CR-203670

GenCorp
AEROJET

Integrated
Advanced Sounding Unit-A (AMSU-A)
Configuration Management Plan

Contract No: NAS5-32314
CDRL: 005

Submitted to:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

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FIGURES

TABLES

Section 1

INTRODUCTION

1.1   **Purpose**–The purpose of this plan is to identify the baselines to be established during the development life cycle of the Integrated AMSU-A, and define the methods and procedures which Aerojet will follow in the implementation of configuration control for each established baseline.

This plan is written in response to the Goddard Space Flight Center (GSFC) Earth Observing System (EOS) Configuration Management Plan, 420-02-02 and GSFC METSAT Configuration Plan S-480-17. It is the intent of these plans to meet the basic requirements specified in DOD-STD-480, DOD-D-1000, MIL-STD-483, and MIL-STD-490.

This formal Configuration Management (CM) system is intended to assure:

a.   Definition of all documentation required for the Integrated AMSU-A product design, fabrication, test, and performance.

b.   Correct and complete descriptions of the approved Integrated AMSU-A configuration. Descriptions include specifications, drawings, parts lists, test procedures, and operating manuals.

c.   Traceability of the Integrated AMSU-A product and its parts to their descriptions.

d.   Accurate and complete identification of each material, part, subassembly, and assembly that goes into the Integrated AMSU-A.

e.   Systematic evaluation of proposed changes to the approved Integrated AMSU-A configuration, and control of implementation of these changes.

f.   Accurate and complete accounting of all changes to the Integrated AMSU-A.

1.2   **Scope**–This plan establishes the Configuration Management process to be used for the deliverable hardware, software, and firmware of the Integrated AMSU-A during development, design, fabrication, test, and delivery.

1.3   **Identification**–The serial numbers and Configuration Item (CI) numbers for the Integrated AMSU-A AMSU A1 and A2 are shown in the table below. The serialization numbers were assigned by NASA and the Configuration Item numbers were assigned by Aerojet.

SERIAL NO.	DESCRIPTION	CI NO.
202	EOS/AMSU-A1	N3
202	EOS/AMSU-A2	N4
105-108	METSAT/AMSU-A1	N13
105-108	METSAT/AMSU-A2	N14

The Integrated AMSU-A Computer Software Configuration Item (CSCI) numbers are identified in 8.4

Section 2

ORGANIZATION

2.1 **Organizational Structure**–With the integrated product team approach, the activities of the disciplines pertinent to the Integrated AMSU-A program are coordinated and integrated into product development teams by the Integrated AMSU-A program management. The Configuration Management officer is a member of the Systems Engineering Integration and Test (SEIT) Product Team and is directly responsible to the Integrated AMSU-A SEIT Integrated Product Team Leader on program-unique CM matters (Figure 1), and to the Director of Mechanical Products Engineering on CM policy matters (Figure 2).

2.2 **CM Organization**–The CM organization provides the technical and administrative direction and surveillance required for configuration management activities.

The plan establishes organizational responsibilities for implementing the CM system, top-level policies for configuration identification, configuration change control, configuration status accounting, and configuration verification of the deliverable hardware and software for the Integrated AMSU-A.

2.3 **Subcontractor Requirements**–Major subcontractors with design responsibility developed for the Integrated AMSU-A will be required to establish a CM program consistent with the intent of MIL-STD-483. The pertinent CM requirements will be set forth in the subcontract Statement of Work (SOW) and Subcontract Data Requirements Lists (SDRL).

2.4 **Related Functions**

2.4.1 **Data Center**–The Data Center is the central distribution point and repository for all engineering specifications, standards, and test procedures. The Data Center issues report numbers, and maintains the master log, and is the control point for all deliverable reports, plans, and other technical data. It provides Government, industry, and program-peculiar documents and works in conjunction with the Engineering Library in providing source material.

The Integrated AMSU-A Configuration Management is the central release point for contractual documentation. The document numbers are issued (i.e. AE numbers, report numbers from Data Center, etc.) and controlled by Configuration Management.

2.4.2 **Data Management**–Management of Integrated AMSU-A data, principally for scheduling, planning, and delivery of data required by the Contract Data Requirements List (CDRL), is provided by the Integrated AMSU-A Configuration/Data Manager.

2.4.3 **Engineering Specifications**–The Engineering Specifications Organization consists of engineers and technical specialists who work with the Integrated AMSU Program Teams in preparing and changing the Integrated AMSU-A CI and CSCI specifications, standards,

test procedures, and other engineering documents. Documentation is prepared in accordance with MIL-STD-490, DOD-STD-480, and applicable Data Item Descriptions (DID).

```
                          ┌─────────────────────────────────────┐              ┌──────────────────────┐
                          │   AMSU Integrated Program Director   │              │       Director       │
                          ├──────────────────┬──────────────────┤              │  Product Assurance   │
                          │   Deputy for     │   Deputy for     │              │                      │
                          │ Program Integration │ Technical Integration │        └──────────────────────┘
                          └──────────────────┴──────────────────┘
```

Antenna	SEIT	Electronics	Receiver	Mechanical Structures	Performance Assurance

- Schedule/MRP Integration
- Contracts
- Business OPS
- Procurement
- Production

- Systems Engineering
- Ground Support Equipment
- Instrument Integration & Test
- CM/DM

- PLO

- Quality Assurance
- Design Assurance
- PMP Control
- System Safety

Figure 1 Integrated AMSU-A Program Team
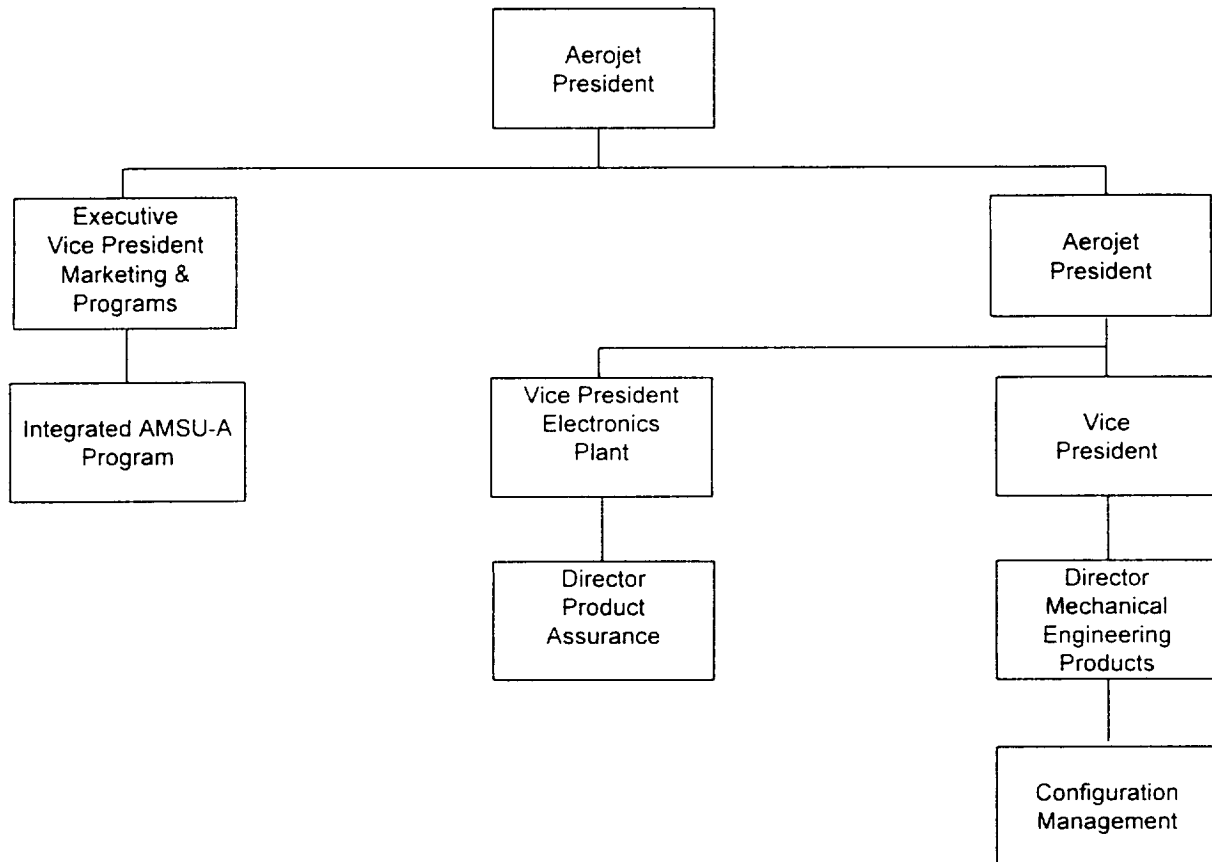
Figure 2 Partial Aerojet Organization Chart

2.4.3.1   **Applicable Documents**

2.4.3.1.1   **Government Documents**–The following documents of the exact issue shown form a part of this document to the extent specified herein. If no issue date is listed, the latest revision is applicable.

DOD-STD-480B   Configuration Control-Engineering
15 Jul 1988   Changes, Deviations, and Waivers

DOD-D-1000B   Drawings, Engineering and Associated
28 Oct 1977   Lists

DOD-STD-100   Engineering Drawing Practices
30 Sep 1991

MIL-STD-483A   Configuration Management Practices for
04 June 1985   Systems, Equipment, Munitions, and Computer Programs

MIL-STD-490A   Specification Practices
04 June 1985

MIL-STD-1521B   Technical Reviews and Audits for Systems,
04 Jan 1985   Equipment, and Computer Software

2.4.3.1.2   Non-Government Documents–The following documents of the exact issue shown form a part of this document to the extent specified herein. If no issue date is listed, the latest revision is applicable. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

NASA Documents

GMI 8040.1A   Configuration Management

422-10-04   Software Acquisition Management Plan
4 Feb 1991

420-02-02   EOS Configuration Management Plan
Jan 1990

S-480-17A   METSAT Configuration Plan
Nov 1983

TD No. 4A   NASA Technical Direction Number 4A
1 Dec 1995

Aerojet Documents

Specifications

AE-26594   Integrated AMSU-A Software Performance Verification
             Specification, CDRL 308

AE-26607   Integrated AMSU-A Antenna Specification, CDRL 301B-1

AE-26608   Integrated AMSU-A Receiver Specification, CDRL 301B-2

AE-26609   Integrated AMSU-A Signal Processor and Power Distributor
             Specification, CDRL 301B-3

AE-26611 Integrated AMSU-A Ground Support Equipment
       Specification, CDRL 301B-4

AE-26633 Integrated AMSU-A Phase-Locked Oscillator (PLO)
       Specification, CDRL 301B-5

Reports

9862   Software Product Users Guide

10339   Software Management Plan, CDRL 008

10428   EOS Software Assurance Plan, CDRL 309

10443*   EOS Software User's Guide (GSE), CDRL 306-10A

10446*   EOS Software User's Guide (Workstation), CDRL 306-10B

10457   EOS Software Requirements (GSE), CDRL 306-2A

10458   EOS Software Requirements (Firmware), CDRL 306-2B

10391*   EOS Software Requirements (Workstation), CDRL 306-2C

10463   EOS Software Detailed Design Document (GSE), CDRL 306-5A

10387   EOS Software Detailed Design Document (Firmware), CDRL
      306-5B

10464   EOS Software Architecture Design Document
      (GSE), CDRL 306-3A

10460   EOS Software Architecture Design Document
      (Firmware), CDRL 306-3B

UM-1   PDMS User's Guide

*   The above reports are to be issued per Contract NAS5-32314 CDRL Schedule.

Standard Manuals

Aerojet Drafting Requirements Manual, Vol. I-C

Aerojet Product Standardization Manual, Vol. I-D

Other Documents

Aerojet Policy Directives

Contract Documentation Requirements List for the Integrated AMSU-A Integrated Programs, AMSU-A Instrument

Integrated AMSU-A Program Directives

2.4.4 **Quality Assurance**–Verification via inspection and audits that the prescribed engineering configuration was produced, as defined by the CM Master Configuration Control List (MCCL) for the hardware and the Software Configuration Control List (SCCL) for the software, is the responsibility of the Quality Assurance organization. All data in the Integrated AMSU-A configuration management database are used to determine as built configuration and to enhance change incorporation verification. Additionally, Quality Assurance is responsible for auditing and evaluating all phases of the software development effort. For further clarification, see the Software Assurance Plan, Report 10428B.

Section 3

CONFIGURATION MANAGEMENT ACTIVITIES

The discipline of configuration management is imposed by Aerojet Policy Directive (APD) 6.03, *Configuration Identification-Management and Control*, which establishes policy and defines responsibilities for implementing the configuration management of Aerojet hardware and software products.

The Configuration Management Plan for the Integrated AMSU-A program is substantially the same as that used on National Oceanic Atmospheric Administration (NOAA)/AMSU-A. The major difference is the inclusion of a Software Configuration Management Plan, covered separately in Section 8.

Although existing NOAA/AMSU-A documentation will be used wherever possible, only documentation with configuration differences will be reidentified with unique Integrated AMSU-A numbers.

3.1 **Configuration Identification**– The Integrated AMSU-A Program configuration identification, established by specifications, drawings, and other technical documentation, will be documented in the MCCL for hardware and the SCCL for the software. The MCCL is initiated and maintained by the CM organization as the applicable specifications, drawings, and changes thereto are formally released. The SCCL is also maintained by CM for applicable software specifications and version of source code for each CSCI.

Aerojet engineering specifications, standards, and procedures, and changes to them, will be prepared in accordance with the Aerojet Specifications and Standards Practices Manual, which is based on the format and content specified in MIL-STD-490.

3.2 **Drawings**– The Integrated AMSU-A two-dimensional (2D) and three-dimensional (3D) computer-aided design (CAD) design, analysis, and documentation will reside electronically in Aerojet's Product Data Management System (PDMS). PDMS is a data management and control tool that provides an automated environment for effective management control and electronic delivery by product data.

Configuration Management will release all engineering drawings through PDMS and place them under PDMS control. Refer to the PDMS User's Guide, Report UM-1.

Aerojet Engineering drawings and associated lists will be prepared to DOD-D-1000 definition of Level 2 drawings and will meet the requirements of DOD-STD-100.

Section 4

BASELINE IDENTIFICATION FOR HARDWARE

4.1 **Allocated Baseline–** The allocated baseline was established at the start of the program by the GSFC Performance and Operation Specification for the Integrated AMSU-A Integrated Programs AMSU-A Instrument, S-480-80.

4.2 **Functional Baseline–** The functional baseline is established upon approval by GSFC of the Integrated AMSU-A Performance Verification Plan, Report 10360 (CDRL 22) and Integrated AMSU-A Performance Verification Specification , AE-26594 (CDRL 308).

4.3 **Production (Product) Baseline–** The pre-product baseline will be established upon successful completion of the Manufacturing Readiness Review. At this point all configuration item documentation will be under formal change control. The EOS product baseline is established upon successful completion of the Pre-Ship Review. The METSAT product baseline is established upon successful completion of the Pre-Ship Review for the first unit. These baselines establish formal configuration control through the Integrated AMSU-A Systems Configuration Control Board.

Section 5

CONFIGURATION CHANGE CONTROL

5.1 **Configuration Control Process**– All engineering data establishing configuration identification will be formally released and will be under change control as directed in Aerojet APD 6.03. Documentation changes to both hardware and software are initiated by preparation of an Engineering Change Notice (ECN) form. Software and firmware changes are initiated by preparation of an Engineering Change Request Software (ECRS) form. The changes are reviewed by the Program Technical Director and the Program Management Office and are then received by CM for review, processing, and final disposition by the Program Configuration Change Board (PCCB). See Figure 3.
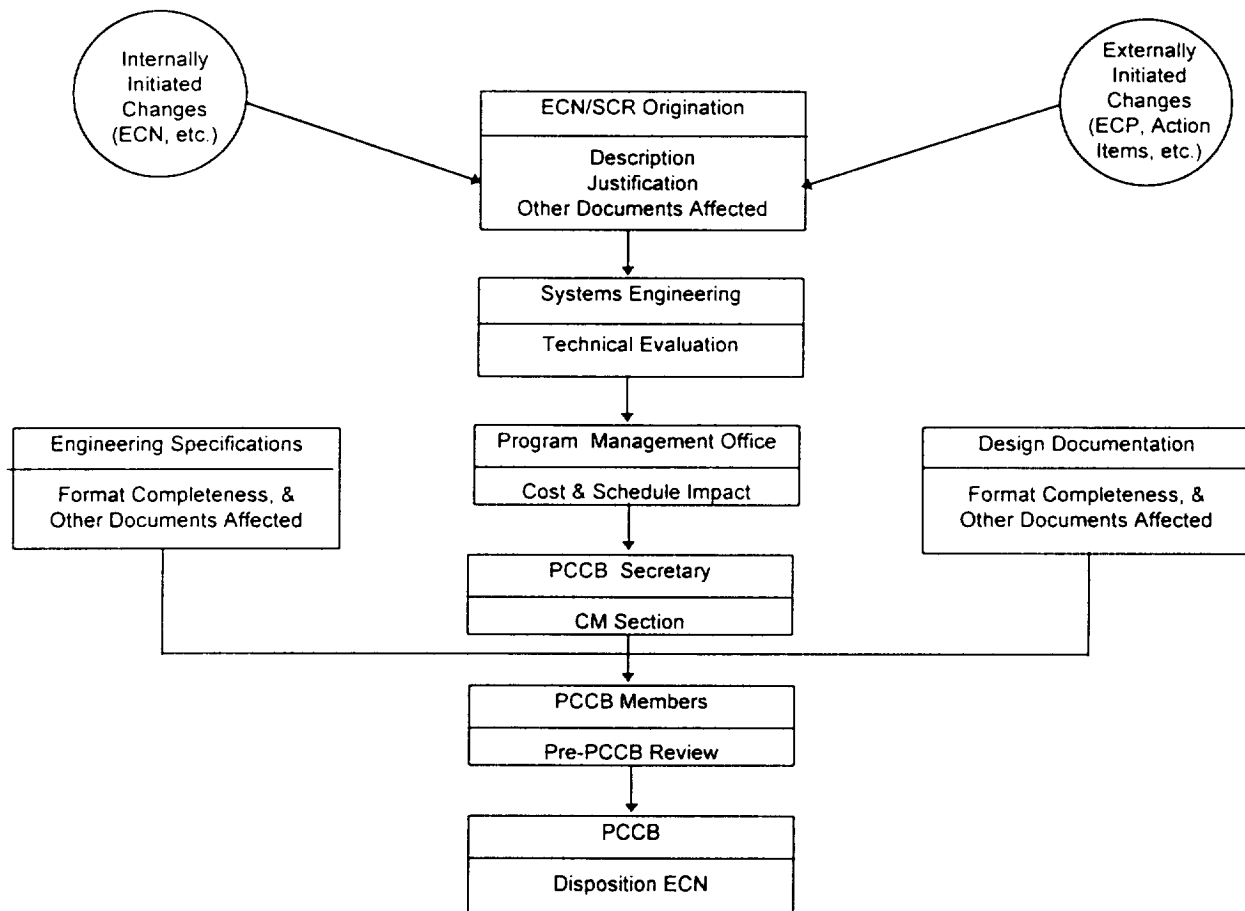
Figure 3 Aerojet Change Control Process Before PCCB Approval

5.2   **Program Configuration Change Board (PCCB)–** The PCCB is the vehicle for disposition of proposed changes. It is chaired by the Program Manager or his designated representative and is administered by the secretary assigned from CM. The PCCB members are responsible for providing an analysis of the change and advising the PCCB chairman of the effect that an individual change will have on their area of responsibility. They represent the following integrated product teams (as appropriate):

      o   Antenna Subsystem
      o   Electronics Subsystem
      o   Mechanical/Thermal Subsystem
      o   Manufacturing
      o   Receiver Subsystem
      o   Performance Assurance
      o   Systems Engineering/Integration/Test
      o   Software

The PCCB membership for the Integrated AMSU-A program was defined in Program Directive No. 28.

The PCCB Chairman's change control decisions are based upon a review of the total effect the change has on design, performance, schedule, documentation, test operations, cost, quality, reliability, interface, and maintainability.

5.3   **Integrated AMSU-A Configuration Change Board Secretary–** The Integrated AMSU-A Configuration Management Officer (CMO) will act as secretary of the PCCB and will assure implementation of the tasks of CM, including configuration identification, configuration control, configuration status accounting, configuration audits, and interface controls.

5.4   **Change Disposition–** Approved changes will be forwarded to the appropriate documentation department for incorporation. A disapproved change will be returned to the initiator with a rejection statement.

Any individual member of the PCCB may disagree with the decision of the PCCB chairman and dissent in the form of a memo to the Program Manager. If the dissent is not resolved to the member's satisfaction, an appeal can be elevated in the Dissent Review Board (DRB). The Program Manager will establish a Dissent Review Board that consists of representatives from the teams affected by the change. The dissenter and the originator of the ECN will both attend the DRB meeting. The final decision will be made by the DRB members.

5.5   **Change Classification–** The PCCB chairman is responsible for classifying each approved change as Class IA, Class IB or Class II.

5.5.1   **Class I Changes–** A change shall be classified as Class I when one or more of the following factors are affected:

- Project baseline documentation

- Technical requirements contained in the product configuration identification, including the following:
  Form, fit, or function
  Power
  Reliability outside stated requirements
  Weight, balance, moment of inertia
  Interface characteristics

- Nontechnical contractual provisions
  Fee
  Incentives
  Cost
  Schedules
  Guarantees or deliveries

- Other factors
  Government-Furnished Equipment (GSE)
  Safety
  Electromagnetic characteristics
  Operational, test, or maintenance computer programs
  Compatibility with support equipment

5.5.2   Class IA Changes- A change shall be classified as Class IA when form, fit, and function is affected (see 1.3), or when any one of the following documents requires change:

- General Instrument Interface Specification (GIIS), 420-03-02
- General Instrument Interface Document (GIRD), GSFC 422-11-01
- Unique Instrument Interface Document (UIID), GSFC 422-12-02
- Unique Instrument Interface Specification (UIIS) , A1, IS-2617547
- Unique Instrument Interface Specification (UIIS), A2, IS-2624483
- ATN-KLM General Instrument Interface Specification, IS-3267415
- Performance and Operations Specification (POS), S-480-80
- Performance Assurance Requirements (PAR), GSFC-S-480-79

5.5.3   Class IB Changes- Other changes fulfilling the MIL-STD-480 definition of a Class I change shall be designated as Class IB changes.

5.5.4   Class II Changes- A proposed change will be classified as Class II when it does not fall within the definition of a Class I change.

5.6   Reporting Documentation- NASA GSFC Technical Direction Number 4A states, "The purpose of this TD is to define the requirements when proposing AMSU-A Class I changes.

"1.   All Class IA changes that affect form, fit, and function and/or have an impact on contractual documents (i.e., interface drawing(s), UIIS, UIID, GIRD, GIIS, etc.) require a Configuration Change Request (CCR). Signature authority for approval is defined by CCR Process requirements.

2.   All other Class IB changes do not require a CCR, however, justification and prudent documentation are required as part of the package that is presented to NASA for approval. The signature authority for approval shall be the AMSU-A contracting Officer Technical Representative (COTR)."

5.6.1   Engineering Change Notice (ECN)- Any individual on the EOS/AMSU-A Program may initiate an ECN. Requests for changes will be submitted to the PCCB on ECN or ECRS form. They will be used to request changes to all documentation comprising the technical data package. After review by program management, a change request is forwarded to the CMO who reviews and analyzes the ECN/ECRS for completeness, correct document change letter, and correct classification of the change. See Figure 4 for the change control process following establishment of a Product Baseline.

The PCCB secretary then assigns a change identification number and distributes the ECN or ECRS for review by the PCCB members.

The PCCB chairman will subsequently disposition the change request.

The ECN form is depicted in Figure 5. Instructions for completing the form are contained in the Aerojet Drafting Requirements Manual, Section 13, Volume 1-C.
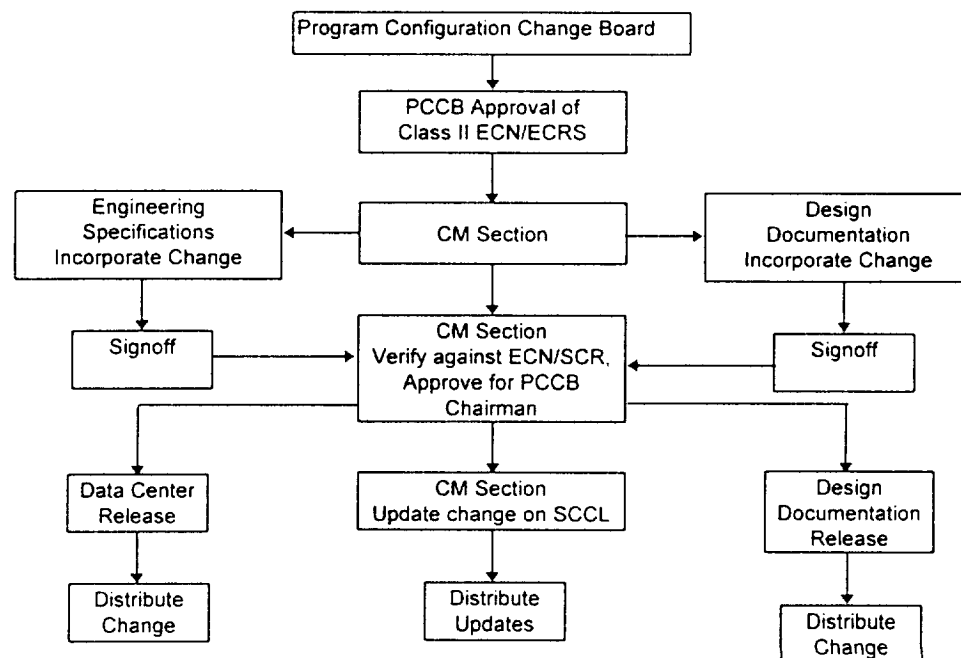
Figure 4   Aerojet Change Control Process Following PCCB Approval (Class II Changes)

GenCorp   ELECTRONIC SYSTEMS DIVISION   **ENGINEERING CHANGE NOTICE**
AEROJET   Azusa, California
CAGE Code 70143

ADVANCE REL ☐   INCORPORATE ☐   SHEET ____ OF ____

1. PROGRAM	2. ECN NUMBER	3. CONTRACT NUMBER	4. PREPARED BY / DATE / EXT						5. DOCUMENT NUMBER	6. NEW REV.

7. CHANGE CLASS.	8. MULTIPLE DOCUMENTS AFFECTED	9. CHG. TYPE	10. HARDWARE	EFFECTIVITY					11. DOCUMENT TITLE

7. CHANGE CLASS. ☐ I ☐ II   ECP # _____

8. ☐ YES ☐ NO

9. ☐ DOC. CHG. ☐ HARDWARE

10. HARDWARE PART NUMBER(S)

EFFECTIVITY: CURR MAND | REV LIST | NEW MAND | REV LIST | ☐ END ITEM S/N ☐ PART SERIAL/LOT NO. | DATE

12. DESCRIPTION OF CHANGE

13. SIGNATURES	CONCUR	DISSENT	14. JUSTIFICATION / REASON FOR CHANGE		16. DISPOSITION OF MATERIAL	USE AS IS	MODIFY	SCRAP	RETURN TO STORES
TECH. DIR.					ON ORDER				
ENGINEERING			15. REMARKS / SPECIAL INSTRUCTIONS / TECHNICAL EVALUATION		IN STOCK				
Q.A.					INSTALLED				
MFG.					20. CONFIGURATION MGR.				
DSN. ASSURANCE					21. DIST. CODE:		22. REL. DATE		
SPECS			17. DCMC CONCURRENCE OF CLASSIFICATION	18. CHANGE CODE	19. PCCB CHAIRMAN / PMO				
NASA COTR					APPROVE ☐ DISAPPROVE ☐	23. INCORPORATION TEAM LEADER _____		DATE __/__/__	
CHECK			DATE: / /		DEFER ☐ DATE: / /	CHECK _____		__/__/__	

Figure 5   Engineering Change Notice (ECN) Form

5.6.2 <u>**Engineering Change Proposal (ECP)**</u>– PCCB recommended Class I changes will be submitted as follows:

All Class IA changes shall be submitted for approval on the METSAT Configuration Change Request (CCR) form depicted in Figure 6. Signature authority for approval is defined by CCR Process requirements. Submittal requirements shall be as defined in CDRL 512. Figure 7 shows the Class IA submittal process.

Class IB changes shall be submitted for approval on the Aerojet ECN form (with attachments) depicted in figure 5. The CCR form is not required. Class IB changes require disposition in Block 13 of the ECN form by the Contracting Officer Technical Representative (COTR): concurrence indicates approval; dissent indicated disapproval. Figure 8 shows the Class IB change submittal process.

Each Class I change will be submitted in accordance with the CDRL, as an ECP documented on a METSAT Configuration Change Request (CCR), GSFC form 480-39. The CCR form is shown in Figure 6.

5.6.3 <u>**Specification Change Notice (SCN)**</u>– The SCN will be used when only a portion of a document is revised. The SCN form and instructions for preparing it are contained in MIL-STD-483, Appendix VIII and MIL-STD-490. See Figures 7 for Class IA changes and Figure 8 for Class IB changes.

5.6.4 <u>**Notice of Revision (NOR)**</u>– The NOR will be used to document all changes to NASA and other government documents and interface control documents not controlled by Aerojet. The NOR form and instructions for preparation are contained in MIL-STD-483, Appendix VIII and MIL-STD-490. The NOR will be included in the Class IA CCR.

Page 1 of 2

| POES CONFIGURATION CHANGE REQUEST | CCR Number: |
| | Date Issued: |

TITLE:								
Indicated By: _____	GSFC _____	Contractor _____	Class: 1___ 2	▆▆▆▆▆	Waiver _____	Deviation ___

EFFECTIVITY
Place an X in all affected instruments and/or spacecraft. (Interfaces MUST have both instrument and spacecraft indicated.) Indicate affected Serial Number(s) od Model(s)

S/C	Contract	X	Serial No.	Inst.	Contract	X	Serial No.	Inst.	Contract	X	Serial No.	Inst.	Contract	X	Serial No.
KLMNN	30350			AMSU-A	29403			AVHRR	30384			HIRS	30384		
					32314				32921				32921		
METOF	Eumet.			DTR	30801			SARR	Canada DoD			SARP-2	CNES		
					32543										
				SBUV	30355			DCS-2	CNES			SEM	92649D		
				AMSU-B	UKM-0			MHS	Eumet.						

1. DESCRIPTION OF PROPOSED CHANGE (NARRATIVE STATEMENT)

(Use attachments if necessary)

2. REASON FOR CHANGEE (STATEMENT OF HOWW REQUIREMENT FOR THE CHANGE DEVELOPED)

(Use attachments if necessary)

3. CONTRACTOR REQUIRES AUTHORIZATION TO PROCEED BY _____.

CHOOSE ONE OF THE FOLLOWING PROCUREMENT CLASSIFICATIONS: (EXPLAIN WHY)
___ EMERGENCY ___URGENT 1 ___URGENT 2 ___ROUTINE 1 ___ROUTINE 2 ___TD ___TA ___CO DIRECTION

(Use attachments if necessary)

4. CONTRACT DOCUMENT(S) (SOW, DPEC, PAR, GIIS, UIIS, Etc.) TO BE CHANGED
IDENTIFY DOCUMENT TITLE(S) – ATTACH CHANGE PAGE(S)

Figure 6   Configuration Change Request (CCR) Form (Page 1 of 2)

TITLE:	CCR Number:
	Date Issued:

5. IMPACT ANALYSIS Note: All items below must be checked off. If "Yes" - a comment is required. (Reference item n0.(s) to impact comment(s).)

	Item	Impact			Item	Impact	
		Yes	No			Yes	No
1.	Attitude Control			14.	Instrument		
2.	Flight Software			15.	Harness		
3.	Materials			16.	Test Procedures		
4.	Reliability			17.	Interface		
5.	Weight			18.	Safety		
6.	Power			19.	Launch Vehicle		
7.	Structure			20.	Mission Operations		
8.	Telemetry			21.	Schedule Effect		
9.	Command			22.	Engineering Hours		
10.	Communications			23.	Manufacturing Hours		
11.	Data Handling			24.	Material Cost		
12.	Thermal			25.	Performance		
13.	GSE						

5A. Impact Comments:

6. IN-HOUSE COST ESTIMATE ATTACHED? ____ YES ____ NO
      SCHEDULE IMPACT DATA ATTACHED? ____ YES ____ NO

_____   _____
Originator   Date

7. GSFC CONFIGURATION MANAGEMENT OFFICER

____ Submit for CCB Review
____ Submit for Mini CCB Review   _____
____ Bypass CCB, submit to PM   init.

Figure 6   Configuration Change Request (CCR) Form (Page 2 of 2)

```
┌─────────────────────────────────────────┐
│      Program Configuration Change Board  │
└─────────────────────────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │     PCCB Approved      │
        │   Class IA ECN/ECRS    │
        └───────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │   CM & Engineering     │
        │     Specifications     │
        │       Prepare          │
        │     ECP/CCR/SCN         │
        └───────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │    PCCB Members &      │
        │    Program Manager     │
        │   Review and Approve   │
        │     ECP/CCR/SCN         │
        └───────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │    CM & Contracts      │
        │       Submit           │
        │     ECP/CCR/SCN         │
        │     Under CDRL          │
        └───────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │       Customer         │
        └───────────────────────┘
```
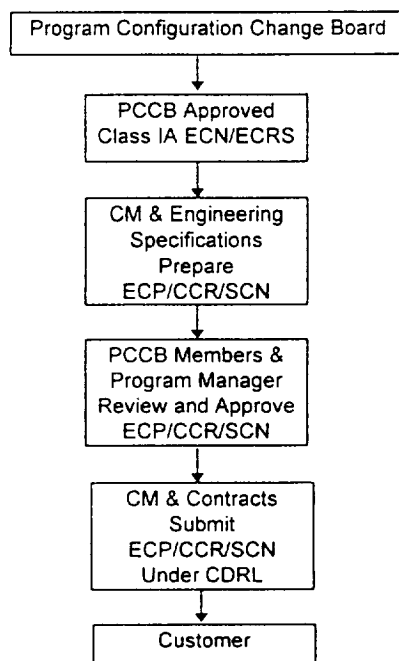
Figure 7   Aerojet Change Control Process Following PCCB Approval (Class IA Changes)

```
┌─────────────────────────────────────────┐
│      Program Configuration Change Board  │
└─────────────────────────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │     PCCB Approved      │
        │   Class IB ECN/ECRS    │
        └───────────────────────┘
            │               │
            ▼               ▼
   ┌────────────────┐  ┌────────────────┐
   │      CM        │  │   Engineering   │
   │  Prepare ECN   │  │  Specifications │
   │    Package     │  │  Prepare SCN    │
   └────────────────┘  └────────────────┘
            │               │
            ▼               ▼
        ┌───────────────────────┐
        │    PCCB Members &      │
        │    Program Manager     │
        │   Review and Approve   │
        │       ECN/SCN          │
        └───────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │    CM & Contracts      │
        │       Submit           │
        │       ECN/SCN          │
        │     Under CDRL          │
        └───────────────────────┘
                    │
                    ▼
        ┌───────────────────────┐
        │       Customer         │
        └───────────────────────┘
```
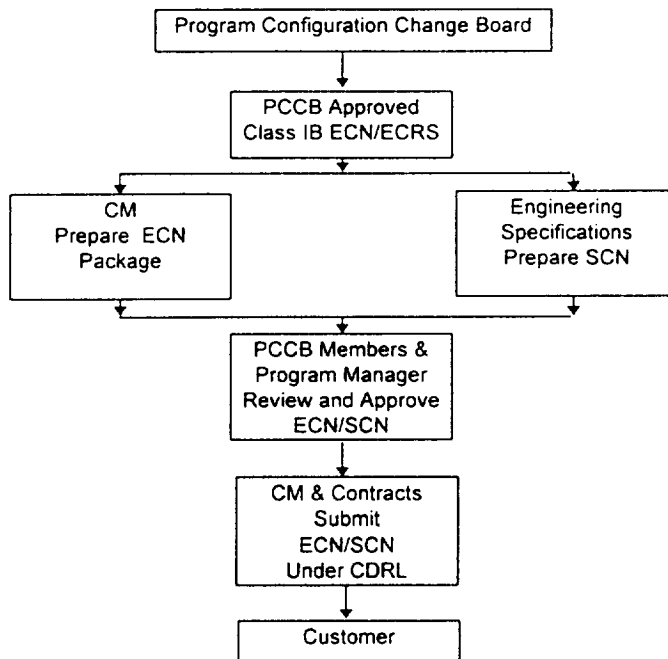
Figure 8   Aerojet Change Control Process Following PCCB Approval (Class IB Changes)

Section 6

CONFIGURATION STATUS ACCOUNTING FOR HARDWARE

Configuration Status Accounting is the recording and reporting of the information needed to effectively manage the configuration of an item, and includes a listing of the approved configuration identification (baseline data), the status of proposed changes to the configuration, and the implementation status of approved changes.

6.1   **Controlling Lists**– The following lists are part of the configuration accounting system, and provide a status of change activity against established customer baselines (e.g., allocated and product). These lists will be prepared and maintained using Aerojet-established formats and procedures.

6.1.1   **Master Configuration Control List (MCCL)**– The MCCL is generated from the Engineering Bills of Material. It will depict the approved configuration of a CI and its lower-tier assemblies, subassemblies, piece parts, and components. The mandatory configuration of all Aerojet components acceptable for use in each CI will be listed by part revision. This list provides the Program Office, Manufacturing, Performance Assurance, Materiel, and Engineering with a common database of the current configuration. The list may be formatted in either of the following:

        a.   Indentured Parts List (IPL)–The IPL indicates the indentured position of the assemblies, subassemblies, piece parts, and processing specifications and standards that are identified as being a part of the Integrated AMSU-A, from the top assembly down.

        b.   Where-Used List (WUL)–The WUL is an alphanumeric list of all assemblies, subassemblies, piece parts, and specifications and standards used on the CI. This list also contains their next higher assembly, next higher assembly revision level, effectivity, quantity, and description.

The MCCL is maintained in the Cincom MRP II database on the IBM mainframe. This database is security protected and only Configuration Management has authorization to make additions to and modify the Engineering bills of material. CM is also responsible for maintaining the manufacturing bills of material as directed by Manufacturing Engineering.

Once the engineering drawing is released, the bills of material are revision controlled with the drawing.

6.1.2   **Engineering Change Notice Log (ECNL)**– The ECNL identifies all ECN submitted to the PCCB for approval. This list contains the ECN number, issue date, affected document number, current revision level, change effectivity, classification of change, PCCB approval/disapproval date of incorporation, and, if Class I, the ECP number.

6.1.3   **Engineering Change Proposal List (ECPL)**– The ECPL identifies all ECP submitted to the customer. This list contains the ECP number, document affected, the proposed SCN or NOR revision level, the date of submission, the customer approval/disapproval date, and any pertinent comments.

6.2   **Drawing Tree**– The drawing tree for each configured item depicts the hierarchy from the top assembly down to the subassemblies, including Aerojet-designed detail parts. CM controls the assignment of drawing numbers and ensures the integrity of the drawing trees.

Section 7

CONFIGURATION VERIFICATION

7.1 **Verification of Change Approval and Incorporation in Hardware (As-Designed/As-Built Record)**– Approved engineering changes made to drawings will be verified by CM following incorporation by means of internal checking and review and approval activities. Approved changes made to CI will be verified by Quality Assurance (QA) following incorporation.

The verification system will ensure that the released manufacturing, planning, and inspection records reflect the incorporation of the released engineering documentation and all approved changes into the hardware and software.

7.2 **Configuration Verification**– To ensure compliance with contract CM requirements, QA will conduct continuous configuration surveillance (internal audits). QA surveillance procedures, that are in place at Aerojet, are performed according to an appropriate schedule which is compatible with the overall program schedule EOS/AMSU-A.

QA surveillance is made of such activities as:

a. Production and inspection methods for implementing design changes, including related record maintenance.

b. Quality control system for serial number control of equipment and verification of change incorporation into the equipment.

c. Manufacturing process paper used for assuring correct drawing and ECN issue to the line.

Section 8

CONFIGURATION CONTROL OF SOFTWARE AND FIRMWARE

8.1 <u>Software Configuration Management</u>– All releases and changes thereto for software and firmware to be included in the deliverable configuration are verified by the CMO, recorded in the SCCL, and retained in the Software Development Library (SDL).

8.2 <u>Configuration Baseline Identification</u>

8.2.1 <u>Allocated Baseline for Software</u>– The Allocated Baseline for the CSCI is established at the start of the program by the GSFC Performance and Operation Specification for the Integrated AMSU-A Integrated Programs AMSU-A Instrument, S-480-80.

8.2.2 <u>Functional Baseline</u>– The Functional Baseline for the CSCI shall be established by customer approval of the Software Requirements (SR) and the Software Architecture Requirements Specifications (SARS). In addition, Aerojet is responsible for the preparation, submittal and approval of the Software Design Documents (SDD).

8.2.3 <u>Product Baseline Identification for CSCI</u>– The Product Baseline Identification will be established upon successful completion of the Software Acceptance Review.

The SDL will also be the repository for all electronic media containing acceptance test data.

8.2.4 <u>Preliminary Design Review/Requirements Review</u>– The following CSCI documents will be placed under formal configuration control upon approval by GSFC:

      a.   Software Management Plan

      b.   Sustaining Engineering and Operations Plan

      c.   Software Test Plan

      d.   Software Requirements Specification

      e.   Software Architecture Design Document

8.2.5 <u>Critical Design Review (CDR)</u>– The following software CI documents will be placed under formal configuration control upon approval by GSFC:

      a.   Software Detail Design Document

      b.   Software Test Plan

8.2.6 <u>Coding and Unit Testing Phase</u>— During the coding and unit testing phase, the source code, object code, and associated output listings and magnetic media for each successfully tested and reviewed unit shall be entered into the SDL for each CSCI.

8.2.7 <u>Computer Software Component (CSC) Integration and Testing Phase</u>— During the CSC integration and testing phase, all iterative updates to the design documentation, source code, object code, and associated listings and magnetic media shall be entered into the SDL.

8.3 <u>Software Development Library (SDL)</u>— An SDL shall be established as a repository for all Integrated AMSU-A software and documentation. The SDL provides a centralized location for storage, handling, and release of project media. It is under the control of the Integrated AMSU-A Configuration Management Officer who controls all access to the contents. All Integrated AMSU-A documentation is controlled by Configuration Management, and access to documents ancillary to the software development are controlled in a similar manner to the SDL.

All data entering the SDL are assigned a unique identifier and indexed by CSCI number, version, description, and media. This index is maintained on PC-based software and is routinely updated and distributed to the Integrated AMSU-A Software Product Team.

Contents of the SDL can be checked out by team members. The name of the team member and the date an item is checked out or in is recorded in the SDL Index. The name of the last person checking out an item is maintained in the index in the event anything is missing.

Employees leaving Aerojet's employment are required to check out through CM as a part of their exiting process.

8.4 <u>CSCI and Related Documentation</u>— The CSCI will be identified by the location of where the Software processing will occur. Aerojet has assigned the following CSCI identifiers:

<u>CSCI Name</u>	<u>CSCI No.</u>
Special Test Equipment, EOS/AMSU-A1	N5
Spacecraft Workstation, EOS/AMSU-A1	N6
Instrument Control Firmware, EOS/AMSU-A1	N7
Command and Data Handling Firmware, EOS/AMSU-A1	N8
Special Test Equipment, EOS/AMSU-A2	N9
Spacecraft Workstation, EOS/AMSU-A2	N10
Instrument Control Firmware, EOS/AMSU-A2	N11
Command and Data Handling Firmware, EOS/AMSU-A2	N12

8.4.1 <u>Computer Software Components (CSC), Special Test Equipment</u>– The CSC of the Special Test Equipment will be identified by the prefix A1 or A2 if unchanged from the NOAA/AMSU-A project, or by the prefix E1 or E2 if modified, followed by a 4-digit number related to the function they will perform. This number system is described in Report 10432. The identifier following the number will relate further to its function and will be up to 24 additional characters in length.

8.4.2 <u>Computer Software Components (CSC), Spacecraft Workstation</u>– The Computer Software developed for the Spacecraft Workstation does not consist of CSC, but instead, a data-base system in which data-base tables are generated within the OASIS-CSTOL environment. No CSC identifiers will be used.

8.4.3 <u>Computer Software Components (CSC), Instrument Control</u>– The Instrument Control CSC will be identified by an abbreviation or acronym of the function they perform.

8.4.4 <u>Computer Software Components (CSC) - Command and Data Handling</u> <u>Firmware</u>– The Computer Software Components (CSC) of the Command and Data Handling Firmware will be identified by an abbreviation or acronym of the function they perform.

8.4.5 <u>Related Documentation</u>– Numbering and revising of specifications will comply with MIL-STD-490, and will follow the Aerojet Product Standardization Manual, Volume I-D, *Specifications and Standard Practices*.

8.5 <u>Configuration Control</u>– Formal baseline configuration control software documents will be implemented upon approval by GSFC. Internal configuration control will be implemented on the Development Configuration during its development. Immediately prior to the Test Readiness Review (TRR), formal configuration control will be implemented.

8.5.1 <u>Flow of Configuration Control</u>

8.5.1.1 <u>Formal Configuration Control</u>– Immediately prior to the start of the Test Readiness Review (TRR), the software will be placed under formal configuration control.

8.5.1.1.1 <u>Changes to Documentation</u>– Formal changes to the CSCI may be generated within Aerojet or by GSFC. Formal changes are initiated by a product team member with the origination of an Engineering Change Notice (ECN) for design documentation and a Engineering Change Request Software (ECRS) for source code. The formal baseline configuration control processing flow, up to the Program Configuration Change Board (PCCB) is depicted in Figure 3.

8.5.2 <u>Reporting Documentation</u>

8.5.2.1 <u>Engineering Change Request - Software (ECRS)</u>– An ECRS is used for *documenting* problems, improvements, and modifications to the AMSU-A/EOS CSCIs. An ECRS will document a detailed description of the software change and will be reviewed by the PCCB for approval. An ECRS is depicted in Figure 9.

10-009-051(REV 1-88)/STK NO. A-7-041   **AERDJET ELECTROSYSTEMS COMPANY**

SHEET 1 OF

ENGINEERING CHANGE REQUEST · SOFTWARE	CONTRACT NO.	DATE	ECRS NO.

ORIGINATOR	NAME	ORG.	BLDG.	EXT.	CPCI NO.	PROGRAM

PROGRAM/ROUTINE/REVISION LETTER	CPCI NAME	NAME/TITLE

DESCRIPTION OF CHANGE

☐ THIS ECRS IS PART OF ECRS/ECP _____

☐ THIS ECRS IS NOT PART OF ANOTHER ECRS

☐ DOCUMENTS AFFECTED BY THIS CHANGE _____

JUSTIFICATION OF CHANGE

SIGNATURE	DATE

TECHNICAL EVALUATION (PROJECT OFFICE)

PROJECT ENGINEER SIGNATURE	ORG.	EXT.	DATE	WALK IN AUTHORIZATION

EFFECT ON CONTRACT COST	EFFECT ON SCHEDULE	DR/SCR NO.

ECRS DISPOSITION	ECRS PRIORITY	IMPACT

ECRS DISPOSITION

IMPROVEMENT ☐

CORRECTION ☐

NEW PROGRAM ☐

OTHER _____ ☐

PCCB DECISION

APPROVED ☐   DISAPPROVED ☐

DEFER UNTIL / /

COMMENTS

ECP NOT REQUIRED ☐

INITIATE ECP ☐

ECP NO. ASSIGNED _____

DOCUMENTATION RELEASE

AUTHORIZED ☐

NOT AUTHORIZED ☐

PROGRAM DIRECTIVE

REQUIRED ☐

ECRS PRIORITY

EXPEDITE ☐

ROUTINE ☐

INCORP. NEXT REV. ☐

CHANGE CLASSIFICATION

CLASS I ☐

CLASS II ☐

SPECIAL INSTRUCTIONS

PCCB SECRETARY

IMPACT				
TIMING		CORE STORAGE		
TEST PROCEDURE		INTERFACES		
MANUALS		TRAINING		
HARDWARE		SPECIFICATIONS		
SIGNATURES		EFFECT ON BUDGET	NA	CON-CUR	DIS-SENT
PROJECT ENGINEERING					
SOFTWARE ENGINEERING					
SUPPORT SYSTEMS					
QUALITY ASSURANCE					
TEST OPERATIONS					

PCCB CHAIRMAN SIGNATURE:	DATE	DCASO CONCURRENCE WITH CHANGE CLASSIFICATION

Figure 9   Engineering Change Request Software Form

8.5.2.2 **Engineering Change Notice (ECN)**– When requesting a change to a released specification or design document, an ECN Form will be initiated. The ECN form is depicted in Figure 5. Instructions for completing the form are contained in the Aerojet Drafting Requirements Manual, Section 13, Volume I-C.

8.5.3 **Engineering Change Proposal (ECP)**– See 5.6.2 of this plan.

8.5.4 **Specification Change Notice (SCN)**– See 5.6.3 of this plan.

8.5.5 **Notice of Revision (NOR)**– The NOR will be used to document all changes to NASA and other government documents and interface control documents not controlled by Aerojet. The NOR form and instructions for preparation are contained in MIL-STD-483, Appendix VIII, and MIL-STD-490. The NOR will be included in the Class IA CCR.

8.6 **Review Procedure**

8.6.1 **Program Configuration Change Board (PCCB)**– Refer to 5.2 of this plan.

8.6.2 **Storage, Handling, and Delivery of Project Media**– An SDL will provide a centralized location for the storage, handling, and release of project media. Centralization provides the following advantages:

    a.   Storage and circulation of software and baselined documents can be managed more efficiently.

    b.   Identifiers can be assigned and controlled according to established procedures.

    c.   Access to software and documents can be controlled.

    d.   The accuracy of change status accounting and reporting can be assured.

The software source code contained within the SDL will be delivered on either magnetic tape or floppy disk.

8.6.3 **Additional Control**– Configuration Management activities are integrated with other Integrated AMSU-A activities to the extent necessary to keep the program office appraised of the configuration status of the Integrated AMSU-A software at any particular point in time, and of the status of SCN, ECP, ECN/ECRS and other configuration documentation. Delays that would result in potential schedule slippage (such as late receipt of inputs or delays in signoff for specifications, test documentation, ECP and SCN) are brought to the attention of the program office.

The Integrated AMSU-A Program Manager is responsible for maintaining the relationship of the CSCI level to the Work Breakdown Structure (WBS) for control of work authorization, scheduling, and cost. CM is responsible for advising the Program Manager of any problems that may result in a schedule slippage for events critical to configuration management.

8.7 **Configuration Status Accounting for Software**– Configuration Management accounting reports provide the current status of the Integrated AMSU-A specifications, design documents, and test documents.

8.7.1 **Controlling Lists**– The Status Accounting reports for software are listed below.

8.7.1.1 **Software Configuration Control List (SCCL)**– Configuration of the CSCI and its documentation.

8.7.1.2 **Software Engineering Change Notice (ECN) Log**– Log of all requested configuration changes for Software documentation.

8.7.1.3 **Unincorporated Software ECN List**– List of all approved unincorporated changes.

8.7.1.4 **Engineering Change Proposal List (ECPL)**– Status of all software ECP.

8.7.1.5 **Software Change Request (SCR) Status**– A log of all requested configuration changes to source code.

8.8 **Preparation for Specification Approval**– All documentation that requires approval will be submitted as an "Approval Draft" and on white paper. Upon receipt of a letter from the Contracting Agency approving a document without comments, Configuration Management/Data Management (CM/DM) will request Engineering Specifications to produce an updated document with a new date. CM/DM will then submit it to GSFC as "Final".

Upon receipt of a contract letter from the Contracting Agency approving a document with comments, CM/DM distributes the letter and the comments for internal approval. Upon internal approval, the originator of the document incorporates the comments and presents CM/DM an updated document. The document will then be submitted to the Contracting Agency as " Final " and will carry a new date. Prior to submittal to the Contracting Agency, CM/DM reviews the updated document for assurance of correct incorporation of the contractor's comments and updates the CM status accounting record to reflect the release of the approved and authenticated document.

If the Contracting Agency disapproves a document, each subsequent submittal of that document will be labeled "Approval Draft", with a new date. Once it is approved by the Contracting Agency, "Approval Draft" will be removed from the cover, a new date will be added, and the document will be submitted to the Contracting Agency as "Final".

8.9   <u>Configuration Management Major Milestones</u>– The major internal and NASA configuration management-related milestones for the life-cycle phases of the Integrated AMSU-A CSCI are depicted in Table I.

Table I   Configuration Management Major Milestones

MILESTONES
Critical Design Review (CDR)
Calibration Peer Review (CPR)
Manufacturing Readiness Review (MRR)
Test Readiness Review (TRR)
Software Acceptance Review (SAR)
Pre-Environmental Test Review
Post-Environmental Test Review
Pre-Ship Review

ACRONYMS/ABBREVIATIONS

AMSU-A	Advance Microwave Sounding Unit A
APD	Aerojet Policy Directives
CAD	Computer Aided Design
CCR	Configuration Change Request
CDR	Critical Design Review
CDRL	Contract Data Requirements Lists
CI	Configuration Item
CM	Configuration Management
CMO	Configuration Management Officer
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
DID	Data Item Descriptions
DM	Data Management
DRB	Dissent Review Board
ECN	Engineering Change Notice
ECNL	Engineering Change Notice Log
ECP	Engineering Change Proposal
ECPL	Engineering Change Proposal Log
ECRS	Engineering Change Request Software
EOS	Earth Observing System
GSFC	Goddard Space Flight Center
GSE	Ground Support Equipment
IPL	Indentured Parts List
MCCL	Master Configuration Control List
METSAT	Meteorological Satellite
NOAA	National Oceanic Atmospheric Administration
NOR	Notice of Revision
PCCB	Program Configuration Change Board
PDMS	Product Data Management Systems
PDR	Preliminary Design Review
PLO	Phase-Locked Oscillator
QA	Quality Assurance
SARS	Software Architecture Requirements Specifications
SCCL	Software Configuration Control List

SCN	Specification Change Notice
SDL	Software Development Library
SDD	Software Design Documents
SDL	Software Development Library
SDRL	Subcontract Data Requirements List
SOW	Statement of Work
SPS	Software Product Specification
SR	Software Requirements
SRS	Software Requirements Specification
TRR	Test Readness Review
WBS	Work Breakdown Structure
WUL	Where-Used List
2D	Two Dimensional
3D	Three Dimensional

NASA
National Aeronautics and
Space Administration

Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
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16. ABSTRACT *(Maximum 200 words)*

This is the Configuration Mangement Plan for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A)

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13. ABSTRACT (Maximum 200 words)

This is the Configuration Management Plan for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).

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Integrated Advanced Microwave Sounding Unit A (AMSU-A) Configuration Management Plan	Report 9803-2 20 March 1996

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