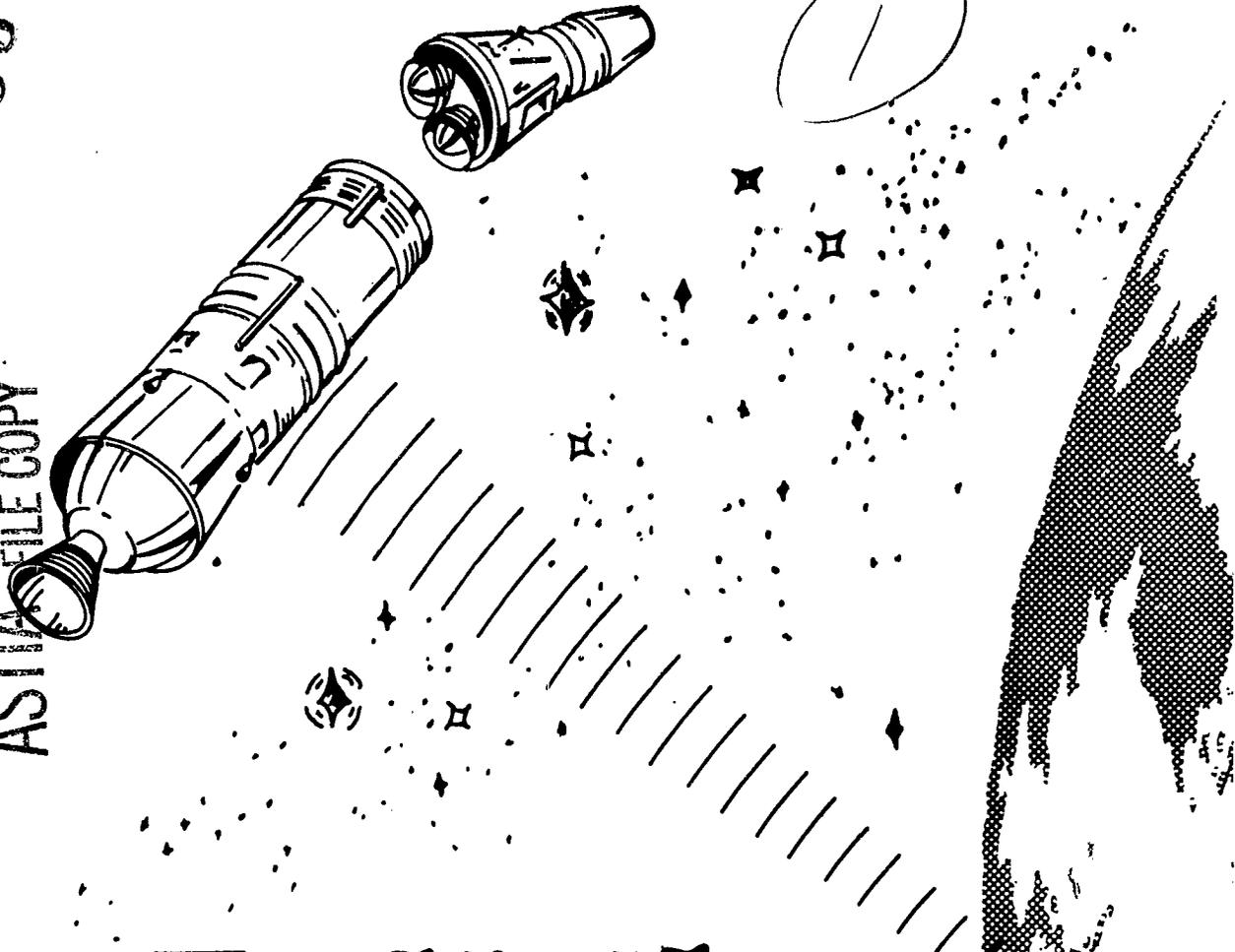


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GEMINI

LAUNCH VEHICLE GUIDANCE

LETTER PROGRESS REPORT NO. 6

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↓

PREFACE

This report describes the General Electric Company activity in accordance with Letter Contract AF 04(695)-100. General Electric is providing system engineering, missileborne systems, and aerospace and ground equipment, plus supports and services related to Gemini Launch Vehicle Guidance. — to p. 1-1

The activities ~~reporting~~ ^{to} include ~~progress~~ ^{the} during the report period, work to be performed during the next report period, and discussions of current significant problems. The reporting for the missileborne production activity (Special Radio Guidance Project) includes progress through the 20th of the month being reported.

In this report, emphasis will be placed upon presentation of new data each month; previously reported items will generally not be repeated. ↑

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SECTION 1

SUMMARY

- The production (including final assembly and unit test) of the missileborne system continues on schedule. System shipments may start in January 1963, one month ahead of the contract schedule.
- The design of the Secondary Antenna is complete. Quotes are being obtained. A delivery schedule will be presented during January 1963.
- The Airborne Beacon Test Set (ABETS) First Article Configuration Inspection (FACI) resulted in minor changes to the equipment and drawings (~~refer to Section 2.5 of this report for more details about this~~). Shipment of the three ABETS is planned for January 1963.
- The Gemini Mod IIIG Test Specification is in the final revision stages.

SECTION 2
EQUIPMENT

2.1 MISSILEBORNE - PRODUCTION

2.1.1 PROGRESS DURING REPORT PERIOD

The first system of modules for the Rate Beacon, Pulse Beacon, and Decoder have been built and are presently in inspection prior to first test. The internal plan for the first system will put the Decoder in Unit Test on 14 January 1963 and the Rate and Pulse Beacons in Unit Test on 17 January 1963. This will give ample time to ship the system in January as planned.

The second and third system of modules are in various stages of assembly or inspection; these will also be shipped in January. Serial numbers 003 and 004 will be complete sets of spares.

2.1.2 WORK PLANNED FOR NEXT PERIOD

It is planned to use system No. 5 as a sample. Although Decoder modules are behind on the internal schedule in the assembly cycle, it is planned to recover by double-building the long lead items. This is in progress at this time and it appears that this effort will be successful.

2.2 MISSILEBORNE - QUALITY ASSURANCE

2.2.1 PROGRESS DURING REPORT PERIOD

2.2.1.1 Vendor Requalification

Two purchased components have failed requalification test to date. The parts that failed are capacitors - 7454716P4, and Chokes - 7728459P1 and P6. The correction action taken is as follows:

Capacitor: The approval of the vendor was removed and another supplier was qualified. The second vendor is supplying good parts.

Chokes: The vendor was notified of the problem and a new and better design was generated. The preliminary qualification data furnished by the vendor indicates considerable improvement in the performance of the components.

2.2.1.2 Vendor Education - Operator Surveillance

A new defect reporting system is being generated; the input documents for this are already in operation. One of the outputs from the system will enable Quality Control Engineering (QCE) to maintain tight surveillance on the operators' performance and educational needs.

Maximum coordination has been achieved between management and the union concerning displacement (bumping) of operators. To date the Gemini Program has not been affected by this.

2.3 MISSILEBORNE - DESIGN ENGINEERING

2.3.1 PROGRESS DURING REPORT PERIOD

The design of the Secondary Antenna is now complete and the manufacturing drawings have been released. Purchasing is in the process of obtaining quotations for price and delivery from vendors. The delivery schedule has not yet been established.

2.4 AEROSPACE GROUND EQUIPMENT

2.4.1 PROGRESS DURING REPORT PERIOD

First article configuration inspection (FACI) and first article acceptance tests of ABETS were undertaken. The following technical problems were obvious during acceptance tests:

- a. The high voltage supply did not perform satisfactorily over the required variation in primary power.
- b. Wiring errors were found between the remote cabinet 2 and cabinets 1 and 3; these particularly involved the pitch-yaw circuits.

Solutions for above items have been found and have been incorporated.

As a result of FACI, considerable paper work had to be initiated. This is outlined in the following list:

- a. Considerable revisions had to be made to the acceptance test specifications to make them compatible with security requirements and the equipment specification.
- b. The equipment specification number was added to Master Index.
- c. A nameplate utilizing the Master Index drawing number was devised.
- d. The data sheets were revised to be compatible with changes in the Acceptance Specification.
- e. A non-standard parts list was accumulated and presented to the local AFPRO.
- f. A complete list of drawings was prepared which includes the latest revisions and all outstanding changes which have not been incorporated.

2.4.2 WORK PLANNED FOR NEXT PERIOD

- a. Acceptance Data for ABETS serial numbers 2 and 3 will be run.
- b. All effort as outlined in the documentation mentioned above will be initiated and completed.
- c. The three ABETS equipments will be shipped.
- d. The rough draft of the technical manual revisions will be reviewed.

2.4.3 CURRENT SIGNIFICANT PROBLEMS

Investigations are being made of various field problems that originated on other ABETS equipments for their applicability to Gemini ABETS.

SECTION 3 SERVICES

3.1 HUMAN ENGINEERING STUDY

3.1.1 PROGRESS DURING REPORT PERIOD

The Human Factors Program Report No. 1 was completed. It reviews the Human Factors Program studies and activities from July through November. A number of corrective actions and special studies are discussed. Recommendations in the report include continuation of the present program and future program development.

3.1.2 WORK PLANNED FOR NEXT PERIOD

Phase IV - Review of Procedures and Countdowns, presently scheduled for the Gemini Ground Guidance System, will be continued.

3.2 RELIABILITY

3.2.1 PROGRESS DURING REPORT PERIOD

3.2.1.1 General

On 18 and 19 December, representatives of the Aerospace Corporation (G. Carson Belden) and the U. S. Air Force, Space Systems Division (Major Goebel) visited the General Electric Company/Defense Systems Department to discuss the Reliability Program for the Gemini Program. A primary topic of the discussion was the program plan for Reliability that was previously submitted in the Defense Systems Department document, Gemini Launch Vehicle Guidance System Program Plan, DSD-GEM-203. All aspects of the program were discussed and customer recommendations were made to include such additions as detailed descriptions of implementation techniques, feedback loops, and procedures in a revised plan to be submitted at a later date.

3.2.1.2 ABETS

A presentation of the in-plant reliability program for Gemini-ABETS was given to representatives of the Aerospace Corporation and the Space Systems Division at the ABETS FACI meeting on 12 December 1962. The reliability prediction for ABETS, as well as the factory data reporting and reliability analysis of in-process failures, were discussed. Satisfaction was expressed with these efforts.

A summary of in-process defects and component part replacements was prepared and distributed to Engineering.

To minimize the recurrence of the 2N1015 transistor problem, an Engineering Change, No. 62M159, has been made to the power supply regulators. This change adds a protective diode and changes the values of resistors R6 and R10.

3.2.1.3 Missileborne

The reliability prediction of the Rate Beacon and the Decoder has been completed. The data will be used during equipment assessment to identify problem areas and it will be updated in accordance with experience data.

The components list for Requalification Testing was resubmitted to the Space Systems Division on 18 December 1962. An advance copy of this list was given to the Space Systems Division at the Reliability meeting on 18 December 1962. At the present time, initial mechanical inspection and electrical testing are complete for all items; environmental testing is in progress on 8 items and life testing is in progress on 5 items.

3.2.2 WORK PLANNED FOR NEXT PERIOD

Participation in a combined contractor meeting for Reliability is scheduled for the latter part of January 1963. This meeting is being sponsored by the Aerospace Corporation and the Space Systems Division.

A rough draft of the revised program plan for Reliability will be completed. This revision will include those comments and recommendations made by the Aerospace Corporation and the Space Systems Division on 18 and 19 December 1962.

Present efforts in the collection and analysis of Gemini-ABETS factory data and the providing of feedback to Engineering (with appropriate recommendations) will be continued.

Requalification testing of Mod IIIG missileborne component parts will also be continued.

3.3 TEST PLANNING

3.3.1 PROGRESS DURING REPORT PERIOD

- The Gemini Specification for Testing Mod IIIG Airborne Guidance Equipment (48A101949) was revised and again reviewed with the local AFPR. The document is now awaiting clarification of 2 items before being ready for formal submittal for approval. The 2 items are:
 - a. Vibration levels for acceptance testing
 - b. Pressurization requirements.
- A test program meeting was held at Martin-Baltimore with all associate contractors. Three items were presented during the meeting for resolution by the Aerospace Corporation:
 - a. Should the Mod IIIG canisters be removed at AMR for laboratory testing?
 - b. Should a GTO canister test philosophy be used for the Mod IIIG canisters?
 - c. Should a requirement of 30-day removal of canisters for laboratory testing requirements be implemented for the Mod IIIG ?
- The cause of false commands during acquisition is still being investigated. Another test has been performed at AMR in which a Decoder located in the hanger was interrogated by the ground station; however, the data from this test has not been evaluated.

3.3.2 WORK PLANNED FOR NEXT PERIOD

- The specification for testing the Mod IIIG Airborne Guidance Equipment (48A101949) will be submitted for approval.
- Investigation will continue to determine the cause of the generation of false commands during acquisition.
- Coordination and integration toward implementing the test program will be continued.

3.4 AMR TEST OPERATIONS ACTIVITY

3.4.1 PROGRESS DURING REPORT PERIOD

The test specification for the Radio Guidance loop-link test (A7907534) has been published. This test was designed so that it can be run either in conjunction with the missile programmer or independently.

An aircraft test program has been proposed. The program would consist of the following types of tests:

- a. Quarterly accuracy tests
- b. Tests of refractometer data*
- c. Special tests, for equipment modification or computer program checking.

3.4.2 WORK PLANNED FOR NEXT PERIOD

Fabrication of Radio Guidance countdowns will continue with emphasis on General Electric - Burroughs Corporation - Martin interface areas.

3.5 MDRCCB ACTIVITY

3.5.1 PROGRESS DURING REPORT PERIOD

The Gemini Material Deficiency Review and Configuration Control Board (MDRCCB) meetings have been conducted during this period.

ABETS FACI meetings were conducted with customer personnel on 12 through 14 December 1962. ABETS baseline sign-off was not obtained at this time. However, a much better understanding was achieved regarding the specific documentation required to establish ABETS equipment baseline and to maintain satisfactory configuration control. During these meetings, presentations were given explaining the functions and activities of various Defense Systems Department groups involved with the Gemini ABETS equipment.

First Article Acceptance of the ABETS equipment did not take place during FACI activities as had been previously scheduled.

* No direction has been received from SSD that this test should be conducted for the Gemini Program.

Effort has commenced on production of a baseline document which will adequately define the initial configuration of the ABETS equipment.

The ABETS Acceptance Specification has been revised as a result of customer coordination during FACI meetings.

3.5.2 WORK PLANNED FOR NEXT PERIOD

The ABETS FACI documentation package will be completed. (This will include an approved baseline index.)

Airborne equipment FACI activities will be conducted during this period.

3.6 SYSTEMS ANALYSIS

3.6.1 PROGRESS DURING REPORT PERIOD

Task I (Applicability of Radio Guidance System for Instrumentation Guidance System Updating) of the subject CCN No. 2 was completed during December. The final report for this Task, dated 1 January 1963, was published and mailed.

The work on Task II (Optimum Radio Guidance System Configuration) of CCN No. 2 was also completed during December. The report for this Task was written and it had reached final editing by the end of December.

Task III (Radio Guidance System Simulation) effort is proceeding on schedule and it had reached the point of complete definition by the end of December.

A customer review of the entire CCN No. 2 effort was held in Syracuse on 14 and 15 December 1962. The scope of the effort, results to date, and recommendations arising from the studies were presented at this meeting. The three reports mentioned above are essentially a documentation of this presentation.

3.6.2 WORK PLANNED FOR JANUARY 1963

The report for Task II will be published. A program plan for the remainder of the Task III effort will be published.

SECTION 5
BIBLIOGRAPHY

<u>Identification</u>	<u>Title</u>	<u>Issue Date</u>
DSD-GEM-400	Letter Progress Report No. 1	20 Aug. 1962
DSD-GEM-401	Letter Progress Report No. 2	20 Sept. 1962
DSD-GEM-203	Program Planning Report	} Published as one report en- titled Program Plan
DSD-GEM-206	Manufacturing Plan	
DSD-GEM-209	Quality Control Plan	
DSD-GEM-204	Reliability Plan	
DSD-GEM-208	Configuration Accounting and Control	
DSD-GEM-200	AGE Plan	
DSD-GEM-207	Safety Plan	
DSD-GEM-300	Bibliography Report	
DSD-GEM-500	Support Plan	
	Facilities Planning Report	
	Facilities Master Plan	
	AF Base Support Requirements	
	Trans. Plan	
	Training Plan	
DSD-GEM-402	Letter Progress Report No. 3	20 Oct. 1962
DSD-GEM-403	Letter Progress Report No. 4	20 Nov. 1962
DSD-GEM-404	Letter Progress Report No. 5	20 Dec. 1962
DSD-GEM-405	Letter Progress Report No. 6	20 Jan. 1963
DSD-GEM-100	Gemini-Mod III Guidance System General Test Plan	3 Aug. 1962
Data Analysis Memo 55	Gemini-Mod III, System 1, Real-Time Measurement Uncertainties	29 Oct. 1962
DSD-GEM-200	Aerospace Ground Equipment Plan Maintenance Ground Equipment Section	13 Nov. 1962
DSD-GEM-301	Antenna Requirements Study, Prelim. Report	15 Nov. 1962
DSD-GEM-201	Aerospace Ground Equipment Recommendation Data - Part I	30 Oct. 1962
DSD-GEM-201	Aerospace Ground Equipment Recommendation Data - Part II	30 Oct. 1962

<u>Identification</u>	<u>Title</u>	<u>Issue Date</u>
(AGERD)	AGE Recommendation Data	Oct. 1962
DSD-GEM-200	AGE Plan	Oct. 1962
	General Gemini Test Plan	Aug. 1962
	Estimated Mass Property Report	Oct. 1962
	Letter Progress Report No. 5	20 Dec. 1962
DSD-GEM-404	Letter Progress Report No. 6	20 Jan. 1963
DSD-GEM-405	Radio Guidance for Gemini	22 Mar. 1962
	Gemini-Mod III Guidance System	3 Aug. 1962
DSD-GEM-100	General Test Plan	
	Maintenance Ground Equipment Section	
	Gemini-Mod III, System 1, Real-Time Measurement Uncertainties	29 Oct. 1962
	Data Analysis Memo No. 55	
DSD-GEM-200	Gemini Launch Vehicle Guidance	13 Nov. 1962
	Aerospace Ground Equipment Plan	
	Maintenance Ground Equipment Section	
DSD-GEM-301	Gemini Launch Vehicle Guidance	15 Nov. 1962
	Antenna Requirements Study Preliminary Report	
	Gemini	16 Nov. 1962
	Aerospace Ground Equipment Recommendation	
	Date - Part I and Part II	