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ELECTRONICS LABORATORY • SYRACUSE, N.Y.

MODIFICATIONS TO INTERIM VISUAL SPACEFLIGHT SIMULATOR

SIXTH QUARTERLY REPORT
12 April to 12 July 1966

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GENERAL ELECTRIC

MODIFICATIONS TO INTERIM VISUAL SPACEFLIGHT SIMULATOR

Contract No. NAS 9-3916

Sixth Quarterly Progress Report
12 April to 12 July 1966

Prepared for

NASA Manned Spacecraft Center
Houston, Texas

Prepared by

Electronics Laboratory
Defense Electronics Division
GENERAL ELECTRIC COMPANY
Syracuse, New York

ABSTRACT

This is the Sixth Quarterly Progress Report, submitted in accordance with the requirements of NASA Contract NAS 9-3916, Modifications to Interim Visual Spaceflight Simulator. It covers the results of the work performed under this contract during the period 12 April to 12 July 1966, at the General Electric Electronics Laboratory, Syracuse, New York.

The program encompasses the design, fabrication, and installation of additions and modifications to the Interim Visual Spaceflight Simulator located at the NASA Manned Spacecraft Center, Houston, Texas. The additions and modifications comprise:

1) Addition of a three-dimensional object generating capability;
2) Addition of the capability for independent operation of the three displays;
3) Increased brightness, improved convergence, and higher resolution;
4) Addition of a rendezvous vehicle beacon; and
5) Addition of input-output equipment.

Effort during the sixth quarter has continued in the organization, logical design, and packaging design of the specific units. In addition, the evaluation of prototype hardware has commenced, and the significant demonstration of a static tetrahedron, generated by prototype hardware, has occurred. A major procurement item, the Raytheon 520 computer, has been selected, ordered, received, and installed during the quarter.

Seventh quarter effort will concentrate on: completion of the IIU design; completion of the DACU design and assembly; completion of the ALS organization and scaling; significant progress in the VCU design; completion of all items necessary for the twenty-four edge evaluation of the OGS concepts; continuation of the TOU design; checkout of the first VPU; continuation of the remaining DES tasks; and completion of the packaging design and procurement of all major packaging items.

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1.0 SUMMARY

1.1 INTRODUCTION

This Sixth Quarterly Progress Report describes the work performed at the Electronics Laboratory of the General Electric Company during the period 12 April to 12 July 1966, on NASA Contract NAS 9-3916, Modifications to Interim Visual Spaceflight Simulator.

This report, consisting of one section only, summarizes the effort during the reporting period, discusses the project status on a subsystem basis, describes problem areas and significant contacts, and lists the work planned for the next month (12 July to 12 August 1966).

The Seventh Quarterly Progress Report is presently planned to be a comprehensive document covering the technical description of the system as of 12 October 1966, and will summarize and update the technical material from all previous quarterly reports.

1.2 SUMMARY OF EFFORT

Effort this quarter has involved the following tasks:

1) Continuation of the ALS organization and design, and procurement of a Raytheon 520 computer for the ACU.
2) Continuation of the detailed design and fabrication of the OGS.
3) Completion of the VPU detailed design and commencement of the VPU fabrication.
4) Continuation of the packaging design.
5) Completion and installation of the dual scene modification.
6) Discovery of the Motorola MC 358A problem and attempts to solve the problem.
7) Completion of the checkout equipment necessary for the OGS checkout, heretofore referred to as the card tester.
8) A status review for NASA personnel at Houston on 24 May and at Syracuse on 27 and 28 June.
9) Successful demonstration of a static tetrahedron, generated by the first prototype OGS hardware.

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1.3 PROGRAM STATUS

1.3.1 General

On 24 May at MSC, Houston, the impact on schedule and cost of the previously reported lack of manpower in critical areas was described. Installation during January was established as an internal General Electric goal, based on a complete-success schedule; and a more conservative estimate of installation during March was described as being realistic. Contrary to what the schedule delay would indicate, the cost runout was reported at less than a three-percent overrun.

Following on the heels of the May 24th meeting, a significant operational problem with the Motorola MC 358A flip-flop was discovered. Considerable effort has been expended in solving the problem and as of 12 July, several possible solutions have been determined. It is felt that by mid-August the problem will be resolved. The resulting effect of the problem has been primarily a postponement of work in the OGS area. Any effort of this magnitude will certainly affect cost and schedule, and the January installation date is now impossible.

On the brighter side, the ALS area is showing encouraging signs. The Raytheon 520 has been selected as the ACU, procurement has been made, and the machine has been received in Syracuse. Mr. Robert Schumacker has assumed complete responsibility for the ALS organization and scaling and is extending the efforts of the SIPD systems engineers. The ALS scaling is scheduled to be complete in late August. The ALS area is now manned at an optimum level with personnel of high competence.

In spite of the Motorola MC 358A problem, a significant milestone was achieved in June, when a static tetrahedron was generated, using breadboard and prototype OGS hardware.

1.3.2 SGS Modification

No effort was expended.

1.3.3 IFS

The IIU organization commenced the latter part of this quarter. The Ampex Memory problem, thought to be solved, has reappeared. Ampex failed to deliver the replacement RF Memory in June, as promised, and are now predicting a September delivery. General Electric is seriously considering cancellation of the Ampex order. A decision will be made in conjunction with the selection of a source for the VCU memory system.

The DACU design has started and the specifications for the twelve-channel DAC are being prepared. Procurement of the DAC is scheduled for August.

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1.3.4 ALS

The entire ALS area, with the exception of the schedule and the degnerate face problem, looks favorable. The rapid procurement of the Raytheon 520 has been an encouraging sign, in spite of the minor problems the computer has exhibitied. The complete availability of the 520 for simulation of the VCU, for aid in prototype hardware checkout, and for generating dynamic object inputs to the OGS prototype hardware will be a great advantage.

New effort in the scaling area is extending the completed work of the SIPD engineers and lending greater insight into the potential problem areas. Sufficient progress has been made to enable the VCU memory systems to be ordered during August.

The degenerate face problem, discovered analytically during this quarter, has no acceptable solution at this time. Further effort will be required to assess the problem and determine a solution that can be implemented in the available computing time.

The design tasks for the VCU have been divided into two separate areas, and each area will be individually manned. The three identical arithmetic sections and their control comprise one area, while the program and data memory controllers and the input/output controller comprise the other area. Detailed design effort will commence in these areas in August.

1.3.5 OGS

The Motorola MC 358A problem has imposed a significant delay on the OGS work. Prototype card fabrication and releases continue to progress, but evaluation of the prototypes has been delayed.

The status of all OGS multilayer items is:

EGG-MB	Prototype received and evaluated.
EG-1	Prototype received and evaluated.
OGG-MB	Design complete. Not released.
HP-1	Released for prototype.
OG-1	Released for prototype.
OG-2	Design complete. Not released.
OG-3	Released for prototype.
FP-1	Prototype received and assembled.
OR-1	Released for prototype.
BL-2	Prototype received and assembled.

A significant milestone was achieved in June when a static tetrahedron was generated by prototype and breadboard hardware driven by the operating checkout equipment utilizing an operational GE605 program.

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1.3.6 DES

The VPU design is complete, and the following is the status of hardware items:

VPU-MB(HW)	To be hardwired. In progress.
VP-1	Prototype received and assembled.
VP-2	Released for artwork.
VP-3	Released for artwork.

No other effort has been expended on the remaining DES tasks this quarter.

1.3.7 Interim Dual Scene Capability

The Interim Dual Scene Capability modification was installed and checked out successfully at MSC, Houston on 25 May 1966.

1.3.8 Packaging

All major items of the packaging design are complete, and hardware is on order, including bins, blowers, bus bars, and cabinets. Special parts for outfitting the cabinets have been designed, and one set will be fabricated and checked out on the first cabinet bay to be received during August.

The delamination and warping problem exhibited by early multilayer cards has been solved through a joint effort with the multilayer vendor. No evidence of delamination or warping has been detected subsequent to implementation of the solution.

Power supply checkout is proceeding well. A minor problem associated with operation of the power supplies in the master-slave configuration has been noticed and will be investigated in more detail during August.

1.4 ACTION ITEMS

No action items exist at the end of this quarter.

1.5 SIGNIFICANT CONTACTS

Two status meetings were held during this quarter.

First, a status meeting at MSC, Houston, on 24 May was conducted to review schedule and cost.

Attendees:
J. Van Artsdalen
W. Miller
T. Lee
J. Gala
R. Rougelot
A. Bombard
C. Appleman

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Second, a status review was presented at Syracuse on 27 and 28 June, at which time the static tetrahedron was demonstrated.

Attendees: W. Miller
E. Lee
J. Gala
R. Rougelot
F. Sawberger

1.6 PROBLEM AREAS

1.6.1 Resolution of Previous Problems

The multilayer delamination and warping problem has been solved by the mutual action of Circuit-Wise, Incorporated and General Electric.

The procurement problem involving the General Electric Semiconductor Products Department special integrated devices has been resolved. The beta specification on the transistors was lowered to enable SPD to build the circuits, without adversely affecting the performance of the circuits in which the devices are being used.

The manpower problems have been eased by the addition of personnel during the quarter. It is safe to say that no further additions of engineering mapower would improve the scheduled delivery date, except in the OGS area, where one man is now being requested.

1.6.2 New or Continuing Problems

Schedule continues to be tight, in view of the heavy effort expended in attempting to solve the Motorola MC 358A problem. Solution of the problem this next month should permit a February installation.

The lack of an acceptable solution to the degenerate face problem constitutes a new problem area. Analytical effort and empirical investigation of the problem on an operating display are needed. An estimate of impact on schedule or cost cannot be made at this time.

The MC 358A problem continues, although an acceptable solution is predicted by mid-August.

1.7 WORK PLANNED FOR NEXT MONTHLY PERIOD (12 July to 12 August 1966)

General

1. Complete the solution of the MC 358A problem.

SGS

2. Purchase delay line memories for the 20 FPS modification.

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IFS

3. Continue the DACU design.
4. Continue the IIU design.

ALS

5. Continue the organization and scaling studies.
6. Continue the detailed design of the VCU.
7. Purchase the VCU memory systems.
8. Continue the programming effort, concentrating on the twenty-four edge program and prototype card checkout programs.

OGS

9. Continue the prototype release and evaluation of OGU cards and motherboards.
10. Commence the IF-1 card design.

DES

11. Complete the VPU releases and continue the evaluation.

Packaging

12. Continue the liaison on multilayer components.
13. Verify all the packaging concepts on the first cabinet bay to be received.

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