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Gravity Probe B Relativity Mission
Plan for Space Vehicle Verification after ECU Rework
(Return to Flight Readiness)

S0968, Rev. -

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ITAR Assessment Performed

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12.08.03
ITAR Control Req'd? ☐ Yes ☒ No

1. Purpose

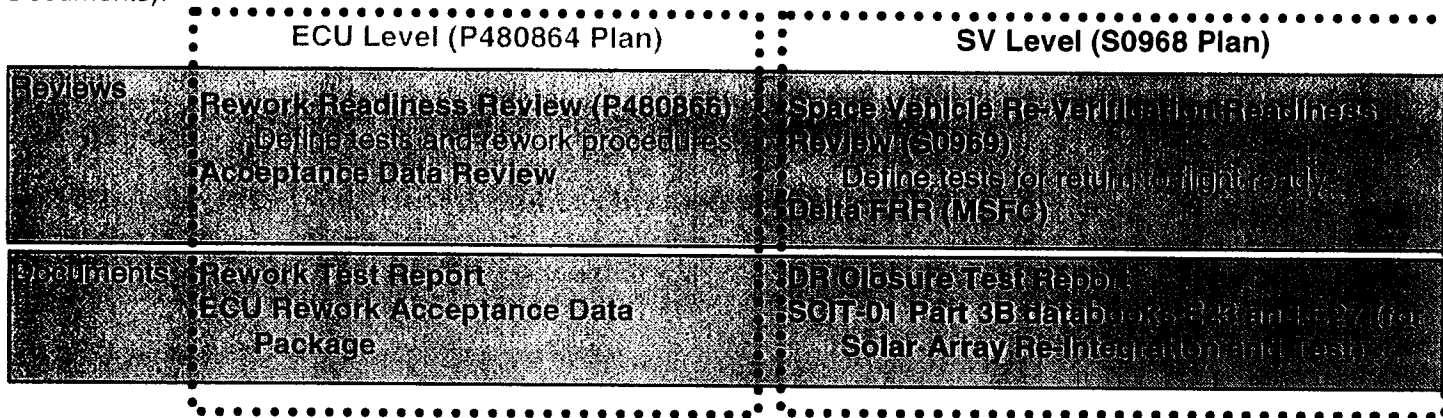
This document defines the steps for returning the Gravity Probe B Space Vehicle to Flight Readiness following the ECU rework and subsequent re-integration with the vehicle. ECU Re-work-specific information is covered in the "ECU Rework Plan", P480864.

Any deviation from this plan is to be worked in accordance with the appropriate discrepancy report process.

1.1 Scope

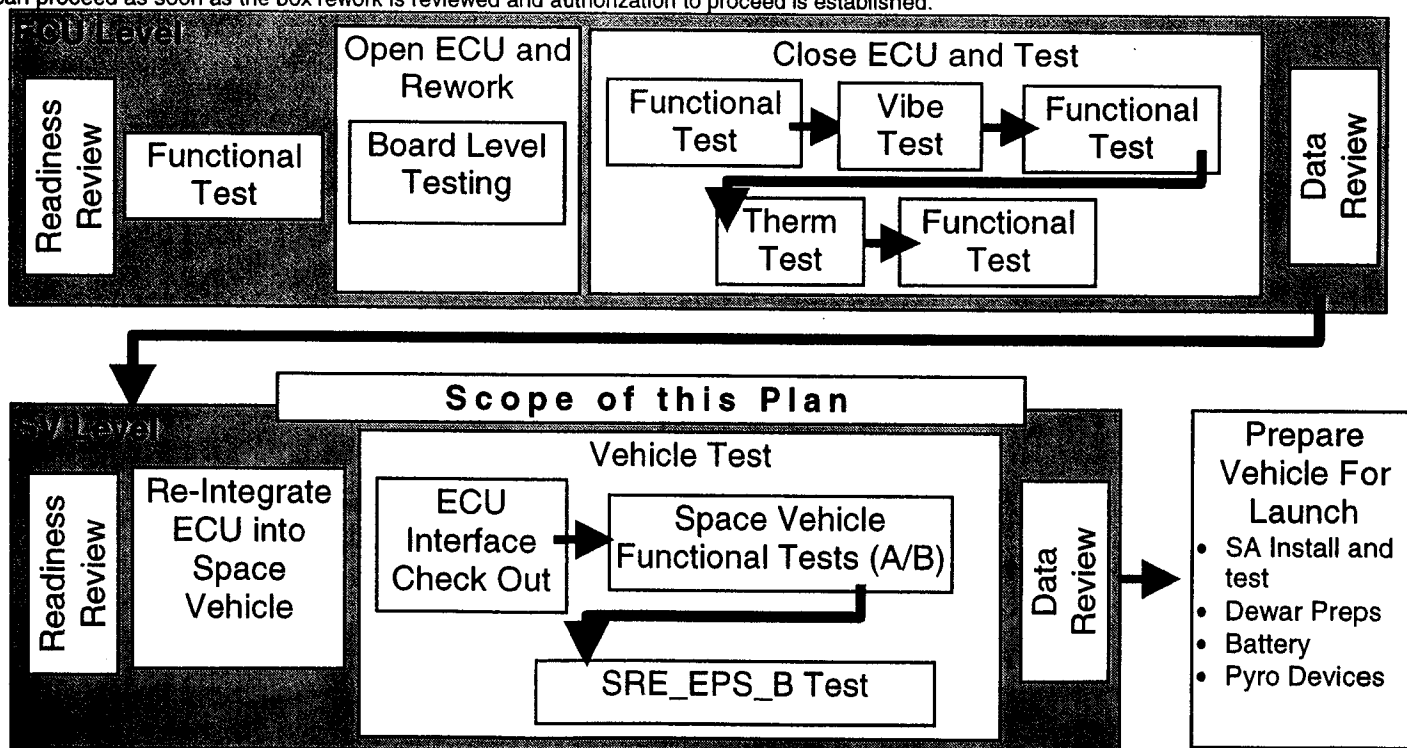
This document contains an overview plan for re-integrating the ECU and performing penalty testing at the Space Vehicle Level. Specifically, this plan calls for system level testing to show that the ECU has been successfully re-integrated and functions nominally at the system level. Success criteria for the reintegration and vehicle-level testing is defined in the Space Vehicle Re-Verification Readiness Review.

Overview of Reviews and Documents (See LM / P480864 for details regarding ECU Level Reviews and Documents):



Plan Overview (note that the top box --ECU Level-- is not covered herein, see LM / P480864)

Note: to optimize schedule, the timing of the ECU level data review and the SV level readiness review will overlap so that the vehicle level activity can proceed as soon as the box rework is reviewed and authorization to proceed is established.



2.0 Planned Reviews

SV / ECU Re-Integration and Test Readiness Review

The SV / ECU Re-Integration and Test Readiness Review contains the following Test Readiness Review information:

- Facilities
- GSE Status
- Hardware Configuration
- Test Personnel
- Test Flow
- Test Procedure Release Status

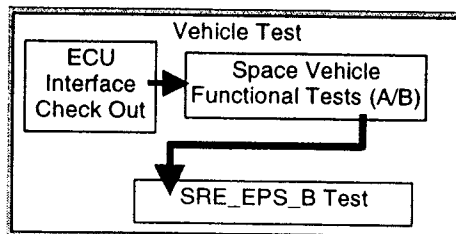
Vehicle Test Data Review

The Vehicle Test Data Review is held shortly after the completion of the final test associated with the ECU re-work and re-integration to the Space Vehicle. In addition to reviewing the results of tests conducted, the as-run tests are delivered to MSFC for further review.

3.0 Planned Tests

Test Approach

Perform tests that perceptively confirm that the ECU has been properly re-integrated into the Space Vehicle Assembly. Secondly, confirm that the SQUID noise resulting from improperly grounded power supplies has improved (although this is not an objective or success criteria of the ECU Re-work).



The following is a list of the anticipated test (and test categories) to be conducted at the Space Vehicle level. The ECU Re-Integration and Test Readiness Review defines the actual test program. This information is provided here to establish the general plan for testing. Specific responses to this plan are fed into the readiness review.

SV / ECU re-integration

SV Level Tests:

1. ECU Interface Tests -- check of ECU interfaces
2. SV Functional Tests -- check of vehicle functions, A and B-sides
3. SRE_EPS_B Test

Other vehicle activities (defined by program master schedule and top level SV Assy drawings)

Dewar prep and return to subatmospheric -- see program schedule for detailed operations

Battery activities

Pyro activities (if applicable)

Solar Array First Motion / Continuity Tests (E24 and E27 per SCIT-01 part 3B)

ECU Burn in

In preparation for the ECU Re-Integration and Test Readiness Review, an assessment of board and box level burn in times will be made, and the anticipated system level burn in times will be disclosed. At that time (coordinated with concerned parties in advance), a determination will be made as to the need for additional ECU burn in time.

Test Level	Estimated Burn in times	Total Burn In
Board Level	Functional: 8 hrs T-Vac: 6 x 24 hrs	152 Hrs Total (76 each A and B sides)
Box Level	Functional: 2 x 8 hrs x 4 times T-Vac: 5 x 24 hrs	184 Hrs Total (92 each A and B sides)
System Level	Interface Tests: 4 x 16 hrs SV Functional: 2 x 5 hrs MISNOMOPS: 2 x 12 hrs A side Only: SRE_EPS_B: 12 hrs	110 Hrs Total for A+B (135 each A and 55 B sides)

Total anticipated Burn in = 303 hrs A side, 223 hrs B side

4.0 Planned Verification

The verification of the re-integration of the ECU and subsequent vehicle level testing is documented in a verification report that provides details for the objectives and results of tests performed, and any residual analysis based on test results. The following is an example of this report:

Example	<p>Test Procedure: INT -998, Title _____; As-Run Completed __/__/____</p> <p>Test Overview and Objective: INT -998 is a procedure performed at the vehicle level that performs the re-integration of the ECU to the Space Vehicle. This procedure provides the physical and electrical re-installation of the ECU and</p> <p>Test Results: As listed on pages 14 and 17, this test successfully demonstrated proper grounding of the power converter case. Furthermore, this test also confirmed that the board functional test was run to completion with nominal (expected) results.</p> <p>Test Criteria: Complete procedure without DR, TAR, or SCR (or disclosed resolution below). Test Successful.</p>
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The documents used to verify the successful re-integration of the ECU and vehicle checkout are listed in this test report. In the event of additional analyses based on test results, these documents (SU Sdocs or LM EMs) are referenced in the report as well, with a brief summary of its conclusion.

The steps required to re-install other flight hardware, in accordance with the Vehicle top assembly drawings 8A00286 are performed per the program master schedule. Only those items with test or analysis based on test are included in the Return to Flight Readiness Verification Report. Documentation required per SCIT-01 part 3B are redelivered as appropriate (E24 and E27 which include Solar Array installation and Solar Array First Motion Tests). These separate deliverables are required for the Return to Flight Readiness Review (FRR #2) but are not included in the Return to Flight Readiness Verification Report document.