	x
SEMCO-GA	x	x	x	x	x
SEMCO-FL	x	x	x	x	x
ELCAM-TEMPE	x	x	x	x	x
WORMSER-SC	x	Sept	Sept	tbd	tbd
SEECO-EL RENO	x	x	x	x	Sept
FERN-LANSING	x	x	x	Sept	(Oct)
COLD-YOSIMITE	x	Holding	Holding	Holding	tbd
IBM-1A	x	x	x	Sept	(Oct)
IBM-2A	x	(Oct)*	(Oct)	(Feb 78)	(Feb 78)
IBM-1B	x	tbd	tbd	tbd	tbd

*Partial shipment to MSFC test breadboard, August 1977

TECHNICAL DIRECTIVES

Word charts for the technical directives active during Septmeber are attached.

<u>TD</u>	<u>Title</u>
23	Solar Cooling-Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
31	Site Selection Analysis for IBM Locations
32	GFE Repair Plan
37	Repair GFE SEPCO Collectors
46	Instrumentation Definition and Site Personalization Tasks

CHANGE INTEGRATION SUPPORT

- o Prepared draft for the Master Test Plan for the Solar Heating and Cooling Project.
- o Began processing approved instrumentation plans and instrumentation programs for approval and baselining.
- o Modified the Site Status Report to incorporate recent changes and additional information.
- o Conducted one Level 301 Change Control Board meeting.
- o Supported design reviews for Stephens College, Travis-Braun, Kaw Valley, Radisson, Calmac, Life Services, and IBM system 1B collector.
- o Received TD No. 47 authorizing up to 42 man months (October 1977 - March 1978) for instrumentation definition and site personalization tasks.

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

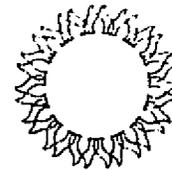
- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

1-5

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

I-7

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

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IBM

REPAIR OF GFE YING COLLECTORS - TD#32

CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

PRESENT STATUS

6-1

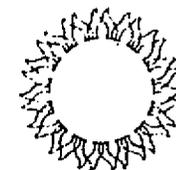
- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77
- EVALUATED MATERIALS AND CONSULTED WITH MSFC ON COLLECTORS REPAIRED BY YING AND SHIPPED TO SPACE MUSEUM

FUTURE ACTION

- REQUIRE TD FROM MSFC TO CONFIRM VERBAL DIRECTION

IBM

GFE REPAIR - TD NO. 37



CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEPCO COLLECTORS
- REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- 56 SEPCO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEPCO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION

FUTURE ACTIONS

- REQUIRE TD CONFIRMING HALT TO REPAIR OPERATION

1-10

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IBM

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 46

(THIS TD SUPERSEDES TD NO. 35)

CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED OPERATIONAL TEST SITE (OTS) INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

II-11

SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS

- FORTY-EIGHT OTS SITES ARE IDENTIFIED
- PERSONALIZATION ACTIVITY INITIATED FOR 15 SITES
- SENSOR SHIPMENTS
 - ONE SHIPMENT DURING SEPTEMBER
 - FIVE SITES PROJECTED FOR OCTOBER
- J-BOX SHIPMENTS
 - ONE SITE SHIPMENT DURING SEPTEMBER
 - FIVE SITE SHIPMENTS PROJECTED FOR OCTOBER
- SDAS SHIPMENTS
 - TWO SITES SHIPPED DURING SEPTEMBER
 - NO SITES PROJECTED FOR OCTOBER
- SDAS INSTALLATION AND CHECKOUT
 - ONE SITES INSTALLED IN SEPTEMBER
 - TWO SITES PROJECTED FOR OCTOBER

SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS (CONTINUED)

- DECADE 80
 - DATA COMMUNICATION LOST 9/20/77
 - PROBLEM ISOLATED/RESOLVED 10/4/77
 - AMBIENT OVERTEMP ($\approx 122^{\circ}\text{F}$) CAUSED TAPE RECORDER JAM
 - DATA COLLECTION UNDERWAY
- SEMCO-GA
 - SDAS INSTALLED 8/6/77
 - DATA COMMUNICATION LOST 9/15/77
 - ON-SITE SDAS REPAIR 10/6/77
 - DATA COLLECTION UNDERWAY
- SEMCO-FLA
 - SDAS INSTALLED 8/24/77
 - DATA WRING OUT UNDERWAY
 - TWO SENSORS REPLACED 9/12/77
- ELCAM-TEMPE
 - SDAS INSTALLED 8/12/77
 - DATA WRING OUT UNDERWAY
- SEECO-EL RENO
 - SDAS INSTALLED 10/15/77
 - DATA WRING OUT UNDERWAY

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IBM

SECTION J
MONTHLY STATUS REPORT

October 1977

INTEGRATION PROGRAM

Prototype Systems

- o System 1A - SDAS checkout was performed on October 11, 1977 with data transferred to the System 7. The instrumentation problems regarding two wattmeters and one flowmeter have been corrected. The wattmeters were wired incorrectly and foreign materials were found in the water line, causing the flowmeter malfunction. Pieces of solder and insulation were flushed from the system, thus indicating the need to flush a system prior to installation. Collected data is currently being evaluated.

Open house for System 1A was held on October 20, 1977.

- o System 1B - The final installation design review was held in Denver and resulted in only minor installation documentation changes suggested. The Wyle Test Report/IBM System Assessment were delivered to MSFC on October 25. Tear down of the system is underway.
- o System 2 - MSFC accepted the system on October 14. The system was removed from the test stand and was shipped the same day. An IBM engineer is supporting the installation on site at Togus, Maine.
- o System 3 - Hardware items have been procured and a test facility installation schedule has been developed.
- o System 4 - The design review was held on October 14. Design features included a remote module containing collectors and other hardware. Interfaces to an existing house have been minimized to allow retrofit applications. Major concerns expressed at the review were costs of the installed system and interface problems with small, slab-style houses. Design approval awaits further review of these issues.

GFE Repair Technical Directives

Status charts on the two active technical directives under paragraph 4.1H for October are attached. They are:

<u>ID</u>	<u>Title</u>
32	Ying Collector Repair
37	SEPCO Collector Repair

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MSFC TEST FACILITY SUPPORT

Solar Simulator

- o Indoor thermal performance tests of the Sunworks liquid collector were completed and data evaluations are currently being performed. Several instrumentation problems were encountered during initial tests which required changes in sensor installation and recalibration prior to completion of testing. An electrical circuit breaker on the simulator had to be replaced, which further delayed the performance tests.

- o Modifications were completed on the Air Test Loop direct system for installation of ASHRAE Standard flow nozzles that will be used in performance tests of the Solaron air collector.

Solar House

- o The Solar House was maintained and operated with data being recorded on magnetic tape. Thermal performance evaluations are being conducted using current data and results will be used to compare with previous data.
- o Several temperature sensors and flowmeters were replaced during October. An additional pyranometer was installed as a redundant measurement.
- o Winterization procedures were implemented for freeze protection and conversion to the winter operational mode.

Breadboard Test Facility

- o System 1 test data evaluations were completed and a test report was issued. Systems 1 and 2 were removed from Test Bed #1, disassembled, and shipped to their respective test sites. A test report for System 2 is in preparation.
- o The LARGO System test data was evaluated and a draft of the test report was prepared. LARGO System tests will be continued to obtain extended term data.
- o A facility cold weather plan was prepared for freeze-protection purposes and this plan is currently being implemented.
- o Solar collectors on Test Bed #4 for weathering tests were removed in order to paint the Test Bed structure.
- o The collector Air Test Loop for solar simulation testing was transported to a site adjacent to Building 4638 where outdoor thermal performance evaluations are being conducted on a SEPCO collector. This particular collector was used previously in weathering tests and showed evidence of contamination on the glazing interior.
- o Pendant solar flux transducers were installed on Test Beds 1 and 2. Solar flux measurements on these transducers were found to be in agreement.

Data Acquisition System

- o Collecting and recording test data from the Breadboard Facility, Simulation Facility, and the Solar House continued during October. Computer programs have been written for nonlinear transducer characterization and IP and CL updates. Data log tapes and post-test data reductions were completed for Systems 1 and 2, and the LARGO System.

DATA PROGRAM

- o Site Personalization - The Operational Test Sites (OTS) currently number 48. Site personalization effort for 15 of these sites has progressed to hardware status as outlined in the following table. Dates are completed/(planned) with an "x" noted for completions prior to status month.

<u>Site</u>	<u>Sensors Ordered</u>	<u>Sensors Shipped</u>	<u>J-Box Shipped</u>	<u>SDAS Shipped</u>	<u>SDAS On-Line</u>
DECADE 80	x	x	x	x	x
SEMCO-GA	x	x	x	x	x
SEMCO-FL	x	x	x	x	x
ELCAM-TEMPE	x	x	x	x	x
WORMSER-SC	x	x	x	Oct	tbd
SEECO-EL RENO	x	x	x	x	x
FERN-LANSING	x	x	x	x	Oct
COLD-YOSIMITE	x	Holding	Holding	Holding	tbd
IBM-1A	x	x	x	x	Oct
IBM-2A	x	Oct	(Feb 78)	(Feb 78)	(Feb 78)
IBM-1B	x	tbd	tbd	tbd	tbd
CONTEMP.-MANCHESTER	x	Oct	(Nov)	tbd	tbd
HONEYWELL-STILLWATER	x	Oct	(Nov)	tbd	tbd
HONEYWELL-NEW CASTLE	x	Oct	(Nov)	tbd	tbd
SE-NORMAL	x	Oct	(Nov)	tbd	tbd

- o On-Site Monitor (OSM) - Ten OSMs were delivered completing the 25 as required by the contract.

TECHNICAL DIRECTIVES

Word charts for the technical directives active during October are attached.

<u>TD</u>	<u>Title</u>
23	Solar Cooling-Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
31	Site Selection Analysis for IBM Locations
32	GFE Repair Plan
37	Repair GFE SEPCO Collectors
46	Instrumentation Definition and Site Personalization Tasks
47	Change Integration Mission

CHANGE INTEGRATION SUPPORT

- o Began the implementation of the Data Dissemination role. This activity includes the preparation of the Data Dissemination Status Report, SHC-3088, which indicates all potential documentation for DOE review. Also, included in this role is the creation of a Data

Dissemination Tracking System and the routing of documentation in accordance with the Data Dissemination Plan flow.

- o Assisted the Project Office in the preparing and finalizing the MSFC Data Dissemination Plan, SHC-2018. Also, assisted in the preparation of an overview presentation on the Data Dissemination Plan.
- o Assisted in the preparation of an overview of the Solar Heating and Cooling Operational Test Plan, SHC-2013.
- o Prepared contract modifications to reflect contractual changes in recent change orders.
- o Supported nine design reviews including GE, Contemporary Systems, Owens Illinois, Brandon Swimming Association, Huntsville Senior Citizens Center, William Tao, Northrop, Columbus Technical Institute and City of Baltimore.

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (HOLD-STATUS)

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

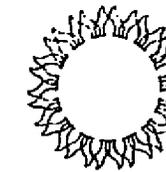
- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION

J-7



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING - TD NO. 24 (HOLD-STATUS)

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

J-8

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SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

REPAIR OF GFE YING COLLECTORS - TD NO. 32

CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

PRESENT STATUS

- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77
- EVALUATED MATERIALS AND CONSULTED WITH MSFC ON COLLECTORS REPAIRED BY YING AND SHIPPED TO SPACE MUSEUM

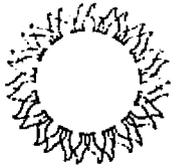
FUTURE ACTION

- REQUIRE TD FROM MSFC TO CONFIRM VERBAL DIRECTION

J-10

IBM

GFE REPAIR - TD NO. 37



CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEPCO COLLECTORS
- REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- 56 SEPCO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEPCO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION

FUTURE ACTIONS

- REQUIRE TD CONFIRMING HALT TO REPAIR OPERATION

J-11

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 46

(THIS TD SUPERSEDES TD NO. 35)

CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED OPERATIONAL TEST SITE (OTS) INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

J-12

IBM

SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS

- o FORTY-EIGHT OTS SITES ARE IDENTIFIED
- o PERSONALIZATION ACTIVITY INITIATED FOR 15 SITES
- o SENSOR SHIPMENTS
 - FIVE SHIPMENTS DURING OCTOBER
 - NO SITES PROJECTED FOR NOVEMBER
- o J-BOX SHIPMENTS
 - NO SITE SHIPMENTS DURING OCTOBER
 - FOUR SITE SHIPMENTS PROJECTED FOR NOVEMBER
- o SDAS SHIPMENTS
 - ONE SITE SHIPPED DURING OCTOBER
 - NO SITES PROJECTED FOR NOVEMBER
- o SDAS INSTALLATION AND CHECKOUT
 - TWO SITES INSTALLED IN OCTOBER
 - NO SITES PROJECTED FOR NOVEMBER

J-13

CHANGE INTEGRATION MISSION - TD NO. 47

CONTRACT SCOPE

- o OPERATE BASELINE AND CHANGE MANAGEMENT SYSTEM ON BOTH PROGRAMMATIC AND TECHNICAL CHANGES FOR THE SOLAR HEATING AND COOLING PROJECT

PRESENT STATUS

- o VARIOUS CHANGE INTEGRATION TASKS SUPPORTING THE SOLAR HEATING AND COOLING PROJECT OFFICE WILL BE PERFORMED NOT TO EXCEED 42 MAN-MONTHS IN THE TIME PERIOD OCTOBER 3, 1977 THROUGH MARCH 31, 1978.

J-14

IBM

SECTION K
MONTHLY STATUS REPORT

November 1977

INTEGRATION PROGRAM

Prototype Systems

- o System 1A - System was operational and data evaluation was underway during November. Also, performed preliminary airflow balancing using measurements. Completed SDAS sensor functional analysis and turned the site log over to the site analyst. The Installation Acceptance Review meeting was held on November 22, 1977.
- o System 1B - Data collection instrumentation documentation was updated and is awaiting review by the site analyst. Test system disassembly was completed, the required SEPCO collectors were identified at the MSFC warehouse, and System 1B was accepted by MSFC via DD250 on October 28, 1977. System 1B has been shipped to Carlsbad.

Discussed our site installation proposal with the National Park Service early in November. The National Park Service has received additional bids for building modifications and system installation.

- o System 2 - Wiring of pyranometer and flow meter sensors was completed at Togus with IBM support. Performance data will not be available until February 1978, when the J-box and SDAS are scheduled to be installed.
- o System 3 - All components required for system test at MSFC have been received except for the hot water exchanger. A substitute heat exchanger will be fabricated by Wyle for test purposes. A schedule slip is anticipated due to late procurement approval and longer-than-anticipated vendor delivery dates.
- o System 4 - Responses to the design review RIDs and Action Items were completed and delivered to MSFC on November 17. The basic design has been modified according to MSFC Action Item direction. Stress analysis of remote unit structure has been started.

GFE Repair Technical Directives

Status charts on the two active technical directives under paragraph 4.1H for November are attached. They are:

<u>TD</u>	<u>Title</u>
32	Ying Collector Repair
37	SEPCO Collector Repair

MSFC TEST FACILITY SUPPORT

Solar Simulator

- o The ASHRAE standard air flowrate measuring test section was assembled and installed on the simulator air loop in early November. Tests were performed to verify the accuracy of flow-rate measurements by comparing the values obtained from the ASHRAE standard test section with those of the turbine-type meter. Results of this comparison showed good agreement between the flowrate measurements. The standard test section will be utilized for airflow rate measurements in future collector tests on the Solar Simulator. Solar Simulator lamps were replaced and a solar intensity contour map was prepared prior to initiation of tests.
- o Test procedures were prepared for the Solaron and Sunworks air collectors. Thermal performance tests were initiated and completed for the Solaron air collector. A test report was prepared and issued to document the results of these tests. The Sunworks air collector was installed on the Simulator Test Stand in preparation of performance testing. Static load tests were performed on the Sunworks liquid and the Solaron air collectors during November.

Breadboard Test Facility

- o System 2 test data evaluations were completed and the test report were delivered to IBM.
- o Test procedures are under preparation for System 3. Available hardware for System 3 is currently being assembled and installed on Facility Test Bed No. 2. These requirements were reviewed and it was determined that the scope of System 3 tests achieve the following objectives:
 - Functional tests of subsystems and components.
 - Evaluation of freeze protection system.
 - Collector array efficiency.
 - Thermal storage capacity of storage subsystem.
 - Overall heat transfer loss coefficient of storage vessel.
 - Overall thermal conductance of the heat exchanger as mounted on the storage vessel interior.
 - System operational performance evaluation.

Subsystems/components which deviate from the prototype system will be analyzed subsequent to system testing.

- o Due to the physical size limitation for testing at the Solar Simulator, it was necessary to conduct thermal performance testing on the Ying and Solaron (SEPCO) collectors at outside weather conditions on the Subscale Test Stand. The testing of the Solaron collector was completed during November. The Ying collector has been installed on the test stand and will be tested as weather conditions permit.
- o The facility cold weather plan has been implemented. This entailed draining water lines, applying thermal insulation, and installing heaters, as necessary, to prevent damage to facility equipment.
- o LARGO system testing was delayed due to painting activities on Test Bed No. 1. This system will be installed and tests will be continued in December.
- o Facility Test Bed painting was completed and collectors were reinstalled on Test Bed No. 4 for weathering tests. Each collector contains a temperature sensor mounted at the center of the absorber plate. These stagnation temperatures are monitored as a function of time to obtain data relevant to collector degradation.

Data Acquisition System

- o The collection and recording of test data from the Breadboard Facility, Solar Simulation Facility, and Solar House has continued during this reporting period.
- o Programming necessary to prepare an Instrumentation Program and Component List for the MSFC Hot Air System located at Building 4638 has been initiated.
- o Post-processing of System 2 test data was accomplished.
- o A report on problems encountered with transducer inaccuracies together with recommendations was prepared and distributed to all participants.

DATA PROGRAM

- o Site Personalization - The Operational Test Sites (OTS) currently number 45. Site personalization effort has progressed to hardware status as outlined in the following table. Dates are completed/ (planned) with an "x" noted for completions prior to status month.

OTS HARDWARE STATUS

<u>SITE</u>	<u>Sensors Ordered</u>	<u>Sensors Shipped</u>	<u>J-Box Shipped</u>	<u>SDAS Shipped</u>	<u>SDAS On-Line</u>
DECADE 80	X	X	X	X	X
SEMCO-GA	X	X	X	X	X
SEMCO-FLA	X	X	X	X	X
ELCAM-TEMPE	X	X	X	X	X
WORMSER-SC	X	X	X	X	(1-78)
SEECO-EL RENO	X	X	X	X	X
FERN-LANSING	X	X	X	X	X
COLT-YOSIMITE	X	Holding	Holding	Holding	tbd
IBM-1A	X	X	X	X	X
IBM-2A	X	X	X	tbd	(2-78)
IBM-1B	X	tbd	tbd	tbd	(2-78)
CONTEMP-MANCHESTER	X	X	X	(12-77)	(12-77)
HONEYWELL-STILLWATER	X	X	X	(1-78)	(1-78)
HONEYWELL-NEW CASTLE	X	X	X	(2-78)	(2-78)
GE-NORMAL	X	X	X	(1-78)	(1-78)
CONTEMP-YORK	X	Nov	Nov	(1-78)	(1-78)
FERN-TUNKHANNOCK	X	Nov	Nov	(12-77)	(12-77)
SEECO-LINCOLN	X	Nov	Nov	(12-77)	(12-77)
ELCAM-SAN DIEGO	X	Nov	Nov	(2-78)	(2-78)
COLT-PUEBLO	X	Nov	Nov	tbd	tbd

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TECHNICAL DIRECTIVES

Word charts for the technical directives active during November are attached:

<u>TD</u>	<u>Title</u>
23	Solar Cooling - Baseline System Performance
24	Collector Selection for Absorption Cycle Cooling
31	Site Selection Analysis for IBM Locations
32	Repair of GFE Ying Collectors
37	Repair GFE SEPCO Collectors
46	Site Instrumentation and Personalization

Note: TDs 32 and 37 are completed and will be deleted from future reports.

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (HOLD-STATUS)

CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

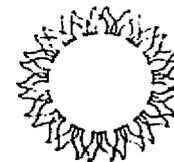
- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION

K-8



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24 (HOLD-STATUS)

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

K-9

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SITE SELECTION ANALYSIS FOR IBM LOCATIONS - TD NO. 31

CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

K-10

IBM

REPAIR OF GFE YING COLLECTORS - TD NO. 32

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CONTRACT SCOPE

- PERFORM WORKMANSHIP INSPECTION ON YING COLLECTORS
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SELECT 5 COLLECTORS WITH MINIMUM DEFECTS AND SHIP TO SPACE MUSEUM
- SHIP 6 COLLECTORS TO YING FOR REPAIR
- REPAIR ONE COLLECTOR AT IBM TO EVALUATE REPAIR PLAN

PRESENT STATUS

- INSPECTED FIVE, EFFORT HALTED BY MSFC DIRECTION PENDING DEFECT RESOLUTION
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77
- EVALUATED MATERIALS AND CONSULTED WITH MSFC ON COLLECTORS REPAIRED BY YING AND SHIPPED TO SPACE MUSEUM

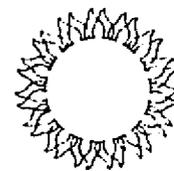
FUTURE ACTION

- RECEIVED TD FROM MSFC TO CONFIRM VERBAL DIRECTION

K-11

IBM

GFE REPAIR - TD NO. 37



CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEPCO COLLECTORS
- REPLACE WITH SILICONE CAULKING

PRESENT STATUS

- 56 SEPCO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEPCO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION

FUTURE ACTIONS

- RECEIVED TD CONFIRMING HALT TO REPAIR OPERATION

IS-12

IBM

SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 46

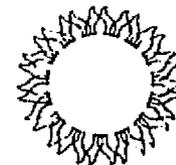
(THIS TD SUPERSEDES TD NO. 35)

CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED OPERATIONAL TEST SITE (OTS) INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

K-18

IBM



SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS

- FORTY-FIVE OTS SITES ARE IDENTIFIED
- PERSONALIZATION ACTIVITY INITIATED FOR 22 SITES
- SENSOR SHIPMENTS
 - FIVE SHIPMENTS DURING NOVEMBER
 - NO SITES PROJECTED FOR DECEMBER
- J-BOX SHIPMENTS
 - FIVE SHIPMENTS DURING NOVEMBER
 - NO SITE SHIPMENTS PROJECTED FOR DECEMBER
- SDAS SHIPMENTS
 - NO SHIPMENTS DURING NOVEMBER
 - THREE SITES PROJECTED FOR DECEMBER
- SDAS INSTALLATION AND CHECKOUT
 - NONE INSTALLED IN NOVEMBER
 - THREE PROJECTED FOR DECEMBER

K-14

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CHANGE INTEGRATION MISSION - TD NO. 47

CONTRACT SCOPE

- OPERATE BASELINE AND CHANGE MANAGEMENT SYSTEM ON BOTH PROGRAMMATIC AND TECHNICAL CHANGES FOR THE SOLAR HEATING AND COOLING PROJECT

PRESENT STATUS

- VARIOUS CHANGE INTEGRATION TASKS SUPPORTING THE SOLAR HEATING AND COOLING PROJECT OFFICE WILL BE PERFORMED NOT TO EXCEED 42 MAN-MONTHS IN THE TIME PERIOD OCTOBER 3, 1977 THROUGH MARCH 31, 1978.

SECTION L
MONTHLY STATUS REPORT

December 1977

INTEGRATION PROGRAM

Prototype Systems

- o System 1A - In early December, the air handler controller was removed and returned to the vendor for repair, due to a blower motor relay failure. Later in the month, the repaired air handler controller was reinstalled along with two new relays and proper operation was restored. Instrumentation for special DHW tests was installed and tests were completed. Air flow measurements revealed that all solar modes have flow rates over 1,300 SCFM. Because solar systems installation conditions prevented ideal air flow data collection sensor locations, the sensors read low, requiring an appropriate correction factor in the data collection technique.
- o System 2 - The IBM Test Results Engineering Analysis Report was in final stages of preparation by the end of this month. Report is scheduled to be delivered the first week of January.
- o System 3 - The schedule for test system installation was delayed to early January due to procurement delivery delays, a necessary selection of an alternate collector source, bad weather conditions and a delay in the approval cycle of the Integration Program Restructure change proposal.
- o System 4 - All subsystem hardware has been ordered as well as the structural elements for the rock bed containers. Rock storage wall samples were fabricated to evaluate fabrication procedure. Remote solar assembly structure drawings have been completed and procurement packages released. The top level remote solar assembly drawing was partially completed.
- o Systems 5 and 6 - A stop work order was verbally received from MSFC on December 5 for all IBM efforts associated with these two systems. This direction will result in large quantities of GFE solar hardware which will not be used in system installations.

IBM has initiated the work required to submit an ECP to delete these systems. The ECP will result in an overall dollar credit to the current contract.

GFE Repair Technical Directions

Status charts on the two current technical directives under Paragraph 4.1H for December are attached. They are:

<u>TD</u>	<u>Title</u>
48	Repairs of Ying Collectors
49	Repairs of SEPCO Collectors

MSFC Test Facility Support

Solar Simulator

- o The Solar Simulator equipment was utilized during December to conduct performance evaluations of two Sunworks solar collectors (liquid and air heat transfer mediums). A thermal performance test report was issued on the Sunworks liquid collectors, and the report for the Sunworks air collector is being prepared.
- o A new collector mounting table for the Solar Simulator Test Facility was designed, fabricated, and installed. This new table will provide more uniform and stable support of the collector test units. Also, new fans for simulation of wind conditions were purchased and installed.
- o The sequence of testing activities necessary for collector performance evaluations has been modified to improve the effectiveness of the Solar Simulator facility.

Breadboard Test Facility

- o Test procedures for evaluation of System 3 were completed in December. Two phases of testing are planned as follows:
 - Phase 1 testing will be performed utilizing the alternate storage tank and heat exchanger as initially provided. Initial testing of this hardware will be continued until the System 3 prototype storage tank and heat exchanger hardware are delivered.
 - Phase 2 testing will be performed utilizing the prototype System 3 hardware. The prototype storage tank and heat exchanger are scheduled to be available for testing in mid-January 1978.
- o The Phase 1 test hardware for System 3 has been assembled and the instrumentation has been installed. A temporary shelter was constructed to house all System 3 components except the collector array. Preliminary checkout testing activities have been performed and functional tests have been initiated.
- o Continued efforts to install instrumentation on the Facility Building 4638 solar heating system. Instrumentation cable trays have been assembled and installed between the building and the junction boxes. Work is continuing to complete the installation of the instrumentation and cabling.

OTS HARDWARE STATUS

<u>SITE</u>	<u>Sensors Ordered</u>	<u>Sensors Shipped</u>	<u>J-Box Shipped</u>	<u>SDAS Shipped</u>	<u>SDAS On-Line</u>
DECADE 80	X	X	X	X	X
SEMCO-GA	X	X	X	X	X
SEMCO-FLA	X	X	X	X	X
ELCAM-TEMPE	X	X	X	X	X
WORMSER-SC	X	X	X	X	(2-78)
SEECO-EL RENO	X	X	X	X	X
FERN-LANSING	X	X	X	X	X
COLT-YOSIMITE	X	Hold	Hold	Hold	Hold
IBM-1A	X	X	X	X	X
IBM-2A	X	X	X	tbd	(2-78)
IBM-1B	X	12-28-77	12-22-77	tbd	(2-78)
CONTEMP-MANCHESTER	X	X	12-30-77	12-30-77	(1-78)
HONEYWELL-STILLWATER	X	X	X	12-28-77	(1-78)
HONEYWELL-NEW CASTLE	X	X	X	(2-78)	(2-78)
GE-NORMAL	X	X	X	1- 5-78	(1-78)
CONTEMP-YORK	X	12-2-77	12-15-77	tbd	tbd
FERN-TUNKHANNOCK	X	12-2-77	12-20-77	(2-78)	(2-78)
SEECO-LINCOLN	X	12-15-77	12-15-77	(2-78)	(1-78)
ELCAM-SAN DIEGO	Hold	Hold	Hold	Hold	Hold
COLT-PUEBLO	X	12-2-77	(1-78)	12-15-79	tbd

- o The LARGO hot water system has been reinstalled in the Test Bed Facility. Performance tests will be continued in this system during January.
- o Thermal performance testing was conducted on several collector units under outdoor conditions. Tests of one SEPCO collector have been completed, and a second SEPCO collector has been installed to the test loop and tests have begun. A Ying collector for liquid heat transfer medium has been installed and performance tests are in progress.
- o Static load testing was accomplished in the Sunworks (air) collector.
- o Facility maintenance activities were required to repair the chiller unit pump. Wyle personnel are monitoring repairs and modifications to the facility flow control stations.

Data Acquisition System

- o Computer programs were prepared for post test analysis of System 3 test data. These computer programs will be used to calculate time dependent performance parameters and to provide computer plots of the measured data.

DATA PROGRAM

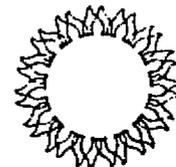
- o Site Personalization - The Operational Test Sites (OTS) currently number 45. Site personalization effort has progressed to hardware status as outlined in the following table. Dates are completed (planned) with an "x" noted for completions prior to status month.

TECHNICAL DIRECTIVES

Word charts for the following Technical Directives active during December are attached:

<u>TD</u>		<u>Title</u>
23		Solar Cooling - Baseline System Performance
24		Collector Selection for Absorption Cycle
31		Site Selection Analysis for IBM Systems
47		Extension on change Integration Mission from October 3, 1977 to March 31, 1978
48	(Closed)	Repairs of GFE Ying Collectors
49	(Closed)	Repairs of GFE SEPCO Collectors

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (HOLD-STATUS)



CONTRACT SCOPE

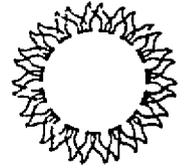
PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

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IBM



SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

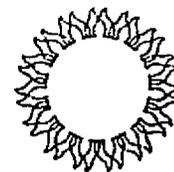
FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION

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IBM



COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24 (HOLD-STATUS)

CONTRACT SCOPE

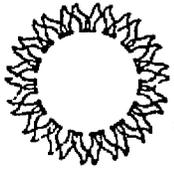
DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS



SITE SELECTION ANALYSIS FOR IBM SYSTEMS - TD NO. 31

CONTRACT SCOPE

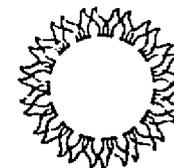
- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT



SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 46

(THIS TD SUPERSEDES TD NO. 35)

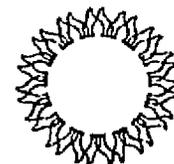
CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED OPERATIONAL TEST SITE (OTS) INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

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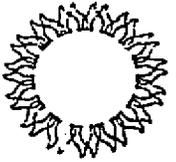
IBM



SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

PRESENT STATUS

- FORTY-FIVE OTS SITES ARE IDENTIFIED
- PERSONALIZATION ACTIVITY INITIATED FOR 22 SITES
- SENSOR SHIPMENTS
 - FIVE SITES COMPLETED DURING DECEMBER
 - NO SITES PROJECTED FOR JANUARY
- J-BOX SHIPMENTS
 - FIVE SHIPMENTS DURING DECEMBER
 - ONE SITE SHIPMENT PROJECTED FOR JANUARY
- SDAS SHIPMENTS
 - TWO SHIPMENTS DURING DECEMBER
 - TWO SITES PROJECTED FOR JANUARY
- SDAS INSTALLATION AND CHECKOUT
 - NONE INSTALLED IN DECEMBER
 - FOUR PROJECTED FOR JANUARY



CHANGE INTEGRATION MISSION - TD NO. 47

CONTRACT SCOPE

- OPERATE BASELINE AND CHANGE MANAGEMENT SYSTEM ON BOTH PROGRAMMATIC AND TECHNICAL CHANGES FOR THE SOLAR HEATING AND COOLING PROJECT

PRESENT STATUS

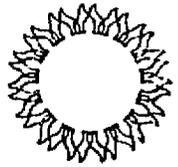
- VARIOUS CHANGE INTEGRATION TASKS SUPPORTING THE SOLAR HEATING AND COOLING PROJECT OFFICE WILL BE PERFORMED NOT TO EXCEED 42 MAN-MONTHS IN THE TIME PERIOD OCTOBER 3, 1977 THROUGH MARCH 31, 1978.

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IBM

REPAIR OF GFE YING COLLECTORS - TD NO. 48 (SUPERSEDES TD NO. 32)



CONTRACT SCOPE

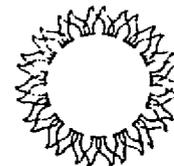
- PERFORM DETAILED WORKMANSHIP INSPECTION ON YING COLLECTORS
- DISASSEMBLE TWO WORST CASE COLLECTORS AND PERFORM ANALYSIS TO DETERMINE PROBLEM
- PREPARE REPAIR PLAN TO CORRECT WORKMANSHIP AND DESIGN DEFICIENCIES
- SHIP SIX COLLECTORS TO YING FOR REFURBISHMENT
- SELECT FIVE COLLECTORS AND SHIP TO SPACE AND ROCKET CENTER FOR FORM AND FIT ON ODESSEY HOUSE
- PROVIDE FOLLOW-ON CONSULTATION

L-14

PRESENT STATUS

- INSPECTED FIVE, INCLUDING DISASSEMBLY OF TWO "WORST CASES"
- REPAIR PLAN SUBMITTED ON 3/21/77
- FIVE COLLECTORS SHIPPED TO SPACE MUSEUM ON 3/18/77
- SIX COLLECTORS SHIPPED TO YING ON 3/25/77
- REPAIR OF ONE COLLECTOR AT IBM HALTED PER MSFC VERBAL DIRECTION 4/15/77
- EVALUATED MATERIALS AND CONSULTED WITH MSFC ON COLLECTORS REPAIRED BY YING AND SHIPPED TO SPACE MUSEUM
- ALL WORK PERFORMED, TD IS CLOSED

IBM



GFE REPAIR SEPCO COLLECTORS - TD NO. 49 (SUPERSEDES TD NO. 37)

CONTRACT SCOPE

- REMOVE GLAZING SPLINES FROM SEPCO COLLECTORS
- REPLACE WITH SILOCONE CAULKING

PRESENT STATUS

- 56 SEPCO COLLECTORS IN STOCK ARE REPAIRED AND AVAILABLE FOR SHIPMENT
- 36 SEPCO COLLECTORS ARE NOT TO BE REPAIRED PER MSFC VERBAL DIRECTION
- ALL WORK COMPLETED, TD IS CLOSED.

L-15

IBM

SECTION M
MONTHLY STATUS REPORT

January 1978

M-1

C-3

I. MANAGEMENT

- o 34 technical documents were submitted to MSFC.
- o 18 Program Office Directives were generated within IBM to accomplish SIMS program objectives.
- o This paragraph containing cost information has been deleted.

II. INTEGRATION PROGRAM

- o System 1A - Failure of the rock storage control sensor required use of substitute resistors to allow system operation until the new sensor was installed with resultant proper operation. Rock storage was inspected for water leaks and found to be dry, indicating that previous sealing operations were successful. In accordance with latest instrumentation philosophy, differential temperature measurements were eliminated and all temperature sensors were calibrated. The revised System 1 Design Data Brochure, including all pertinent MSFC critique comments, was submitted to MSFC at the end of the month.
- o System 1B - An IBM engineer attended the pre-installation conference at Carlsbad and has supported system installation throughout the month. A new data collection installation kit, reflecting temperature differential and flow meter changes, was released. The revised test report, including all MSFC comments, was submitted to MSFC toward the end of the month.
- o System 2 - The Design Data Brochure was revised in accordance with MSFC comments and submitted to MSFC. Likewise, the test report was reviewed with MSFC, updated and submitted. Data collection instrumentation was revised to reflect eliminations of temperature differentials and inclusion of a cumulative water flow sensor. Throughout the month the system performed without problems.
- o System 3 - Because of procurement delivery delays, a necessary selection of an alternate collector source, bad weather conditions, and a delay in the approval cycle of the Integration Program Restructure change proposal a revised delivery date was required. System installation at the MSFC test facility was completed early in the month and testing started with satisfactory system operation. Continued bad weather throughout the month hampered test operations, although the revised schedule should not be affected. Results of an additional study of the selected collector were submitted to MSFC.

Controllers which had exhibited reliability problems were replaced by new units from the MSFC 407-buy and are operating properly. The Design Data Brochure was reviewed by MSFC, was updated and put into final typing.

- o System 4 - All major hardware purchases were made and 90% received. Fabrication of rock storage container panels started with all pre-cut parts completed and the bonding operation brought to 50% completion. The structure assembly of the Remote Solar Assembly (RSA) also started with completion expected by early next month. The RSA drawing was completed and sent out for bids. A revised hazards analysis was completed and submitted to MSFC.
- o Systems 5 and 6 - An ECP to delete these systems has been submitted to MSFC. The ECP results in an overall dollar credit to the current contract.

III. SITE DATA COLLECTION SUBSYSTEM

- o Additional J-Box Procurement - The 37 J-Boxes and associated cables are in the build cycle. Delivery of all units is expected in February.
- o SDAS/OSM Spares - The procurement of spare parts has been worked on a priority basis, with critical spares or parts shortages being worked first. To date, most piece parts required as spare parts or required to build higher order assemblies, such as cards, are in stock or on order. As piece parts are received, higher order assemblies are being fabricated. The procurement and production effort on the SDAS/OSM Spares contract is expected to continue to at least the next two months.
- o Additional Sensor Procurement - A quantity buy of sensors was made to provide a working inventory for the near term future sites. The number, types, models, and sizes were projected from experience factors gained from earlier sites. Upon final definition of the actual sensor requirements for a specific site, the sensors available from inventory are shipped to the site and special procurement is initiated for those outstanding. The in-house inventory will be periodically updated to restore and to reflect the latest usage projections.

IV. CENTRAL DATA PROCESSING SYSTEM

- o Production Processing - Detailed measurement data and plots continue to be supplied for OTS sites. Software for data collection via four telephone lines was completed. All sites, including intrastate and those outside the 48 contiguous states, have been added to automatic data collection. Data handling from the initial SDAS MOD II, 96-Channel box has been satisfactorily demonstrated. Effort has been initiated to prepare tools for seasonal analysis reports. Plans for the development of models for the FCHART and TRNSYS simulators to allow site performance prediction has begun.
- o Data Evaluation - Several working sessions and meetings have been held with MSFC to clearly define the Data Evaluation requirements and plans. The plan now reflects daily automated data outputs in computer printouts and magnetic tape, monthly automated data listings of performance factors for each active site, and a total of 144 monthly, 18 seasonal, and 12 final system performance reports. Finalization of these plans is underway while implementation of the early stages is proceeding.

V. SYSTEM ANALYSIS

- o Analysis - Two Technical Directives remain open in the System Analysis area: (1) TD23 and (2) TD24. Efforts on both tasks have been stopped until the data evaluation issues are resolved. MSFC has concurred in this action.
- o Change Integration - In addition to the routine tasks assigned to the change integration mission, the following special activities were accomplished:
 - Completed updates and published "Operational Test Plan" SHC-2013, "MSFC Test & Evaluation Plan" SHC-3087, and "Logistic Requirements Plan" SHC-2007A.
 - Prepared status of Technical Directives on various 406 contracts for MSFC.
 - Prepared a breakdown in the Change Integration effort. This Breakdown included the task and % of time spent in 1977 and the plan for 1978.

- o An outdoor thermal performance evaluation was conducted on a SEPCO solar collector from the System 1 test array. This test was performed as a re-test check on the collector after exposure.
- o Thermal performance evaluations were initiated on the Ying collector and are being continued subject to satisfactory weather conditions. Static load tests were completed on the Sunworks collectors.
- o Work is continuing to complete the installation of instrumentation for the Facility Building (4638) solar heating system. Direct solar and total solar flux transducers were positioned on a solar tracking mount, and the assembly was installed on Test Bed #1.

The purpose of this instrumentation is to obtain solar insolation data necessary for thermal performance tests of concentrating-tracking collectors.

Data Acquisition System

- o Post test data analyses have been performed on the System 3 data to calculate time-dependent performance parameters and to provide computer plots of measured data.
- o IP&CL updates were performed as necessary for collectors installed on weathering tests.

VII. DATA PROGRAM

- o Site Personalization - The Operational Test Sites (OTS) currently number 45. Site personalization effort has progressed to hardware status as outlined in Table I. Dates are completed (planned) with an "x" noted for completions prior to status month.

VIII. TECHNICAL DIRECTIVES

Word charts for the following Technical Directives active during December are attached:

<u>TD</u>	<u>Title</u>
23 (HOLD)	Solar Cooling - Baseline System Performance
24 (HOLD)	Collector Selection for Absorption Cycle
31	Site Selection Analysis for IBM Systems
46	Site Instrumentation and Personalization
47	Extension on change Integration Mission from October 3, 1977 to March 31, 1978

- Prepared detailed Task descriptions on the Change Management Mission.
- Supported the following design review scrub downs:
 - Tenn. Building Assoc.
 - Florida Solar Center
 - Arlington Assoc.
 - Huntsville Senior Citizen Center

VI. TEST FACILITY OPERATIONS

Solar Simulator

- o The Solar Simulator lamps and lenses were replaced as necessary prior to initiation of testing in January. Heat flux contour maps were prepared to establish the uniformity of the energy distribution onto the collector test stand after replacement of lamps.
- o Thermal performance evaluations were conducted of the Life Sciences solar collector and analyses of test data is currently being performed.
- o The Solar Energy Systems solar collector as currently installed for weathering tests has shown evidence of significant deterioration. Therefore, a new collector will be obtained from inventory for thermal performance testing at the Simulator Facility.

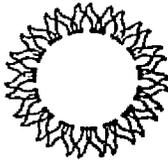
Breadboard Test Facility

- o Functional tests were completed and operational testing of System 3 has continued during the month of January. Controls for the domestic hot water subsystem required replacement prior to performance of tests in the system's operational mode. The prototype storage tank and heat exchanger were received in late January and are currently being assembled with distribution manifolds and temperature stratification instrumentation. The second phase of System 3 testing with the prototype equipment will be initiated in the early part of February.
- o The LARGO solar hot water system tests were not continued during this reporting period due to unsatisfactory weather conditions.

TABLE I
OTS HARDWARE STATUS

<u>SITE</u>	<u>Sensors Ordered</u>	<u>Sensors Shipped</u>	<u>J-Box Shipped</u>	<u>SDAS Shipped</u>	<u>SDAS On-Line</u>
DECADE 80	X	X	X	X	X
SEMCO-GA	X	X	X	X	X
SEMCO-FLA	X	X	X	X	X
ELCAM-TEMPE	X	X	X	X	X
WORMSER-SC	X	X	X	X	(2-78)
SEECO-EL RENO	X	X	X	X	X
FERN-LANSING	X	X	X	X	X
COLT-YOSIMITE	X	Hold	Hold	Hold	Hold
IBM-1A	X	X	X	X	X
IBM-2A	X	X	X	(2-78)	(2-78)
IBM-1B	X	Jan	Jan	(2-78)	(2-78)
CONTEMP-MANCHESTER	X	X	X	Jan	(3-78)
HONEYWELL-STILLWATER	X	X	X	Jan	(2-78)
HONEYWELL-NEW CASTLE	X	X	X	(3-78)	(3-78)
GE-NORMAL	X	X	X	Jan	(3-78)
CONTEMP-YORK	X	Jan	X	tbd	tbd
FERN-TUNKHANNOCK	X	Jan	X	(2-78)	(2-78)
SEECG-LINCOLN	X	Jan	X	Jan	(3-78)
ELCAM-SAN DIEGO	X	Hold	Hold	Hold	Hold
COLT-PUEBLO	X	Jan	X	(2-78)	(2-78)

SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (HOLD-STATUS)



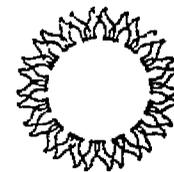
CONTRACT SCOPE

PROVIDE BASELINE SOLAR COOLING PERFORMANCE DATA FOR SINGLE FAMILY RESIDENCES

PRESENT STATUS

- CLIMATIC REGIONS FOR COOLING HAVE BEEN DETERMINED
- COMFORT CRITERIA HAVE BEEN ESTABLISHED
- GENERIC SYSTEM DESCRIPTIONS HAVE BEEN BASELINED
- RESTRUCTURING OF MINI-SHAC TO ACCEPT COOLING MODIFICATIONS HAS BEEN INITIATED
- EXPANDED SITE DEPENDENT CLIMATIC DATA HAS BEEN ASSEMBLED AND PRE-PROCESSED

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SOLAR COOLING - BASELINE SYSTEM PERFORMANCE - TD NO. 23 (CONTINUED)

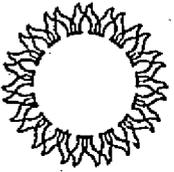
FUTURE ACTIONS

- DOCUMENTATION OF REGIONALIZATION AND GENERIC SYSTEMS
- COMPLETION OF MODIFICATION OF MINI-SHAC
- ADDITION OF EXPANDED CLIMATIC DATA TO MINI-SHAC DATA BASE
- INITIATE DEVELOPMENT OF PARAMETRIC DATA FOR PERFORMANCE CORRELATION

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COLLECTOR SELECTION FOR ABSORPTION CYCLE COOLING -
TD NO. 24 (HOLD-STATUS)

CONTRACT SCOPE

DETERMINE COLLECTOR TYPE FOR ABSORPTION CYCLE APPLICATIONS

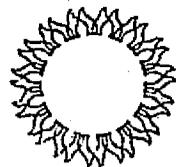
PRESENT STATUS

- INPUT GENERATOR CHARACTERISTICS FOR CONCENTRATING,
2 PANE SELECTIVE, 2 PANE NON-SELECTIVE
- UPDATED ECONOMIC ANALYSIS TOOLS TO INCLUDE IMPACT OF OPERATING
COST AND CONVENTIONAL EQUIPMENT PERFORMANCE

FUTURE ACTIONS

- VALIDATE TRANSIENT PERFORMANCE (SIMULATION)
- DETERMINE SYSTEM ECONOMICS

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SITE SELECTION ANALYSIS FOR IBM SYSTEMS - TD NO. 31

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CONTRACT SCOPE

- PROVIDE SITE SELECTION ANALYSIS FOR INITIAL SITE ASSESSMENT
- PROVIDE RECOMMENDATIONS FOR FINAL SITE SELECTION FOR 13 IBM DESIGNATED SITE LOCATIONS
- PROVIDE ONE TRIP FOR ONE IBM PERSON TO EACH OF THE 13 SITES

PRESENT STATUS

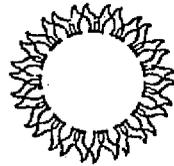
- THREE SITES ADDRESSED - TWO VISITED
 - CARLSBAD, N.M. (VISITED)
 - LARAMIE, WYOMING (VISITED)
 - TOGUS, MAINE

FUTURE ACTIONS

- COMPLETE SITE ASSESSMENT

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IBM



SITE INSTRUMENTATION AND PERSONALIZATION - TD NO. 46

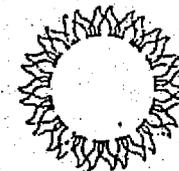
(THIS TD SUPERSEDES TD NO. 35)

CONTRACT SCOPE

- PERFORM SITE PERSONALIZATION ACTIVITIES FOR THE MSFC DIRECTED OPERATIONAL TEST SITE (OTS) INSTALLATIONS
 - INSTRUMENTATION DEFINITION
 - SDAS PERSONALIZATION
 - PERFORMANCE EQUATION MODIFICATIONS
 - J-BOX PERSONALIZATION
 - CDPS PERSONALIZATION
 - INSTALL AND CHECKOUT

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SITE INSTRUMENTATION AND PERSONALIZATION (CONTINUED)

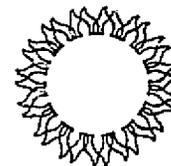


PRESENT STATUS

- FORTY-FIVE OTS SITES ARE IDENTIFIED
- PERSONALIZATION ACTIVITY INITIATED FOR 22 SITES
- SENSOR SHIPMENTS
 - FIVE SITES COMPLETED DURING JANUARY
 - NO SITES PROJECTED FOR FEBRUARY
- J-BOX SHIPMENTS
 - ONE SHIPMENT DURING JANUARY
 - NO SHIPMENTS PROJECTED FOR FEBRUARY
- SDAS SHIPMENTS
 - FOUR SHIPMENTS DURING JANUARY
 - FOUR SITES PROJECTED FOR FEBRUARY
- SDAS INSTALLATION AND CHECKOUT
 - NONE INSTALLED IN JANUARY
 - SIX PROJECTED FOR FEBRUARY

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IBM



CHANGE INTEGRATION MISSION - TD NO. 47

CONTRACT SCOPE

- OPERATE BASELINE AND CHANGE MANAGEMENT SYSTEM ON BOTH PROGRAMMATIC AND TECHNICAL CHANGES FOR THE SOLAR HEATING AND COOLING PROJECT

PRESENT STATUS

- VARIOUS CHANGE INTEGRATION TASKS SUPPORTING THE SOLAR HEATING AND COOLING PROJECT OFFICE WILL BE PERFORMED NOT TO EXCEED 42 MAN-MONTHS IN THE TIME PERIOD OCTOBER 3, 1977 THROUGH MARCH 31, 1978.

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