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File Number PMIC-MA03-469-29

November 28, 1983

PO-83-506
RAKM/2/2

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

Attention: JA02/Mr. Jack Bean (2)

Subject: Data Requirement MA-03, Progress Report
Contract NAS8-32712

Dear Mr. Bean:

In accordance with Data Requirement (DR) MA-03, Teledyne Brown Engineering, a Division of Teledyne Industries, Inc., submits the "Payload Missions Integration Progress Report," dated November 28, 1983. Since this is a Type 3 DR, distribution is made per your prior direction.

Sincerely,

TELEDYNE BROWN ENGINEERING
A DIVISION OF TELEDYNE INDUSTRIES, INC.

Donald Hofgencer

D. H. Spencer
Contract Manager

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Enclosure

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(NASA-CR-170949) PAYLOAD MISSIONS INTEGRATION Progress Report, 19 Sep. - 11 Nov. 1983 (Teledyne Brown Engineering) 52 p HC A04/MF A01 CSCL 22B

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DATA REQUIREMENT (DR) MA-03

PAYLOAD MISSIONS INTEGRATION

PROGRESS REPORT

September 19, 1983, through November 11, 1983
(WBS 05.1)

November 28, 1983

Contract Number: NAS8-32712

Payload Missions Integration Division
Teledyne Brown Engineering
Building 4708 (Mail Stop PMIC/TBE)
George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

ABSTRACT

This document summarizes Teledyne Brown Engineering's (TBE) progress on the Payload Missions Integration Contract (PMIC) during the report period from September 19, 1983, through November 11, 1983. It fulfills the requirements of Data Requirement (DR) MA-03 Progress Report.

R. A. K. Mitchell
Payload Missions Integration Division

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1. INTRODUCTION

This report is organized for use by the Spacelab Payload Project Office (SPPO). The Management Summary summarizes the contents of the report. The General Section provides information which concerns two or more missions or is nonmission oriented. The Missions' Sections provide information relative to payload integration progress on the specific missions for which TBE is responsible in its PMI contractor role.

Within each section of the report, information is organized in Work Breakdown Structure (WBS) number sequence. Only active WBS elements are identified by number and title for reporting purposes.

2. MANAGEMENT SUMMARY

Highlights of the PMIC contract effort during this period are summarized below.

General

- Four Supplemental Agreements (SAs) were negotiated that added 60,129 hours and $2,935,470 to the contract value.
- Responses were submitted to 11 Change Order Modifications (C/O Mods) during the period, and responses are being prepared for 7 other C/O Mods.

Spacelab Mission No. 1 (SL-1)

- Major efforts were directed toward preparations for the SL-1 November 28, 1983, launch date. We prepared for and participated in four major simulations during the period, with PMIC personnel participating at KSC and MSFC.
- Our Configuration Management personnel supported the Delta Flight Readiness Review (FRR) by providing data needed for evaluating mission flight readiness.
- Our Mission Manager support at KSC continued.

Spacelab Mission No. 2 (SL-2)

- PCA design documentation was updated to incorporate the new ESA/DS clamp unit actuation system design and add interface provisions to the PCA assembly fixture for the new ESA/DS-provided X-struts. PCA modifications will be completed by mid-December.
- Meetings with the Experiment 10/11 instrument developer and NRL have revealed the need for additional MLI blanket design work for the HRTS aperture door and the SUSIM. A 3 to 6 week slip in release to fabrication is anticipated.
- The GSE/ECE Ground Operations Safety Data Package was updated to Phase III status with many open items remaining pending receipt of required GFE data.

Spacelab Mission No. 3 (SL-3)

- The first MPE hardware shipment consisting of Racks 6, 9, and 11 hardware took place on September 30, 1983. All MPE is scheduled to be delivered by December 16, 1983.
- Conceptual layout and feasibility studies were prepared for adding the SL-1 metric camera, galactic wide field camera, and an additional MPESS to the SL-3 payload.
- We participated in a study to evaluate two alternative orbital attitudes for the mission.
- The initial SL-3 Deintegration Requirements and the GSE/ECE Ground Operations Safety Data Package, Phase III, were submitted.
- The ARCLSP and MICG IIAs were baselined this period.
- Experiment Operating Procedures for GFFC, RAHF, and AFT were fabricated for the Payload Flight Data File.

Office of Space and Terrestrial Application (OSTA) Partial Payloads

- OAST-1 structural/mechanical piece part fabrication is 85 percent complete and purchased hardware is 90 percent received. MPE-to-MPESS assembly will start no later than November 21, 1983.
- Fit-checks of the MSL-1 Get Away Special (GAS) Can brackets to the can were successful.
- Middeck Electronics Module (MEM) structural/mechanical piece parts were completed. Assembly has begun.
- A feasibility study was initiated to add a materials mounting plate to the MSL-1 payload.
- The second MEM GFE Interdyne tape recorder was received and successfully tested. MEM software was completely tested.
- The OAST-1 Baseline Deintegration Requirements were submitted 9 weeks ahead of schedule.

- We attended and participated in many partial payload meetings and reviews at MSFC, KSC, JSC, and experimenter facilities.

Astro-1 Mission

- Aluminum plate for the cruciform blades arrived and plate machining to the external envelopes of the blades was authorized.
- At the close of the period, 118 MPE drawings had been delivered for checking and 25 of these have been baselined or are near baselining.
- Work proceeded rapidly on the Wide Field Camera (WFC) design drawings, and several issues raised at the WFC PDR were resolved.
- We designed a new WFC RAU serial command receiver circuit with a lower parts count and higher reliability. A critical pulse transformer component was located in MSFC AGS surplus stock in both flight and breadboard form.
- A design modification of the VFI thermal sensing system was initiated to improve the accuracy of cruciform temperature measurements.
- The Phase I Flight Safety Review was conducted at JSC.
- IIAs are being updated based on baseline reviews held with the experiment developers during the period.
- The preliminary results from the deploy restow analysis were presented to MSFC and a recommendation was made to adjust the relationship of the clamps to the IPS to ensure restow under worst case conditions.

Premission Definition

- Fabrication of MPESS SN 006 for MSL-2 is 75 percent complete.
- We are placing major emphasis on preparations for the December 5, 1983, MSL-2 MPE PDR. A 6-week delay was

experienced due to the change from use of ESA coldplates to Rockwell coldplates.

- Approximately 95 percent of the MSL-2 MPE design drawings are complete.
- Design and procurement functions on the MSL-2 SCU continued at a fast pace. The CEI Part I Specification was released for baselining.
- The MSL-2 IIAs were revised to reflect RR DN closures and resubmitted to MSFC.
- Our official request for MSL-2 GFE hardware/equipment was submitted on October 26, 1983.
- The Shuttle High Energy Astrophysical Laboratory (SHEAL) special study was completed and presented to GSFC.

Mission Peculiar Equipment Support Structure

- Fit-check of the GFE primary and secondary trunnions to MPESS SNs 003 and 004 was successfully completed.

3. GENERAL

WBS 05.0 - PROJECT MANAGEMENT

WBS 05.1 - Performance Management and Administration

The project management contract deliverables this period were the DR MA-03, Progress Report submitted on September 28, and the DR MA-04, Financial Management Reports submitted on October 14 and November 11.

Four SAs were incorporated into the contract during this period. Their impact was as follows:

SA	Hours Added	Dollars Added
MSFC-248	21,950	$ 950,351
MSFC-252	20,889	843,586
MSFC-260	-	1,100,000
MSFC-265	17,290	41,533
	60,129	$2,935,470

In total, they closed out 18 C/O Mod Proposals and 8 ECPs. Four additional C/O Mod Proposals (MSFC-213, 215, 216, and 217), Engineering Change Proposal (ECP) 87, and our MSL-2 proposal in response to RFP 8-AP-32-MSL-2 were negotiated but not incorporated by SA at the period's end.

Seven C/O Mods were received from MSFC, and we responded to eleven C/O Mods, ten of which were received prior to the start of this report period.

Responses are being prepared to seven C/O Mods at this period's end; one ECP that will have a cost impact is in preparation. There are currently 17 unnegotiated C/O Mod Proposals and 2 ECPs with a cost impact in the MSFC evaluation process.

WBS 05.2 - Information Management

During this period, PMIC Information Management activities resulted in the reproduction of 83,076 pages in support of various SPPO and PMIC documentation requirements. We added 80 new documents to our

master files and coordinated, published, and distributed the September and October 1983 Spacelab Payloads and Applications and Technology Project Management Reports.

WBS 75.0 - PAYLOAD INTEGRATION REQUIREMENTS

WBS 75.9 - Ground Operations Analysis and Requirements Definition

We are continuing to develop the data inputs to the MPE Inventory Control System for the SPPO. Inventory is reported monthly.

WBS 75.10 - Safety and Quality Assurance

We obtained agreement from NASA to revise DR IR-29, Acceptance Data Package, to reflect the data really wanted by NASA.

4. SPACELAB MISSION NO. 1

WBS 75.0 - PAYLOAD INTEGRATION REQUIREMENTS

WBS 75.2 - MPE DESIGN

Design of additional flight stowage item mockups was completed. Mockups will be fabricated and used in the PCTC during the SL-1 mission.

WBS 75.9 Ground Operations Analysis and Requirements Definition

We continued to support KSC activities through GIRD maintenance. The Ground Operations employee assigned to KSC for SL-1 Mission Manager support returned to MSFC.

WBS 75.11 - Configuration Change Coordination and Processing

During this period, we supported the SL-1 Delta Flight Readiness Review (FRR). We compiled a listing of all changes processed through the various configuration control boards (CCBs) subsequent to the SL-1 Phase II FRR. This listing was utilized by the FRR team in evaluating the payload readiness for flight. We processed 14 engineering change requests (ECRs) through the MSFC Level II CCB. Most of these changes applied to requests for approval of late stowage items and included approval of Revision E to the SL-1 stowage list. We processed a change approving the SL-1 payload deintegration requirements which were incorporated into the SL-1 GIRD. We processed six field engineering changes (FECs) which were implemented onsite at KSC.

We participated in the Joint Integrated Simulations at the JSC POCC. This participation included the monitoring of the POCC terminal in the Customer Services Room, the maintenance of an activities log, and the maintenance of SPAN-CSR action requests. We forwarded these action requests to the specified actionees.

WBS 75.13 - Integrated Payload Compatibility

The Mission Manager's payload integration support group at KSC continued to support the payload activities. Primary tasks were replacement of expendable SL-1 flight items impacted by the launch delay, and review and updating of the SL-1 deintegration requirements

based on updated guidelines. We are also supporting the simulation activities at the POCC and the HOSC in preparation for the November 28, 1983, launch.

WBS 95.0 - PAYLOAD FLIGHT OPERATIONS INTEGRATION

WBS 95.1 - Onboard Flight/Mission Operations

Launch date changes from September to October and finally to November caused portions of the Payload Flight Data File (PFDF) to be revised and put through the printing and fabrication process again. These revisions required additional short-term effort, which we provided to meet the delivery requirements.

We continued to support the Integrated Training/Proficiency Training (IT/PT) that was rescheduled and conducted in October and November 1983.

WBS 95.2 - POCC Requirements

Four of the five remaining POCC cadre training simulations were conducted at JSC and supported from the Huntsville Operations Support Center (HOSC) and the Payload Crew Training Complex (PCTC). Joint Integrated Simulation (JIS) -04 was a 72-hour mission simulation, which started on Monday, September 19, 1983. For the first time, virtually all of the elements that will function during the mission participated in the simulation. We prepared the MSFC simulation script and assisted in the coordination of that script with the JSC simulation team. We also participated in the debriefing of the simulation held on September 23, 1983, at which we presented the payload malfunctions that had been included in the script for that simulation.

We participated in the conduct of 8-hour simulations on September 28, 1983, and October 6, 1983. These were on-orbit simulations for which we coordinated the payload inputs to the simulation script with JSC and participated in both the sim prebriefing and debriefing.

A 57-hour simulation, JIS-07, was conducted October 11-13, 1983. Again, we prepared and coordinated the payload portion of the script and

participated in the conduct of the simulation and the simulation prebriefing and debriefing.

POCC Operations Training Documents (DR FI-05) were prepared and delivered for Joint Integrated Simulations 02, 03, and 08.

The HOSC HRM Data Base was finalized and delivered on October 26, 1983.

WBS 95.3 - Payload Data Processing Requirements

We incorporated changes resulting from a meeting with the Principal Investigators in preparation for republishing the Spacelab Data Processing Facility Requirements Document, Part I, and the Video Requirements Document.

We assisted Boeing in checking out modifications to the Automated Data Requirements System (ADRS).

WBS 95.4 - Public Affairs Inflight Video and Photographic Requirements

We participated in the four Joint Integrated Simulations conducted at JSC during the reporting period by manning the TV Ops position in the POCC.

The contents of the TV/Photo Ops Book were continually changing throughout the reporting period. Revision A to the final document was delivered on September 30, 1983. Changes to this issue were in progress at the close of the reporting period.

The last payload crew training on TV operations was conducted in the PCTC using flight type TV cameras and associated equipment.

5. SPACELAB MISSION NO. 2

WBS 35.0 - SUPPORT SYSTEM DEVELOPMENT

WBS 35.1 - Mission Peculiar Equipment (MPE)

Miscellaneous Parts/Materials

The following parts/materials were delivered during this report period:

- Twenty-five electrical cables to KSC
- Cable markers and lacing tape to KSC
- Two RAU mounting brackets to MSFC/MDTSCO
- MLI material to the University of Iowa
- Two connectors to the Naval Research Laboratory.

MLI

The following MLI blankets are in work at Sheldahl:

- Experiment 6
- Coldplates 1 and 12
- Experiment 10 electronics.

Our manufacturing division has been authorized to fabricate the coldplate MLI tent frames. The 2219 aluminum tubing specified on the drawings could not be obtained in time to meet any reasonable delivery schedule; therefore, 6061 aluminum tubing was ordered for this job and is expected not later than November 21, 1983. The work will then proceed and delivery should be complete not later than December 23, 1983.

Cables

Of the 54 MPE cables in work, 23 are at KSC, 12 are at MSFC for baking, 9 are in fabrication, and 10 are on hold for various reasons, i.e., awaiting; connectors baking; 2 EOS from MSFC; and GFE connectors from MDTSCO. Fabrication of the three VFI cruciform cables will begin upon receipt of tie wraps and wire.

PCA

The PCA modifications are in work and will be complete not later than December 9, 1983.

WBS 75.0 - PAYLOAD INTEGRATION REQUIREMENTS

WBS 75.2 - MPE Final Design

Meetings were held with the Experiment 10/11 instrument developer to review new insulation requirements for the HRTS telescope and the status of the design for the additional radiator area on the SUSIM instrument. An additional meeting was held at NRL to examine the hardware and trial fit the insulation designs to the flight hardware. The results of this meeting require some redesign of the HRTS aperture door blankets and a new start on the SUSIM designs. These changes will necessitate an approximate 3 to 6 weeks slip in design baseline and release for fabrication.

The PCA design documentation was updated during this period to incorporate the new ESA/DS clamp unit actuation system design and add interface provisions to the PCA assembly fixture for the new ESA/DS-provided X-struts. This PCA assembly documentation and associated Part I and II CEI specifications, materials lists, and associated analyses will be submitted for MSFC Level II baseline on or before November 21, 1983.

WBS 75.9 - Ground Operations Analysis and Requirements Definition

For SL-2, we are preparing the initial release of the deintegration requirements for early review submittal on December 14, 1983. GIRD maintenance for SL-2 is continuing.

WBS 75.10 - Safety and Quality Assurance

Trips were made to experiment developer facilities on Experiments 3, 7, and 9 to acquire data for the ground and flight safety data packages. The GSE/ECE Ground Operations Data Package was updated to Phase III status and submitted for MSFC review. There are still many open items which will be closed after receipt of GFE data. We prepared Acceptance Data Packages (ADPs) and held Acceptance Reviews for 25 cables.

WBS 75.11 - Configuration Change Coordination and Processing

We continued to process ECRs and ECPs against SL-2 baselined documentation. This effort required the preparation of PCN folders, the tracking of the change data in the SCIT, the distribution of change evaluation requests, and the preparation and processing of CCB directives for SL-2 changes submitted to SPPO. We published a weekly SL-2 Open Action Report, K014, and a TBE Drawing Release List (DRL) which reflects all SL-2 MPE CEIs being built by TBE.

We submitted for MPE Project Office review the SL-2 blanket drawings for Coldplates 5, 6, 8, 9, and Experiment 10, and released the following SL-2 ECPs to SPPO:

ECP No.	TITLE	CEI
TBE 104F	Inc X-strut Mounting Provision on the As-built SL-2 PCA Assembly Fixture	NA
TBE 105F	Update Cruciform Assembly and Part I & II CEI Specifications to Incorporate Baseline ESA Hardware	F23001A
TBE 110F	Incorporate Mounting Provisions for New GSE Bypass Cables	NA
TBE 111F	Incorporate Experiment Developer Provided Interface Drill Template and Provide Cable Support per MSFC Request.	F23018A

We baselined the Acceptance Test Procedures and the Operations and Maintenance Manual, with addendum, for the Experiment Power Branching Distributor (EPBD).

We continued to perform the configuration management requirements for SL-2 MPE being designed by MSFC/S&E and controlled by the Spacelab Payloads MPE, Level III CCB. We published monthly a Spacelab Payload MPE (MSFC/JA51) Drawing Release List, PMIC-DRL-3774, which reflects all releases authorized by this CCB.

We prepared the agenda and minutes for the SL-2 Payload Level II CCB which met November 4, 1983.

WBS 75.12 - Interface Agreements

An ECR for Experiment 7 was developed and submitted to update access accommodations, thermal data, and ground operations power requirements. Change pages for 10 approved ECRs were incorporated into the SL-2 IIAs and submitted for distribution.

WBS 75.13 - Integrated Payload Compatibility

The PCA Verification Requirements Document (DR IR-28) and Mass Properties Report were updated to incorporate the new PCA actuator system, new ESA parts, and revised JA-061 requirements.

An IPRD ECR was developed and submitted to revise the weight allocation for Experiment 9.

The initial structural verification package from Experiment 14 was reviewed. Discrepancies in the package were discussed with the experiment developer via telecon. In addition, three trips were taken to experiment developers' facilities (Experiments 3, 7, and 10) to review progress and discuss how to complete an acceptable verification package.

We also initiated a review with MSFC of weld X-rays for Experiment 10. Portions of the welds were found inadequate and the developer was asked to correct the problem. Additional dynamic analysis of Experiment 6 was performed to resolve questions posed by MSFC S&E.

We initiated the task of updating the SL-2 Cruciform/PCA NASTRAN dynamic model for use in a "basedrive" analysis to validate design load factors. Fracture Control Plans were completed for Experiments 1 and 9 and were submitted to the Fracture Control Board. In addition, a preliminary fracture screening was performed for Experiment 7 and the fracture analysis begun.

The Fracture Control Plan for the PCA was updated during this report period and submitted to design for analysis.

The Fracture Control Plans for Experiments 1 and 9 were submitted during this report period. Coordination of these plans with the MSFC Fracture Control Board is scheduled on November 15, 1983.

WBS 95.0 - PAYLOAD FLIGHT OPERATIONS INTEGRATION

WBS 95.1 - Onboard Flight/Mission Operations

Acceptance Test Procedures (ATPs) were prepared and delivered to support acceptance testing of the experiment simulators for Experiments 8 and 9 and to support acceptance testing of the Phase II Design Interface Validation Simulator. Work is ongoing on the ATPs for Experiments 7 and 10. Work started on a generic display and command response simulator for SL-2.

Revision A to the final Level C Experiment Simulator Model Requirements (ESMR) was completed and delivered.

WBS 95.2 - POCC Requirements

We continued work on the telemetry file of the POCC data base.

The Level IV Development Data Base was prepared and delivered.

6. SPACELAB MISSION NO. 3

WBS 35.0 - SUPPORT SYSTEM DEVELOPMENT

WBS 35.1 - Mission Peculiar Equipment (MPE)

Hardware

SL-3 MPE hardware fabrication and mockup fit-checks have proceeded on a "fast as possible" basis during this period. Fabrication completion, testing, and shipment of the Racks 6, 9, and 11 hardware were accomplished by September 30, 1983, with very few open items. Design revisions and engineering changes have resulted in the addition of several items to be shipped to KSC. These remaining items will be shipped on or about November 18, 1983.

Fabrication completion of Rack 4 MPE was accomplished on November 7, 1983. Mockup buildup is being accomplished at this time with completion to be November 21, 1983. Rack 4 flex hoses have not been received as of this date and progress is being hampered by fit-check problems (i.e., ground rack not built to SPAH specifications). Shipment of Rack 4 MPE will be delayed until the end of November.

ESS assembly piece part fabrication and buildup has proceeded ahead of schedule. MPESS, payload adapter, utility bridge, and experiment mounting assemblies are complete and are being integrated at this time. Minor problems have occurred during fit-check but are being resolved.

Underfloor MPE hardware fabrication was completed November 4, 1983, and mockup buildup will begin shortly (emphasis has been placed on Rack 4 and ESS to date). No major problems are foreseen on this assembly, assuming flex hoses arrive and fluid flow tests can be accomplished in a timely manner.

Rack 3 MPE started the fabrication cycle the end of October. Hardware consists principally of reinforcing angles, shims, closure panels, cables, and attachment hardware.

Vacuum vent MPE hardware has been on hold because of emphasis on other assemblies, and no measurable progress was made during this period. Approximately 50 percent of this hardware is completed and

shipment on December 16, 1983, should not present a problem once other assemblies are finished and work can proceed.

We completed MPE verification forms for the MPE hardware and processed verification data for Racks 4, 5, 6, 7, and 11.

Cables

The six cables for Rack 11 were shipped to KSC on September 30, 1983. All other cable fabrication is awaiting cable lengths, which are to be determined the week of November 16, 1983.

Documentation

The O&M Manual for the Module Rack 4/Underfloor Fluid Loop was completed and delivered on schedule on November 10, 1983.

WBS 75.0 - PAYLOAD INTEGRATION REQUIREMENTS

WBS 75.1 - Configuration Design Definition

Conceptual layouts and feasibility studies were prepared for adding the SL-1 metric camera, galactic wide field camera, and an additional MPESS to the SL-3 payload.

Preliminary design layouts were prepared for the SL-3 stowage items and the ground support service equipment. We updated the stowage list with the new DDM stowage items and the Spacelab GMT/MET clocks. Work started on the stowage of tools and CCTV equipment.

WBS 75.2 MPE Design

The MPE drawings for the bolt-on payload adapter structural fix were baselined during this reporting period.

An equivalent design for the Spacelab flight rack transverse longitudinal strut and associated hardware was completed, submitted for NASA review, and baselined.

WBS 75.6 - Electrical System Integration

TBE/PMIC personnel visited the DDM experiment developer to support EMC qualification testing. EMC verification test data were reviewed for compliance with specification requirements. EMC verification data packages for the IONS, ARC, ATMOS, FES/VCGS, and GFFC

experiments were also reviewed, and comments were submitted with closure action.

Studies were initiated to identify and assess the impact of inclusion of the Very Wide Field Camera experiment as part of the SL-3 payload. This included consideration of the power and energy budget, cable interface requirements, and mission timeline. Proposed changes in mission sequence testing were coordinated with TBE personnel at KSC.

WBS 75.7 - Structural/Mechanical System Integration

We completed checking of the payload bay and underfloor MPE analysis for verification. We also completed analytical verification of all MPE in Rack 4, the payload bay, and the underfloor area. We reviewed approximately 25 structural/mechanical verification items submitted by the experiment developers.

We participated in an analysis to determine the impact of adding additional experiments to the mission. The Fracture Control Plan for MPE was revised to include Racks 5 and 7 MPE and revisions to the SL-3 payload bay ESS. A fracture control problem with the DDM experiment hinge pins was also resolved.

WBS 75.8 - Pointing Stabilization Systems Integration

We participated in a study to evaluate two alternate orbital attitudes for the SL-3 mission. The study determined how many additional VRCS thruster firings would be required for each alternate attitude compared to that predicted for the gradient attitude. A second output of this study was the line of restrictions for ATMOS for 360-degree viewing.

WBS 75.9 - Ground Operations Analysis and Requirements Definition

We supported and participated in the SL-3 Prelevel IV Coordination Meeting at KSC during September 21, 22, 23, 1983. The initial release of the SL-3 deintegration requirements was submitted on September 17, 1983, 7 weeks ahead of the scheduled date of December 2, 1983. We have also provided a Ground Operations employee for SL-3 Mission Manager support at KSC beginning November 4, 1983. GIRD maintenance and coordination activities are continuing at MSFC.

WBS 75.10 - Safety and Quality Assurance

The GSE/ECE Ground Operations Safety Compliance Data Package was updated to Phase III and submitted to MSFC for transmittal to KSC. The Phase III Safety Review has been scheduled for November 15, 1983, and review materials are currently being developed. We prepared ADPs and held Acceptance Reviews on Racks 6, 9, and 11.

WBS 75.11 - Configuration Management

SL-3 Configuration Change Coordination and Processing activities during this period required extensive change processing coordination with the MSFC Level II and the PMIC/TBE Level IV CCBs. We supported MSFC Level II CCB meetings on September 27, 1983, and October 27, 1983. This support included the preparation and distribution of the agendas and minutes for these meetings and the preparation of Level II CCB Directives (CCBDs) reflecting the board dispositions of the change requests considered during these meetings. The September 27, 1983, Level II CCB agenda included 19 scheduled change requests and 2 walk-on change requests. We prepared and coordinated 12 Level II CCBDs reflecting Level II CCB dispositions which included the baselining of the MICG and ARCLSP IIAs and board direction for PMIC/TBE issue of Revision B to the SL-3 IPRD. Support for the PMIC/TBE Level IV CCB encompassed the preparation of Level IV CCBDs approving 6 SL-3 MPE drawing revisions, baselining 17 SL-3 MPE drawings, and approving engineering change orders (ECOs) against previously baselined SL-3 MPE drawings.

We provided the drawings, parts lists, and outstanding ECOs required to assemble the acceptance data packages for SL-3 Racks 6, 9, and 11.

We continued to process and track actions to close DNs submitted against the various milestone review data packages and published periodic reports reflecting open DN actions. We published on a regular basis reports reflecting SL-3 baselined documents, open change activities, and TBE released drawings.

WBS 75.12 - Interface Agreements

The ARCLSP and MICG IIAs were baselined during this period. The FES/VCGS will be baselined in the next period. We prepared ECRs to UMI, IONS, and DDM IIAs and reviewed UMI inputs to its updated ERD.

WBS 75.13 - Integrated Payload Compatibility

ECR TBE 3-0169 was approved with modification by the MSFC Level II board. We supported the DDM IRR on September 29 with updated verification status, and processed over 150 other instrument verification packages.

The following SL-3 MPE materials lists were submitted to MSFC: Racks 4, 5, 6, 7, and 9. The materials list for Rack 11 should be submitted shortly. The following SL-3 PI experiments were coordinated with the MSFC Materials Laboratory: MICG, ARCLSP, GFFC, and DDM. Numerous drawings and ECOs were reviewed for various MPE programs to ensure that the materials called out on these documents meet the design requirement of toxicity, flammability, stress corrosion, etc.

WBS 75.14 - Mass Properties

The mass data base was updated in preparation for the Mass Properties Quarterly Report scheduled for November 30, 1983. We assisted in the stowage analysis effort and supported verification item reviews on instrument hardware. Mass data was provided for racks that have been shipped to KSC.

WBS 95.0 - PAYLOAD FLIGHT OPERATIONS INTEGRATION

WBS 95.1 - Onboard Flight/Mission Operation

Experiment operating procedures for the GFFC, RAHF, and AFT experiments were fabricated for inclusion in the Payload Flight Data File.

WBS 95.2 - POCC Requirements

Work continued on the telemetry file of the POCC data base.

WBS 95.3 - Payload Data Processing Requirements

The final Spacelab Data Processing Facility Requirements Document was prepared and delivered.

7. OSTA PARTIAL PAYLOADS

WBS 35.0 - SUPPORT SYSTEM DEVELOPMENT

WBS 35.1 - Mission Peculiar Equipment (MPE)

OAST-1

The structural/mechanical MPE piece part fabrication is 85 percent complete and purchased hardware is 90 percent received. Approximately 25 percent of this MPE has been painted. OAST-1 MPE-to-MPESS SN 004 assembly is scheduled to start not later than November 21, 1983. Electrical cable lengths have been determined and cable fabrication is to be complete not later than December 21, 1983. Deliveries this period consisted of: Thermal isolators for the DAE subsystems plate on November 10, 1983, and the MPE Maintenance Plan delivered on schedule November 3, 1983. Procedures for OAST-1 assembly and DAE alignment were also completed.

MSL-1

Fabrication of the Get Away Special (GAS) Can brackets and shoulder bolts was completed October 21, 1983. Fit-checks of these brackets to the GAS Cans were successfully completed at GSFC on October 24, 1983. The MSL-1 cable was fabricated and is presently being baked at MSFC.

MIDDECK

Structural/mechanical piece parts for the Middeck Electronics Module (MEM) were completed. Assembly of the MEM was started the last week of this report period.

WBS 75.0 - PAYLOAD INTEGRATION REQUIREMENTS

WBS 75.1 - Configuration Design Definition

The OAST-1 Top Assembly Drawing (F4-10030) was revised per MSFC comments and resubmitted for baselining.

WBS 75.2 MPE Design

The OAST-1 SCCF experiment MPE was re-analyzed for stress and dynamics in order to accommodate 1/2-inch isolators at the four footprints. This was requested by SCCF. ECOs were issued on the OAST-1 drawings (F4-30607, F4-30615, F4-30616, F4-20003, F4-30172, F4-30175, F4-30195) to facilitate manufacturing, cable routing, etc. Design of the support stand assembly for the OAST-1 DAE was completed, and the final drawing (G4-60372) was issued.

A final issue of the MSL-1 Metallic and Nonmetallic Materials List (DR IR-36) was issued. An ECO to MSL-1 MPE drawing (F4-30594) was issued to facilitate the GAS Can Insulation Blanket. A feasibility study was initiated to add a materials mounting plate to the MSL-1 payload.

An MPESS Shipping Cradle Tent Stand was designed and analyzed.

The second GFE Interdyne tape recorder was received for MEM on November 8, 1983. Prior to formal acceptance by the government, the tape recorder was tested at the TBE facility. The test indicated the recorder was operational in both read and write modes. The first recorder will be sent to Interdyne for refurbishment after Interdyne receives a new four-track head.

The MEM PC board was received from the vendor. The board components were mounted and board testing was completed. Numerous artwork errors were found and corrected by the use of green wire techniques. The prototype board is now operational.

The MEM modification of the SEP enclosure started. The card gauge and brackets are complete.

The MEM software was completely tested. The fast tape rewind (120 IPS) was replaced with the fast search (40 IPS) rewind. This was necessary because of the removal of the head disengagement capability.

WBS 75.4 - Command and Data Requirements

We participated in a telecon with the OAST-1 MSFC Payload Operations Working Group during review of PIP Annex 3, Flight Operations Support Annex. Discussions included clarification of commands and applicable end item feedback for DAE, SAE, and SCCF. We reviewed Change 1 to PIP Annex 4, Command/Data and corrected nomenclature for OAST-1 use of the FMDM pulse output discrete. A Data Change Request (DCR) is being written by Dick Welch at JSC.

WBS 75.5 - Environmental System Integration

Additional analyses and coordination were performed to resolve the thermal problem with the OAST-1 SAE tape recorder. A thermal problem with the OAST-1 SCCF was resolved. Thermal isolation is being added between the SCCF and the MPE. Additional analyses of the OAST-1 PCB were completed and a technical memo prepared.

WBS 75.7 - Structural/Mechanical Systems Integration

The OAST-1 integrated payload model was updated to the latest SAE mass and CG. A copy of the model was sent to John Sunkel at JSC as requested by MSFC. The OAST-1 Fracture Control Plan for the SAE experiment was completed and submitted to the Fracture Control Board for review.

WBS 75.8 - Pointing/Stabilization Systems Integration

We continued the task to resolve OAST-1 DN 2-452-2873. We validated new aerodynamic data (bay doors open) that was received earlier from JSC. We incorporated a more accurate atmosphere model into the OSOS computer code. This atmosphere model includes atmosphere changes as a function of orbital position. We are presently awaiting data from JSC to verify this change.

WBS 75.9 - Ground Operations Analysis and Requirements Definition

The OAST-1 baseline deintegration requirements were completed and submitted on November 10, 1983, 9 weeks ahead of the scheduled date of January 17, 1984. GIRD maintenance activities for OAST-1 are continuing.

WBS 75.10 - Safety and Quality Assurance

Support was provided for the Phase I/II Ground Operations Safety Review conducted with KSC on October 25, 1983. The OAST-1 GSE/ECE Ground Operations Safety Data Package was updated to Phase III status and submitted to MSFC for review prior to submittal to KSC.

We prepared ADPs and held Acceptance Reviews on the OAST-1 thermal isolators and MPESS SN 004 and its associated GHE.

WBS 75.11 - Configuration Change Coordination and Processing

We concluded processing changes against the OSTA-2 baseline with the approval of ECP 94F. This ECP completed the incorporation of outstanding ECOs into the OSTA-2 Cable Assembly Drawings to reflect as-built configuration.

We continued to process all ECRs and ECPs against the current OAST-1 and MSL-1 baselines. This effort required preparation of PCN folders, processing of change evaluation requests, tracking changes in SCIT, and preparation of CCBDs. We published weekly a partial payload open action report, K32A, which lists all outstanding open actions against OAST-1 and MSL-1 baselined documentation.

We continued to track OAST-1 and MSL-1 DN open actions and published each month the open actions in the partial payload DN SCIT Report, K062.

We baselined the OAST-1 IPL Verification Plan, JA-148, and the Cable Interconnect Diagram and Electrical System Schematic. The following OAST-1 ECPs were released to SPPO.

ECP No.	TITLE	CEI No.
TBE 106F	Add Requirement for Payload Circuit Protection	F44003A
TBE 107F	Maintain Compatibility Between OAST-1 Payload and Orbiter Electrical Interfaces	F44003A
TBE 108F	Maintain Compatibility Between OAST-1 Payload and Orbiter Electrical Interfaces	NA

All OAST-1 drawings and CEI specifications have been baselined except the OAST-1 Thermal MPE Part II CEI Specification and the OAST-1 Payload Installation/Assembly Drawing, F4-10030.

We baselined the MSL-1 Ground Integration Requirements Document (GIRD), JA-143.

We submitted the MPESS (SNs 003 and subsequent) Operations and Maintenance Manual, PMIC-O&M-3864, for S&E review and evaluation prior to baselining.

During this period, we baselined and submitted for MSFC evaluation the ADSF Middeck Electronics Module Assembly and associated drawings and processed 14 Class II ECOs through the TBE/PMIC Level IV CCB. We distributed these baselined drawings and ECOs for the manufacturing effort and submitted these documents to the MSFC Documentation Repository.

We continued to process and track DN closeouts against the ADSF, ARC, and IEF milestone review data packages and to process change requests submitted by MSFC organizational elements. We published on a regular basis reports depicting DN and open change activities.

WBS 75.12 - Interface Agreements

The CCB meeting held on October 18, 1983, included the review of ECRs to the DAE and SAE IIAs. Action was deferred on all submittals presented.

WBS 75.13 - Integrated Payload Compatibility

We attended the OAST-1 POWG telecon with JSC on November 2, 1983. The latest OAST-1 timeline was reviewed and data was presented to support the MSFC proposal to allow VRCS maneuvers with the SAE array at 70 percent deployment. JSC subsequently agreed to this operation which will significantly decrease the number of deployments on the array.

Several DN closeouts were submitted and several previously submitted closeouts were approved. Most of the remaining open issues relate to thermal analysis, GSE for handling MPE and experiments, and

pointing and stabilization, including alignment. Most of these issues are being actively worked.

We supported a 2-day MSFC working group meeting to review the procedures in the Flight Operations Support Annex and the STS crew checklist.

In a followup telecon with JSC and Rockwell representatives on the changes to the connectors at the SIP interface, it was agreed that TBE would revise the MPE cable connectors and JSC would provide hardware to support this change.

The SCCF interface plate was received at JPL and a fit-check of the actual hardware verified the interface compatibility.

A potential thermal problem with the SCCF surfaced and several telecons resulted. The present approach will be for TBE to provide four thermal isolators as MPE to go between the SCCF interface plate and the SCCF support brace. Low emissivity thermal tape will also be provided by JPL and applied to both sides of the SCCF interface plate by TBE.

We attended and participated in regularly scheduled OAST-1 payload working group meetings at MSFC. Although no definite guidelines have been provided by MSFC with regard to tethered connector caps, we have provided an attach point for SAE test connector cable covers for J3 and J7 test connectors.

At the direction of the Mission Manager, we furnished Lockheed with silverized Teflon thermal tape to wrap the SAE tape recorder.

We attended the OAST-1 Phase II Safety Review telecon with KSC, which reviewed the ground operations hazard analyses and safety compliance. Plans are to install the SAE NSI pyros in the O&C Building at KSC.

SAE verification is continuing after the IRR with open items being closed now. The final stress analysis was received from LMSC during this reporting period, and verification requirements which were awaiting receipt of the analysis are being worked. Several waivers on the SAE pyrotechnique system have been processed, but final approval has not been received on the JSC-imposed requirements.

The SCCF IRR was held October 13. The review was very good with only seven items being included on the Open Items List. One of these, the GSE proof loading, has been closed with the remaining ones to be closed nearer the time to ship to KSC.

The DAE IRR is now scheduled for December 20, with the associated documentation delivery on December 1. The primary delay in the DAE IRR scheduling is completion and documentation of hardware testing.

The Integrated payload verification has begun with all requirements which can be satisfied by GIRD paragraphs having been sent to NASA for evaluation. Twelve of the integrated payload verification requirements cannot be worked until the DAE data is received. The remaining folders are being prepared for delivery to NASA.

OAST-1 MPE acceptance reviews have been rescheduled as follows:

- Electrical - December 20
- S/M - December 7
- Thermal - December 7

Manufacturing route sheets are being accumulated for support of these Acceptance Reviews.

The MEA-A2 (instrument) Verification Plan has been received, but the similarity statement necessary to close most of the requirements has not.

The Interface Verification Summary Report for the SAE experiment was completed and submitted to SPPO on September 21, 1983. The Interface Verification Summary Report for the SCCF experiment was completed and submitted to SPPO on October 13, 1983.

On September 20, 1983, PMIC personnel met with the MSFC Fracture Control Board to discuss PMIC Fracture Control Plans. The MSFC Fracture Control Board stated in this meeting that visual inspection would no longer be acceptable for detecting surface defects. The subject PMIC control plans were revised to incorporate this requirement and resubmitted to the Board. The MSL-1 Fracture Control Plan has been approved by the MSFC Fracture Control Board.

The MSL-1 Materials Usage List (DR IR-36) is being coordinated with the MSFC Materials Laboratory.

WBS 75.14 - Mass Properties

The OAST-1 Mass Properties Status Report No. 5 (DR IR-05) was submitted November 1, 1983.

The MSL-1 Mass Properties Status Report No. 5 (DR IR-05) will be submitted November 15, 1983.

8. ASTRO-1 MISSION

WBS 35.0 - SUPPORT SYSTEM DEVELOPMENT

WBS 35.1 - Mission Peculiar Equipment (MPE)

Six pieces of titanium for the MPE mounting feet were ordered and are expected not later than February 22, 1984. The aluminum plate for the cruciform blades arrived and our manufacturing division was authorized to machine these blades to the required external envelopes. This machining will be completed in time to start detailed machining when the detail drawings are complete.

The fabrication of the epoxy test fixture started. It will not be complete on November 16, 1983, as requested. We are attempting to complete the fixture on or before December 9, 1983. The Invar plate for the Optical Sensor Package (OSP) platform was ordered and delivery is expected not later than January 6, 1984. Two pieces of titanium were delivered to the University of Wisconsin on September 21, 1983.

WBS 75.0 - PAYLOAD INTEGRATION REQUIREMENTS

WBS 75.2 - MPE Design

During this reporting period, detail design work in all areas of the Astro-1 project proceeded rapidly. By the end of the period, 118 drawings had been delivered to checking and 25 drawings have either been baselined or are in the process of being baselined. Critical drawings which were baselined are the cruciform envelope drawings.

Astro design personnel supported an Astro Clamp Status Review which was held at Rockwell, Downey.

All design-related DNs which were scheduled to be closed during this period were closed out.

Thermal analyses of the cruciform, Integrated Radiator System (IRS), and PCA continued during the period. The cruciform thermal model is being updated to reflect post-PDR design changes. The sensitivity study was completed and the results were presented to MSFC. A tentative

decision was made to place heat pipes on the cruciform. The final decision was delayed pending the completion of additional analyses to determine the improvement to be expected from adding heat pipes. Updating of the IRS thermal model and simulation of the design cases were completed. Evaluation of the heat pipe proposals was completed and selection of a vendor is expected by November 25. Development of the thermal model of the PCA continued. Calculation of form factors, gray bodies, and radiation constants will begin by November 12.

Stress analyses of the alignment holding fixtures, alignment simulators, and the cruciform envelope drawings were completed during this period. Continued stress and dynamics work on the IRS and the OSP mount plate has resulted in a number of required design changes which are being implemented in the IRS and OSP mount drawings. Increased weight in the instrument electronics boxes supported by the IRS and in the MSFC-designed OSP Sun shade baffles was the primary cause of the required redesign efforts.

Deflection analyses of the cruciform-mounted instruments were done in support of the thermal sensitivity analyses for on-orbit alignment and stability. Basedrive efforts were begun on the cruciform and PCA. Cruciform, PCA, and OSP analyses are proceeding on schedule.

The cruciform, PCA, and IRS Part I CEI Specifications were reviewed, finalized, and delivered to MSFC for baselining on October 28. Preliminary layout and design work was begun on the Astro MLI and cable routing drawings.

During this period, work proceeded rapidly on the detail design drawings for the Wide Field Camera (WFC). Several issues raised during the informal PDR process were resolved. Thermal and stress models are under development for the camera canister and a thermal model for the camera electronics box is well underway.

WBS 75.3 - Command Data/Communications Systems Integration

We completed one section of the WFC breadboard to test the RAU command interpreter. Execution of firmware and the RS-232 test port were verified. We designed a new RAU serial command receiver circuit with a lower parts count and higher reliability. A critical pulse transformer component, which replaces 22 previous components, was located in MSFC AGS surplus stock in both flight and breadboard form. The analog/discrete interface breadboard wirelist and layout is 90 percent complete. We plan to provide a wirelist and component layout to the technician for wirewrap. PDR schematics were updated to show correct Dual In-line Package (DIP) mounted resistors and capacitors. We provided a copy of MSFC-SPEC-521A to Tempo for EIU power supply design. We completed checkout of the Avionics Development Facility (ADF) RAU serial command simulator to be used to test the WFC Electronics Interface Unit (EIU) RAU serial receiver. The RAU simulator uses the OPAA prototype and Starplex firmware. We also placed orders for 90 percent of the EIU flight parts.

WBS 75.6 - Electrical Systems Integration

A design modification of the Astro-1 VFI thermal sensing system was initiated to improve the accuracy of cruciform temperature measurements. Vendors were contacted to establish price and delivery estimates for platinum temperature sensors and matching signal conditioning sets. A draft of the VFI thermal sensing system contract end item specification was completed. The development of an electrical bonding plan for cruciform-mounted experiments and mission-peculiar equipment was initiated and coordinated with affected design elements.

An EMC qualification test procedure for the WFC experiment was completed. Phase I breadboard testing of the experiment interface unit continued.

WBS 75.10 - Safety and Quality Assurance

Data were prepared and support provided for the Phase I Flight Safety Review conducted at JSC on November 8, 1983.

WBS 75.11 - Configuration Change Coordination and Processing

During this period we baselined or submitted for baselining the following Astro-1 documents:

- JA-343, Astro-1 Wide Field Camera ERD, submitted for baseline on 10-19-83
- PMIC-DOC-3746, TBE MPE Systems Requirements Document, CCBD TBE-83-0240, dated 10-28-83
- Astro-1 Instrument Holding Fixture Drawings, CCBD TBE-83-0245, dated 11-2-83
- Cruciform Blade Envelope drawings, CCBD TBE-83-0239, dated 10-28-83

We entered into SCIT the Astro-1 IPL IDE RIDs and MPE PDR DNs and coordinated closure actions as appropriate with the various review team leaders.

WBS 75.12 Interface Agreements

Work is continuing to incorporate RIDs from the IPL IDE into the IIAs for WUPPE, UIT, and HUT. The status as of November 11, 1983, is as follows:

DOCUMENTS	RIDs RECEIVED	INCORPORATED	PENDING INPUT
IIA WUPPE	23	21	2
IIA UIT	8	7	1
IIA HUT	27	27	0

Baseline reviews of the HUT and UIT IIAs were completed September 29 and 30 at Johns Hopkins University and GSFC. The WUPPE IIA review was completed on September 15 at Wisconsin. Each document is undergoing major revisions as a result of these reviews.

Methods for electrically bonding the telescopes to the cruciform and for bonding the electronics to the IRS were considered and recommendations were made to MSFC.

Isometric layout drawings depicting cable routing and general access for the HUT telescope were completed and forwarded to the experimenter for review.

The WFC (WFC) ICD is being revised. A ground operations section was developed. The IMCS ICD was revised and submitted to MSFC for review. Action was completed on all RIDs except those dependent upon receiving data from MSFC.

WBS 75.13 Integrated Payload Compatibility

Several documents were baselined by TBE: Systems Requirements Document, Cruciform Blades Envelope Drawings, Epoxy Test Fixture, Alignment Holding Fixtures, and Optical Cube Adjustable Assembly.

The CEI Specification Part I for the cruciform, IRS, and PCA, and also the Systems Requirements Document were provided to MSFC on October 28, 1983, as contract deliverables.

Revision "C" of the MPE Development Plan was distributed to all Astro-1 team members and included the latest changes from an MSFC review as well as revised schedule dates for certain MPE and GSE items.

An MPE development schedule was developed and distributed to the Astro-1 team and includes a schedule for each item of MPE and GSE and for test equipment requirements. Schedules are provided on the following pages.

The preliminary results from the deploy restow analysis were presented to MSFC and a recommendation was made to adjust the relationship of the clamps to the IPS to ensure restow under worst case conditions. No Criticality I safety failure modes were identified for the PCA configuration and deploy/restow sequences. Areas were identified where data inputs were not firm, particularly in regard to IPS characteristics. This analysis will be updated as thermal modeling is sufficiently complete on the PCA/pallet and as the IPS characteristics are better defined. The systems-level FMEA analysis results are continuing to be evaluated and studied for contingency operations as these analyses are performed.

A presentation was made to the principal investigators in a meeting at GSFC to show the results of the thermal stability analysis of the cruciform and to show the effect on long-term drift between the

WBS NO. _____

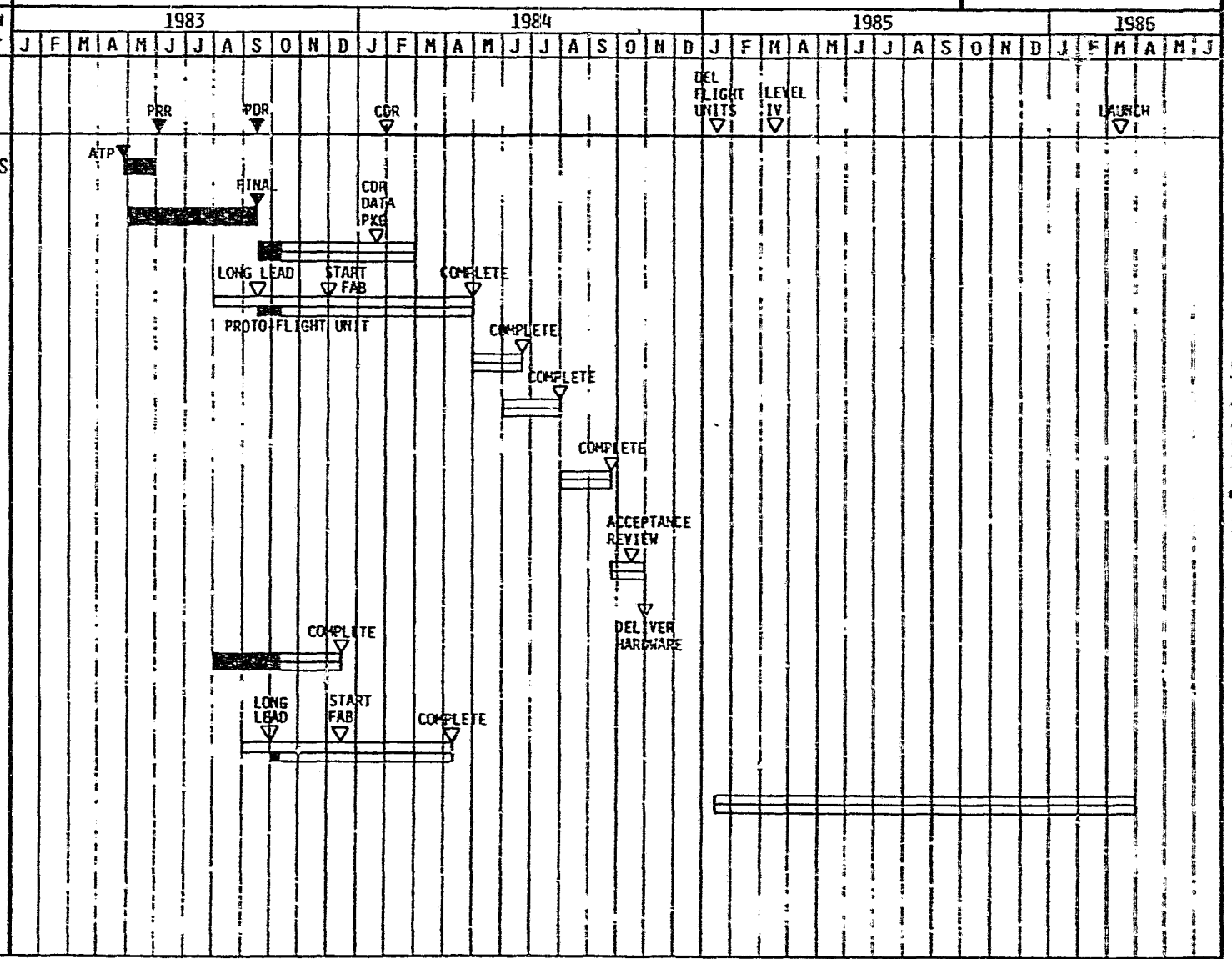
RESP J. McGUIRE

TBE/PMC PAYLOAD MISSION INTEGRATION SCHEDULE

WIDE FIELD CAMERA SYSTEM PREL. SCHEDULE

MISSION(S) ASTRO-1

SHEET 1 OF 1



NOTES

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DATE PREPARED 3/23/83

REVISION DATE 11-1-83

REVISION J

TBE-PMC-0018

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WBS NO. ALL

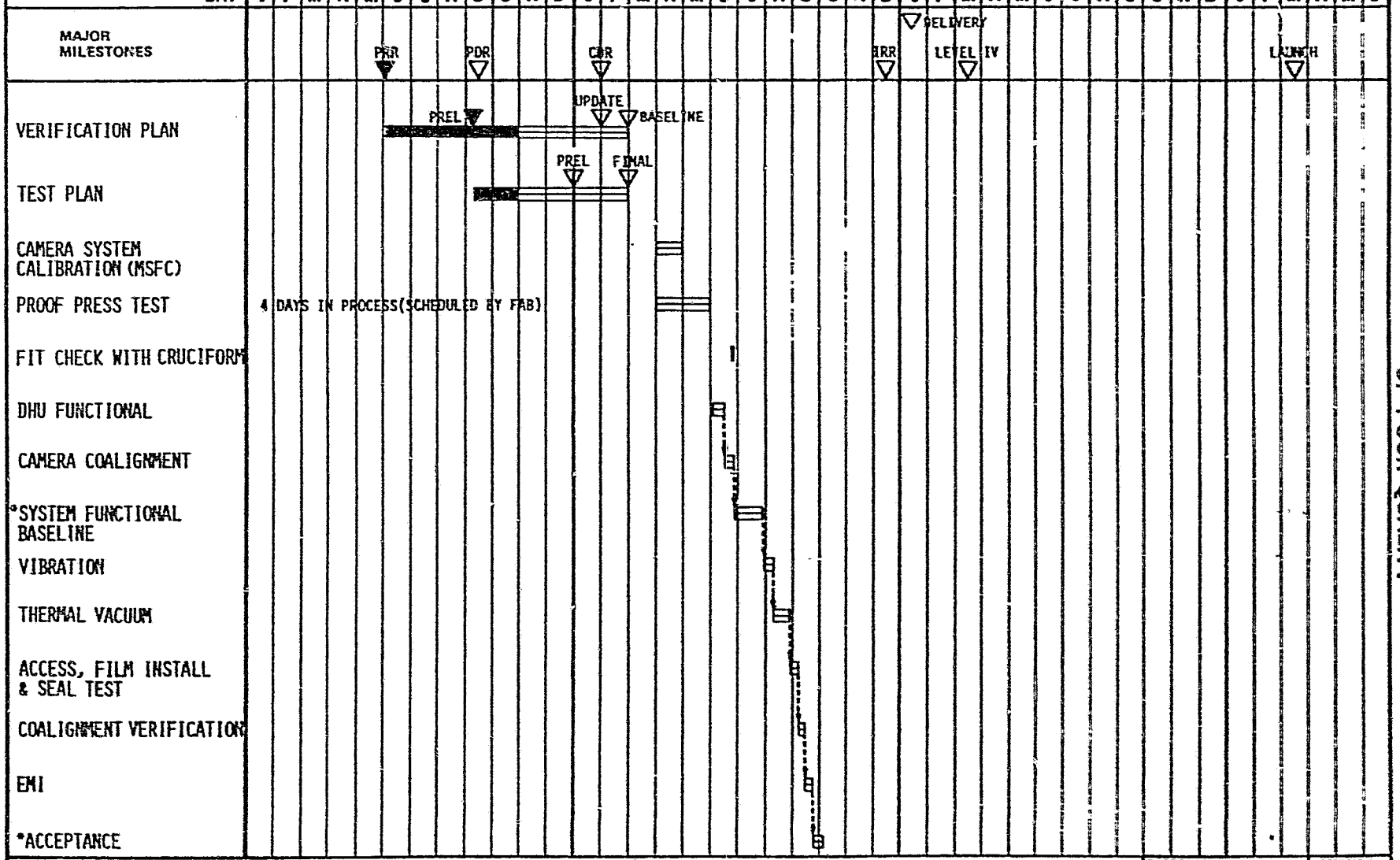
RESP G. HUFFMAN

TBE/PMIC PAYLOAD MISSION INTEGRATION SCHEDULE

VERIFICATION PROGRAM MFC ASSEMBLY

MISSION(S) ASTRO-1

SHEET 1 OF 1



NOTES

* PDSS REQUIRED TWO WEEKS EACH
PRELIMINARY PROCEDURES 2 MONTHS PRIOR TO TEST,
FINAL TWO WEEKS PRIOR TO TEST

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DATE PREPARED 9-7-83

REVISION DATE 11-1-83

REVISION C

TBE-PMIC-6018

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WBS NO. ALL

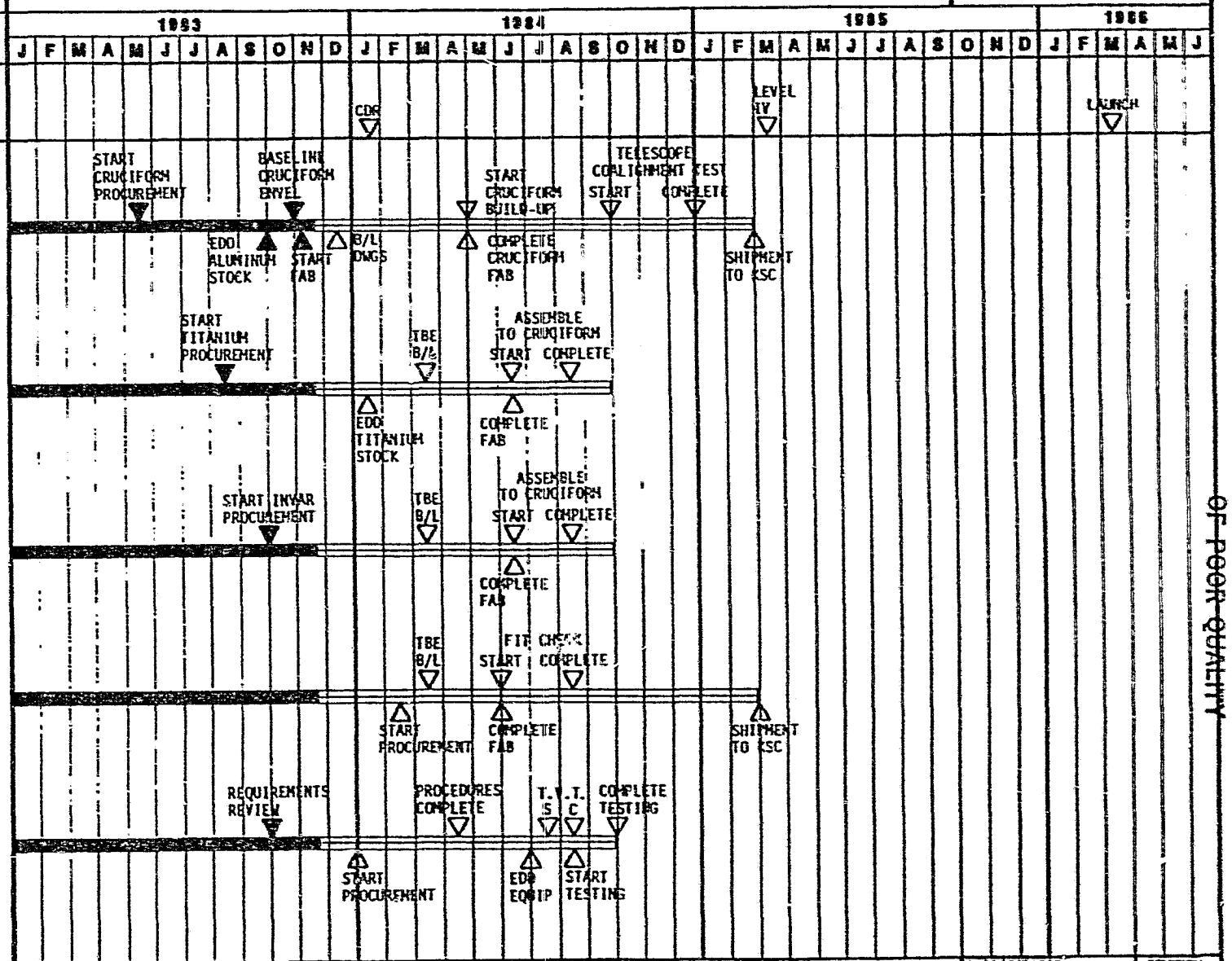
RESP E. PEVEY

TBE/MMC PAYLOAD MISSION INTEGRATION SCHEDULE

MPE DEVELOPMENT SCHEDULE

MISSION(S) ASTRO-1

SHEET 1 OF 5



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DATE PREPARED 10-18-83

REVISION DATE 11-21-83

REVISION B

TBE-MMC-8318

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WBS NO. ALL

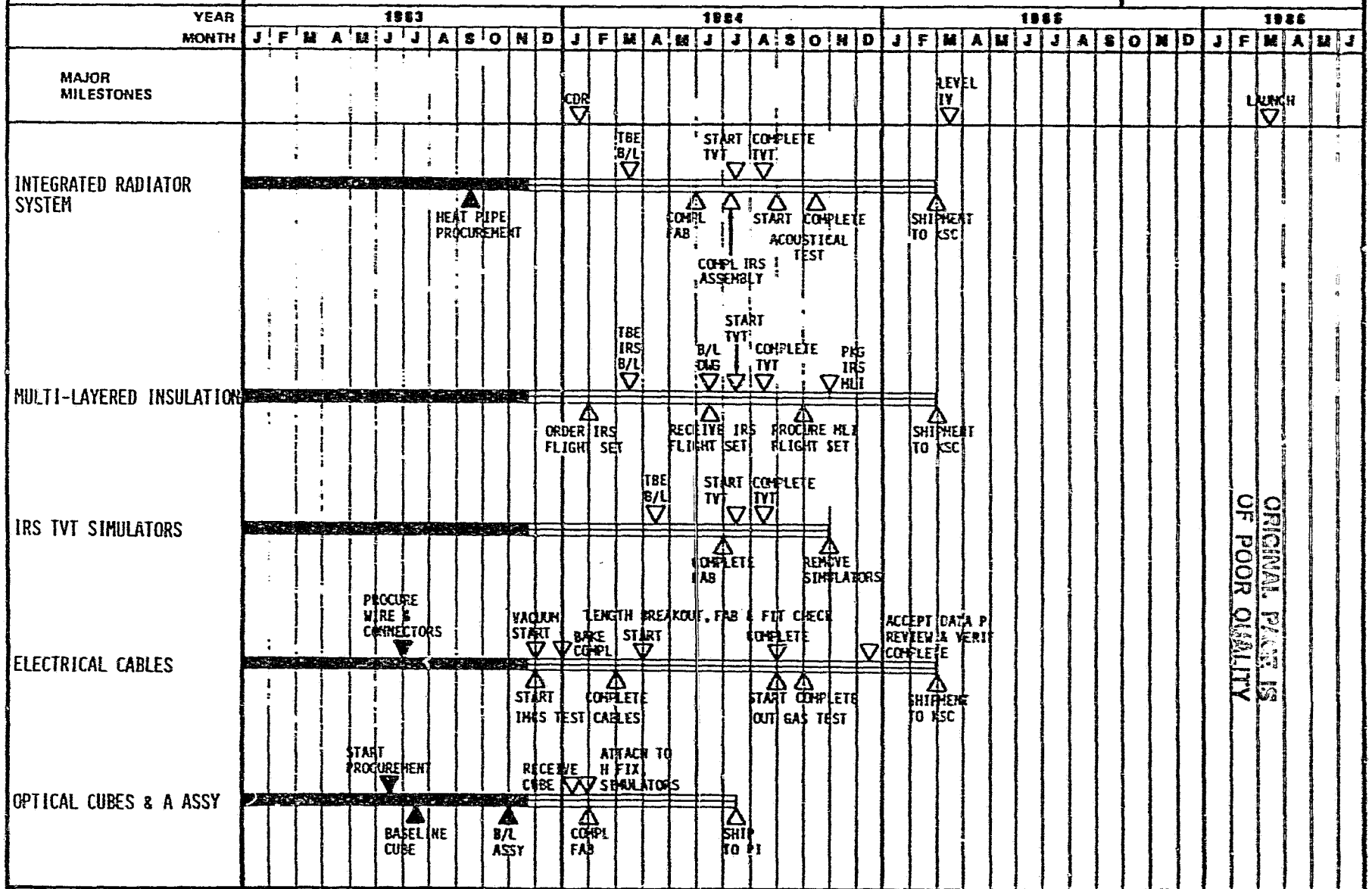
RESP E. PEVEY

TBE/PSOC PAYLOAD MISSION INTEGRATION SCHEDULE

MPE DEVELOPMENT SCHEDULE

MISSION(S) ASTRO-1

SHEET 2 OF 5



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DATE PREPARED 10-18-83

REVISION DATE 11-21-83

REVISION B

TBE-PSOC-8018

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WBS NO. ALL

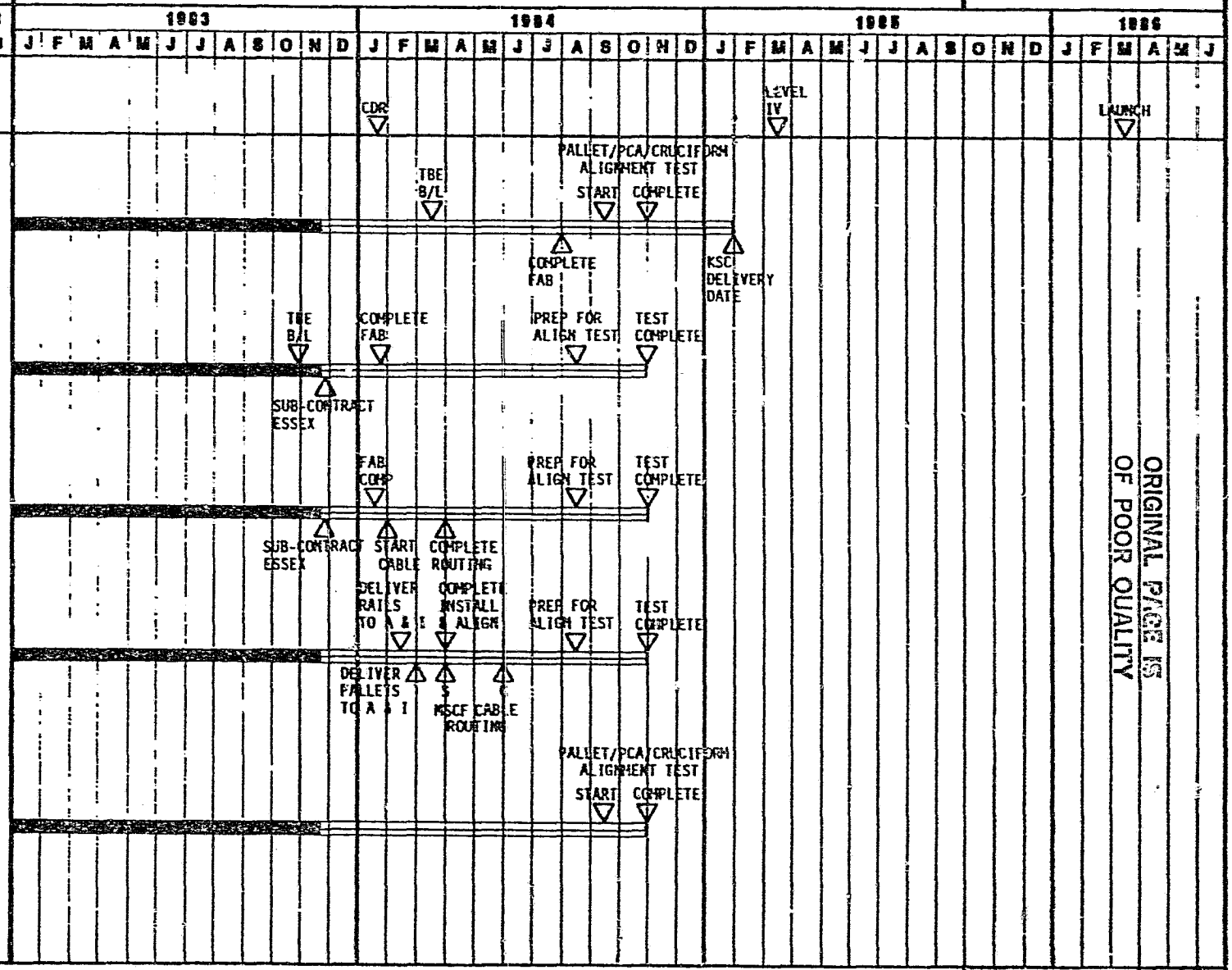
RESP E. PEVEY

TBE/PMC PAYLOAD MISSION INTEGRATION SCHEDULE

MPE DEVELOPMENT SCHEDULE

MISSION(S) ASTRO-1

SHEET 3 OF 5



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DATE PREPARED 10-18-83

REVISION DATE 11-21-83

REVISION B

TBE-PMC-6518

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WBS NO. ALL

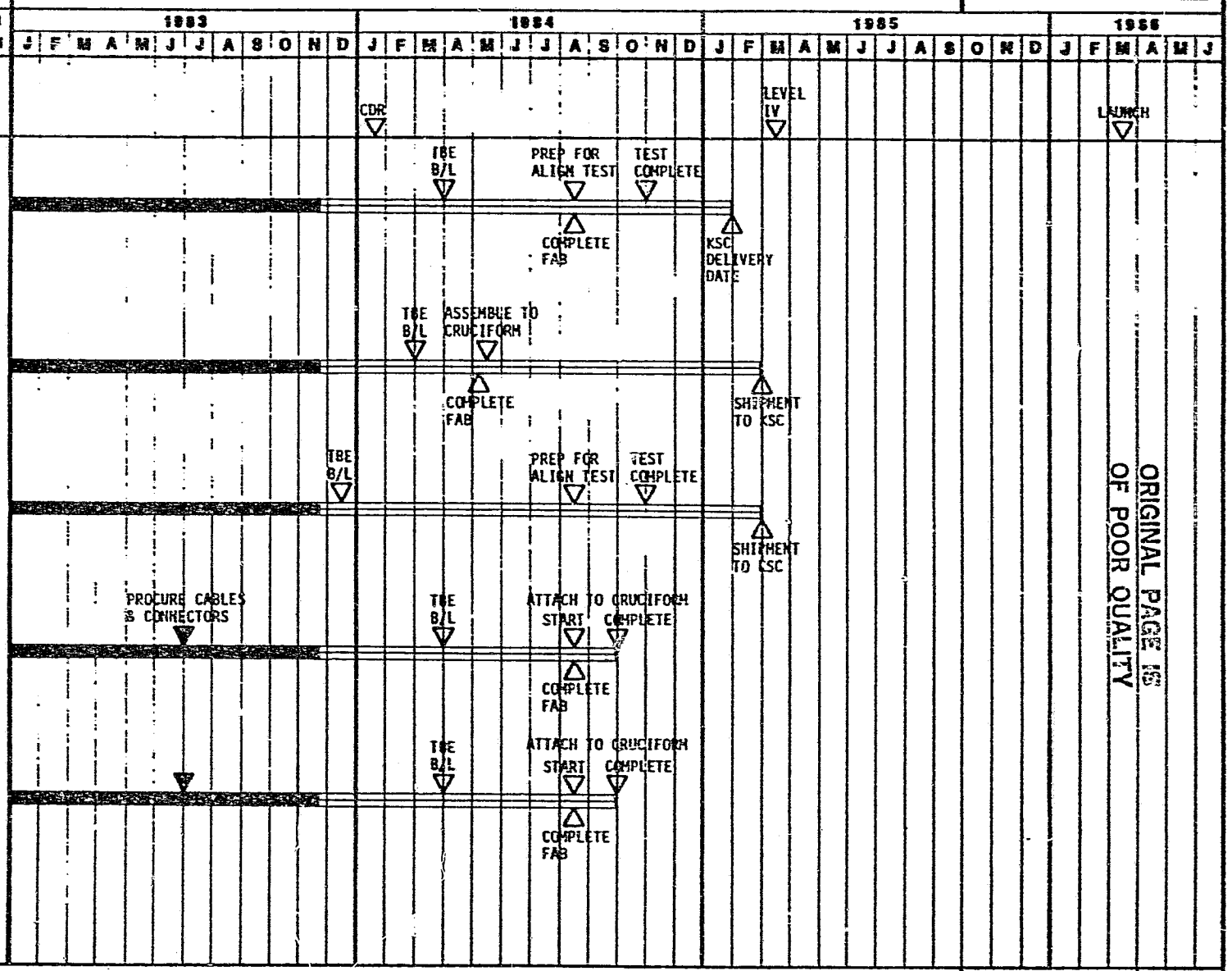
RESP E. PEVEY

TBE/PMC PAYLOAD MISSION INTEGRATION SCHEDULE

NPE DEVELOPMENT SCHEDULE

MISSION(S) ASTRO-1

SHEET 4 OF 5



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DATE PREPARED 10-18-83

REVISION DATE 11-21-83

REVISION B

TBE-PMC-0019

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WBS NO. ALL

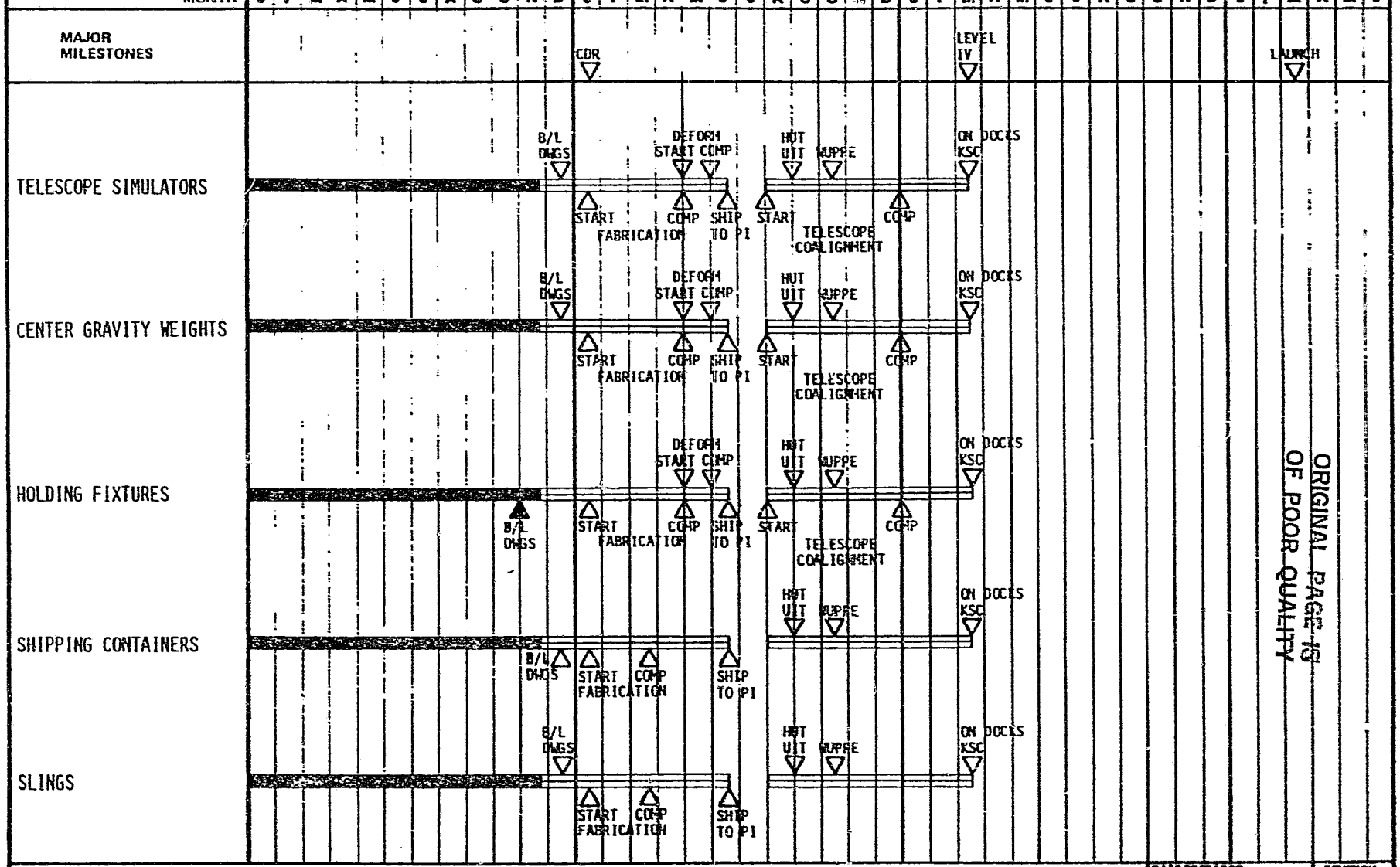
RESP E. PEVEY

TBE/PMIC PAYLOAD MISSION INTEGRATION SCHEDULE

MPE DEVELOPMENT SCHEDULE

MISSION(S) ASTRO-1

SHEET 5 OF 5



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DATE PREPARED 10-18-83

REVISION DATE 11-21-83

REVISION B

TBE-PMIC-0018

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telescopes and between the OSP and the HUT telescope. This was a key meeting where MSFC and the PIs agreed on pointing accuracy and stability goals.

The cruciform thermal stability sensitivity analysis was completed for 10 parametric cases and was presented to MSFC. A recommendation was made to add five heat pipes to the cruciform to improve thermal stability and thereby improve the probability of meeting the 2-arc-sec stability goal between the OSP platform and the telescopes. Coalignment between telescopes and stability between telescopes will also be improved by addition of the heat pipes.

A set of design weights was developed to establish the load carrying capability of the IRS, the cruciform, and the PCA. These design weights were approved by the Mission Manager and were included in the CEI specifications. Biweekly weight reports were also submitted to MSFC in which comparisons were made between estimated current weights and MPE limit weights. The latest report showed the TBE MPE limit weight to be exceeded by 206 kg.

DNs written against the MPE PDR data package have continued to be worked. Most of the ones remaining open are to be closed with the release of the CDR data package in January. A summary of DN status follows:

GENERATED	WITHDRAWN	CLOSED	OPEN
132	14	76	42

The IPRD is under revision from RIDs written during the IPL IDE review. Only two RIDs remain open, and that is because required data was not received from MSFC.

All WFC PDR comments were incorporated into the documentation and change pages were sent to MSFC.

Verification and test planning has continued in many areas. The following plans were submitted to MSFC for review:

- Instrument Alignment Plan
- IRS Acoustic Test Plan

- IRS Thermal Vacuum Test Plan
- Pallet/PCA/Cruciform Alignment Test Plan
- UIT Instrument Verification Plan
- HUT Instrument Verification Plan
- WUPPE Instrument Verification Plan.

The WFC Test Plan was developed and is going through review by TBE.

The use of two Spacelab pallet engineering models in the Pallet/PCA/Cruciform Alignment Test was proposed by MSFC and is being evaluated. The special GSE and facilities required to make use of these in lieu of special fixtures are being identified and evaluated. The results of a preliminary assessment were forwarded to MSFC.

The requirements for use of MSFC optical instruments, ATM Clean Room in Building 4708, cranes, and support personnel as a part of the Astro-1 instrument alignment verification was coordinated and submitted to MSFC.

The canister for the WFC was evaluated and reclassified as a sealed container to eliminate the unnecessary safety requirements for pressure vessels.

9. PREMISSION DEFINITION

TD-JA02-83-02, dated June 9, 1983, authorized the performance of the MSL-2 Premission Definition Study. This study activity consists of the initial payload integration work on the MSL-2 mission. It is reported below in WBS sequence.

WBS 35.0 - SUPPORT SYSTEM DEVELOPMENT

WBS 35.1 - Mission Peculiar Equipment (MPE)

Fabrication of the MPESS SN006 piece parts is 75 percent complete. Long-lead electrical connectors for MSL-2 and the Experiment Apparatus Containers (EAC) were ordered.

Our Manufacturing Division is presently estimating manhours and material costs for fabricating seven EACs for inclusion in our EAC proposal which is being prepared.

WBS 75.0 - PAYLOAD INTEGRATION REQUIREMENTS

WBS 75.1 - Configuration Design Definition

The MSL-2 work emphasis this reporting period was on preparing the initial configuration design layouts for the MSL-2 configuration leading to a preliminary design review on December 5, 1983. A 6-week delay in drawing production was encountered due to the design change from the ESA coldplate to the Rockwell coldplate. The assembly and installation drawings being prepared for the December 5 PDR are approximately 85 percent complete.

WBS 75.2 - MPE Design

Approximately 95 percent of the MSL-2 MPE design drawings are complete and will be presented at the PDR on December 5, 1983. The EAC drawings and the EAC CEI Part I Specification are complete and will be distributed for NASA review on November 16, 1983.

The SCU housing design was also completed during this reporting period.

The System Control Unit (SCU) CEI Part I Specification was released for formal baselining.

During this period, two SCU working group meetings were attended. The first meeting, held on October 27, 1983, introduced the SCU and its role in MSL. The status of the SCU, including individual board design status and parts procurement status was discussed. The second meeting was held on November 8, 1983, and the status, schedule, and parts selection were discussed.

During the period, the SCU schedule was revised to reflect changes in requirements since initial schedule definition. The impact of the requirements changes resulted in a 2-week delay in delivery of the flight unit, from June 1, 1983, to June 15, 1983. This delay does not impact the MSL system delivery date.

On October 5, 1983, a presentation was given to the EB lab on the SCU software. This presentation included a software requirement overview, a review of the software architecture, and the development approach. The software requirements for both the SCU and SCU GSE are being documented with a Software Requirements Review scheduled for November 21, 1983.

On October 20, 1983, a presentation on the SCU was given to NASA Headquarters personnel during their visit to MSFC. The use of SCU in MSL, its hardware and software architecture, and the flexibility in general of the SCU were discussed.

WBS 75.3 - Command/Data/Communications Systems Integration

We completed a schematic for the Buffered Serial/Digital I/O (BSDIO) module including standard multibus interface. The parts list was modified based on this schematic design and was provided to TBE manufacturing.

WBS 75.5 - Environmental System Integration

The following thermal analyses are in process for the MSL-2 MPE/PDR:

- Pressure Drop Analysis
- Heat Load Analysis

- Accumulator Analysis
- Leakage Analysis.

The geometric model of the MSL-2 payload is complete and runs are now being set up to calculate form factors, gray bodies, radiation constants, and heat fluxes.

Inputs for the IIAs were completed and input for the IPRD is being developed.

WBS 75.6 - Electrical System Integration

The development of an MPE PDR data package was initiated with the submission of inputs to the three experiment IIAs, PIP Annex 6, the Unique ICD, and the Integrated Payload Requirements Document. An electrical part for CEI specification was developed and submitted for inclusion in the overall systems specification.

An initial MSL-2 Cable Interconnect Diagram (CID) and an end-to-end electrical system schematic were drafted for review. The development of a generic MSL CID and schematic was initiated based on an explanation of the MSL-2 documentation.

Cable design drawings with associated parts and materials lists are being developed as system design progresses.

WBS 75.7 - Structural/Mechanical Systems Integration

The MSL-2 stress analyses for the EACs, SCU, and the ETR are complete.

The MSL-2 basedrive analysis is in the data reduction phase. All lift-off and landing load cases have been run. Current efforts involve tabulating the results from each case to determine the maximum accelerations.

The NASTRAN models (dynamic and stress) for the MSL-2 experiment and subsystem payload adapters are complete. Hand analysis of the bolted connections are 40 percent complete. The analysis for the MSL-2 generic integrated model is complete. The analysis for the MPESS modification is 60 percent complete.

WBS 75.9 - Ground Operations Analysis and Requirements Definition

We are proceeding with the ground operations analyses and requirements definition as planned. We are preparing the GIRD for FDOR data package release on February 13, 1984.

WBS 75.10 - Safety and Quality Assurance

Trips were made to each of the MSL-2 experimenter facilities to explain the type of data required and obtain information to enable development of a safety data package to support flight safety. Hazard analyses were performed and a Phase I Safety Data Package developed for review by MSFC. MSFC comments were received and will be incorporated for submittal to JSC during the next report period.

WBS 75.11 - Configuration Change Coordination and Processing

We supported activities resulting from the MSL-2 IPL RR. We prepared and published on September 20, 1983, the minutes for the September 16, 1983, MSL-2 IPL RR Preboard Meeting. The Preboard dispositioned all DNs submitted against the IPL RR data package and recommended that the Mission Manager cancel the IPL RR Board meeting scheduled for September 28, 1983. We prepared and distributed on September 26, 1983, a Mission Manager memorandum advising the Board members of this cancellation.

We entered into our tracking system the 89 DNs against the IPL RR data package. These inputs reflect the Preboard dispositions and the individuals/organizations responsible for closing assigned actions. We published on a regular basis reports depicting the status of open DN actions.

WBS 75.12 - Interface Agreements

The three MSL-2 IIAs were revised and submitted to SPPO on October 12, 1983. These revisions included the closures of the outstanding Requirements Review DNs.

On October 14, 1983, we participated in a working group meeting at the General Electrical Company facility. On October 20, 1983, we participated in a working group meeting at JPL.

The inputs to the STS/Payload Unique ICD-A-18425 were completed and submitted to SPPO on October 4, 1983. Annex 1 to JSC18425 was also updated and submitted to SPPO on October 4, 1983.

We participated in an MSL-2 working group meeting at JSC on October 12, 1983, to clarify and establish the requirements contained in the Annex 1 to JSC18425 and the STS/Payload Unique ICD-A-18425.

We received a redlined copy of the MSL-2 STS/payload ICD on October 21, 1983. This redlined copy was produced during the working group meeting at JSC on October 12, 1983. The document was again updated (redlined) and submitted to SPPO on November 1, 1983.

WBS 75.13 - Integrated Payload Compatibility

On October 3, 1983, SPPO made the decision to use the Rockwell coldplates instead of the ESA coldplates for the MSL-2 payload. This change caused a 6-week slip in the MSL-2 schedule.

The MSL-2 Payload Integration Plan (PIP) was redlined and submitted to SPPO on October 5, 1983. On October 6, 1983, we supported a telecon with JSC to discuss these MSL-2 PIP changes. The Annex 6 to JSC18425 was updated and submitted to SPPO on October 4, 1983.

On October 12, 1983, we participated in a working group meeting at JSC to clarify and establish the requirements for the MSL-2 payload as it pertains to the PIP and Annex 6.

A preliminary listing of the GFE for the MSL-2 payload was given to SPPO and SPO (Mr. G. Hawkins and Mr. E. Noel) on October 7, 1983. The official request for the GFE for both flight and ground use was submitted to SPPO on October 26, 1983.

The Preliminary Mission Implementation Agreements for the three MSL-2 experiments (ADSF, EML, and 3AAL) were completed and submitted to SPPO on November 1, 1983.

The Part I CEI Specification for the Systems Control Unit (SCU) was submitted to MSFC for baselining on November 3, 1983.

WBS 75.14 - Mass Properties

The MSL-2 mass control data has been included in the IPRD. A Mass Properties Report remains in the preliminary phase of development until a configuration drawing is made available.

TD-JA02-83-01, dated September 20, 1983, authorized the WBS 05.5 Shuttle High Energy Astrophysical Laboratory (SHEAL) study.

The concept for the SHEAL, originally developed under this task and reported on at Goddard Space Flight Center on July 6, 1983, was further defined during this period. Major design issues associated with development of the two-axis pointing system for use with BBXRT and LAMAR were addressed and total resource use estimates were refined. As a result of these analyses, a more detailed mission concept was derived and a higher confidence cost estimate for integrating the mission was generated. Space Data Corporation under subcontract, developed a concept for a two-axis system which would provide the required pointing accuracy and carry launch and landing loads with an axially mounted brake system. A concept for instrument mounting to the two-axis system was defined and the use of a GSFC-provided star tracker and gyro system was investigated for providing pointing information for the system. The results of the study were presented to the GSFC Mission Management team on October 26, 1983. This presentation and the distribution of the associated documentation closed out the activities under this task.

10. MISSION PECULIAR EQUIPMENT SUPPORT STRUCTURE

WBS 35.0 - SUPPORT SYSTEM DEVELOPMENT

WBS 35.1 - Mission Peculiar Equipment (MPE)

The fit-check of the GFE primary and secondary trunnions to MPESS SNs 003 and 004 was completed. All bolt hole alignments were checked with flight bolts and all holes aligned perfectly.

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