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Surveyor Project Status Report

As of 5 March 1965

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JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

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Surveyor Project Status Report

As of 5 March 1965

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JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
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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

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 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.

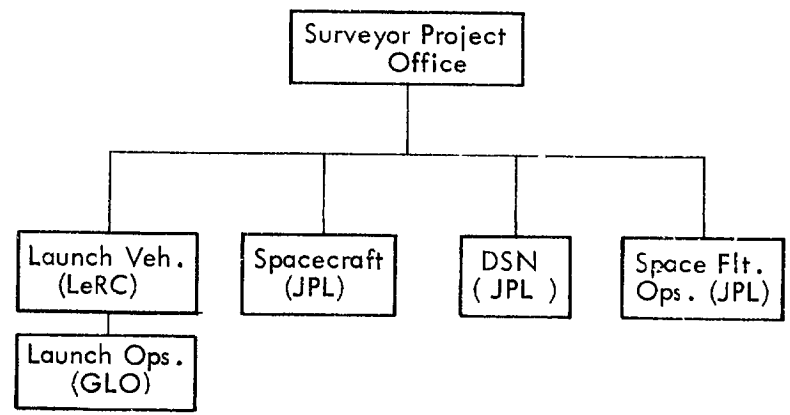
The Surveyor Project Block I currently comprises seven flight missions. These missions will utilize the Atlas/Centaur launch vehicle with launches to be conducted from Complex 36 at the Air Force Eastern Test Range (ETR), Cape Kennedy. The missions will be conducted utilizing direct ascent launch trajectories 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.

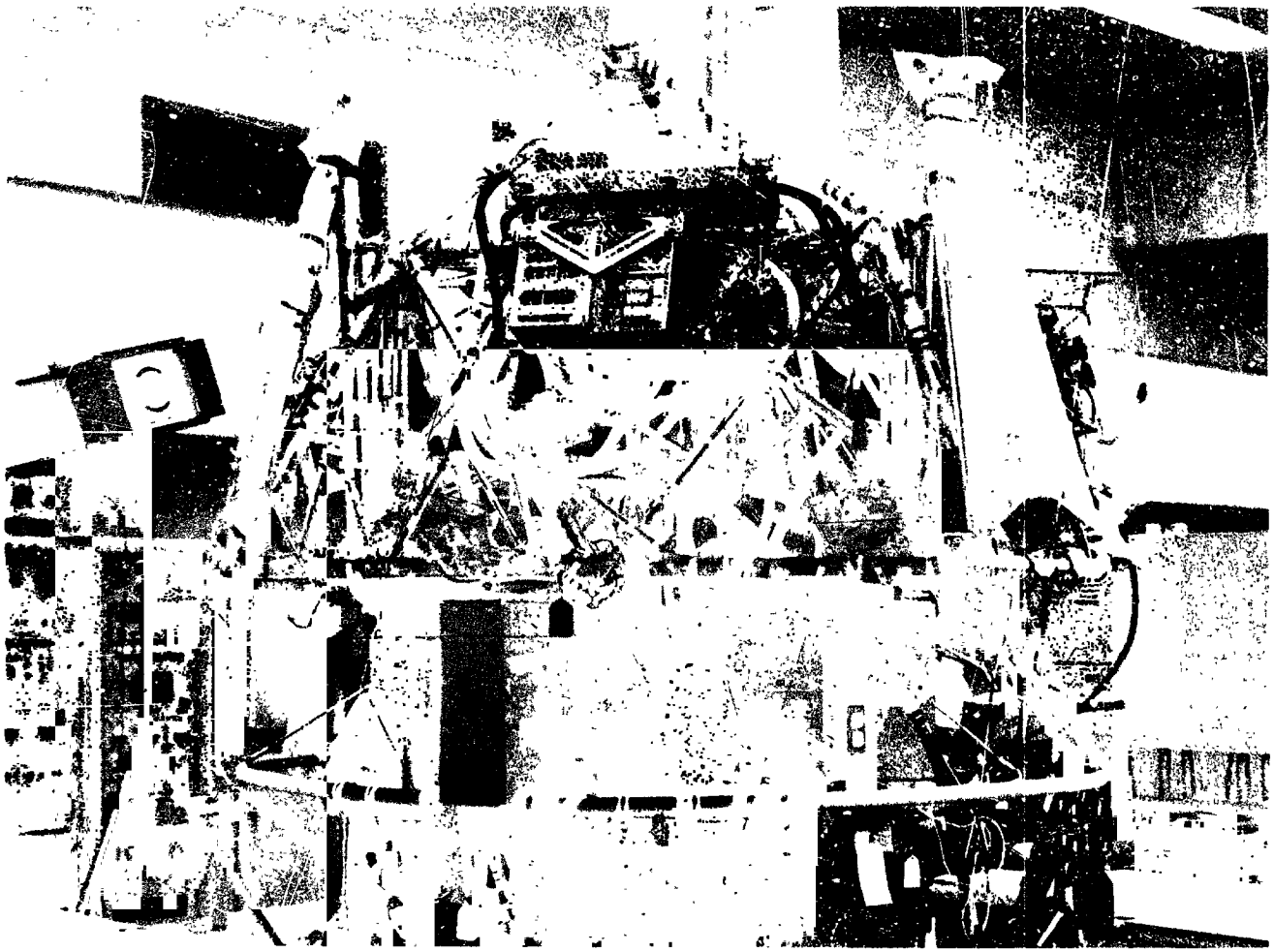
The scientific payload will consist of the following experiments: television (2 survey cameras), micrometeorite ejecta, seismographic, alpha scattering, surface sampler (for soil mechanics), and touchdown dynamics.

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.

SC-2 ON TEST STAND



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PROJECT SUMMARY

CURRENT EVENTS

1.0 T-21 PROOF TEST MODEL

Remaining Solar Thermal Vacuum tests (STV) were conducted during the period 15-18 February. An eclipse condition was established in the chamber, during which an abbreviated low temperature mission sequence was performed. Subsequent to this test, systems readiness test and trouble shooting was accomplished. The vehicle was removed from the end bell 24 February in preparation for upgrade. The T-21 vehicle is now being upgraded for vibration tests which are scheduled to begin 12 March.

2.0 SC-1 FLIGHT SPACECRAFT

Systems Group Testing is expected to be completed 10 March as previously reported. Mechanisms and vehicle/telecommunications group tests have been conducted. RADVS group tests are now in process and approximately 40 percent complete. Initial systems checkout is being conducted concurrent with systems group tests and is expected to be completed approximately 22 March. Flight Control and telecommunications integration tests were completed during this report period.

3.0 SC-2 FLIGHT SPACECRAFT

Systems Group Tests are essentially on schedule with an expected completion date of 12 March. RF power integration tests are now in process. Upon completion of these tests the command decoder/signal processing tests will be started.

4.0 DYNAMIC MODELS (SD-1)

The Integrated Launch Control Test was completed on 18 February and plugs out tests finished 19 February. The spacecraft transponder, microwave link and ground equipment operated satisfactorily. The payload was then removed and decapsulated. Final functional checkout of the transponder and end to end calibration of instrumentation was completed 23 February. The launch occurred 2 March and resulted in failure because of a launch vehicle malfunction which is currently being investigated.

DYNAMIC MODELS (SD-2)

The SD-2 Dynamic Model is presently going through flight acceptance tests at GD/C. Combined systems test is scheduled to be conducted during the next report period.

5.0 TERMINAL DESCENT TEST PROGRAM

The telemetry, STEA and pyrotechnics design reviews were completed during this report period. Arrangements have been completed to provide rapid reporting of procurement problems which will permit timely corrective action. At the present time there are no items considered critical. Initial air bag tests have indicated the need for design changes to the air bag assembly which is now under study. After repair and instrumentation upgrade, air bag tests were resumed on 5 March with an expected completion date of 12 March.

Buy off of the dummy test vehicle (iron maiden) for the recovery system tests was conducted 5 March. Tests will be conducted at Holloman AFB and are expected to occur 15 March at the old T-2 test site. The new drop test site at Holloman AFB is expected to be completed during the next report period. However, work has been temporarily suspended due to inclement weather.

6.0 STRUCTURAL DYNAMICS SUBSYSTEM TESTS

The drop testing of the S-2A vehicle has been discontinued due to a failure of the ASPP on 2 March when it landed

PROJECT SUMMARY (CONTINUED)

on an angular surface. ASPP redesign is underway and effects of this failure on the rest of the program are being evaluated.

7.0 VERNIER PROPULSION SUBSYSTEM TESTS

The second set of TCA's for the S-6 vehicle were delivered to Hughes Aircraft on 2 March. The vehicle was delivered to Placerita Test Site on 3 March and two weeks of load testing will begin on 9 March. The S-6 helium tank is currently being used to checkout and calibrate the vibration fixture which is to be used for checking out all tanks.

8.0 THERMAL CONTROL MODEL TESTS

The substructure frame is now expected to be ready for paint by 10 March. SC-1 changes have been reviewed with respect to their impact on TCM design and schedule ramifications are being examined. The Hughes Aircraft facility evaluation test is scheduled to be performed during the week of 8 March.

The Hughes contract with [illegible]/Valley Forge for use of their solar vacuum chamber was cancelled on 24 February by direction of JPL. Details concerning this phase of the TCM test program will be discussed in the next report.

9.0

The training and operating capability tests (A1.2) are continuing on schedule.

On 3 March the Goldstone compatibility test (EC-110) was started. Phase II of the Deep Space Net (DSN) training program was started on 22 February. This phase comprises five weeks of concentrated study of the C DC subsystems.

Mission Operations participated in a Lunar Orbiter/Surveyor scheduling meeting on 23 February to discuss actual and potential conflicts in the utilization of the DSN facilities. The second meeting will be in Washington and is scheduled for the 18th and 19th of March.

10.0 CRITICAL PATH ANALYSIS

SC-1 MISSION A

The completion of systems group test is expected 10 March which represents approximately 5.0 weeks slippage against the original HAC working plan. HAC has revised the SC-1 test plan which is presented in the Mission A schedule chart of this report. This plan is presented in order to portray on-going status pending completion of the overall programming effort being conducted by JPL.

T-21 PROOF TEST MODEL

Solar Thermal Vacuum Tests were completed approximately 3.0 weeks late as compared to the original HAC working plan. The revised test plan portrayed in this report will accommodate this slippage. This plan is presented in order to portray on-going status pending completion of the overall programming effort being conducted by JPL.

A-21 PROTOTYPE SYSTEM TEST VEHICLE T-21

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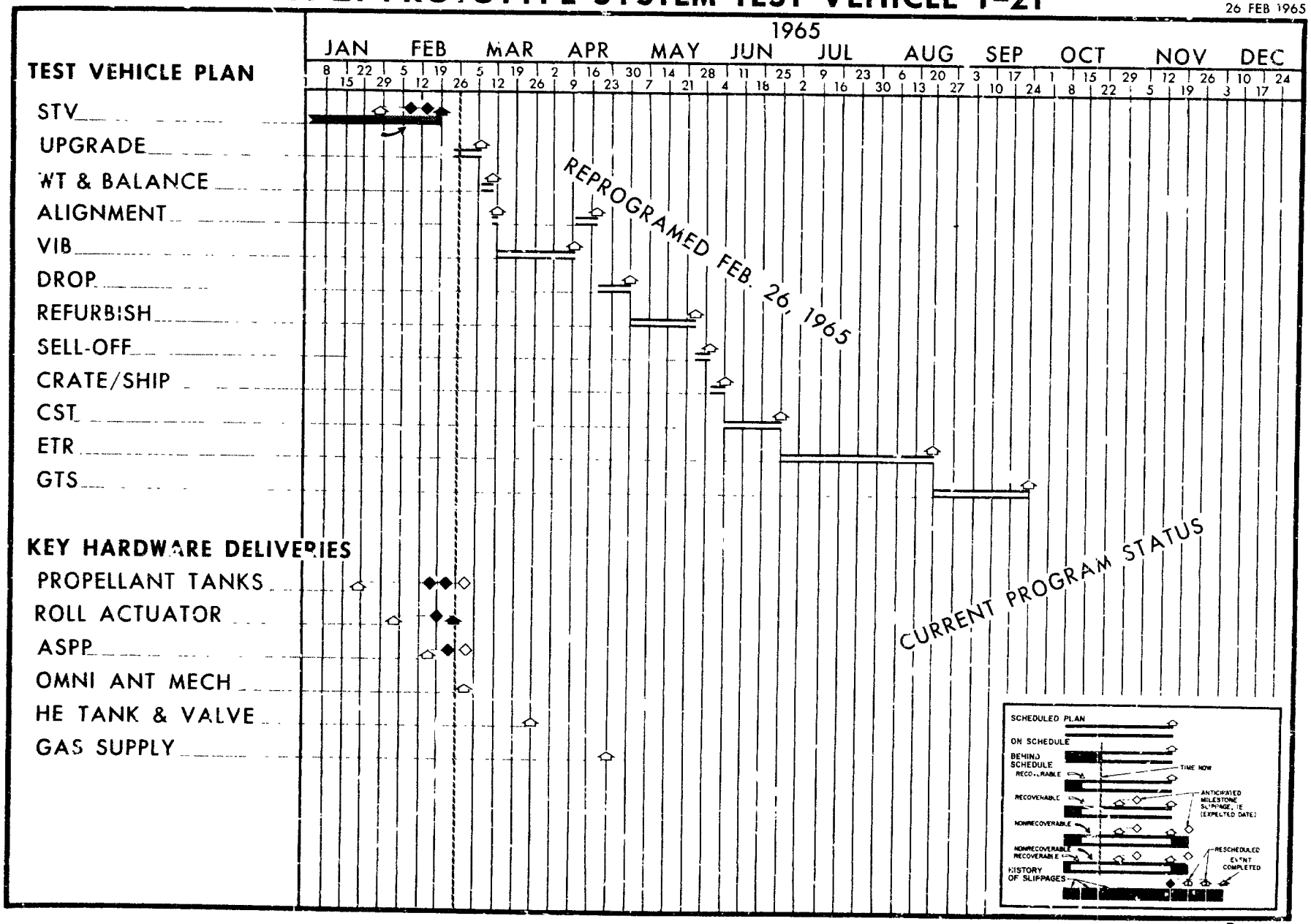
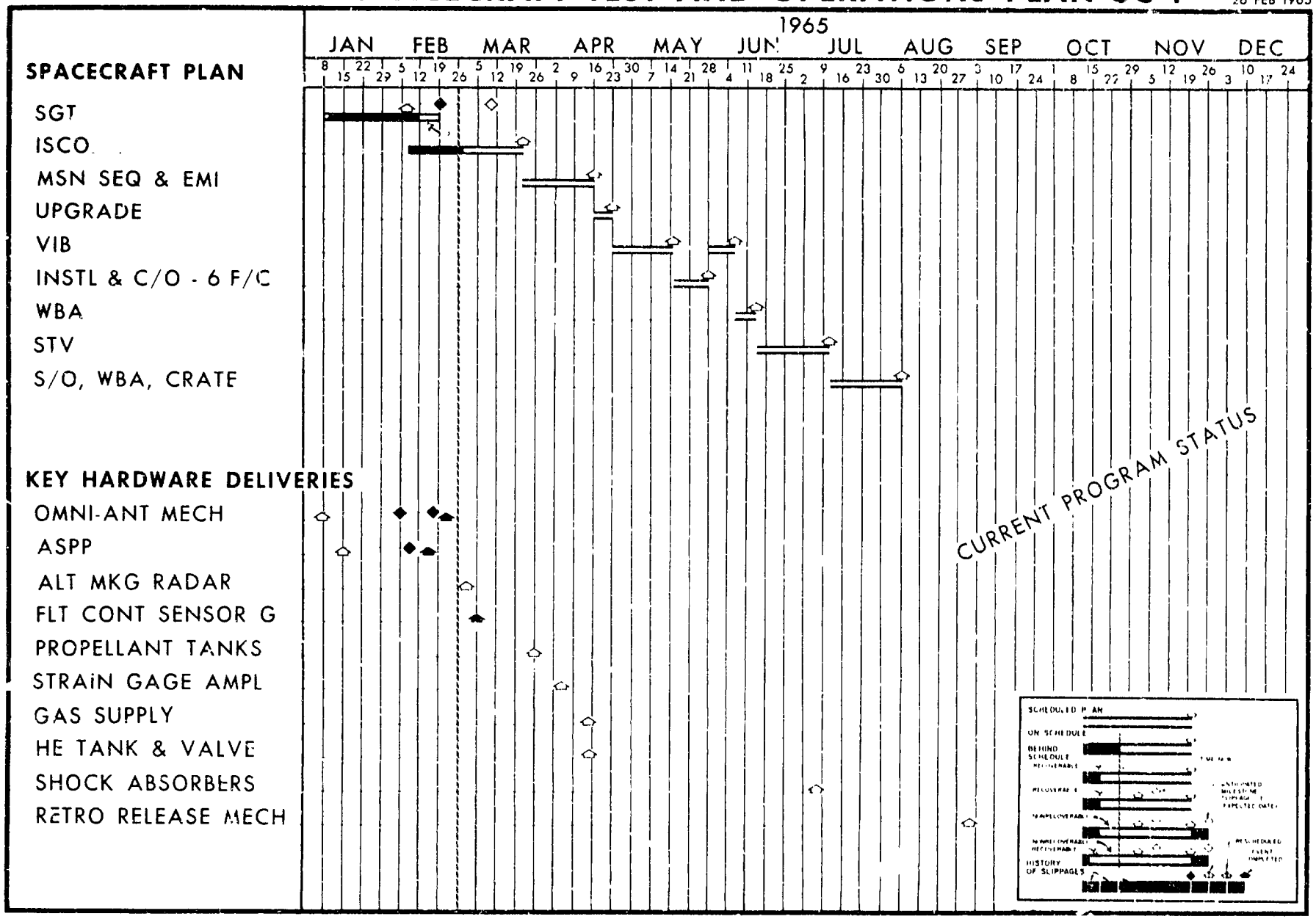
26 FEB 1965



MISSION A SPACECRAFT TEST AND OPERATIONS PLAN SC-1

DATE 26 FEB 1965



MISSION B SPACECRAFT TEST AND OPERATIONS PLAN SC-2

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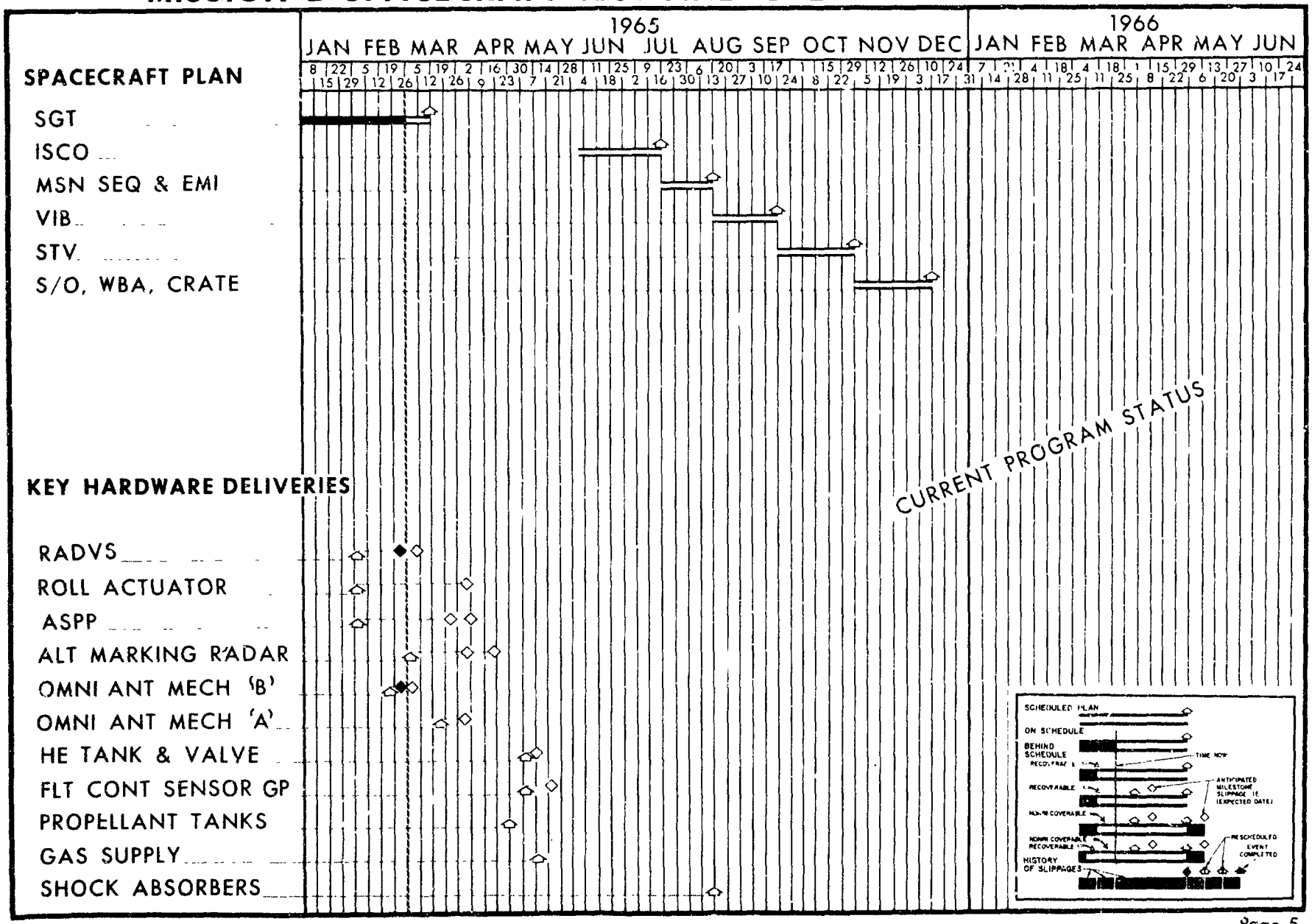

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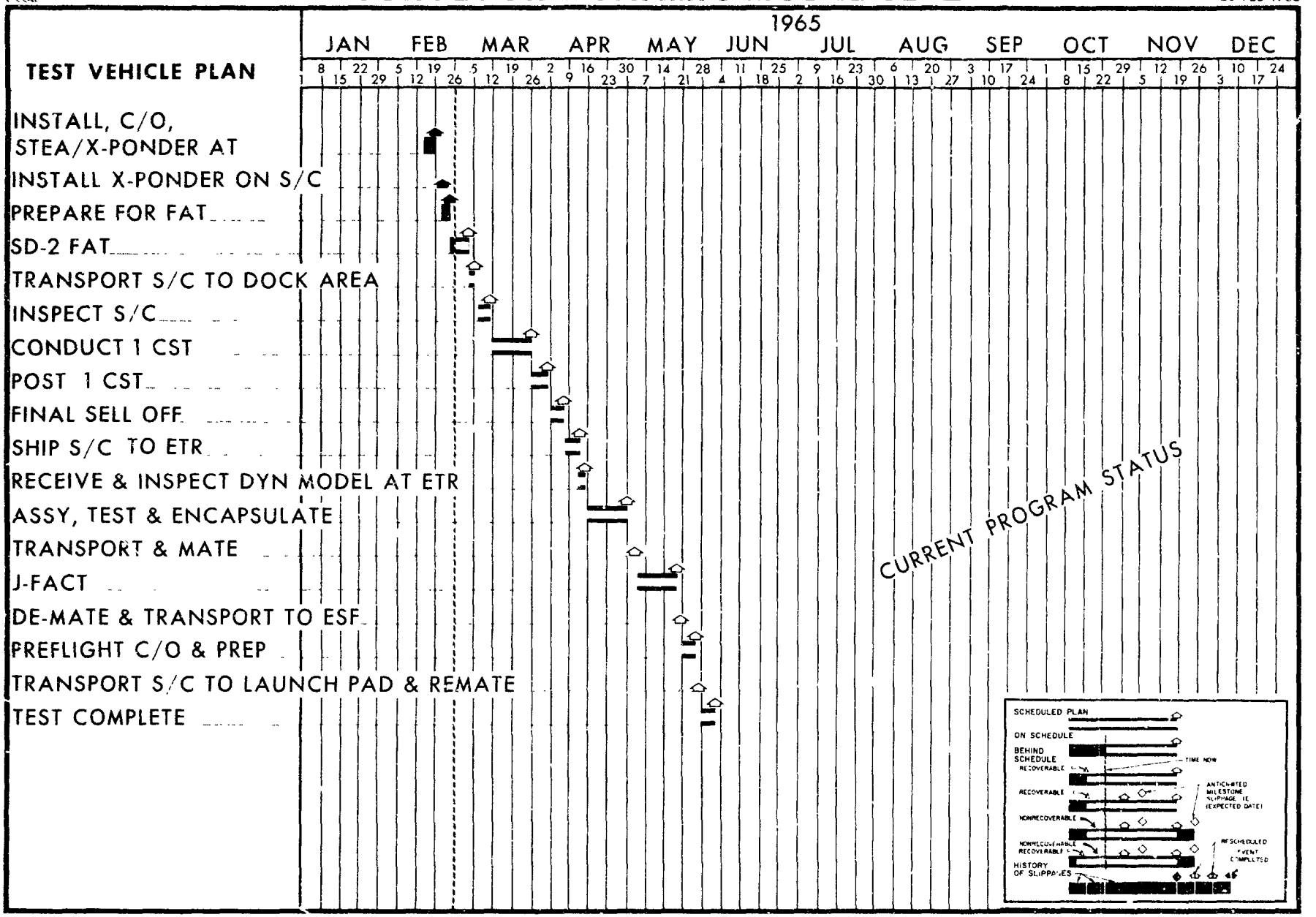
SURVEYOR DYNAMIC MODEL SD 2



T-2N TERMINAL DESCENT SUBSYSTEM TESTS

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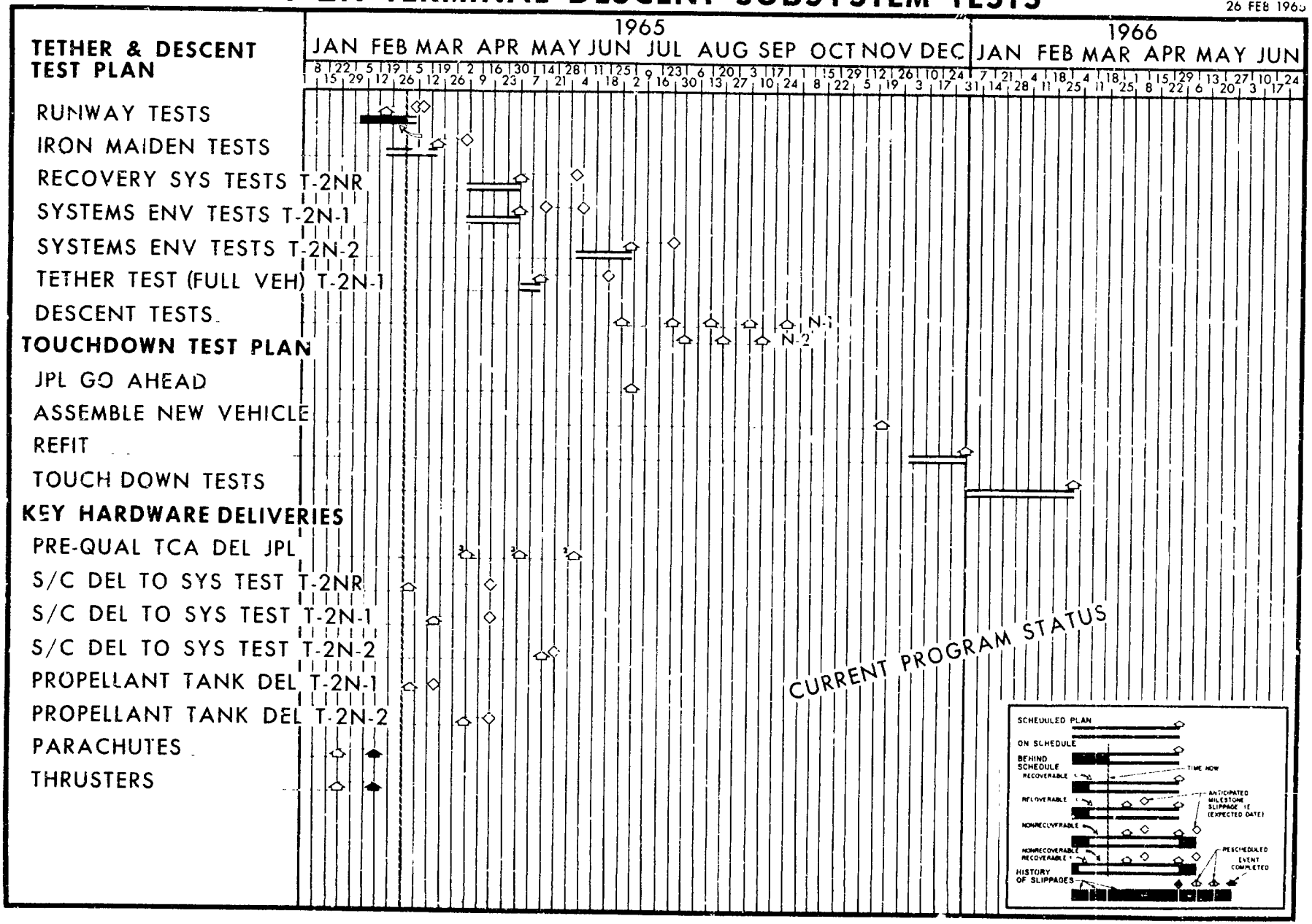

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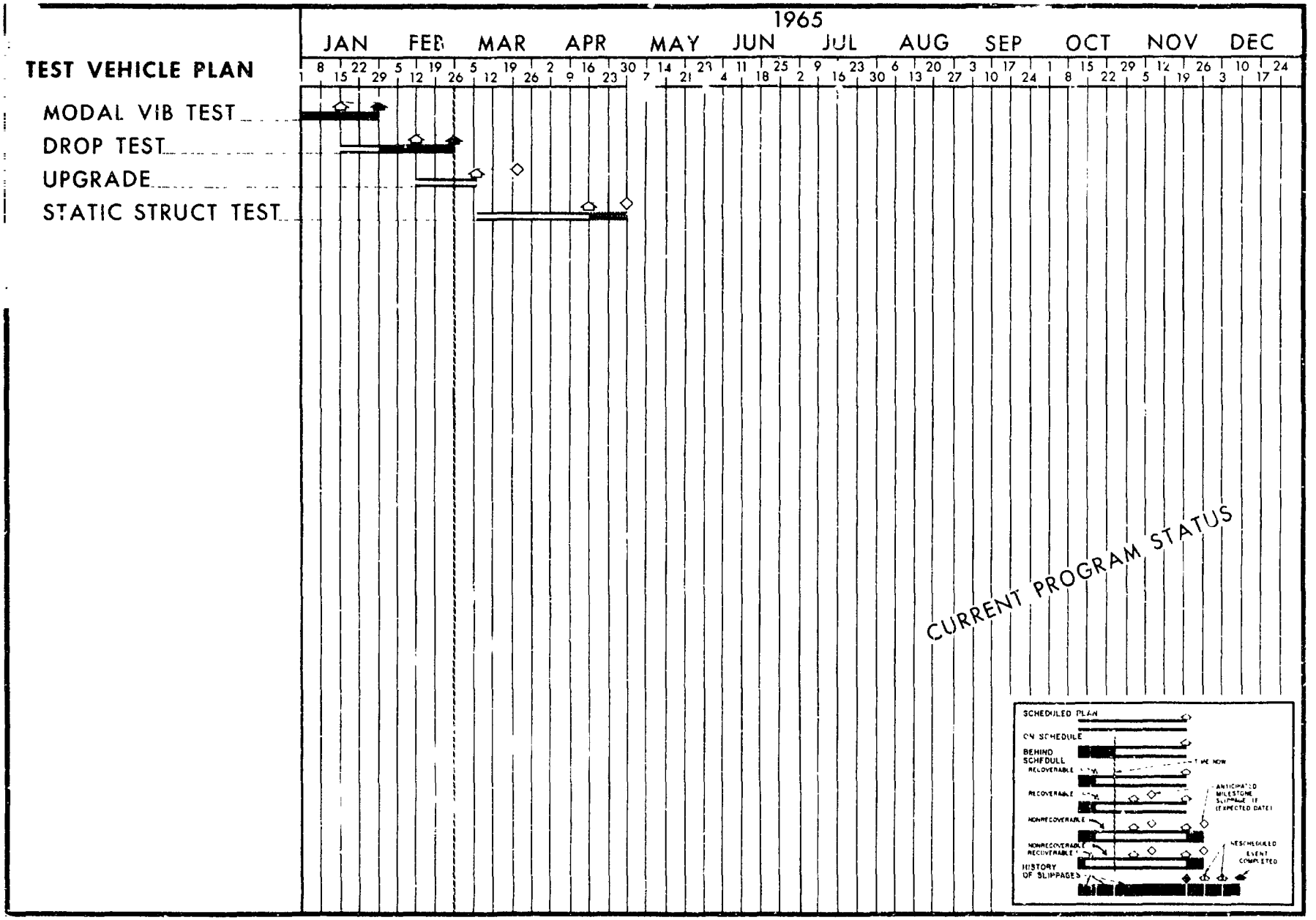
S-2A STRUCTURAL DYNAMICS SUBSYSTEM TESTS



S-6 VERNIER PROPULSION SUBSYSTEM TESTS

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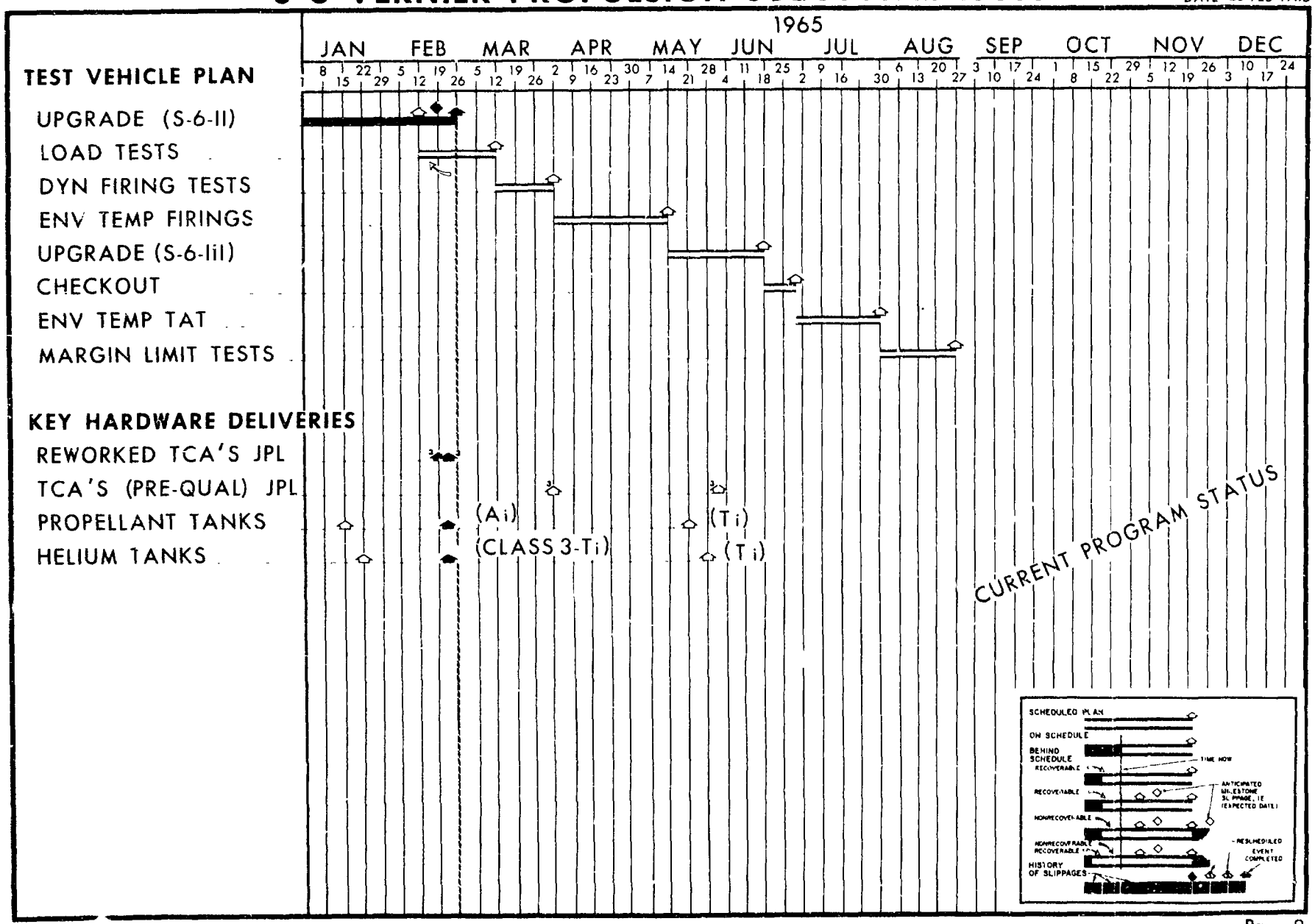

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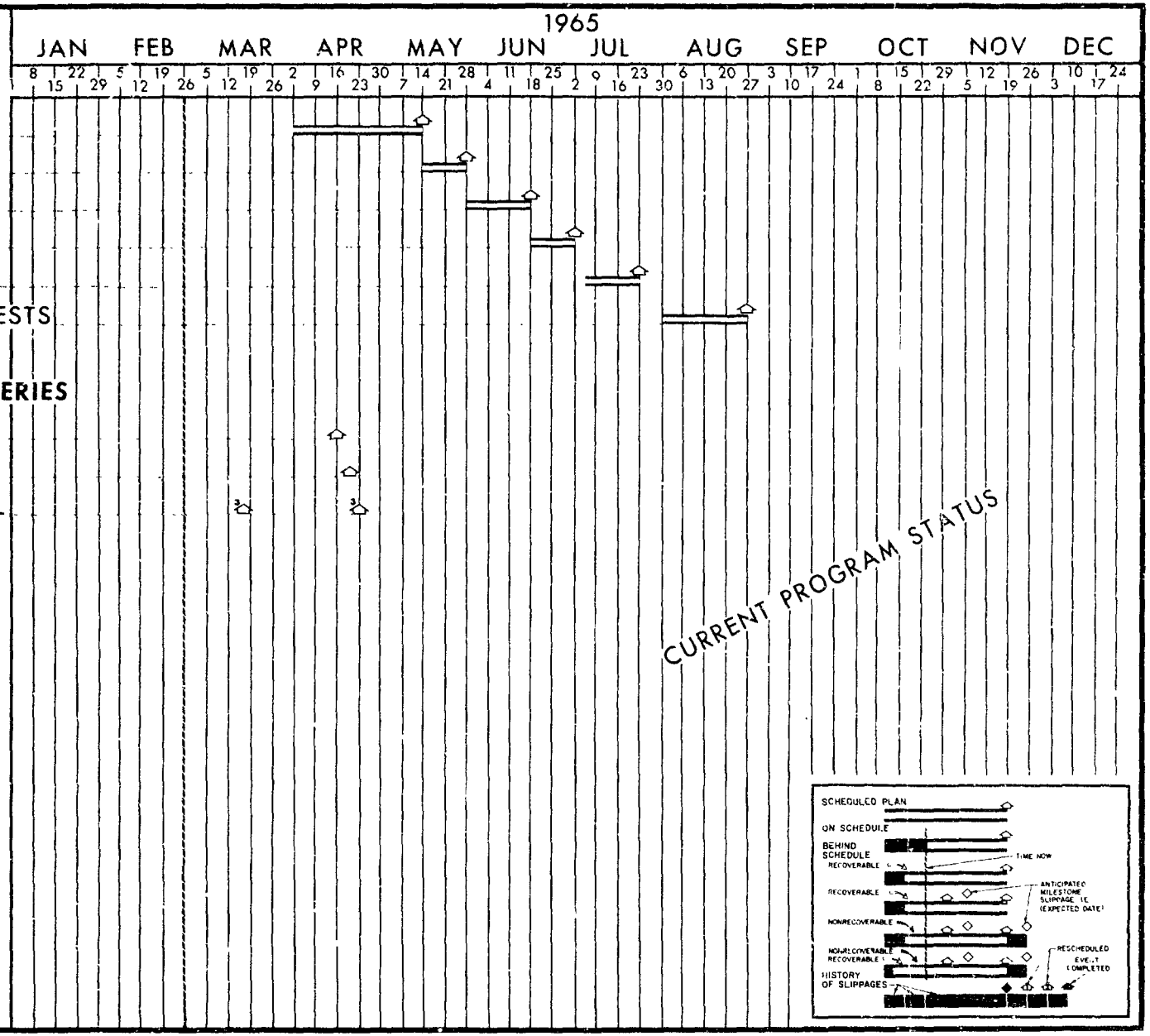
S-7 VERNIER PROPULSION SUBSYSTEM TESTS



THERMAL CONTROL MODEL TESTS TCM

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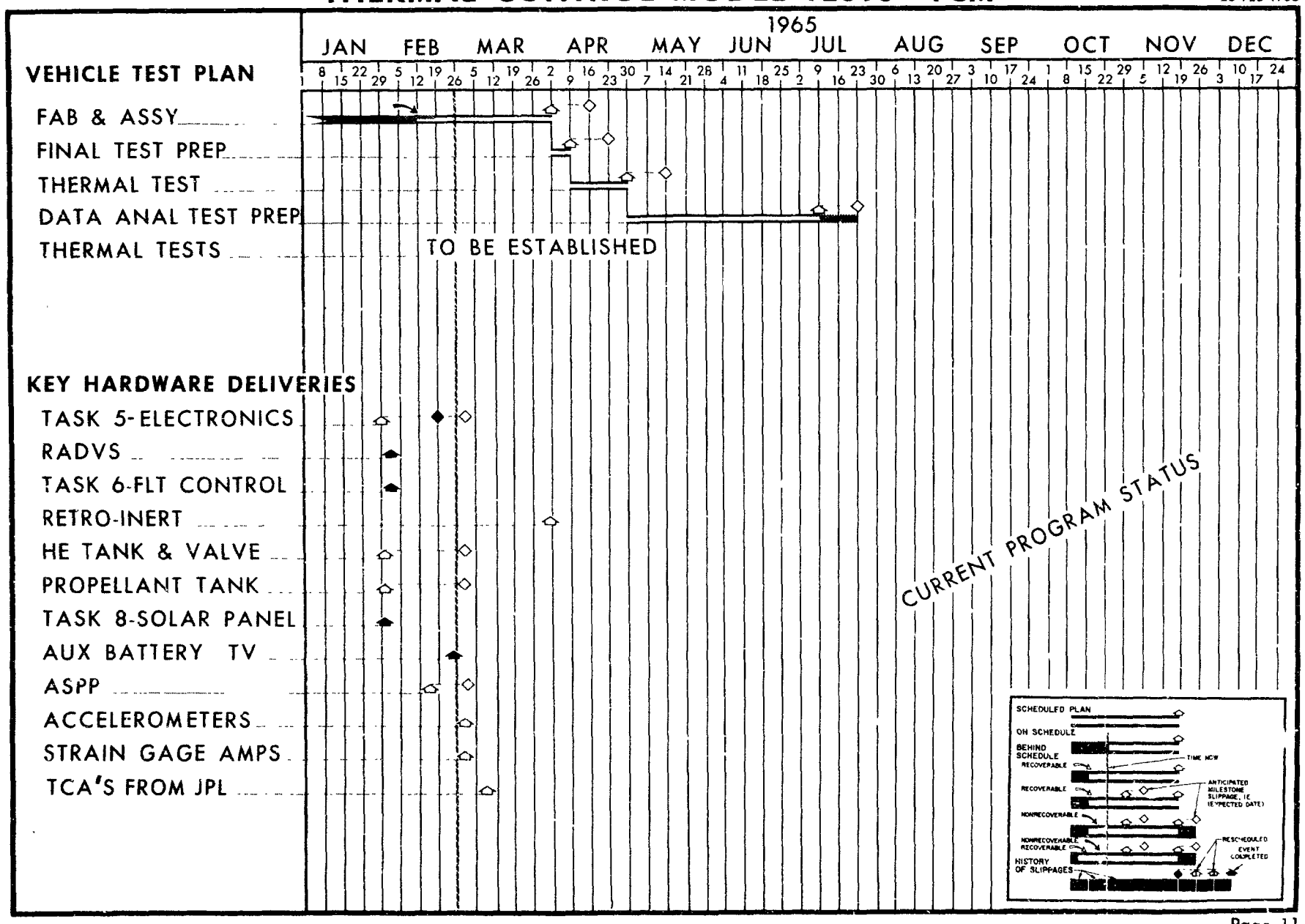

MISSION PECULIAR EQUIPMENT

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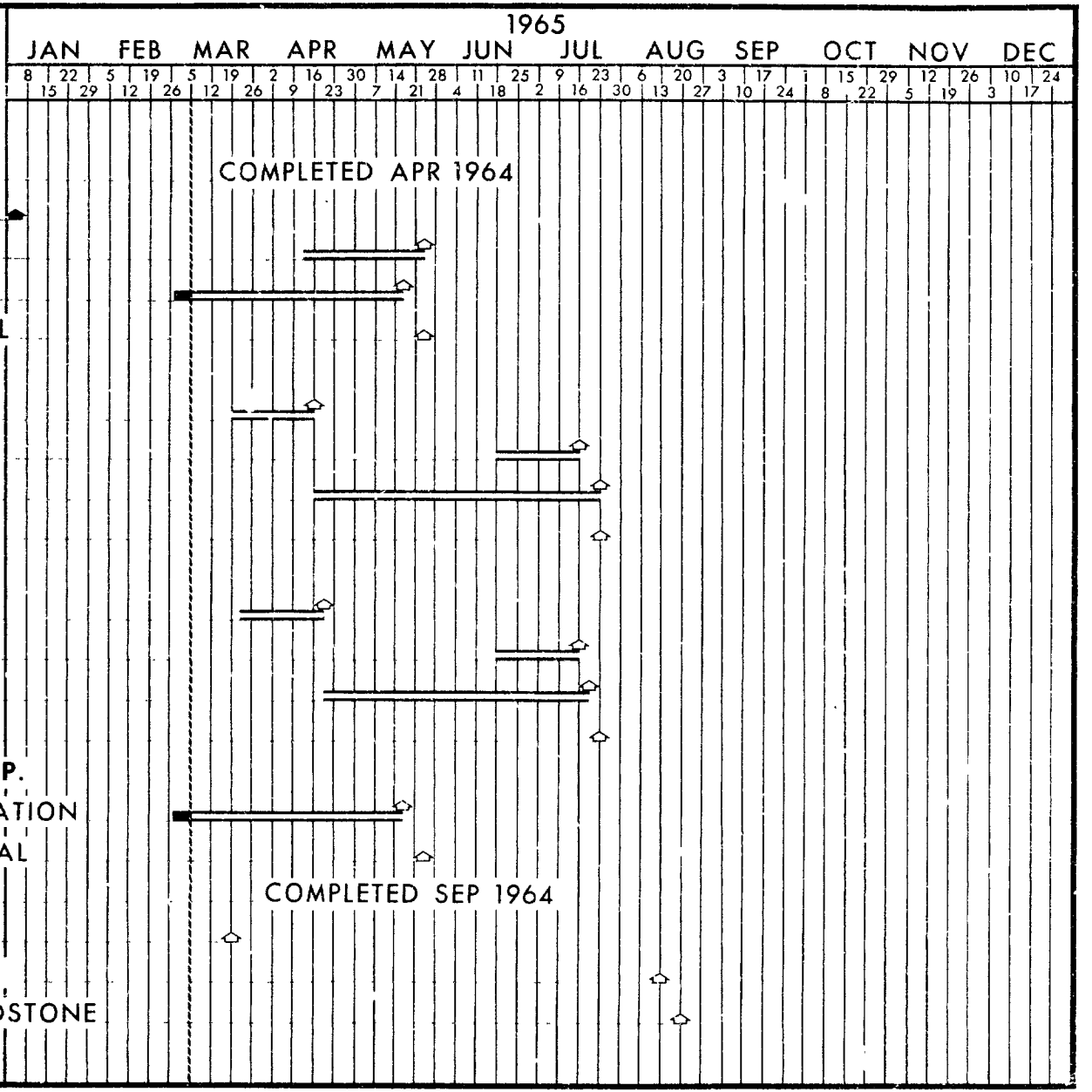

SPACE OPERATIONS SYSTEMS TEST SCHEDULE

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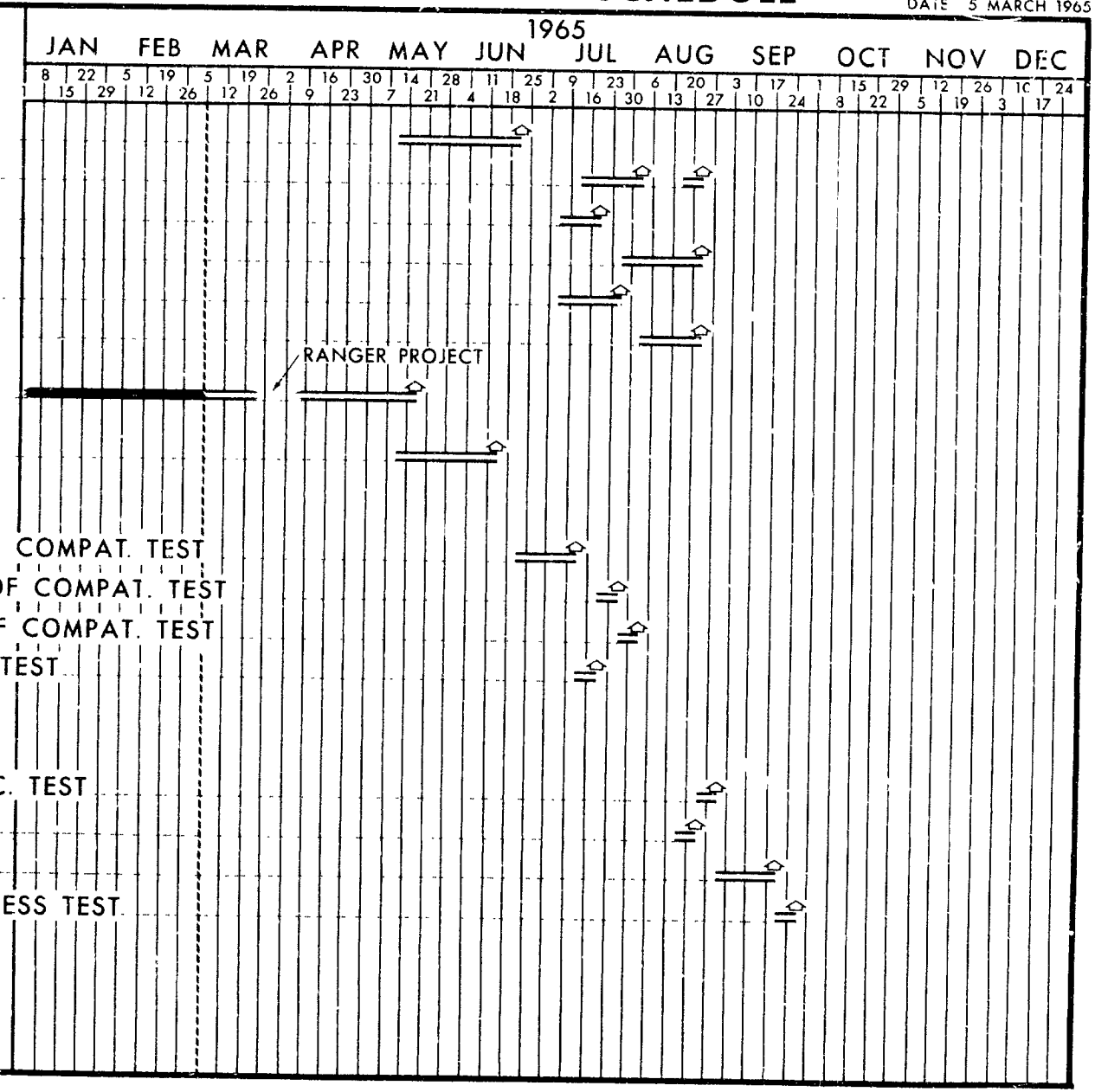
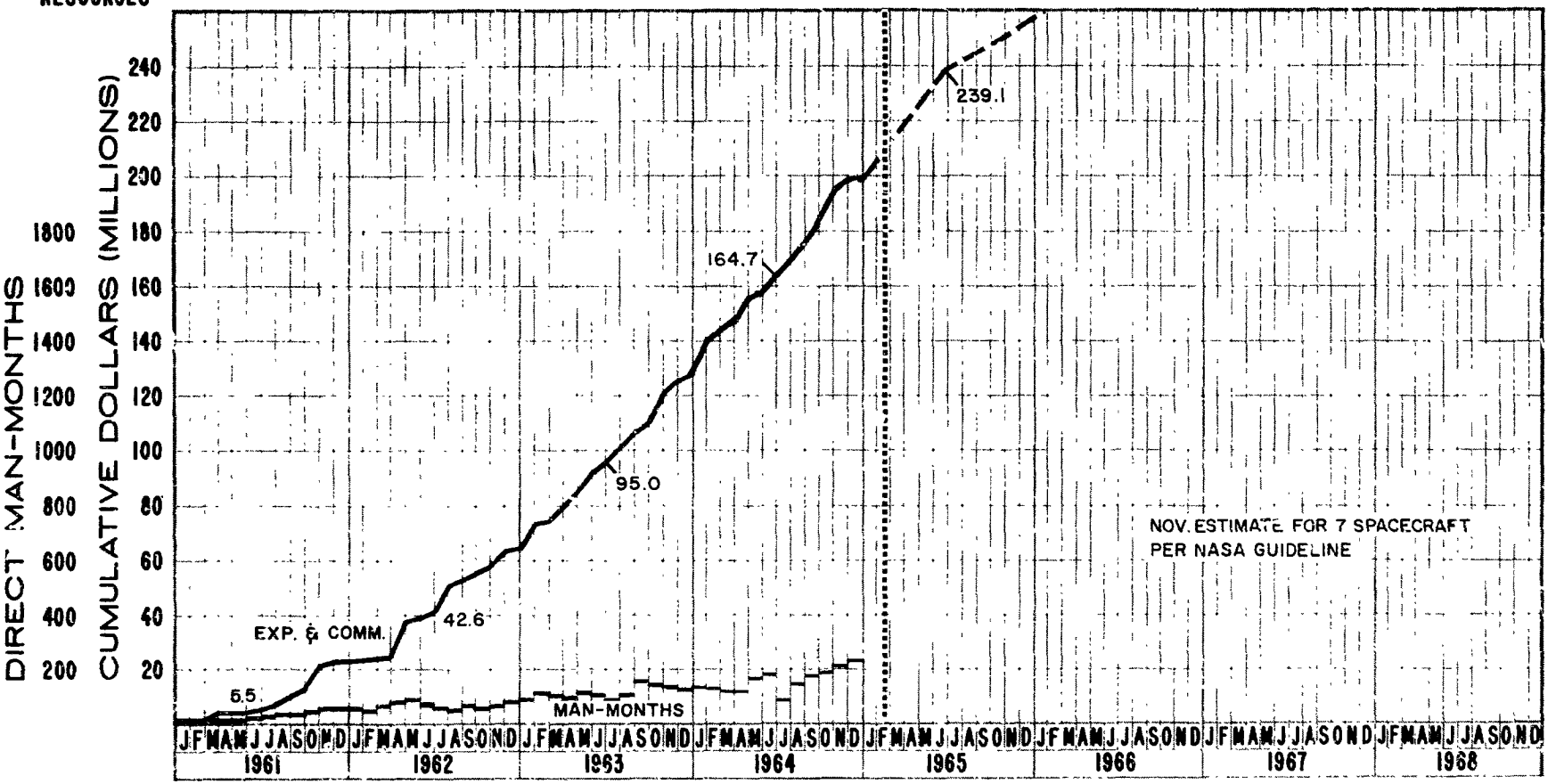


RESOURCES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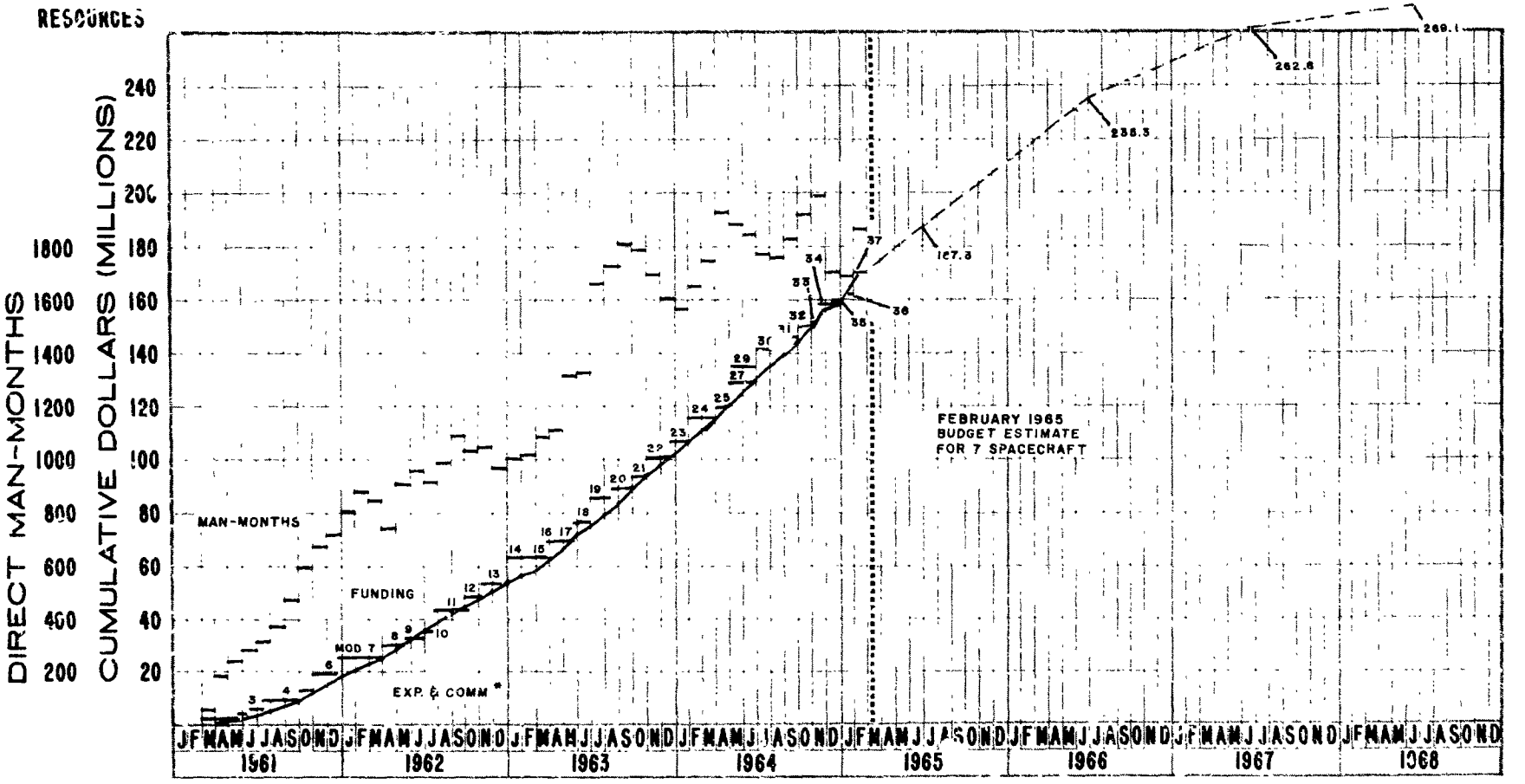
Surveyor Project Status Report AS OF:

STATUS SUMMARY

ACTIVITY SPACECRAFT CONTRACTOR - HUGHES AIRCRAFT



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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