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ATTACHMENT C**

**ADVANCED TECHNOLOGY MICROWAVE
SOUNDER (ATMS)**

**WORK BREAKDOWN STRUCTURE
(WBS)**

June 23, 2000



**GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND**

**INTEGRATED PROGRAM OFFICE
SILVER SPRING, MARYLAND**

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INTRODUCTION

This document provides the Work Breakdown Structure (WBS) that shall be implemented by the Advanced Technology Microwave Sounder (ATMS) contractor. This WBS provides the basis task and cost breakdown for planning, implementation, and reporting. The WBS diagram and supporting summary task descriptions will be updated by the contractor, as required during the life of the contract, to reflect negotiations, new work, modifications/changes, work element distribution changes, and configuration changes. All WBS updates or planning changes must be approved in advance by the ATMS Contracting Officer (CO).

This document's heading numbering scheme follows the WBS numbering. The most significant digit of the WBS number, the second digit, designates ATMS activities for either the NPOESS Preparatory Project (NPP) Proto-Flight Model (PFM) or the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Flight Model (FM) instruments. The digit ".0" is related to NPP, while the digit ".5" is related to NPOESS. For example, the section number "1.0" refers to the Project Management for NPP, while the section number "1.5" refers to the Project Management for NPOESS.

1.0 OR 1.5 PROJECT MANAGEMENT

The contractor's Program Manager shall have full responsibility and authority to manage and administer all phases of the contract. This element encompasses all efforts required to provide program management.

1.0.1 OR 1.5.1 PROGRAM OFFICE

This element includes all efforts by the Program Manager and his/her supporting staff for program technical direction and management including planning and evaluation.

This element specifically includes the efforts of the Program Manager, the program staff, and administrative support.

1.0.2 OR 1.5.2 ENGINEERING MANAGEMENT

This element includes all efforts except that contained in the Program Office element for technical management of all aspects of the program.

1.0.2.1 or 1.5.2.1 Technical Manager

This element includes the efforts of the Technical Manager in planning and evaluation, technical direction of the program, and supervision of assembly managers.

This element includes planned, scheduled, and documented monthly Program Management Reviews (PRMS). These monthly reviews and monthly reports are to ensure satisfactory progress and identify any problem areas in both technical and resource

areas. Other reviews included are:

- Software Requirements Preliminary Design Review for NPP only
- Critical Design Review (CDR)
- Delta Critical Design Review (Δ CDR)
- Pre-Environmental Reviews (PER)
- Software Critical Design Review (SCDR) for NPP only
- Software Test Readiness Review (STRR) for NPP only
- Software Acceptance Review (SAR) for NPP only
- Pre-Ship Reviews (PSRs).
- Earned Value System Review
- ICD Interface Meetings
- SDR Interface Meetings
- SDR Algorithm Meetings

This element also includes a series of spacecraft/instrument interface reviews and other special reviews as needed.

1.0.2.2 or 1.5.2.2 Configuration Management

This element includes the establishment and implementation of a formal configuration management system.

1.0.2.3 or 1.5.2.3 Subcontractor Management

This element includes technical management of all subcontracts.

1.0.2.4 or 1.5.2.4 Schedule Control

This element includes the effort to develop and maintain program schedules, including preparation, maintenance, and updating of network schedules and support for the preparation of standard NASA Form 533.

1.0.3 OR 1.5.3 RESOURCE MANAGEMENT

The contractor shall provide administrative support to technical echelons in order to maintain financial, procurement, and contractual control.

1.0.3.1 or 1.5.3.1 Financial Control

Support to the Program Manager in the area of cost and cost control is included in this element.

1.0.3.2 or 1.5.3.2 Procurement

This element includes the effort to procure those materials and supporting services necessary for the design, fabrication, and verification of the Advanced Technology Microwave Sounder (ATMS). This element also includes the financial management of all subcontracts.

1.0.3.3 or 1.5.3.3 Contract Administration

This element includes the effort to administratively manage the contract. Included in this task are such items as change order, proposal preparation and negotiation, property administration, and contract award.

1.0.4 or 1.5.4 Documentation

This element includes the compilation, review, reproduction, and distribution of all documentation identified as deliverable items. The task includes the creative effort to organize the outline of the documents prior to their editing, layout, printing, or other documentation/publication services efforts. The task does not include the actual writing of the documents, as this effort should be covered under the separate tasks as applicable.

2.0 OR 2.5 System Engineering

This element includes the effort to define the overall instrument design as well as the definition of the performance verification requirements and methods. The evaluation of instrument test data is also included. Life testing of critical elements is included in this task.

2.0.1 or 2.5.1 Instrument Design and Analysis

This element includes the effort necessary to define the overall ATMS system using trade-off analysis and assigning error budgets as required. Performance requirements for each assembly are to be allocated. This task includes the design of the instruments and the breadboards, and the test of critical elements.

2.0.1.1 Spacecraft Interface Design (NPP only)

This element includes the effort necessary to provide inputs to the NPP spacecraft integrating contractor to aid in establishing and maintaining an Interface Control Document (ICD), which defines the detailed ATMS spacecraft interface characteristics. The NPP Project will also maintain an Instrument Description Document (IDD) under configuration control until the NPP spacecraft contractor generates the ICDs.

2.5.1.1 Spacecraft Interface Design (NPOESS only) /Support

This element includes the effort necessary to provide inputs to the NPOESS spacecraft integrating contractor to aid in establishing and maintaining an Interface Control

Document (ICD), which defines the detailed ATMS spacecraft interface characteristics. The NPOESS Project will also maintain an Instrument Description Document under configuration control until the NPOESS spacecraft contractor generates the ICDs.

2.0.1.2 Electronic Assembly Design and Breadboard

This element includes the overall effort necessary for the detailed design, development, breadboard, and test of the electronics of the ATMS including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

2.0.1.3 Mechanical Design/Support

This element includes the overall effort necessary for the detailed design and development of the integral structure of the ATMS, mounting of the assemblies to/within this structure, and instrument closures.

2.0.1.4 or 2.5.1.4 Thermal Design/Support

This element includes the overall effort necessary for the detailed design, development, breadboard, and test of techniques requisite to maintain the ATMS temperature within operational constraints, both for instrument stability and accuracy requirements and spacecraft interface requirements.

2.0.1.5 Antenna Assembly Design and Breadboard

This element includes the overall effort necessary for the detailed design, development, breadboard, and test of the antenna assembly of the ATMS including:

- reflector
- feed
- scan mechanism and calibration targets.

2.0.1.6 Software Design

This element includes the overall effort to design, develop, and test the flight software necessary to operate and validate the ATMS. It also includes the computer code, documentation, and manuals required for this effort.

2.0.1.7 or 2.5.1.7 Design Analysis

This element includes all efforts to analyze the derived ATMS design to ensure its conformance with the performance requirements in the instrument specification and the spacecraft interfaces as defined in the ICD.

2.0.2 OR 2.5.2 SYSTEM PLANS AND PROCEDURES

This element includes the preparation of written fabrication, integration, functional and performance tests, qualification/acceptance tests, and calibration procedures.

2.0.2.1 or 2.5.2.1 System Integration Procedures

This element includes integration procedures necessary to integrate the ATMS instrument from each of its constituent subsystems and necessary procedures for integration of the ATMS with the spacecraft.

2.0.2.2 or 2.5.2.2 Performance Verification Procedures

This element includes the generation of ATMS performance and verification procedures as required in the Mission Assurance Requirements (MAR) document. Appropriate sections of the "Specification for the ATMS" must be referenced to demonstrate compliance.

2.0.3 or 2.5.3 SUSTAINING ENGINEERING

This element covers the engineering support necessary from instrument fabrication through delivery of the final flight unit. This task includes the effort to support fabrication, testing, troubleshooting, and the analysis and review of test results (for proto-flight and flight units). Its purpose is to determine conformance with performance requirements and to provide such engineering changes as may be required.

2.0.3.1 Operations and Maintenance Manuals

This element includes the preparation of the ATMS Operations and Maintenance Manuals and Special Test Equipment Operations and Maintenance Manuals.

3.0 ENGINEERING DEVELOPMENT UNIT

The Engineering Development Unit (EDU) will be fully tested in equivalent fashion to a space-qualified instrument. This element includes all the effort necessary to fabricate, assemble, and verify the EDU.

3.0.1 FABRICATE STRUCTURAL ELEMENT

This element includes the effort necessary to fabricate the ATMS integral structures, assembly mounting structures, and instrument closures.

3.0.2 FABRICATE ELECTRONICS SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS electronics assemblies

including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

3.0.3 FABRICATE ANTENNA SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS antenna subassemblies including:

- reflector
- feed
- scan mechanism and calibration targets.

3.0.4 FABRICATE THERMAL CONTROL SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS thermal control subassemblies that are provided by the ATMS contractor.

3.0.5 Subassembly Functional Testing

This element includes the overall effort to verify and characterize the performance of the electronics and antenna subassemblies prior to their integration into the next higher hardware assembly.

3.0.6 Assembly Integration and Testing

This element covers the integration of the subassemblies into their requisite assemblies and verification that the operation of these assemblies meets or exceeds functional requirements.

3.0.7 Component Integration and Testing

- This element covers the integration of the electronics and antenna assemblies and the verification that the design meets or exceeds functional requirements. The task includes:

- (a) implementing and documenting the applicable instrument qualification level and/or acceptance level tests.
- (b) establishing the calibration of the ATMS.

3.0.8 PARTS AND MATERIALS

This element includes any necessary special testing of parts and materials in order to verify performance of the parts and ensure compatibility with the life requirements of the

ATMS.

Parts procurement is included with each subassembly.

3.0.9 ENGINEERING DEVELOPMENT UNIT AVAILABILITY FOR NPP

The Engineering Development Unit may be used for the NPP spacecraft initial integration.

4.0 NPP PROTO-FLIGHT MODEL

The NPP Proto-Flight Model (PFM) will be a fully space-qualified instrument, which will be flown on the NPP spacecraft. This element includes all the effort necessary to develop, fabricate, assemble, and verify the PFM.

4.0.1 FABRICATE STRUCTURAL ELEMENTS

This element includes the effort necessary to fabricate the ATMS integral structures, assembly mounting structures, and instrument closures.

4.0.2 FABRICATE ELECTRONICS SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS electronics assemblies including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

4.0.3 FABRICATE ANTENNA SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS antenna subassemblies including:

- reflector
- feed
- scan mechanism and calibration targets.

4.0.4 FABRICATE THERMAL SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS thermal control subassemblies that are provided by the ATMS contractor.

4.0.5 SUBASSEMBLY FUNCTIONAL TESTING

This element includes the overall effort to verify and characterize the performance of the electronics and antenna subassemblies prior to their integration into the next higher

hardware assembly.

4.0.6 ASSEMBLY INTEGRATION AND TESTING

This element covers the integration of the subassemblies into their requisite assemblies and verification that the operation of these assemblies meets or exceeds functional requirements.

4.0.7 COMPONENT INTEGRATION AND TESTING

This element covers the integration of the electronics and antenna assemblies and the verification that the design meets or exceeds functional requirements.

The task includes the effort required to implement and document the applicable instrument qualification level and/or acceptance level tests.

The task also includes the effort required to establish the calibration of the ATMS.

4.0.8 PARTS AND MATERIALS

This element includes any necessary special testing of parts and materials in order to verify performance of the parts and ensure compatibility with the life requirements of the ATMS.

Parts procurement is included with each subassembly.

5.0 or 5.5 GROUND SUPPORT EQUIPMENT AND FIXTURING

The Ground Support Equipment (GSE) shall include all documentation, hardware, and software necessary to support all functions peculiar to the ATMS instrument, including handling, powering and controlling, testing, calibration, maintenance, checkout, integration with spacecraft, and shipping and storage.

5.0.1 or 5.5.1 SPECIAL TEST EQUIPMENT

This element includes all Special Test Equipment (STE) necessary to support the design, performance verification, and calibration of the ATMS at the contractor's facility.

This element includes all effort necessary for the detailed design, development, fabrication, assembly, and validation of the STE.

5.0.2 or 5.5.2 GSE MAINTENANCE

The element includes the effort to maintain the GSE in proper working order until the instrument has been launched.

5.0.3 or 5.5.3 INSTRUMENT HANDLING FIXTURES

This element includes all effort necessary to design, fabricate, and validate special fixtures required for handling the ATMS. These fixtures shall include but not be limited to a “primary handling fixture” for each instrument and a spacecraft integration fixture.

5.0.4 or 5.5.4 TEST FIXTURES

This element includes the overall effort necessary for the design, fabrication, assembly, and validation of all test hardware necessary for performance validation, calibration, and instrument qualification and/or acceptance. This task also provides a calibration test fixture for use at the spacecraft contractor’s facility, separate from the fixture used for the primary calibration.

5.0.5 or 5.5.5 ATMS SHIPPING/STORAGE CONTAINERS

This element includes the overall effort to design, fabricate, assemble, and validate the ATMS shipping/storage containers. Parts procurement is included with each subassembly.

5.0.6 or 5.5.6 GSE SHIPPING/STORAGE CONTAINERS

This element includes the overall effort to design, fabricate, assemble, and validate the ATMS GSE shipping/storage containers. Parts procurement is included with each subassembly.

5.0.7 or 5.5.7 GSE SOFTWARE

This element includes all the computer code, documentation, and manuals required to operate, verify and calibrate the instruments, and to display the instruments output in numerical formats as well as images.

5.0.8 or 5.5.8 SENSOR DATA RECORD (SDR)

This element includes all the computer code, documentation, and manuals required for ground processing and interpretation of the ATMS flight data. It also includes the demonstration and validation of the SDR algorithms.

6.0 or 6.5 MISSION ASSURANCE

This element covers the mission assurance activities delineated in the MAR document and includes the Mission Assurance Manager, support coordinator, and inspectors.

6.0.1 or 6.5.1 SYSTEM SAFETY

This element provides for the effort involved in reviewing and monitoring the implementation of an approved safety program, which will identify and control hazards to personnel, facilities, support equipment, and the ATMS instrument during all stages of program development.

6.0.2 or 6.5.2 PARTS CONTROL

This element provides for the overall effort necessary for the contractor to plan, implement, and conduct a parts control program. Under the program, only parts with acceptance, demonstrated performance, and reliability shall be used. When possible, only standard parts will be used.

6.0.3 or 6.5.3 MATERIALS AND PROCESS CONTROL

This element provides for the effort involved in the implementation of a comprehensive materials and processes program.

6.0.4 or 6.5.4 RELIABILITY

This element provides for the overall effort necessary for the contractor's planning and implementing a reliability program that interacts with assurance programs for design, parts, materials, testing, and other space program activities.

6.0.5 or 6.5.5 QUALITY ASSURANCE

This element provides for the overall effort necessary for the contractor to establish, document, and ensure compliance with design control requirements and quality criteria during all phases of the contract work.

7.0 or 7.5 SPACECRAFT INTEGRATION SUPPORT

This element provides for the overall effort necessary for the contractor to provide technical consultation during the integration and test of the instrument onto the spacecraft. The contractor will also provide training for spacecraft contractor personnel pertinent to the ATMS and its associated ground support equipment. The contractor will also provide support to integrate the instrument GSE with the S/C GSE.

7.0.1 NPP/SPACECRAFT INTEGRATION AND TEST

This element covers all support from the time the PFM leaves the contractor's facility through spacecraft integration and electrical system checkout.

8.0 FIELD SUPPORT

This element covers all effort for support for the instruments after they leave the contractor's facility. This support may include, but not be limited to, bench checkout, instrument adjustment, in-flight calibration and verification of instrument operation. As necessary, an instrument may be returned to the contractor's facility for rehab/repair.

Included in this effort are support for all instruments at the launch facility, 3 months of post-launch operations, anomaly investigations, analytical support caused by spacecraft modification or mission change, instrument studies, and support for the GSE.

Also included in this effort is troubleshooting/rehab/repair of any instrument subsequent to its leaving the contractor's facility.

9.0 or 9.5 CRITICAL SPARE PARTS

This element provides for the overall effort necessary for the contractor to plan, provide, fabricate, test, and store sufficient spare parts and assemblies to ensure performances of the instruments and the GSE at time of delivery and support the integration and test of the instruments. For all instruments, all spare articles will be identical, of the same quality, and certified as flight-ready.

9.0.1 or 9.5.1 FABRICATION AND ASSEMBLY

This element provides for the necessary spare parts to be procured, fabricated, and/or assembled as applicable.

9.0.2 or 9.5.2 TEST AND STORAGE

This element provides for all spare parts to be functionally tested and environmentally qualified to flight levels where appropriate, and stored in a manner and area certified by the Quality Assurance function. In addition, it covers the effort to maintain an inventory of the parts by name, part number, serial number, and quantity and an to revise this list on an as-used basis.

10.5 FLIGHT MODEL 1

The FM will be a fully space-qualified instrument, which will be flown on the NPOESS spacecraft. This element includes all the effort necessary to develop, fabricate, assemble, and verify the FM.

10.5.1 FABRICATE STRUCTURAL ELEMENTS

This element includes the effort necessary to fabricate the ATMS integral structures, assembly mounting structures, and instrument closures.

10.5.2 FABRICATE ELECTRONICS SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS electronics assemblies including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

10.5.3 FABRICATE ANTENNA SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS antenna subassemblies including:

- reflector
- feed
- scan mechanism and calibration targets.

10.5.4 FABRICATE THERMAL CONTROL SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS thermal control subassemblies that are provided by the ATMS contractor.

10.5.5 SUBASSEMBLY FUNCTIONAL TESTING

This element includes the overall effort to verify and characterize the performance of the electronics and antenna subassemblies prior to their integration into the next higher hardware assembly.

10.5.6 ASSEMBLY INTEGRATION AND TESTING

This element covers the integration of the subassemblies into their requisite assemblies and verification that the operation of these assemblies meets or exceeds functional requirements.

10.5.7 COMPONENT INTEGRATION AND TESTING

This element covers the integration of the electronics and antenna assemblies and the verification that the design meets or exceeds functional requirements.

The task includes the effort required to implement and document the applicable instrument qualification level and/or acceptance level tests.

The task also includes the effort required to establish the calibration of the ATMS.

10.5.8 PARTS AND MATERIALS

This element includes any necessary special testing of parts and materials in order to verify performance of the parts and assure compatibility with the life requirements of the ATMS.

Parts procurement is included with each subassembly.

11.5 FLIGHT MODEL 2

The FM will be a fully space-qualified instrument, which will be flown on the NPOESS spacecraft. This element includes all the effort necessary to develop, fabricate, assemble, and verify the FM.

11.5.1 FABRICATE STRUCTURAL ELEMENTS

This element includes the effort necessary to fabricate the ATMS integral structures, assembly mounting structures, and instrument closures.

11.5.2 FABRICATE ELECTRONICS SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS electronics assemblies including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

11.5.3 FABRICATE ANTENNA SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS antenna subassemblies including:

- reflector
- feed
- scan mechanism and calibration targets.

11.5.4 FABRICATE THERMAL CONTROL SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS thermal control subassemblies that are provided by the ATMS contractor.

11.5.5 SUBASSEMBLY FUNCTIONAL TESTING

This element includes the overall effort to verify and characterize the performance of the electronics and antenna subassemblies prior to their integration into the next higher hardware assembly.

11.5.6 ASSEMBLY INTEGRATION AND TESTING

This element covers the integration of the subassemblies into their requisite assemblies and verification that the operation of these assemblies meets or exceeds functional requirements.

11.5.7 COMPONENT INTEGRATION AND TESTING

This element covers the integration of the electronics and antenna assemblies and the verification that the design meets or exceeds functional requirements.

The task includes the effort required to implement and document the applicable instrument qualification level and/or acceptance level tests.

The task also includes the effort required to establish the calibration of the ATMS.

11.5.8 PARTS AND MATERIALS

This element includes any necessary special testing of parts and materials in order to verify performance of the parts and assure compatibility with the life requirements of the ATMS.

Parts procurement is included with each subassembly.

12.5 FLIGHT MODEL 3

The FM will be a fully space-qualified instrument, which will be flown on the NPOESS spacecraft. This element includes all the effort necessary to develop, fabricate, assemble, and verify the FM.

12.5.1 FABRICATE STRUCTURAL ELEMENTS

This element includes the effort necessary to fabricate the ATMS integral structures, assembly mounting structures, and instrument closures.

12.5.2 FABRICATE ELECTRONICS SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS electronics assemblies including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

12.5.3 FABRICATE ANTENNA SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS antenna subassemblies including:

- reflector
- feed
- scan mechanism and calibration targets.

12.5.4 FABRICATE THERMAL CONTROL SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS thermal control subassemblies that are provided by the ATMS contractor.

12.5.5 SUBASSEMBLY FUNCTIONAL TESTING

This element includes the overall effort to verify and characterize the performance of the electronics and antenna subassemblies prior to their integration into the next higher hardware assembly.

12.5.6 ASSEMBLY INTEGRATION AND TESTING

This element covers the integration of the subassemblies into their requisite assemblies and verification that the operation of these assemblies meets or exceeds functional requirements.

12.5.7 COMPONENT INTEGRATION AND TESTING

This element covers the integration of the electronics and antenna assemblies and the verification that the design meets or exceeds functional requirements.

The task includes the effort required to implement and document the applicable instrument qualification level and/or acceptance level tests.

The task also includes the effort required to establish the calibration of the ATMS.

12.5.8 PARTS AND MATERIALS

This element includes any necessary special testing of parts and materials in order to verify performance of the parts and assure compatibility with the life requirements of the ATMS.

Parts procurement is included with each subassembly.

13.5 FLIGHT MODEL 4

The FM will be a fully space-qualified instrument, which will be flown on the NPOESS

spacecraft. This element includes all the effort necessary to develop, fabricate, assemble, and verify the FM.

13.5.1 FABRICATE STRUCTURAL ELEMENTS

This element includes the effort necessary to fabricate the ATMS integral structures, assembly mounting structures, and instrument closures.

13.5.2 FABRICATE ELECTRONICS SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS electronics assemblies including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

13.5.3 FABRICATE ANTENNA SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS antenna subassemblies including:

- reflector
- feed
- scan mechanism and calibration targets.

13.5.4 FABRICATE THERMAL CONTROL SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS thermal control subassemblies that are provided by the ATMS contractor.

13.5.5 SUBASSEMBLY FUNCTIONAL TESTING

This element includes the overall effort to verify and characterize the performance of the electronics and antenna subassemblies prior to their integration into the next higher hardware assembly.

13.5.6 ASSEMBLY INTEGRATION AND TESTING

This element covers the integration of the subassemblies into their requisite assemblies and verification that the operation of these assemblies meets or exceeds functional requirements.

13.5.7 COMPONENT INTEGRATION AND TESTING

This element covers the integration of the electronics and antenna assemblies and the verification that the design meets or exceeds functional requirements.

The task includes the effort required to implement and document the applicable instrument qualification level and/or acceptance level tests.

The task also includes the effort required to establish the calibration of the ATMS.

13.5.8 PARTS AND MATERIALS

This element includes any necessary special testing of parts and materials in order to verify performance of the parts and assure compatibility with the life requirements of the ATMS.

Parts procurement is included with each subassembly.

14.5 FLIGHT MODEL 5

The FM will be a fully space-qualified instrument, which will be flown on the NPOESS spacecraft. This element includes all the effort necessary to develop, fabricate, assemble, and verify the FM.

14.5.1 FABRICATE STRUCTURAL ELEMENTS

This element includes the effort necessary to fabricate the ATMS integral structures, assembly mounting structures, and instrument closures.

14.5.2 FABRICATE ELECTRONICS SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS electronics assemblies including:

- radiometer receivers
- radiometer processors
- timing and control circuits
- power supplies, and telemetry.

14.5.3 FABRICATE ANTENNA SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS antenna subassemblies including:

- reflector
- feed
- scan mechanism and calibration targets.

14.5.4 FABRICATE THERMAL CONTROL SUBASSEMBLIES

This element includes the effort necessary to fabricate the ATMS thermal control subassemblies that are provided by the ATMS contractor.

14.5.5 SUBASSEMBLY FUNCTIONAL TESTING

This element includes the overall effort to verify and characterize the performance of the electronics and antenna subassemblies prior to their integration into the next higher hardware assembly.

14.5.6 ASSEMBLY INTEGRATION AND TESTING

This element covers the integration of the subassemblies into their requisite assemblies and verification that the operation of these assemblies meets or exceeds functional requirements.

14.5.7 COMPONENT INTEGRATION AND TESTING

This element covers the integration of the electronics and antenna assemblies and the verification that the design meets or exceeds functional requirements.

The task includes the effort required to implement and document the applicable instrument qualification level and/or acceptance level tests.

The task also includes the effort required to establish the calibration of the ATMS.

14.5.8 PARTS AND MATERIALS

This element includes any necessary special testing of parts and materials in order to verify performance of the parts and assure compatibility with the life requirements of the ATMS. Parts procurement is included with each subassembly.

APPENDIX A. WORK BREAKDOWN STRUCTURE MATRIX

