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Surveyor Project Status Report

As of 14 May 1965

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JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

Issue Date: 20 May 1965

Surveyor Project Status Report

As of 14 May 1965

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JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

FOREWORD

The biweekly Surveyor Project Status Report presents, in one document, a summary of schedule, manpower, and cost status information for the Surveyor Project and its associated systems.

All schedule information is correlated and reviewed by the Project Office on a biweekly basis. Cost and manpower information is correlated from monthly financial reports maintained by the Jet Propulsion Laboratory.

Jet Propulsion Laboratory
California Institute of Technology
Prepared under Contract No. NAS 7-100
National Aeronautics and Space Administration

PROJECT DEVELOPMENT PLAN SUMMARY

Surveyor is a lunar soft landing and surface investigation project managed by JPL's Lunar and Planetary Project Office for the NASA Headquarters Office of Space Science and Applications. The Project is supported from within NASA by the Lewis Research Center (LeRC) and the Goddard Space Flight Center (GSFC). Within JPL, the cooperation of the Deep Space Network is involved. Hughes Aircraft Company (HAC) is under contract to JPL to develop the spacecraft.

The objectives are to demonstrate a soft landing on the Moon, as evidenced by postlanding spacecraft operations, and to perform lunar surface operations which will contribute new scientific knowledge about the Moon and provide basic data in support of Project Apollo.

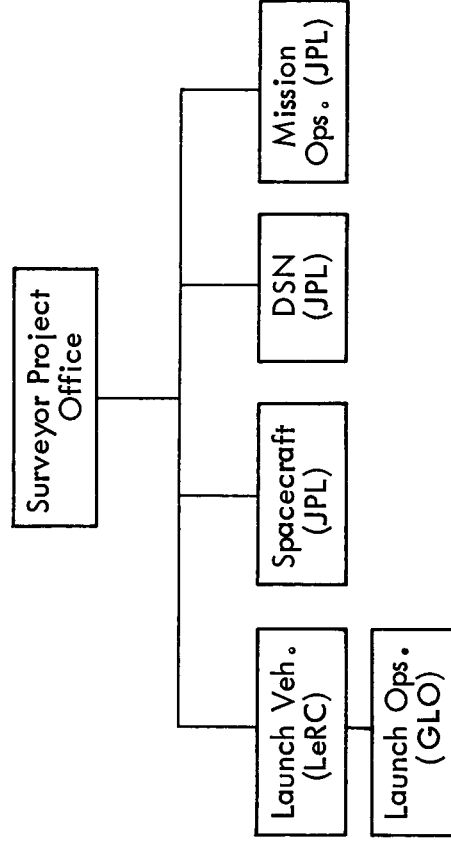
The Surveyor Project Block I currently comprises seven flight missions. These missions will utilize the Atlas/Centaur launch vehicle with launches to be conducted from Complex 36 at the Air Force Eastern Test Range (ETR), Cape Kennedy. The missions will be divided into two groups consisting of (1) four spacecraft designated as engineering test flights, containing an engineering performance payload; and (2) three spacecraft designated as operational vehicles which contain a scientific instrument payload.

During transit, the Deep Space Instrumentation Facility will be used for spacecraft orbit determination and to transmit the necessary commands to effect a midcourse maneuver to minimize the lunar landing dispersion. The DSIF will also be used to receive engineering and scientific data telemetered from the spacecraft during transit to and operations on the lunar surface.

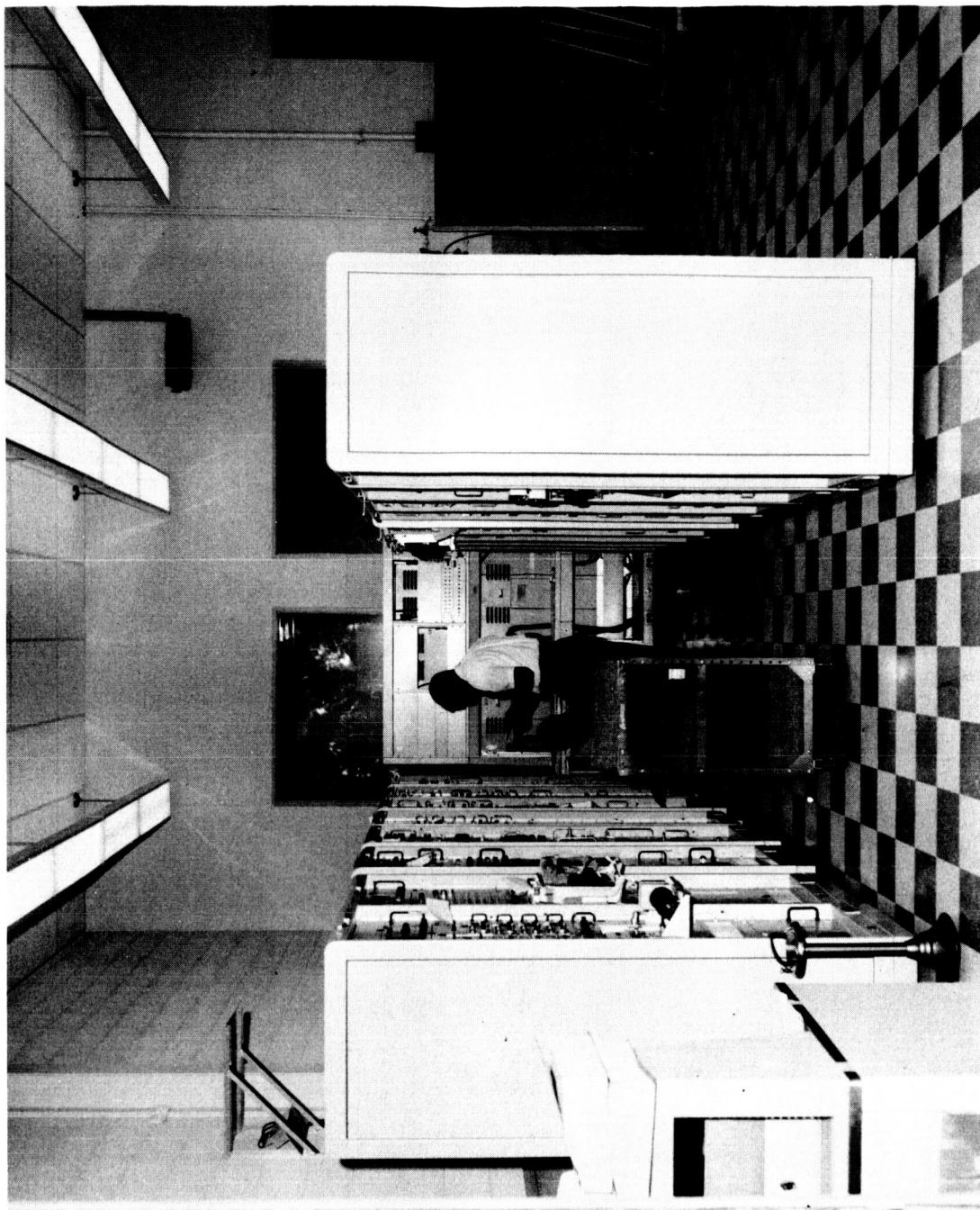
After spacecraft injection, all additional mission operations will normally be conducted from the JPL Space Flight Operations Facility. Accumulation of engineering and scientific data and the processing and partial reduction of the scientific data will be accomplished at this Facility. The SFOF will be the focus of continuing operations associated with the conduct of experiments during the life of the Surveyor spacecraft on the lunar surface.

The scientific payload will consist of the following experiments: television (2 survey cameras), micrometeorite ejecta, seismographic, alpha scattering, surface sampler (for soil mechanics), and touchdown dynamics.

A project organization consisting of four systems has been planned for Surveyor. The four systems and their parent organizations are shown in the accompanying chart.



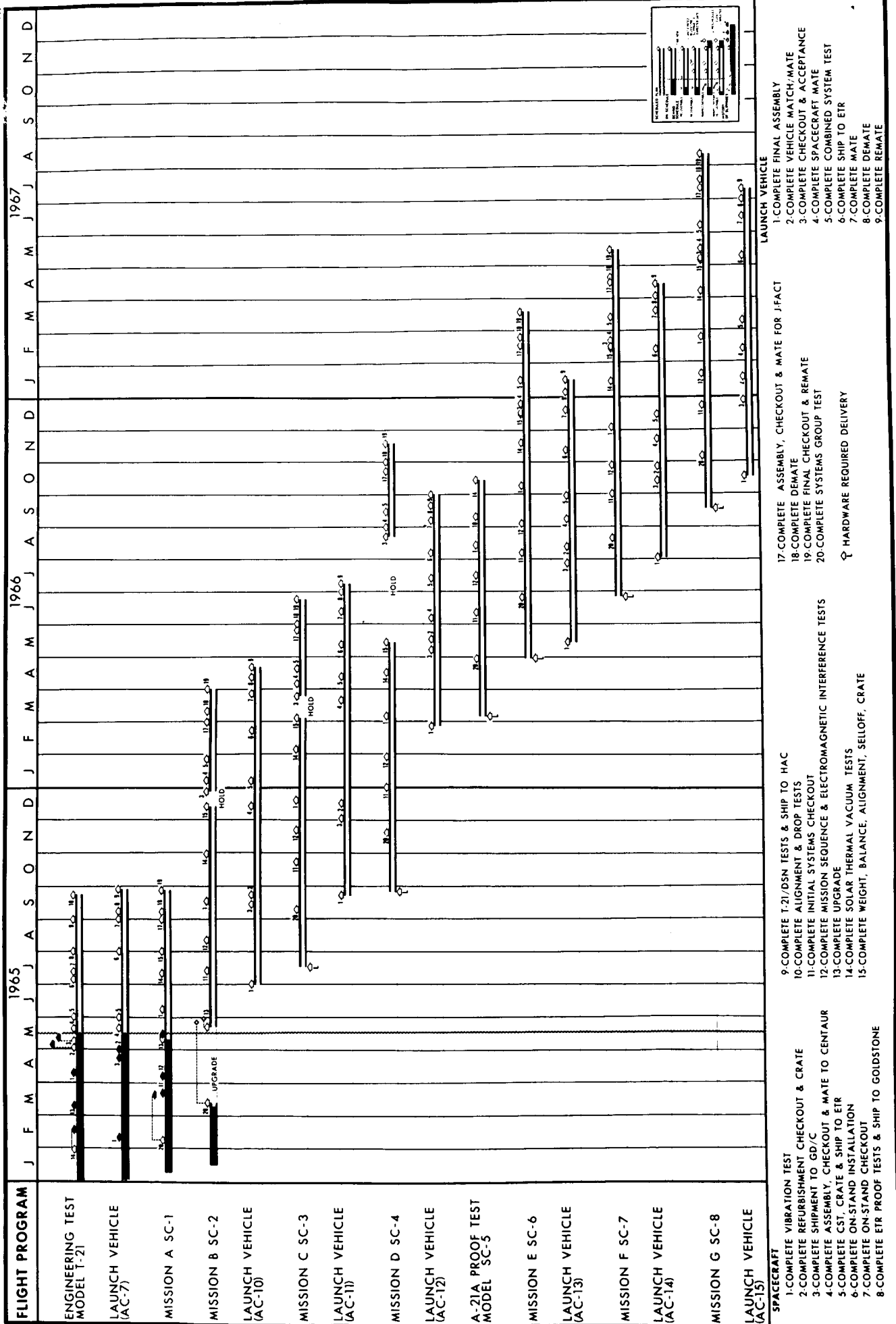
ARRIVAL OF GROUND SUPPORT
EQUIPMENT FOR SURVEYOR.
A & O BUILDING. ETR



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SURVEYOR PROJECT SCHEDULE





MISSION OPERATIONS SYSTEM TEST SCHEDULE

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

I OSDP SOFTWARE C/O

1. DSIF PIONEER 11
2. DSIF JOBURG 51
3. DSIF CANBERRA 42

III CLASS A-1.2 TESTS TRAINING IN SFOF

III CLASS A-2.0 (SFOF) TESTS

IV CLASS A-1.1 TESTS TRAINING AT DSIF

1. A-1.1 DSIF-11 PREP FOR B TESTS
2. A-1.1 DSIF-11 PREP FOR C TESTS
3. A-1.1 DSIF-51 PREP FOR B TESTS
4. A-1.1 DSIF-51 PREP FOR C TESTS
5. A-1.1 DSIF-42 PREP FOR B TESTS
6. A-1.1 DSIF-42 PREP FOR C TESTS

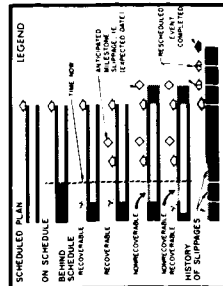
V CLASS-B TESTS

1. B1.1-DSIF-11
2. B1.2-DSIF-51
3. B1.3-DSIF-42
4. B2.0-ETR

VI CLASS-C TESTS

1. C-2.0 SURV. SFO COMD. PROC. TEST DSIF 11, 51, 42
2. C-3.0 SURV. SFO/ETR INTEG. TEST
3. C-4.0 SURV. SFO DSN INTEG. TEST
4. C-5.0 SO SYS. OPN'S READINESS TEST

* READY FOR OPS TEST

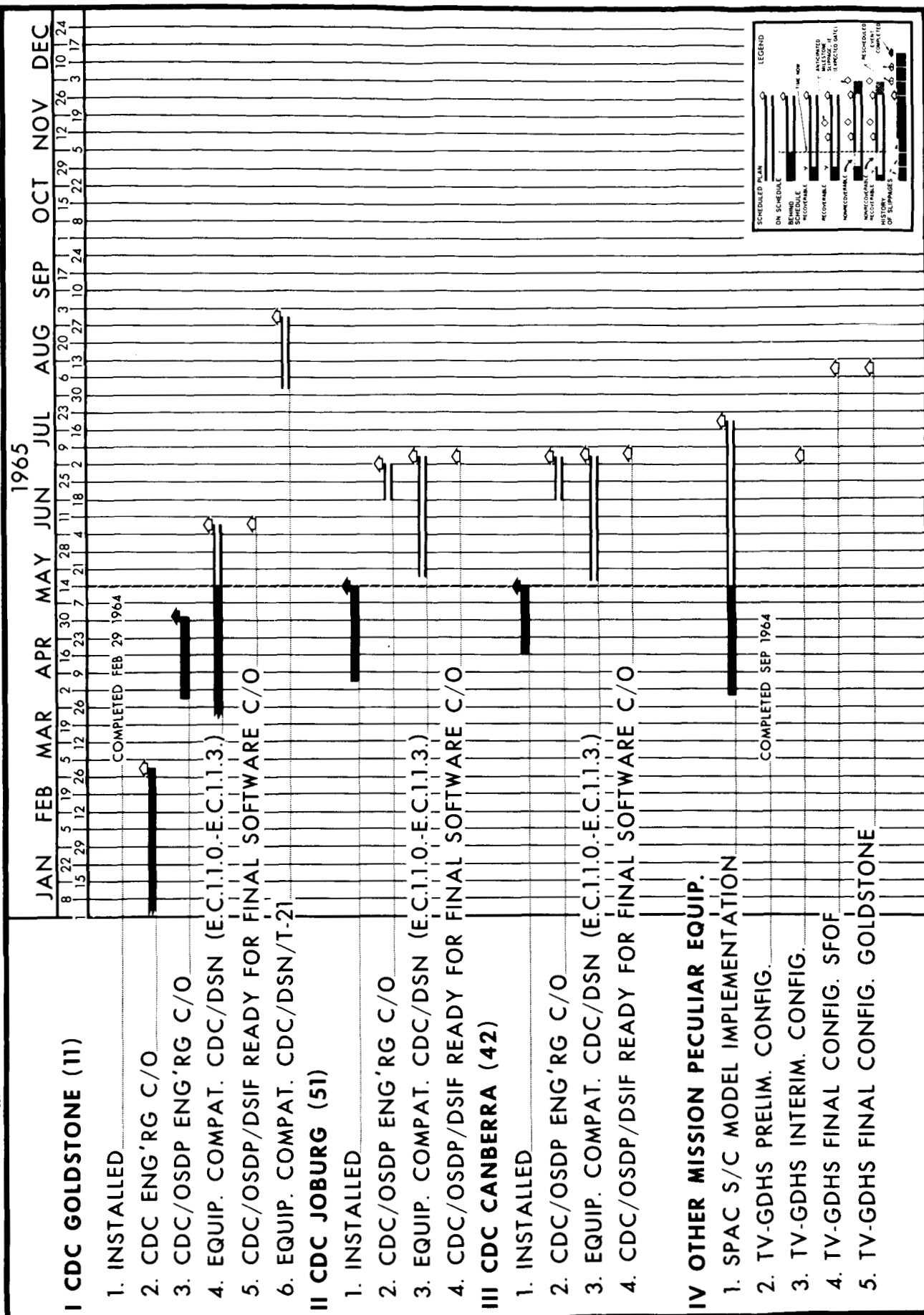


SUMMARY OUTLOOK

MISSION OPERATIONS SYSTEM TEST

Test activities continued during the reporting period with the completion of three SPAC and seven SSAC A-1.2 Tests, one each FPAC and SPAC Program Certification test, and numerous System Integration and Data Package Checkout Runs.

Efforts are continuing on User Program Development; however, progress is still not up to the projected level of completion at this time. Further slippages are contemplated due to restriction of computer time, brought on by software timing interface problems with the 7044 computers, now being installed in the S.F.O.F.



SUMMARY OUTLOOK

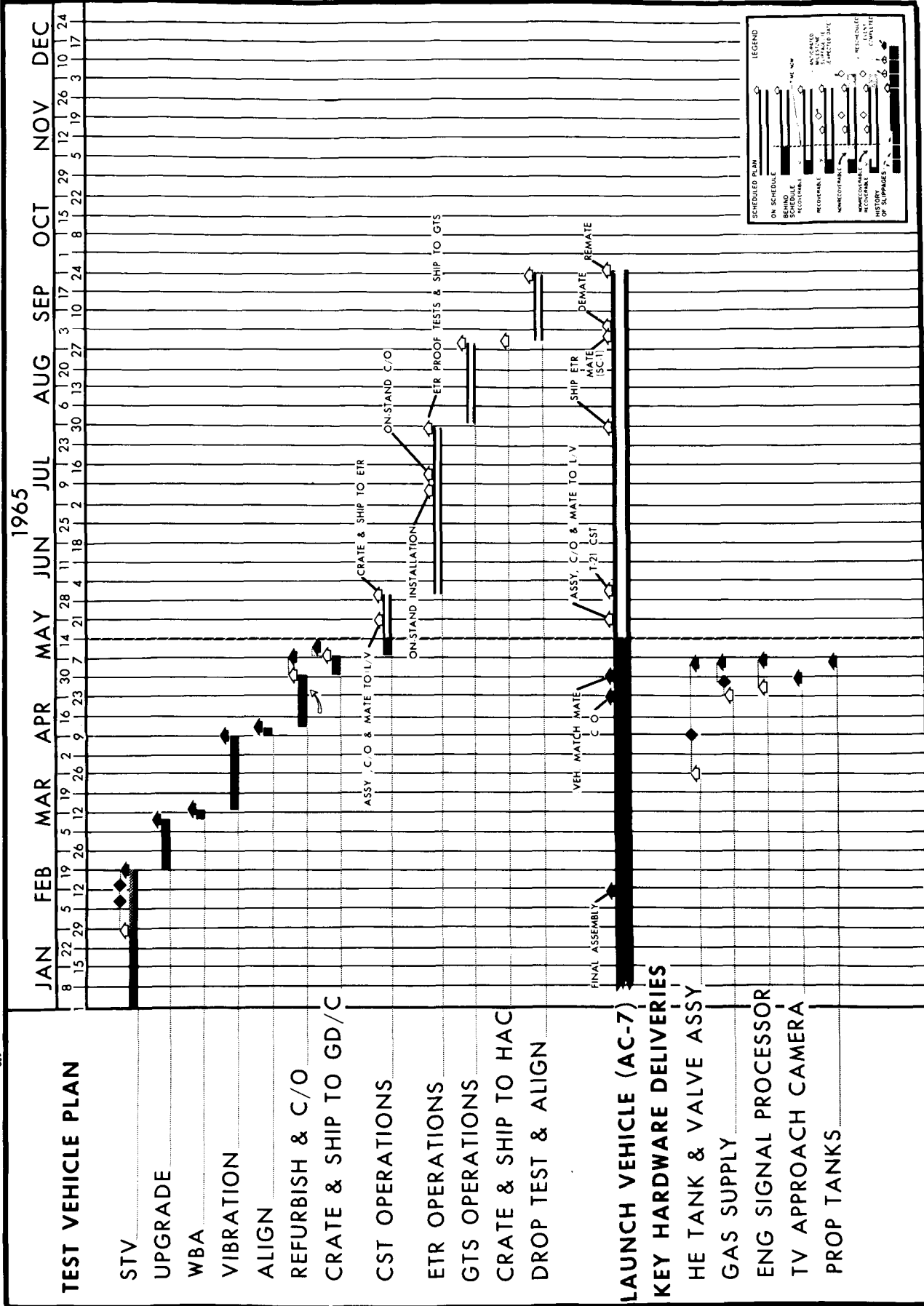
MISSION OPERATIONS MISSION PECULIAR EQUIPMENT

The Goldstone CDC/DSIF Compatibility Tests are proceeding on schedule and are now 60% complete. Typical minor operational and equipment problems were uncovered. The new units required for interfacing with the On-Site Data Processor (OSDP) were installed and engineering type tests run. A few minor circuit problems were found and corrected. The units for the overseas stations have been delivered to Goldstone. Engineering tests on these will be run during the next two weeks.

The Canberra CDC installation is complete. The unit, subsystem and system tests have also been completed. The first formal CDC/DSIF Compatibility Test is scheduled for 18 May with some preliminary testing prior to that time. This testing is prior to DSN's committed support date of 24 May.

The Johannesburg CDC installation is complete. The last test, a system test, is in process on this date. The DSN has committed to start support of CDC/DSIF Compatibility tests by 24 May.

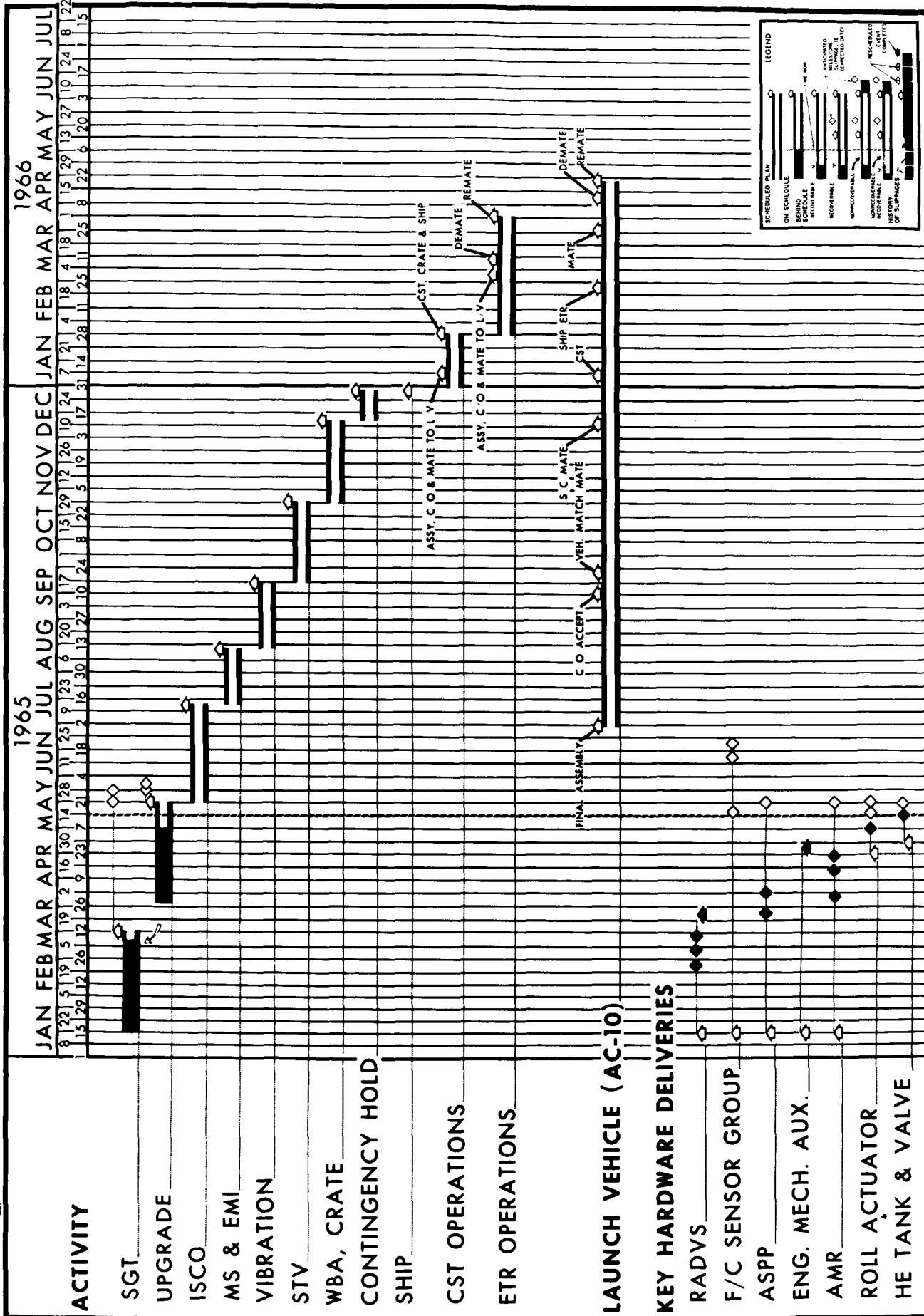
pl A-21 PROTOTYPE SYSTEM TEST VEHICLE T-21

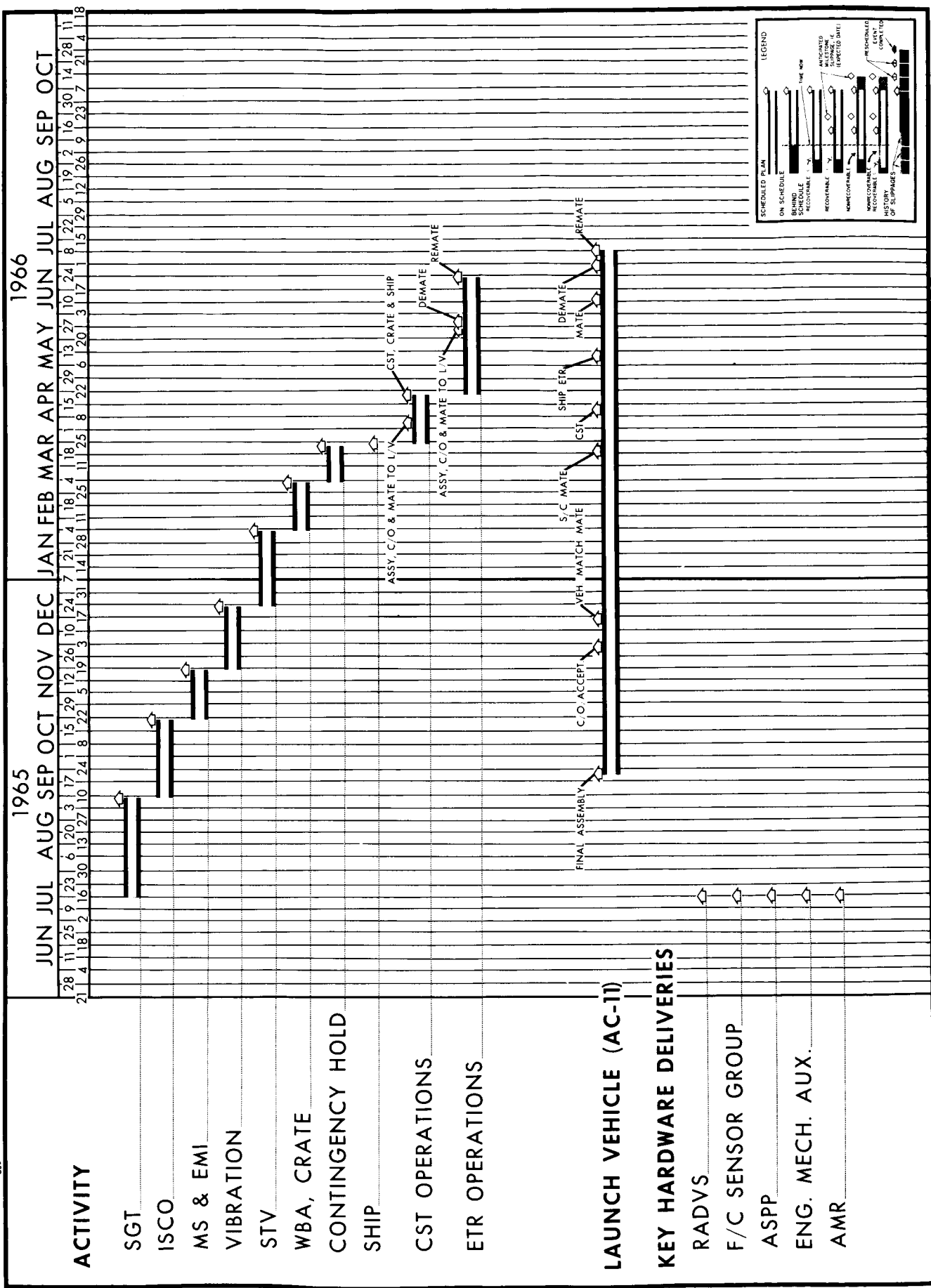


SUMMARY OUTLOOK:

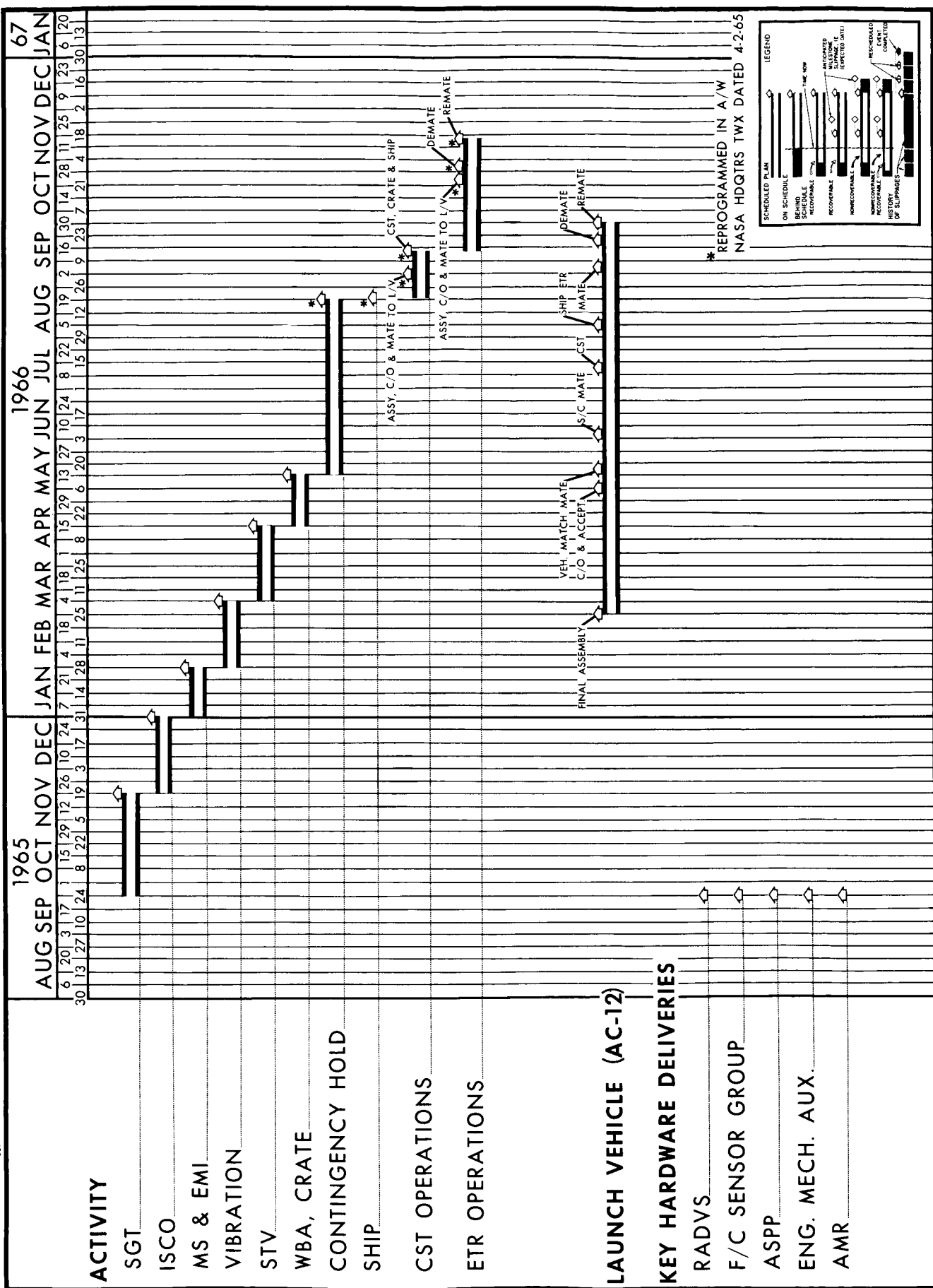
T-21 PROOF TEST MODEL

The vehicle was delivered to GD/C, San Diego on 11 May, uncrated on 12 May, and is currently undergoing receiving inspection. On completion of receiving inspection, premate operations check will be performed concurrently with short system confidence checks prior to final assembly. Encapsulation is expected to occur on Wednesday, 19 May, and mate with the launch vehicle on Thursday, 20 May.



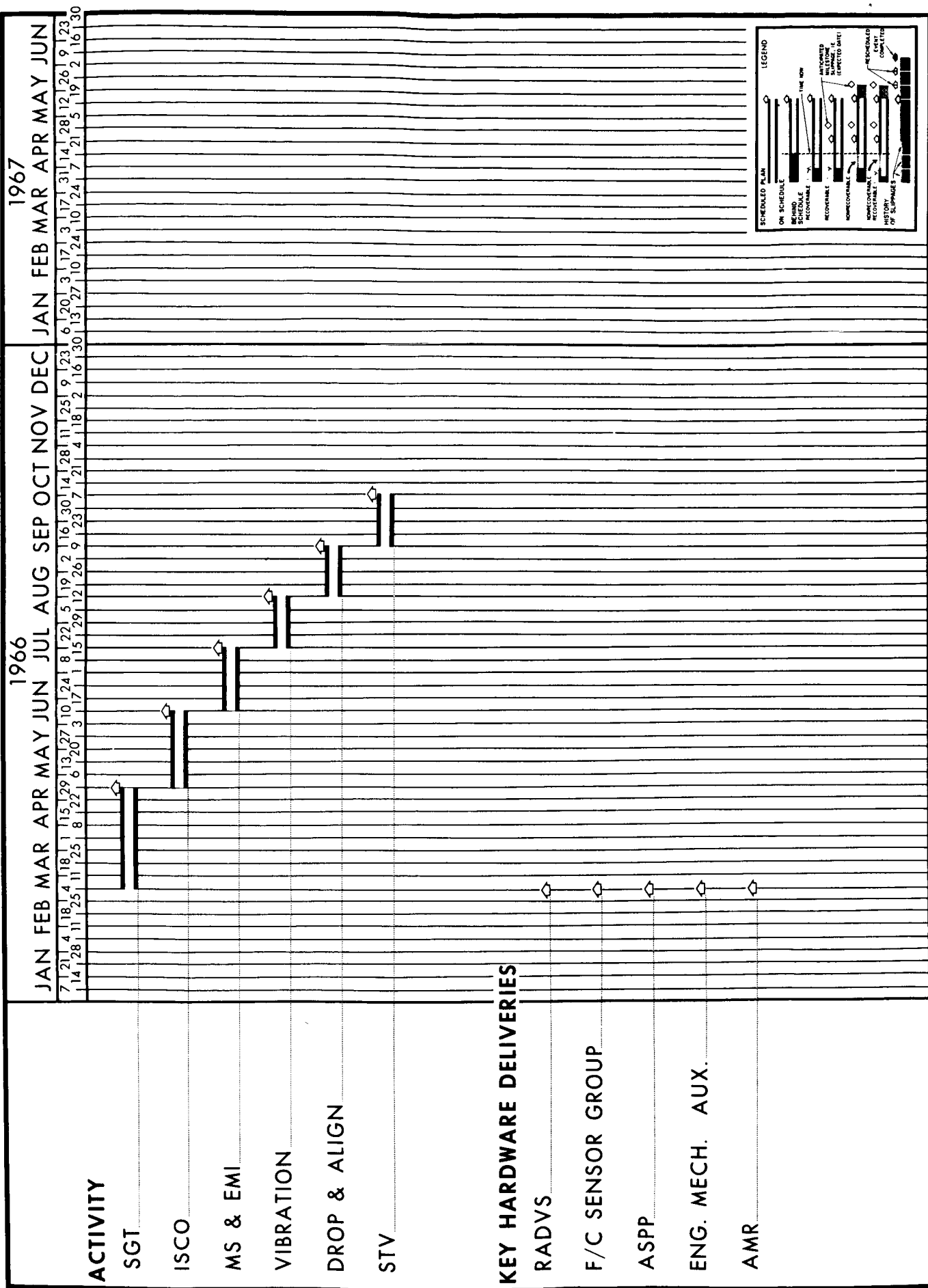


MISSION D SPACECRAFT TEST & OPERATIONS PLAN SC-4



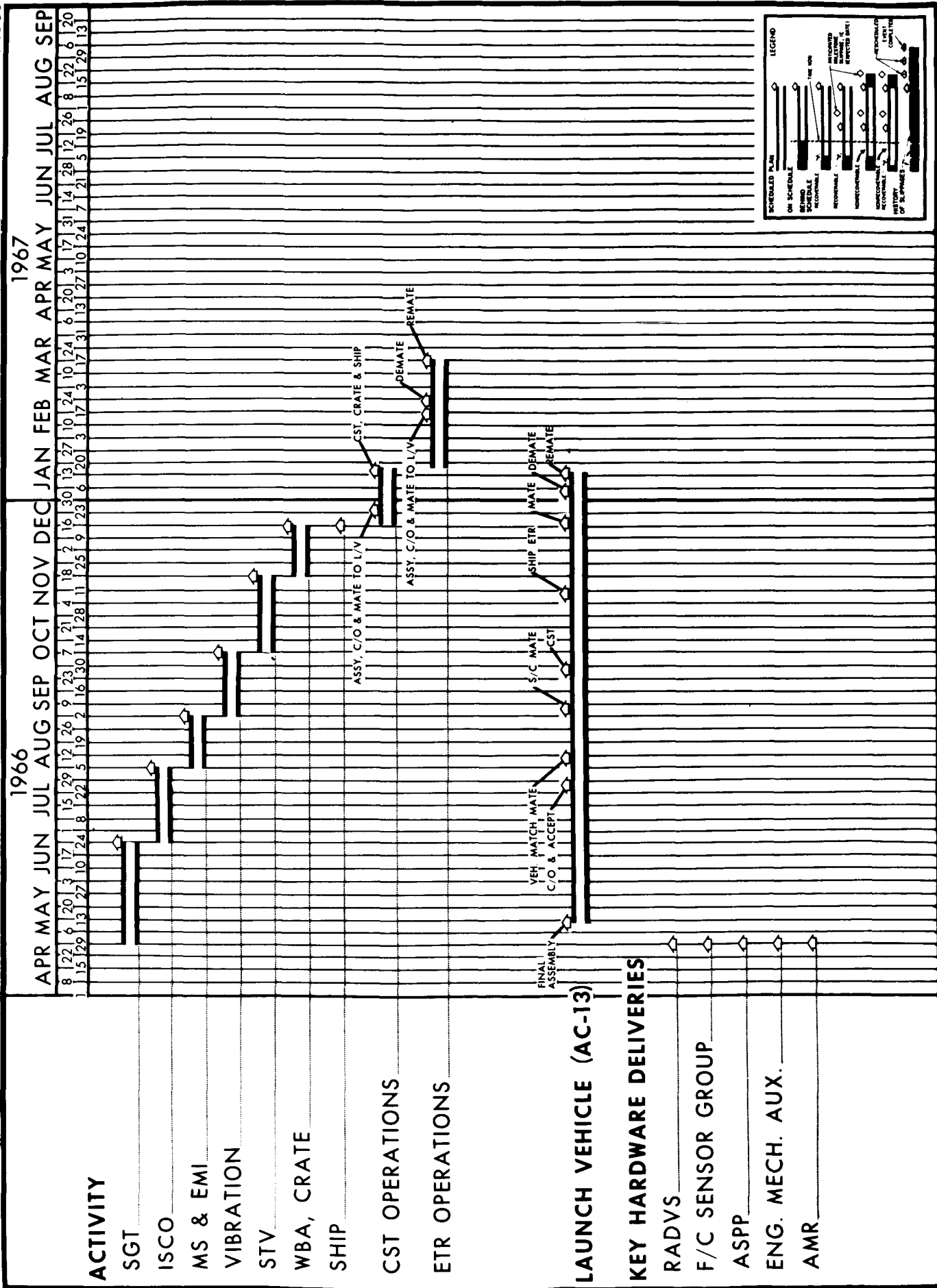
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A-21A PROOF TEST MODEL (SC-5)

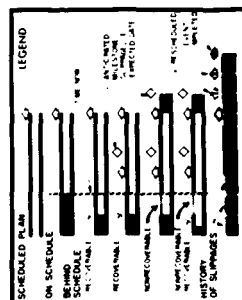


SUMMARY OUTLOOK

The proposed Surveyor Spacecraft Development Plan (SSDP) for the A-21A configuration has been received from HAC. Development and test plan schedules are currently being reviewed prior to final negotiation with HAC. Upon review and approval by JPL, detail plans and schedules for the Proof Test Model (SC-5) and flight spacecraft SC-6, SC-7 and SC-8 will be established.

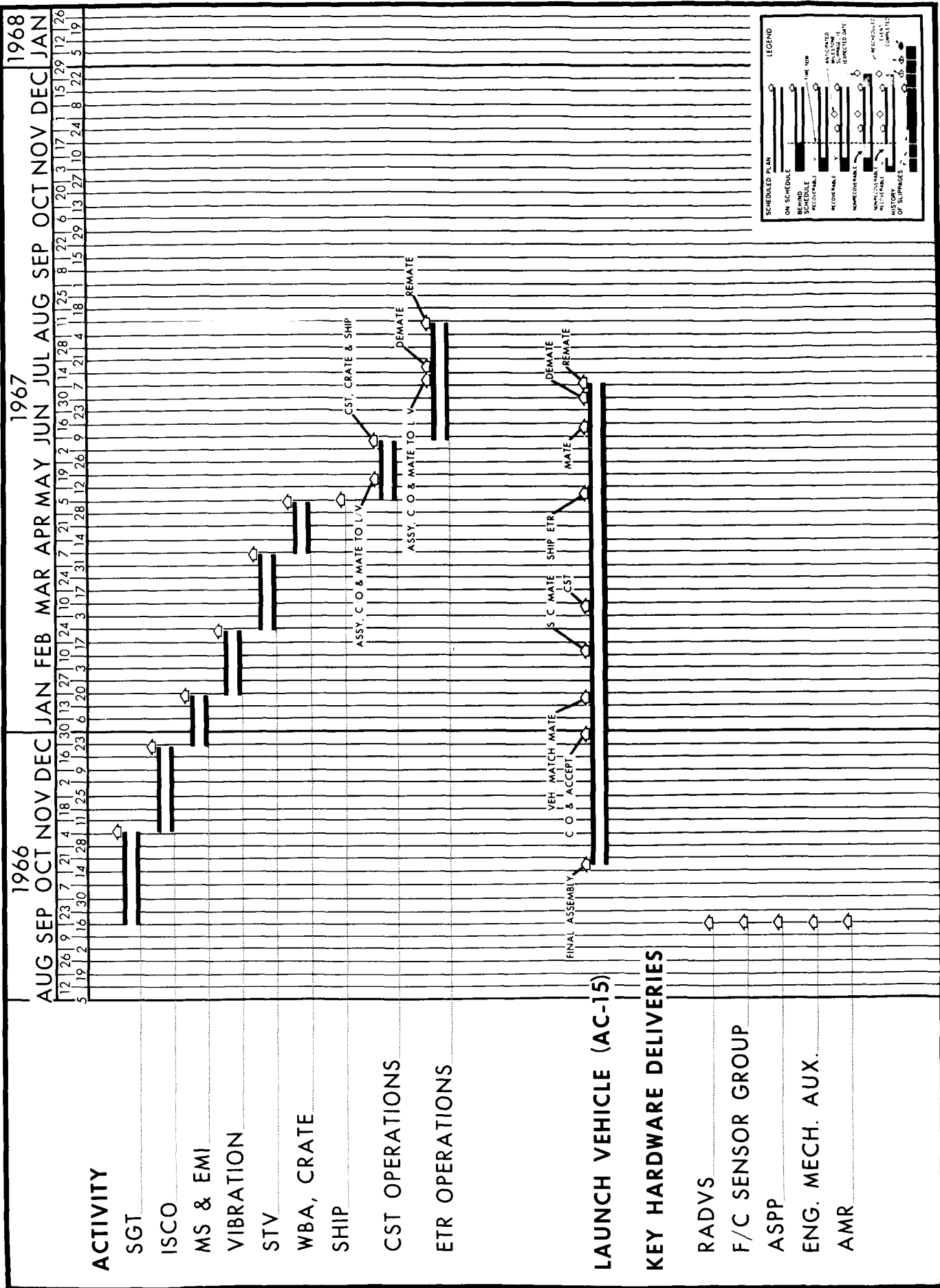


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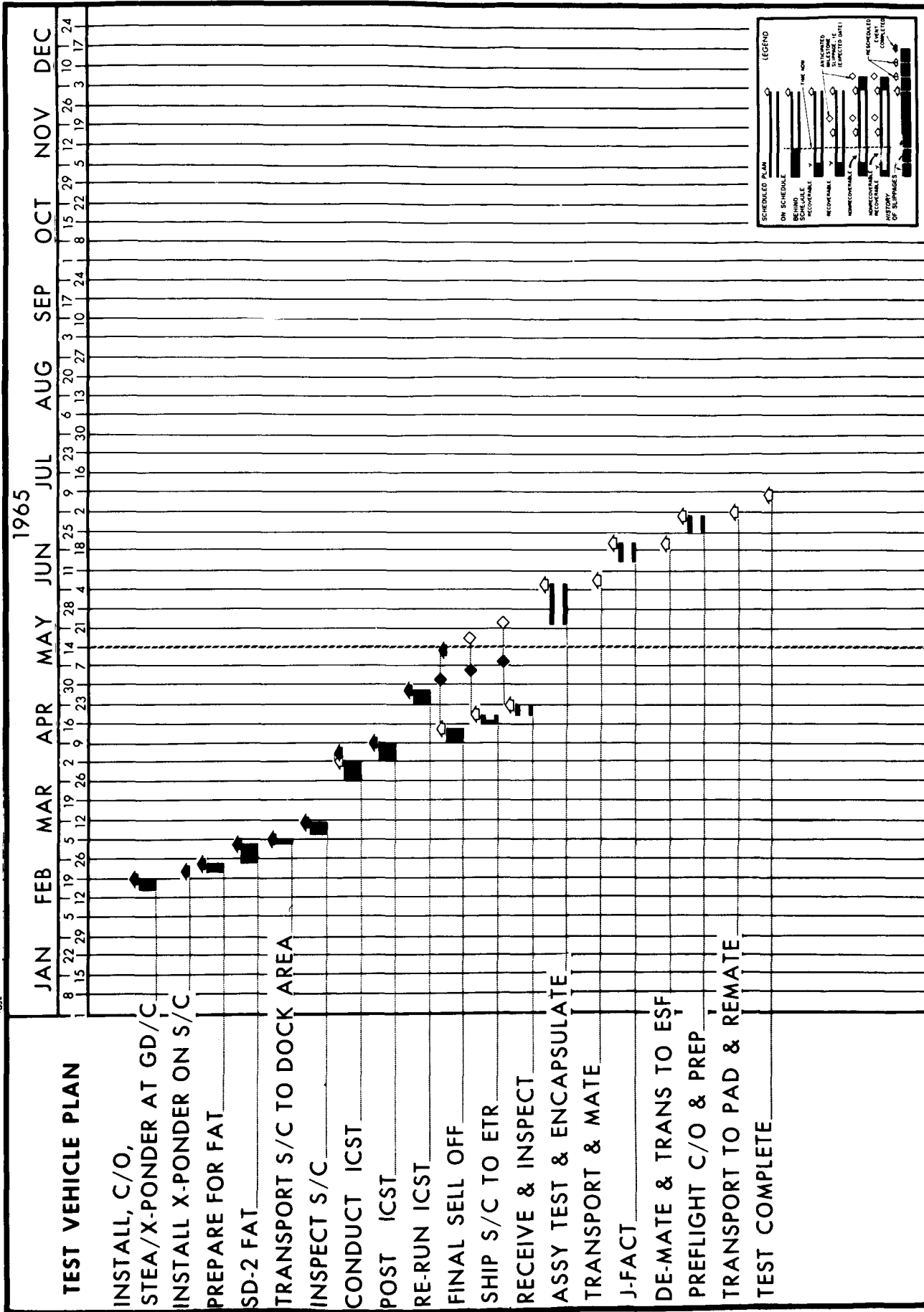
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MISSION G SPACECRAFT TEST & OPERATIONS PLAN SC-8



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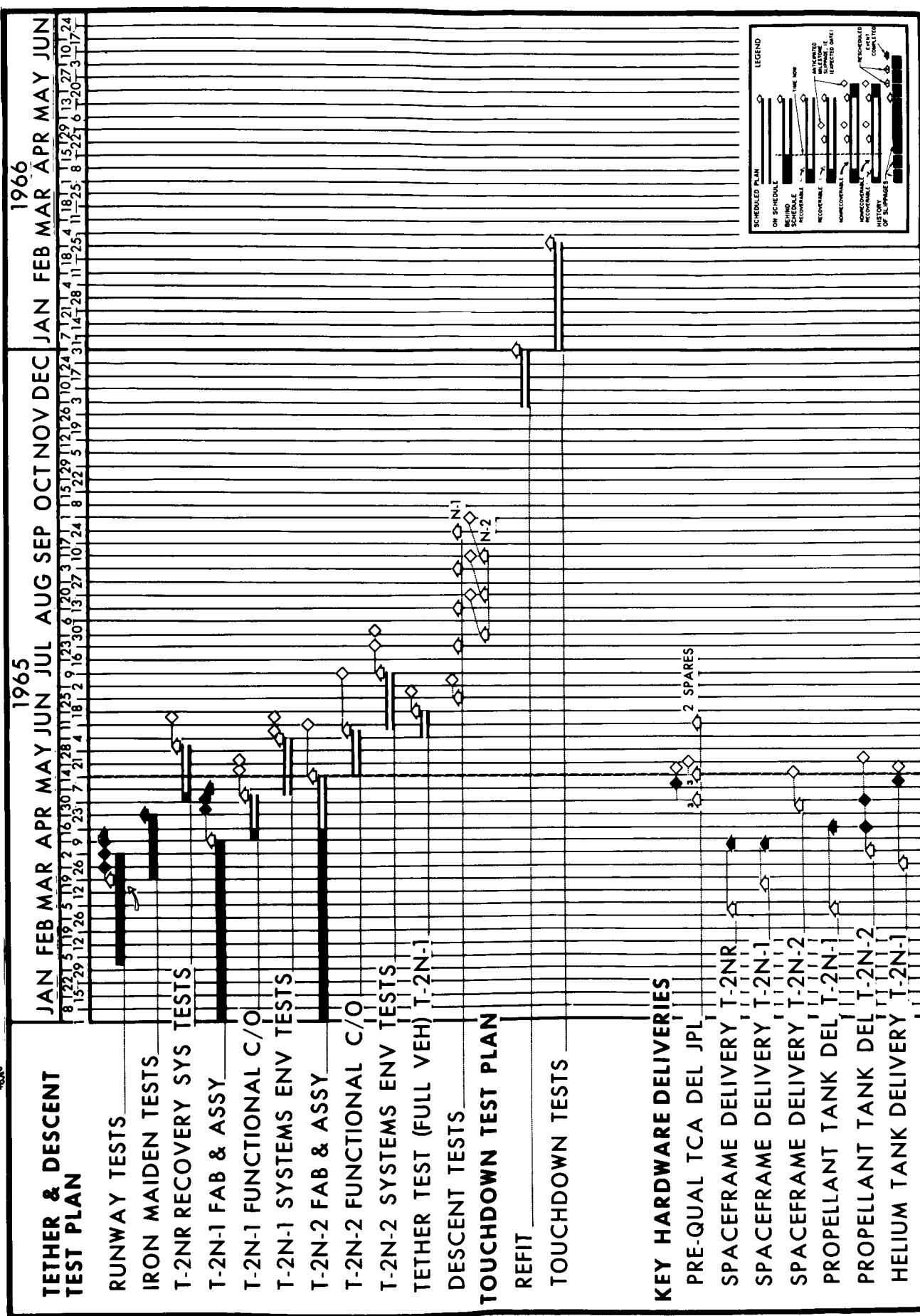
SURVEYOR DYNAMIC MODEL SD-2



SUMMARY OUTLOOK

DYNAMIC MODEL SD-2

SD-2 was shipped by air to ETR 13 May 1965. AC-6/SD-2 ETR operations schedules were not available at the time of this report because of the AC-6 launch vehicle schedule reevaluation that is currently underway. Integrated schedules for AC-6/SD-2 are expected to be completed prior to the next report period.



SUMMARY OUTLOOK

TERMINAL DESCENT SUBSYSTEM TEST

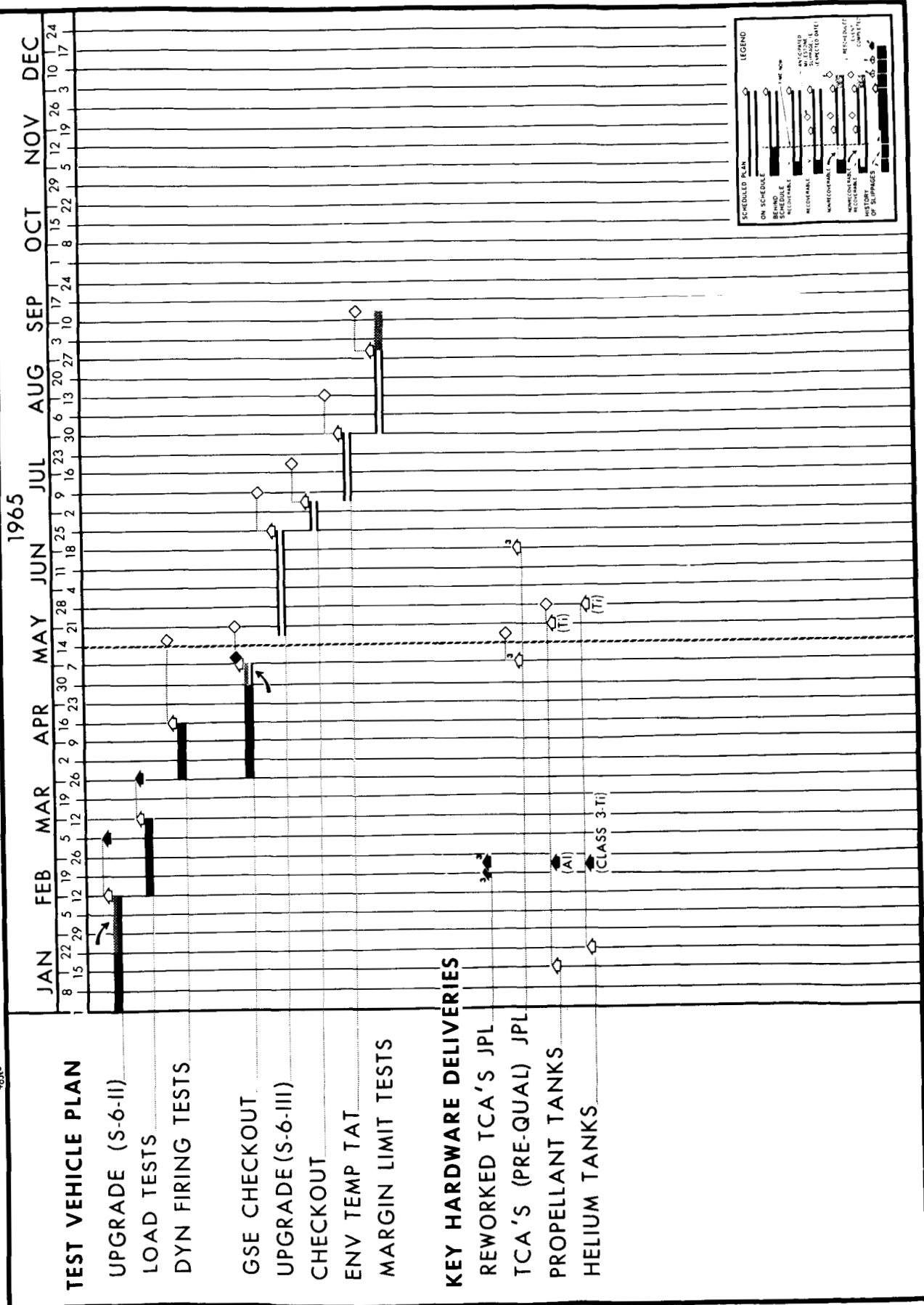
Review of the recovery systems test results have been conducted to determine adequacy of the parachute system prior to proceeding with T-2N-R drop testing. Sink rates of the main cluster were accurately measured to be 22 ft./sec., rather than the design goal of 20 ft./sec. Two design fixes are planned which will contribute to lowering the sink rate; (1) lengthening of the main chute risers such that each chute acts independently with less reaction from other chutes and (2) installation of a "centerline" suspension cord which splays the chute over a broader cross section, this giving the same effect as increased drag area. Additional para-bomb and iron maiden drop tests will be conducted at Holloman (HAFB) during the next report period to checkout these design fixes.

The T2NR is in functional test at El Segundo and is expected to be shipped to Holloman (HAFB) for testing 26 May. Completion of recovery systems tests is expected 15 June.

Functional checkout of T-2N-1 continued during this report period. Expected completion date is now estimated to be 25 May. Weekly operational schedules are being prepared which will provide improved visibility and control of this activity. Delayed completion of T-2N-1 functional checkout impacts upon the first drop test schedule 1.5 weeks. However this slippage will be recovered prior to the second scheduled drop test.

T-2N-2 fabrication and assembly is behind schedule approximately 5.0 weeks which causes an anticipated slippage of T-2N-2 drop tests by 3.0 weeks. This condition, if not corrected, will result in approximately 1.0 weeks slippage of the completion schedule for the overall terminal descent test program. Further evaluation of current planning will be undertaken to determine necessary schedule recovery action.

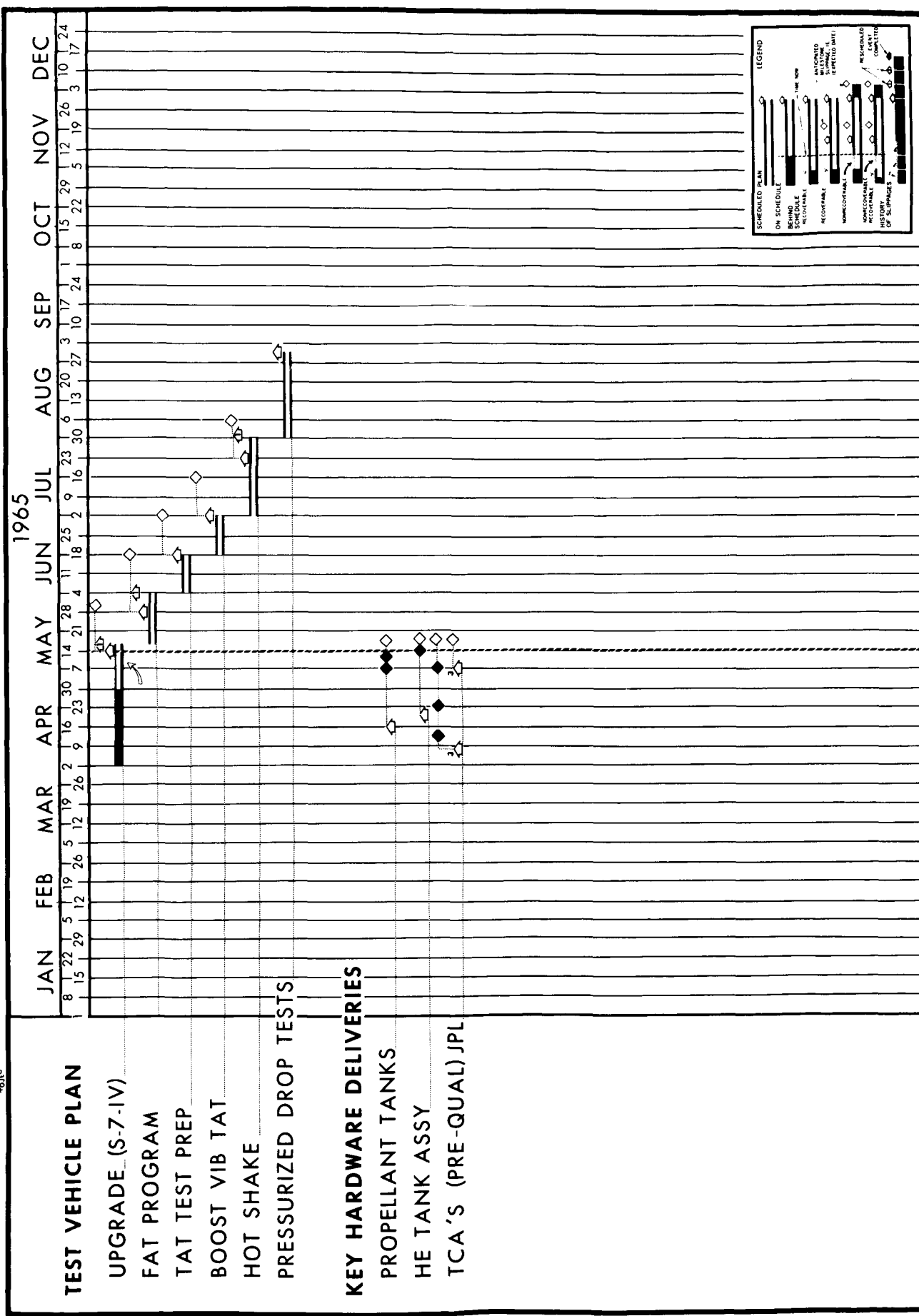
Primary cause for terminal descent test program schedule slippage was the diversion of effort to the T-21, SC-1 and SC-2 spacecraft that were undergoing upgrade during the month of April.



SUMMARY OUTLOOK

S-6 VERNIER PROPULSION SUBSYSTEM TESTS

Three closed loop 50 second test runs with unsaturated propellant have been completed and the final run will be accomplished during the week of 17-21 May. The vehicle is not expected to enter up-grade until 31 May, due to slippage of the S-7 program. During the period between completion of tests and start of up-grade, the vehicle will remain at Placerita and will be utilized for crew training in propellant loading.

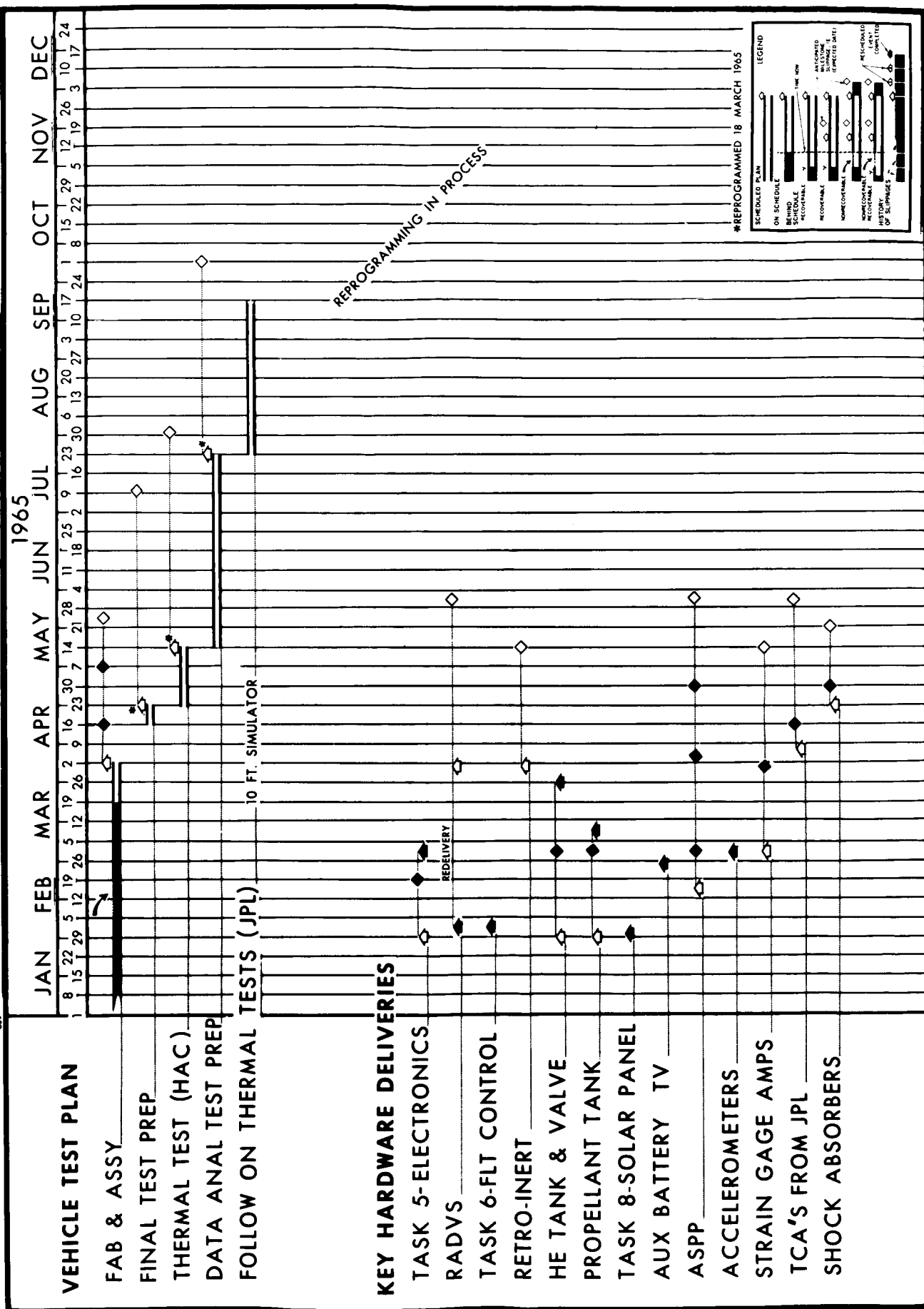


SUMMARY OUTLOOK

S-7 VERNIER PROPULSION SUBSYSTEM TESTS

Completion of up-grade is now expected to occur on 31 May. The prime reason for the anticipated slippage is the reallocation of resources, both material and manpower, caused by higher priorities being assigned to the T-21 and SC-1 programs. Items such as quick-disconnects have been removed for use on T-21 and SC-1.

THERMAL CONTROL MODEL TESTS TCM

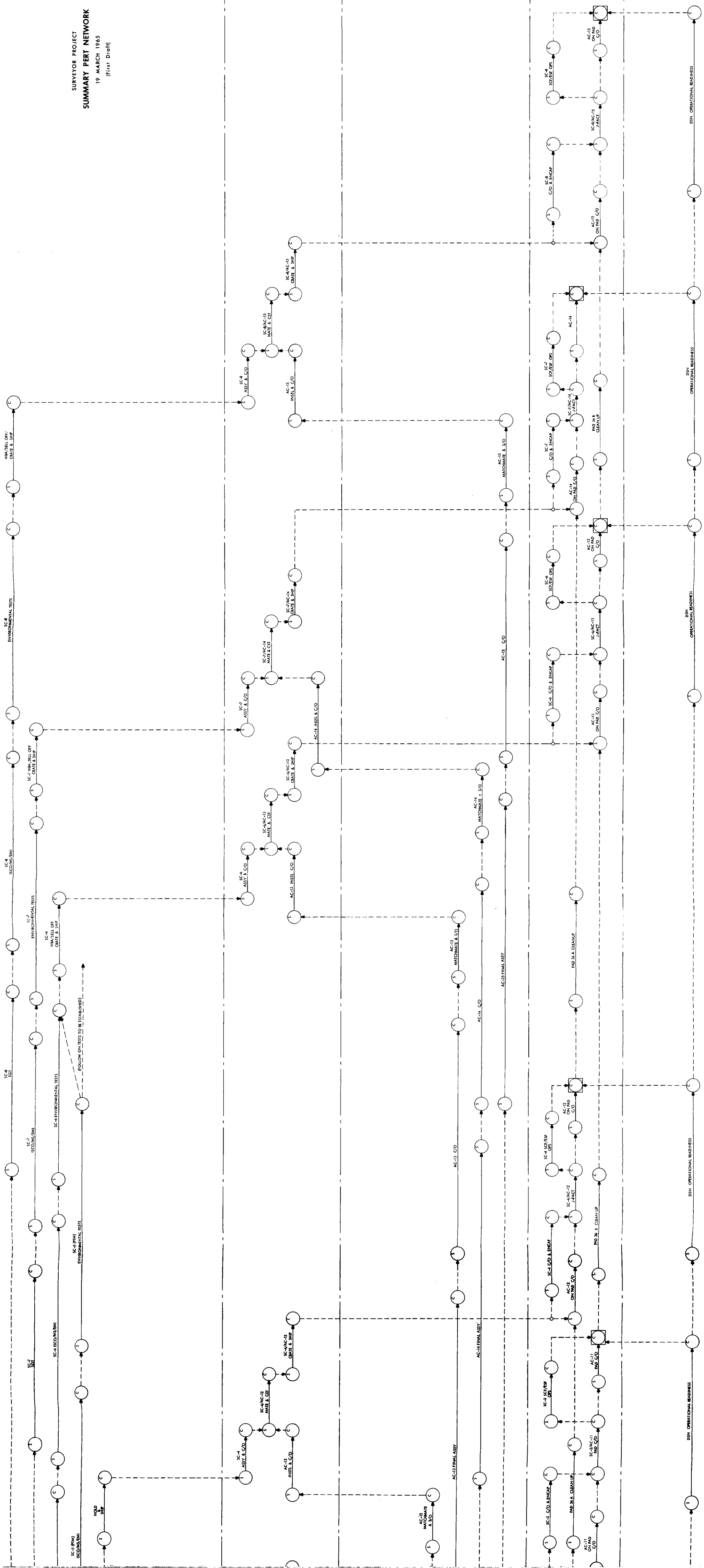


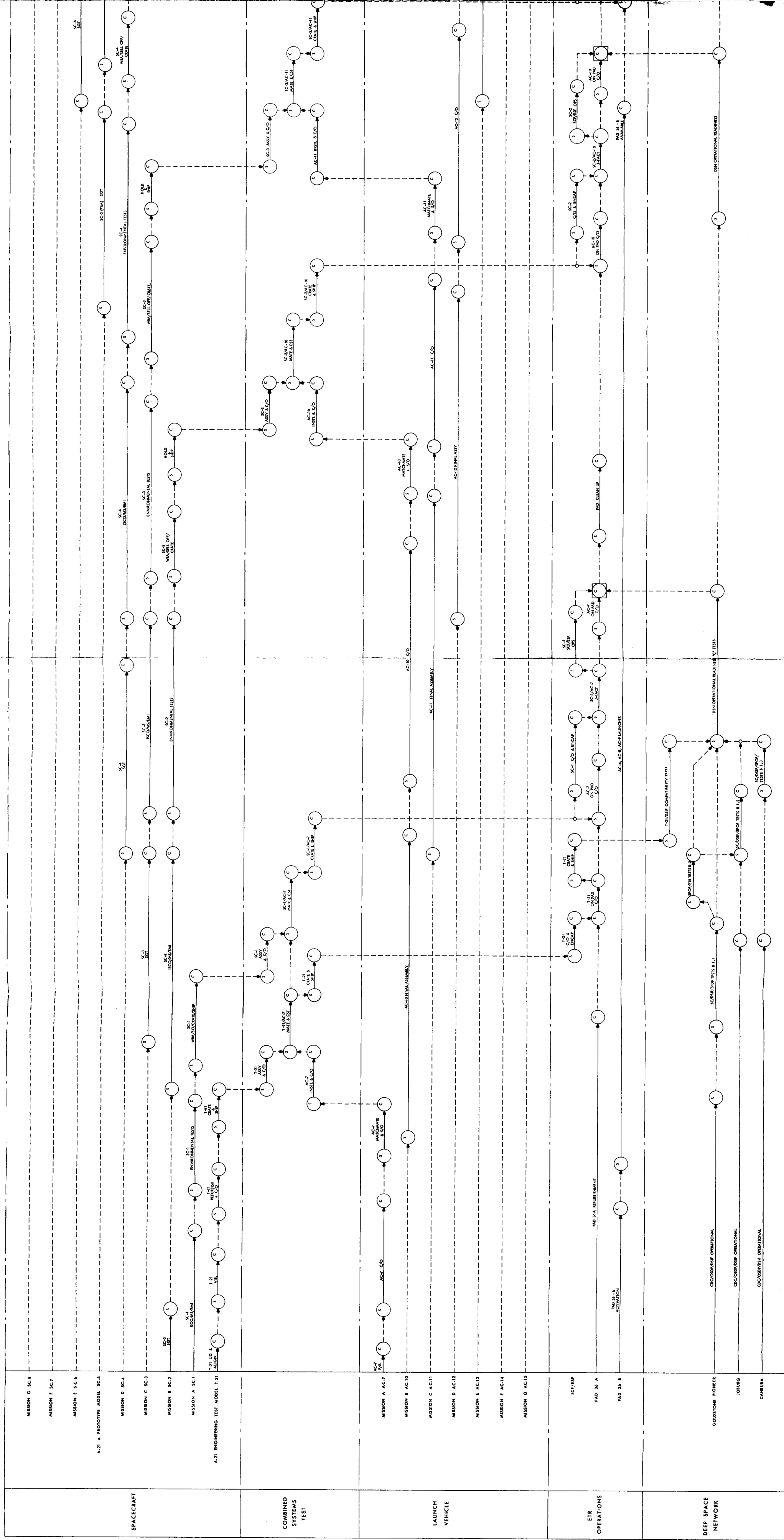
SUMMARY OUTLOOK

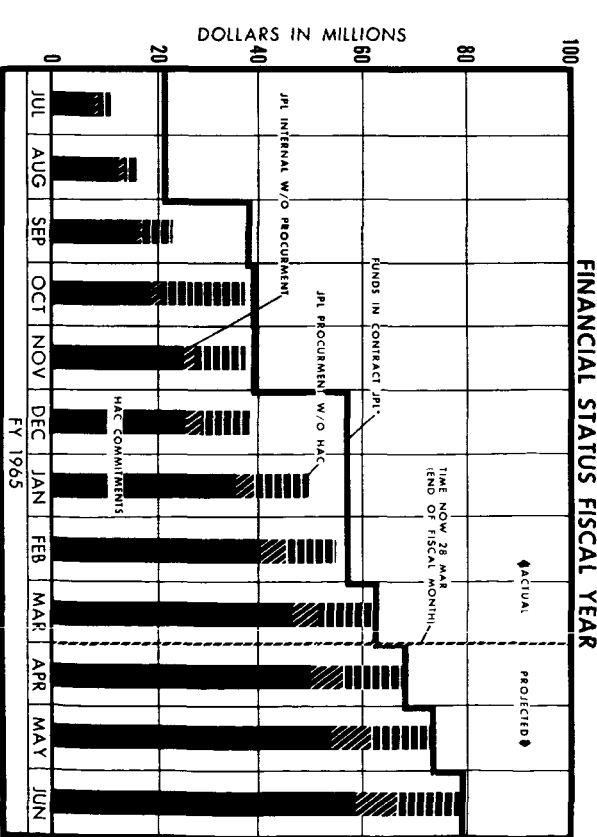
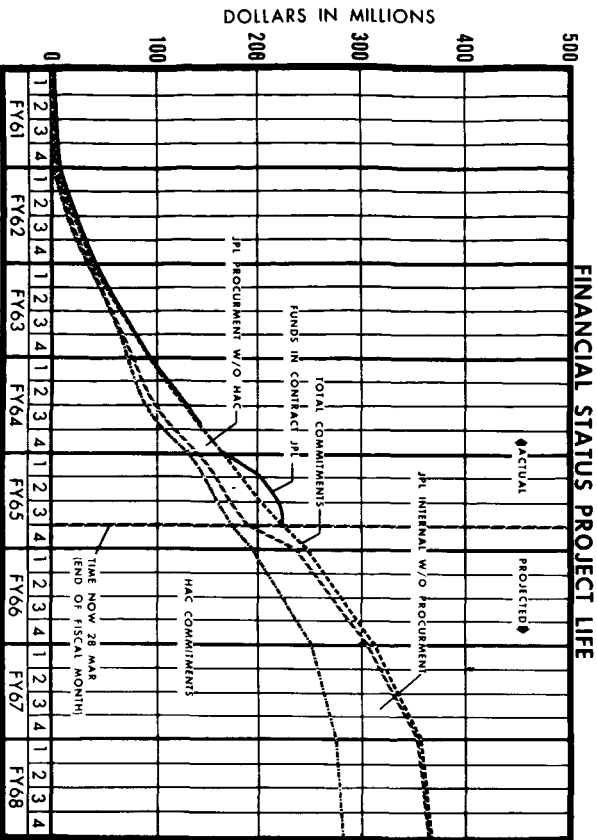
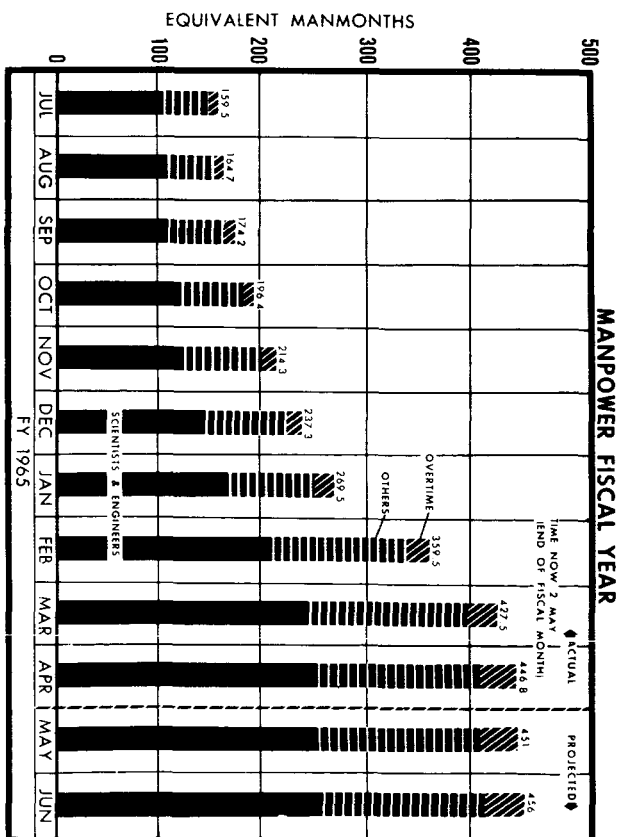
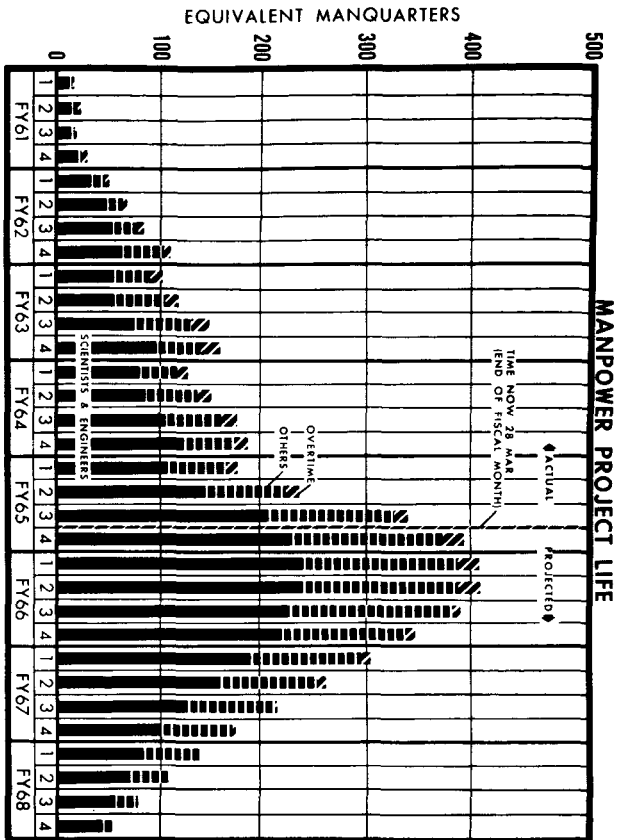
THERMAL CONTROL MODEL TESTS - TCM

Evaluation of the TCM program plan continues in an effort to establish a new schedule that will be compatible with hardware and test facility availabilities. The need to reschedule is due to higher priorities being assigned to the T-21 and SC-1 programs.

SURVEYOR PROJECT
SUMMARY PERT NETWORK
19 MARCH 1965
(First Draft)



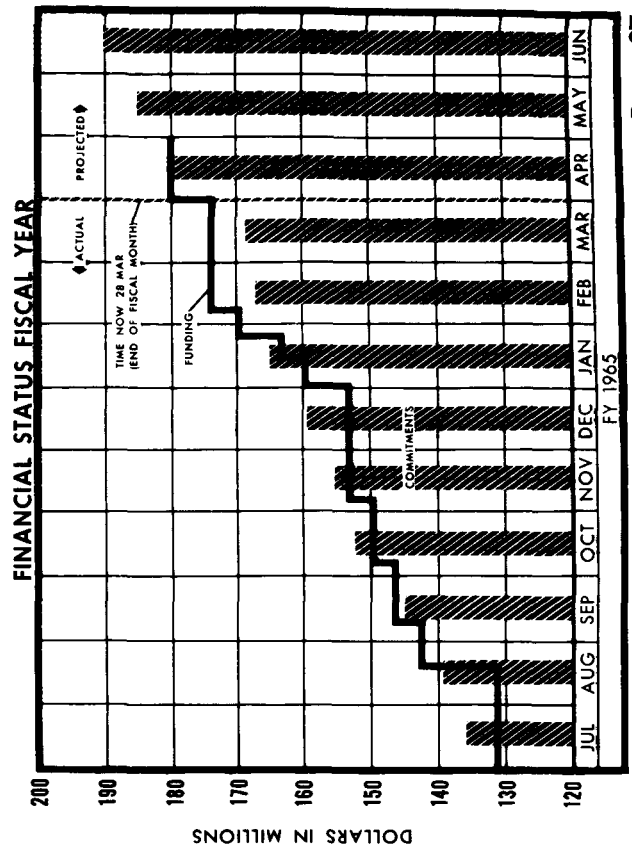
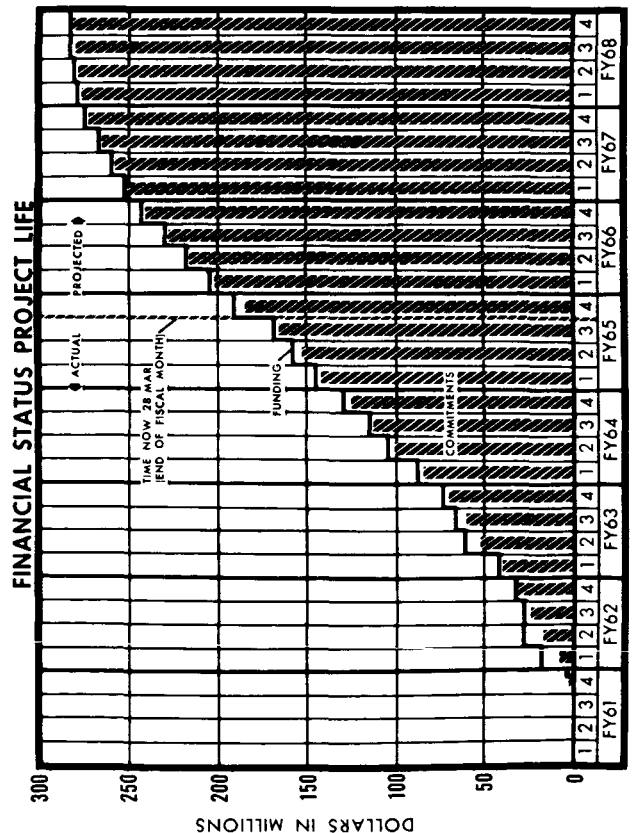
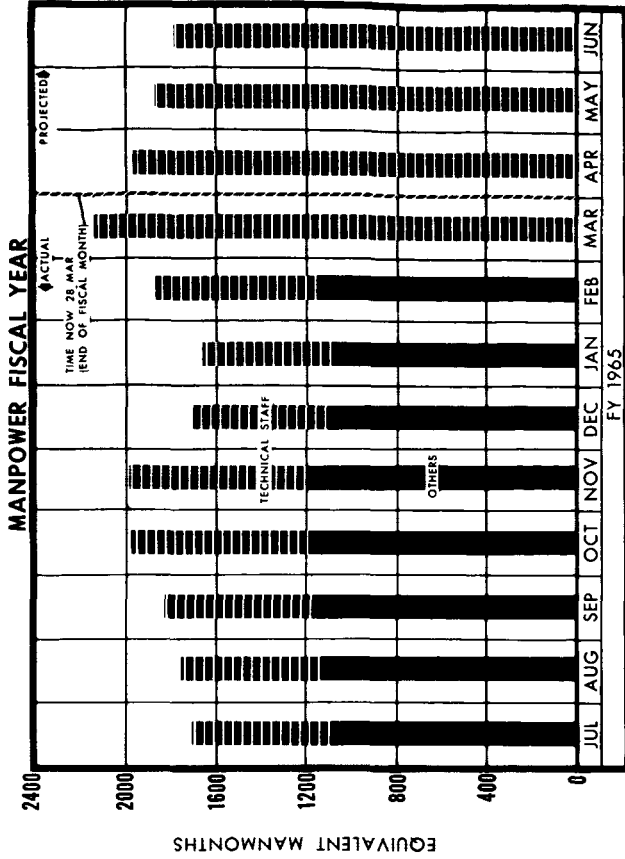
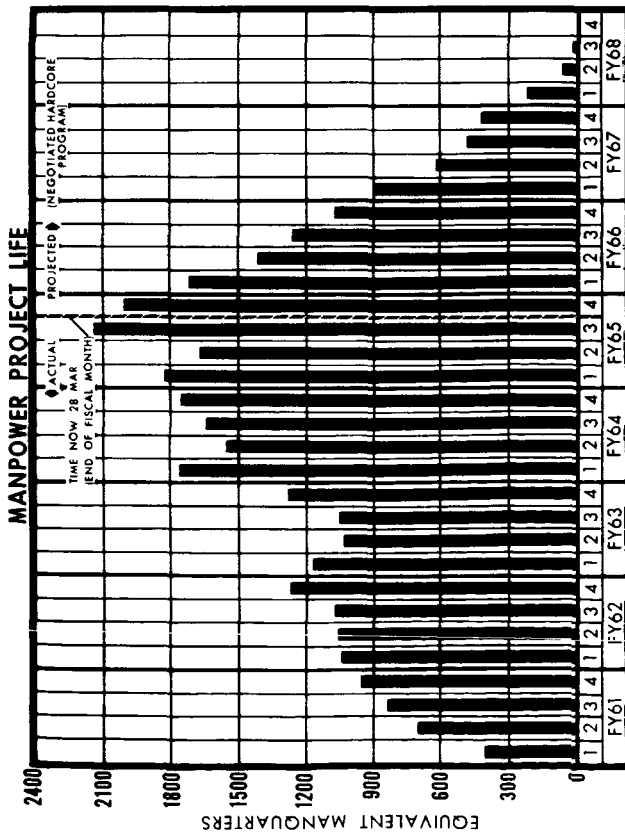




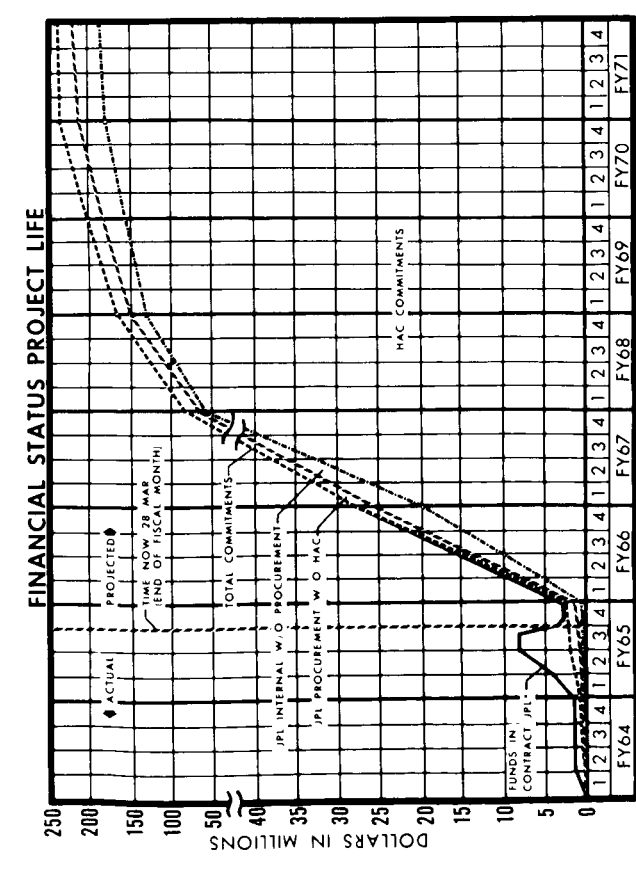
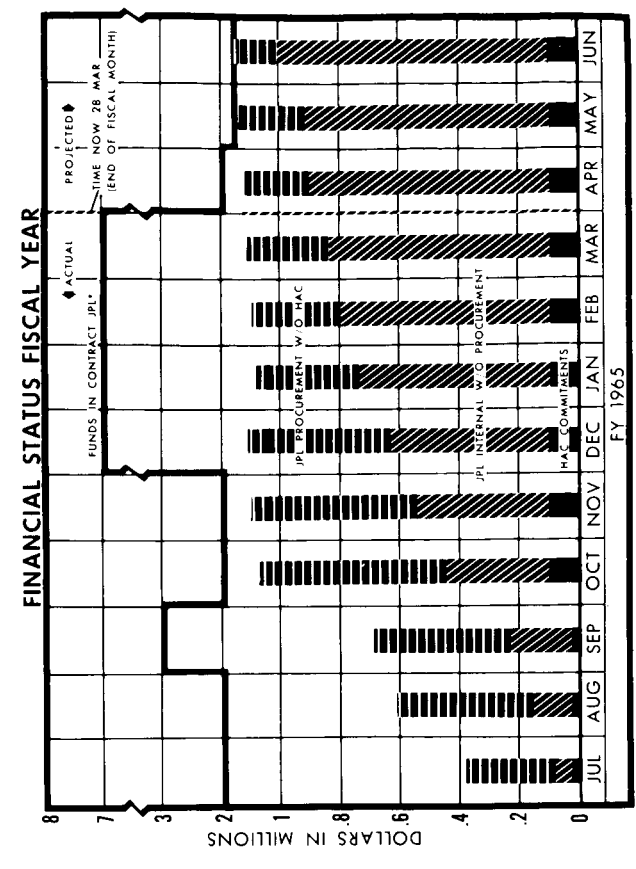
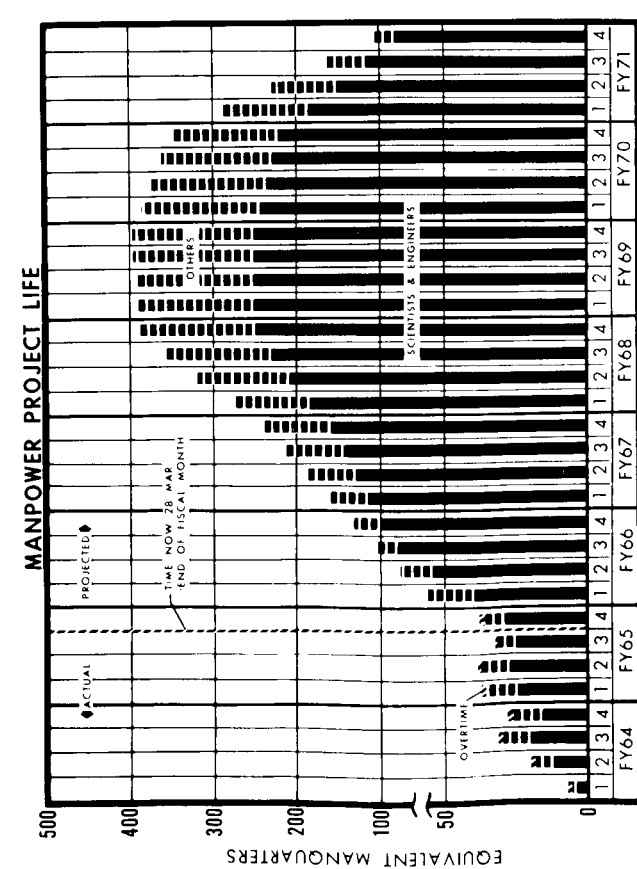
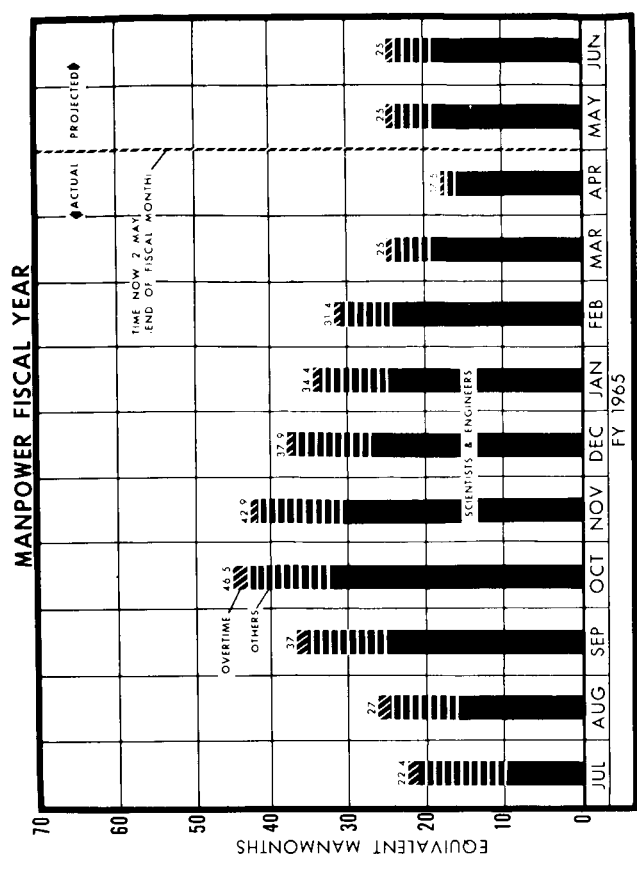
*Funds Received FY65 (Comparative Analysis of Funds Planned & Authorized)

HAC SURVEYOR BLOCK I RESOURCES

15 APR 1965



SURVEYOR BLOCK 2 RESOURCES

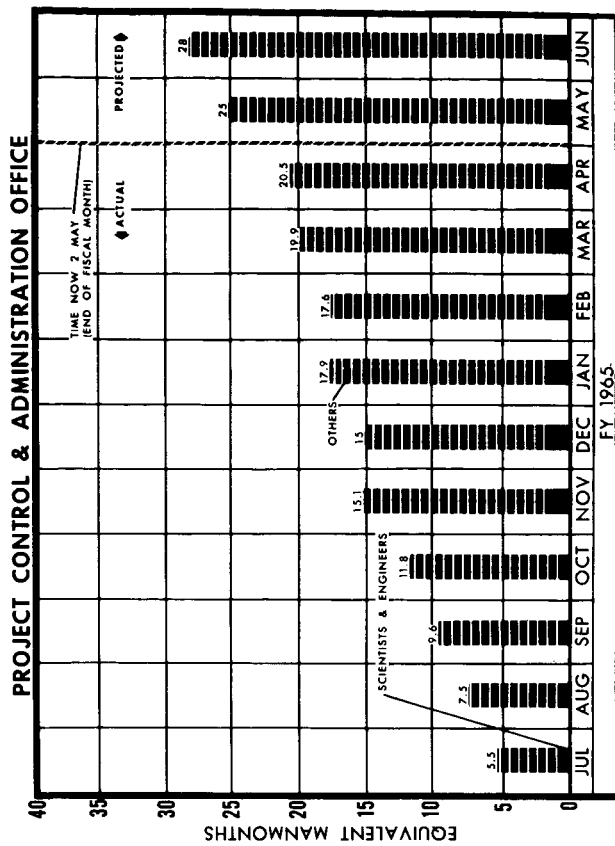
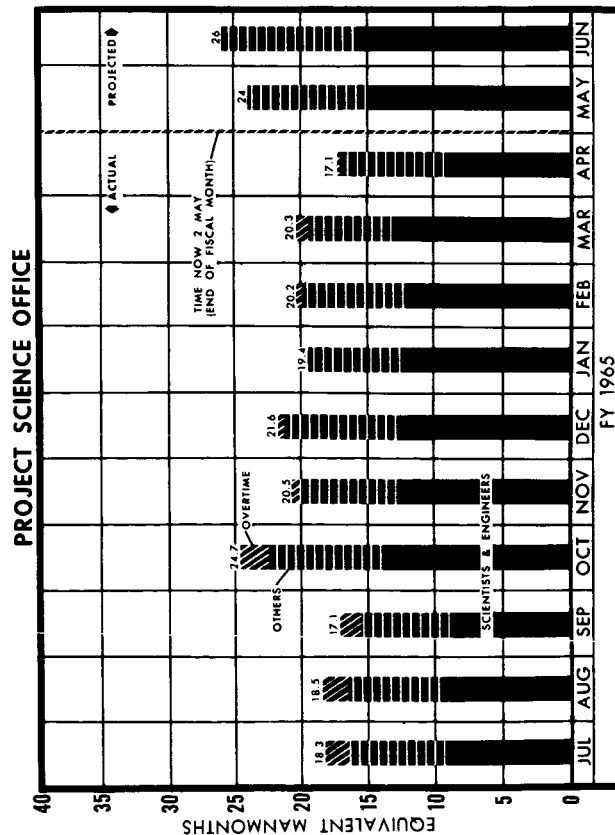
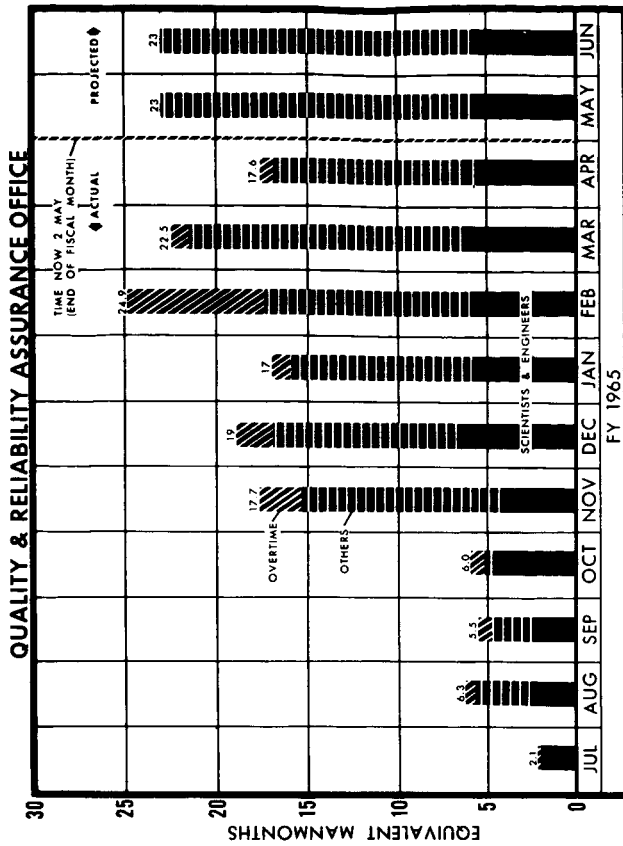
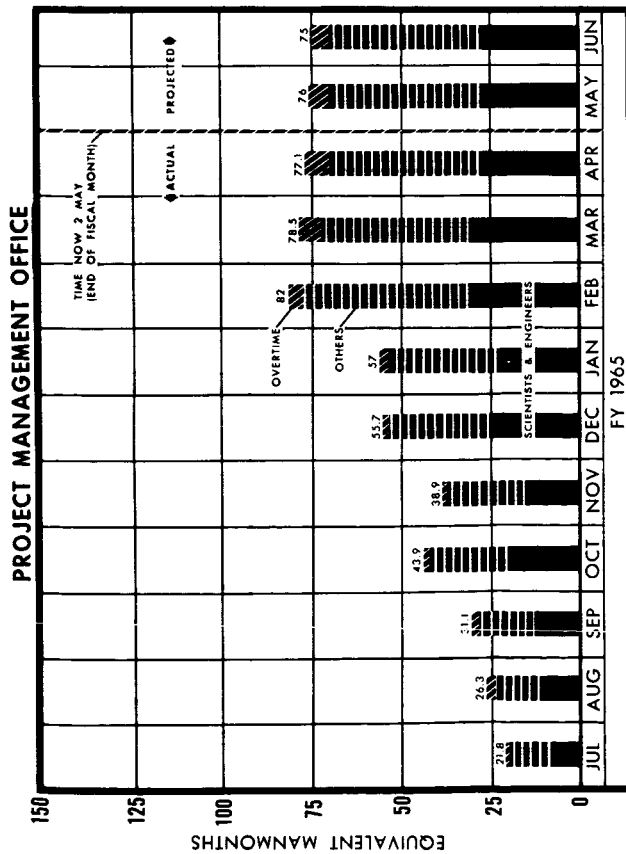


* Funds Rec'd FY 65 (Comparative Analysis Of Funds Planned & Authorized)

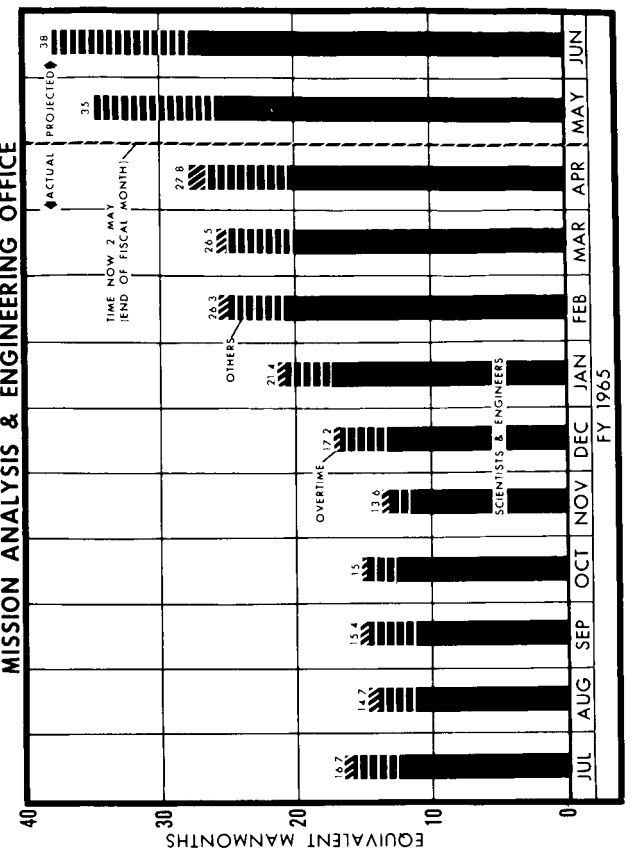
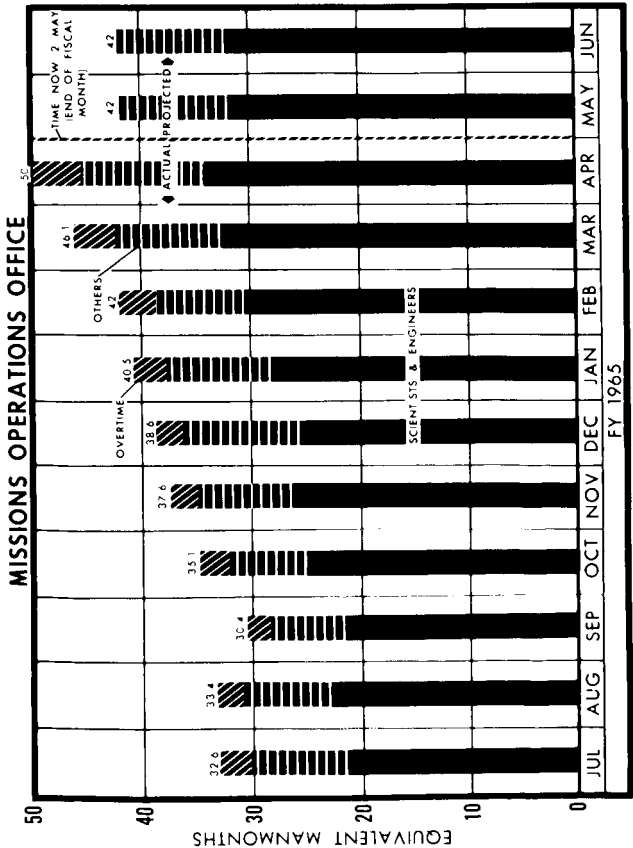
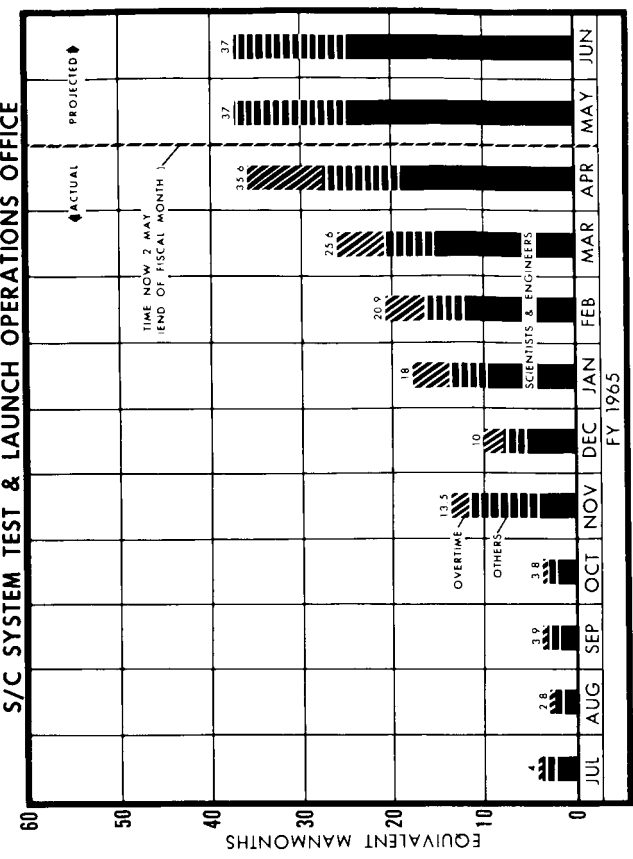
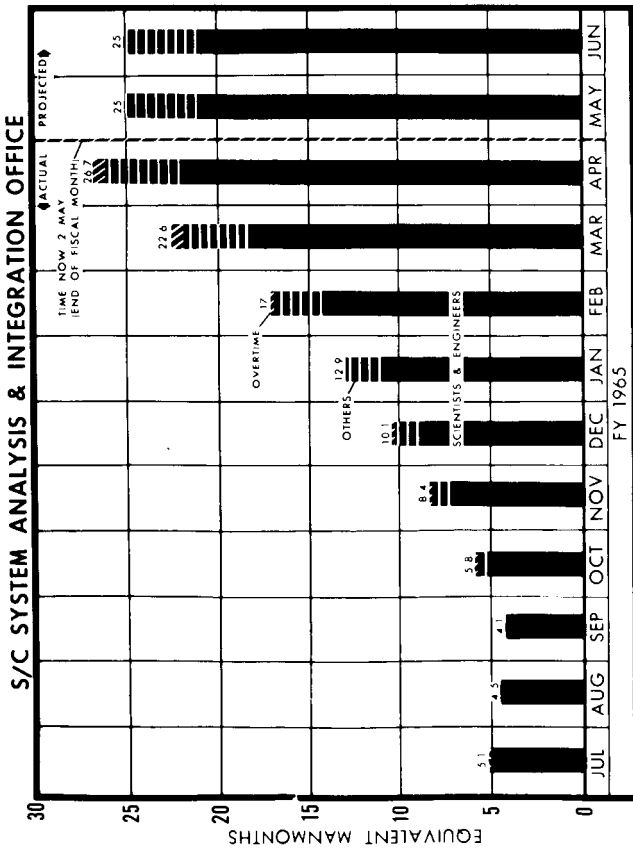


SURVEYOR BLOCK I MANPOWER

14 MAY 1965



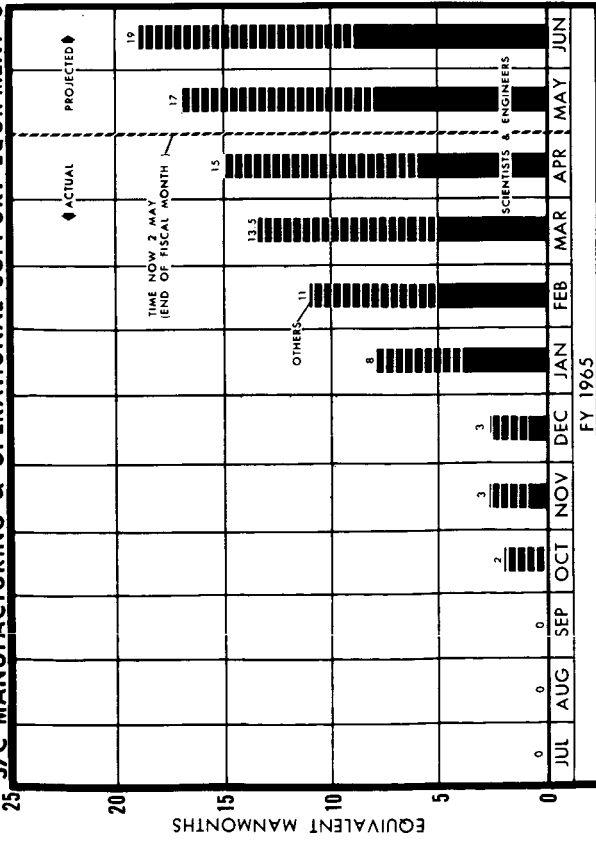
SURVEYOR BLOCK I MANPOWER



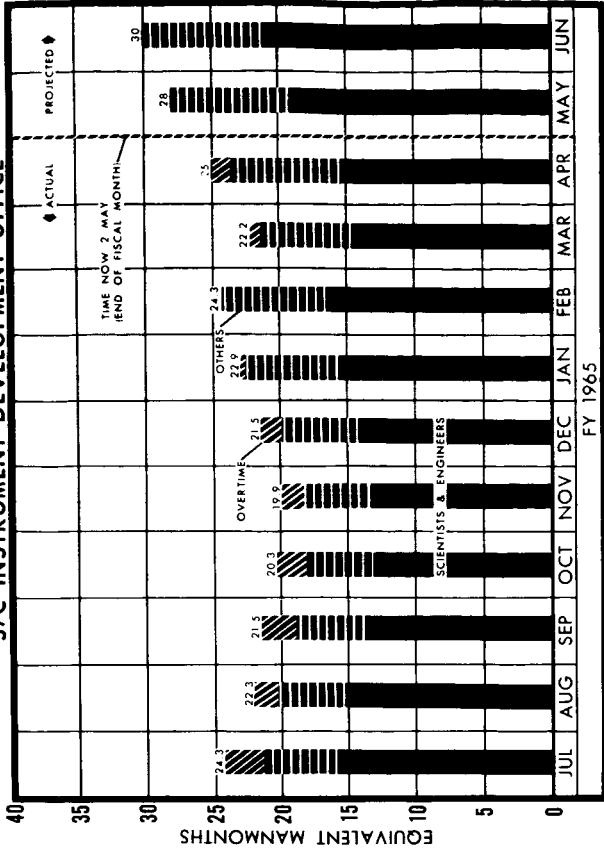
SURVEYOR BLOCK I MANPOWER

14 MAY 1965

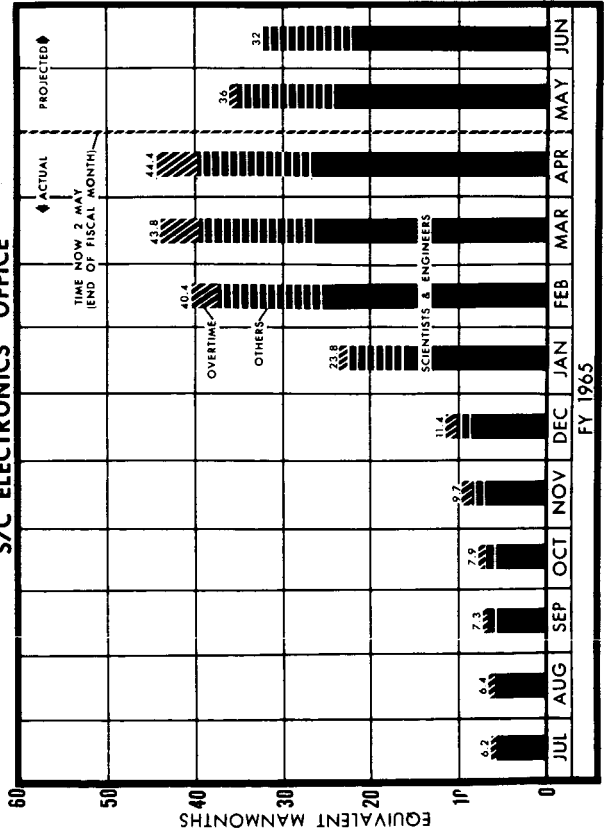
S/C MANUFACTURING & OPERATIONAL SUPPORT EQUIPMENT OFFICE



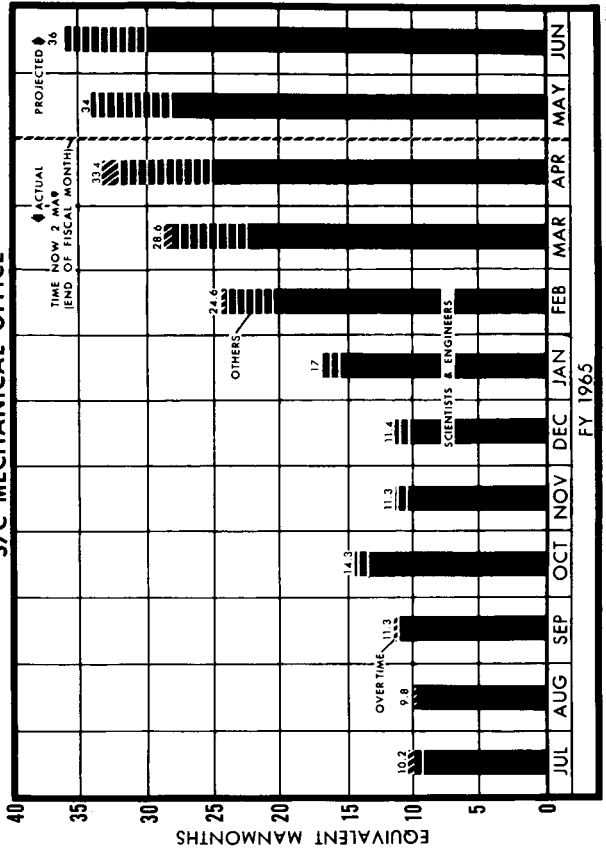
S/C INSTRUMENT DEVELOPMENT OFFICE



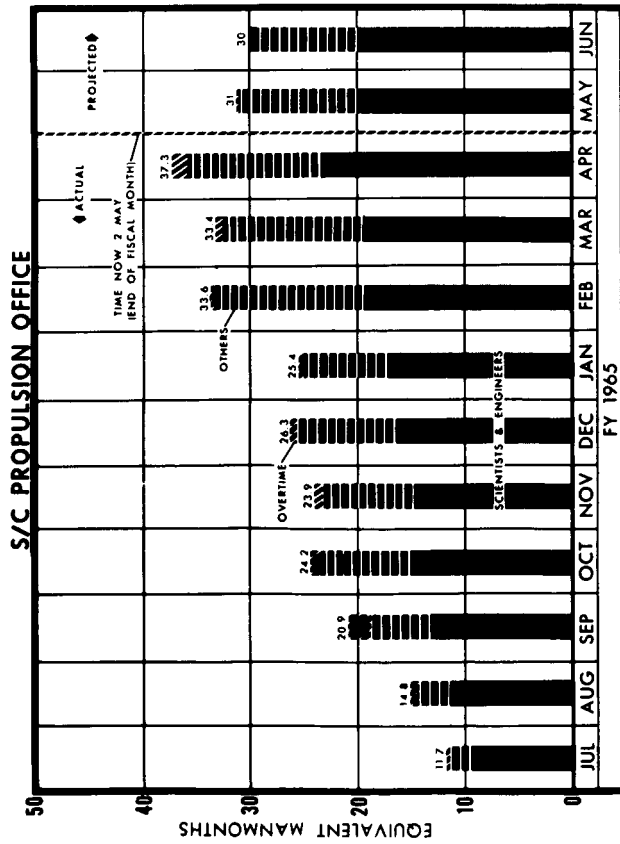
S/C ELECTRONICS OFFICE



S/C MECHANICAL OFFICE



SURVEYOR BLOCK I MANPOWER



GLOSSARY

Spacecraft Model Designations

A-21 (SC-1 through SC-4). Flight-quality, subsystem and system flight-acceptance tested spacecraft carrying the engineering payload and designated for Surveyor test missions.

A-21A (SC-6 through SC-8). Flight-quality, subsystem and system flight-acceptance test spacecraft carrying the scientific payload and designated for operational missions.

SD-1 through SD-4. Spacecraft dynamic models associated with Centaur R and D flight AC-5 and AC-6 and two Plumbrook tests respectively.

S-2. Test spacecraft for vibration, shock, and static structural tests of the A-21 spacecraft.

S-6, S-7. Test spacecrafts for vernier propulsion system prequalification testing.

T-1. Test spacecraft for simulated lunar landing drop tests and Centaur separation testing.

T-2N. Test spacecraft for descent dynamics testing.

A-21 (T-21). Prototype spacecraft having same configuration as SC-1 through SC-4 for system, type-approval, and mission-simulation tests.

A-21A (SC-5). Proof test model (PTM) spacecraft having same configuration as SC-6 through SC-8 for system, type-approval, and mission simulation tests.

MT-1. Thermal test spacecraft, constructed in three sectors, comprising together a thermal mockup of spacecraft.

Abbreviations

AC Atlas Centaur

AFETR Air Force Eastern Test Range, Cape Kennedy.

Al Aluminium

AMR Altitude Marking Range

ASPP Antenna Solar Panel Positioner

ASSY Assembly

CDC Command and Data Handling Console.

CLASS A-1.1 TESTS Personnel Training and Equipment Operational Tests.

CLASS A-1.2 TESTS Same as A-1.1 Tests Except Limited to SFOF.

CLASS A-2.0 TESTS SFOF Verification Tests.

CLASS B-1.1 TESTS DSIF-11 Spaceflight Operations System Functional Compatibility Tests.

CLASS B-1.2 TESTS DSIF-42 Spaceflight Operations System Functional Compatibility Tests.

CLASS B-1.3 TESTS DSIF-51 Spaceflight Operations System Functional Compatibility Tests.

CLASS B-2.0 TESTS ETR Spaceflight Operations System Functional Compatibility Tests.

CLASS-C-2.0 TESTS SFOF/DSIF Command Procedures Tests.

CLASS-C-3.0 TESTS SFOF/AFETR Integration Tests.

CLASS-C-4.0 TESTS SFOF/DSIF Integration Tests.

CLASS-C-5.0 TESTS Space Operations System Operational Readiness Tests.

GLOSSARY

Abbreviations (Continued)

<u>C/O</u>	Checkout.	<u>GSE</u>	Ground Support Equipment.
<u>CONTR</u>	Contractor.	<u>HAC</u>	Hughes Aircraft Company, Spacecraft System contractor (JPL contract).
<u>CST</u>	Combined System Test.	<u>He</u>	Helium.
<u>DEL</u>	Delivery.	<u>ICST</u>	Integrated Combined Systems Test.
<u>DSIF</u>	Deep Space Instrumentation Facility.	<u>ISCO</u>	Initial Systems Checkout.
<u>DSIF-11</u>	Pioneer Deep Space Instrumentation Facility (Goldstone).	<u>J-FACT</u>	Joint Flight Acceptance and Composite Test.
<u>DSIF-42</u>	Camerra Deep Space Instrumentation Facility.	<u>LeRC</u>	Lewis Research Center, NASA.
<u>DSIF-51</u>	Johannesburg Deep Space Instrumentation Facility.	<u>L/V</u>	Launch Vehicle.
<u>DSN</u>	Deep Space Net.	<u>MS</u>	Mission Sequence.
<u>DSS</u>	Deep Space Station of DSIF (located at Krugersdorp, South Africa; Woomera, Australia; Canberra, Australia; Goldstone, California; and Madrid, Spain).	<u>OSDP</u>	On Site Data Processing.
<u>EMI</u>	Electro Magnetic Interference.	<u>PDP</u>	Surveyor Project Development Plan, dated 28 February 1964.
<u>ENV.</u>	Environmental.	<u>RADVS</u>	Radar Altimeter and Doppler Velocity Sensor.
<u>ESF</u>	Explosive Safe Facility.	<u>RMD</u>	Reaction Motors Division, Thiokol, vernier engine subcontractor (JPL).
<u>ETR</u>	Eastern Test Range.	<u>SCF</u>	Spacecraft Checkout Facility.
<u>FAT</u>	Flight Acceptance Test.	<u>SFOF</u>	Space Flight Operations Facility.
<u>FC</u>	Flight Control.	<u>SFOP</u>	Space Flight Operations Plan.
<u>FCSG</u>	Flight Control Sensor Group.	<u>SGT</u>	System Group Test.
<u>FPAC</u>	Flight Path Analysis and Command.	<u>SLRV</u>	Surveyor Lander Roving Vehicle.
<u>GD/C</u>	General Dynamics/Convair, Atlas/Centaur vehicle contractor (LeRC contract).	<u>SPAC</u>	Spacecraft Performance Analysis and Command.
<u>GDHS</u>	Ground Data Handling System.	<u>SSAC</u>	Space Science Analysis and Command.

GLOSSARY

Abbreviations (Continued)

<u>STE</u>	System Test Equipment Assembly.
<u>STV</u>	Solar Thermal Vacuum.
<u>TAT</u>	Type Approval Test.
<u>TCA</u>	Thrust Chamber Assembly.
<u>T-2NR</u>	Terminal Descent Test, Recovery System Test Vehicle.
<u>WBA</u>	Weight Balance Alignment.
<u>X-PONDER</u>	Transponder.

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PROJECT	PROJECT
DIVISION	PROJECT
OFF LAB	OFF LAB

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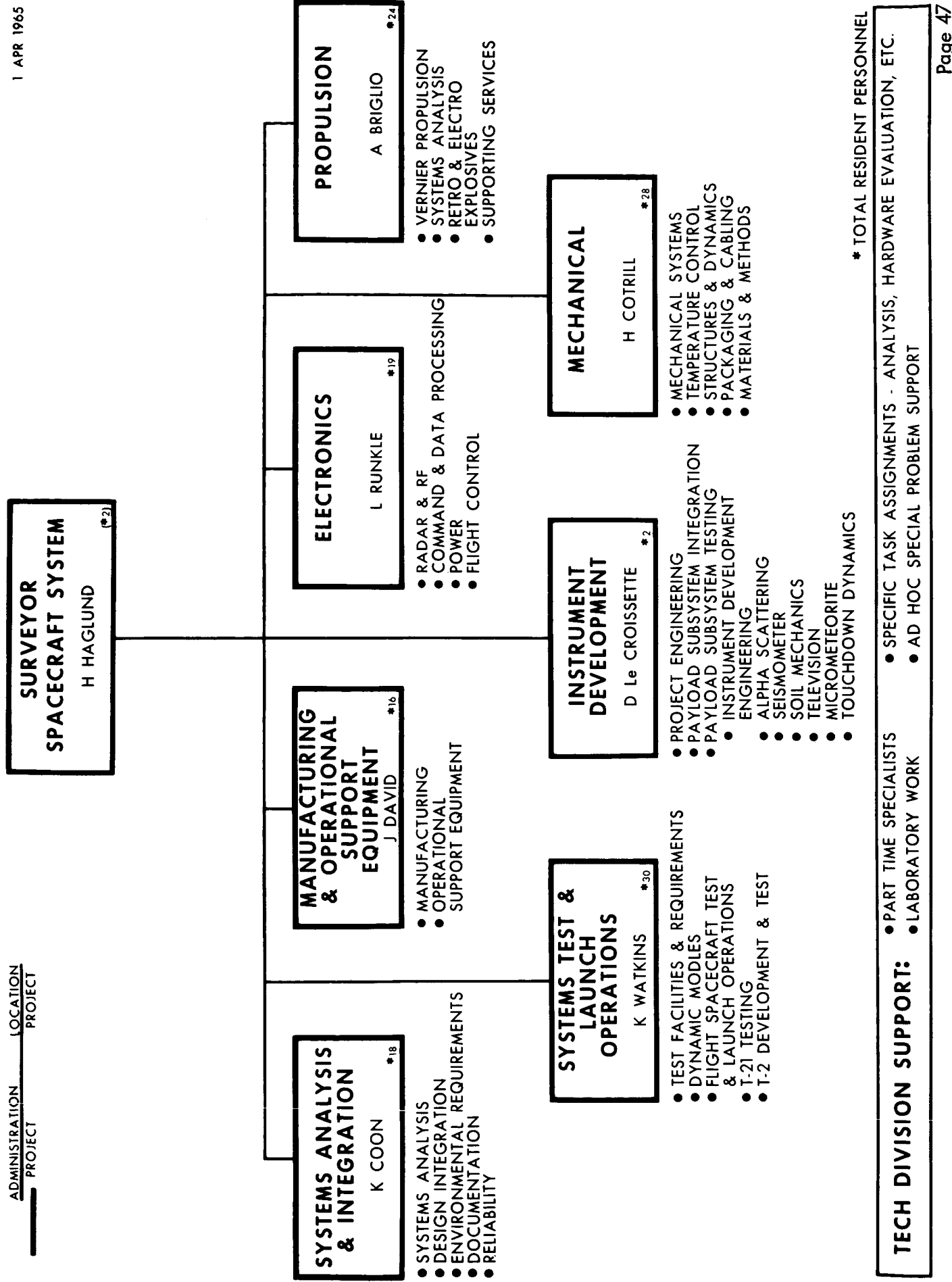
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