Surveyor Project Status Report

As of 19 February 1965

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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

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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 objective shall be to demonstrate a soft landing on the Moon in 1965 as evidenced by postlanding spacecraft operations in one or more missions. Subsequent to 1965, the primary objective will be to perform lunar surface operations contributing new scientific knowledge about the Moon and providing basic data in support of Project Apollo.

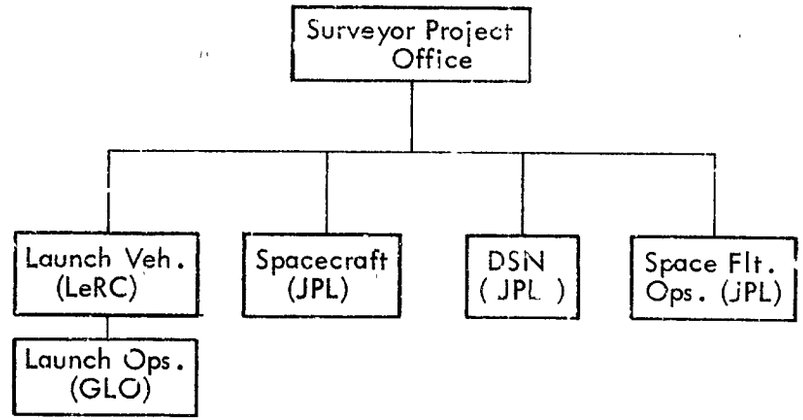
The Surveyor Project Block I currently comprises seven flight missions. These missions will utilize the Atlas/Centaur launch vehicle with launches to be conducted from Complex 36 at the Air Force Eastern Test Range (ETR), Cape Kennedy. The missions will be conducted utilizing direct ascent launch trajectories with a spacecraft having a nominal separated weight of 2150 lbs. The missions will be divided into two groups consisting of (1) four spacecraft designated as engineering test flights and 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.

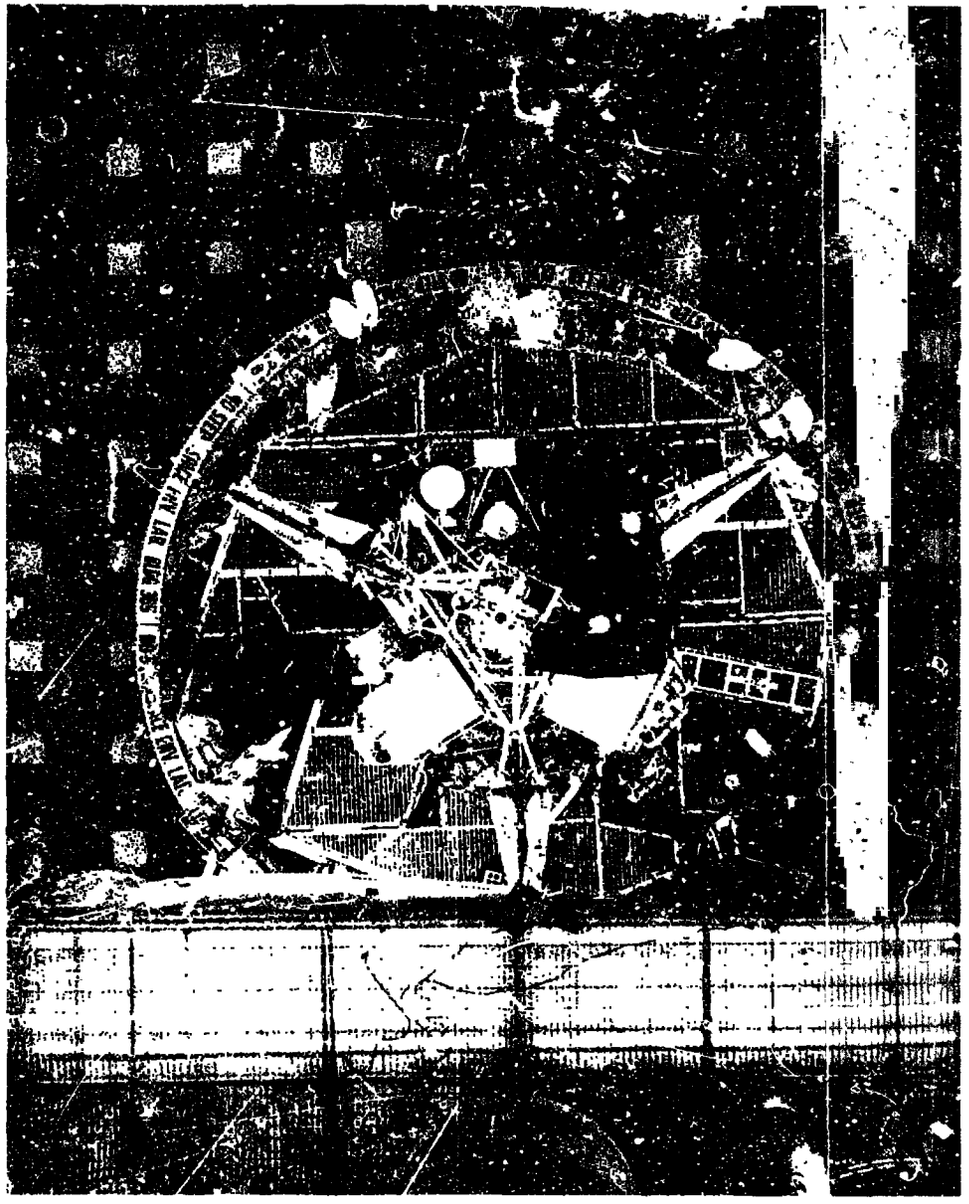
After spacecraft injection, all additional mission operations will be conducted from the JPL Space Flight Operations Facility. Accumulation of engineering and scientific data and the processing and partial reduction of the scientific data will be accomplished at this Facility. The SFOF will be the focus of continuing operations associated with the conduct of experiments during the 30 - to 90 day 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.



* Updated abstracts from pre-release PDP dated 28 February 1964.



TOP VIEW OF T-21
ON END BELL
(STV COMPLETED)

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PROJECT SUMMARY

CURRENT EVENTS

1.0 T-21 PROOF TEST MODEL

Solar Thermal Vacuum (STV) testing of T-21 resumed with pumpdown on February 15, 1965. The STV test abort on February 5, 1965, because of a failure in the RADVD Klystron Power Supply module, prevented continuance of STV testing until February 15, 1965. During this period the KPSM was removed and repaired. Completion of Thermal Vacuum Test is now expected by February 21, 1965. This is approximately a month slip over the scheduled plan. A plan is now under investigation by HAC by which this slippage may be recovered by April 1, 1965.

2.0 SC-1 FLIGHT SPACECRAFT

SC-1 is currently undergoing system group tests. Originally scheduled for completion on February 8, 1965, SGT completion is now expected on March 10, 1965. Although SGT has been delayed, several weeks of ISCO has been accomplished. Data received from testing thus far indicates acceptable spacecraft performance. Television / Telecommunications Integration Tests were started on February 15, 1965 but were suspended due to a malfunction. The ASPP was installed and Mechanism and Vehicle Integration Tests began on February 18, 1965.

3.0 SC-2 FLIGHT SPACECRAFT

System Group Tests are being performed and are scheduled to continue until March 12, 1965. Flight Control Group Tests on spacecraft power as well as Telecommunication Intergroup tests were completed during the report period. No functional problems were encountered during these tests. RF/Spacecraft Power Integration Tests have been in process during the past week.

4.0 DYNAMIC MODELS (SD-1)

SD-1 has been undergoing various tests since its mating to the Atlas/Centaur Launch Vehicle (AC-5) on February 5, 1965. Quadtanking was started on February 11, 1965 and subsequently completed. Plugs Out Test and J-Fact have been scheduled for February 16, 1965 and February 18, 1965 respectively, however, verification of their completion is not available at this time.

5.0 TERMINAL DESCENT TEST PROGRAM

A. Vehicle Design -- On February 18 the tube size decision was made and fabrication will proceed on the two spaceframes. Revised drawings of the Recovery Electronics Assembly, incorporating the modifications for improving emergency firing procedures and reducing weight, were released to fabrication on February 15. Detail design of the new Klystron Power Supply Modulator is in progress. Battery performance under thermal conditions is being evaluated. The plan to allow a vehicle weight of 188.0 pounds has been firmly adopted. The current estimate is 0.8 pounds over this.

Design reviews are progressing well. Information prepared for the design reviews will be directly usable in specifications yet to be issued. Results of the vibration tests of the X-3 RADVS antennas were poor so the effort on completion of fabrication and test of the X-4 (flight type) is being accelerated. The required propulsion tanks (6-4) will be available on April 20 as scheduled.

B. Site Preparation --The buildings arrived on schedule and the framework is being raised. The concrete barricade wall between the fueling and checkout areas has been erected. The road to ground zero has been compacted and gravelled in preparation for oiling. The 500-foot radius circle around ground zero is essentially completed. Power poles have been installed.

C. Current Tests--Air Bag tests started Feb. 15, the Runway Tests started on Feb. 16 and the Static Drogue Gun

PROJECT SUMMARY (CONTINUED)

tests started Feb. 19. The Iron Maiden will be weighed and cg'd on Feb. 22. The Iron Maiden tests series of four drops at Holloman AFMDC are expected to start about March 1.

6.0 STRUCTURAL DYNAMICS SUBSYSTEM TESTS

The vibration response testing of the Flight Control Sensor Group is complete. Static load tests and low level dummy drops have been completed on the vehicle support system.

The S-2A vehicle was delivered to the drop test area (Bldg. 365, Hughes Aircraft) on Feb. 17. A twelve foot safety barrier is being built around the drop test platform. The test is expected to occur on Feb 23-25.

7.0 VERNIER PROP SUBSYSTEM TEST PROGRAM

The S-6 vehicle upgrade is now expected to be complete about Feb. 24. The first 3 TCA's were delivered from JPL to Hughes Aircraft on schedule and without performance deviation. The next set of reworked TCA'a have passed acceptance test and are expected to be delivered to Hughes Aircraft on Feb. 22.

A special Tank Storage Test will start on Feb. 22 at the Hughes Aircraft Placerita Canyon test site to find out how much helium permeates through bladders into the propellant during various time periods.

The S-7 vehicle is still in upgrade. The S-7 storage report is complete and will be released during the next report period.

8.0 THERMAL CONTROL TEST PROGRAM

Buildup of the substructure on the TCM space [illegible] in process and readiness of the vehicle for paint is expected on March 4. Thermocouple harness materials are presently expected to be delivered about February 26. Every effort is being made to improve this delivery date. The three TCA's for the TCM that were delivered to JPL (ahead of schedule) are being returned to RMD on February 22 for upgrade. A proper fit was established between the TCA barrel and nozzle extension to provide adquate joint conduction for thermal control.

9.0 MISSION OPERATIONS

In the area of test activities as identified in the last issue of the status report; no SFOF tests were accomplished during the week of 15 February due to the Ranger mission. The first week of this reporting period, two SPAC tests, one FPAC test and two SSAC tests were completed.

All factory System Test Plans and Procedures for the CDC's going to overseas sites are being reviewed by JPL. The equipment compatibility test procedures are being generated by Hughes Aircraft Company. The Surveyor peculiar equipment on site data processing computer programs are being compiled.

CRITICAL PATH ANALYSIS

SC-1 MISSION A

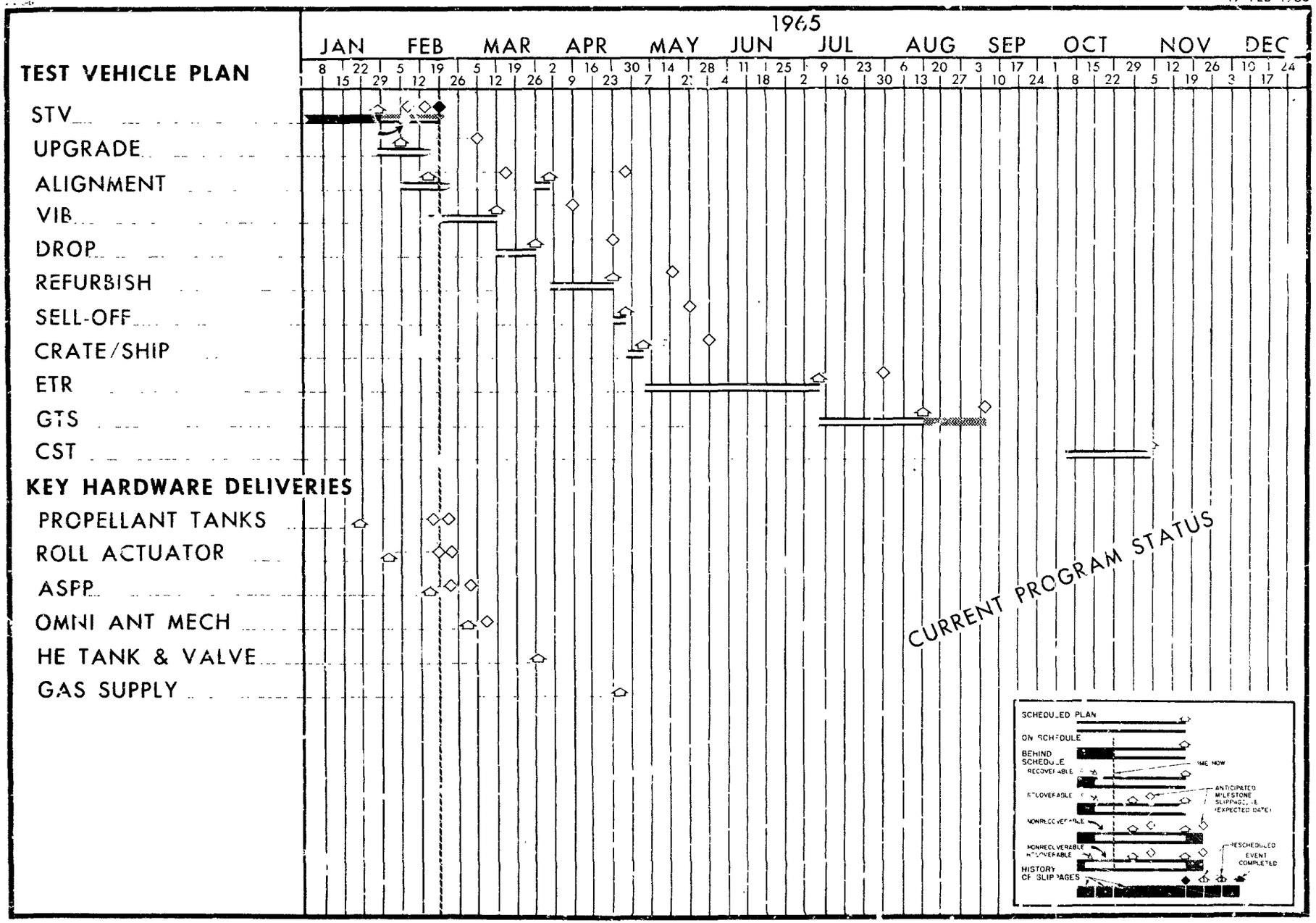
Completion of Systems Group Test is approximately 5.0 weeks behind schedule. The late delivery of hardware is contributing to this delay. Recovery of schedule slippage is expected before the completion of Initial Systems Checkout which is being performed concurrently with Group Tests.

T-21 PROOF TEST MODEL

The completion of Solar Vacuum Testing is 3.1 weeks behind schedule and is presently effecting the delivery date by 3 weeks. A plan to reduce this slippage is under consideration by HAC at this time.

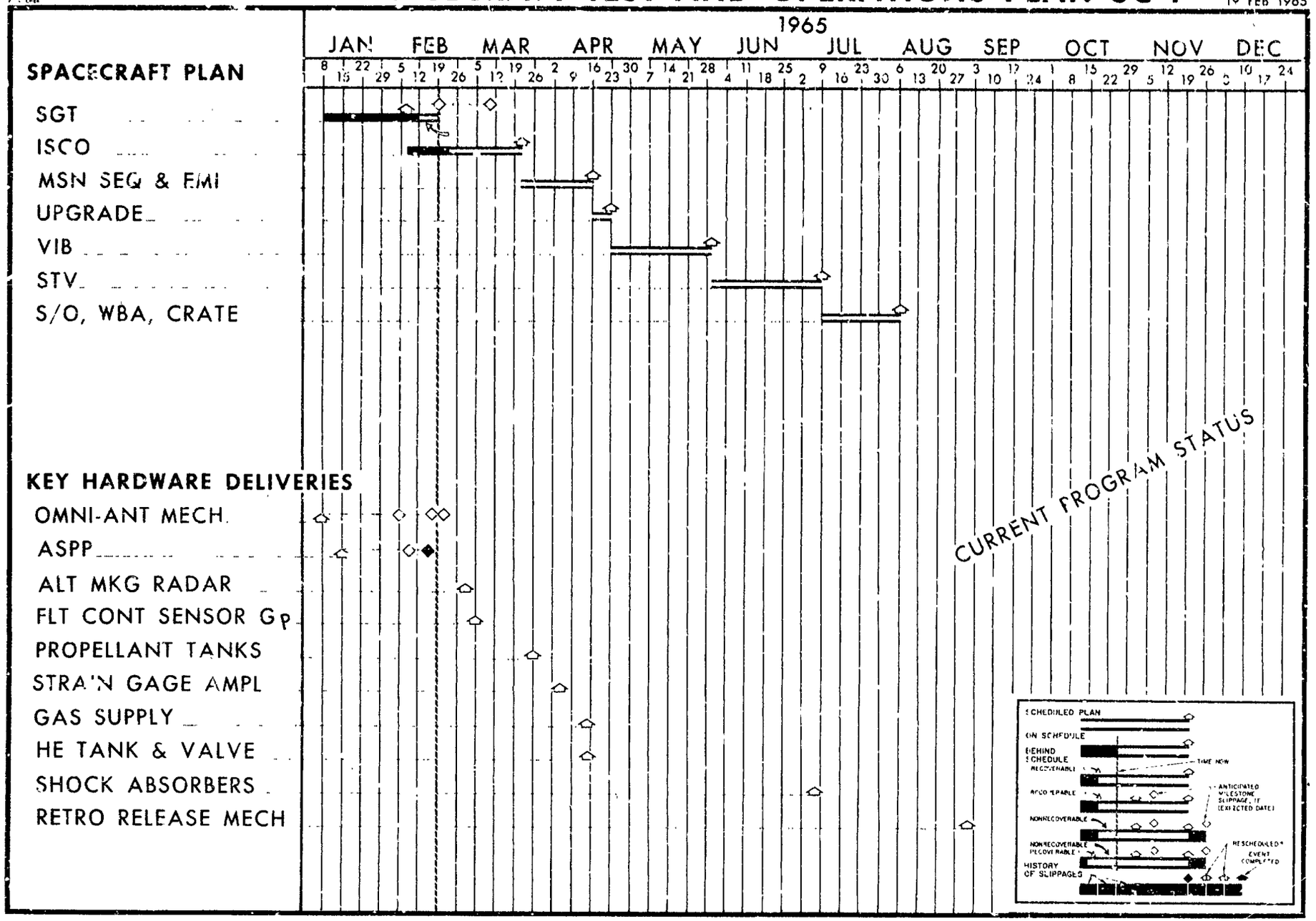
A-21 PROTOTYPE SYSTEM TEST VEHICLE T-21

DATE
19 FEB 1965



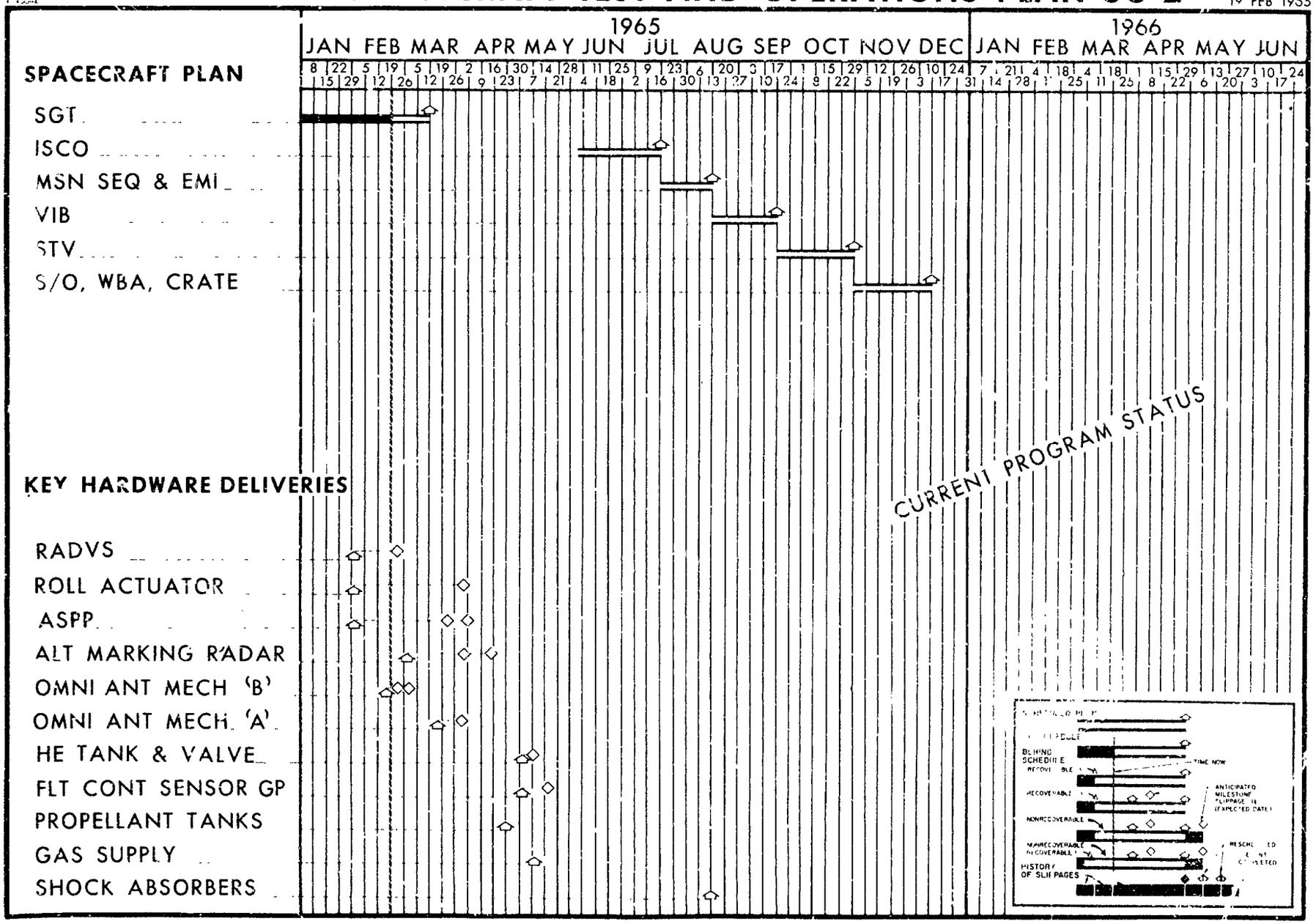
MISSION A SPACECRAFT TEST AND OPERATIONS PLAN SC-1

DATE 19 FEB 1965



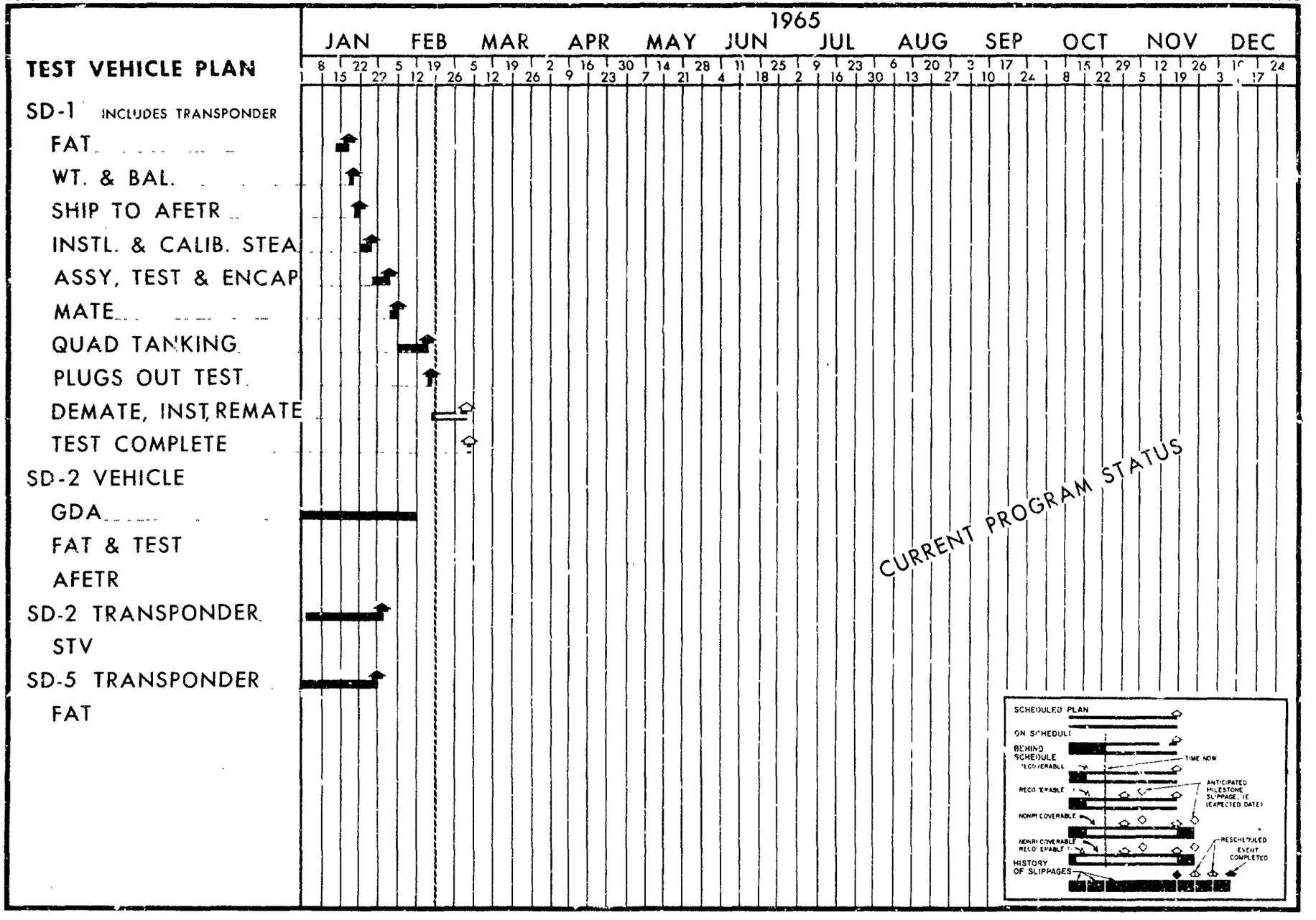
MISSION B SPACECRAFT TEST AND OPERATIONS PLAN SC-2

DATE 19 FEB 1965



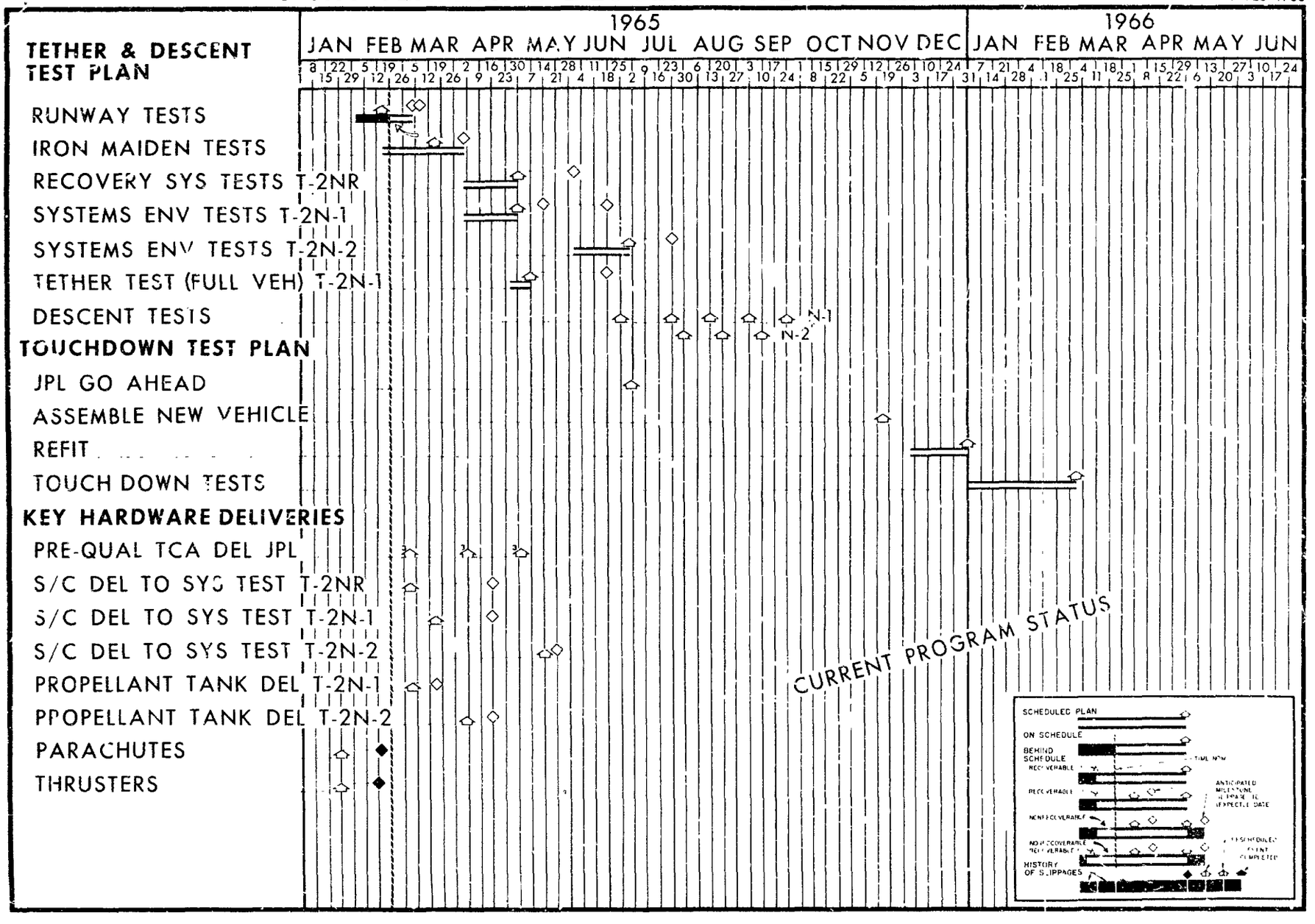
DYNAMIC MODELS FOR CENTAUR R AND D FLIGHTS TEST PLAN

DATE 19 FEB 1965



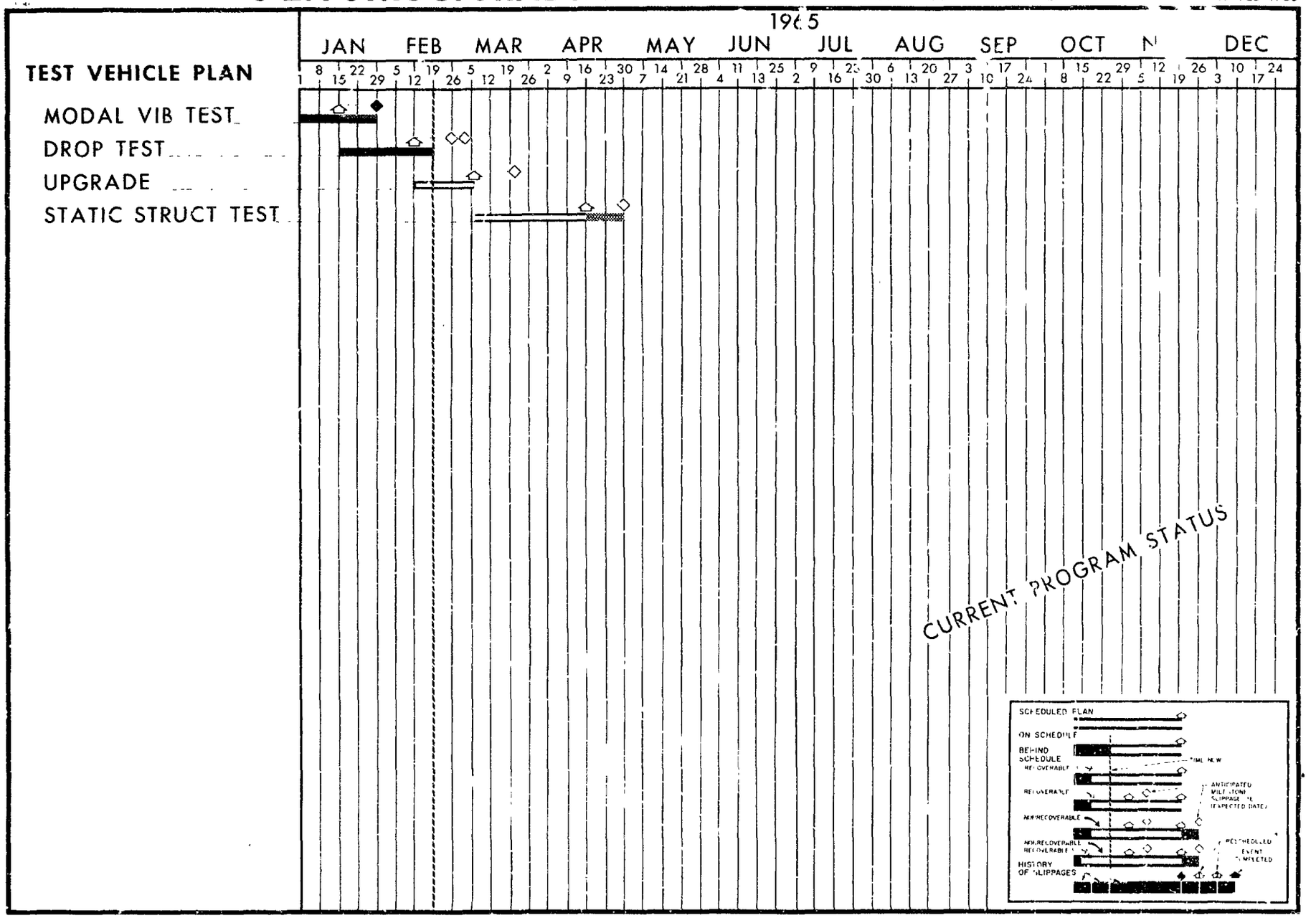
T-2N TERMINAL DESCENT SUBSYSTEM TESTS

DATE
19 FEB 1965



S-2A STRUCTURAL DYNAMICS SUBSYSTEM TESTS

DATE
19 FEB 1965



S-6 VERNIER PROPULSION SUBSYSTEM TESTS

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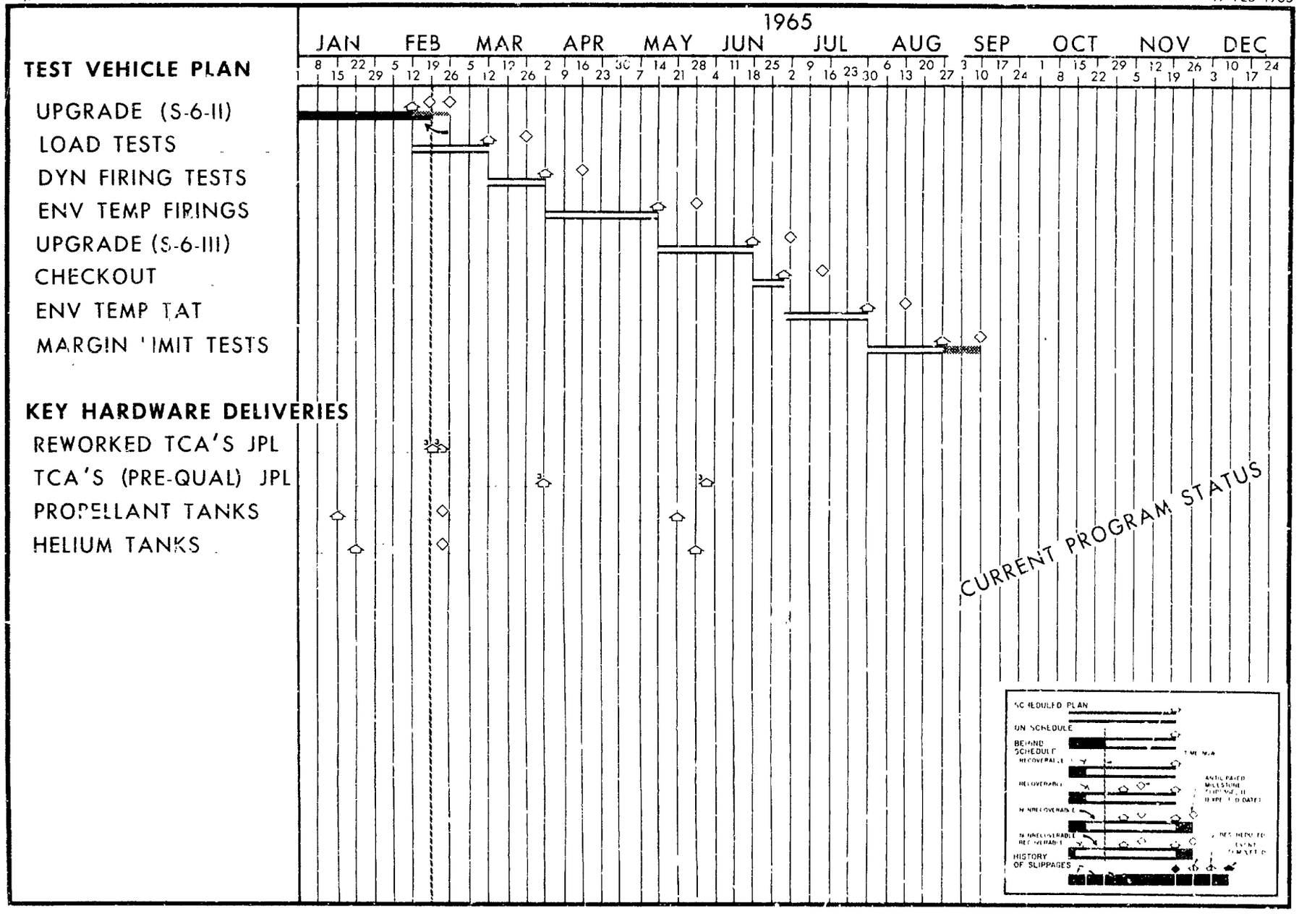
19 FEB 1965



S-7 VERNIER PROPULSION SUBSYSTEM TESTS

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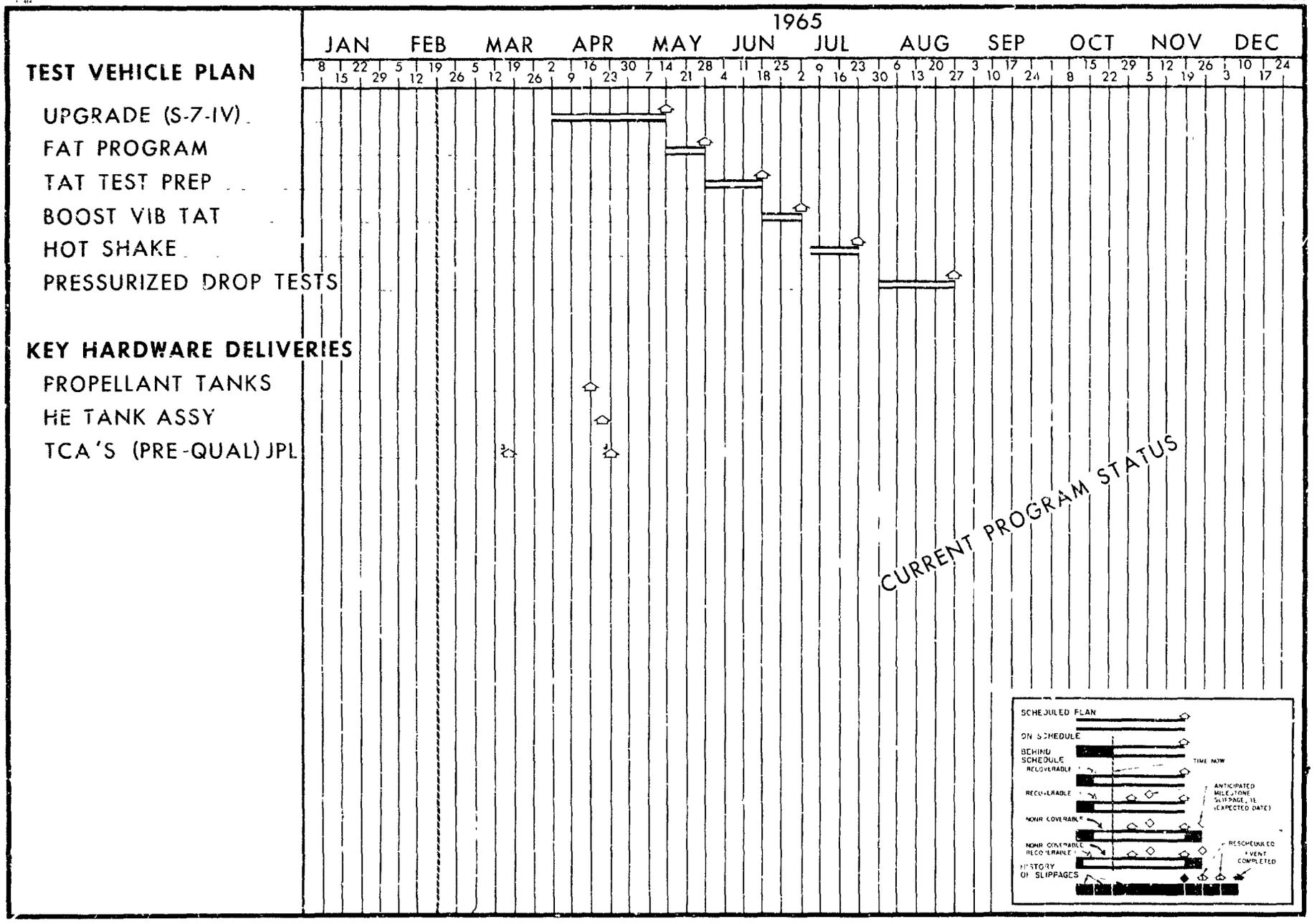
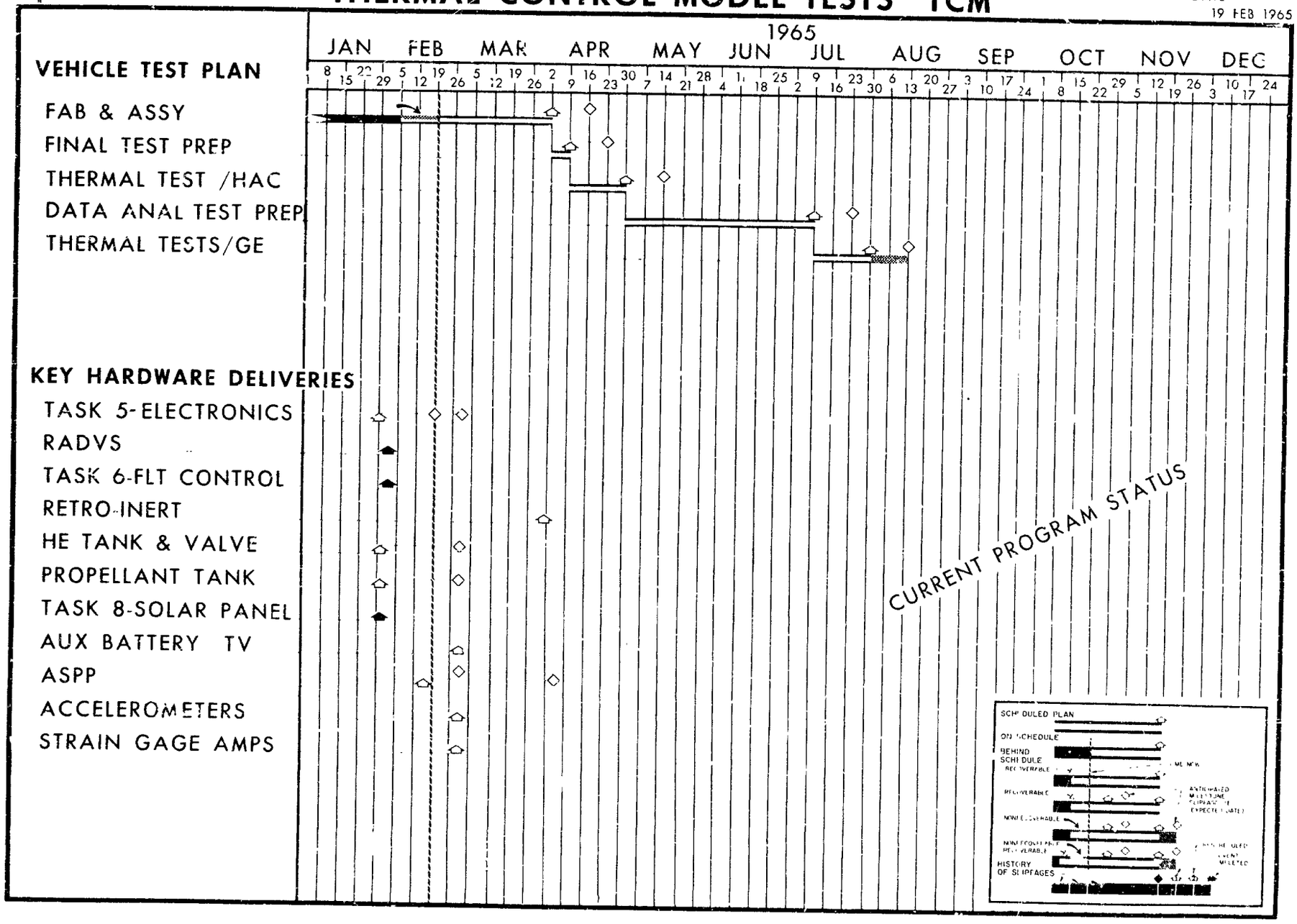
19 FEB 1965



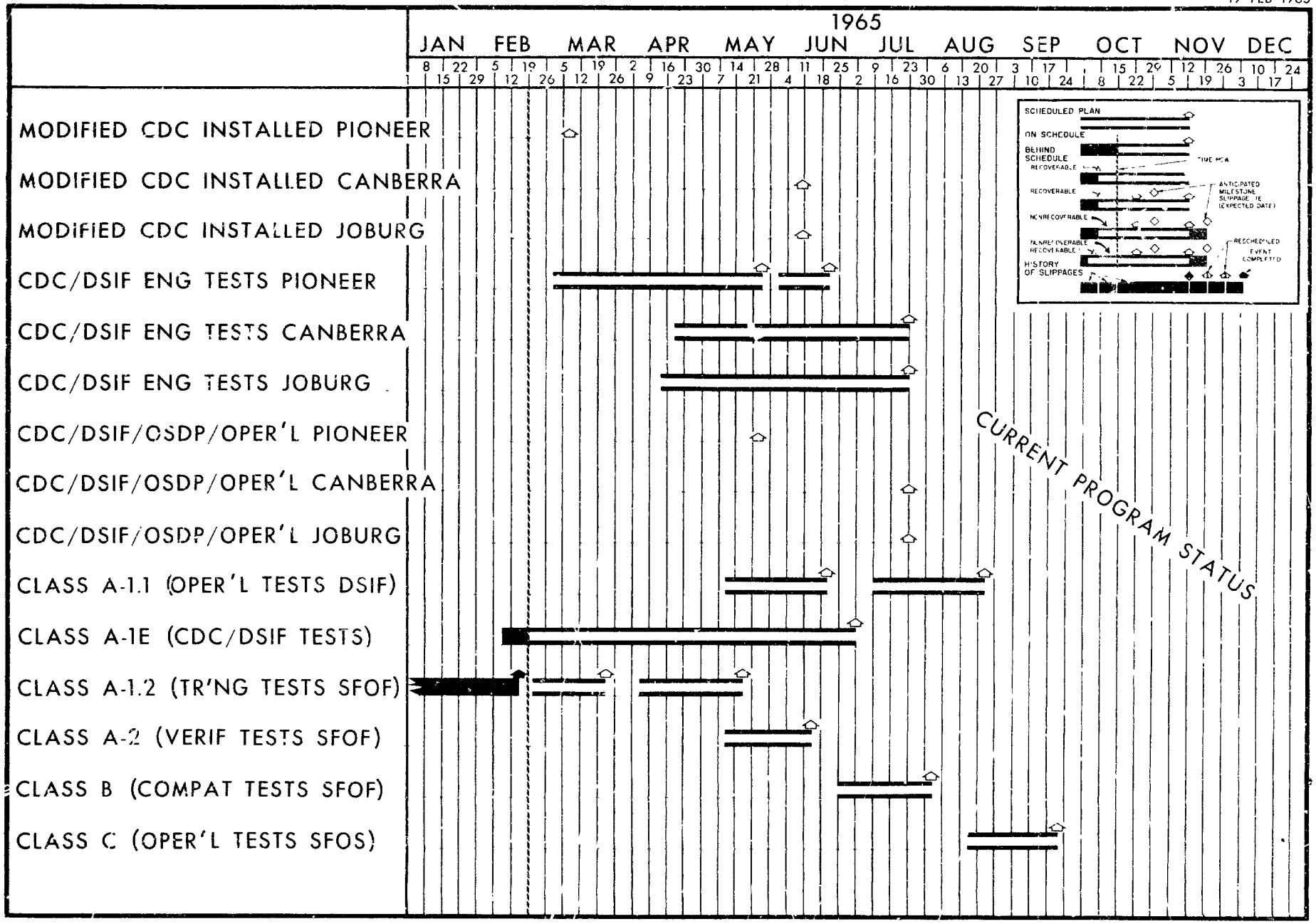
THERMAL CONTROL MODEL TESTS TCM

DATE
19 FEB 1965



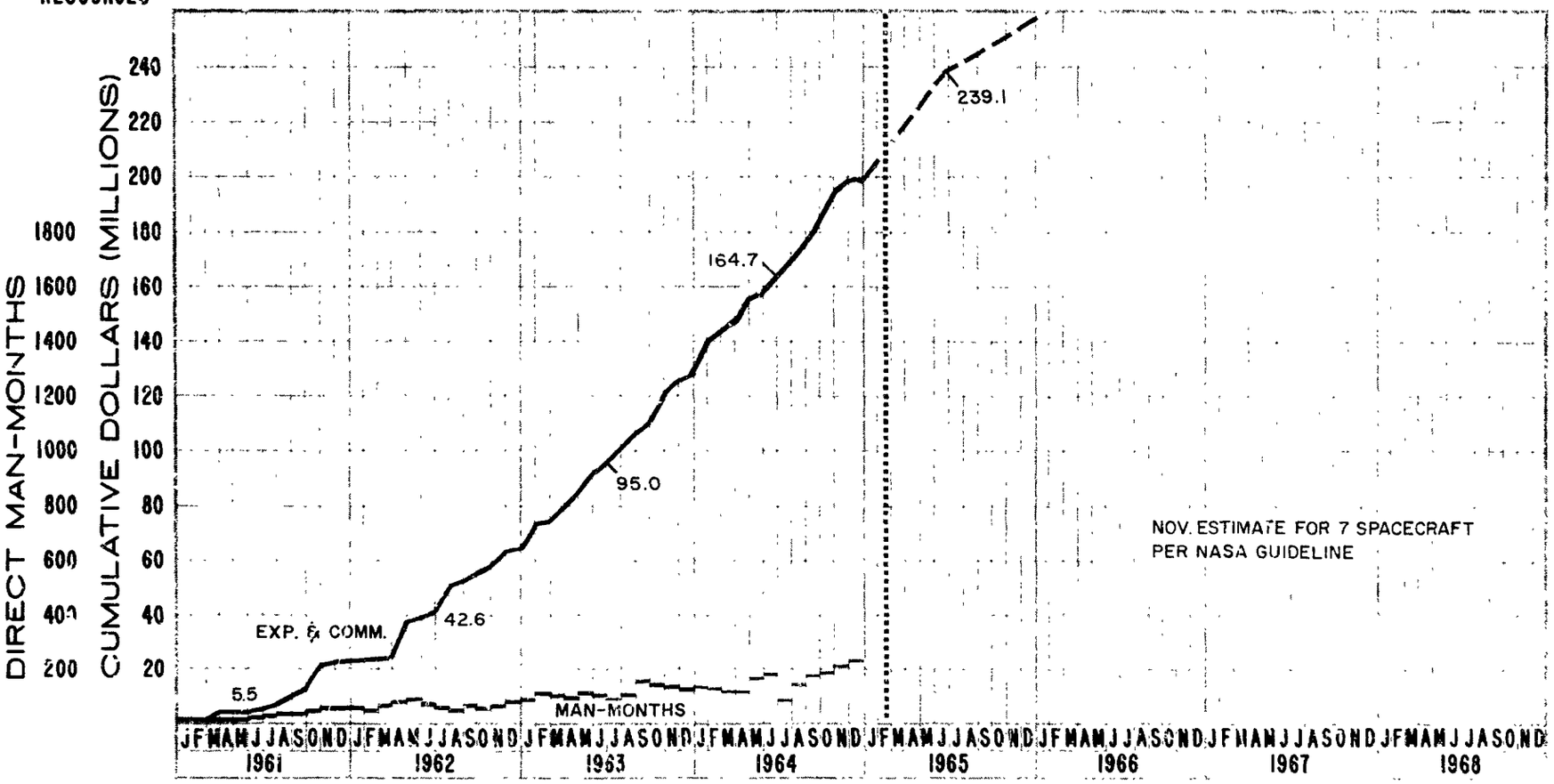
MISSION OPERATIONS

DATE
19 FEB 1965

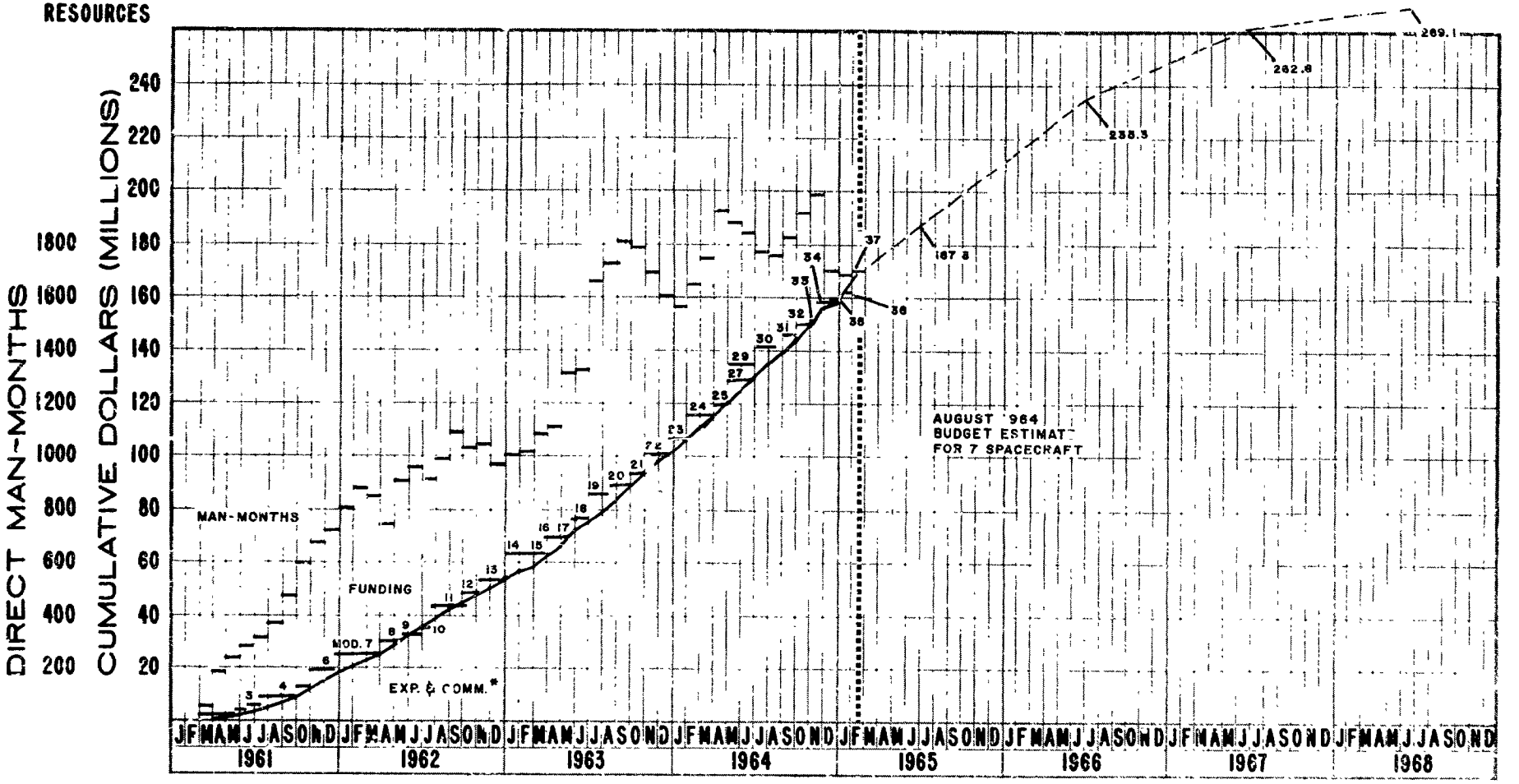


Surveyor Project Status Report AS OF: 19 FEBRUARY 1965 STATUS SUMMARY
ACTIVITY: PROJECT

RESOURCES



RESOURCES


DIRECT MAN-MONTHS
CUMULATIVE DOLLARS (MILLIONS)
MAN-MONTHS
FUNDING
EXP. & COMM.*
MOD. 7
AUGUST 1964
BUDGET ESTIMATE
FOR 7 SPACECRAFT
167.8
238.3
262.6
269.1
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GLOSSARY

Spacecraft Model Designations

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

SC-5 through SC-7. 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 spaceframe for vibration, shock, and static structural tests of the A-21 spacecraft.

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

S-8. Spacecraft for tether tests to determine dynamic compatibility of spaceframe, vernier engine subsystem and flight control subsystem.

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

T-2. Test spacecraft for descent dynamics testing.

T-2H. Helicopter test vehicle for descent tests of T-2 RADVS.

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

T-21A. Prototype spacecraft having same configuration as as SC-5 through SC-7 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 launch vehicle system.

AFETR Air force Eastern Test Range, Cape Kennedy.

CDC Command and data-handling console installed at the DSS.

CST Combined System Test.

DSIF Deep Space Instrumentation Facility.

DSS Deep Space Station of DSIF (located at Krugersdorp, South Africa; Woomera, Australia; and Goldstone, California).

ESA Explosive Safe Area, ETR.

GD/A General Dynamics/Astronautics, Atlas/Centaur vehicle contractor (LeRC contract).

GSE Ground Support Equipment.

HAC Hughes Aircraft Company, Spacecraft System contractor (JPL contract).

LeRC Lewis Research Center, NASA

PDP Surveyor Project Development Plan, dated 28 February 1964.

RADVS Radar Altimeter and Doppler Velocity Sensor.

RMD Reaction Motors Division, Thiokol, vernier engine subcontractor (JPL).

SCF Spacecraft Checkout Facility.

SFOF Space Flight Operations Facility.

SFOP Space Flight Operations Plan.

STEA System Test Equipment Assembly used to perform overall systems test on spacecraft.

STL Space Technology Laboratories, vernier-engine back-up feasibility contractor (JPL subcontract).

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