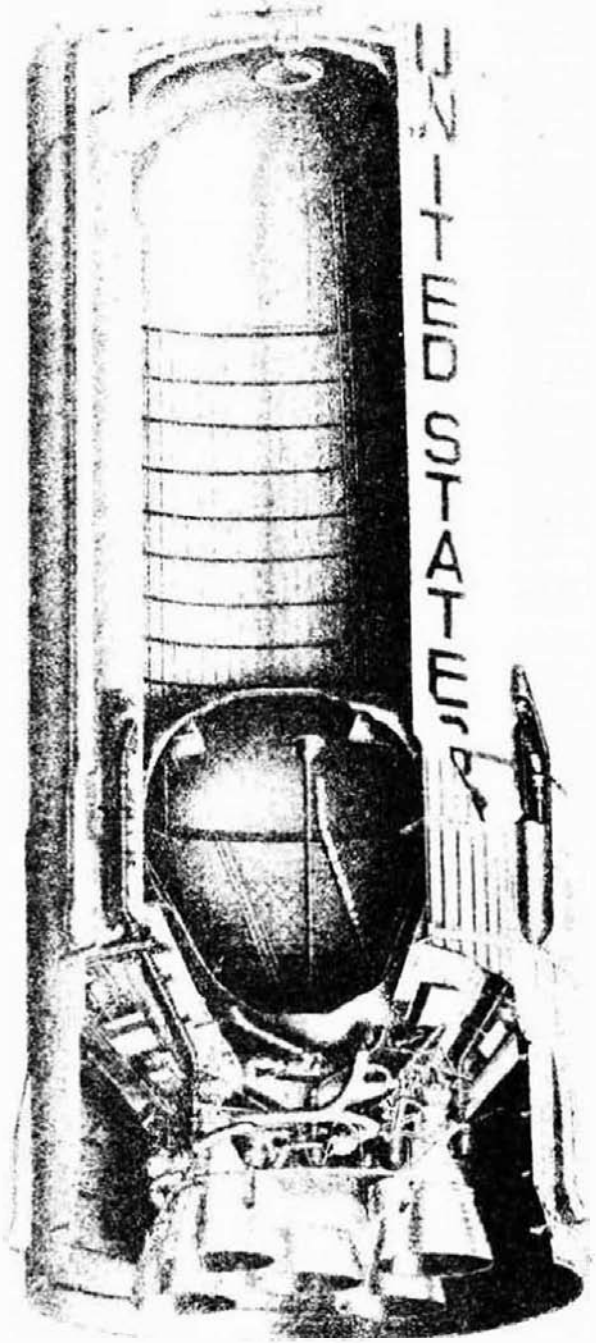


SID 61-363

1 APRIL 1966

SATURN S-II STAGE PROGRAM PLAN

APPROVED BY

J. F. Gray

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

TE HICAL REPORT INDEX/ABSTRACT

ACCESSION NUMBER		DOCUMENT SECURITY CLASSIFICATION	
		Unclassified	

TITLE OF DOCUMENT	LIBRARY USE ONLY
Saturn S-II Program Plan	
AUTHOR(S)	
R. M. Welsh, Jr.	

CODE	ORIGINATING AGENCY AND OTHER SOURCES	DOCUMENT NUMBER
	NAA/S&ID	SID61-363

PUBLICATION DATE	CONTRACT NUMBER
Reissued 1 April 1966	NAS7-200

DESCRIPTIVE TERMS

ABSTRACT

This document outlines the S&ID plan to fulfil the requirements of Contracts NAS7-80 and NAS7-200 for the design, development, and manufacture of the Saturn S-II stage.

FOREWORD

This document outlines the S&ID plan to fulfill the requirements of contracts NAS7-80 and NAS7-200 for the design, development, and manufacture of the Saturn S-II stage.

This document is updated and published semi-annually throughout the Saturn S-II program.

CONTENTS

INTRODUCTION

The S-II stage is 81.5 feet in length and 33 feet in diameter, with a usable propellant capacity of 970,000 pounds. The S-II propellants are fully cryogenic—liquid oxygen at -297 F and liquid hydrogen at -423 F. Its five-engine cluster provides one million pounds of thrust.

The stage is a cylindrical structure of relatively light weight with a shell designed to resist all loads without the use of stiffening members. Its skin is of welded aluminum panels, as are the elliptical bulkheads of the fuel and oxidizer tanks. Unique to its design is the common bulkhead that separates the -423 F liquid hydrogen from the -297 F liquid oxygen. The common bulkhead—a sandwich of two 33-foot diameter aluminum domes separated by an insulating filler of honeycomb—eliminates the weight penalty that would be imposed by the second bulkhead in more conventional design.

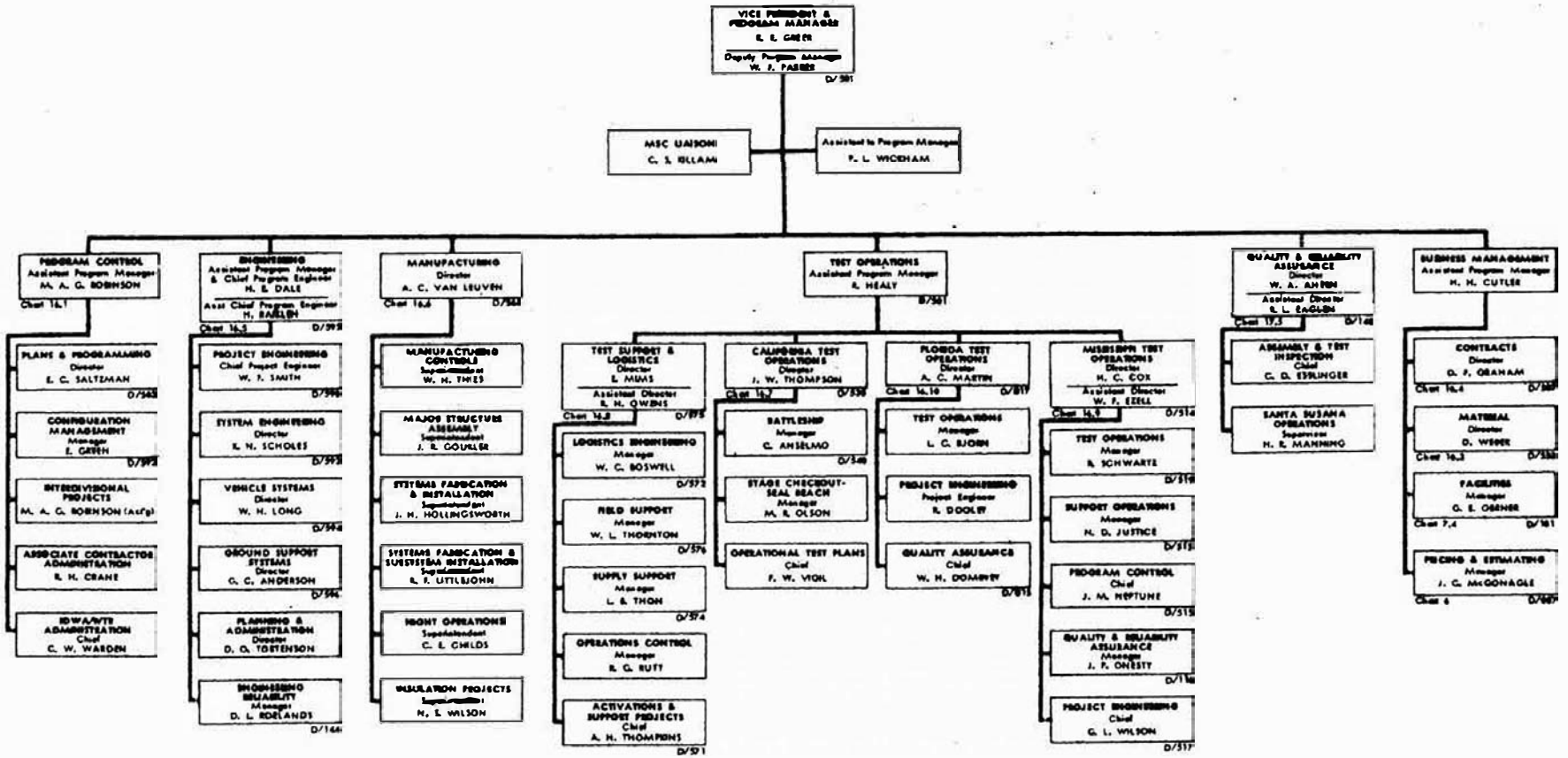
This document describes the S&ID program plan for development of the S-II stage and associated support equipment.

PROGRAM MANAGEMENT

PROGRAM ORGANIZATION

Harrison A. Storms is President of the Space and Information Systems Division. R. E. Greer is Vice President and Saturn S-II Program Manager, and W. F. Parker is Deputy Program Manager. Responsible to Mr. Greer are an assistant to program manager and functional program managers of Program Control, Engineering, Test Operations, and Business Management. The director of Manufacturing also reports to Mr. Greer. Reporting to the functional assistant program managers are directors and superintendents. A liaison representative reporting directly to Mr. Greer ensures close coordination with MSC.

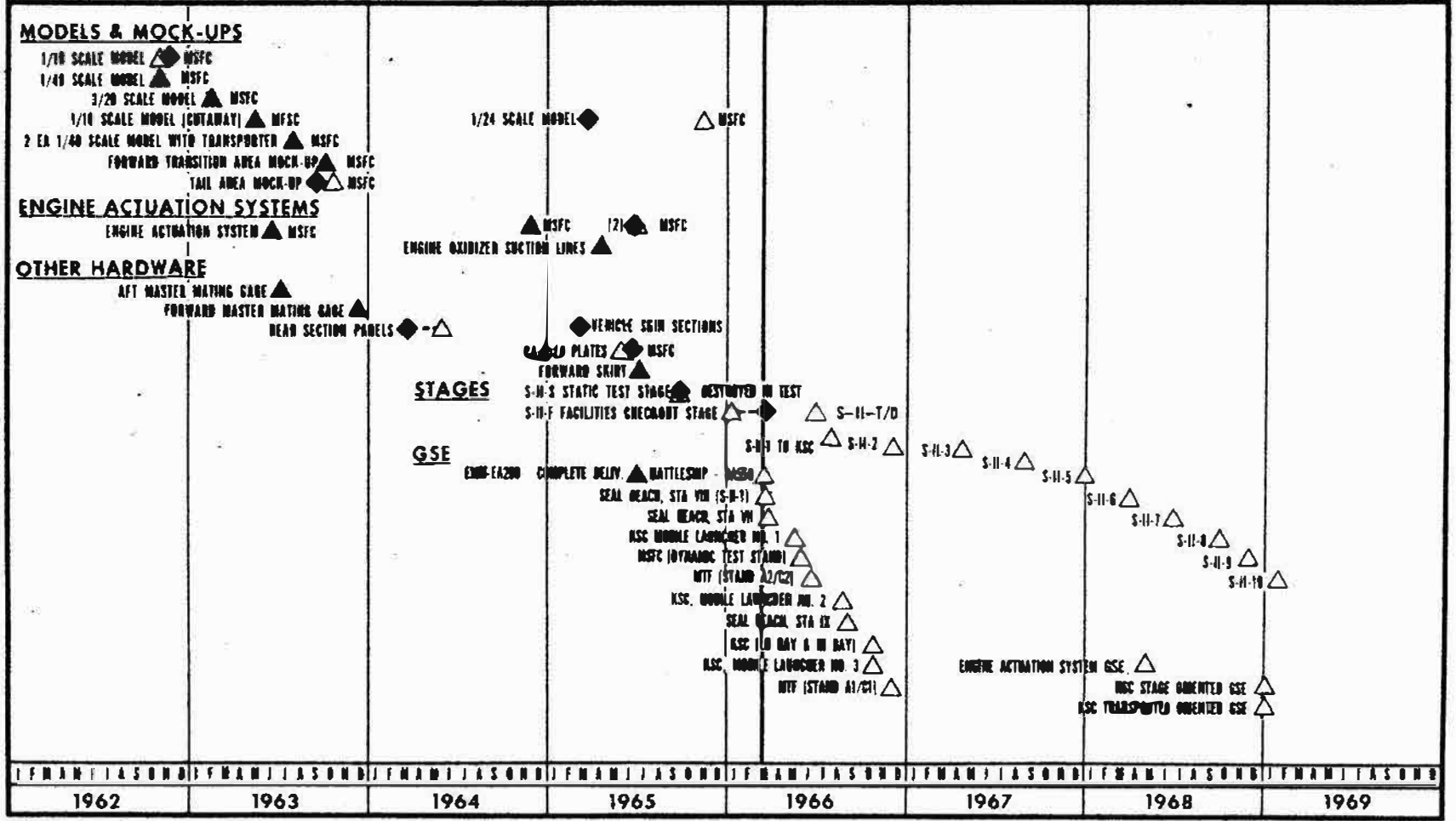
SPACE and INFORMATION SYSTEMS DIVISION
NORTH AMERICAN AVIATION, INC.
SATURN S-II PROGRAM
APPROVED



CONTRACT HARDWARE DELIVERIES

The accompanying chart presents the Saturn S-II contractual hardware delivery dates. The GSE delivery sets shown are as being proposed for the CPIF contract and do not represent an increase in the sets reflected in the current NAS7-200 contract.

SATURN S-II
CONTRACTUAL HARDWARE DELIVERIES



S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

CONFIGURATION MANAGEMENT

The purpose of configuration management is to identify, control, and account for contract end items. Configuration management on the S-II program is being implemented in accordance with the requirements of the document, "Saturn S-II Project Minimum Configuration Management Requirements." The important elements of the S-II configuration management program are described briefly in the following paragraphs.

Part I specifications in accordance with Exhibit II of NPC 500-1 have been prepared and are on contract for all flight stages and the S-II-F.

Part II specifications which comply with the intent of Exhibit II of NPC 500-1 are being prepared for all flight stages and for all prime equipment items of GSE (KSC equipment).

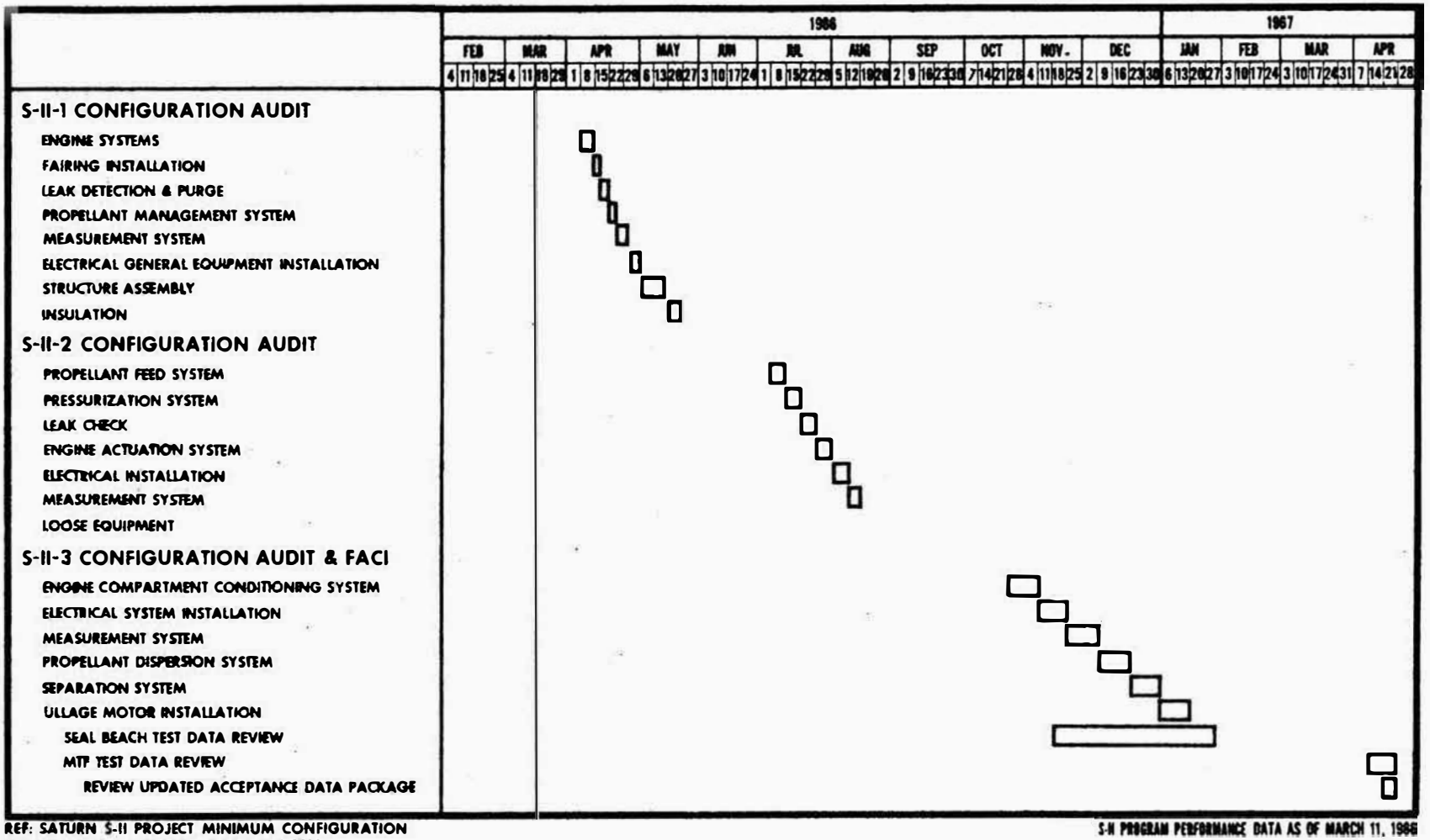
Change control requirements will be in accordance with "S-II Program Engineering Change Proposal Requirements," dated 18 June 1965. This document incorporates the requirements of ANA Bulletin 445 and includes other requirements as imposed by MSFC.

A first-article configuration inspection (FACI) will be conducted on S-II-3 to establish the product configuration baseline for subsequent flight stages. FACI of engineering critical components of the flight stages is underway and is scheduled for completion during August 1966. FACI has been conducted on nine items of prime equipment of GSE, with the remainder scheduled for completion by July 1966.

Configuration accounting reports in accordance with Exhibits XV and XVI of AFSCM 375-1 will be prepared and submitted to MSFC.

A schedule for implementation of configuration management has been submitted to NASA.

SATURN S-II
STAGE CONFIGURATION AUDITS

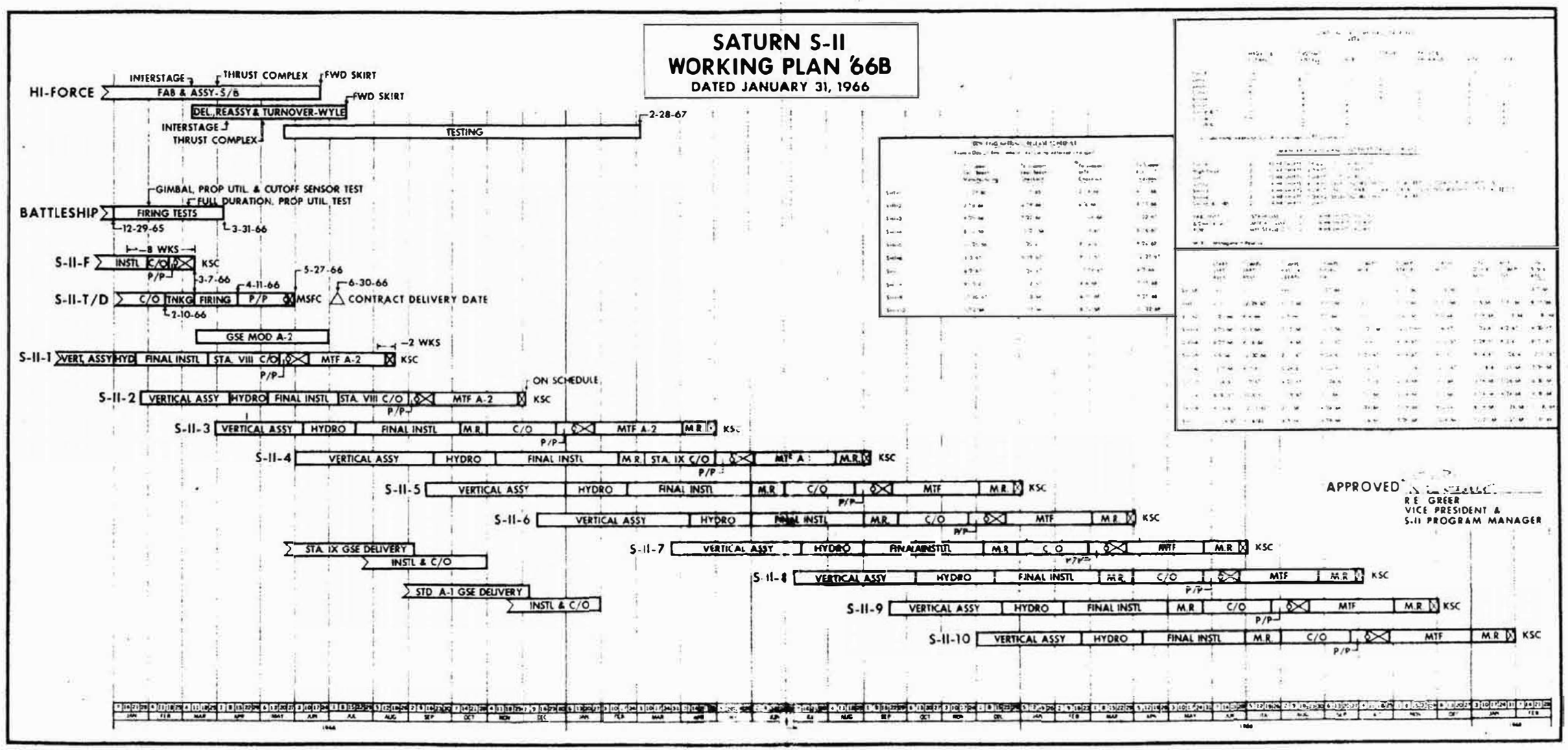


REF: SATURN S-II PROJECT MINIMUM CONFIGURATION MANAGEMENT REQUIREMENTS SID-65-1515

S-II PROGRAM PERFORMANCE DATA AS OF MARCH 11, 1966

MASTER PROGRAM SCHEDULE

Working Plan 66B, dated and implemented 31 January 1966, is presented on the accompanying chart. The plan effectively defines and establishes scheduled milestone events supporting stage deliveries through S-II-10.


SATURN S-II
WORKING PLAN '66B
DATED JANUARY 31, 1966
HI-FORCE
INTERSTAGE
THRUST COMPLEX
FWD SKIRT
FAB & ASSY-S/B
FWD SKIRT
DEL, REASSY & TURNOVER-WYLE
INTERSTAGE
THRUST COMPLEX
TESTING
2-28-67
BATTLESHIP
GIMBAL, PROP UTIL & CUTOFF SENSOR TEST
FULL DURATION, PROP UTIL TEST
FIRING TESTS
12-29-65
3-31-66
8 WKS
S-II-F
INSTL C/O
KSC
P/P
3-7-66
4-11-66
5-27-66
6-30-66
S-II-T/D
C/O
TNKG
FIRING
P/P
MSFC
CONTRACT DELIVERY DATE
2-10-66
GSE MOD A-2
2 WKS
S-II-1
VERT. ASSY
HYD
FINAL INSTL
STA. VIII C/O
MTF A-2
KSC
P/P
ON SCHEDULE
S-II-2
VERTICAL ASSY
HYDRO
FINAL INSTL
STA. VIII C/O
MTF A-2
KSC
P/P
S-II-3
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
C/O
MTF A-2
M.R.
KSC
P/P
S-II-4
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
STA. IX C/O
MTF A-2
M.R.
KSC
P/P
S-II-5
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
C/O
MTF
M.R.
KSC
P/P
S-II-6
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
C/O
MTF
M.R.
KSC
P/P
S-II-7
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
C/O
MTF
M.R.
KSC
P/P
S-II-8
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
C/O
MTF
M.R.
KSC
P/P
S-II-9
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
C/O
MTF
M.R.
KSC
P/P
S-II-10
VERTICAL ASSY
HYDRO
FINAL INSTL
M.R.
C/O
MTF
M.R.
KSC
P/P
STA. IX GSE DELIVERY
INSTL & C/O
STD A-1 GSE DELIVERY
INSTL & C/O
APPROVED
R E GREER
VICE PRESIDENT &
S-II PROGRAM MANAGER

CONFIGURATION CHANGE POINTS

Configuration change points for test stages and for the initial flight stages are listed in the following charts.

CONFIGURATION CHANGE POINTS

Change Point	Description	66-B Working Plan Schedule
	BATTLESHIP	
BA-530	LOX Low-Level Cutoff Test with Cutoff/Timer and Gimballing at Moderate Angles	1 Feb. 1966 (actual)
BA-540	Full-Duration Test with Timer Set for Lower Levels and Gimballing at Large Angles	24 Feb. 1966 (actual)
BA-550	Full-Duration Propellant Utilization and PMR Test Chilling with A7-71, Gimballing to Full Programmed Deflection of Seven Degrees	4 March 1966 (actual)
BA-560	Full-Duration Second Propellant Utilization and PMR Test at Full Programmed Gimballing (Seven Degrees)	16 March 1966
BA-570	Third PU and PMR Test at Full Programmed Gimballing (Seven Degrees)	30 March 1966
	CHECKOUT STAGE	
FA-100	Initiation of Stage Checkout Operations at Seal Beach	30 Jan. 1966 (actual)
FA-200	Preparation for Shipment to KSC from Seal Beach	19 Feb. 1966 (actual)
FA-600	Completion of S-II-F Acceptance at KSC	7 March 1966
FA-700	Delivery of S-II-F to High Bay at KSC	28 March 1966
FA-800	Initiation of First S-II-F Propellant Loading at KSC	June 1966

CONFIGURATION CHANGE POINTS (Cont)

Change Point	Description	66-B Working Plan Schedule
	ALL-SYSTEMS	
AA-020	Initiation of ACE Checkout	1 Aug 1965 (actual)
AA-100	Initiation of Stage Checkout Operations at MTF	17 Oct. 1965 (actual)
AA-200	Initiation of Countdown for First Cryogenic Tanking Test	10 Feb. 1966
AA-300	Initiation of Countdown for First Static-Firing Test	7 March 1966
** AA-650	Initiation of S-II-T Automated Checkout	
* AA-700	Beginning of Update Period in Preparation for Installation in Test Stand A-1	
* AA-800	Initiation of Boattail Environment Tests at Test Stand A-1	
AA-850	Modification of S-II-T at MTF to support conversion to S-II-T/D	1 May 1966
AA-900	Conversion of S-II-T to S-II-T/D at MSFC	June 1966
* AB-100	Initiation of Countdown for Static-Firing Test Stand A-1	
* AB-200	Need-Point of Static Firing Program, Test Stand A-1	

* Deleted per Contract Advice 345, dated 25 January 1966.

** Deleted per IL S-II-PC-PP-66-2012, dated 12 January 1966.

CONFIGURATION CHANGE POINTS FOR INITIAL FLIGHT STAGES

Change Point	Description	66-B Working Plan Schedule
	V7-1 NO. 5(S-II-1)	
V1-100	Initiation of Stage Checkout at Seal Beach, Station 8	18 March 1966
V1-200	Preparation for Shipment from Seal Beach (MSC)	20 May 1966
V1-300	Initiation of Checkout Operations at MTF	20 June 1966
V1-400	Initiation of Countdown for First Static Firing at MTF	30 June 1966
V1-450	Initiation of Checkout After Static Firing at MTF	5 July 1966
V1-500	Preparation for Shipment to KSC (Acceptance Test Complete)	31 July 1966
V1-600	Completion of Acceptance at KSC (on dock)	15 Aug 1966
V1-700	Delivery of S-II-1 to KSC High Bay	September 1966
V1-800	Initiation of First Propellant Loading of S-II-1 at KSC	December 1966
V1-900	Initiation of Countdown for Launch of S-II-1	January 1967

CONFIGURATION CHANGE POINTS FOR INITIAL FLIGHT STAGES (Cont)

V7-1 NO. 6 (S-II-2)		V7-1 NO. 7 (S-II-3)	
Change Point	66-B Working Plan Schedule	Change Point	66-B Working Plan Schedule
V2-100*	1 July 1966	V3-100	28 Oct 1966
V2-200	2 Sept 1966	V3-200	6 Jan 1967
V2-300	3 Oct 1966	V3-300	6 Feb 1967
V2-400	13 Oct 1966	V3-400	16 Feb 1967
V2-450	18 Oct 1966	V3-450	21 Feb 1967
V2-500	15 Nov 1966	V3-500	26 March 1967
V2-600	30 Nov 1966	V3-600	30 April 1967
V2-700	December 1966	V3-700	May 1967
V2-800	March 1967	V3-800	August 1967
V2-900	April 1967	V3-900	September 1967

*The configuration changepoints for each stage are the same as those listed for S-II-1. However, the identifying number changes for each stage (e.g., V2-100 for the S-II-2, V3-100 for the S-II-3, etc.).

CONFIGURATION CHANGE POINTS FOR INITIAL FLIGHT STAGES (Cont)

V7-1 NO. 8 (S-II-4)		V7-1 NO. 9 (S-II-5)	
Change Point	66-B Working Plan Schedule	Change Point	66-B Working Plan Schedule
V4-100	3 March 1967	V5-100	23 June 1967
V4-200	12 May 1967	V5-200	1 Sept 1967
V4-300	12 June 1967	V5-300	2 Oct 1967
V4-400	22 June 1967	V5-400	12 Oct 1967
V4-450	27 June 1967	V5-450	17 Oct 1967
V4-500	27 July 1967	V5-500	19 Nov 1967
V4-600	31 Aug 1967	V5-600	31 Dec 1967
V4-700	September 1967	V5-700	January 1968
V4-800	December 1967	V5-800	April 1968
V4-900	January 1968	V5-900	May 1968

CONFIGURATION CHANGE POINTS FOR INITIAL FLIGHT STAGES (Cont)

V7-1 NO. 10 (S-II-6)		V7-1 NO. 11 (S-II-7)	
Change Point	66-B Working Plan Schedule	Change Point	66-B Working Plan Schedule
V6-100	22 Sept 1967	V7-100	22 Dec 1967
V6-200	1 Dec 1967	V7-200	1 Mar 1968
V6-300	1 Jan 1968	V7-300	1 April 1968
V6-400	11 Jan 1968	V7-400	11 April 1968
V6-450	16 Jan 1968	V7-450	16 April 1968
V6-500	18 Feb 1968	V7-500	19 May 1968
V6-600	31 Mar 1968	V7-600	30 June 1968
V6-700	April 1968	V7-700	July 1968
V6-800	July 1968	V7-800	October 1968
V6-900	August 1968	V7-900	November 1968

CONFIGURATION CHANGE POINTS FOR INITIAL FLIGHT STAGES (Cont)

V7-1 NO. 12 (S-II-8)		V7-1 NO. 13 (S-II-9)	
Change Point	66-B Working Plan Schedule	Change Point	66-B Working Plan Schedule
V8-100	29 Mar 1968	V9-100	24 May 1968
V8-200	7 June 1968	V9-200	2 Aug 1968
V8-300	8 July 1968	V9-300	2 Sept 1968
V8-400	18 July 1968	V9-400	12 Sept 1968
V8-450	23 July 1968	V9-450	17 Sept 1968
V8-500	19 Aug 1968	V9-500	19 Oct 1968
V8-600	30 Sept 1968	V9-600	30 Nov 1968
V8-700	October 1968	V9-700	December 1968
V8-800	January 1968	V9-800	March 1969
V8-900	February 1969	V9-900	April 1969

CONFIGURATION CHANGE POINTS FOR INITIAL FLIGHT STAGES (Cont)

V7-1 NO. 14 (S-II-10)			
Change Point	66-B Working Plan Schedule	Change Point	66-B Working Plan Schedule
V10-100	26 July 1968	V10-500	16 Dec 1968
V10-200	4 Oct 1968	V10-600	31 Jan 1969
V10-300	4 Nov 1968	V10-700	February 1969
V10-400	14 Nov 1968	V10-800	May 1969
V10-450	19 Nov 1968	V10-900	June 1969

PROJECT SCHEDULES

SATURN ALL-SYSTEMS STAGE (S-II-T)

The All-Systems (S-II-T) is the first flight weight stage to be manufactured and static fired. The S-II-T will be identical to that of the first flight stage (S-II-1) except for changes caused by safety requirements and other changes peculiar to static hot firing. The functional major systems are: structures, propellant dispersion (simulated by GSE), electrical power, engine actuation, engine, measurement, pressurization, propellant feed, propellant management, thermal control, separation (simulated by GSE), radio frequency, and leak detection and purge.

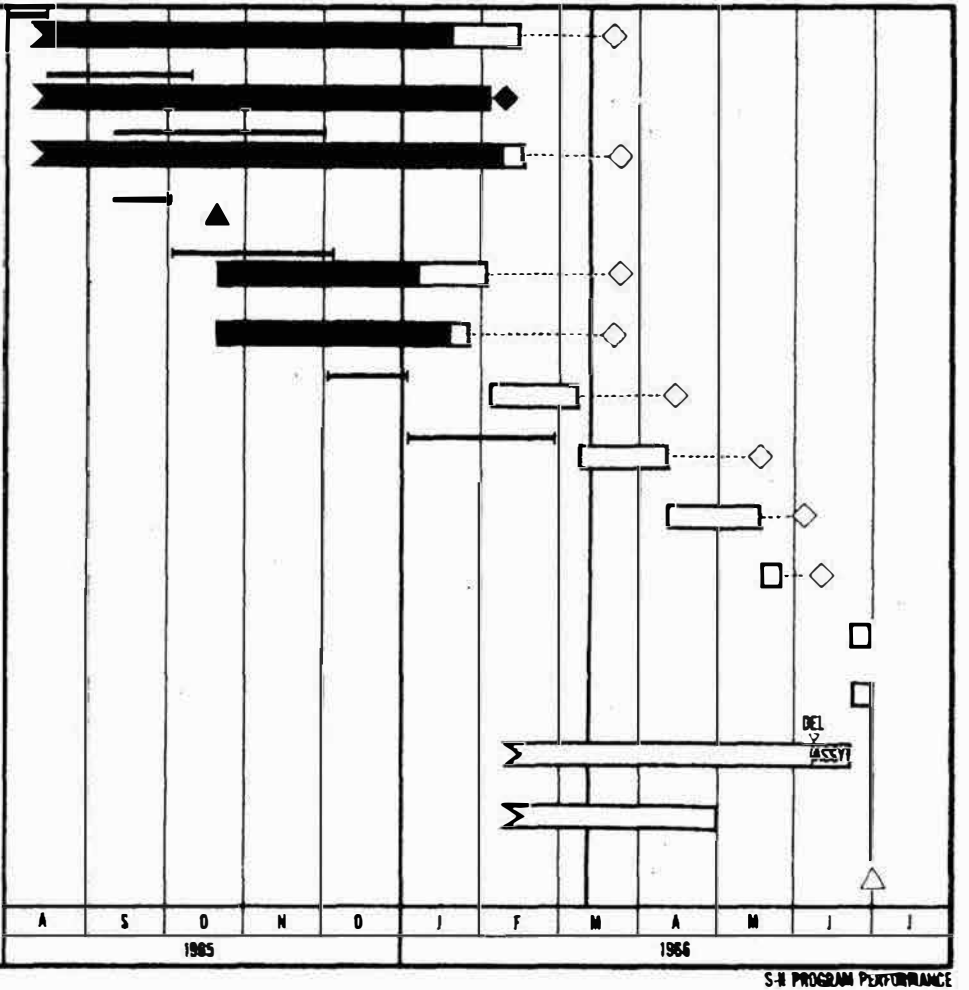
The S-II-T and MTF Test Stand A-2, along with manual checkout GSE, will be used for the static firing to confirm that model specification design requirements are met. The basic operations that will be conducted are: receiving and handling, stage installation on test stand, preliminary system checkout and test preparation, leak and functional tests, simulated tanking tests, wet tanking tests, static firing, stage removal from test stand, cleaning and preparation, weigh stage only, and ship to MSFC.

The All-Systems test program at MTF is underway with the S-II-T installed in Test Stand A-2. This program consists of a series of tests to evaluate stage performance. The program objectives are (1) development and evaluation of flight-weight S-II system performance during static firing and cryogenic tests; (2) accumulation of experience with operational hardware and procedures related to flight-weight vehicle and its associated GSE; (3) accumulation of performance data to be used in establishing test criteria for the MTF acceptance test program; (4) development and verification of procedures for systems tests and countdown operations for use in flight system stages; and (5) correlation of data from the Battleship test program with data from the S-II-T.

Upon completion of this program, the S-II-T will be shipped to MSFC for conversion to the S-II-T/D configuration. An aft interstage, being completed at Tulsa, will be mated to the S-II-T at MSFC. The aft interstage will be shipped from Tulsa in quadrants and assembled at MSFC before mating with the S-II-T. Dummy ballast to represent the flame shield and ullage motors will be installed during mating. Upon completion of these changes, and preservation of the engines so that the system can be hot fired in the future, the stage will be turned over to MSFC. The contractual date for this delivery is 30 June 1966. NASA will plan and conduct the static structural tests to determine the approximate flight stage weight distribution, mass properties, and structural stiffness characteristics.

SATURN S-II
S-II-T/D TEST STAGE

1. DET'D OPER PROCEDURES MTF A-2
2. GSE/SDD FAB C/O & DEL MTF A-2 ACTIVATION (S-II-T)
3. GSE INST & C/O MTF A-2 ACTIVATION (S-II-T)
4. STAGE INSTALLATION A-2
5. STAGE C/O AT MTF A-2
6. INSULATION COMPLETION
7. TANKING TESTS & PREP FOR HOT FIRE
8. HOT FIRE TESTING
9. POST FIRE, WEIGH, PREP FOR SHIP TO MSFC
10. TRANSPORT TO MSFC
11. MATE S-II-T TO INTERSTAGE
12. INSTALL BALLAST
13. FAB DELIVERY & ASSY S-II-T/D INTERSTAGE
14. DELIVER S-II-T/D GSE TO MSFC
15. DELIVER S-II-T/D TO MSFC



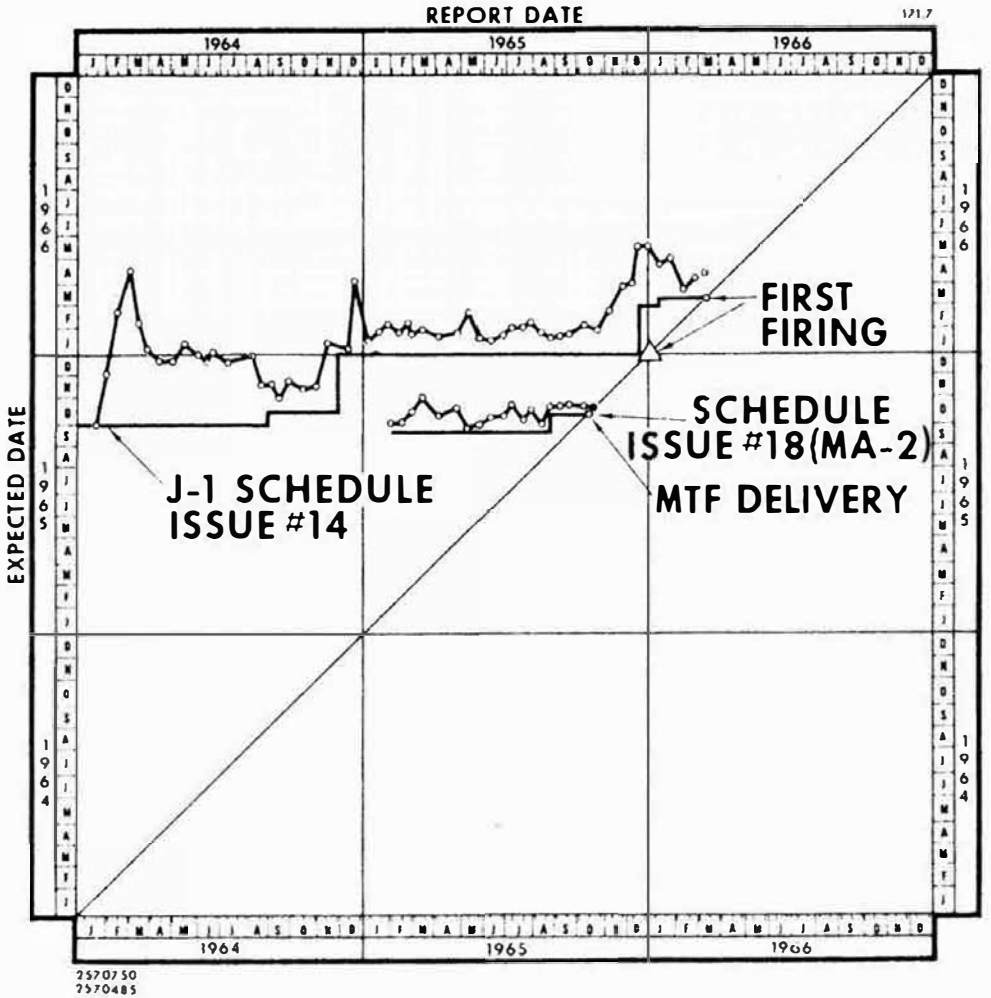
S-II PROGRAM PERFORMANCE

DATA AS OF MARCH 11, 1966

S-II-T PERT CHART

The chart opposite shows the schedule trend for the S-II-T delivery to MTF and for its first firing. The forecast dates for these milestones as obtained from PERT runs are plotted against their schedule dates. The "data as of" dates are plotted on the horizontal axis and the forecast dates on the vertical axis.

S-II-T TEST STAGE



LEGEND

△ SCHEDULE ISSUE #18 (MA-2)

o — PLAN 66-B

S II PROGRAM PERFORMANCE DATA AS OF MARCH 11, 1966

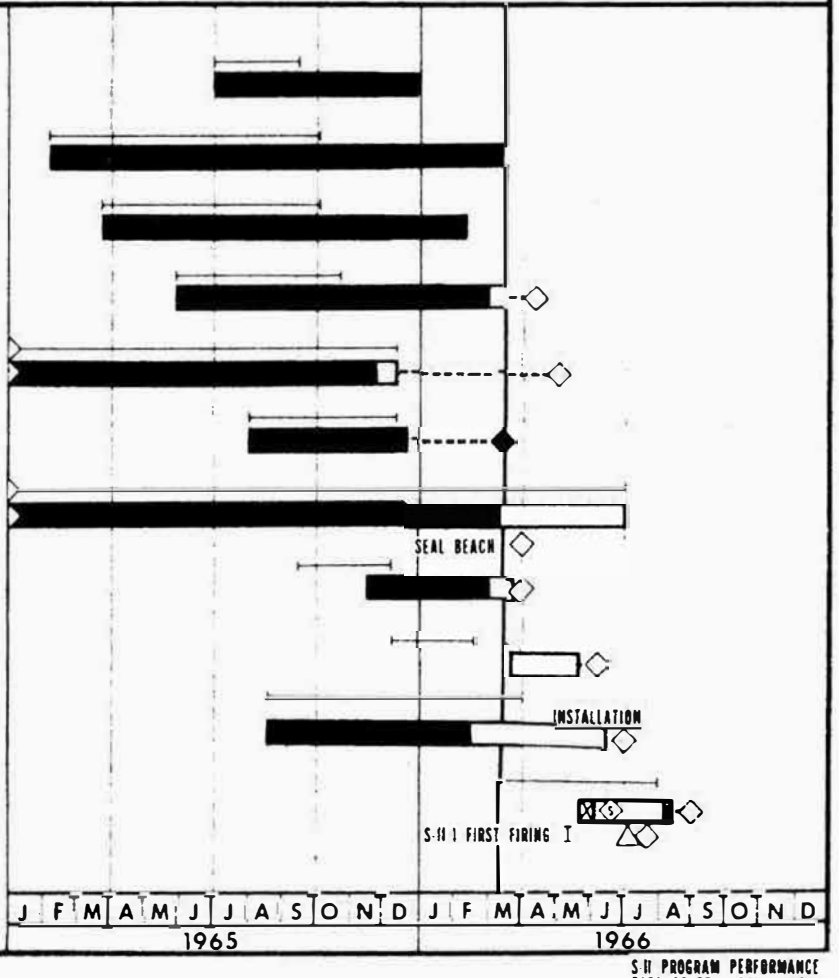
FIRST FLIGHT STAGE (S-II-1)

The primary purpose of the S-II-1 flight stage is to accomplish earth escape of the Apollo manned spacecraft in a direct-ascent mission.

Critical part shortages (i.e., prevalves, disconnects, insulation, brackets, and tube assemblies) and part failures during qualification testing have delayed installations so that the manufacturing shop completion schedule is behind. Tradeoffs and workaround plans are being developed and will be instituted to recover as much of this slippage as possible to minimize program impact. Current forecasts indicate that shop completion and delivery of the S-II-1 will be delayed by a minimum of two weeks; however, continuous effort is being applied to reduce this slippage. Based on the latest forecast, the date for shipping the S-II-1 stage to MTF is 2 June 1966, with delivery to KSC forecast for 29 August 1966.

SATURN S-II
FIRST FLIGHT STAGE S-II-1 STATUS

1. STAGE STRUCTURE FINAL ASSY
2. CONTAINERS
3. TRUNK HARNESS
4. MECHANICAL SYSTEMS
5. GSE FAB & CHECKOUT
6. GSE/SDD INTEG C/O STA V III
7. AIRBORNE QUALIFICATION
8. STAGE SYSTEMS INSTL
9. STAGE SYSTEMS C/O & MSC
10. V1-300 MOD KITS & INSTL
11. MTF ACCEPT TESTS - STAND A-2

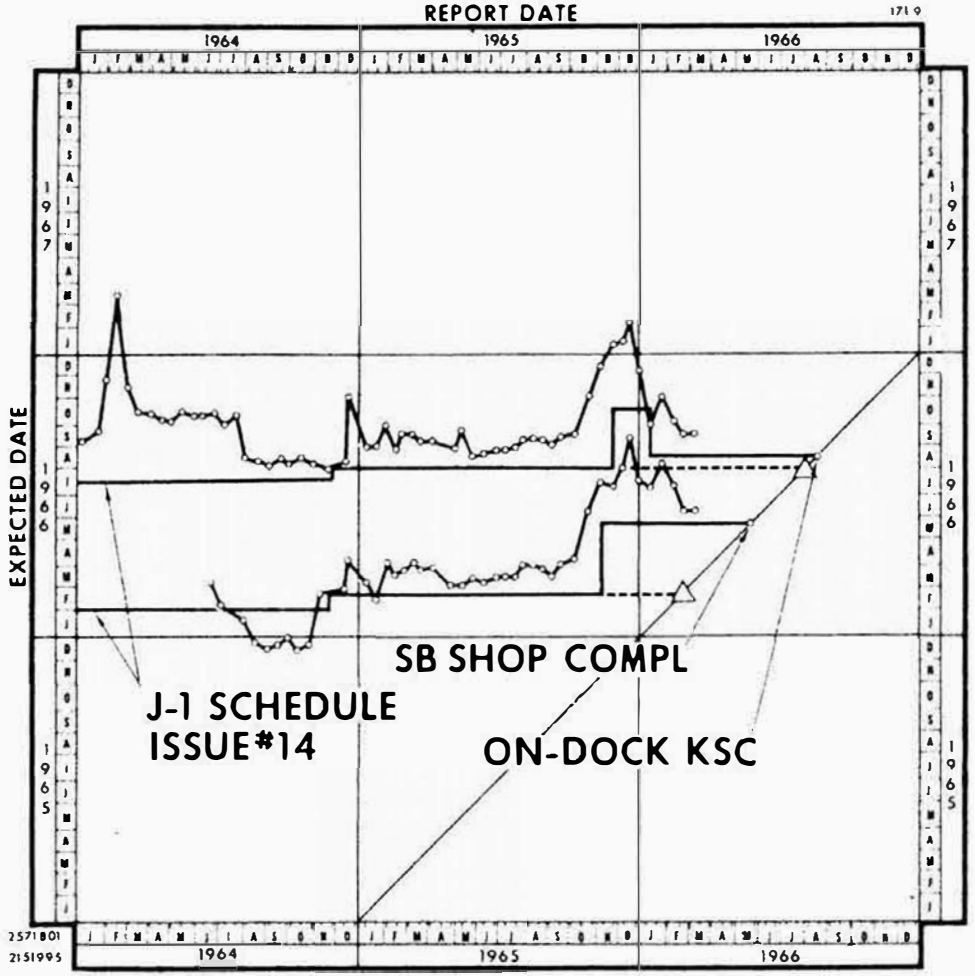


S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

S-II-1 PERT CHART

The accompanying chart shows the schedule trend for manufacturing shop completion and delivery of the first flight stage to KSC. The forecast dates for these milestones as obtained from PERT runs are plotted against their schedule dates. The "data as of" dates are plotted on the horizontal axis and the forecast dates on the vertical axis.

SATURN S-II SCHEDULE TREND
FIRST FLIGHT STAGE S-II-1



SECOND FLIGHT STAGE (S-II-2)

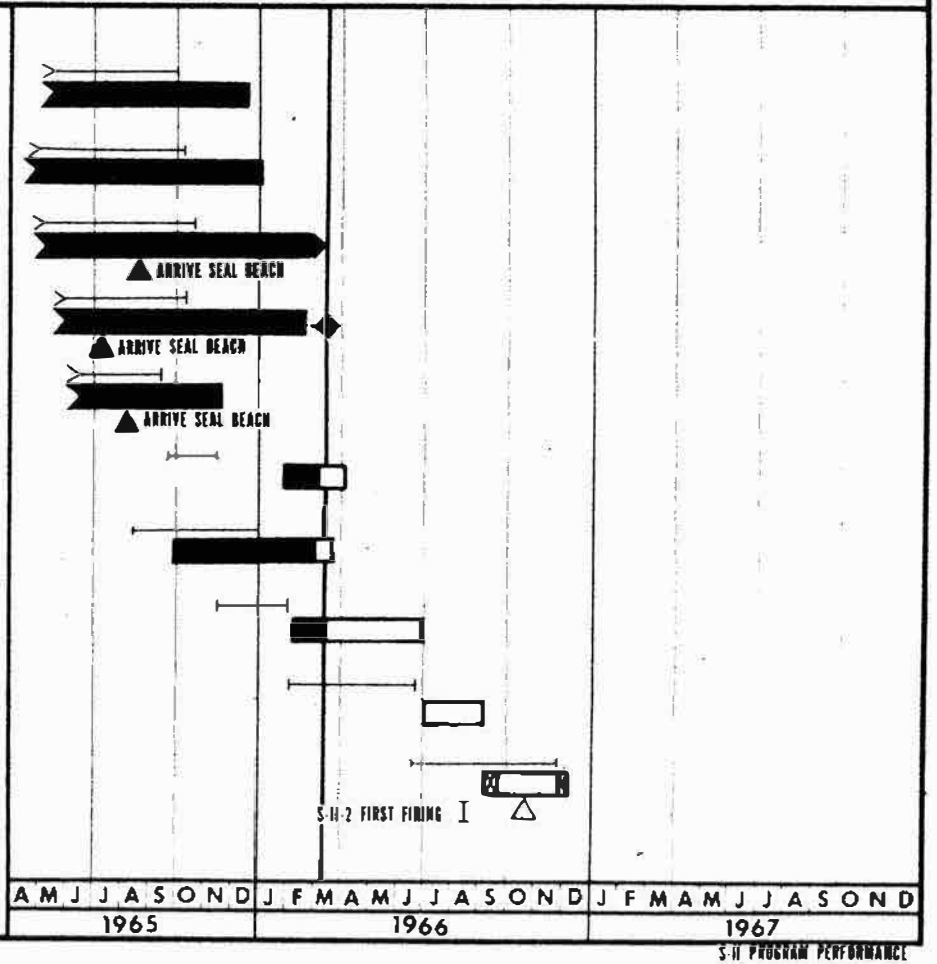
The primary purpose of the S-II flight stage is to accomplish earth escape of the Apollo manned spacecraft in a direct-ascent mission.

Completion of the fabrication of Cylinder 6 and the LH_2 bulkhead was delayed because of insulation part shortages. These parts have since been received and installed, which completes the fabrication process. These shortages, however, resulted in a four-day behind-schedule condition to Working Plan 66B.

An accelerated weld plan for Cylinder 6 to the LH_2 bulkhead was developed and will be implemented. In addition, all remaining manufacturing processes through completion of vertical buildup are being accelerated, which will recover the four-day slippage and enable the scheduled completion date for structural final assembly to be realized.

SATURN S-II
SECOND FLIGHT STAGE S-II-2 STATUS

1. COMMON BULKHEAD ASSY
2. FWD LH_2 BULKHEAD
3. AFT LOX BULKHEAD
4. LH_2 CYLINDER ASSY
5. THRUST STRUCT/AFT SKIRT ASSY
6. STAGE STRUCTURE FINAL ASSY
7. STAGE SYSTEMS FAB.
8. STAGE SYSTEMS INSTALLATION
9. STAGE SYSTEMS C/O & MSC
10. MTF ACCEPT TESTS STAND A2

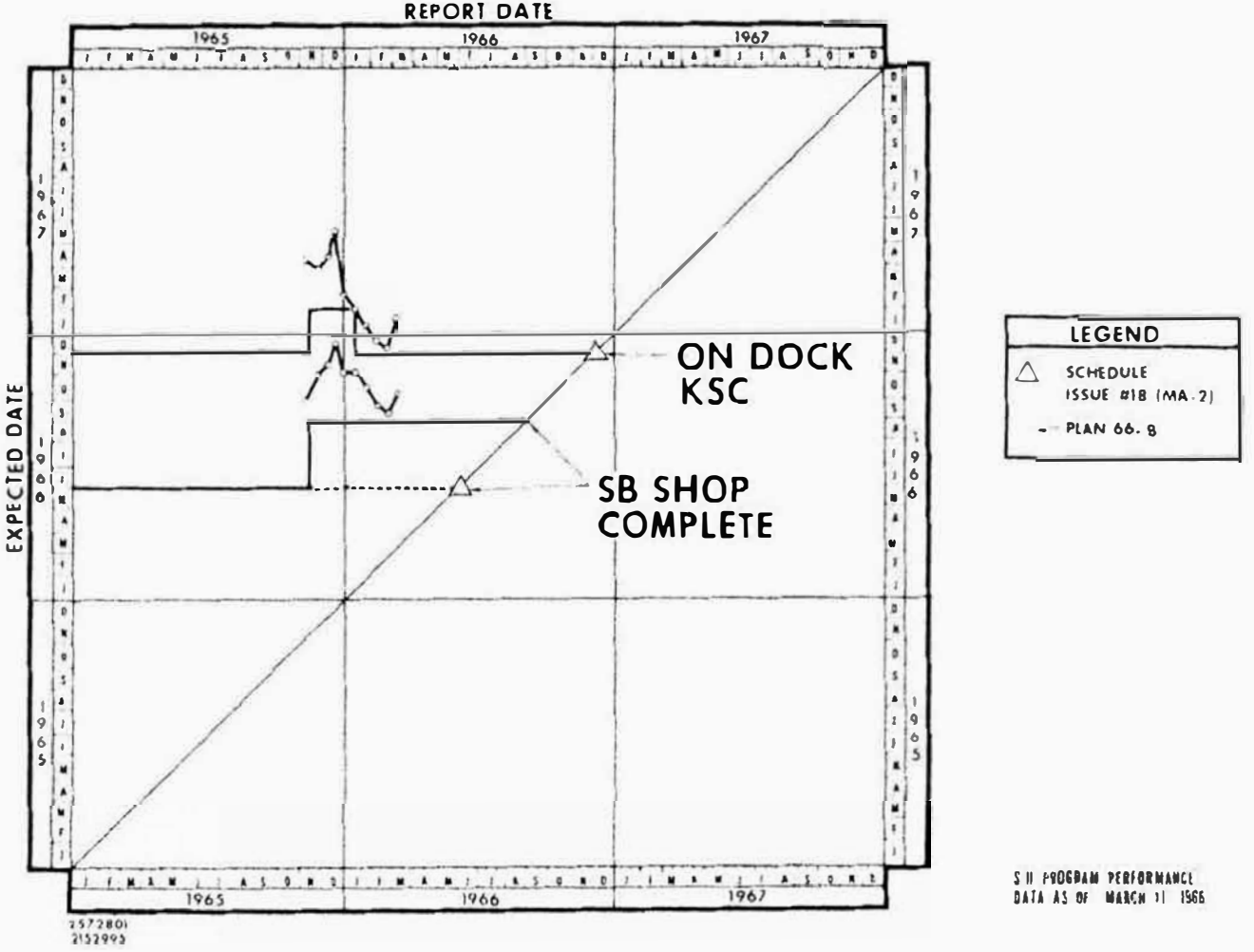


S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

S-II-2 PERT CHART

The accompanying chart shows the schedule trend for manufacturing shop completion and delivery of the second flight stage to KSC. The forecast dates for these milestones as obtained from PERT runs are plotted against their schedule dates. The "data as of" dates are plotted on the horizontal axis and the forecast dates on the vertical axis.

SATURN S-II SCHEDULE TREND
SECOND FLIGHT STAGE S-II-2



THIRD FLIGHT STAGE (S-II-3)

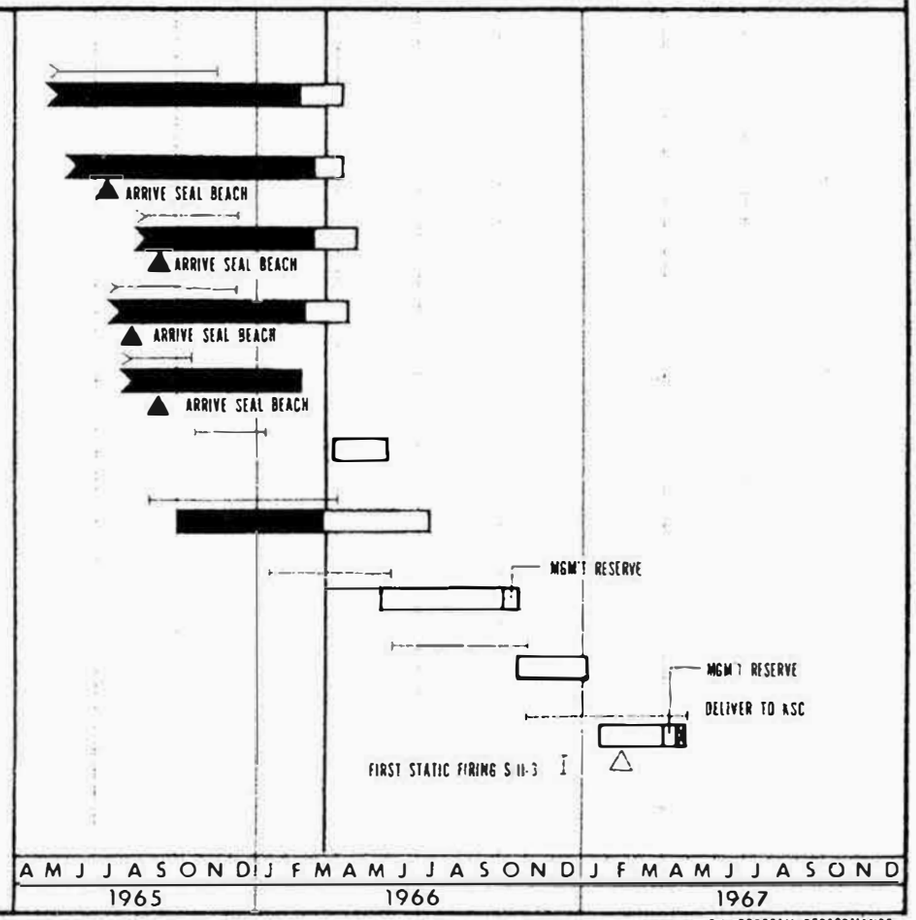
The primary purpose of the S-II-flight stage is to accomplish earth escape of the Apollo manned spacecraft in a direct-ascent mission.

The fabrication and assembly effort of the common bulkhead, forward LH_2 bulkhead, aft LOX bulkhead, and LH_2 cylinders is currently 1 to 3 weeks behind Saturn S-II Working Plan 66B. This is due to a delayed start, but bonding problems, defective insulation material, and material shortages have been the major factors in causing this slippage.

A manufacturing workaround plan has been developed to recover slippage. Current forecasts indicate that the scheduled MSC date of 6 January 1967 will be met.

SATURN-S-II
THIRD FLIGHT STAGE S-II-3 STATUS

1. COMMON BULKHEAD ASSEMBLY
2. FWD LH_2 BULKHEAD
3. AFT LOX BULKHEAD
4. LH_2 CYLINDER ASSEMBLY
5. THRUST STRUCT/AFT SKIRT ASSY
6. STAGE STRUCTURES FINAL ASSY
7. STAGE SYSTEMS FAB
8. STAGE SYSTEMS INSTALLATION
9. STAGE SYSTEMS C/O & MSC
10. MTF ACCEPT TEST

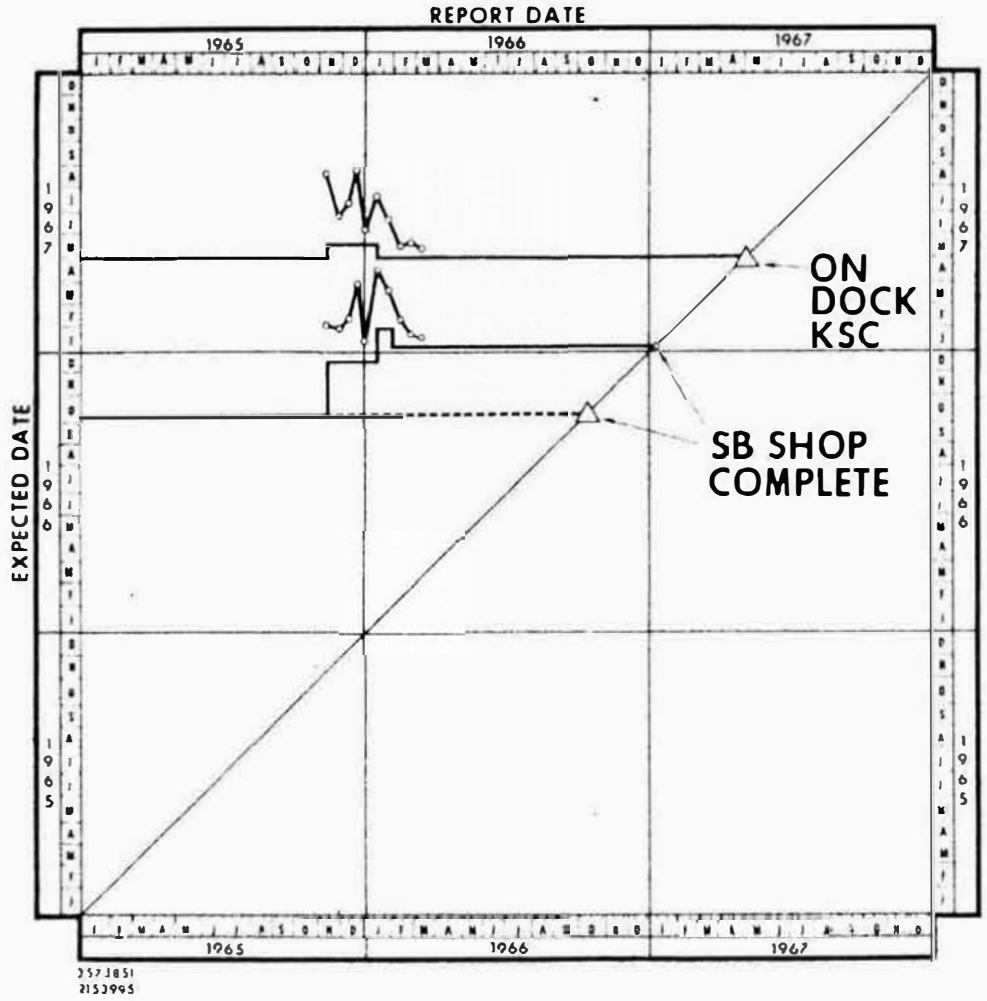


S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

S-II-3 PERT CHART

The accompanying chart shows the schedule trend for manufacturing shop completion and delivery of the third flight stage to KSC. The forecast dates for these milestones as obtained from PERT runs are plotted against their schedule dates. The "data as of" dates are plotted on the horizontal axis and the forecast dates on the vertical axis.

SATURN S-II SCHEDULE TREND
THIRD FLIGHT STAGE S-II-3



FOURTH FLIGHT STAGE (S-II-4)

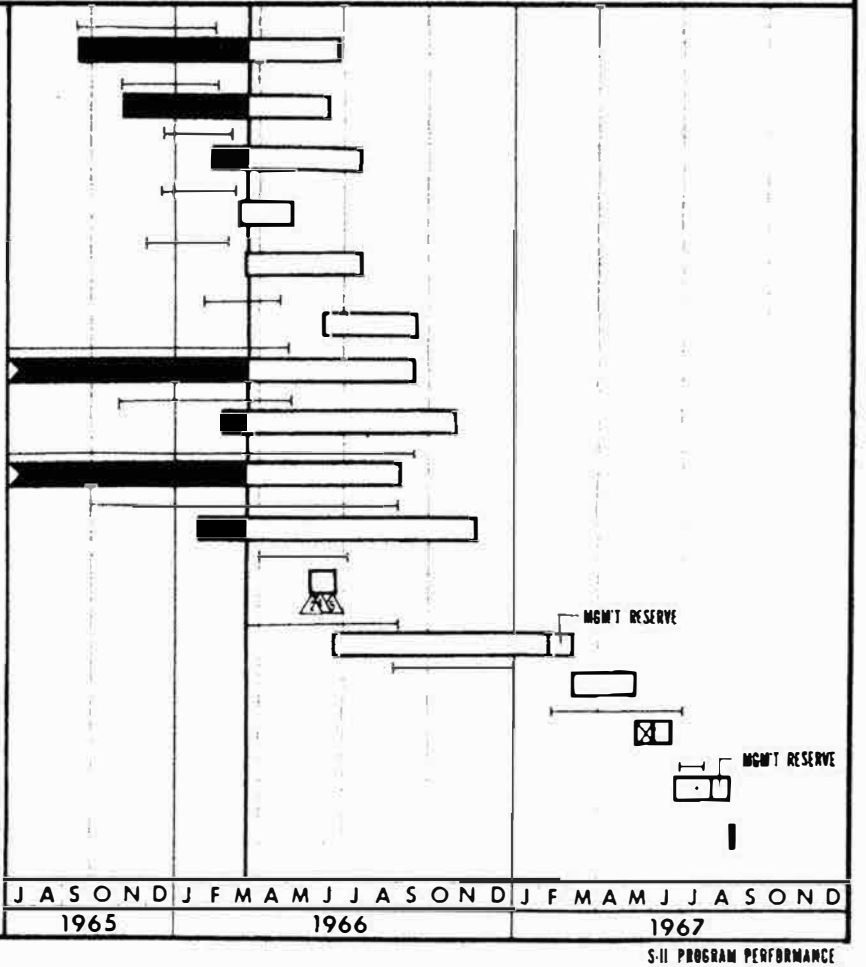
The S-II-4 will be the sixth production stage and the first to encounter a major change point. These changes will include the following:

1. MCR S00495 - Weight reduction/interconnect harness assemblies
2. MCR S00507 - Elimination of propellant tank pressurized stored helium
3. MCR S00634 - S-II stage weight reduction
4. MCR S01227 - New design loads
5. MCR S01265 - Common bulkhead J section material change
6. MCR S01447 - Redesign of flow and tank chassis (signal conditioning)
7. MCR S01879 (UCN) - Add prime and paint specification
8. MCR S01921 - Removal of temperature transducer, fuel turbine bearing
9. MCR S01949 - Hydrogen tapoff orifice outlet pressure parameter, deletion of
10. MCR S02102 - Container 221 cover access doors
11. MCR S02227 - Eliminate power to J-2 engine flight instrumentation heater
12. MCR S02474 - Redefinition of instrumentation requirements

This stage will be fabricated in the same manner as previous stages, but will be the first to activate and check out Station IX at Seal Beach. Upon completion, S-II-4 will be delivered to MTF Test Stand A-1 with subsequent delivery to KSC.

SATURN S-II
FLIGHT STAGE S-II-4 STATUS

1. COMMON BULKHEAD ASSEMBLY
2. FORWARD LH_2 BULKHEAD ASSEMBLY
3. LOX AFT BULKHEAD ASSEMBLY
4. NON-PRESSURIZED STRUCTURES (TULSA)
5. LH_2 CYLINDER ASSEMBLY
6. STAGE STRUCTURES FINAL ASSEMBLY
7. SYSTEMS COMPONENT DELIVERY
8. STAGE SYSTEMS FABRICATION
9. GSE/SDD FAB & DEL S/B - STA IX
10. GSE/SDD INSTL & C/O ,S/B - STA IX
11. J-2 ENGINE DELIVERY
12. STAGE SYSTEMS INSTALLATION
13. STAGE SYSTEMS CHECKOUT (MSC)
14. VEHICLE DELIVERY, INSTL & C/O, MTF A-1
15. TANKING TEST & STATIC FIRING, MTF A-1
16. SHIP TO KSC

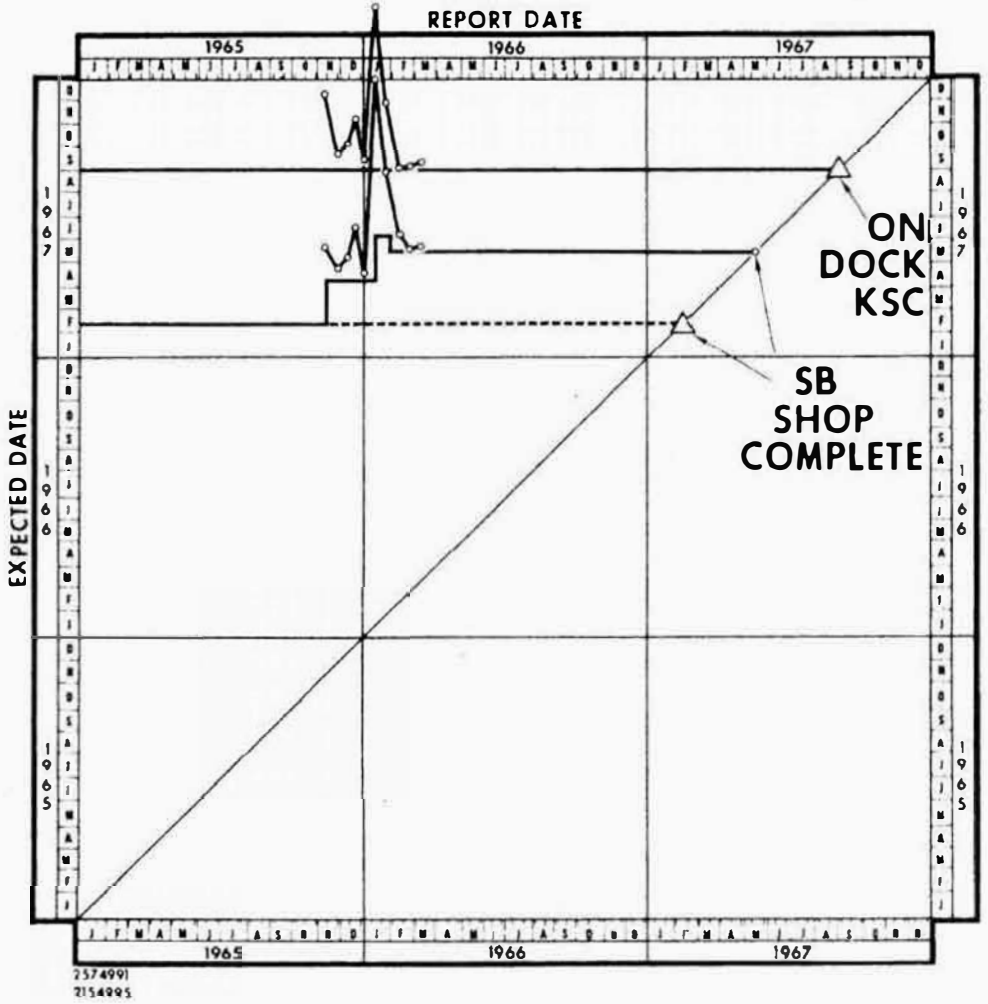


S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

S-II-4 PERT CHART

The accompanying chart shows the schedule trend for manufacturing shop completion and delivery of the fourth flight stage to KSC. The forecast dates for these milestones as obtained from PERT runs are plotted against their schedule dates. The "data as of" dates are plotted on the horizontal axis and the forecast dates on the vertical axis.

SATURN S-II-SCHEDULE TREND
FOURTH FLIGHT STAGE S-II-4



LEGEND

△ SCHEDULE ISSUE #18 (MA-2)

○—PLAN 66-8

S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

HIGH-FORCE TEST PROGRAM

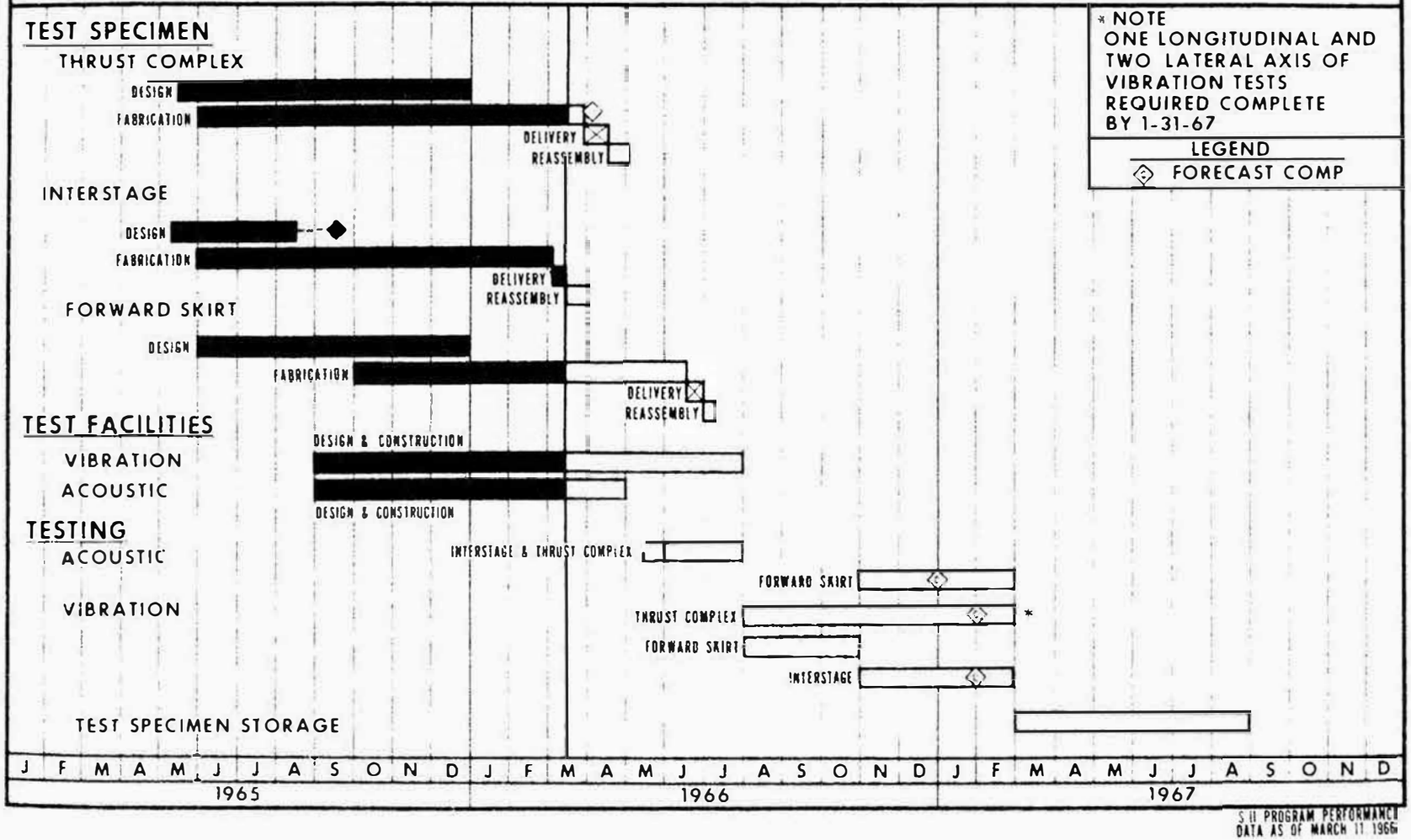
The high-force test program consists of subjecting three major portions of the Saturn S-II stage to certain simulated environments that are expected to be experienced in flight. The program will provide a practical understanding of current structural design and will allow for practical and efficient design changes in final structural concepts at a minimum expenditure of time and money.

Since the release of Change Order 207 (15 January 1965), which provided for this program, all activities preparatory to selection of a test agency to perform the required tests has been accomplished and negotiation of a firm contract with the customer has been concluded.

Wyle Laboratories, whose main offices are located in El Segundo, California, was selected as the test agency and awarded a contract on 7 September 1965. Wyle will conduct vibration and acoustic tests at their Huntsville, Alabama, testing facility. Vibration tests will be conducted in a special facility which is being constructed; the acoustic tests will be conducted in an existing acoustic chamber which is being modified.

The aft interstage test specimen was delivered to Wyle on 28 February 1966. The thrust complex will be shipped on 1 April 1966, reassembled, and mated to the aft interstage in support of the 15 May 1966 turnover date to Wyle for initiation of acoustic test preparation. The forward skirt specimen will be turned over to Wyle on 8 July 1966. Available parts and subassemblies from the cancelled S-II-D stage have been used in the fabrication of the test specimen (aft interstage, thrust complex, and forward skirt).

SATURN S-II
HIGH FORCE TEST PROGRAM



S II PROGRAM PERFORMANCE
DATA AS OF MARCH 11 1966

GSE/SDD

DESCRIPTION

GSE is designed to support all phases of the S-II stage. Based on various usage requirements, GSE is categorized in four types: automatic checkout, servicing, handling, and auxiliary. Requirements and usage are specified in the GSE model specification (SID 61-362) applicable to the specific type of equipment furnished.

AUTOMATIC CHECKOUT EQUIPMENT (C SERIES)

The purpose of checkout equipment, the most complex of the required GSE, is two-fold. Its primary use is malfunction isolation checkout and certification of the S-II stage. The secondary purpose is to establish a greater confidence by virtue of a more complete checkout, elimination of human errors, and a more complete accumulation of records.

The automatic checkout operation consists of five test stations and a controlling computer complex. The computer complex will be employed during automatic operation to relay control signals to the station for the application of stimuli to the stage. The five checkout stations will receive data for telemetry, electrical, mechanical, radio frequency systems, and digital data equipment.

Telemetry

The telemetry support equipment will be used to check out the single-sideband telemeter and the pulse amplitude modulated (PAM) telemetry systems. The checkout philosophy for both systems will be for selection and measurement of one channel at a time. Automatic control is provided by the computer to allow more rapid checkout.

Electrical

The electrical equipment will be used to check out the airborne engine, ullage motor, electrical power, electrical control, separation, propellant dispersion, emergency detection, and flight control

electronics systems. The electrical station may be functioned through automatic computer control or manually through the local control panel.

Mechanical

The mechanical equipment will receive commands through the electrical system for checkout of the engine hydraulic system, S-II stage pressurization system, functional or leak tests of the engine and propellant systems, and flow control of the pneumatic fluids to the stage.

Radio Frequency

The radio frequency equipment will be utilized to check the secure range safety command receiver. A stimulus is generated from the electrical and radio frequency check station to the stage with the response received through the telemetry system for evaluation and analysis.

Digital Data Acquisition

The digital data equipment is used to check out the pulse code modulated (PCM) telemetry system. Transmission noise is removed from PCM signals, which are converted from serial to parallel format to produce an output suitable for processing in the computer.

HANDLING EQUIPMENT (H SERIES)

The handling equipment for the S-II stage will be used to handle the stage and components during all phases of manufacture, transportation, servicing, and repair. This equipment is composed of slings, dollies, transporters, ramps, covers, component installers, and handlers.

SERVICING EQUIPMENT (S SERIES)

The servicing equipment is required to supply electrical power for ground operation and to furnish operating fluids and gases to the Saturn S-II stage. The equipment consists of system hydraulic service units, pneumatically operated service units, desiccator system, and service cables and lines.

AUXILIARY EQUIPMENT (A SERIES)

Auxiliary equipment provided for the stage assembly affords safety provisions and protective apparatus for personnel and various S-II units. This equipment is composed of specific tools, walkway fixtures, test sets, and instrumentation units to support combined systems checkout as well as the supporting equipment used in conjunction with the tower umbilical swing arms.

SPECIAL DEVELOPMENT DEVICES

The special development devices are GSE end items used to support the development of the Saturn S-II stage and GSE. These devices have minimal quality requirements, falling into categories of special tools, handling equipment, service platforms, breadboard test devices, GSE/SDD tiedown fittings, hardware installation adapters, etc. The general categories are identical to GSE: checkout, service, handling, and auxiliary. GSE/SDD site requirements versus deliveries as of 11 March 1966 are as follows:

Site	Total Requirements	Total Shipped	Total Currently Undersupporting
MTF			
(A_2 C_2)	143	121	1
(A_1 C_1)	118	19	0
Station VIII	92	87	5
Station IX	85	25	0
MSFC	53	17	2
KSC	112	38	4
	603	307	12

All quantities include shared items when applicable.

PROGRAM STATUS

The program status is indicated in the accompanying schedule charts, current as of 11 March 1966. Problem areas are reviewed in the following paragraphs. The charts reflect the status of equipment by site.

MISSISSIPPI TEST FACILITY

The Mississippi Test Facility is currently contracted for 143 end items of GSE/SDD for Test Stands A2 and C2, of which 121 have been delivered. All automatic checkout and auxiliary equipment, and all special development devices are meeting MTF schedule requirements. Problem areas include one item of servicing equipment and seven items of handling equipment. In the case of the former, two components were delayed because of late release of engineering documents. These documents were released on expedite basis and the two remaining items have been placed on .001 priority. In the case of the handling equipment, the seven end items have been completed, but contracts documents (SID 61-362A, Model Specification for Saturn Stage S-II Ground Support Equipment, dated 2 August 1965, and SID 61-348A, Saturn S-II Stage Ground Support Equipment Requirements and Utilization) were not revised to reflect the increase in quantity and redesignation of the end item, LH_2 tank access cover handle (H7-99). This caused a delay of customer buy-off to permit shipment. The affected contract documents are being revised to reflect the correct required quantities, which will expedite delivery.

The Mississippi Test Facility is currently contracted for 118 end items of GSE/SDD for Test Stands A1 and C1, of which 19 have been delivered. All end items are meeting the MTF schedule.

STATION VIII

Station VIII is currently contracted for 92 end items of GSE/SDD, of which 87 have been delivered. All handling and servicing equipment and all special development devices have been

delivered. Problem areas include two items of automatic checkout equipment and three items of auxiliary equipment. In the case of the two ACE items, one unit of the engine system flow monitoring system (C7-51) was delayed because of the necessity for a part replacement request (PRR) for a vendor flowmeter, and the other problem results from advancement of the site need date for the engine actuation system control unit (C7-64). The vendor is expediting the flowmeter to complete the C7-51 requirements, and Purchasing and Manufacturing are pacing their activities to the new site need date. The auxiliary equipment problems involve two thrust cone internal access ladders (A7-85) delayed because of a subassembly shortage (pad and lock) and portable helium leak detector set (A7-119) delayed because the leak rate test required by the vendor was not available. In the first case, the shortage has been ended and the access ladders have been placed on .001 priority. In the latter case, the leak rate test results have been received and effort has begun to complete the detector set as soon as possible.

STATION IX

Station IX is currently contracted for 85 end items of GSE/SDD, of which 24 have been delivered. All requirements of all categories of equipment are meeting the site need date.

MARSHALL SPACE FLIGHT CENTER

MSFC is currently contracted for 53 end items of GSE/SDD, of which 17 have been delivered. All automatic checkout, handling, and servicing equipment is either meeting schedule requirements or has been delivered. Problem areas are two items of auxiliary equipment (LH_2 and LOX fill disconnects, A7-64 and A7-65), which are delayed because an assembly to the eight-inch propellant fill disconnects has failed proof pressure tests at the supplier. The supplier has been directed to develop an alternate source for the failed assembly.

Modification 84 (umbilical disconnects) status is reflected on the charts in this section.

KENNEDY SPACE CENTER

The Kennedy Space Center is currently contracted for 112 end items, of which 38 have been delivered. All items of automatic checkout, handling, and servicing equipment are meeting KSC site

need dates. Problems involve one item of auxiliary equipment and three SDD items. In the first case, design changes to the forward bulkhead protection set (A7-91) for Low Bay delayed completion; the design changes have been completed and the protection set is expected to be complete the week of 18 March 1966. The three SDD items (LOX tank access platform, SDD-258, LOX tank internal access kit, SDD-259, and LOX tank internal protective cover, SDD-260) have been delayed by numerous engineering design changes. Two of the end items are currently in data pack with an expected shipping date of 25 March 1966. The remaining item (SDD-260) was scrapped. The replacement item is estimated to be complete on 31 March 1966.

MODIFICATION 88 (KSC PNEUMATIC EQUIPMENT)

Change Order 88 directs that the pneumatic equipment be designed and provided through a servicing electrical console (S7-42) (MTF only), pneumatic console set (S7-41), LH_2 heat exchanger (A7-71), and a pneumatic console test set (C7-70). The system allows for purging, pressurizing, control, and checkout of the S-II stage in preparation for a launch or static firing. Scheduled delivery of all units will meet site needs except for the heat exchanger to KSC. The two heat exchanger unit completions are being paced by the availability of a new transducer, a long-lead-time item. In addition, changes to the acceptance test procedures for the heat exchanger have contributed to the delay. A proposed change to the pressure transducer is being evaluated by the Saturn S-II Configuration Change Board (CCB). Upon approval by the CCB, a plan reflecting a rework schedule by the supplier will be released. A schedule for expediting the tubing changes has been coordinated with the vendor.

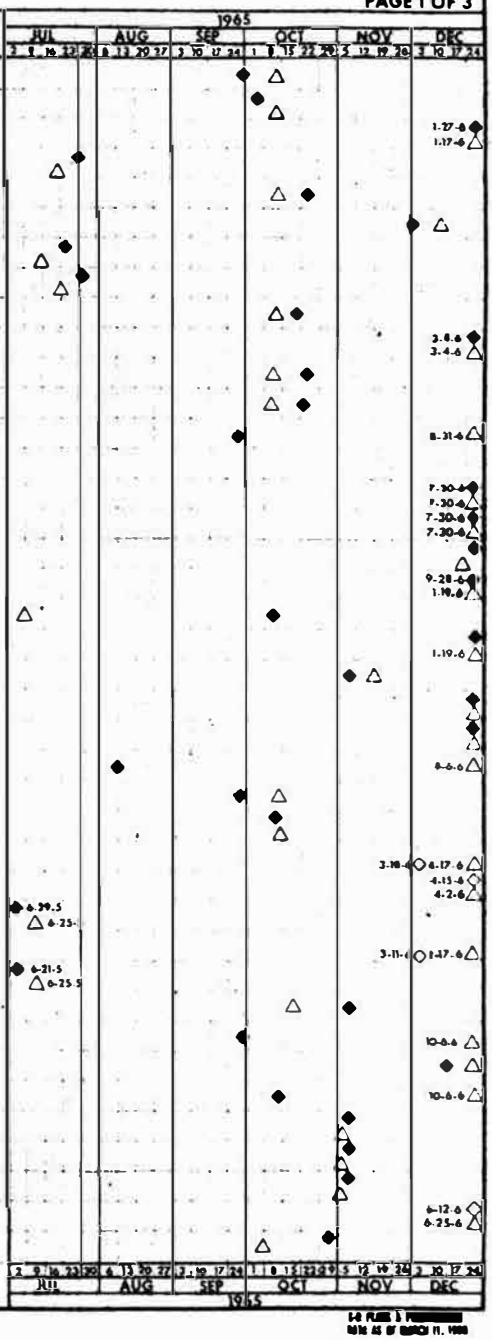
MODIFICATION 165

Change Order 165 directs that S&ID provide a propellant tank leak detection and insulation purge system capable of purging and proving the integrity of the insulation, common bulkhead, and propellant tanks prior to, during, and after cryogenic loading at SSFL, MTF, and KSC. This equipment should also have the ability to detect the concentration of hydrogen, oxygen, and nitrogen at all times during the fueling and draining procedures. All units are meeting the schedule.

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED
PAGE 1 OF 3

MTF - A2

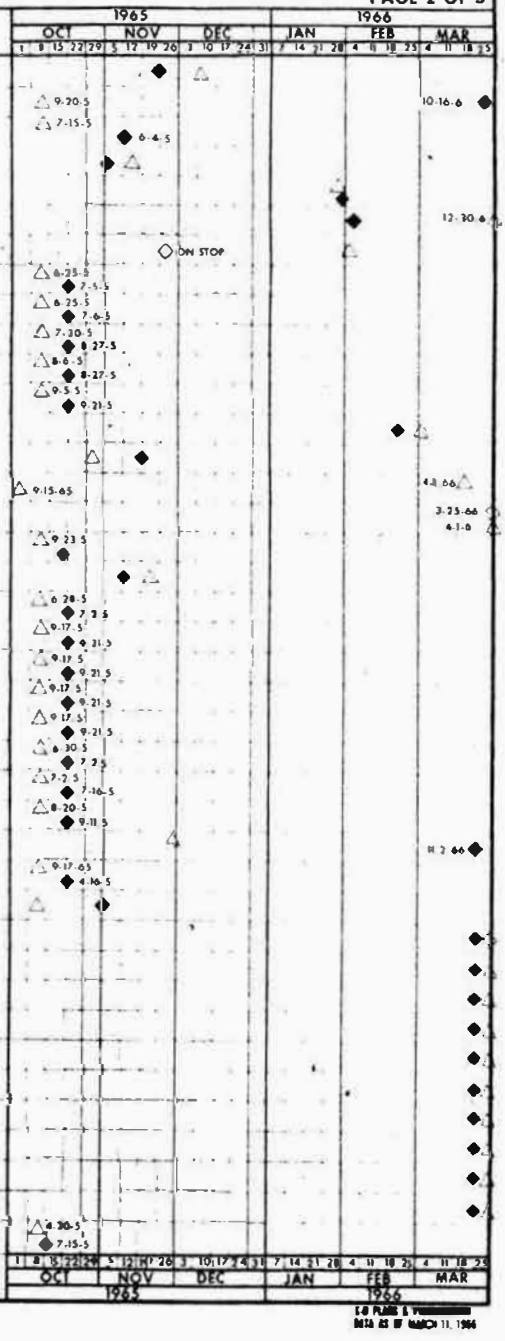


NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED

MTF - A2



- C7-72 HARNESS SET, ARREST MECH, SIDE LOAD
- C7-73 JUNCTION BOX, ARREST MECH, SIDE LOAD
- C7-80 POWER DIST SYS, ACCEPTANCE STAND 1
- C7-84 CALID UNIT, PROPELLANT UTILIZATION
- C7-85 TEST SET, PROPELLANT UTILIZATION
- C7-92 HARNESS SET, ELECT STAGE BATTERY SIMU
- C7-94 CABLE SET, AFT INTERSTAGE CHECKOUT
- C7-108 RACK , DIGITAL DRIVE LINK, REMOTE
- C7-201 RACK, AUTOMATIC CONTROL
- C7-204 RACK, SIGNAL DISTRIBUTION
- C7-205 RACK, SPECIAL DATA
- C7-210 RACK, STAGE SUBSTITUTES
- C7-211 RACK, SCANNING
- C7-213 RACK, RELAY INTERLOCK
- C7-603 CONSOLE SET, PNEUMATIC C O
- C7-603 CONSOLE SET, PNEUMATIC C O
- C7-802 RACK, STATIC FIRING A, REMOTE
- C7-805 RACK, ENGINE CUT OFF
- H7-17 FIXTURE, STAGE FIT-UP
- H7-20 SIMULATOR,ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-25 FRAME, HOISTING, AFT
- H7-29 ADAPTER SET, TAG LINES
- H7-79 BRACKET SE, STAGE GUIDE
- H7-83 SLING, TRANSPORTER COMPONENTS
- H7-94 ADAPTER, VERTICAL INSTL CENTER ENGINE
- H7-95 ADAPTER, VERTICAL INSTL OUTBOARD ENGINE
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-106 SLING, VERTICAL INSTALLER ENGINE

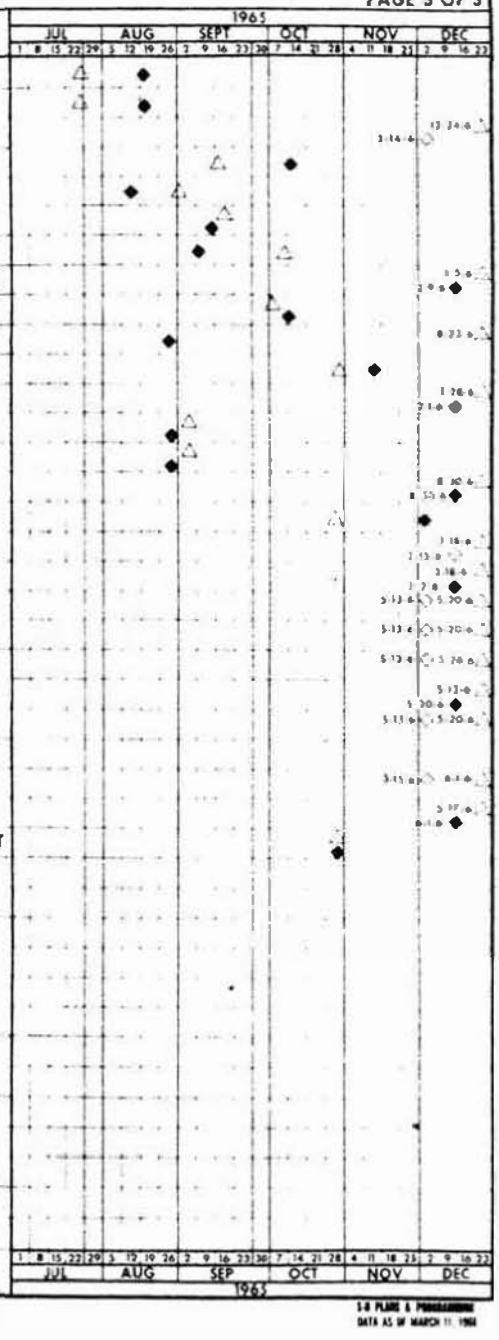
OCT
NOV
DEC
JAN
FEB
MAR
1965
1966

DATA AS OF MARCH 11, 1966

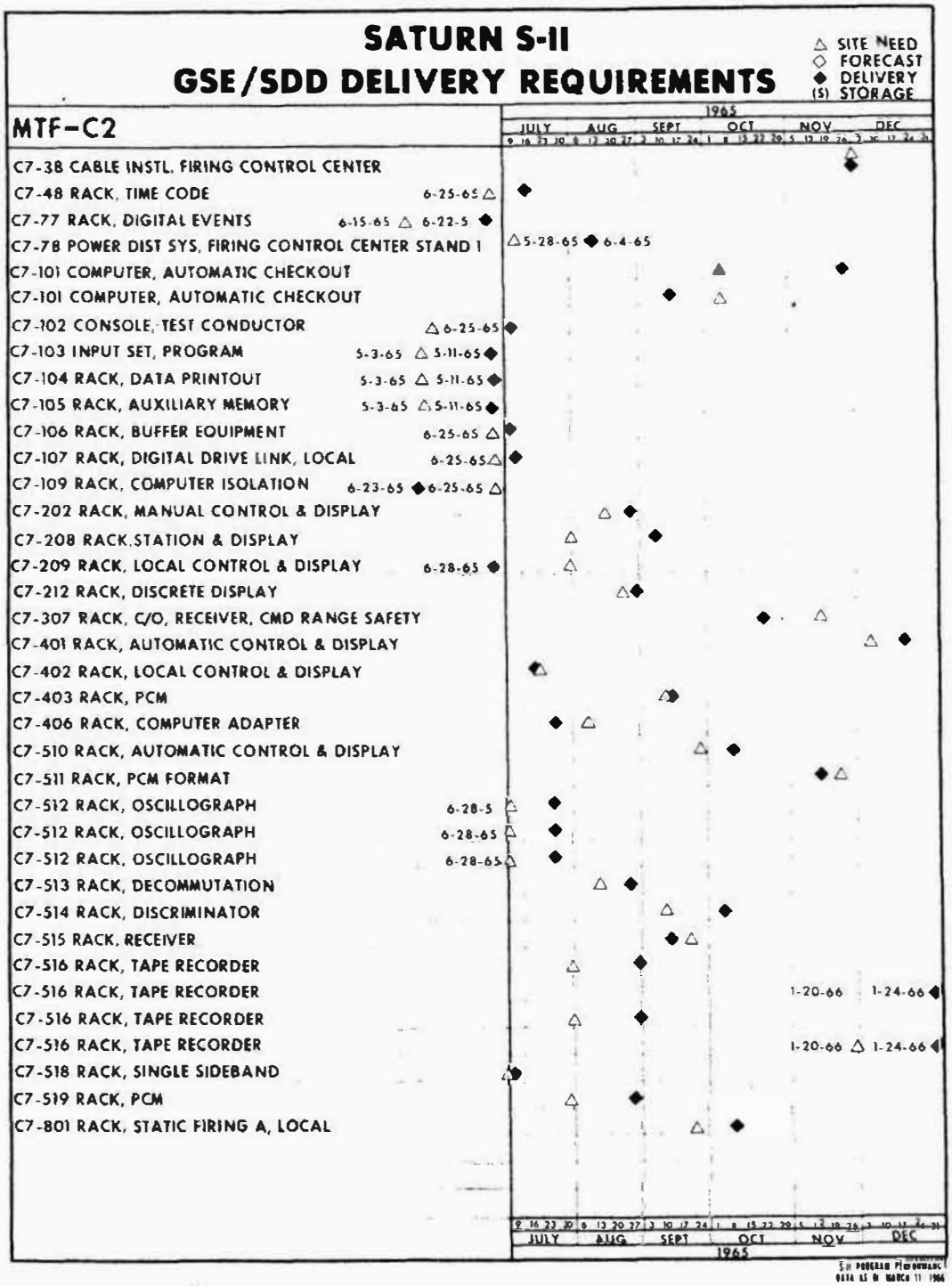
SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED
PAGE 3 OF 3

MTF - A2



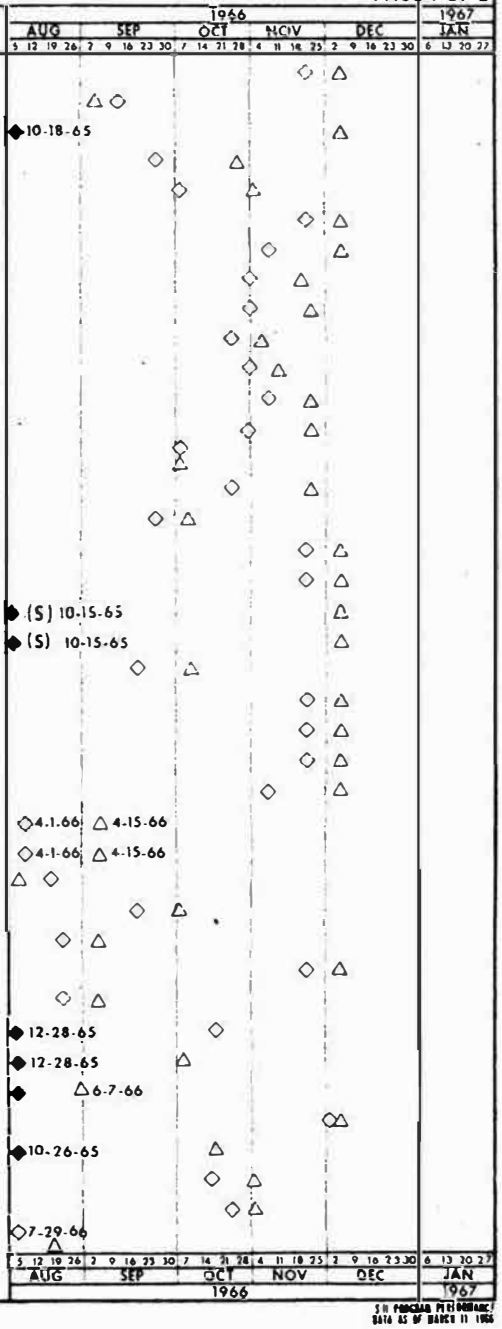
S-II PLANS & PROGRAMMING
DATA AS OF MARCH 11, 1963



SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERY
S STORAGE

MTF A1

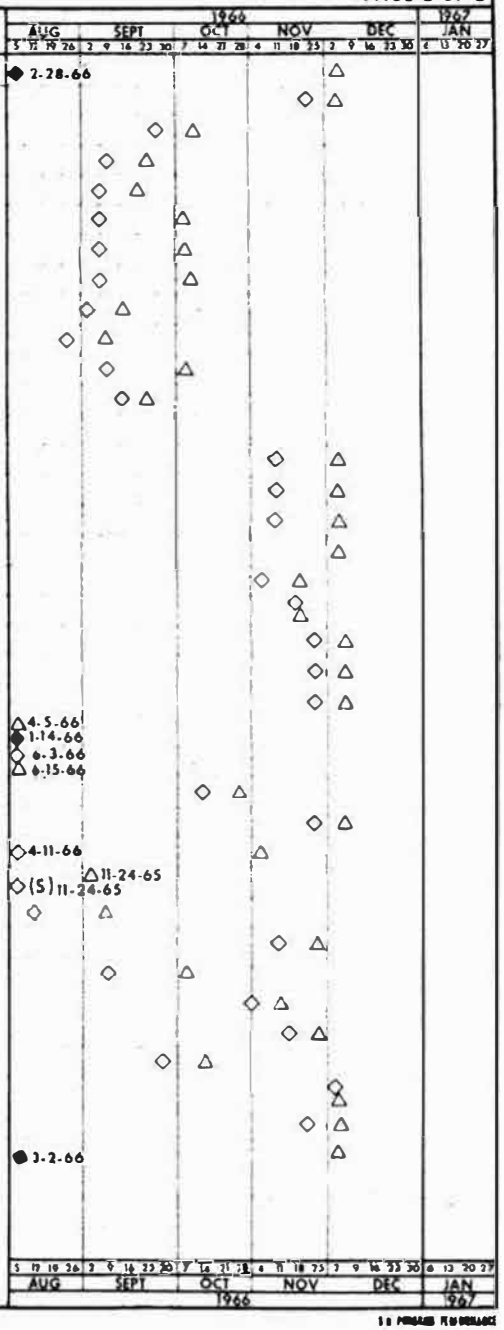


S II PROGRAM PERFORMANCE
DATA AS OF MARCH 11 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERY
(S) STORAGE
PAGE 2 OF 2

MTF A1



C7-84 CALIBRATION UNIT, PROPELLANT UTILIZATION
C7-92 HARNESS SET, ELECT STAGE BATTERY SIMULATION
C7-108 RACK, DIGITAL DRIVE LINK, REMOTE
C7-201 RACK, AUTOMATIC CONTROL
C7-204 RACK, SIGNAL DISTRIBUTION
C7-205 RACK, SPECIAL DATA
C7-210 RACK, STAGE SUBSTITUTES
C7-211 RACK SCANNING
C7-213 RACK, RELAY INTERLOCK
C7-603 CONSOLE SET, PNEUMATIC C/O
C7-802 RACK, STATIC FIRING A, REMOTE
C7-805 RACK ENGINE CUT OFF
H7-20 SIMULATOR, ACTUATOR, ENGINE
H7-20 SIMULATOR, ACTUATOR, ENGINE
H7-20 SIMULATOR ACTUATOR ENGINE
H7-20 SIMULATOR ACTUATOR, ENGINE
H7-29 ADAPTER SET, TAG LINES
H7-79 BRACKET SET, STAGE GUIDE
H7-94 ADAPTER, VERTICAL INSTL CENTER ENGINE
H7-95 ADAPTER, VERTICAL INSTL OUTBOARD ENGINE
H7-99 HANDLE ACCESS COVER, LH_2 TANK 10 UNITS
S7-29 PUMP, VACUUM, STATIONARY
S7-33 FLUID DISTRIBUTION SYS. ACCEPTANCE STAND 2
S7-34 AIR SERVICING UNIT, CONTAINER ACCUMULATOR
S7-38 SERVICING UNIT PREGHARGE HYDRAULIC CONTROL
S7-40 SERVICING UNIT, NITROGEN PURGE & THERMAL
S7-41 CONSOLE SET S-II PNEUMATIC
S7-42 CONSOLE, PNEUMATIC SERVICING ELECTRICAL
S7-45 CONSOLE INSULATION PURGE PNEUMATIC CONTROL
S7-49 PURGE UNIT, J-2 ENGINE
SDD 235 IGNITION SYS BSF GH_2 BURN OFF
SOD-240 REGULATION UNIT, GH_2 BURN OFF
SDD-254 FLAME DETECTION & LOGIC
SDD-258 PLATFORM, LOX TANK ACCESS
SDD-259 ACCESS KIT, LOX TANK INTERNAL
SDD 260 COVER, LN LOX TANK INTERNAL PROTECTIVE

S-II PURCHASED FLIGHT HARDWARE
Data as of March 11, 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◌ FORECAST
◆ DELIVERY
(S) STORAGE

MTF C1

1966

APRIL 1 8 15 22 29 | MAY 6 13 20 27 | JUN 3 10 17 24 | JUL 1 8 15 22 29 | AUG 5 12 19 26 | SEPT 2 9 16 23

C7-48 RACK, TIME CODE	
C7-77 RACK, DIGITAL EVENTS	
C7-79 POWER DISTR SYS ,FIRING CONTROL NO2 STAND	
C7-101 COMPUTER AUTOMATIC C/O	
C7 102 CONSOLE, TEST CONDUCTOR	
C7-103 INPUT SET PROGRAM	◆ 9-10-65
C7-104 RACK,DATA PRINTOUT	◆ 9-10-65
C7-105RACK AUXILIARY MEMORY	◆ 9-10-65
C7-106 RACK,BUFFER EQUIPMENT	
C7-107 RACK, DIGITAL DRIVE LINK LOCAL	
C7-109 RACK, COMPUTER ISOLATION	◌ 3-25-66
C7-202 RACK MANUAL CONTROL & DISPLAY	
C7-208 RACK, STATION CONTROL A & DISPLAY	
C7-209 RACK, LOCAL CONTROL & DISPLAY	◆ 2-17-66
C7-212 RACK, DISCRETE DISPLAY	
C7-307 RACK,C O,RECEIVER,COMMAND RANGE SAFETY	
C7-401 RACK,AUTOMATIC CONTROL & DISPLAY	
C7-402 RACK, LOCAL CONTROL & DISPLAY	◆ 2-5-66
C7-403 RACK, PCM	
C7-406 RACK,COMPUTER ADAPTER	
C7-510 RACK AUTOMATIC CONTROL & DISPLAY	
C7-511 RACK,PCM FORMAT	◆ 2-17-66
C7-512 RACK, OSCILLOGRAPH	
C7-S12 RACK, OSCILLOGRAPH	
C7-512 RACK, OSCILLOGRAPH	
C7-513 RACK, DECOMMUTATION	
C7-514 RACK DISCRIMINATOR	
C7-515 RACK RECEIVER	
C7-516 RACK,TAPE RECORDER	◆ 3-1-66
C7-516 RACK, TAPE RECORDER	◆ 3-1-66
C7-518 RACK, SINGLE SIDEBAND	
C7-519 RACK, PCM	
C7-801 RACK, STATIC FIRING A, LOCAL	

1 8 15 22 29 | 6 13 20 27 | 3 10 17 24 | 1 8 15 22 29 | 5 12 19 26 | 2 9 16 23
APRIL | MAY | JUN | JUL | AUG | SEPT
1966

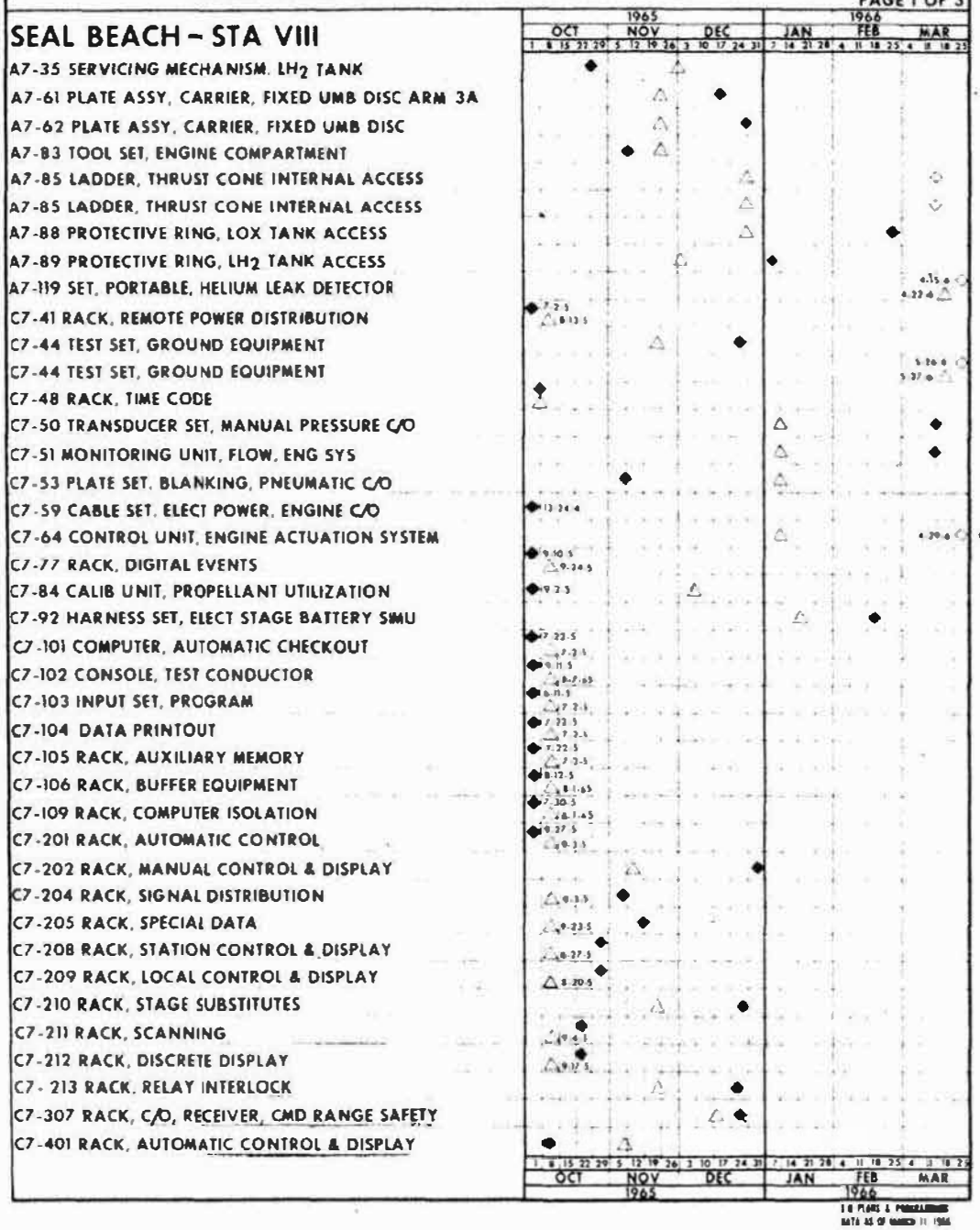
S-II PROGRAM PERFORMANCE
DATE AS OF MARCH 15 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED

PAGE 1 OF 3

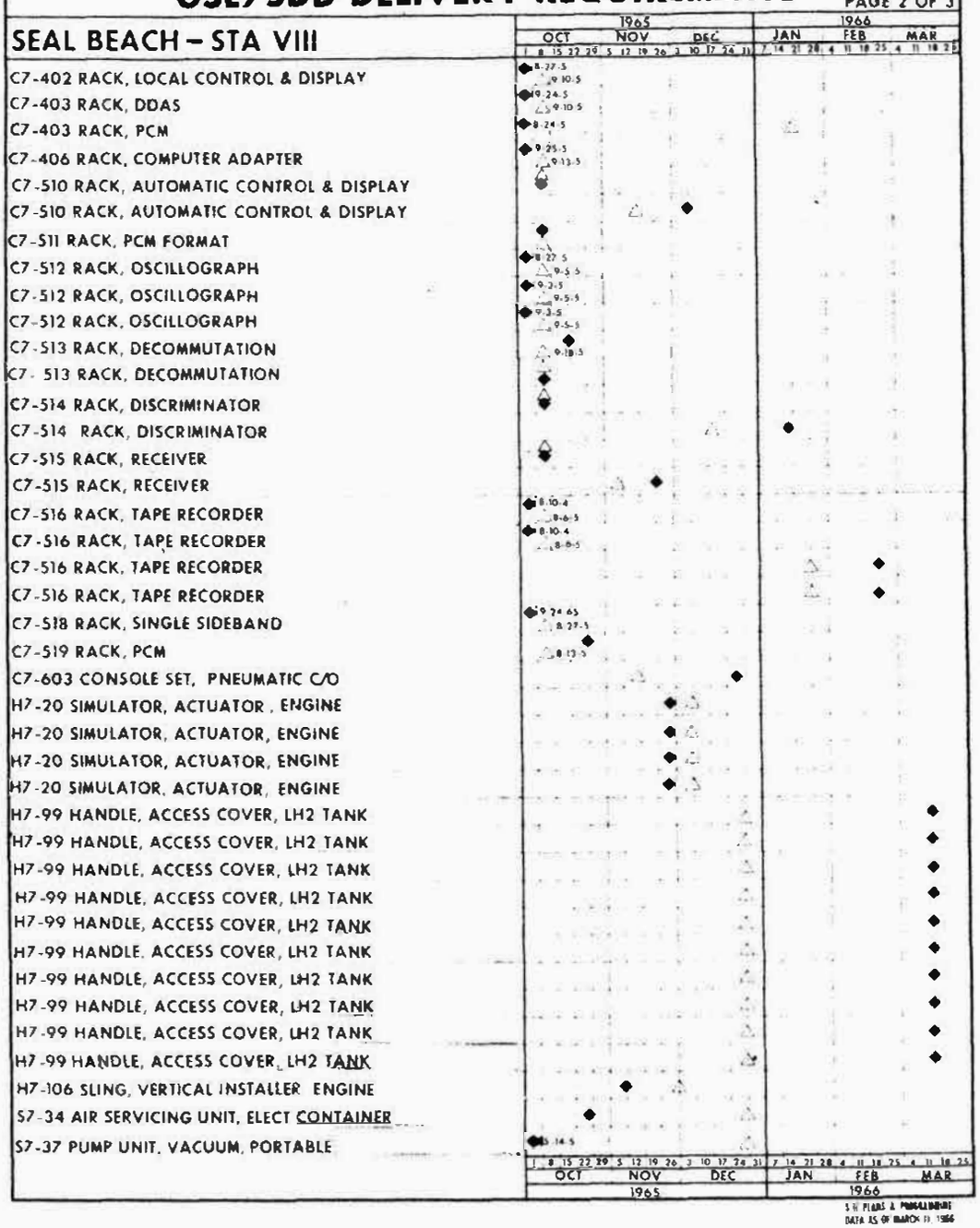
SEAL BEACH – STA VIII



SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED
PAGE 2 OF 3

SEAL BEACH – STA VIII

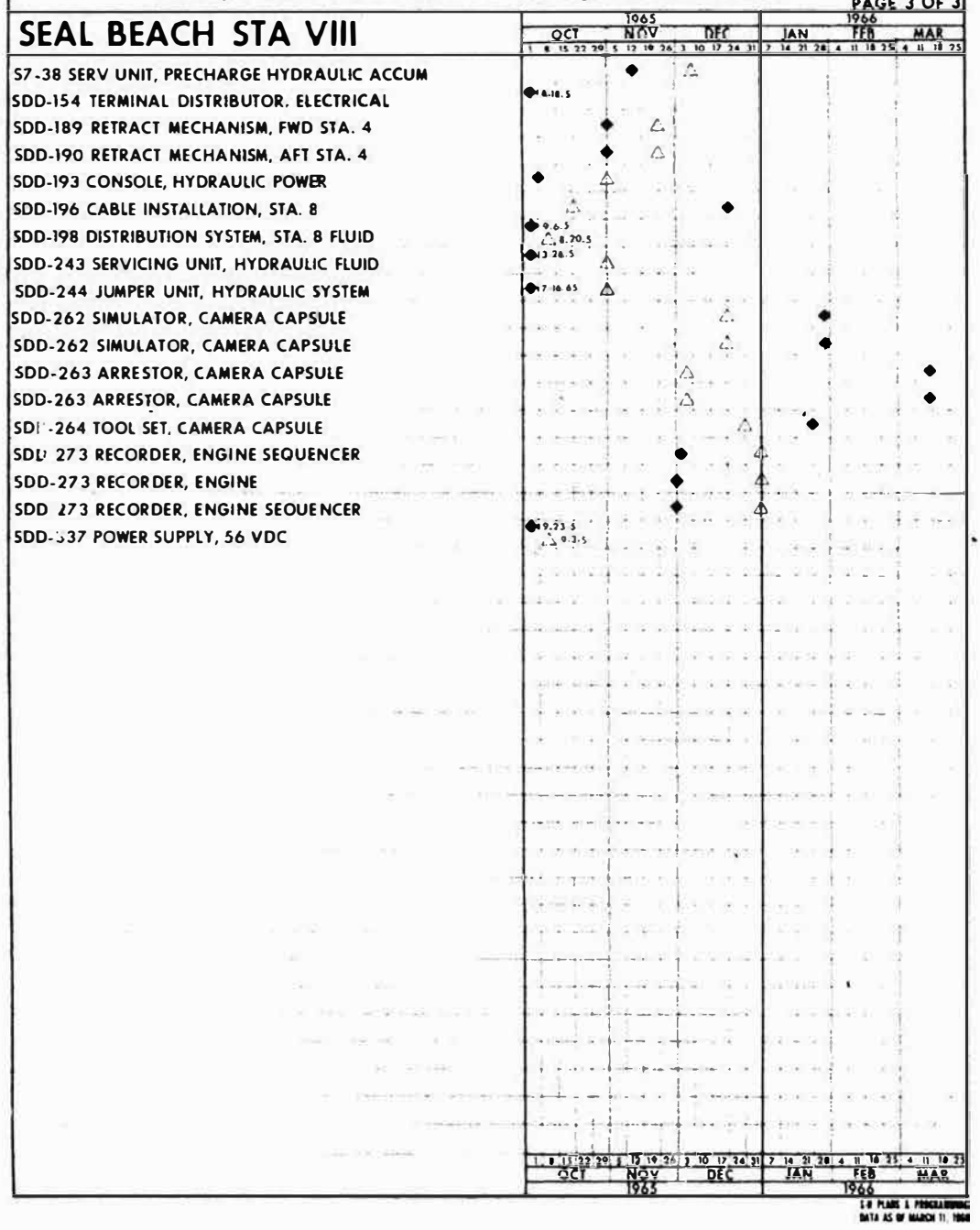


S-II PLANS & PROGRAMS
DATA AS OF MARCH 11, 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED

SEAL BEACH STA VIII

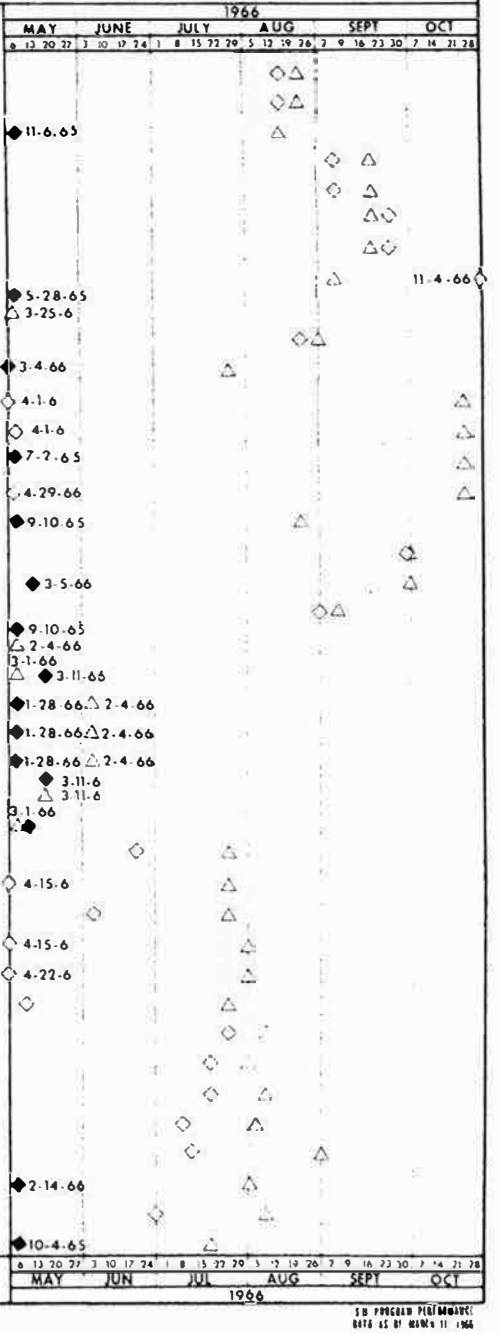


L-8 PLANS & PROGRAMMING
DATA AS OF MARCH 11, 1966

SATURN S-II
GSE/SDD DELIVERY REQUIRMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERY
(S) STORAGE
PAGE 1 OF 2

SEAL BEACH STA IX



SID PROGRAM PERFORMANCE
DATA AS OF MARCH 11 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERY
(S) STORAGE

SEAL BEACH STA IX

1966 — MAR | APRIL | MAY | JUNE | JULY | AUG

C7-406 RACK, COMPUTER ADAPTER	
C7-510 RACK, AUTOMATIC CONTROL & DISPLAY	
C7-511 RACK, PCM FORMAT	
C7-512 RACK, OSCILLOGRAPH	
C7-512 RACK, OSCILLOGRAPH	
C7-512 RACK, OSCILLOGRAPH	
C7-513 RACK, DECOMMUTATION	
C7-514 RACK, DISCRIMINATOR	
C7-515 RACK, RECEIVER	
C7-516 RACK, TAPE RECORDER	◆ 2-9-66
C7-516 RACK, TAPE RECORDER	◆ 2-9-66
C7-518 RACK, SINGLE SIDEBAND	
C7-519 RACK, PCM	
C7-603 CONSOLE SET, PNEUMATIC CHECKOUT	
H7-20 SIMULATOR, ACTUATOR	8-26-66 ◇ 9-2-66 △
H7-99 HANDLE, ACCESS COVER, LH_2 TANK	9-2-66 △ 9-9-66 ◇
S7-34 AIR SERV UNIT, ELECT CONTAINER	
S7-37 PUMP UNIT, VACUUM, PORTABLE	◆ 11-8-65
S7-38 SERV UNIT, PRECHARGE HYDRAULIC ACCUM	◆ 11-8-65
SDD-151 HEADSET INTERCOMMUNICATION	◆ 8-13-65
SDD-152 HEADSET, INTERCOMMUNICATION, PROTECTIVE	◆ 7-2-65
SDD-154 TERMINAL DISTRIBUTOR ELECTRICAL	◆ △ 2-18-66
SDD-189 RETRACT MECHANISM, FWD STA IV	
SDD-190 RETRACT MECHANISM AFT STA IV	
SDD-193 CONSOLE, HYDRAULIC POWER	◆ 8-27-65
SDD-197 CABLE INSTALLATION, STA IX	
SDD-199 DISTRIBUTION SYSTEM	◆ 1-14-66
SDD-239 ADAPTER, AFT HOISTING FRAME 65T	9-23-66 ◇ 9-30-66 △
SDD-243 SERVICING UNIT, HYDRAULIC FLUID	
SDD-244 JUMPER UNIT, HYDRAULIC SYSTEM	
SDD-264 TOOL SET, CAMERA CAPSULE	◆ 1-21-66
SDD-273 RECORDER, ENGINE SEQUENCER	◆ 11-20-65
SDD-273 ENGRG SEQUENCE RECORDER	◆ 11-26-65
SDD-273 RECORDER, ENGINE SEQUENCER	◆ 11-29-65
SDD-337 POWER SUPPLY, 56 VDC	◆ 1-27-66 9-1-66 △

MAR | APRIL | MAY | JUNE | JULY | AUG
1966

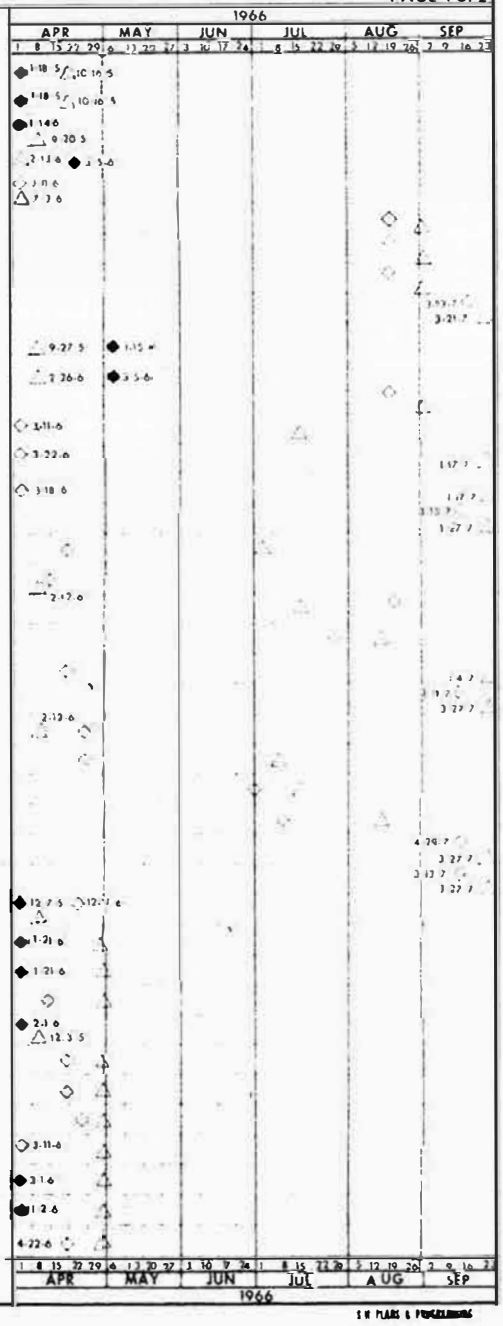
S-II PROGRAM PLAN SCHEDULE
DATA AS OF MARCH 11, 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED
PAGE 1 OF 2

MSFC

A7-36 INDICATOR, PUMP SHAFT SEAL VISUAL LEAKAGE
A7-36 INDICATOR, PUMP SHAFT SEAL VISUAL LEAKAGE
A7-41 PLATE ASSY, CARRIER, UMB DISC ARM 3A
A7-41 PLATE ASSY, CARRIER, UMB DISC ARM 3A
A7-41 PLATE ASSY, CARRIER, UMB DISC ARM 3A
A7-41 PLATE ASSY, CARRIER, UMB DISC ARM 3A
A7-41 PLATE ASSY, CARRIER, UMB DISC ARM 3A
A7-41 PLATE ASSY, CARRIER, UMB DISC ARM 3A
A7-41 PLATE ASSY, CARRIER, UMB DISC ARM 3A
A7-42 PLATE ASSY, CARRIER, UMB DISC ARM 4
A7-42 PLATE ASSY, CARRIER, UMB DISC ARM 4
A7-42 PLATE ASSY, CARRIER, UMB DISC ARM 4
A7-42 PLATE ASSY, CARRIER, UMB DISC ARM 4
A7-42 PLATE ASSY, CARRIER, UMB DISC ARM 4
A7-42 PLATE ASSY, CARRIER, UMB DISC ARM 4
A7-42 PLATE ASSY, CARRIER, UMB DISC ARM 4
A7-64 DISCONNECT, LH_2 FILL
A7-64 DISCONNECT, LH_2 FILL
A7-64 DISCONNECT, LH_2 FILL
A7-64 DISCONNECT, LH_2 FILL
A7-64 DISCONNECT, LH_2 FILL
A7-64 DISCONNECT, LH2 FILL
A7-65 DISCONNECT, LOX FILL
A7-65 DISCONNECT, LOX FILL
A7-65 DISCONNECT, LOX FILL
A7-65 DISCONNECT, LOX FILL
A7-65 DISCONNECT, LOX FILL
A7-65 DISCONNECT, LOX FILL
A7-71 HEAT EXCHANGER, S-II LH2 H7-3-3
A7-85 LADDER, THRUST CONE INTERNAL ACCESS
A7-85 LADDER, THRUST CONE INTERNAL ACCESS
A7-91 FWD BULKHEAD PROTECTION SET
C7-70 TEST SET, S-II PNEUMATIC CONSOLE
H7-3 RING, AFT, STAGE SUPPORT
H7-21 SKIRT, STATIC FIRING
H7-25 FRAME, HOISTING, AFT
H7-28 SLING, RING SEGMENT, SUPPORT
H7-29 ADAPTER SET, TAG LINES
H7-30 SLING, INTERSTAGE & STATIC FIRING SKIRT
H7-83 SLING, TRANSPORTER COMPONENTS

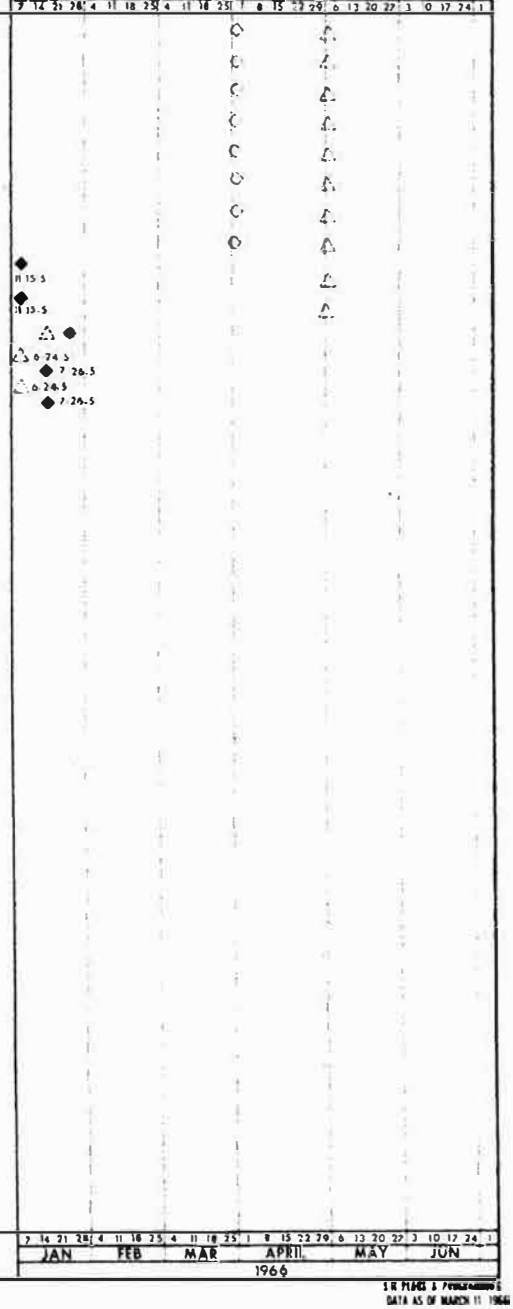


S-II PLANS & PROGRAMS
DATA AS OF MARCH 11, 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

◇ FORECAST
△ SITE NEED
◆ DELIVERED

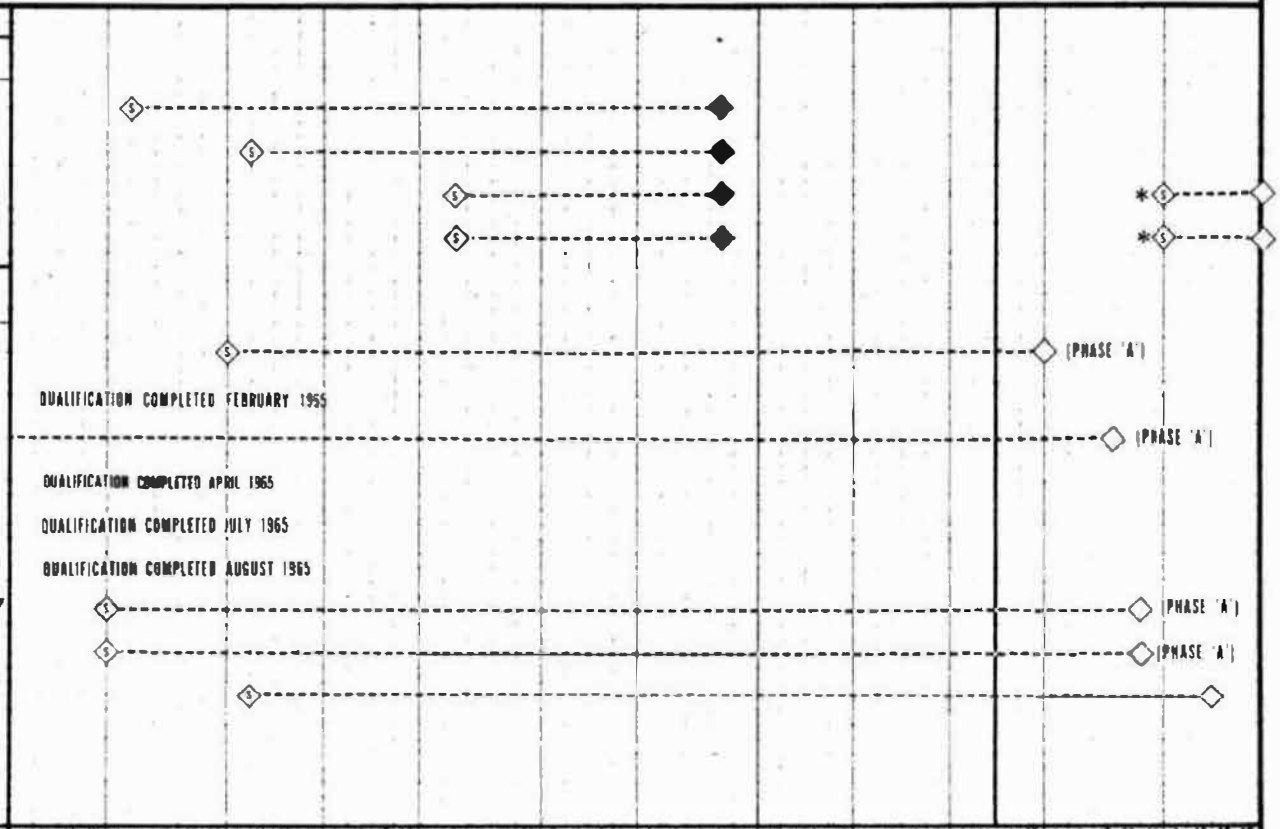
MSFC
H7-99 HANDLE, ACCESS COVER, LH_2 TANK
H7-99 HANDLE, ACCESS COVER, LH2 TANK
H7-99 HANDLE, ACCESS COVER , LH_2 TANK
H7-99 HANDLE, ACCESS COVER, LH_2 TANK
H7-99 HANDLE, ACCESS COVER, LH_2 TANK
H7-99 HANDLE, ACCESS COVER, LH_2 TANK
H7-99 HANDLE , ACCESS COVER, LH_2 TANK
H7-99 HANDLE, ACCESS COVER, LH_2 TANK
H7-113 ADAPTER, AFT HOISTING FRAME 200T
H7-114 ADAPTER, STAGE ERECTING SLING 200T
S7-41 CONSOLE SET, S-II PNEUMATIC
SDD-183 CARRIER PLATE, ARM NO. 3A BSF
SDD-184 CARRIER PLATE, ARM NO. 4 BSF



DATA AS OF MARCH 11 1966

SATURN S-II
UMBILICAL DISCONNECT MOD CO#84 - QUAL TESTS

MODEL	NAME
SYSTEMS QUAL TEST	
A7-41	AFT UMBILICAL CARRIER PLATE
A7-42	FWD UMBILICAL CARRIER PLATE
A7-64	LH_2 PROPELLANT DISC
A7-65	LOX PROPELLANT DISC
COMPONENTS TEST	
HELIUM DISC VALVE MC 144-0010	
INERTING DISC MC 273-0016	
LH_2 VENT VALVE MC 144-0011	
UMB CONNECTOR MC 414-0055	
ELECT CONNECTOR MC 414-0518	
H_E DISC COUPLING MC 273-0055	
LH_2 TANK VENT DISC MC 273-0017	
HELIUM FILL DISC MC 273-0013	
PROP FILL DISC MC 144-0005	

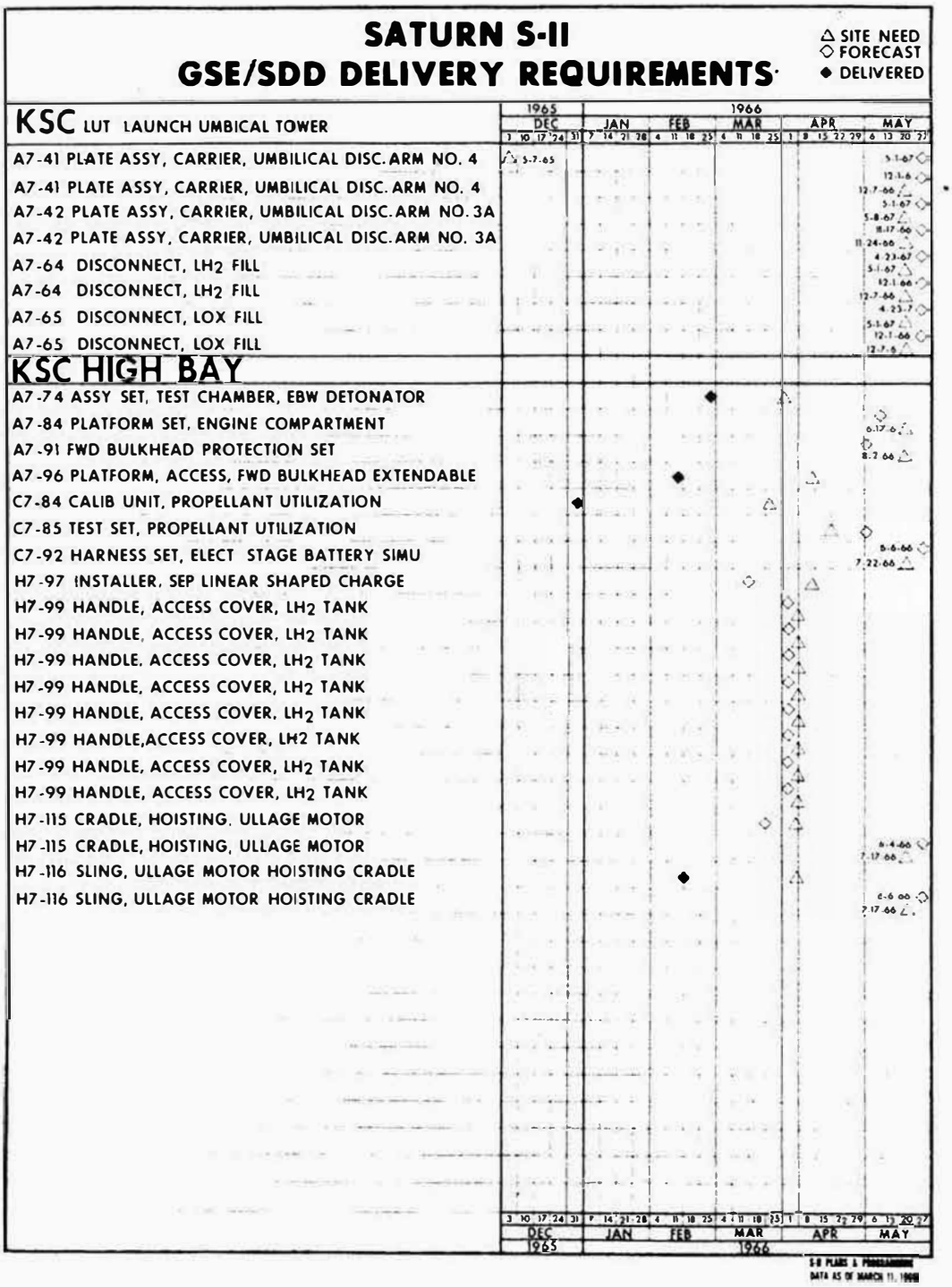


LEGEND
◇ START OF QUAL TEST *◇ FOLLOW-ON QUAL TESTS
◇ TEST COMPL FORECAST (PHASE A)

S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED

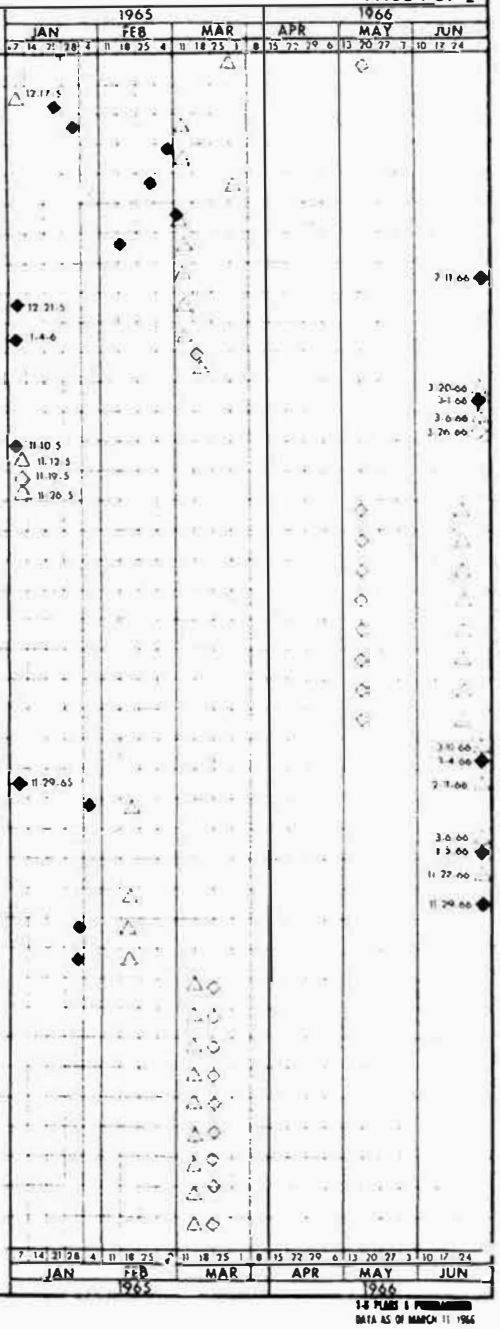


S-II PLANS & PROGRAMMING
DATA AS OF MARCH 11, 1966

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED
PAGE 1 OF 2

KSC–LOW BAY



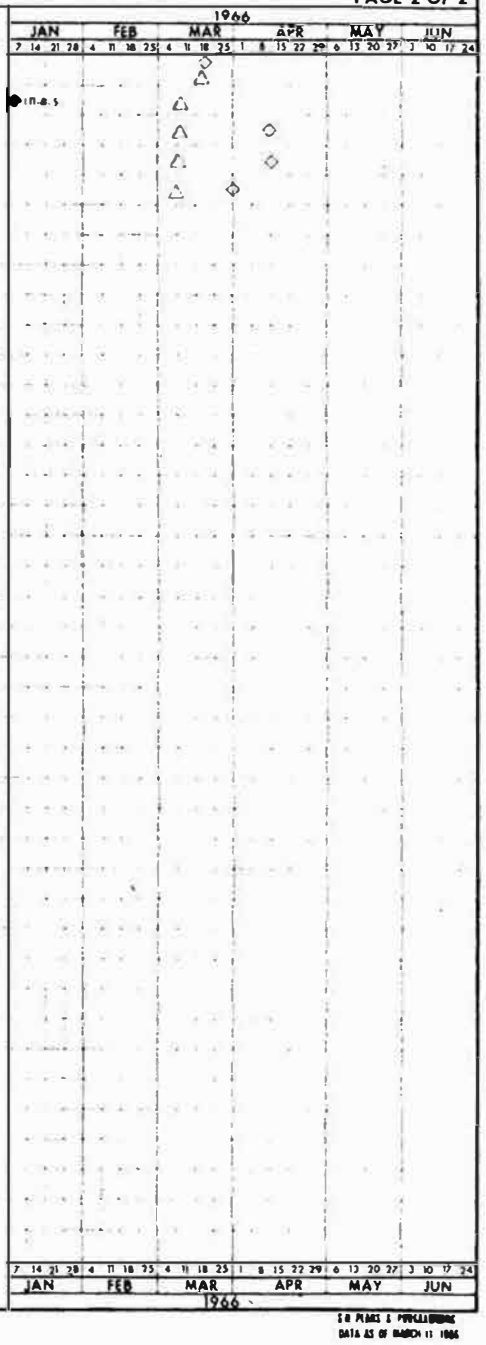
- A7-35 SERVICING MECHANISM LH_2 TANK
- A7-39 CLEAN ROOM, LH_2 TANK
- A7-40 ADAPTER SET, AIR CONDITIONER, TANK SERVICING
- A7-59 COVER, SERVICING MECHANISM LH_2 TANK
- A7-83 ADAPTER SET-TAG LINES
- A7-84 SLING, TRANSPORTER COMPONENTS
- A7-85 SLING, TRANSPORTER COMPONENTS
- A7-85 SLING , TRANSPORTER COMPONENTS
- A7-88 PROTECTIVE RING, LOX TANK ACCESS
- A7-89 PROTECTIVE RING, LH_2 TANK ACCESS
- A7-91 FWD BULKHEAD PROTECTION SET
- A7-116 PLATFORM, ENGINE COMPARTMENT CENTER
- A7-119 SET, PORTABLE HELIUM LEAK DETECTOR
- C7-84 CALIBRATION UNIT, PROPELLANT UTILIZATION
- H7-8 DOLLY, AFT INTERSTAGE
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-20 SIMULATOR, ACTUATOR
- H7-25 FRAME, HOISTING, AFT
- H7-27 SLING, INTERSTAGE & STATIC FIRING SKT SEG
- H7-28 SLING,RING SEGMENT, SUPPORT
- H7-29 ADAPTER SET, TAG LINES
- H7-30 SLING, INTERSTAGE & STATIC FIRING SKIRT
- H7-83 SLING, TRANSPORTER COMPONENTS
- H7-94 ADAPTER, VERTICAL INSTL CENTER ENGINE
- H7-95 ADAPTER, VERTICAL INSTL OUTBOARD ENG
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK
- H7-99 HANDLE, ACCESS COVER, LH_2 TANK

SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED
PAGE 2 OF 2

KSC-LOW BAY

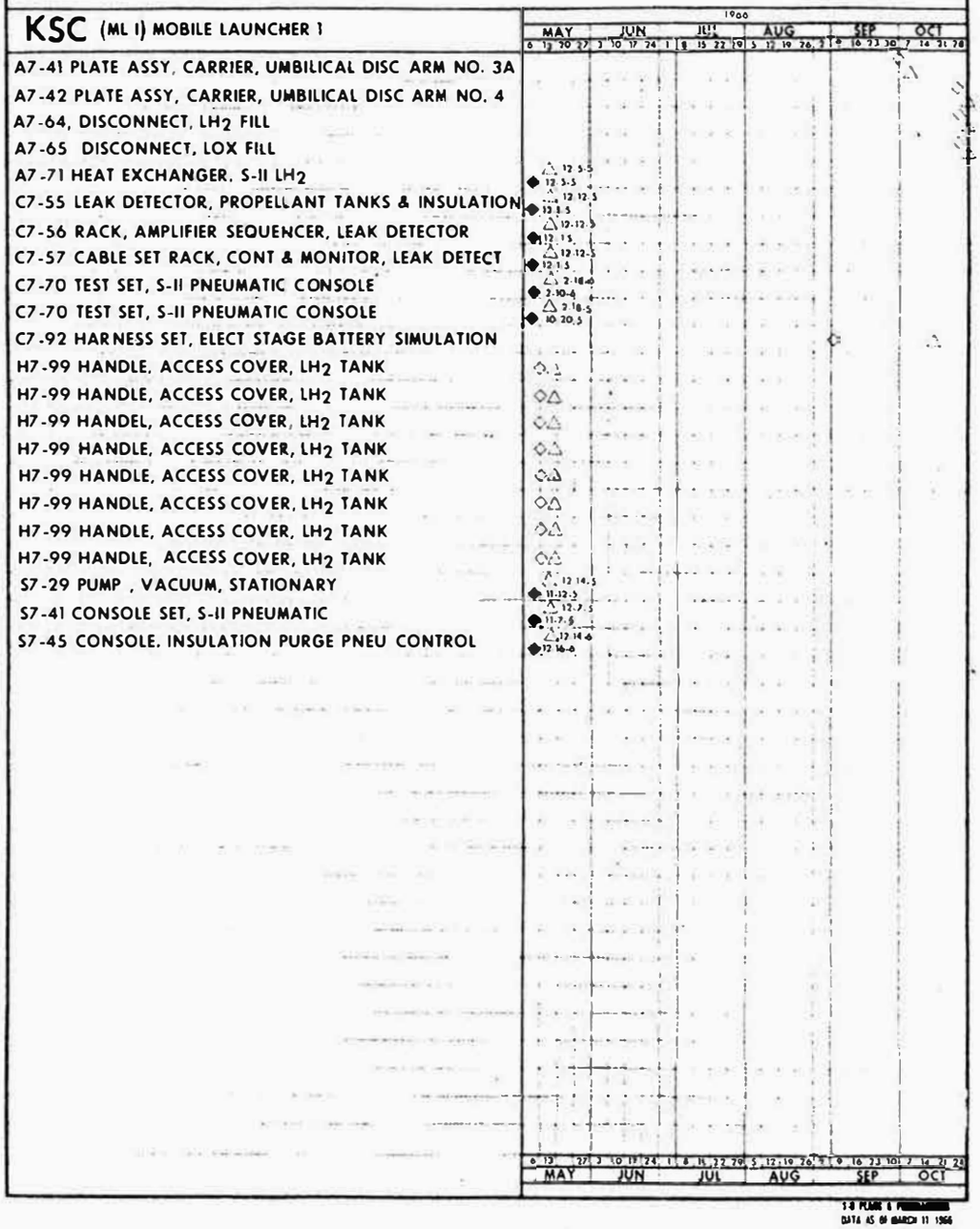
H7-99 HANDLE, ACCESS COVER, LH_2 TANK
S7-29 PUMP, VACUUM, STATIONARY
SDD-258 LOX TANK, ACCESS LADDER
SDD-259 LOX TANK, INTERNAL SERV PLATFORM SET
SDD-260 LOX TANK, INTERNAL PROTECTIVE COVER



SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED

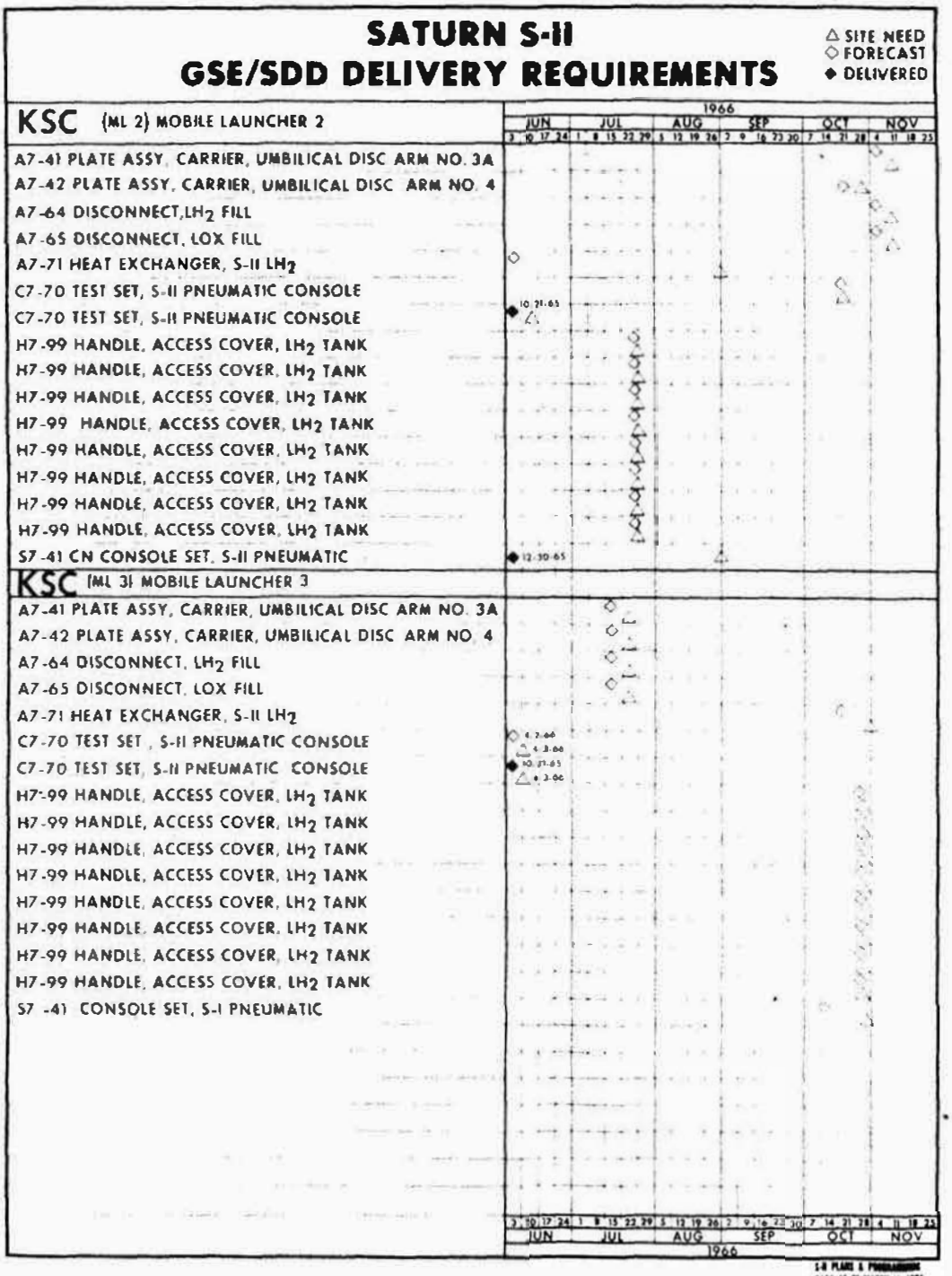
KSC (ML I) MOBILE LAUNCHER 1



DATA AS OF MARCH 11 1966

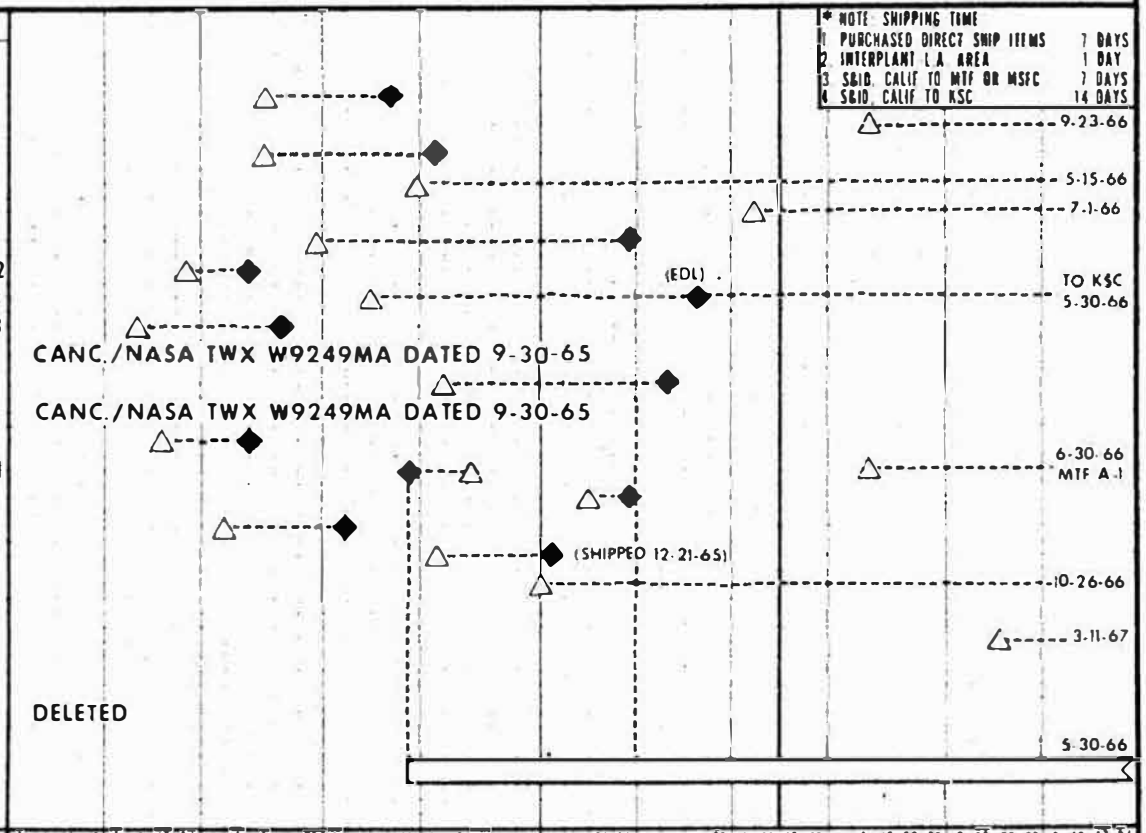
SATURN S-II
GSE/SDD DELIVERY REQUIREMENTS

△ SITE NEED
◇ FORECAST
◆ DELIVERED



SATURN S-II
CHANGE ORDER NO. 88

MODEL	NAME	SERIAL	USE
PNEUMATIC EQUIPMENT			
A7-71	HEAT EXCHANGER, LH_2 (PURCH'D)	001	MTF-A2
		003	MTF-A1
		004	KSC#1
		005	KSC#2
		006	KSC#3
		007	B/S
C7-70	PNEUMATIC CONSOLE TEST SET	001	MTF-A1/A2
		002	KSC#1,2,3
		003	KSC#1,2,3
		004	
		005	MSFC
		006	
S7-41	PNEUMATIC CONSOLE SET	001	MTF-A2
		002	TE/MTF-A1
		003	MSFC
		004	KSC#1
		005	KSC#2
		006	KSC#3
S7-42	PNEUMATIC SERV ELECT CONSOLE	001	MTF-A2
		003	MTF-A1
DESIGN VERIFICATION TESTS			
A7-71	HEAT EXCHANGER, LH_2 (PURCH'D)	003	MTF-A1
S7-41	PNEUMATIC CONSOLE SET	002	MTF-A1

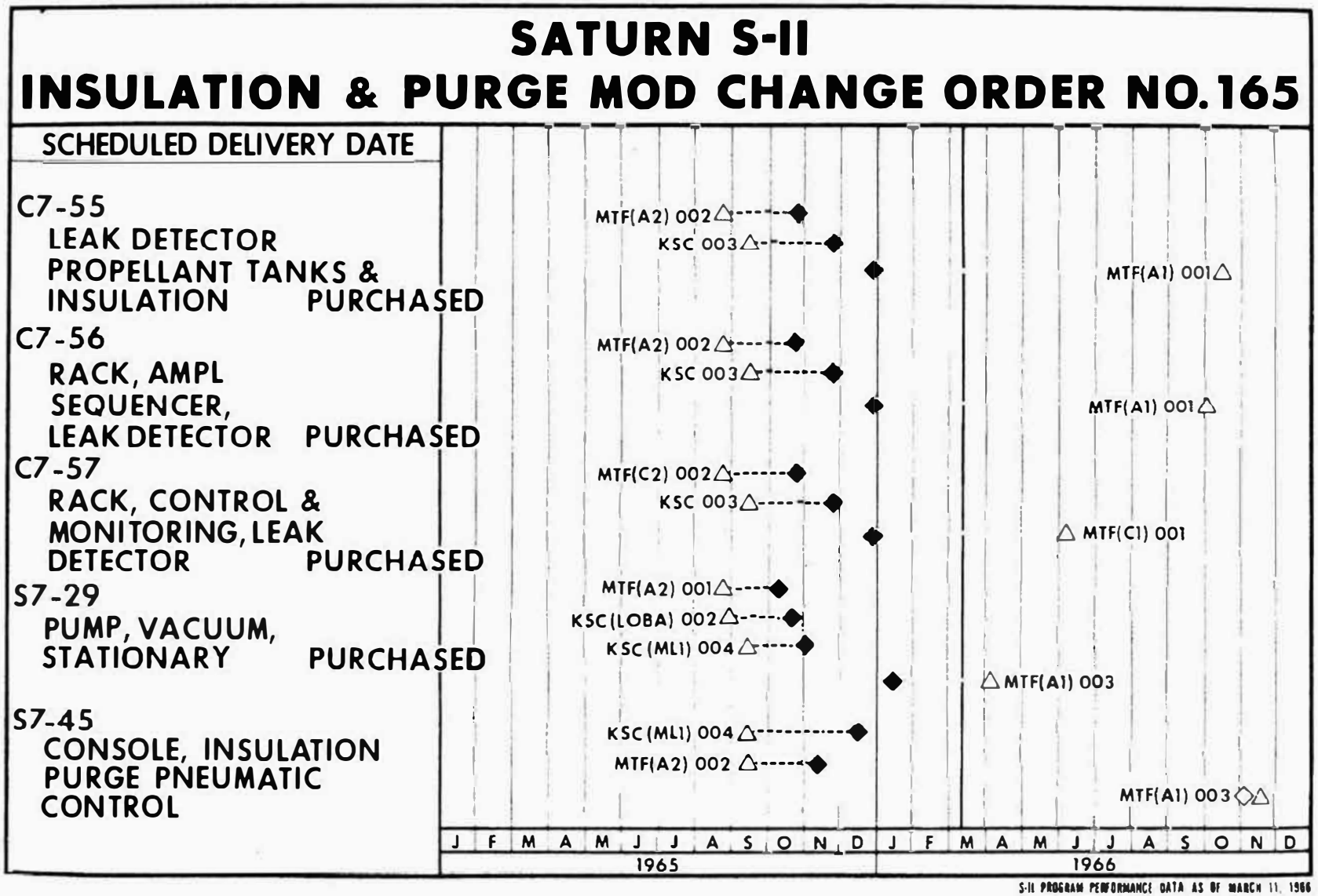


△ SITE NEED McMILLAN TO PARKER JL 1-CO2 62 L 65 SEPTEMBER 3, 1965

◇ ESTIMATE SITE DELIVERY

S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

SATURN S-II
INSULATION & PURGE MOD CHANGE ORDER NO. 165



S-II PROGRAM PERFORMANCE DATA AS OF MARCH 11, 1966

RELIABILITY

MAJOR DESIGN REVIEW

The S&ID design review program assures that the intended design meets specified functional and reliability goals, that no discernible weakness exists that will affect reliability of the product, and that a sound basis exists for proceeding to the next program milestone.

Design review makes a great number of technical and operational skills available to the design engineer. This review neither infringes upon nor usurps the designer's responsibility for the integrity and reliability of his design. As standard procedure, design guidance data are furnished to all designers by participating activities to facilitate conformance to review objectives and make reviews less time-consuming.

Major design review is conducted prior to 100-percent design release and includes an evaluation of engineering test results and manufacturing and quality plans. In addition, a detailed evaluation is made of all aspects of the design, including handling, packaging, and installation requirements. Assembly and detail drawings, detailed checklists, failure mode analyses, and prediction analyses are reviewed to ensure compatibility with GSE and interface requirements with the S-IC and S-IVB stages.

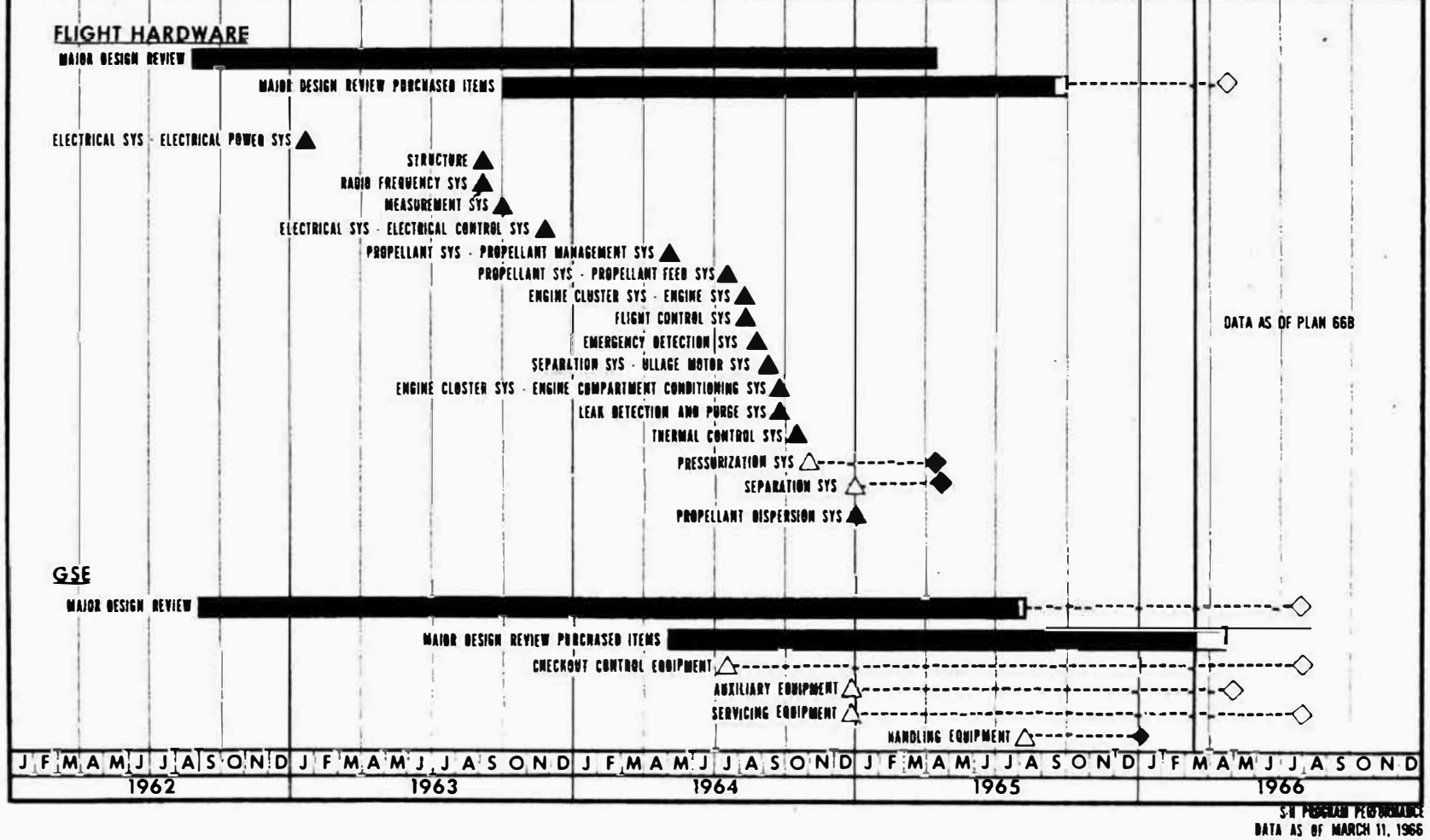
The Saturn S-II reliability program includes design analysis, the confidence development plan, application approval of R&D hardware, design review, and manufacturing control levels (operational assurance of flight hardware). The reliability program emphasizes preventive measures to achieve reliability and man-rating objectives.

Several hundred documents have been written or approved to date, and requisite analyses have been performed. The milestones completed include initial studies and reviews of the mathematical model (reliability prediction and assessment), failure mode analyses, design reviews, procurement specifications, pretest analyses, and data management procedures.

Illustrated in the following chart are the S&ID achievements in S-II major design reviews of flight hardware by systems and including associated GSE. The GSE major design review activity reflects a change in completion due to added, changed, and rescheduled GSE end items. As of 11 March 1966, the last pacing item is the design review of GSE end items for Test Stand A-1 at MTF.

160 4a

SATURN S-II
RELIABILITY MAJOR DESIGN REVIEWS



S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

CONFIDENCE DEVELOPMENT PLAN

The confidence development program provides an integrated reliability development and demonstration program to assure that all Saturn S-II stages and associated GSE will adhere to mission reliability requirements. The plan is designed to reveal all areas of weakness early in the program and provide for prompt corrective action at reasonable cost.

Three confidence level milestones have been established for each phase of application approval testing:

	1	2	3
Components	Battleship static firing	S-II-1 hardware installation	S-II-1 launch
Systems	All-Systems static firing	S-II-2 static firing	S-II-1 launch
Stage	S-II-1 static firing	S-II-2 launch	S-II-5 launch

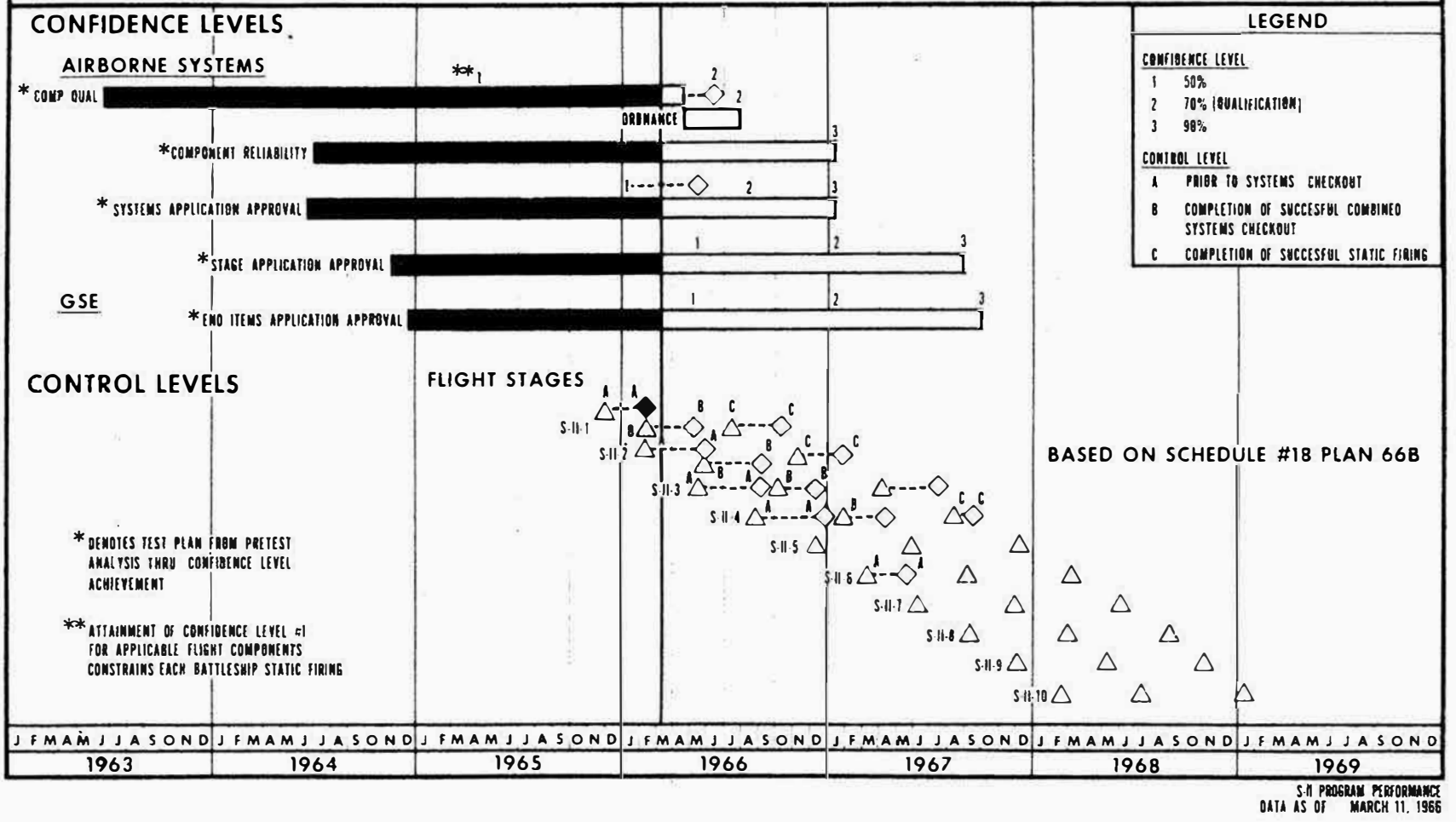
These levels represent increasing assurance that reliability goals are being achieved and signify demonstration of reliability with a confidence of 50 percent, 70 percent, and 90 percent, respectively. Implementation of the application approval program is divided into three primary areas: parts and components, systems, and stage. Further implementation is provided in the area of GSE to achieve reductions in test costs by relating the number of test specimens and the extent of testing to the specific criticality category as it affects the S-II program.

Three control levels have been established as reliability criteria for the operational assurance phase of the confidence development program. These control levels provide progressive assurance that product quality meets reliability requirements throughout the production process. The control levels are:

1. Control Level A, associated with components and assemblies, is the assurance that at a given time an item is acceptable for installation in the next higher assembly.
2. Control Level B, associated with complete airborne systems and stages, is the assurance that at a given time flight systems and the stage are acceptable for delivery to MTF for static firing.
3. Control Level C, associated with production stages, is the assurance that at a given time the stage is acceptable for delivery to KSC for launch operations.

160 4b

SATURN S-II
RELIABILITY CONFIDENCE DEVELOPMENT PLAN (R&D)



S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

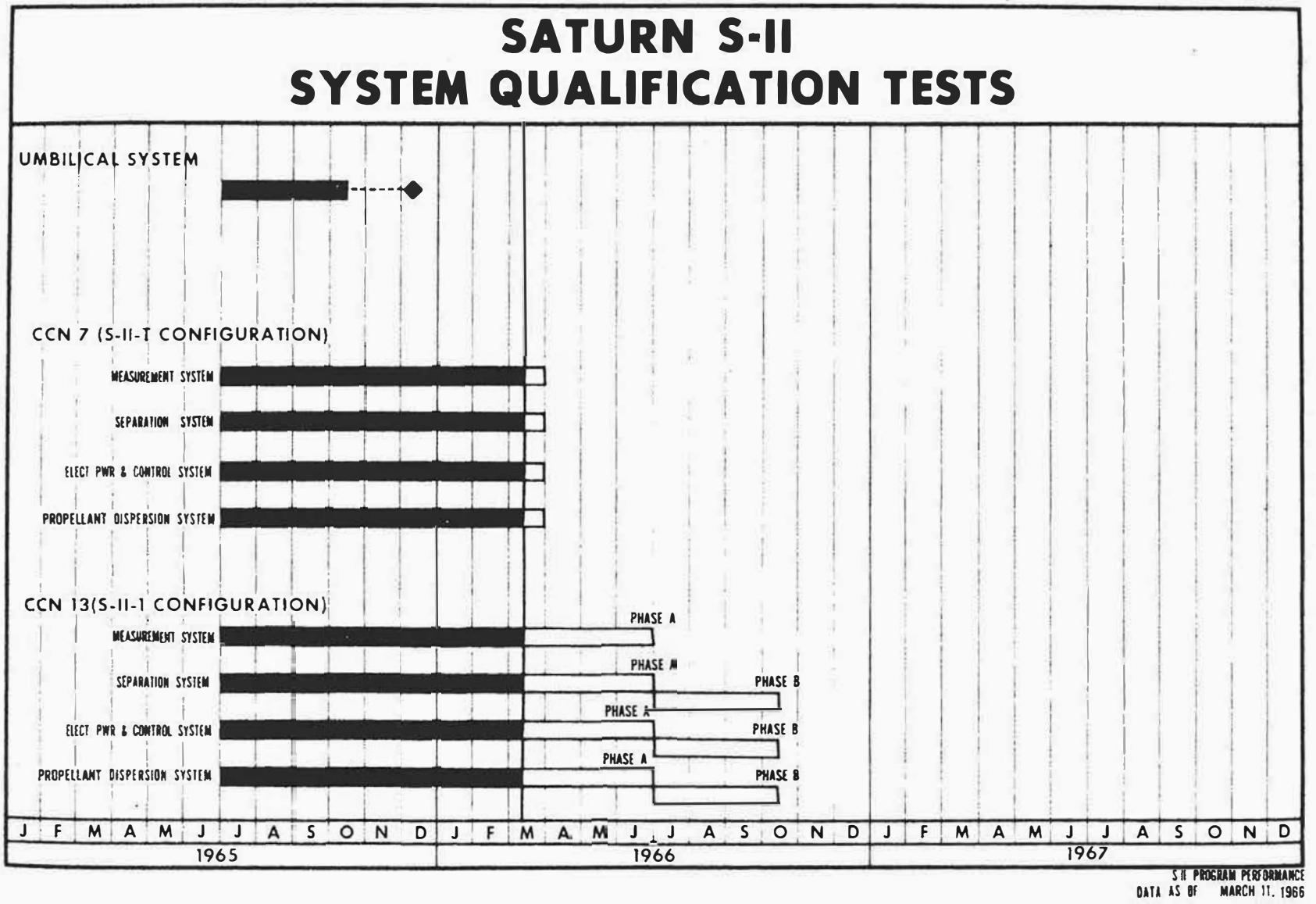
SYSTEM QUALIFICATION TESTS

The system test plans established under the Saturn S-II confidence development program are designed to evaluate the application of subsystems and systems. This program will establish reliability factors, safety margins, and conformance to design criteria, and will provide information necessary to evaluate system interactions under operational conditions. These tests usually will be limited by environmental and functional stress levels associated with the area and method of testing.

The tests used in qualifying S-II systems will consist of subjecting representative specimens repetitively to a preselected combination of environments and functional operations to best simulate the most severe condition which will be experienced during flight. The extent of repetition for each system depends on the rigor of the analysis it will undergo and on other testing planned at the stage level. In some cases, environmental tests may precede repetitive cycling to test the specimen in its anticipated condition at liftoff. In those cases, the environmental exposures will be performed according to the most critical sequence actually anticipated during service. Statements of system performance, output parameters, and out-of-tolerance problems can be made on the basis of the data obtained. In addition, the test provides information on the effects of the environment to which the system is exposed. The test also will provide information concerning the effects of variations in the manufacturing process and data for wearout analysis. This information will be used primarily for reliability assessment.

The data accumulated during this test program will be correlated with the component data obtained during component qualification and reliability tests. With these accrued data, analysis at the component level can be directly related to the system level. Statistical methods also will be used for data analysis. After the reliability demonstration tests, off-limit tests will be conducted to determine safety margins.

The systems qualification test chart illustrates the system-level qualification test programs necessary to attain Saturn S-II airborne system milestones. The schedules associated with these tests support program requirements. Phase A testing establishes minimum assurance of the safety and performance that will be attained prior to first All-Systems stage static firing. Phase B testing establishes qualification that will be attained prior to first S-II-2 static firing. Confidence Level 3 establishes application approval which will be attained prior to S-II-1 launch. The data accumulated from these qualification test programs will be integrated with data obtained from stage-level testing to attain confidence level milestones.


SATURN S-II
SYSTEM QUALIFICATION TESTS
UMBILICAL SYSTEM
CCN 7 (S-II-T CONFIGURATION)
MEASUREMENT SYSTEM
SEPARATION SYSTEM
ELECT PWR & CONTROL SYSTEM
PROPELLANT DISPERSION SYSTEM
CCN 13(S-II-1 CONFIGURATION)
MEASUREMENT SYSTEM
PHASE A
SEPARATION SYSTEM
PHASE A
PHASE B
ELECT PWR & CONTROL SYSTEM
PHASE A
PHASE B
PROPELLANT DISPERSION SYSTEM
PHASE A
PHASE B
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1965
1966
1967
S II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

QUALIFICATION DESIGN VERIFICATION TESTING

All models of GSE classified as critical are analyzed to determine possible requirements for design verification testing (DVT) and qualification testing. In some cases noncritical GSE is analyzed, depending on whether the end function could create a hazard or contribute to degradation of stage servicing, checkout, or launch.

During the GSE design development phase, various engineering tests are required to verify design integrity. Evaluations of component, subsystem, and end item functional capabilities and performance are carried out under actual or simulated operating conditions to demonstrate the ability of the item to support, service, and check out the S-II stage during ground operations. During the initial design of some GSE, many preliminary tests are required to confirm application and operation of selected component and subassembly units.

All models of GSE are investigated for possible DVT requirements. Individual tests are planned for each end item selected, and operating conditions are specified. Structural, proof-loading, performance, radio frequency interference, functional checkout, and various environmental tests are programmed. Coordination with Reliability Engineering is maintained to confirm requirements and procedures and to preclude redundancy during the reliability qualification test program. DVT is planned for production units if schedules allow. Upon completion of all testing, the equipment is refurbished and delivered to using sites. In some cases, prototype units are built by the model shop to support DVT requirements and schedules. Some prototype equipment is scheduled for further use or testing after DVT completion.

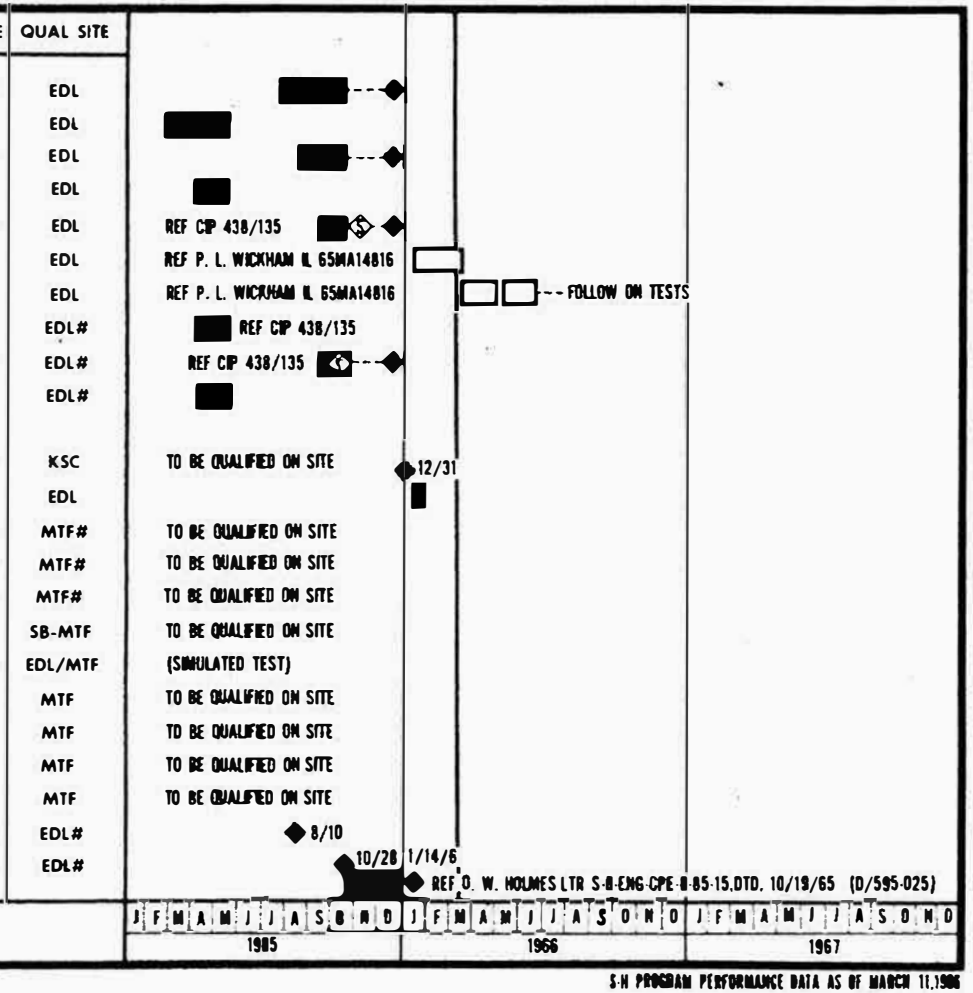
Qualification testing in accordance with specified design requirements is intended to verify the ability of a component, system, or end item to maintain acceptable performance levels in its operating environment. In addition, a demonstration of minimum life while operating in service environments is an essential part of every qualification test program. In every case, the specimens are tested during qualification in accordance with specified design requirements. Specimens tested are typical of service counterparts. Final design and normal production methods and processes are represented. Thus the physical test qualifies both the design and the manufacturing methods. Environmental conditions generated for testing are, in most cases, the extremes that the item might encounter in service. Upon conclusion of environmental testing, specimen performance is measured to verify continued acceptability. In the Saturn S-II program, the minimum life test is designed to provide a predetermined level of statistical confidence that the item will function correctly throughout the critical time of usage during the total service life. Successful completion of qualification testing provides the user with the assurance that the component, system, or end item will perform correctly when operated within design conditions.

The following chart shows models of GSE that have completed DVT or qualification testing and testing programmed to support major milestones in the Master Program Schedule.

SATURN S-II
GSE QUAL/DESIGN VERIF TESTING

1 OF 3

MODEL	NOMENCLATURE	S/N	Q/E	QUAL SITE
A7-41	PLATE ASSY, CARRIER UMBIL DISC #3A	001	Q*	EDL
MOD 924	A7-41 PROTOTYPE		E	EDL
A7-42	PLATE ASSY CARRIER UMBIL DISC #4	001	Q*	EDL
MOD 925	A7-42 PROTOTYPE		E	EDL
MOD 949	A7-64 PROTOTYPE	001	Q*	EDL
			E	EDL
			Q	EDL
A7-64	DISCONNECT LH2 FILL	000	E	EDL#
A7-65	DISCONNECT LOX FILL	001	Q*	EDL#
MOD 950 PROTO	A7-65 PROTOTYPE	000	E	EDL#
A7-74	ASSY SET TEST CHAMBER EBW DETONATOR	002	Q-	KSC
A7-84	PLATFORM SET ENGINE COMPARTMENT	002	E	EDL
C7-35	CABLE INST ACCEPT STAND #1	001	Q-	MTF#
C7-38	CABLE INST FIRE CONTROL CTR, MTF	001	Q-	MTF#
C7-40	CABLE INST ACCEPTANCE STAND #2	001	Q-	MTF#
C7-41	RACK REMOTE POWER DISU DISTRIBUTION	005	Q	SB-MTF
C7-43	HARNESS SET ELECT. STATIC TEST STAGE	000	Q-	EDL/MTF
C7-78	POWER DISTR SYS, FIRING CONTROL CENTER STAND #1	001	Q	MTF
C7-79	POWER DISTR SYS, FIRING CONTROL CENTER STAND #2	001	Q	MTF
C7-80	POWER DISTRIBUTION SYSTEM, ACCEPT. STAND #1	001	Q	MTF
C7-81	POWER DISTRIBUTION SYSTEM, ACCEPT. STAND #2	001	Q	MTF
C7-106	RACK, BUFFER EQUIPMENT	005	E-	EDL#
C7-107	RACK, DIGITAL DRIVE LINK, LOCAL	001	E-	EDL#

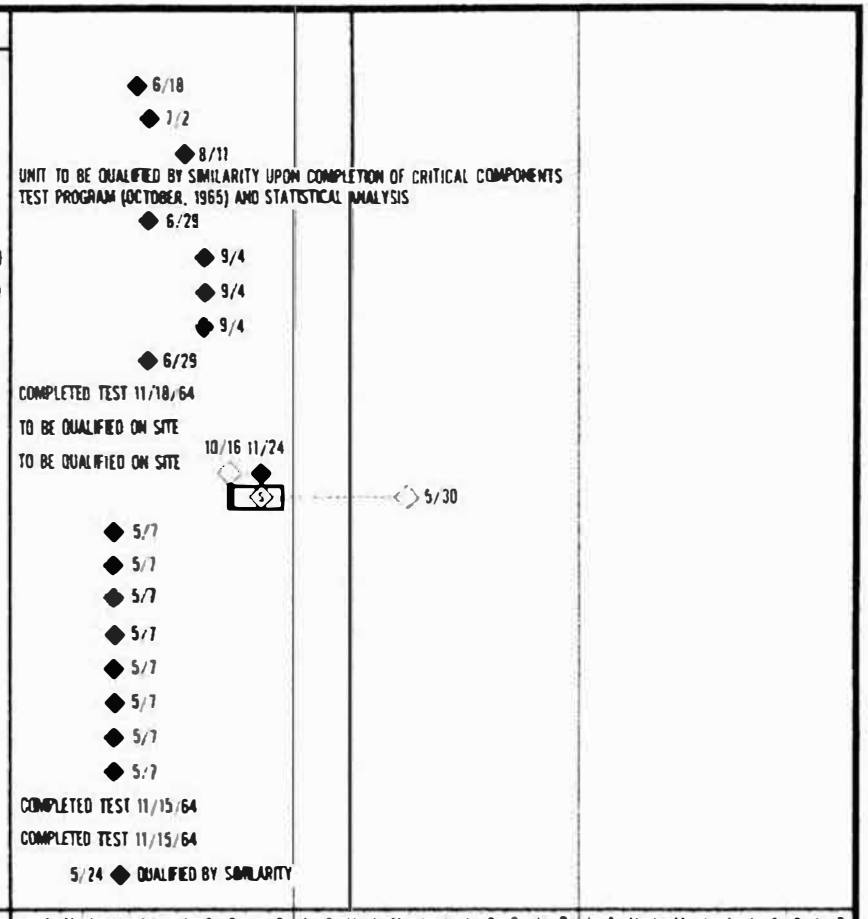


E - DESIGN VERIFICATION TEST • - EXPENDABLE ITEM
Q - QUALIFICATION TEST # - NO RETURN REQ'D

S-II PROGRAM PERFORMANCE DATA AS OF MARCH 11,1966

SATURN S-II
GSE QUAL/DESIGN VERIF TESTING (CONT)

MODEL	NOMENCLATURE	S/N	Q/E	QUAL SITE
C7-109	RACK COMPUTER ISOLATION	002	E	EDL #
C7-201	RACK, AUTO CONTROL	003	E	EDL #
C7-513	RACK DECOMMUTATION	002	E	EDL #
C7-805	RACK, ENGINE CUTOFF	001	Q	EDL/MTF EDL
H7-2	RING FWD STAGE SUPPORT	003	E	EDL
H7-3	RING, AFT STAGE SUPPORT	003	E	EDL # (SEAL BEACH)
H7-21	SKIRT STATIC FIRING	003	E	EDL # (SEAL BEACH)
H7-23	SLING, STAGE ERECTING	002	E	EDL (SEAL BEACH)
H7-24	FRAME, HOISTING - FWD	002	E	EDL (SEAL BEACH)
H7-25	FRAME HOISTING - AFT	004	E	EDL (SEAL BEACH)
S7-27	FLUID DIST SYS ACCEPT STAND #1	001	Q	MTF #
S7-33	FLUID DIST SYS ACCEPT STAND #2	001	Q	MTF #
S7-41	CONSOLE SET PNEU SERV & C/O	002	E	EDL
SDD-103	CABLE INST BATTLESHIP STAND	001	Q	PFL #
SDD-105	CABLE INST FIRING CONTROL CENTER (PFL) BATTLESHIP	001	Q	PFL #
SDD-107	CABLE INST FACILITY AS AND BS STAND	001	Q	PFL #
SDD-110	FLUID DISTR SYM BATTLESHIP	001	Q	PFL #
SDD-130	STATION, SIGNAL COND BATTLESHIP	001	Q	PFL #
SDD-133	RACK-ENGINE C/O & FIRING BATTLESHIP	001	Q	PFL #
SDD-134	RACK-FIRING SEQUENCE MONITOR, BATTLESHIP	001	Q	PFL #
SDD-135	RACK, CONTROL MONITOR BATTLESHIP	001	Q	PFL #
SDD-151	HEADSET, INTERCOM	082 & 083	Q	EDL #
SDD-152	HEADSET, INTERCOM-PROTECTIVE	118 & 119	Q	EDL
SDD-155	ARM #3A UMBILICAL DISCON (SIMULATED)	001	Q	EDL #



E - DESIGN VERIFICATION TEST
Q - QUALIFICATION TEST
● - EXPENDABLE
- NO REFURB REQ'D

S II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

SATURN S-II
GSE QUAL DESIGN VERIF TESTING (CONT)

MODEL	NOMENCLATURE	S/N	Q/E	QUAL SITE	
SDD-156	ARM #4 UMBILICAL DISCONNECT	001	Q	EDL#	◆ QUALIFIED BY SIMILARITY
SDD-170	PROPELLANT COUPLING LOX STATIC FIRING, BATTLESHIP	001	Q	PFL	◆
SDD-181	CONSOLE SET, PNEUMATIC SERVICING, BATTLESHIP	001	Q	PFL#	◆
SDD-185	TEST CONDUCTOR CONSOLE BATTLESHIP	001	Q	PFL#	◆
SDD-217	ARRESTING MECHANISM SIDE BATTLESHIP	001	E	EDL#(LAD)	COMPLETED TEST 12/15/64

E - DESIGN VERIFICATION TEST
Q - QUALIFICATION TEST
● - EXPENDABLE ITEM
- NO REFURB REQ'D

J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D
1965 | 1966 | 1967

S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966

AIRBORNE COMPONENT QUALIFICATION TEST

Component qualification represents the attainment of flight readiness and constitutes approval for use of equipment in flight stages. Determination of the qualification test approach and the extent of testing for a given item is based on criticality, complexity, cost, function, redundancy, use history, previous testing results, and frequency and duration of operation in service.

Test specimens are selected from a random sampling of production hardware and are subjected to a combination of the most critical environments. Specific performance parameters are checked constantly during specimen testing. The tests constitute an integral segment of the Saturn S-II general test plan and combine with the remaining segments to assess progress toward the completion of program goals.

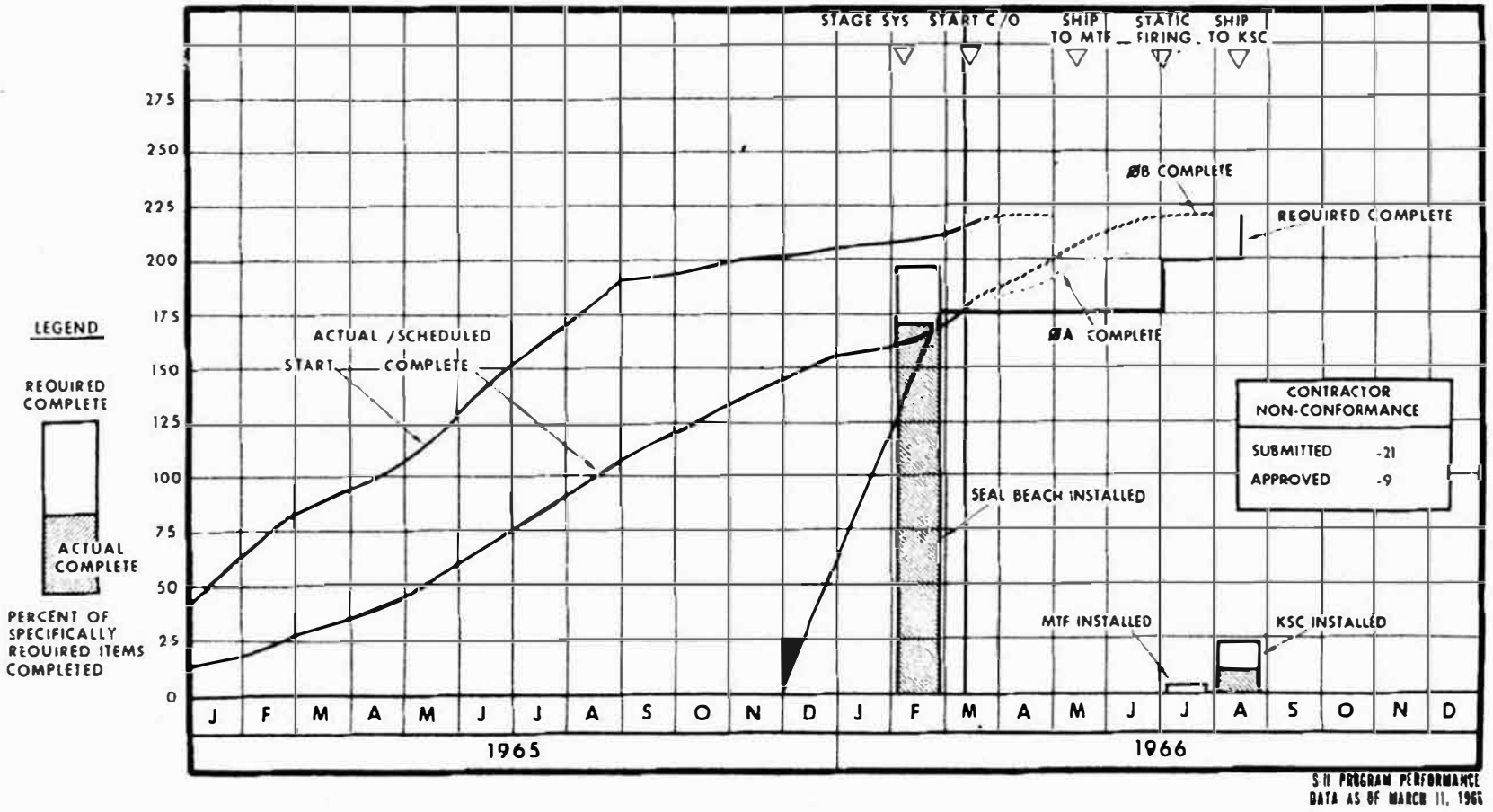
A total of 224 components will be qualified by test. An additional 900 components will be qualified by similarity. As indicated by the accompanying chart, testing is complete for 171 items. Tests completed provide qualification by similarity for an additional 842 components.

The earliest qualification test constraint is S-II-1 systems installation. A total of 196 components qualified by test will be installed at Seal Beach, 4 at MTF, and 24 at KSC.

Contract non-conformance (CNC) documents have been initiated to extend qualification test time for all items that do not support the S-II-1 installation schedule. CNC documents provide extended dates for 20 items.

SATURN S-II

AIRBORNE COMPONENT QUALIFICATION STATUS



GSE COMPONENT QUALIFICATION TEST

GSE component qualification is an integral portion of the confidence development plan for attainment of end item reliability confidence levels and is required to support certain milestones.

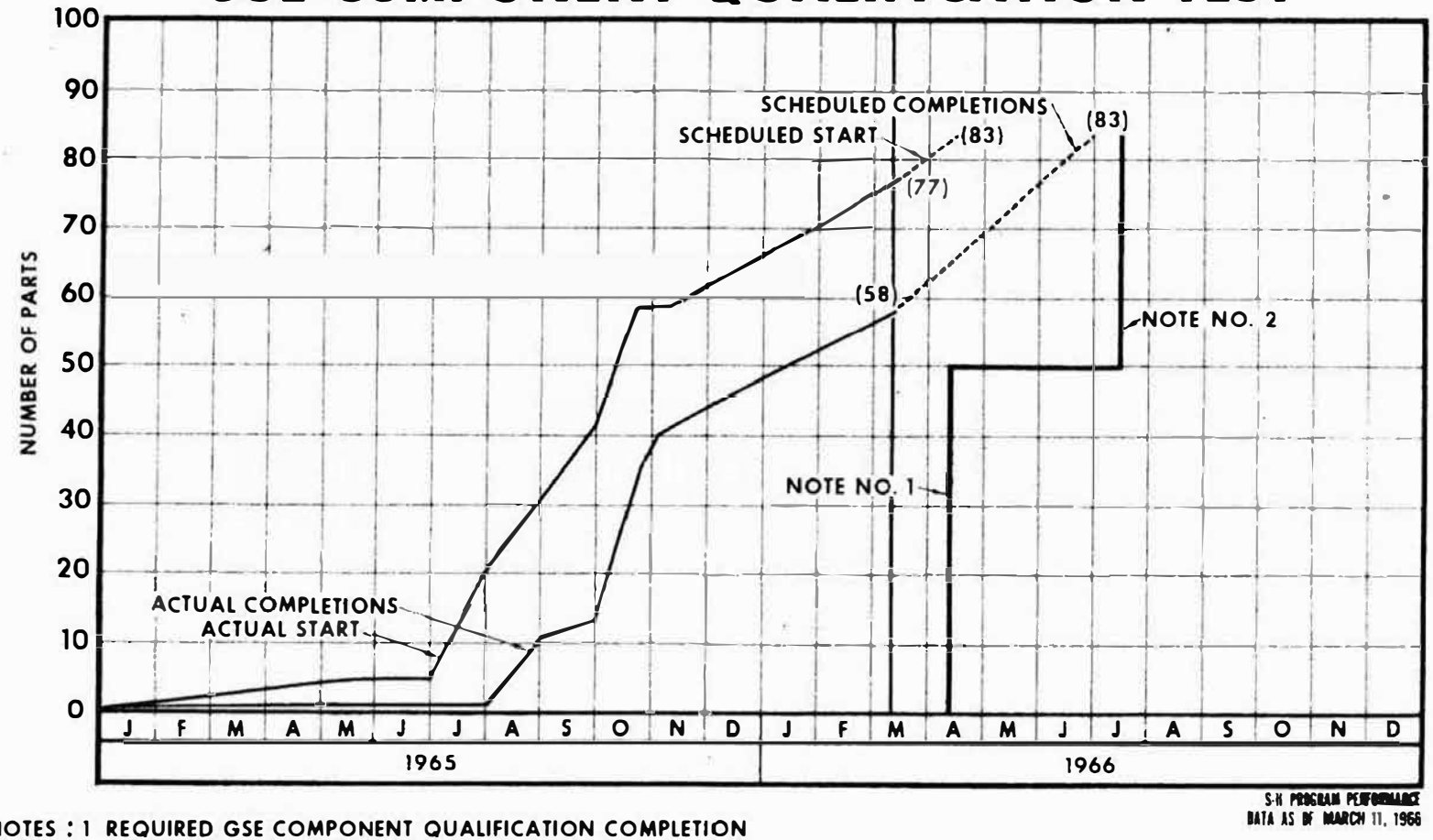
The approach and extent of testing for a component are determined by unit function and complexity, including frequency and duration of operation in service. Additional considerations are prior test history, usage in the system, and component redundancy. Test specimens are selected randomly from production hardware and are subjected to combinations of critical environments. Specific performance parameters are checked while the specimens are tested. Testing is performed separately for climatic and dynamic environments so that degradations can be analyzed.

The following chart reflects the actual and scheduled status of components with reference to the following milestones:

1. Required GSE component qualification completion to support S-II-T tanking at MTF

2. Required GSE component qualification completion to support the S-II-1 stage at KSC

SATURN S-II
GSE COMPONENT QUALIFICATION TEST



NOTES : 1 REQUIRED GSE COMPONENT QUALIFICATION COMPLETION TO SUPPORT S-II-T TANKING AT MTF - PLAN 66B

2 REQUIRED GSE COMPONENT QUALIFICATION COMPLETION TO SUPPORT S-II-1 AT KSC - PLAN 66B

FACILITIES

SEAL BEACH

The Seal Beach facility, where final assembly of the S-II takes place, is located at the U.S. Naval Weapons Station, Seal Beach, California. It comprises the following facilities:

1. Bulkhead fabrication building—provides for fabrication, processing, and testing of LH_2 cylinders, thrust structure assembly, and the common, LH_2, and LOX bulkheads

2. Vertical assembly and hydrotest facility—provides four vertical assembly stations for welding, insulation, and system installation and two hydrostatic test stations for LOX and LH_2 tank hydrostatic testing, leak checking, cleaning, and installation of baffles and probes

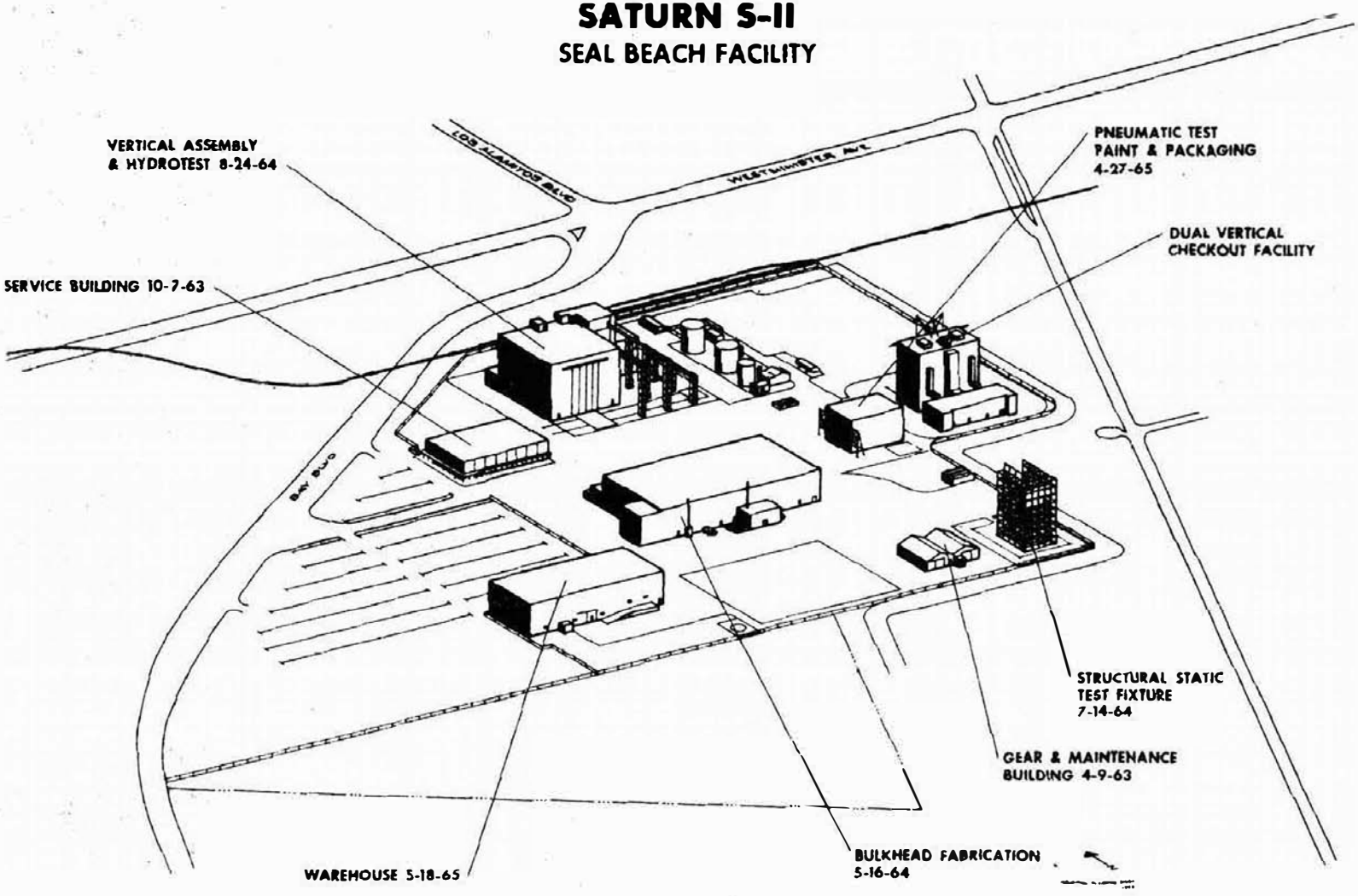
3. Pneumatic test, paint, and packaging facility—provides for pneumatic testing, limited checkout, and painting and packaging of the stage for shipment

4. Dual vertical checkout facility—provides two vertical stations for mechanical and electrical checkout and pneumatic testing of the stage

5. Structural static test tower—houses the static test stage, which is a structurally complete stage that includes tanks, bulkheads, thrust structure, and aft interstage

6. Water conditioning plant—provides demineralized water, heated detergent solution, and trichloroethylene; provides water for fire fighting; and furnishes air at 100-psi line pressure

SATURN S-II
SEAL BEACH FACILITY



SEAL BEACH SUMMARY

The 60-foot extension to the bulkhead fabrication facility and the craneway at the west end of the facility have been completed.

The contract for the subassembly building was awarded 3 March 1966 and construction started 7 March 1966. Site preparation and grading have begun.

Modifications to Stations III and IV in the vertical assembly building have been completed.

The dual vertical checkout facility has been completed except for the following:

- The fluid distribution system (SDD-198) for Station VIII, both the initial and follow-on contracts, were completed in January 1966. Additional requirements initiated by MCR2163 are planned. Bids are out and bid awards and immediate construction are being expedited to support S-II-1 checkout.

- The cable installation (SDD-197) and fluid distribution system (SDD-199) for Station IX are under construction and are expected to be finished by 27 May 1966.

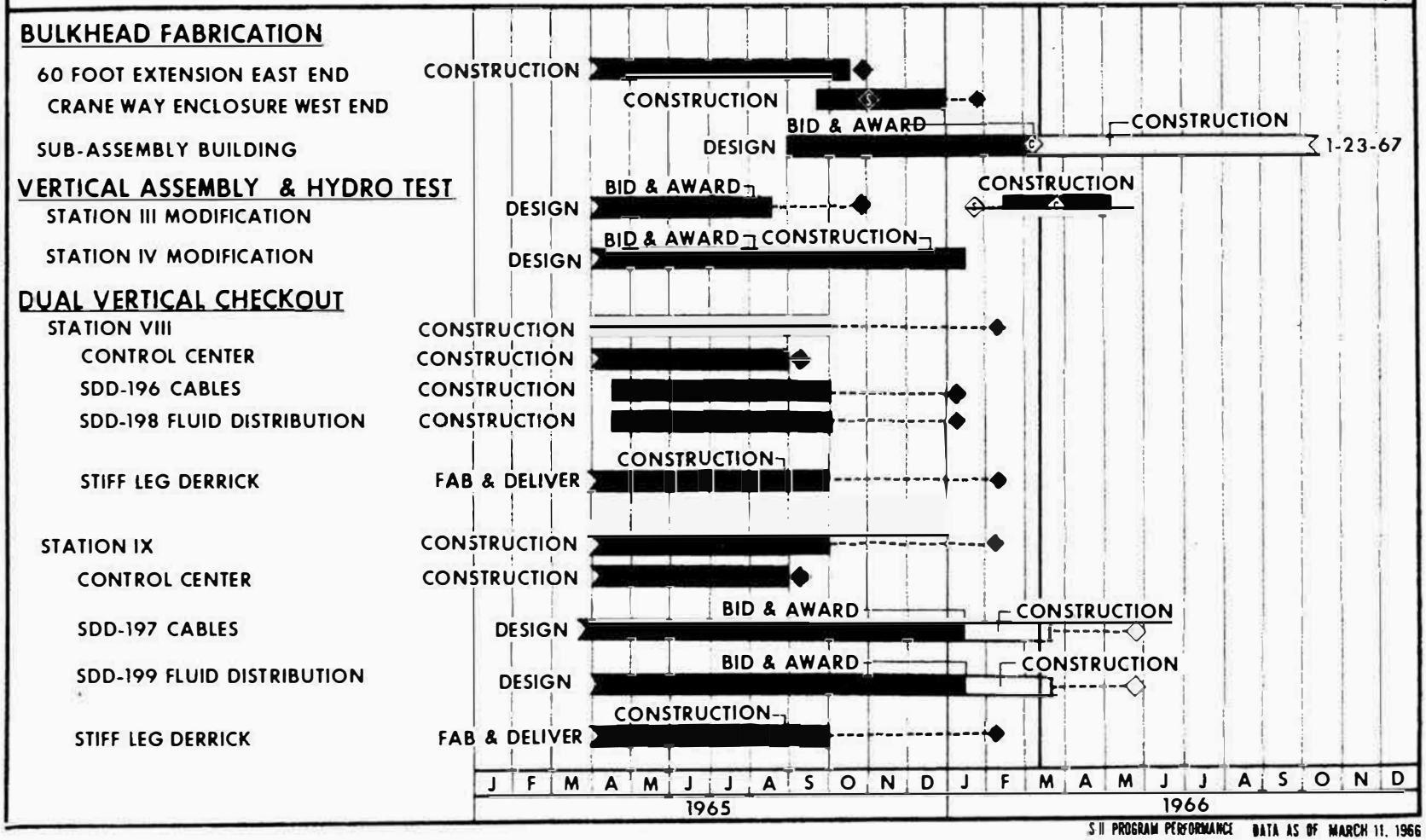
Station VII modifications are expected to be completed by 18 March 1966.

The trailer complex, consisting of eight 12-unit complexes and four single units to accommodate 800 occupants, is expected to be completed by 31 March 1966. Six units remain to be completed.

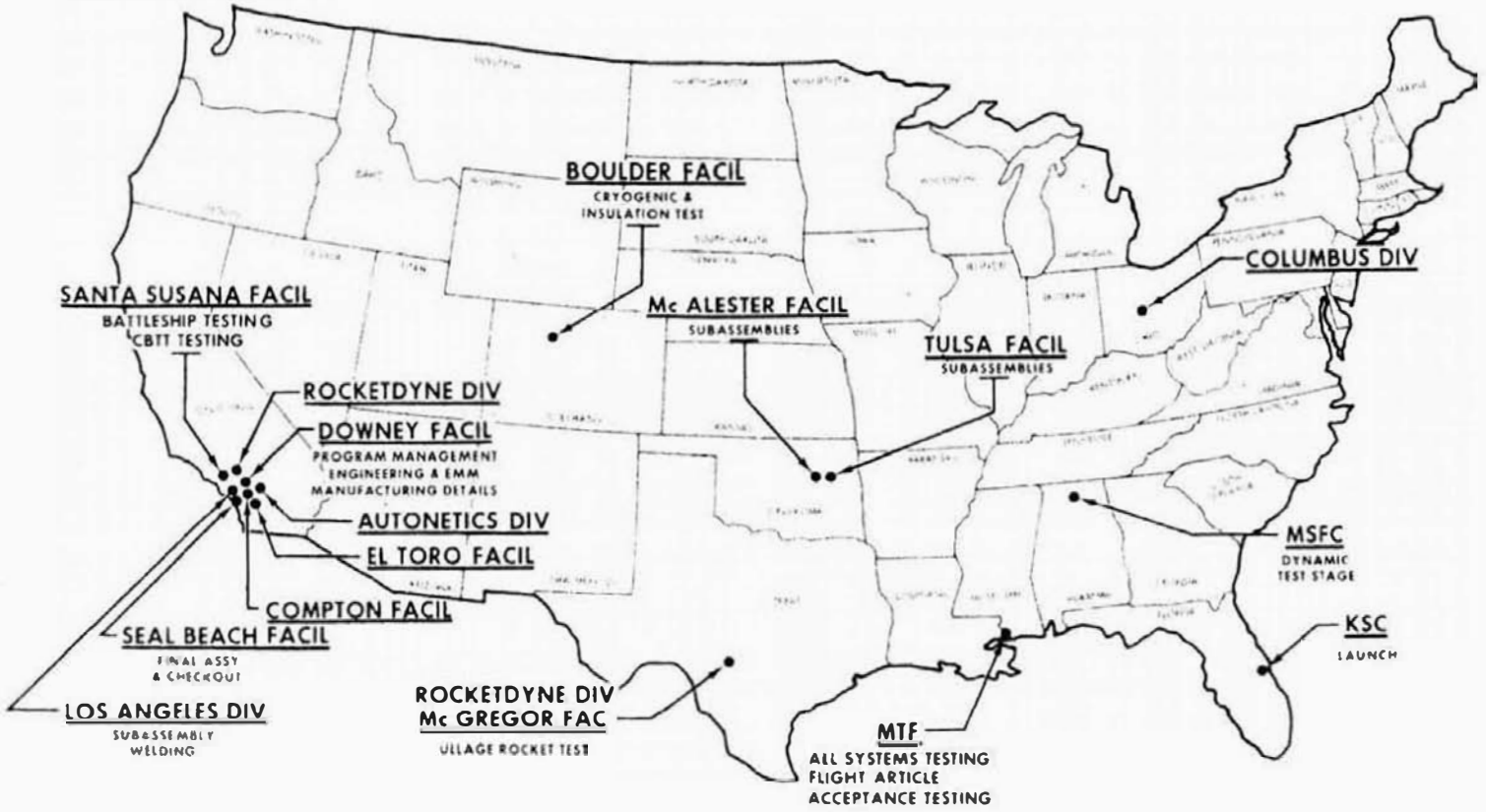
The chart is updated to reflect Master Program Schedule Working Plan 66B, with status as of 11 March 1966.

Saturn S-II activity locations throughout the United States are shown on the chart on the back of the Seal Beach summary chart.

SATURN S-II
SEAL BEACH FACILITIES SUMMARY



SATURN S-II ACTIVITY LOCATIONS



GFP/GFAE

GFP/GFAE J-2 ENGINES

Rocketdyne, as a prime contractor to NASA, supplied J-2 engines to S&ID as GFAE. The total requirements are reflected in the GFP/GFAE document, SID 61-368.

Operational-simulator-type engines were provided for the Electromechanical Mockup, ground-test-type engines for the Battleship, and flight-configuration-type engines for All-Systems test stage. The flight-weight stages (S-II-1 through S-II-10) require qualified production engines. A spares program will provide support at the test facilities.

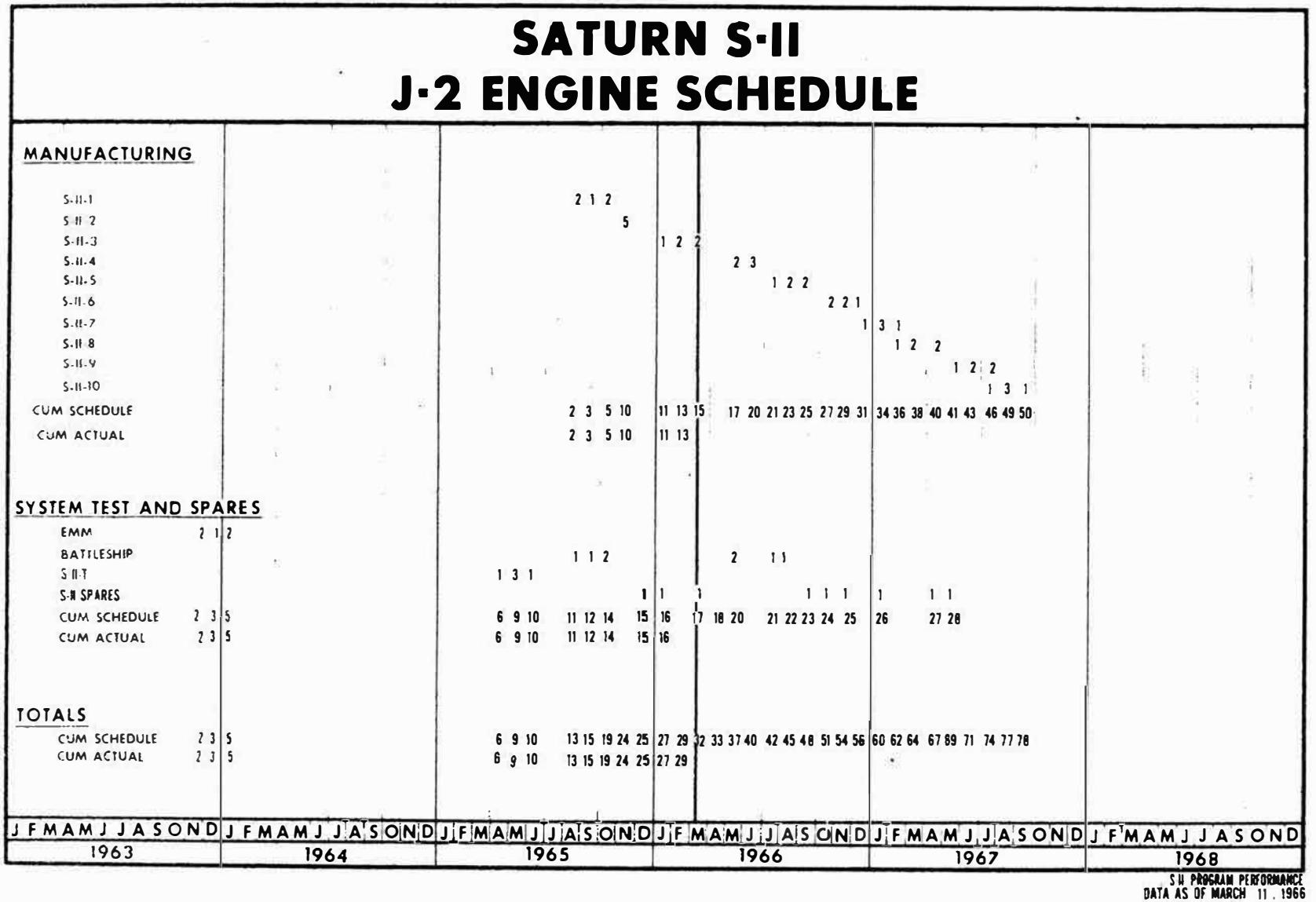
The engine system consists of five J-2 engines that utilize liquid oxygen and liquid hydrogen for propellants at a ratio of 5:1 by weight. Each engine is rated at 200,000 pounds of vacuum thrust and approximately 132,000 pounds of thrust at sea level. The four outboard engines are gimballed for thrust vector control, and the center engine is fixed. For static firing operations, thrust chamber diffusers and side-load arresting mechanisms (SLAM's) will be attached to each engine to reduce the start and cutoff transient loads.

Checkout of each J-2 engine prior to installation in the stage, in compliance with NPC 200-2, will be conducted using primarily Rocketdyne-built GSE (Government furnished property) and S&ID-supplied gaseous helium and electrical power.

To date, engines for the Electromechanical Mockup have been used to calibrate and check applicable GSE, fit-check each engine location, mock up lines and harnesses, and assure basic stage-engine compatibility. The first Battleship engines (six, including one spare) have been used in initial Battleship firing tests. The second Battleship set was used to update this program to the flight configuration, and the third set, if used, will replace the second after expiration of their useful life. The initial All-Systems engines (five) have been delivered and installed and are currently undergoing checkout prior to static firing. The spares program will support Battleship, All-Systems, and production stage operations at each of the respective sites.

The following chart reflects normal manufacturing cycles for receiving inspection, buildup, and functional checkout. These dates are reflected in SID 61-368, dated 2 August 1965.

SATURN S-II
J-2 ENGINE SCHEDULE



S-II PROGRAM PERFORMANCE
DATA AS OF MARCH 11, 1966