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X-RAY SATELLITE STATUS REPORT - SECOND QUARTER 1985

Deutsche Forschungs- und Versuchsanstalt
fuer Luft- und Raumfahrt (DFVLR)

Translation of "Roentgen Satellit Statusbericht, 2. Quartal 1985," Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt (German Aerospace Research Establishment), Cologne West Germany, Report No. WF2/8734, June 30, 1985, pp. 1-63

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16. Abstract

An overview of the second quarter 1985 development of the X-ray satellite project is presented. It is shown that the project is proceeding according to plan and that the projected launch date of September 9, 1987 is on schedule. An overview of the work completed and underway on the systems, subsystems, payload, assembly, ground equipment and interfaces is presented. Problem areas shown include cost increases in the area of focal instrumentation, the star sensor light scattering requirements, and postponements in the data transmission subsystems.

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STATUS REPORT

1.0 Survey and Outlook /3*

1.1 Status of Projects

Summary

With regard to technical perfomance and costs, the project is running according to plan. The valid schedule for EM- and FM-completion on April 20, 1985, leads to a launch date on October 30, 1987. This corresponds to the contract milestone plan and, taking the four-week buffer into consideration, meets with the launch date of September 9, 1987, agreed upon in the Payload Integration Plan.

The FM-mirror system remains under critical pressure to meet the schedule due to problems with the gold plating.

Documentation

Project Plan:

The project plan has not yet been presented to the DFVLR board because of reservations regarding the data processing concept during the mission.

Main Contract:

Contract addition No. 2 to the main contract was signed.

Specification Documents:

The reworked version of the interface specifications for the WFC from May 9, 1985, was put into effect.

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*Numbers in margin indicate pagination in the foreign text.

NASA-STS Interface Documents:

An adapted version of the Launch Site Support Plan (PIP-Annex 8) was presented by NASA as "Preliminary Issue."

The Phase 2 Safety Data Packet was sent to NASA, so that /4 the planned safety tests can be carried out as planned in September and October.

Development and Production

Production of FM-instruments is to be continued as planned.

Test and Integration

The infeed of the WFC-EM for EM-integration is completed. Infeed of the flight mirror pairs P3-H3 and P4-H4 is completed in the C/D contract. EM-integration corresponds to the planning status of April 20, 1985.

Review

The ninth status review by the chief contractor was carried out in May with NASA participating.

Milestones

No changes.

Problems

The schedule cannot be changed. Should the IABG plant become unavailable for the solar simulation test of the STM, it would /5 be necessary to use a facility outside Europe to keep on schedule. Cost increases in the area of focal instrumentation exceed the average estimates for the payload in the project plan.

1.2 Outlook

The next general talks with NASA on safety tests, as well as on lift-off preparation and launch vehicle operation will begin in the last weeks of September.

With regard to completion of EM-integration, the EM-subsystem will be transferred from the auxiliary structure to the flight structure.

The effects of the irregularities with the gold plating of the flight mirror on the FM-schedule need to be clarified.

1.3 Survey of Problems /6

Area	Type of Problem
1. Management	- At present, no problems with chief contractor.
2. System	- Agreement with NASA on HRI random testloads has not been reached.
3. Mechanical Subsystems	- At present, no problems.
4. Electric Subsystems	- Failure of the oven stabilized quartz in the data processing system needs to be clarified to guarantee that sufficient operation safety exists for the FM on this "Single-Point-Failure" position.*
5. Telescope	- The light scattering requirements of the star sensor on the AKS-system cannot be satisfied and need to be discussed.
	- Assembly of the FM-mirror system has been

interrupted due to irregularities in the gold plating /of paraboloids P3 and P4.*

6. Assembly, Integration Test
   - Suitcase test date for JSC overlaps with EM-AIT planning by about one week.*
   - The possibility that the IABG test chamber for the solar simulation test may not be available when needed would necessitate costly replacement measures.* /7

7. Ground Equipment
   - At present, no problems.

8. Mission Safety
   - Dragging construction part delivery from MBB.

9. Launch Vehicle Interface
   - At present, no problems.

10. Mission Operation
    - Mission operation and simulator development suffer from understaffing.
    - Data processing design not finalized.

11. Schedule
    - Postponements are anticipated in the subsystems of data transmission and building parts supply.

(* Items 4, 5b, 6a, and 6b are problems recently under consideration.)

2.0 System /8

System Construction

Concluding detailed projects related to the interface on the

Shuttle included:

-- current supply for heaters from the Shuttle over the SURS
-- cable line from the SURS to the ROSAT harness
-- details of the SURS plug assembly on the ROSAT structure.

System Budgets

The summary of the measured mass characteristic values of the components into a system-related value is still being prepared.

A review of the attitude measurement budget is not yet completed.

System Documentation

A review of system and subsystem specifications is nearly completed. Inclusion of DFVLR commentary is to be carried out by Dornier.

3.0 Mechanical Subsystems

3.1 Structure/Mechanisms

A review of results of coupled analyses carried out by NASA and MBB revealed that both calculations contained errors. After clearing up errors, NASA presented results of another calculation. Whether MBB will carry out another coupled analysis is being determined at present.

The solidity analyses and investigations on fracture mechanics were continued. The concept for structure verification was established in the "Verification Control Sheets." Verification for all structural components was begun using measures outlined in these sheets.

The static load test was carried out successfully on the structure. Results for channels and spans correlated well with calculations. Distortion measurements remaining after the test are of subordinate dimensions and lie within alignment tolerances.

The Modal Survey Test was carried out by the IABG, since DFVLR-Goettingen had retracted their offer to carry out the test. At present, it is under consideration whether the test can be carried out by DS with IAGB test equipment. This would save two weeks.

It is anticipated that the STM-structure will be transfered from MBB to DS on July 5, 1985.

Qualification of the telescope opening, as well as of the antenna boom mechanism was completed successfully. There were no problems. /10

The welding spot of a "roller leaf" broke during the vibration of the isolator switch mechanism. The cause is being investigated at present. Suggestions for a suitable test for flight hardware are being considered. The thermal tests on the isolator switch were completed successfully.

After completion of the documentation, the three QM-mechanisms are available for AIT.

3.2 Thermal Budget

The projects for implementing the STS-fed heaters are running according to plan. The maximum temperatures of these heaters were calculated for the Safety II Report. The compartments were coated with thermal paint using lacquer patterns.

Mission temperature forecasts were made available using the readapted large nodal model.

At present there are no problems.

4.0 Electric subsystems /11

4.1 and 4.2 Energy Supply, Pyrotechnics

After delivery of the EM-electronics boxes (PDU, PCU, BCU, Shunt, and Pyro) to the EM-Bus integration, the ADP ("Acceptance Data Package") was made available and production documentation for the FM-electronics boxes was readapted.

Mechanical production of the FM-electronics boxes was begun. Preparations for the qualification of the batteries are completed.

Development and production of the STM-solar generator is nearly completed following mechanical adaption projects on the satellite structure by MBB. Its integration into the system is planned for the KW 30/85.

4.3 Cabling

The EM-laced wiring harness, consisting of the three parts--power/pyro/signal--was delivered for integration to the laced wiring harness transport/integration frame in the middle of April, 1985. The ADP was made available.

Adaptation of production documentation and preparation work for production of the FM-laced wiring harness were begun.

4.4 Data Processing /12

The DHS subsystem was tested at the end of June and delivered to the structure for integration. Only small modifications need to be discussed, if any are necessary for the flight model.

This delivery schedule means a delay of almost exactly two months from the original planning. Unfortunately, these two months became necessary to eliminate several errors and disturbances, and--as already reported--to adapt the necessary software to the limited storage facility. This delay has been taken into account in the present schedule, status as of April 20, 1985.

Several disturbances with and failure of the furnace stabilized quartz are cause for concern at present. This has given rise once more to discussions about the redundant construction of this single-point-failure-construction part.

Due to delivery difficulties in the case of construction parts tempered to withstand radiation, delays on the DHS-FM must be feared.

4.5 Data Transmission /13

Transponder

Delivery of the transponder is expected on July 12, 1985. Integration into the EM-Bus had been planned until now for July 11, 1985. Effects on EM-integration completion can be circumvented.

Decoder

Following conclusion of subsequent work, the EM was re-installed in the EM-Bus.

Antenna

A repeated measuring of the radiation diagram following mechanical changes in the hybrid building blocks could not be carried out because of bottlenecks in the measuring area condensor plates. For this reason, an antenna for a test integration with the transponder is being temporarily prepared. This will circumvent effects on EM-integration completion.

4.6 Attitude Measurement and Control

Star Sensor: EM-tests completed, preparations for FM-production begun.

Gyroscope: Execution of EMC-test on the EM, preparations for FM-production begun.

AMCS: Preparation of EMC-tests for the EM, preparations for FM-production begun.

Reaction Wheels: EMC-tests on EM still outstanding; FM-production (wheel and WDE-tests and plates) are begun.

Schedule Situation for Subsystems

Subsystem tests (safe mode, rotary table tests, checkout mode) are being carried out. Delivery of an operational EM-subsystem is planned for the beginning of September 1985 and would be available for the Pre-IST of the EM-Bus. Mass-produced models will be used again when necessary for previously run EM-Bus integration activities. This will not disrupt the currently valid EM-integration schedule, status as of April 20, 1985.

5.0 Payload /15

5.1 X-Ray Telescope

5.1.1 Telescope-QM

Since all components were completed on schedule, the integration of the telescope's qualification model (QM) could be completed on May 24, 1985. Afterwards the vibration qualification of the telescope QM (ordal and random vibration) was carried out on the new device of the IABG with four simultaneous vibrators. In spite of a failure of the test device which lasted several days, the qualification was completed successfully on June 25, 1985.

Test data are now being evaluated. At the same time, the telescope is being disassembled under control to test if the mechanical adjustments remained in tact.

5.1.2 Mirror System

The mirror system-STM was installed in the telescope-QM.

Projects on the flight mirror system: While preparing the assembly of the flight mirror system, both flight mirror pairs, P4-H4 and P3-H3, were adjusted in the C/D contract. The paraboloids, P4 and P3, which were mounted first, were plated with gold by Balzers Co. In spite of careful cleaning and testing of the surafces before plating there are small areas on the gold layers which do not perfectly reflect the light of a highly sensitive testing device. This error had not been observed by the VM-mirrors.

Since it is not clear if the X-ray reflectivity is /16 disturbed in this or even other areas, the assembly of the mirror system was stopped temporarily. Investigations of the error must

be carried out. This delays work on the mirror system assembly by about five months. At present, measures are being considered which would prevent missing the scheduled integration of the mirror system into the telescope.

Because of the problem with the gold damping and the postponement of the mirror system assembly resulting from it, the approximately four-week delay of the production of the Invar structure parts is not critical.

The status of the projects in this contract, separate from contracts for the entire system, for producing the individual mirrors of the flight model is as follows:

The mirror pairs P4-H4 and P3-H3 were received from the DFVLR-PL* and adjusted in the C/D-contract. Mirrors P1 and P2 were process treated, X-ray-optically measured and accepted. The hyperboloids H1 and H2 can be repolished easily to attain the specified surface quality.

5.1.3 Focal Plane Instrumentation

The development and production of the FI underwent the following progress at MPE during the time involved in the report:

- Conclusion of EM-component tests,
- Conclusion of FI-EM-integration,
- Execution of a reduced thermal vacuum test with FI-EM,
- Determination of mass characteristics of FI-EM,
- Execution of "Pre-Environmental Review" for HRI at SAO /17 through GSFC,
- Start of production of FI-FM-components,
- Delivery of FI-mass models for telescope vibration, and
- Preparation of documentation for FI-EM-adjustment.

*DFVLR-PL = DFVLR Project Management

Furthermore, the design of the structure verification plan of the FI and the FI supports were worked on at the DFVLR-Pl for NASA safety inspection (phase 2) under agreement with MPE.

Open-ended problems from the last status report were taken up again:

- Following discussions between DFVLR, NASA/GSFC and DS, an approximation of the understandings regarding random vibration was reached. DS agreed to define the most realistic possible input loads into the FI, based on the telescope vibration tests. From this, readapted HRI-testloads can be derived.

- The question of the FI-FM-delays remained unanswered.

- The problem of the carousel drive is solved. Due to the late date, at which DS needed the FI-EM, MPE was able to provide a suitable substitute drive. The FI-EM will be delivered with the substitute drive.

5.2 Wide Field Camera /18

After receipt of the two technical memoranda No. 29 and 30 from DS, the level 0 document "Spacecraft/XUV Wide Field Camera, Interface Requirements" was reworked. The currently valid version is the one from May 9, 1985 (received from DS by TA 36).

Of the seven existing requests for waiver,
* RfW EM LU 001 to 004 (EMC) was approved,
* RfW EM LU 005 (EMC) was withdrawn,
* RfW STM LU 001 (vibration) was approved, and
* RfW STM LU 002 (vibration) is being processed.

The small deficiencies on the WFC's electric ground auxiliary instruments (EGSE) noted in the protocol at the time of the

adjustment (March 1985) have, in the meantime, been completely eradicated.

In April, the DFVLR-PL checked the ADP of the EM of the WFC at MSSL. On the basis of spot checks in the presence of DS, the good working condition of the EM was verified and its fundamental transmitting ability was licensed.

All points which remained open could be decided upon in about eight weeks.

In June, the engineering model (EM) of the wide field camera was:

* sent from England to DS,
* accepted after a successful trial run of the DFVLR-PL, and
* adapted in accordance with DS' contract.

Adaptation took place ahead of schedule, namely about /19
two weeks before the date anticipated in the AIT-plan.

The routine interface talks on May 22 in the framework of the status meeting at DS served to clarify unanswered problems.

The data packet for the Phase 2 Safety Test was prepared by the DFVLR-PL from the WFCC-reports and sent to DS. A possible problem: parts of the rose bearings on the struts are made of a steel which tends toward stress corrosion according to NASA safety classifications.

In mid-June, talks on mission operation were held in the GSOC with marked English participation (10 people).

Outlook for the next quarter:

No problems are seen with regard to on-schedule STM-adaptation.

6.0 Assembly, Integration, and Test /20

Bus Integration

According to the schedule, this began with the pre-integration of the subsystems on an auxiliary structure.

The following were carried out: integration, test of the EM-laced wiring harness, of energy supply and of the decoder.

The data handling system (DHS) was prepared for integration.

Telescope Integration

Preparation of the FI-mass model took place on schedule. Since the heat shield was prepared punctually, as well, telescope integration could be carried out according to plan. The vibration test at IABG was successful. The optical measurements did not deviate from those made before the test. After the remaining hardware is installed, transmission to the S/C can take place promptly.

WFC-Adaptation

The WFC and its component EGSE were delivered by RAL, and following successful acceptance tests it was adapted to the DS. The WFC-integration manual has been released, which allows S/C integration to be carried out according to plan.

EM-FI Preparation /21

Contrary to the assumption feared up until now, that the EM-FI would be delivered with the FM carousel drive, which would require adaptation later at the MPE, the MPE was able to procure the substitute drive remaining in the EM-FI on-time, so that no additional time was required.

AMCS Mass Models

AMCS mass models are being constructed until the modal survey test, since the EM probably will not be delivered on-time and thermically representative STM are too expensive.

RF-Compatibility Suitcase Test

Dates for carrying out the tests were agreed upon with the GSOC and JSC. An overlap with the EM-AIT schedule still has to be attended to.

Solar Simulation Test at the IABG

During the period of January 1 to March 4, 1986, set for our test, the TV-SAT Project wants to use the WSA-chamber from January 20 to February 24, 1986. Two talks with the IABG and one with BMFT were held to pursue avenues which would make it possible for both projects to be carried out.

The IABG plans an additional integration room to make parallel projects possible during rigging and the dismantling phases. In the meantime, relevant drawings have been distributed to the projects for their consideration.

A change in schedule one way or the other would affect the projects SKYNET or HIPPARCOS.

IABG intends by mid-September 1985 to distribute a suggestion corresponding to the detailed project planning and actual project status; it is possible, however, that this suggestion will not be compatible with the ROSAT schedule.

Alternatives to the IABG-WSA for the proposed time are only available outside Europe (JPL).

FM-Integration

It was agreed upon with the chief contractor, to integrate the subsystems of the flight model on to the exisitng auxiliary structure, just as with those of the EM. This procedure saves time and allows more flexibility.

7.0 Ground Equipment /23

7.1 Electric Ground Equipment

Developmental projects and tests on various software packets were continued.

The Interface Acceptance Test for integrating the FI-EGSE into the ROSAT-EGSE was concluded successfully. The monitoring tables for the ESA-checkout-software for the system test were presented and reworked a number of times. ETOL-test sequences for the integration system were developed for power supply system, decoder, focal instrumentation, and wide-field camera.

More module function tests were made on the TT&C and on the S/C-EGSE software. Performance tests including simulation of transmission of telemetric data were carried out successfully with the FI-EGSE and, also, with the WFG-EGSE. Service programs were developed for AIT-support.

System function tests were carried out in the TT&C-station and the S/C-EGSE.

7.2 Mechanical Ground Equipment /24

A large part of the MGSE is ready for production, has been tested and is already in use (S/C-transport container, vibration adapter, telescope picture mounting frame, cargo sling, etc.). To ensure application safety, an additional telescope repository

must be built to avoid damage to the telescope during removal of the separate carrier ring. A new cargo sling was required for assembling the finished mounting of the carrier support structure. This allows the support structure to turn from the vertical to the horizontal position.

Production of the vertical trolley began on schedule.

Preparation of test and operation instructions was continued.

7.3 Optical Ground Equipment

The optical testing stand was employed successfully during integration of the telescope-QM.

8.0 Mission Safety /25

* STS Safety (Flight and Ground Operations)

The integrated data packets for safety testing for Phase 2 were delivered by the chief contractor on schedule. On July 10, 1985, they were handed over to the DFVLR-PL and, following internal review and approval by project directors for NASA-GSFC, were sent to the NASA-JSC review board.

The project directors count on a confirmation of the date decided on with NASA in May 1985 (beginning of September/October 1985) for safety tests of flight and ground operations.

The status of documentation relevant to safety is as follows:

** FI structure verification plan has been finished by PT, commented on by MPE, and integrated into the test packet for Phase 2 safety testing.

** Adaptation of material lists has been completed. The results, set down in Revisions No. 4, were sent to NASA-GSFC project directors at the beginning of May 1985 for review.

The test pattern of the circuits produced by Reinshagen Co. according to Mil-C-27500-24-TF-2-M14-019-0 and Mil-W-22759/17, 25 passed the combustability test in accordance with NHB 8060.1B at NASA.

This information was relayed to the company by HAN at the beginning of May 1985.

* Dependability /26

The FMECA and SPF lists for the S/C subsystems were handed over to the DFVLR-PL. At present they are being analyzed. Delivery of the system analysis, which also covers operational aspects, has still not taken place.

* Quality Control

By the end of the period covered in this report, 79 disturbances and second stage MRB's involving EM and FM components of the satellite system had been checked and evaluated by the project directors. Supervision of MRB decisions released to the public is controlled by lists which in the future will also contain information on the status of decisions affecting disturbance controls.

On June 24, 1985, a quality audit on the production of two-sided PCB's (printed circuit boards) was carried out at MBB. This audit became necessary after MBB had submitted three "requests for waivers" (RfWs) arising from the MBB-process for the decoder, star sensor electronics and AMCE. These requests, directed to other ESA-qualified producers, suggested alternatives to the use of PCB's. The results of this audit were overwhelmingly positive. It was determined that MBB is suited to fulfill the technical requirements and removal criteria of the ESA-PSS-50 (August 1979). The RfWs were approved.

It was announced that, in the meantime, MBB has entered a qualification contract for two-sided PCB's with ESA. To date, the first test pattern has been presented to ESA and tested /27 by them. For this reason, it was agreed that MBB report on its progress with ESA-qualification as part of the status report.

* Central Construction Part Acquisition

In the period covered by this report, two talks were held (on May 21, and June 26, 1985) on the status of construction part acquisitions. The following outlines this status at the end of the report period:

** Acquisitions

- The agency was able to avoid further delays in delivery of construction parts by increasing the number of workers and through organizational measures controlling intake of goods and transit storage.

- Alternative plans were worked out and accepted regarding the grave delays still existing on the delivery of "line items (LI's).

  An alternative plan for counteracting delays in the production of the FM-construction groups AMCD and DPS (DS-portion), resulting from an export license which is still unavailable for two radiation-proof RCA CMOS construction parts from the US State Department, has yet to be worked out. At present, there are justified hopes that the US State Department, encouraged by NASA, will issue to RCA the export license for these parts by the middle of July 1985.

Of the 30 "upgrading" construction parts, there are /28 presently 20 being tested at EPI Co. in Wiesbaden. In the first

week of July, this company intends to carry out a test documentation control and, also, a goods intake control (WEK), which is to be combined with the last function test at the company, since MBB cannot carry out any WEK on these construction parts due to technical problems.

The remaining 10 "upgrading" construction parts will be sent to the testing houses of EPI and Electronics Central (DK) in July 1985. Those construction parts which are needed most by the user have priority.

The project directors are working presently on two acquisitions' lists for internal use. They are based on overall acquisitions and the agency's "delivery delay" lists. These lists will contain the most important information on the delivery status of LI to the 12 users and/or delivery measures to avoid hardware delays for the users.

** Reduction in Quality of Delivered Construction Parts

The discoloring of connections located directly at the discharge from the "dual in-line" housings, discovered during the WEK on integrated CMOS-circuits (IC) from the SGS Co. (F), were the subject of an MRB held on April 25, 1985 at SGS. During this MRB, three IC's, subjected to an accelerated moisture test by the SGS Co., were handed over to MBB/ERNO, DS, and ESTEC for error analysis. The results of error analyses are now available. So far they have shown that discoloring has no negative effects /29 on connection quality. Upon the suggestion of the agency, the affected and already tested CMOS IC's were immediately delivered to the user, without changing the packaging.

The delivery delays resulting from the involved CMOS IC's have not had any effect on the course of the project.

9.0 Launch Vehicle Interface /30

Private discussions were held between DS and NASA representatives during the ninth status discussions from May 20 to 23, 1985. They discussed thermal, structural and launch vehicle interfaces (flight/ground). On May 28, 1985, the results were summarized by the DFVLR. The results of the thermal and structural discussions are recorded in Sections 3.1 and 3.2.

* ICD-A-18410

The participants in talks on launch vehicle interface presented a tentative "draft version" (Feb. 15, 1985) ICD (with commentary from DS made on May 6, 1985) for discussion and final draft. It was agreed that NASA-JSC review all commentary and present an improved tentative version of the ICD to the project directors by June 30, 1985.

The "design review" of the OIB was postponed from June to the end of September 1985, since discussion results on the electric setup of the OIB call for a reworking of the related document TN-2002-2180 DS/017 defining its electrical interfaces. This adapted version could not be ready before the end of June 1985.

* PIP-Annexes

** PIP-Annex 2: NASA-JSC will provide the "basic" annex by August 30, 1985.

** PIP-Annex 4: NASA-JSC will send DFVLR forms which it will fill out based on a NASA master project. /31

** PIP-Annex 5: NASA-JSC will provide the basic version by September 15, 1985, and include results of the GSOC interface discussions on May 20,

1985, in Oberpfaffenhofen.

** PIP-Annex 8: The reworked version, "Preliminary Issue," was handed over at the launch vehicle interface talks.

* Suitcase Test at NASA-JSC and JPL

The dates for the suitcase test at JSC were set by NASA.

All necessary information on test set-up and the equipment lists were made available to NASA-JSC at the end of May 1985. Consignment of the test plan for the "Suitcase Test", agreed upon with NASA-JSC on May 28, 1985, is planned for the beginning of September.

* Dates

It was agreed with NASA to group the next talks on lift-off preparation and launch vehicle operation around the Phase 2 safety tests for flight and ground operations at JSC and KSC (planned for October 2, 3, and 10, 1985).

* Status of NASA Modifications according to PIP of Dec. 13, 1985:
Figure 15-1 /32

- RSGF-Mock up : delivered on March 15, 1985 (planned return to NASA: March 15, 1986)

additionally:

* Retention Spring (Flight-Type) : delivered on May 22, 1985

- RSGF-FM : requested delivery date: April 30, 1986

- SURS-Combination (Assembly/Pigtail/bonding strap) incl. documentation : the delivery date of Sept. 01, 1985, upon agreement with Dornier was postponed to Nov. 29, 1985, in order to install "repluggable" version

Confirmation of the following dates were made by telephone with NASA:

RSGF-Mock up: return to NASA: March 15, 1986
and RSGF-FM : delivery date: April 30, 1986

10.0 Mission Operation /33

Work structure planning, scheduling, and documentation for the ground operation system were reworked and coordinated. A review of mission operation requirements was planned for Fall 1985.

Flight Operation

The concept of the experiment operations requirements document (EORD) was presented and commended to the MPE for completion. It was determined that MPE should coordinate and represent the requirements of all experimenters in dealings with the GSOC in the EORD.

Network Operation

Definition of network support system requirements was continued with JSC assuming responsibility for determining the "Remote POCC." NASA has agreed to the use of American ground stations in emergencies.

Mission Planning and Analysis

Implementation of the post-facto site determination software

was begun. Further analysis of site-regulating division requirements for ground operation system was undertaken. Mission planning requirements were discussed in talks with MPE.

Facilities /34

To simplify completion of projects, plans were set forth to devise the data system compatibility test originally planned with S/C in Weilheim in such a way that mission operation installations can be connected with S/C and a system test place at Dornier or IABG.

An analysis of WT-DV's off-line computer's capacity to support ROSAT requirements was introduced, taking requirements of all projects into consideration.

The GSOC-commando system was extended to a sender rate of 1 kbps.

Insufficient investment funds for analog tape recorders have not as yet become a problem, since the test for which they are necessary was postponed until the beginning of 1986.

AMCS-Simulator

The simulator concept was completed.

The development of simulator hardware was begun at Dornier under the conditions of the ROSAT phase C/D-contract.

Software requirements were completed at the GSOC about eight weeks behind schedule. Projects for creating software--with the exception of entries from the British project partners--were not yet begun because of manpower deficiencies (approximately two-months' delay). A related request for special financing has not yet been decided upon by the BMFT.

11.0 Schedule /35

Planned Dates

Currently valid schedule: In agreement with the contract milestone plan, EM, QM, STM AIT, and FM AIT on April 4, 1985, all indicate October 10, 1987, as the lift-off date.

In the PIP, NASA scheduled September 30, 1986, as the lift-off date (reference milestone "ready for launch"). Taking into consideration the four-week buffer before transport of the flight unit to the launch pad, this date will be kept.

Actual EM-Status

Considering the schedule on April 4, 1985, EM-integration shows no delays which cannot be avoided by measures such as: sequence readjustment, overtime, or use of robots.

Actual FM-Status

Delays in FM-integration have thus far been qualitative. Their quantitative effects must still be reviewed.

ROSAT - BARCHART

EM,QM,STM AIT

ISSUE : 20.4.85

TIME NOW: 01.07.85 | ORIGIN: BITZER | PART.: PUP

DORNIER SYSTEM FRIEDRICHSHAFEN

PLAN: 6-86 | PAGE: 1

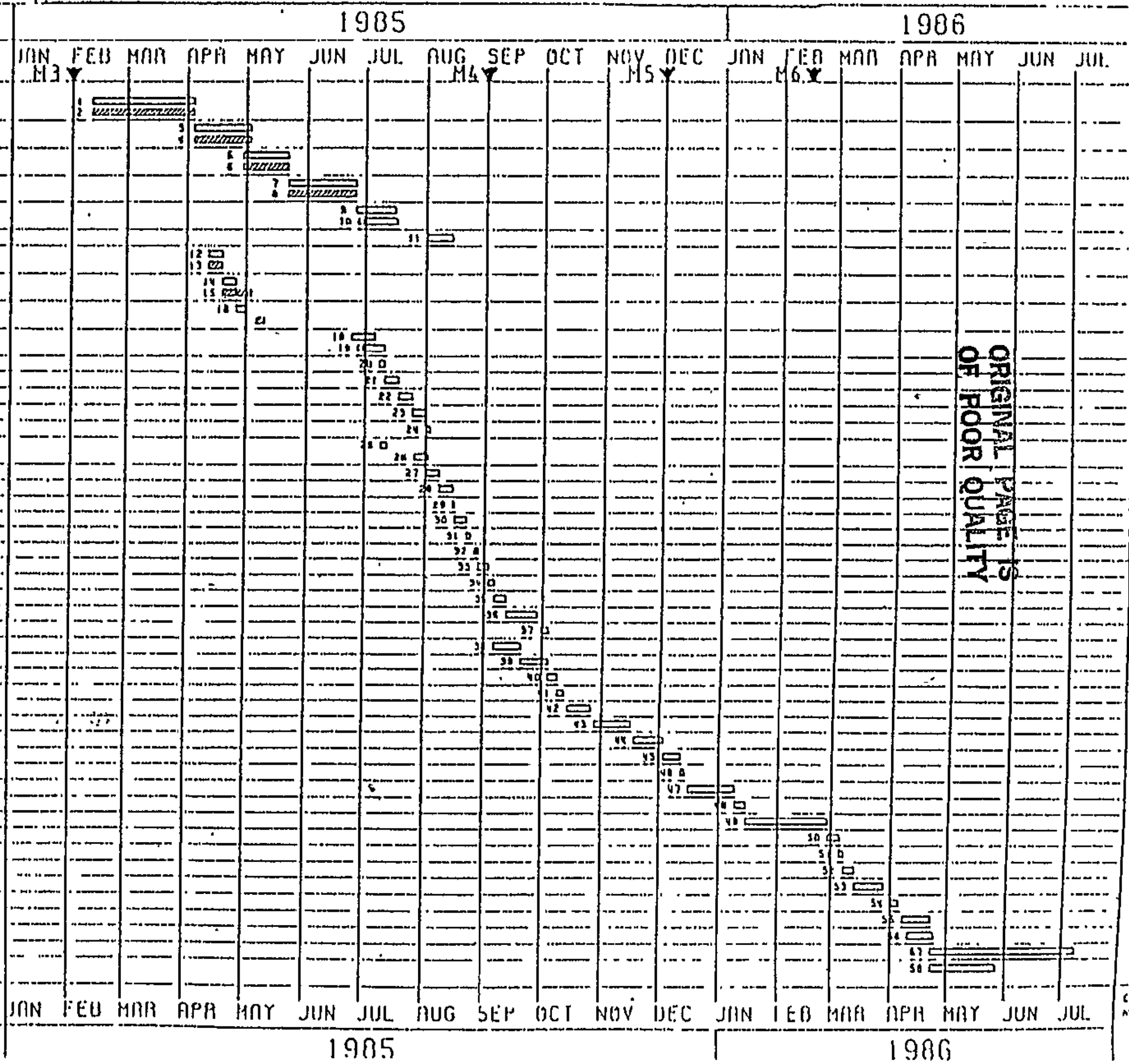
WK. DAYS/PER: 5 WK. DAYS/WEEK: 5 HRS/DAY: 8.00

MILESTONES ▼

M1	START PHASE C/D	1.10.83
M2	DESIGN REVIEW NR.1	17.05.84
M3	STM SPIEGELSYSTEM AN AIT	1.02.85
M4	START MOD.SURVEY TEST	2.09.85
M5	DESIGN REVIEW NR.2	2.12.85
M6	END OF STM S/C TEST	14.02.86

BARCHART

ROW NUM	SNR NRM	ACTIVITY DESCRIPTION	ACT. DUR.	EARLY START	EARLY FINISH
1	2	MA.FCS.MEO & OPT.TEST	7.6	11FEB85	03APR85
2	3		7.8	11FEB85	03APR85
3	4	GTP RM,ST-STM/RM THERM.H/W	3.6	04APR85	02MAY85
4	5		3.8	04APR85	02MAY85
5	6	OPT.TEST. THERM BAFFLE,TUN,FI-RM,ALIGNM	2.8	29APR85	21MAY85
6	7		2.8	29APR85	21MAY85
7	8	TRANSP. & VIBR. TELESC.AT IABG	4.2	22MAY85	25JUN85
8	9		4.2	22MAY85	25JUN85
9	10	OPT.TEST. ALIGNM.	2.8	26JUN85	15JUL85
10	11		2.8	27JUN85	16JUL85
11	12	MOUNT.FI-EM, THERM H/W.	1.8	01AUG85	13AUG85
12	14	HARNESS INTEGR.	1.0	12APR85	18APR85
13	15		1.0	12APR85	18APR85
14	16	POWER S/S INTEGR.	1.0	19APR85	25APR85
15	17		1.0	19APR85	25APR85
16	18	DECODER INTEGR.	0.6	26APR85	30APR85
17	19		0.8	26APR85	30APR85
18	20	DATA HANDLING INTEGR.	2.0	24JUN85	05JUL85
19	21		2.0	27JUN85	10JUL85
20	22	PTAB INTEGR.	0.8	08JUL85	10JUL85
21	24	TRANSPONDER INTEGR.	1.0	11JUL85	17JUL85
22	26	HFC-EM ELECTR.INTEGR.	1.0	18JUL85	24JUL85
23	28	FI-EM ELECTR.INTEGR	1.0	25JUL85	31JUL85
24	30	DISMOUNT. ALL BUS-UNITS	0.4	01AUG85	02AUG85
25	34	STRUCT PREPERATION	0.8	09JUL85	11JUL85
26	35	SUPP STRUCT. & TH.H/W	1.0	26JUL85	01AUG85
27	36	HARNESS INTEGR & THERM.H/W.	1.0	01AUG85	07AUG85
28	38	REINSTALL.OF ALL UNITS & THERM.H/W	1.0	08AUG85	14AUG85
29	40	-X PANEL BLANKET MONT.	0.2	15AUG85	15AUG85
30	42	TELESC INTEGR & THERM.H/W.	0.8	16AUG85	21AUG85
31	44	CENTR.SG INT.	0.4	22AUG85	23AUG85
32	46	ANTENNA BOOM INTEGR & RELEASE TEST	0.4	26AUG85	27AUG85
33	48	HFC-STM INST. & THERM.H/W.	0.8	28AUG85	02SEP85
34	50	DISM RX/TX-OPS,MT RX/TX OPS MRIRNCS STMS	0.6	03SEP85	05SEP85
35	52	TRANSP.TO (IABG)	0.8	06SEP85	11SEP85
36	54	MODAL SURVEY-TEST	2.4	12SEP85	27SEP85
37	56	TRANSP.TO DS	0.8	30SEP85	03OCT85
38	58	OPS PCB'S EXCH.	2.0	06SEP85	19SEP85
39	60	RF SUITCASE TEST (JSC)	2.0	20SEP85	03OCT85
40	62	HFC STM/EM EXCH.& INST.OF AHCS EM UNITS	0.6	04OCT85	08OCT85
41	64	OPTIC ALIGNEMENT	0.8	09OCT85	11OCT85
42	66	AHCS ELECTR.INTEGR	2.0	14OCT85	25OCT85
43	68	PRE-TST	2.8	28OCT85	15NOV85
44	70	TST	2.0	18NOV85	02DEC85
45	82	EMC, CONDUCTION	1.4	03DEC85	11DEC85
46	83	HFC-EM/STM EXCH	0.4	12DEC85	13DEC85
47	72	BLANKET (THERM H/W.) INTEGR.	1.4	16DEC85	08JAN86
48	74	TRANSP TO IABG	0.8	09JAN86	14JAN86
49	76	SOLAR SIM TEST	6.2	15JAN86	26FEB86
50	78	TRANSP.TO DS	0.8	27FEB86	04MAR86
51	80	HFC STM/EM EXCH. & BOOM INTEGR.	0.4	05MAR86	06MAR86
52	84	TRANSP TO MBB	0.8	07MAR86	12MAR86
53	86	EMC, RADIATION	2.2	13MAR86	27MAR86
54	88	TRANSP.TO DS	0.8	01APR86	04APR86
55	90	DISMOUNT.STM	2.2	07APR86	21APR86
56	92	RF SUITCASE TEST (GSOC)	2.0	10APR86	23APR86
57	94	STRUCT TRANSPORT & REFURBISHMENT (MAN)	9.2	22APR86	07JUL86
58	98	TRANSP., TELESCOPE HANDL.TEST (RPE)	4.0	22APR86	20MAY86



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TIME NOW	07.05.85
AUTHOR	BITZER
DEPART.	FBP

DORNIER SYSTEM FRIEDRICHSHAFEN

ROSAT - BARCHART FM AIT

ISSUE : 20.11.85

PLAN: 6-08 PAGE: 1

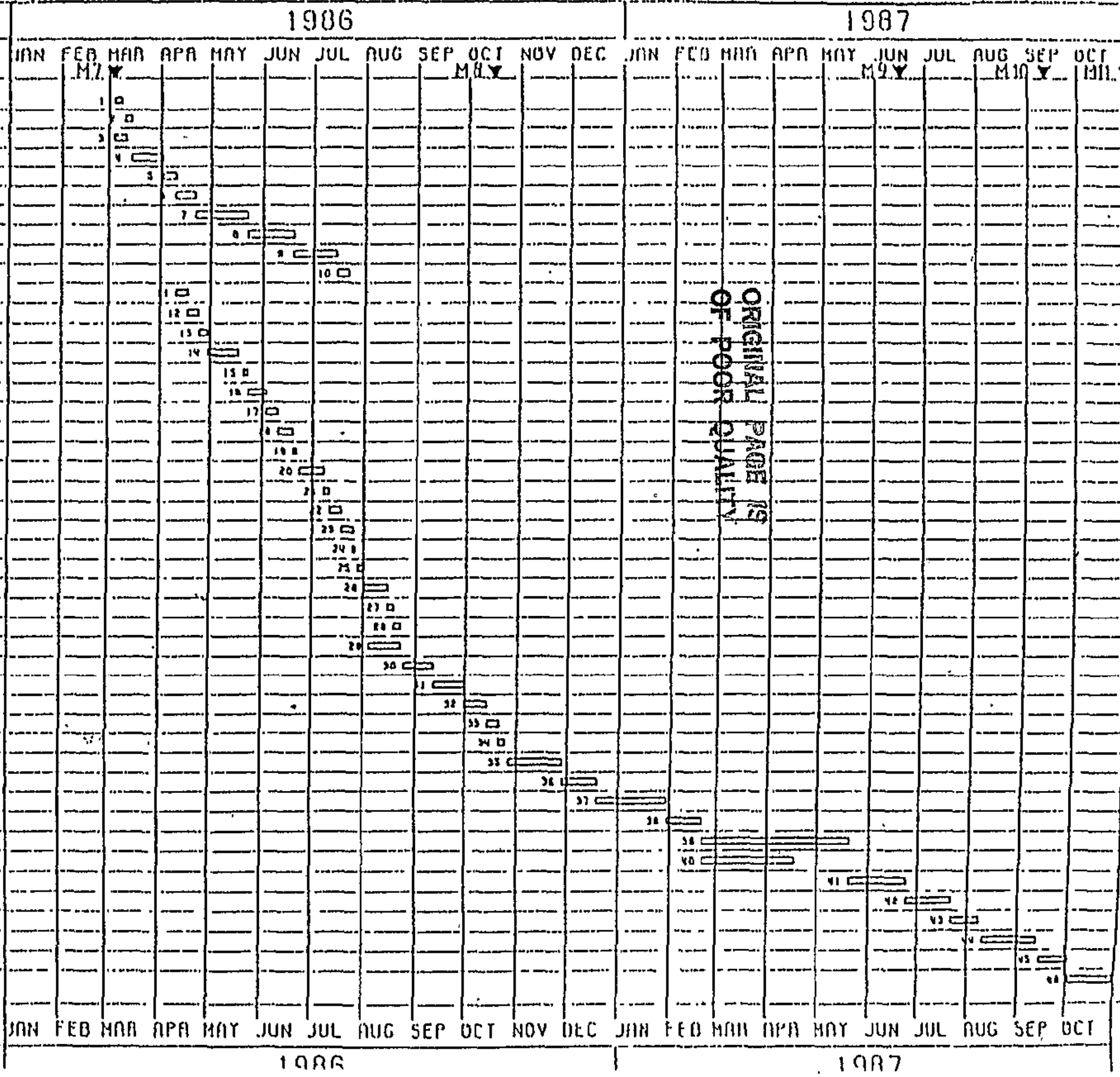
WK. DAYS/PER: 5 WK. DAYS/WEEK: 5 HRS/DAY: 8.00

MILESTONES ▼

M7	FM SPIEGELSYSTEM AN AIT	3.03.86
M8	START FM S/C ENVIRONM. TEST	15.10.86
M9	PRE-SHIPPING REVIEW	15.06.87
M10	END OF TESTS IN PPF	10.09.87
M11	LAUNCH	30.10.87

BARCHART

CUR NUM	SRR NUM	ACTIVITY DESCRIPTION	ACT. DUR.	EARLY START	EARLY FINISH
1	2	MM, OPT. TEST	0.8	04MAR86	07MAR86
2	4	INTEGR. STS-HEATER, MA-TH, H/W, FLS-PARTS	0.8	10MAR86	13MAR86
3	6	TEL FM. TUBE, FTI-CHECK TOM, ADAP. RING, HEAT.	1.0	04MAR86	10MAR86
4	8	INT. FM. TUBE, MA, MEO, FLS, TH, BAFFLE, ALIGN.	2.2	14MAR86	01APR86
5	10	INT. MEAN TUBE, TOM, OPT. TEST	1.2	02APR86	09APR86
6	12	INT. HARN., STM-ST, EM-ST, GTP-EM, TH, H/W, FE	1.6	10APR86	21APR86
7	14	TRANSP. U TELESCOPE-VIBRATION AT IABG	3.6	22APR86	22MAY86
8	16	MOUNT. TEST-RING, DISM. FI, ALIGNM. TA., OPT. TE	3.0	23MAY86	14JUN86
9	18	TRANSPORT, TEST FOCAL LENGTH AT MPE	3.6	18JUN86	14JUL86
10	20	MOUNT. DM-RING, FI, TH, H/W, TO S/C-FM	1.0	15JUL86	21JUL86
11	22	HARNESS INTEGR.	1.0	10APR86	16APR86
12	24	POWER S/S INTEGR.	1.0	17APR86	23APR86
13	26	DECODER INTEGR.	0.6	24APR86	28APR86
14	28	OBS INTEGR.	2.0	29APR86	16MAY86
15	30	PCMU INTEGR.	0.8	20MAY86	22MAY86
16	32	TRANSPONDER INTEGR.	1.0	23MAY86	02JUN86
17	34	MFC ELECTR. INTEGR	1.0	03JUN86	09JUN86
18	36	FE ELECTRICAL INTEGR.	1.0	10JUN86	16JUN86
19	38	DISMOUNT. ALL SUB-UNITS	0.4	19JUN86	20JUN86
20	40	BUFFER	2.2	23JUN86	07JUL86
21	42	STRUCTURE PREPARATION	0.6	08JUL86	10JUL86
22	44	HARNESS INTEGR. U. TH. H/W	1.0	11JUL86	17JUL86
23	46	REINSTALLATION OF ALL UNITS U. TH. H/W	1.0	18JUL86	24JUL86
24	48	BLANKET + E PANEL MOUNT.	0.2	26JUL86	25JUL86
25	50	TELESCOPE INTEGR. U. TH. H/W	0.8	28JUL86	31JUL86
26	52	SUPP. STRUCT., SC U. TH. H/W	2.0	01AUG86	14AUG86
27	54	ANTENNA BOOM INTEGR. U RELEASE TEST	0.4	15AUG86	18AUG86
28	56	MOUNT. MFC U. TH. H/W	0.8	19AUG86	22AUG86
29	58	REQUALIFICATION AMCS	3.0	04AUG86	22AUG86
30	60	INTEGR. AMCS U. ALIGNMENT	2.8	25AUG86	11SEP86
31	62	PRE IST	2.4	12SEP86	29SEP86
32	64	IST	2.0	30SEP86	13OCT86
33	66	EMC, CONDUCTION	1.0	14OCT86	20OCT86
34	68	TRANSPORT TO IABG	0.8	21OCT86	24OCT86
35	70	THERMAL VACUUM TEST AT IABG	4.6	27OCT86	27NOV86
36	72	ACOUSTIC NOISE TEST AT IABG	3.0	28NOV86	18DEC86
37	74	TRANSP. AND COMPAT TEST AT GSOC	4.0	19DEC86	29JAN87
38	76	TRSP DISM. TEL, HT, FL-RING, OPT. TE, ALIGN.	3.0	30JAN87	19FEB87
39	78	TRANSP. TELESCOPE, X-RAY PERF. TEST	12.0	20FEB87	19MAY87
40	80	DISM AMCS, INT. ST-FM, AMCS PERFORM. TEST	6.0	20FEB87	10APR87
41	82	TRANSP., MOUNT. TEL., FL RING, FINAL IST	4.0	20MAY87	23JUN87
42	84	BUFFER	4.0	24JUN87	21JUL87
43	86	TRANSP. KSC	2.6	22JUL87	07AUG87
44	88	REINTEGR. & IST AT PPF	6.0	10AUG87	15SEP87
45	90	PPF	2.8	14SEP87	01OCT87
46	92	HSS, LAUNCH PAD	4.2	02OCT87	30OCT87



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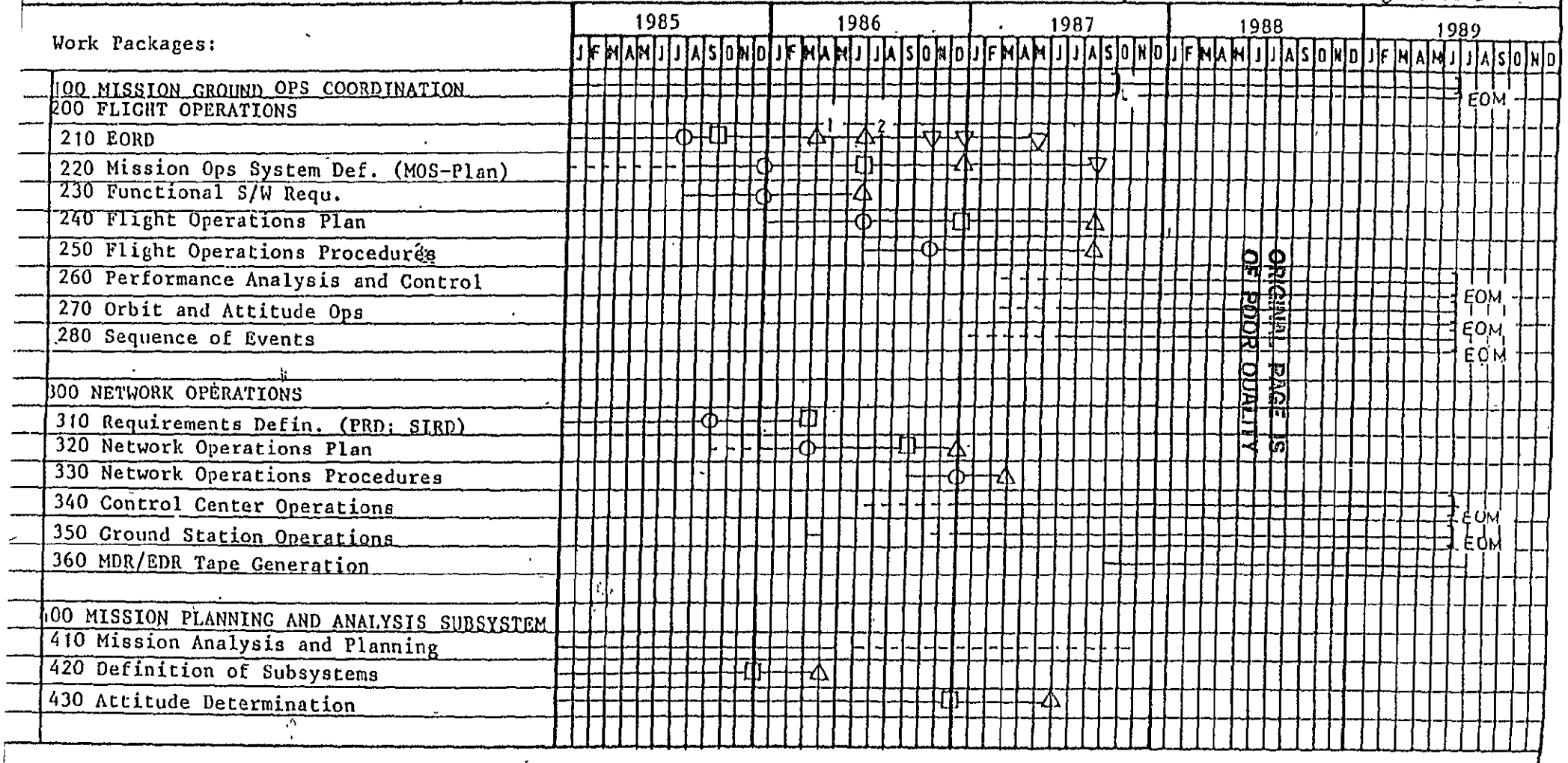
prepared: F. Lucken GSOC
Mission Ground Ops Mgr.

ROSAT
MISSION GROUND OPERATIONS
GOSC/DFVLR

Original Schedule: July, 16. 1984
Last Schedule Change: June, 18. 1985
Status as of: June, 18. 1985



○ PRELIMINARY
□ BASELINE
△ FINAL
▽ UPDATE
] MARK-EVENT

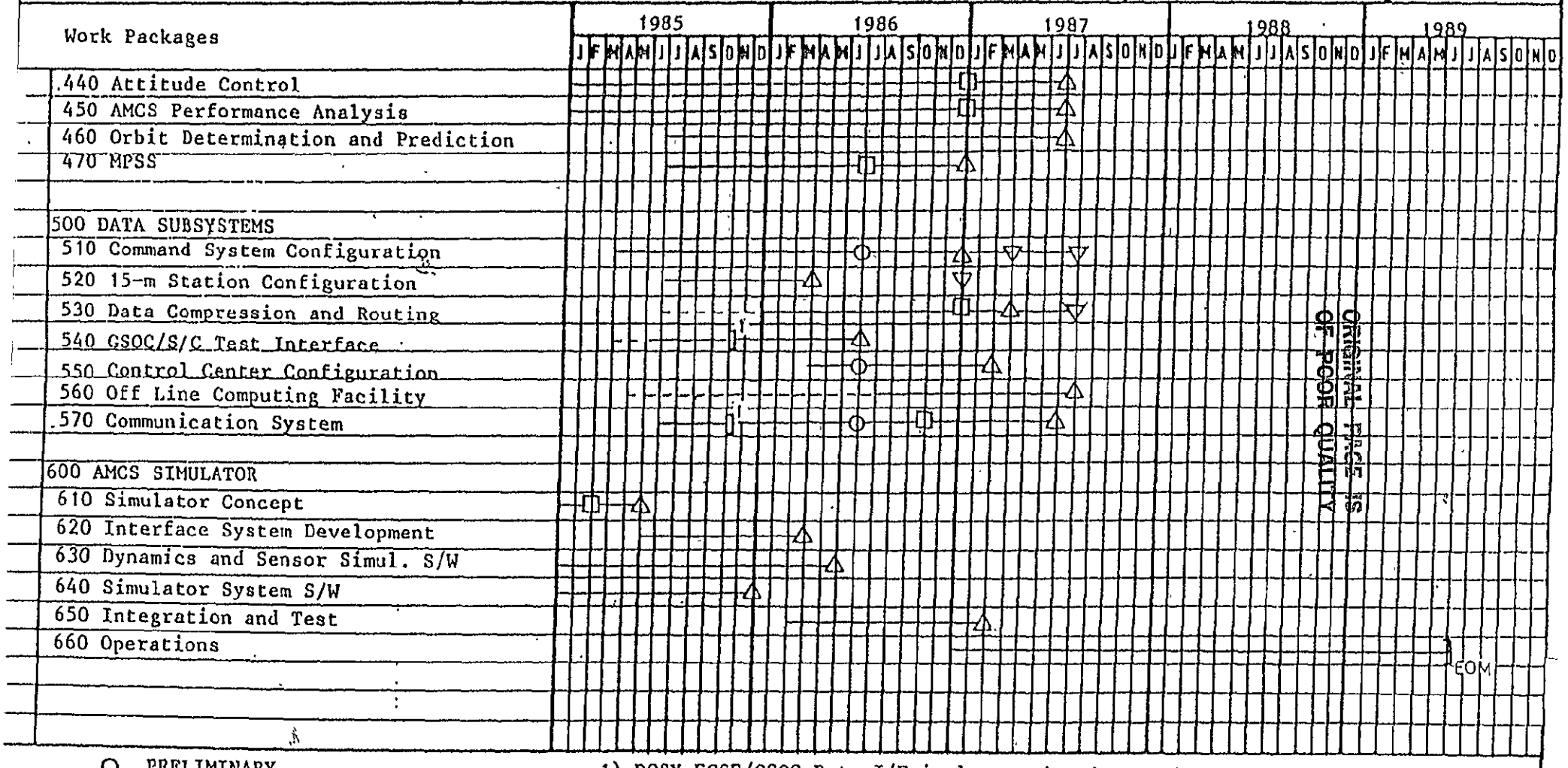
1) TLM+CMD Requirements
2) OPS+ATTITUDE Requirements

L = Launch
EOM = End of Mission

prepared: [signature]
Mission Ground Ops Mgr.

ROSAT
MISSION GROUND OPERATIONS
GOSC/DFVLR

Original Schedule: July, 16. 1984
Last Schedule Change: June, 18. 1985
Status as of: June, 18. 1985



○ PRELIMINARY
□ BASELINE
△ FINAL
▽ UPDATE
] MARK-EVENT

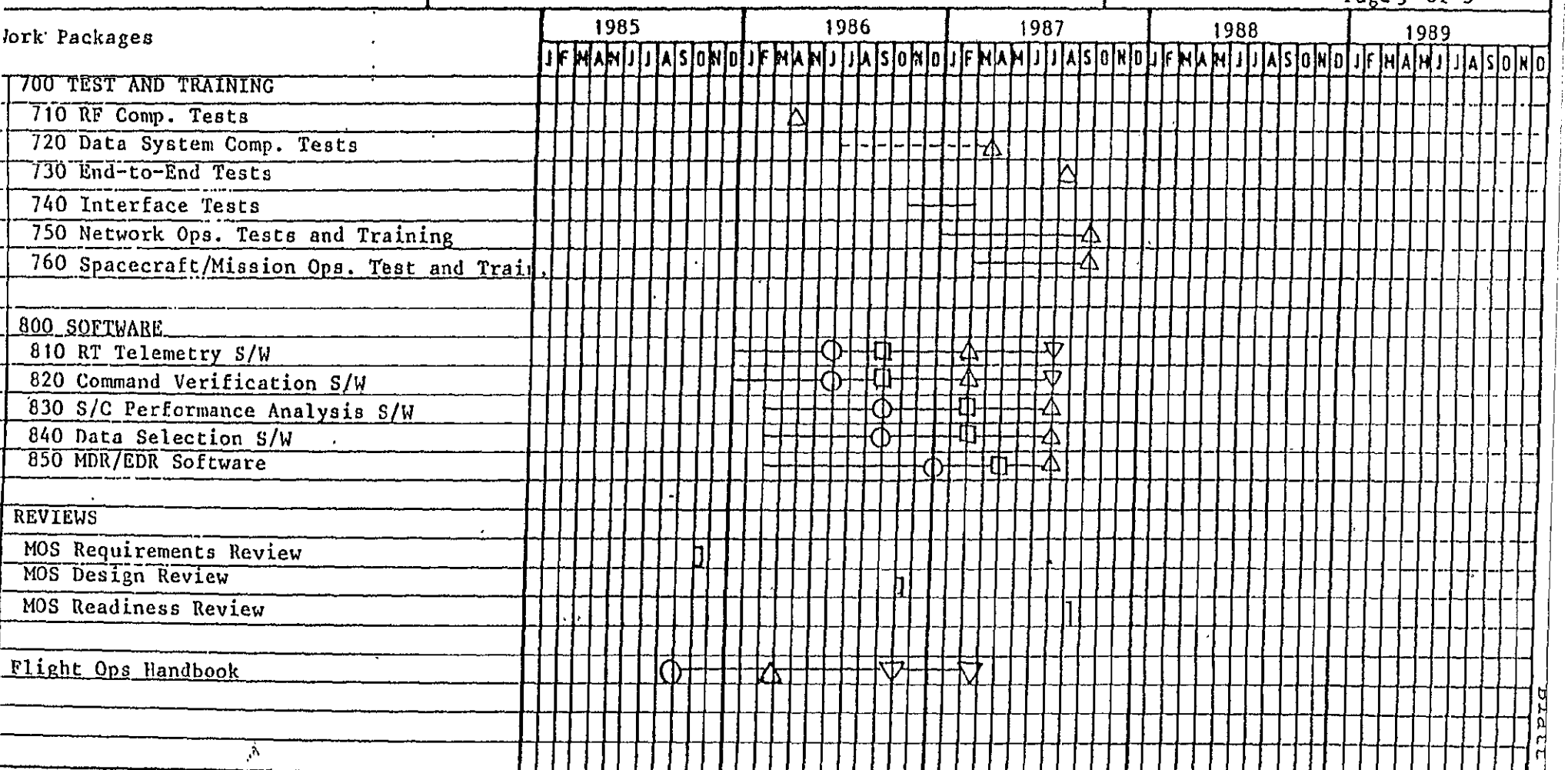
1) DOSY-EGSE/GSOC Data I/F implemented and tested

34

repared: T. Lundquist
Mission Ground Ops Mgr.

ROSAT
MISSION GROUND OPERATIONS
GOSC/DFVLR

Original Schedule: July, 16. 1984
Last Schedule Change: June, 18. 1985
Status as of: June, 18. 1985



○ PRELIMINARY
□ BASELINE
△ FINAL
▽ UPDATE
] MARK-EVENT

13:0 Appendix

13:1 Personnel Inventory for DFVLR-PT and DFVLR-WT

ROENTGENSATELLIT

Personnel Inventory for DF-VLR-PT

(Man-months)

STATUS: 30.06.1985

	Period	Ideal	Actual	Period	Ideal	Actual	Period	Ideal	Actual	Period	Ideal	Actual
Category I	12/84	13.0	8.2	1/85	13.5	8.1	2/85	13.5	8.6	3/85	13.5	9.1
Category II		3.5	0.9		3.5	1.0		3.5	1.0		3.5	1.0
Category III		4.0	4.1		4.0	3.5		4.0	3.1		4.0	3.4
Total		20.5	13.2		21.0	12.2		21.0	12.7		21.0	13.5
Kat. I	4/85	13.5	9.3	5/85	13.5	9.6	6/85	13.5	10.8			
Category II		3.5	1.1		3.5	1.1		3.5	1.1			
Category III		4.0	3.9		4.0	3.9		4.0	3.7			
Total		21.0	14.3		21.0	14.6		21.0	15.6			

ROENTGENSATELLIT

Personnel Inventory for DFVLR-WT

(Man-months)

STATUS: 30.06.1985

	Period	Ideal	Actual	Period	Ideal	Actual	Period	Ideal	Actual	Period	Ideal	Actual
Category I	1/85	6.0		2/85	6.0		3/85	6.0		4/85	6.0	5.4
Category II		6.0			6.0			6.0			6.0	2.8
Category III		1.0			1.0			1.0			1.0	0.2
Total		13.0	5.6		13.0	7.6		13.0	8.1		13.0	8.4
Contractors		10.5	2.8*		10.5	2.8*		10.5	2.8*		10.5	2.8*
Category I	5/85	6.0	6.3	6/85	6.0	6.1						
Category II		6.0	3.1		6.0	2.9						
Category III		1.0	0.2		1.0	0.2						
Total		13.0	9.6		13.0	9.2						
Contractors		10.5	2.8*		10.5	2.8*						

*Average for first half of year

13.2 Key to Abbreviations

ADP	Acceptance Data Package
AIT	Assembly, Integration and Test
AMCD	Attitude Measurement and Control Data Unit
AMCE	Attitude Measurement and Control Interface Electronics
AMCS	Attitude Measurement and Control Subsystem
BAT	Battery
BCU	Battery Control Unit
Bit. Sync.	Bit Synchronizer (Synchronization)
BMFT	Bundesminister für Forschung und Technologie
CCD	Charge Coupled Device
CCL	Charge Current Limiter
C&DH	Command and Data Handling
CEL	Control Electronics
CFK	kohlefaserverstärkter Kunststoff
CFRP	Carbon Fiber Reinforced Plastics
CITE	Cargo Integration Test Equipment
Cmd	Command
CPU	Central Processing Unit
CSA	Charge Solar Array
CSS	Coarse Sun Sensor
CZ	Firma Carl Zeiss
DC	Direct Current
DEC	Decoder
DFVLR	Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt
DFVLR-PL	DFVLR-Projektleitung

DHS	Data Handling Subsystem
DMA	Direct Memory Access (Direct Assess to Memory)
DMOD	Demodulator
DNEL	Disconnection of Non-Essential Loads
DPS	Data Processing System
DS	Dornier System
ECS	Environmental Control System
EED	Electro-Explosive Device
EEL	Experiment-Electronics
EGSE	Electrical Ground Support Equipment
EM	Engineering Model
EMC	Electromagnetic Compatibility
EOL	End-of-Life
EORD	Experiment Operations Requirements Document
EPD	External Power Dumper
ESA	European Space Agency
ETOL	ESA Test Operation Language
EUV	Extreme Ultraviolet
FI	Focal Plane Instrumentation
FLS	Fiducial Light System
FM	Flight Model
FMECA	Failure Mode Criticallity Analysis
FWHM	Full Width at Half Maximum
GF	Grapple Fixture
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
GSOC	German Space Operations Center
GVS	Gas Supply System
GYP	Gyropackage

GYPE	Gyropackage Electronics
GYPS	Gyropackage Sensor
HC	Heater Control
HEAO-2	High Energy Astronomy Observatory ("Einstein")
HK	Housekeeping
HP	High Power
HRI	High Resolution Imager
ICD	Interface Control Document
INVAR	(Handelsname für eine besondere Stahllegierung)
IST	Integrated System Test
JSC	Johnson Space Center
kbps	Kilobit per second (deutsch: kbit/s)
KSC	Kennedy Space Center
LCL	Latching Current Limiter
LED	Light Emitting Diode
LHC	Left-hand Circulation
LP	Low Power
MA	Mirror Assembly
MAC	Mirror Attachment Cone
Mbps	Megabit per second (deutsch: Megabit/s)
MC	Magnetic Coil
MCC	Mission Control Center
MCP	Microchannel Plate
MDM	Multiplexer/Demultiplexer
MED	Magnetic Electron Deflector
MES	Mechanisms Subsystem

MGSE	Mechanical Ground Support Equipment
MLI	Multilayer Insulation
MM	Magnetometer
MOU	Memorandum of Understanding
MPE	Max-Planck-Institut für Physik und Astrophysik, Institut für Extraterrestrische Physik
MPG	Max-Planck-Gesellschaft
MPSS	Mission Planning and Scheduling System
MRB	Material Review Board
MSA	Main Solar Array
MSSL	Mullard Space Science Laboratory
MUC	Multi-Use Container
MUDAS	Modular Universal Data Acquisition and Control System
MVL	Main Voltage Limiter
NASA	National Aeronautics and Space Administration
NRZ/L-Code	Non-Return-to-Zero/L-Code
NSI	NASA Standard Initiator
OBC	Onboard Computer
OGSE	Optical Ground Support Equipment
OIB	Orbiter Interface Box
OSR	Optical Surface Reflector
PCU	Power Control Unit
PDU	Power Distribution Unit
PETS	Payload Environmental Transportation System
PGHM	Payload Ground Handling Mechanism
PHP	Paraboloid-Hyperboloid Pair
POCC	Payload Operations Control Center
PPF	Payload Processing Facility

PSE	Payload Support Equipment
PSK	Phase-shift Keying
PSPC	Position Sensitive Proportional Counter
PSS	Power Supply Subsystem
PYB	Pyrotechnics Electronic Box
QM	Qualification Model
RAL	Rutherford Appleton Laboratory
RE	Radiated Emission
RF	Radio Frequency
RfW	Request for Waiver
RMC	Right-hand Circulation
RMS	Remote Manipulator System
ROSAT	Röntgensatellit
RS	Radiated Susceptibility
RSGF	Rigidized Sensing Grapple Fixture
RSS	Rotating Service Structure
RT	Real Time
RW	Reaction Wheel
RX	Receiver
S/C	Spacecraft
SERC	Science & Engineering Research Council
SEU	Single Event Upset
S/L	Serial Load
SOC	Science Operations Center
SPF	Single Point Failure
SPL Code	Split Phase Level Code
SSM	Single Surface Mirror
ST	Star Tracker
STC	Star Tracker Camera

STE	Star Tracker Electronics
STM	Structural Thermal Model
STS	Space Transportation System
SURS	Shuttle Umbilical Retraction System
TA	Technische Anweisung
TC	Telecommand
T/C	Thermal Control
TCE	Thermal Conditioning Equipment
TCS	Telecommunication Subsystem
TM	Telemetry
TR	Tape Recorder
TT & C	Telemetry, Tracking and Command
TV	Thermal-Vakuum
TX	Transmitter
US	Subsystem
VPHD	Vertical Payload Handling Device
VPF	Vertical Processing Facility
WDE	Wheel Drive Electronics
WFC	Wide Field Camera
WFCC	WFC-Consortium
WSA	Weltraumsimulationsanlage
XRT	X-Ray Telescope
ZERODUR	(Handelsname für den Glas-Keramik-Werkstoff des Spiegels)
ZDE	Central Data Electronics