SPIRE

SUBJECT: **SPIRE Configuration Management Plan**

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Issue 1.1	9th August 2001	Appendix A (Live-Link information) added.
Issue 1.2	31 October 2001	Various changes on most pages to bring it up to date with current practises
Issue 1.3	20 December 2001	Configuration of Software changed to conform with current practice
Issue 1.4	23 September 2008	Updated EGSE software section to say it is treated in the same way as ICC software.

1.

Glossary

PROJECT/SSTD	Rutherford Appleton Laboratory Space Science and Technology Department
ADP	Acceptance Data Package
CCB	Configuration Control Board
CCN	Change Control Notice
CDR	Critical Design Review
CI	Configuration Item
CID	Configuration Item Data
CMP	Configuration Management Plan
CSL	Configuration Status List
CVS	Concurrent Versions System
DDR	Detailed Design Review
DRL	Document Requirement List
ECP	Engineering Change Proposal
ECR	Engineering Change Request
GSE	Ground Support Equipment
ICC	Instrument Control Center
NCR	Non Conformance Report
PAD	Parts Approval Document
PDR	Preliminary Design Review
PT	Product Tree
RFW	Request for Waiver
SQA	Software Quality Assurance
SW	Software
TRR	Test Readiness Review

Customer	RAL
Supplier	Sub system or sub contractor

1. INTRODUCTION

Configuration management is the establishment and control of the configuration status of the project and forms the basis for an efficient comparison between the nominal and actual status at any time.
Configuration management is oriented towards the clear definition of the design configuration, establishment of a technical baseline and the management of any changes to that baseline.

2. CONFIGURATION MANAGEMENT SUMMARY

2.1. Scope of Document

This Configuration Management Plan (CMP) describes the Configuration and Data management controls and activities to be implemented by the Rutherford Appleton Laboratory Space Science and Technology Department (PROJECT/SSTD) on behalf of the Customer. These activities apply during the design, manufacture, assembly and test of the SPIRE hardware and software produced by PROJECT/SSTD and any SPIRE agencies i.e. sub contractors or agencies at all levels.

The requirements described herein apply to the following: -
All flight and flight spare models
All hardware subjected to or participating in design verification or qualification testing
All deliverable ground support equipment (GSE) and for GSE with direct interface with hardware
All flight software, checkout software, and performance evaluation software

This CMP defines the way in which configuration management of the project shall be applied to ensure that:

1. A configuration baseline shall be established to identify and define, through specifications, relevant documentation and associated data the requirements for all end items.
2. Each document identifying the configuration of a Configuration Item (CI) can be uniquely identified and related to the hardware and/or software.
3. The design/build standard of the CI is defined at all times
4. Effective change control is established and maintained
5. All affected parties are informed and aware of the impact of proposed changes and actively participate in their evaluation
6. Project documentation is received, recorded, actioned and released in an orderly and consistent manner.

3. DOCUMENTS

3.1. Applicable Documents

AD1 SPIRE Product Assurance Plan (SPIRE-PROJECT-PRJ-000017)

3.2. Reference Documents

RD1 SPIRE Document Management Plan (SPIRE-RAL-PRJ-000032)
RD2 DPU/ICU Onboard Software Product Assurance Plan. (IFSI/OBS/PL/2000-001)
RD3 Spire ICC Configuration Management Plan. (SPIRE-RAL-PRJ-001106)

4. CONFIGURATION MANAGEMENT REQUIREMENTS

4.1. General

All supplied hardware/software and associated GSE and associated test equipment is defined by a set of specifications and drawings etc. These documents/drawings shall be updated to reflect the current configuration of the equipment. The process of changing the requirements or design shall be controlled by the formal procedures described below These activities are applicable to both hardware and software.

The Configuration Manager or his delegated deputy shall be responsible for configuration control to ensure the implementation of the following system and perform the function of Configuration manager.

4.2. Configuration Baseline Management

The formal departure point for control of future changes is the current configuration baseline design. At key points in the programme i.e. major reviews the current baseline will be defined and approved allowing work to progress to the next stage.
The baseline design shall be established by a set of design documents approved by the HERSCHEL Customer during review action
The baseline will be updated as the design and test programme progresses.
A Configuration Status List shall be prepared for each baseline or Model and or sub system, which identifies the documents and their current issue. The list shall reflect the history of the design showing the dates of all the revisions and reference all change notices.

4.2.1. System Requirements Baseline

The system requirements baseline is established with the approved system specifications related system support specifications, system level interface specifications, instrument specifications and instrument interface specifications. The baseline shall also include the relevant plans.

4.2.2. Development Baseline

The development baseline consists of the documents identified in the systems requirements baseline (above) together with the approved subsystem specifications, equipment specifications and related interface control documents.
This is based on the Detailed Design Reviews (DDR) .

4.2.3. Production Baseline

The production baseline is defined by the set of documents, which are current on completion of the programme and will deal in particular with engineering drawings and unit related test documentation. This baseline is established at the **CRITICAL DESIGN REVIEW** (CDR) on completion of qualification testing, thus allowing **FLIGHT** build to commence,.

4.2.4. Final Configuration Baseline

The Final configuration baseline is in two parts: -

- **“AS DESIGNED” BASELINE/CONFIGURATION**, Which follows on from the production baseline and is the starting point for the Flight build and takes into account “approved” changes.

- **“AS BUILT” CONFIGURATION**: The configuration above plus all NCR’s/waivers, change documents etc. approved between the CDR and Flight delivery. All this information to form part of the delivered ADP together with all other “As Built” data.
This baseline will normally be established for Test Readiness Reviews (TRR’s) and technical acceptance reviews prior to delivery.
Flight Spare configuration would normally be as per the “As Built ” version above; any further changes shall be documented and approved in the normal way.
Additional acceptance reviews may be required if changes have taken place between F and FS.

5. ORGANIZATION

5.1. Organizational Structure

5.2. Sub-Contractor Configuration Management

All Suppliers shall comply with the requirements described in this document. All changes must be recorded and approved by the local CCB and any that effect interfaces shall be formally recorded and passed up to the CCB to be actioned.

5.3. Configuration Control Board

5.3.1. General

All proposed changes to the valid technical baseline shall be considered by the CCB for impact assessment and eventual decision. The responsibility for formal change is vested in the Configuration Control Board (CCB*). At the Customer level this will be a sub set of the Project team and will meet as an extension to the regular Project Team meetings. The board will normally consist of the Project manager, Systems Engineer, PA manager, Configuration manager and any other co-opted expert(s).*

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5.3.2. Responsibilities

The tasks and responsibilities of the CCB may be summarised but not limited to the following: -

a) Review, approve/disapprove and classify proposed changes and waivers.
b) Coordinate reviews with respective activities.
c) Determine whether the proposed change is a mandatory change.
d) Return disapproved changes to their originators with instructions for further action.
e) Periodically hold" change status" meetings at which all past changes related to hardware status are reviewed.
f) Ensure CCB actions are fed back to the suppliers in a timely way.
g) Assessment of schedule, financial and contractual impacts.
h) Include software changes in the above activities.
I) Be the final technical authority for approval/disapproval of changes.

6. CONFIGURATION IDENTIFICATION

6.1. General

This function consists of the provision of the technical description of the equipment as set forth in the configuration identification documentation comprising specifications, drawings and parts lists, procedures, reports and manuals as well as the assignment of unique identification numbers to each document/drawing and the physical identification of the related hardware and software.
The configuration identification shall be applied to: -
a) All approved and released engineering documentation,
b) All parts, tools, equipment and assemblies specified in drawings and specifications,
c) All delivered items including parts, equipment, documents and computer software.
The sum of these configuration identification documents provide the media for the controlled definition of the product

6.2. Configuration Item (CI)

A configuration item is an aggregation of hardware, software or any of its discrete portions, which satisfies an end use function and is designated for configuration control.

6.3. Configuration Item Selection

The selection of these items for configuration control is based on the following criteria: -

- The item requires planning, programme, cost and performance data
- The item is subject to separate qualification and/or acceptance testing
- The item may be procured on a contract which requires design responsibility
- The item is deliverable
- The item may be procured in the assembled condition (e.g. as a spare)
- Maintenance.

The CI selection process is one of separating the elements of each product produced into individually identified subsets for the purpose of managing their physical and functional characteristics.
Normally, selection of a CI is made at the highest practicable level of assembly, however in some cases lower levels may be used.

6.4. Product Tree (PT)

Items selected as CI's are listed in the Product Tree.

6.5. Configuration Item Numbering

The CI number usually consists of a prefix "CI" and a number of digits, e.g. CI TBD.
However as "SPIRE" comprises of a Quantity of Sub-systems from a variety of institutions etc, a different system is envisaged:
The "Description" & "Model", as listed on the Product Tree will be used to identify each item as required.
It is each institutes responsibility to ensure each item is identified as required and to ensure that the control and traceability of all items is maintained accordingly.

6.6. Configuration Item Documentation

The configuration of each CI will be identified through design documentation (i.e. specifications, procedures, plans, drawings, lists, etc).
For each model delivered a Configuration Item Data List will be supplied.

6.7. Product Identification

6.7.1. Document Identification

Documents shall be assigned a unique identification number which once assigned shall not be reassigned, this is to provide the means by which the documents can be readily associated with the configured items they support.
The following main categories of documents for hardware and software shall be covered: -
Specifications, plans, drawings, lists, control documents (test plans, test procedures, test reports), change proposals and administration controlled documents.
The Customers documentation numbering system as defined in "SPIRE Document Management Plan (RD1), shall be used for guidance.

The SPIRE Project Office shall maintain a project document register and copies of all controlled documents including externally produced interface and assembly drawings will be listed. (See Appendix A)
The Project office shall be responsible for the distribution of all controlled documents including approved masters.
Drawings (electrical/electronic and mechanical), drawing lists and modification sheets will be stored within the drawing office system used by sub contractors, Paper copies / electronic copies being made available for use in ADP's etc.

Where an institute has a suitable drawing standard and numbering system this can be used, if not the PROJECT drawing standard and numbering system detailed below can be adopted.

The PROJECT drawing standard, numbering system and in house procedure is shown below.
The sub contractors/institute drawing office manager will allocate the drawing and modification sheet numbers.
Interface drawings requiring customer approval and top level assembly drawings will be assigned a specific document number (i.e. PRJ-xxxxxx and placed on Live Link) as well as the in house number.

Note: The PROJECT drawing takes the form: -
e.g. 0 KE 0113 699 00 B which may be interpreted as follows;

0		*Sheet size*
	K	Department code
E		*Division code*
0113		*Job number*
699		*Sequence number i.e. individual drawing number*
00		*Sheet number, note 1*
B		*Issue letter, note 2*

Note 1
Sheet number Where drawing consists of a single sheet, this will be sheet 00. Where drawing consists of more than one sheet, sheet numbers will start from 01 and increase sequentially.

Note 2
An alphabetical letter, the original issue being A, will indicate the issue number.

6.7.2. Hardware Identification

All items of hardware listed in the product tree will be marked in order to achieve configuration traceability. Where the physical size of a CI precludes marking the item itself, a “bag and label” technique shall be used.

As a minimum the identification shall include: -

- CI number (from product tree)
- Drawing Number (or extract from drawing number) with issue/rev.
- Supplier
- Date
- Serial number if appropriate.

Note: The model identifier i.e. Avionics Model, Cryogenics Model, Proto-Flight, or Flight Model is contained within the CI number

Lower level assemblies and parts will be identified by
a) Part name
b) Part number

Both of the above being taken from the current controlling drawing the part number being an abridged version of the drawing number.

Unique serial numbers will be allocated to lower level items as appropriate to meet Product Assurance traceability requirements.

6.7.3. Software Identification

Each software package will be allocated a CI number.
Each package has been broken down into executable components, which are the lowest controlled level to be tested as an entity. These are identified, named and described in the Architectual Project Design Documents.
Each component shall be identified within the header using the File (module) identifier/component identifier/version/date.

e.g.	File (module)	Component	Vers.	Date
	TBD	TBD	0.1	11/01/00

The Data carrier of the software (disc/tape) will be permanently marked with the following information:-

Project name:	SPIRE
Supplier:	XXX
	CI number
	S/W title
	Module title (if applicable)
	Version number and date.
	Release status

6.7.4. Firmware Identification

Firmware (i.e. programmable semiconductor devices) produced for the project will provide: -

a) Identification of the un-programmed device.

b) Programming and validation instructions, which clearly identify the programme, source documents.

c) Identification and control of design build standard of the programmed device.

d) Any special instructions such as burn in procedures.

e) Identification of specification and standards for part marking, handling, packaging and storage of the programmed device.

The programmed device will be marked with an identification code. An accompanying label will identify the: -

Project name:	SPIRE
Supplier:	XXX
	The part number
	Identification code (i.e. File/module name, version)
	Date of programming
	Status
	Checksum
	Any special handling instructions.

In cases where SW will require more than one programmed device the accompanying documentation shall contain information on the individual devices the SW stored in each being traceable using the unique device number.

It shall be clearly stated which is the correct position on the PCB in cases where more than one position is possible.

The checksum for the whole SW shall be contained in the Software Configuration List and be part of the accompanying documentation.

7. CONFIGURATION CONTROL

7.1. Configuration Change Control

The primary purpose of this function is to provide an efficient system by which changes are proposed, evaluated and approved or disapproved.
The first milestone for document approval is the Detailed Design Review. Change control will commence with the approval of the documents submitted and continue through all project phases to delivery.

7.1.1. Change Initiation,

All changes will be processed in the same manner, through the hierarchy of the CCB Changes may be originated by the Supplier or Customer.

7.1.2. Change Processing and Approval

All changes will be submitted to the appropriate CCB within the hierarchy. Each change will be evaluated for its effects on physical, functional, and procedural Project interfaces, performance, cost, schedule, operational effectiveness, logistics, support equipment, training and multiple use of the affected configuration.
The alternative of not introducing the change shall also be considered.
Changes shall be limited to those necessary to correct design deficiencies, offer significant improvements or benefits to operational use, make cost savings or prevent slippage in schedules.
Changes approved by the CCB will then be submitted to the next level in the hierarchy for approval using an Engineering Change Request (ECR) if it affects any interface ref. PA Plan

7.1.3. Change Review Board

In cases where approval cannot be granted by normal means, e.g. in cases of disagreement or where further discussion is required a change review Board will be set up consisting of the Supplier and Customer and, assisted by specialists as required.
The CRB will be chaired by the Project Manager or appointed deputy.

7.1.4. Change Priorities and Numbering

7.1.4.1.Change Priority

Change requests will be assigned priorities based on their criticality. In cases of emergency priority shall be given by all parties to review and approve or disapprove the change.

7.1.4.2.Change Numbering

Change requests will be numbered in line with project documentation identification procedures.

7.1.4.3.Engineering Change Request (ECR) Submission

In certain circumstances (e.g. to maintain a schedule) an Engineering Change Request may be used prior to a CCN in order to speed up the decision process.

7.1.5. Change Implementation and Incorporation

Implementation of the change shall not commence prior to written authorisation or approval from the Customer. In cases where this procedure is not followed the resulting consequences shall be borne by contractor.
Upon receipt of approval the necessary action shall be taken to incorporate the change, this to include up-issuing all affected documents.

7.1.6. Change Verification

Changes will be verified by the normal series of inspections, tests and reviews.

7.1.7. Interchangeability

All changes that affect the product will be identified as either causing non-interchangeability or not affecting the interchangeability of the item concerned.

7.1.8. Document Change Requests (DCR)

All changes to documents requiring customer approval will be initiated using a change request form. Changes will be submitted via the local CCB.
A Document Change Request may accompany a CCN or be a “free standing” document. The Document Change Notice giving approval for the implementation of the change is the final approved version of the DCR.

7.1.8.1.Change Initiation

Changes to configuration-controlled documents may be initiated by all parties within the project.
Customer initiated changes in the form of change requests are routed through the contractor project management for reaction or incorporation.
PROJECT raised requests are initially dealt with by the local CCB, internal changes not affecting customer approved documents are dealt with locally, the change request register being available for contractor inspection as required, e.g. progress meetings, reviews etc. System related changes affecting customer-approved documents are then forwarded to the customer for consideration.

7.1.8.2.The Document Change Request/Notice Form Sheet

Ref PROJECT PA Plan (AD1) Appendix C fig 15

7.1.8.3.Emergency Case

In exceptional cases when time is critical email may be used. In parallel with this activity, the formal sheet shall be processed to satisfy the documentation needs. Copies of all relevant emails should be retained with it.

7.1.9. Change Status Reporting

The status of all changes, including waivers shall be summarised and submitted to the customer on a regular basis e.g. progress meetings and reports.

7.2. Waivers / Deviations

Any departure from base-lined requirements and design, have to be granted by the concerned level of customer.
A specific written authorisation, granted prior to the manufacture or test of an item, to depart from a particular performance or design requirement of a specification, drawing or other document for a specific number of units or a specific period of time.

7.2.1. Definitions

All Waivers / Deviations will be entered into the RAL RFW database

7.2.1.1.Waiver

Used for unplanned departures from design.
Through manufacturing or software coding errors, which are usually detected by product assurance through non-conformance reports. The supplier shall submit a request for waiver (RFW) which shall describe the extent to which the concerned product will not fulfil the base-lined configuration identification documentation, as detailed above with the exception that the non-conforming product has already been produced and await permission for use as described in the waiver.
A waiver does not require revision of the applicable document.
All waivers (RFW) to approved baseline requirements will be submitted to the customer for approval.
Waivers are subject to Configuration Control Board Processing.
A waiver shall be limited to a specific item.
The traceability of the waiver shall be recorded in the manufacturing record or logbook and shall be identified at each higher level of assembly. Its model applicability shall be recorded in the CSL.
Waivers must be requested for the use of substitute parts and materials.
When such special requirements are applicable to all future items, a permanent design or document change shall be made in subsequent items using a change request in the normal way with the RFW being cited as the “reason for change”.

7.2.1.2.Deviation

Used for planned departures from requirements or design.
The supplier shall submit a request for deviation (RFD), which shall describe the extent to which the concerned product will not fulfil the base-lined configuration identification documentation.
When such special requirements are applicable to all future items, a permanent design or document change shall be made in subsequent items using a change request in the normal way with the RFD being cited as the "reason for change".

7.2.2. Numbering of Waivers

Waivers shall be numbered in accordance with project documentation identification requirements.

7.2.3. Incorporation into Configuration Items Identification

As waivers document temporary deviations from the baseline design they shall be listed in the Configuration Status List, and copies of approved waivers supplied in the Acceptance Data Package.

7.2.4. Format

Format shall be as per the Product Assurance Plan.

7.2.5. Preparation

Self-explanatory

7.2.6. Submittal

Requests for waiver shall be submitted via normal CCB route.
i.e. As attachments (in word format) to E-mail. or as a fax.

7.2.7. Review, Acceptance and Approval

Review, acceptance and approval will be carried out under normal CCB action.

7.2.8. Waiver Status Reporting

All waivers shall be listed in the PROJECT database with current status.
This list shall be part of the regular configuration reporting e.g. progress meetings and reports.

8. CONFIGURATION STATUS ACCOUNTING

8.1. General

Configuration status accounting records provide the information required to identify the item and determine its status at any time.
The key documents used are: -

- Progress reports
- Configuration status lists
- Change request lists
- Baseline status listing
- Configuration data reports
- Waiver status lists
- Non-conformance lists
- Configuration verification reports
- Review documentation
- Action item status reports

A description of the above documentation follows.

8.2. Configuration Identification Listings

8.2.1. Configuration Status List (CSL)

A configuration status list, entitled, SPIRE Configuration Item Data List" will be issued for individual CI's for hardware and software. Initially for the DDR and subsequently for each deliverable model, the listing will include drawings, specifications, procedures, reports and other documents used within the project and defining the design in relation to the different models of the configuration item. If software will be included in the hardware delivery the software listing will be included with the hardware documentation

The SPIRE Configuration Item Data List will contain: -

1. Requirements (Inc. deviations e.g. RFW)
2. Definition of HW/SW (see note below)
3. Analysis documentation
4. As Design documentation
5. Interface Control Documentation
6. As Built definition.
7. AIV Documentation
8. Manuals and handling procedures

Listings for the following:

9. Critical Items
10. Contractors Parts (EEE) List
11. Declared materials
12. Declared Mechanical Parts
13. Declared process
14. Software Code Listings only if necessary

Drawings: drawings will be listed in a separate document entitled "SPIRE Hardware Status List" which contains all hardware items down to individual parts plus drawing numbers current at the time of delivery, NCR's/ECR's/RFW's associated with integration and post integration testing are listed and referenced to appropriate drawing number.

Software

Each containing the following information: -
Applicable documents
Current Document Status
Note: the above is duplicated in the Configuration Item Data List.
Status of Modules, containing the following information: -
File (module)
Components
Phase
Version
Date
Checksum
Remarks
Checksum for the complete package will be included in the above and also on the release note and the documentation accompanying a programmed device.

At the time of delivery the current SPIRE Configuration Item Data will define the "As Built" version of the CI delivered and provide the "As Designed" definition for the following model.

The CSL will commence with the baseline approved for the DDR. A change record will be included which will provide a complete change history for the items listed in the CSL. The CSL shall be used: -

a) At all Design Reviews, as a formal statement of the design standard.
b) During manufacture and assembly to establish the standard of manufacture and assembly.
c) During inspection and test, as the standard for inspection and test.
d) At delivery to the customer, as a statement of the design standard.

8.2.2. ECR/CCN Status List

All change requests will be listed on the PROJECT/SSTD database. Allowing status listing to be requested as required.

8.2.3. Baseline Status Listing (BSL)

A baseline status listing will be prepared for all deliverable items.
This will consist of: -

- Customer approved specifications
- Customer approved drawings
- Controlled technical documentation
- Verification documentation

These documents will be listed in the Configuration Item Data List and will become section 3 of the CSL.

8.2.4. Configuration Data Reports

Refers to various documents relating to technical budgets such as, mass, power, alignment etc.

8.2.5. Waivers /Deviation Status List

All waivers will be listed in the PROJECT/SSTD database.

8.2.6. Non-Conformances

All NCR's will be listed in the PROJECT/SSTD database.

8.2.7. Configuration Verification Status

The PA manager will assure that the "As designed" configuration is used for manufacture and test, and that any changes are approved and acted upon. (Either the local PA manager or PROJECT as appropriate).

8.2.8. Review Documentation

PROJECT or relevant institute will submit before each review a review package highlighting all aspects, which affect system performance, cost and schedule, as well as a synthesis of the present status.
The review data package will contain the current baseline status as defined in the Configuration Item Data list, (Ref: Para 3.2.
Following each review PROJECT or relevant institute, will submit a close out report on the review board comments and the recommendations accepted by PROJECT.

8.2.9. Action Item Status Reports

Action items will be listed and the status presented at regular progress meetings.

9. INTERFACE CONTROL

9.1. Interface Management

Interface Requirements Documents are treated as system criteria and are listed among the baseline documents.
Interface Control Document (ICD), lists agreed interface parameters.

9.2. Interface Responsibilities

PROJECT have the responsibility for preparing and maintaining the SPIRE ICD.

9.3. Proposal of I/F Changes

Changes will be controlled and handled in the same way as other All other documents.

10. SW CONFIGURATION MANAGEMENT

10.1. General

The Spire Software comprises of two categories: -
1). Onboard Software (OBS)
2). ICC Software.

10.1.1. Onboard software

This is provided by IFSI as part of the DCU/ICU. And therefore is controlled as part of their Configuration control procedures detailed in RD2, DPU/ICU Onboard Software Product Assurance Plan. (IFSI/OBS/PL/2000-001)

10.1.2. ICC Software

This is software written for ICC and uses CVS for configuration control. The CVS server resides at an ESA site, currently ESAC.
Configuration of ICC Software is detailed in RD3, Spire ICC Configuration Management Plan. (SPIRE-RAL-PRJ-001106)
Reference: documents will be stored on “LiveLink” and configuration controlled shall be the same as for any other SPIRE document.

10.1.3. EGSE Software

EGSE software is subject to the same configuration management as the ICC software, see previous section and RD3, Spire ICC Configuration Management Plan (SPIRE-RAL-PRJ-001106).

10.1.4. Responsibility

It is the responsibility of the relevant software design manager to ensure configuration and version control is applied.
Each development engineer will be responsible for allocating version numbers (manually if not done automatically) to his own software. The software design manager will have a networked file in which the details of the software development will be kept.
Only the project manager and the specific engineer have write access to this file. Read access should be available to all of the project team including SQA.

This file will provide input data to the Software Configuration Status List, show traceability of release and qualification/acceptance at the time of delivery and provide input for the regular status reports required for progress meetings.

Audits will be carried out by SQA on a regular basis to confirm that the file is up to date and accurate.
When a Software File (module) has completed testing and is released, details will be entered into the main SPIRE document database (LiveLink) and a copy of the released version of the software placed in the master file, to which the development engineers have read only access.

The master file will contain directories for each of the models to be delivered, EM, Flight and Flight Spare, sub directories for THE SUB SYSTEMS and EGSE if appropriate.
Software will only be transferred into this master directory after it has been fully tested in the presence of SQA, any changes to the software in this directory will require authorisation via ECR/NCR action. Transfer will take in the presence of SQA.
Software to be entered into programmable devices will be taken from this master directory, in the presence of SQA, transfer medium will be marked as per Para 5.7.3.
Only the software deliverable will be stored in the master directory.
Copies of earlier versions will be retained by the development engineers.

10.2. Configuration Identification

Each software package will of been allocated a CI number.
Each module (file) will have an identifier that distinguishes it from other items with different requirements and implementation, ref, Para 5.7.3
Each executable module/component will be recorded in the Software Configuration List complete with a checksum calculated according to an algorithm.

All components which are necessary to reproduce the development and test will require configuration control.

* Documentation
* Source and executable code
* Test files
* Command procedures
* Software development environment (compiler, linker etc.)

10.3. Configuration Item Storage

Ref 9 above.
To ensure security and control of the SW the following libraries shall be implemented: -
Development library for use by development engineers and for storage prior to tested release.
Master library (for storage of finished/tested deliverable units etc.) under the control of the SW configuration manager with SQA.
Changes to master library will require authorisation via NCR/ECR etc.
Backups are carried out on a regular basis.

10.4. Configuration Change Control

Changes to software after internal and external approval will be dealt with in the same way as other changes using change request or NCR action to initiate the change. The change control board will include software specialists.
All changes of a CI will be documented in the header and showing: -
Component name
Version number
Change title
Ref number e.g. ECR/NCR
Date

10.5. SW Release

For each software release, a Software Configuration Status List will be issued.
As each release will usually accompany a hardware delivery a full ADP will also be supplied, which will contain a release note and full information on which changes are incorporated within the release.
In the event that the release does not accompany a hardware delivery the above information will be supplied with the software.
All modified software will be tested before release.

10.6. SW Configuration Management Plan

Software configuration management is contained within this Project configuration management plan.

11. TEST SETS, SPECIAL TOOLS AND TRANSPORTATION / STORAGE CONTAINERS

11.1. General

All special tools, test sets and containers delivered to the customer in accordance with the statement of work shall be subject to the configuration management described in this document
Change requests submitted shall identify any impact on tooling, test sets and containers, which will result from acceptance of the proposal.

11.2. Tooling and Test Set Identification

Hardware and associated documentation will be identified in accordance with this document.

11.3. Tooling and Test Set Drawings

Tooling and test set drawings shall be treated as other drawings.

11.4. Transportation / Storage Containers

Container drawings if required will be prepared and identified as other drawings.

12. CONFIGURATION MANAGEMENT AUDITS

12.1. Purpose and Scope

Configuration management audits shall be conducted periodically to ensure that the procedures described herein are being carried out. During the project life cycle the following audits shall be carried out: -

- Full system audit
- In process audit
- Ad hoc audit
- Key /mandatory inspection points
- Prior to buy off

All sub contractors will demonstrate that all approved changes were implemented and that differences between the “As-designed” standard and the “As-built” standard are properly identified and processed.
The Configuration Item Data List for the specific model will be frozen, and any further changes shall only be included in the case of retrofit activities and refurbishments with consequential retest activities.

12.2. Audit of Lower Tier Contractors

It is unlikely that lower level contractors will be used, however in the event that they are they will be include in the audit programme detailed in section 11.1.

13.DATA MANAGEMENT

13.1. Data Information System

The SPIRE Project will have in place a Project Information Management System where project documents are recorded on a project specific database (Live Link). Electronic copies and released versions of software will be maintained in a configured document folder on Live Link.
The QA office maintains database records of NCR's / ECR's / RFW's / PAD's materials and processes used.
The appropriate drawing office maintains Drawing and modification sheet records.
All manufacturing records, assembly and test logs and copies of ADP and design review packages (i.e. baseline definition) will be stored as a composite set in a QA controlled document store until an agreed time after launch when they will be archived with all other project documents.
(The ADP and any other relevant information may be stored on a CD-ROM).
These documents will be preserved for 10 years after delivery and will be readily accessible.

13.2. Release System

For each document the approval and change boxes shall be signed by the author and approval authorities which will be identified and then the document is entered into database along with the current status, after approval a master copy will be maintained protected on Live Link against unauthorised change.
At each subsequent release due to the embodiment of an approved change records shall be amended to include the details of the change.
A similar system operates for drawings and will be maintained by the drawing offices.

13.3. Documentation Identification

This will follow the recommended numbering system for simple summary ref. PROJECT PA Plan Reference Document RD1.

13.4. Format and Standards

13.4.1. Correspondence

- All letters, E-Mails and faxes will be clearly identified with a Document number and added to the database.

13.4.2. Drawings.

All engineering drawings will include the following: -

- Projection used shall be identified on each drawing
- Symbols will be to recognised international standards
- Drawings will be of such a quality to allow electronic storage and printing.
- Standard international units shall be used for all dimensions, units etc.
- All drawings will be checked/approved and signed to this effect prior to initial and subsequent release

13.4.3. Documents

All documents will be prepared in a way that satisfies the Customer (Ref RD1).
Each author is responsible for: -

- Preparing the document in accordance with project standards and coherent with the required document set
- Identifying the document with respect to the document tree and the traceability of the requirements
- Subjecting the document to the internal review and approval cycle, incorporating comments and creating the first formal issue and release.

Deliverable documents will: -

- Be written in English
- Be A4 size (or folded to) and be suitable for incorporation in loose leaf binders
- Have a customer approval signature box
- Carry a heading of the “SPIRE” project.
- Unless agreed otherwise, be identified by a unique document number, revision status and date of issue. This information with a page number to be on the upper right hand corner of each page of the document
- Identify on the front page, if applicable, the model to which the document refers
- Provide in the contents: -
  Front cover
  Change record
  Page issue record if pages are controlled or changed separately
  Table of contents
  Distribution list
- If provided in “electronic form” will be formatted in such a way that if printed they suit the hardcopy document requirements and shall be produced in Word for Windows, with the exception of drawings and large tables. (May be converted to Adobe Acrobat “Pdf” files).

13.5. Revision and Maintenance of Documents

The originator/author will be responsible for maintaining the document in an up to date form.
The initial issue will be Issue 1.
Once documents are approved by a higher level, they are considered “frozen”, any changes will require “change request action”.
Updates will be distributed to the original recipients.
Changes, which affect less than 30% of the document, will be permitted revision rather than reissue. In which case only the affected pages, the cover, change record, to include page change record, contents and distribution list require circulation for approval.
Recipients are responsible for incorporation of changes into their own copy.

Documents will be reissued when major changes to a document have occurred, either over 30% of the document changed or the number of revisions so large to be confusing.
Draft documents before approval should be clearly marked.
After initial approval and release of configuration-controlled documents only changes approved by change request action may be incorporated.
Any update will be documented in the document change record, and changes between consecutive issues be marked by a symbol (i.e. vertical bar) in the right hand margin
Changes will be performed on the original of the document and be performed by the author.
The approval signatures for the updated document will, where possible, be identical to the original document, or a least be the same managerial level.
Distribution of exchange pages shall be for new revisions only, for new issues the full document shall be distributed.

13.6. Revision and Maintenance of Drawings

All changes to drawings will be recorded as a modification.
A “modification sheet” describing the changes, with traceability for the change (i.e. NCR/ECR) and complete with a unique number will be issued and logged in the modification sheet register.
Each revision will be noted on the drawing complete with the modification sheet number.
Issuing of drawing numbers and modification sheet numbers is the responsibility of the suppliers drawing office.

13.7. Documentation Status

A list of all documents generated or received with their current status will be maintained and put in the appropriate folder on “Live-Link” as they become available.

13.8. Deliverable Documentation

The Documents will be agreed between the Customer and the supplier's documents in the Statement of Work, MOU, Business Agreements, Contracts, or supplied to the Customers requirements.

The documents are classified into one of the following categories: -

"A": Documentation for customer approval, which is: -

- For approval by the Customer prior to implementation
- Jointly agreed at contract implementation and subsequent reviews
- There after subject to formal change procedure between Customer and the Supplier. Where changes or waivers/deviations are requested by Supplier to category A documents, the Customer shall be informed prior to implementation and the Supplier may proceed at their own risk.

"B": Other documentation which is: -

- Generated by the contractor to satisfy the requirements of the contract
- Not subject to formal customer control or review as in **"A"** above
- However, to be maintained up to date by PROJECT in accordance with programme requirements and to be delivered to the customer.

13.8.1. Data Packages

To enable clear visibility on the contents and permit easy searching and tracing of information all data packages supplied to the customer will be: -

- Identified in accordance with the project document numbering system
- Have a list of contents referencing all documents contained within the package and their location within the package.

13.9. Minutes and Action Items

Actions will normally originate from meetings; each meeting will formally review the action status from previous meetings in the series and decide on closure or continuation. Action items will be formally noted within the meeting minutes and an action summary list attached as part of the minutes. Action items must be numbered within the text of the minutes in order to maintain traceability of the action.

Appendix A

14.1. Introduction

This document details how Live-Link is used to inform all personnel, (from the customer, project, subsystem, and approved interested parties) of the current status of the HERSCHEL/SPIRE documentation.
It is also used to distribute documentation for consultation and information purposes
To specify the principals and procedures required in using "Live-link" in which all HERSCHEL/SPIRE Documentation, Specifications, Drawings etc are recorded.

14.1.1. Definitions

"Documentation" in the context of this document includes, but is not exclusive to, all Documents, Specifications, Drawings, Reports, Plans, Minutes of Meetings, etc

14.2. About Live-Link

"Live Link" is the preferred system (for document, records, storage and control) by ESA ESTEC.
It is a multiple project media, of which the HERSCHEL/SPIRE consortium documentation is one part.

14.2.1. Scope

The purpose of Live-Link is the "circulation and record" of documents in a controlled manner (as opposed to use of mail/email/fax/etc.) rather than their "production".
It provides a repository for documents, such as specifications, interface documents, technical notes drawings and procedures etc, so that they are always available and accessible from a single Source.

14.3. Documents

14.3.1. Applicable Documents

Refer to Section 3.1

14.3.2. Reference Documents.

Refer to Section 3.2

14.4. Document Control

The Customer Office at PROJECT, is the control point for all SPIRE documents inserted on to Live-Link.
Documents are sent to the Customer Office and actioned as follows

14.4.1. New documents

If it's a new document the Customer Office at PROJECT will allocate it the next available number and place in the appropriate folder/directory. This number is then dedicated and can't be used for any other purpose.

14.4.2. Up-issue of an existing document

If an existing document is up-issued, it is placed in the appropriate folder/directory, and the previous issue is automatically archived.

14.4.3. Access

14.4.3.1. Write access

Only the Customer Office, and Customer Manager, have full Read and Write access to Live-Link.
With the exception of: "Working Documentation" section. (See 14.5.4 below)
(Write access allows a document to be created or updated in the database.)

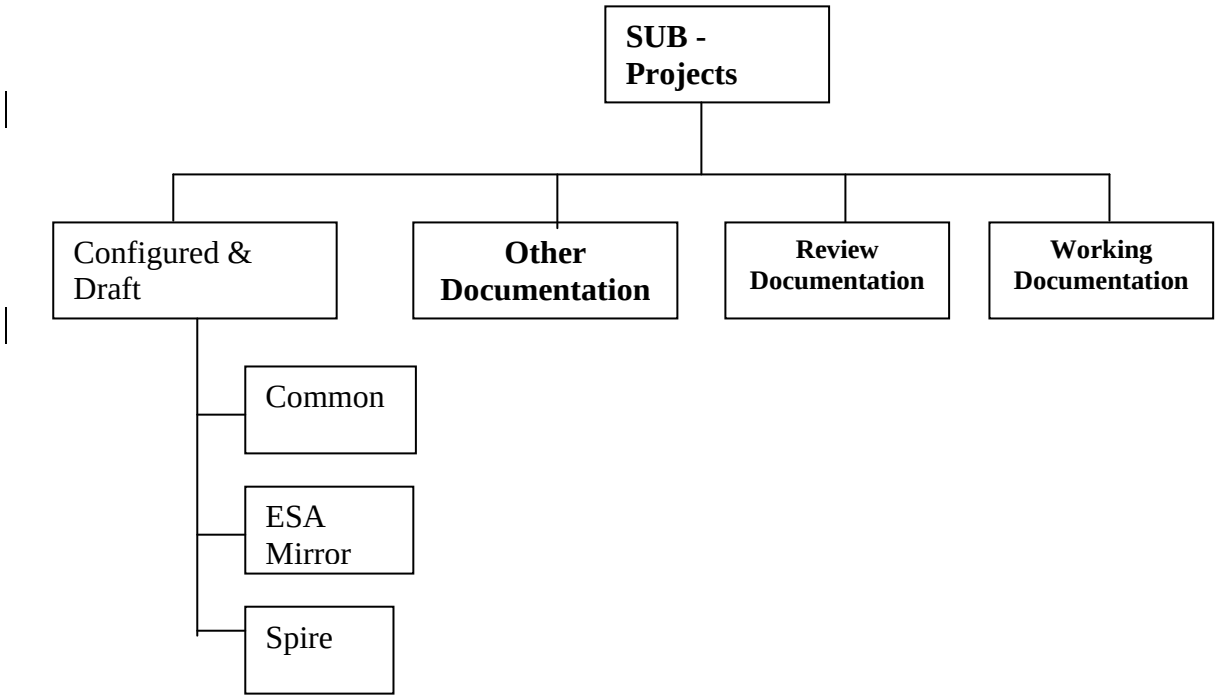
14.4.3.2. Read access

All members of the SPIRE consortium will be granted read access to the HERSCHEL/SPIRE domain.
In the form of a unique "User id" and "Password."
Read access allows documents to be searched for and extracted. (Copied).

14.5. Structure

The Spire section on Live-Link is split in to four **SUB -Projects**:
Each is then divided into folders as required.

14.5.1. SUB –Projects



14.5.2. Configured and Draft Documentation.

Configured and Draft Documents fall into three categories:

1 Documents that are configuration controlled by ESA.

2 Documents that are configuration controlled at Project level.

3 Documents that are configuration controlled at Sub-system level.

Draft documents are the documents that are either new documents or proposed up issues to existing documents that have been prepared awaiting approval, comments or input from other consortium members.
When a draft document is approved its issue number is then fixed i.e. Draft 1.1 would become Issue 1.1
The approved document then becomes the “configured Document” and replaces the Draft version. The draft document is deleted.

14.5.3. Other Documents

Other Documents are the Non Configured Documents, i.e. the documents that are issued for information or record purposes, and are not part of the Configuration control as such. (Although they may have document numbers with issue and or revision levels on them).

14.5.4. Working Documents

"Working Documents" Will contains any documents that are "work in progress". The intention is that any document, drawing, specification etc that any institute or sub system is currently working on, can be inserted in this section. This will allow other members of the Spire consortium to comment, amend, suggest alternatives etc. Therefore unlike the other sections any of the Spire consortium can have read and write access to this section only.

14.5.5. Review Documentation

Review documentation contains copies of review documentation. These documents are NOT updated, but stand as a Record of the "Review," including the Board Report and Responses. If the review and subsequent actions arising from the review are to be more formally recorded, then the updated version will be put in "other documents". Any updates to documents will be placed in the relevant sections "Configured" or "other" documents.

14.5.6. Configured and Draft sub section

The Configured and Draft Documentation section has three sub sections is detailed below.

14.5.7. Common

As SPIRE is one of a group of instruments that are to be launched together on the same platform, some commonality exists. Therefore any documentation that is common to all groups are contained in the relevant section as appropriate.

All documents most be approved by the working group of all three instruments.

14.5.8. ESA Mirror

The latest ESA documents received by PROJECT, Project team members or Project office are contained in this sub section accordingly.
Note however that any document in this section may not be the latest issue but will be the latest issue received.

14.5.9. Spire

This sub-section contains the Spire Documentation Tree and is split into folders,

1. *DRAFT* documents held by the authors only.
2. *OFFICAL CONFIGURED* documents, which will be Stamped as below if the document is in the process of any changes.

CHANGE REQUESTED
(Contact PROJECT PA Section for details)