

CONTRACT CONDITIONS, TECHNICAL, STANDARD FOR

SUBTITLE : PART 1: HIGHLY COMPLEX PROGRAMMES

SUMMARY : ARMSCOR'S TECHNICAL CONTRACT REQUIREMENTS FOR ACQUISITION, MANAGEMENT OF ENGINEERING EFFORT AND OTHER TECHNICAL WORK.

KEYWORDS : TECHNICAL CONTRACT CONDITIONS, ENGINEERING EFFORT, PROGRAMME ACQUISITION, PROCUREMENT, PRODUCT SYSTEMS, MAINTENANCE

DATE OF APPROVAL OF THIS ISSUE: 27 AUGUST 2004

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AMENDMENT HISTORY

Doc Issue	Date	Amendments	Doc Change Proposal No.	CM Conformance	
				Name	Initials
1	27-08-2004	Release. Supersedes K-STD-61. Document electronically converted from Word-Perfect to MS Word. Document number adapted to corporate policy.	None	O Phiri	

TABLE OF CONTENTS

1	SCOPE	6
1.1	PURPOSE	6
1.2	APPLICATION	6
2	REFERENCE DOCUMENTS	6
3	DEFINITIONS	6
3.1	ARMSCOR'S PROGRAMME MANAGER	6
3.2	CERTIFICATION	6
3.3	CERTIFICATION FOR SAFETY OF FLIGHT	7
3.4	CONCEPT PHASE	7
3.5	CONTRACTOR	7
3.6	CONTRACT BASELINE	7
3.7	DEFINITION PHASE	7
3.8	DEVELOPMENT PHASE	8
3.9	PRODUCTION PHASE	8
3.10	QUALIFICATION	8
3.11	QUALITY RECORD	8
3.12	SEGMENT PLAN	8
3.13	USER	9
3.14	VALIDATION	9
3.15	VALUE SYSTEM	9
3.16	VERIFICATION	9
4	GENERAL REQUIREMENTS	9
4.1	DOCUMENT BREAKDOWN	9
4.2	SELECTION GUIDELINES	9
4.3	TAILORING	11
5	DETAILED REQUIREMENTS	11
6	NOTES	11



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APPENDIX 1: CONTRACT CONDITIONS, TECHNICAL HIGHLY COMPLEX PROGRAMMES	12
APPENDIX 2: ABBREVIATIONS	59



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1 SCOPE

1.1 PURPOSE

A-STD-61 formulates different sets of technical contract conditions from which Armscor's requirements for the management of the technical effort during the execution of a contract or order should be selected.

1.2 APPLICATION

These sets of requirements must be tailored to suit the acquisition / procurement of specific product systems, products, product sub-systems and components for the specific ORDER.

When these requirements are applied to an ORDER between the Prime CONTRACTOR and a Sub-contractor, the Prime CONTRACTOR may, at his discretion or as specified by Armscor, impose tailored requirements based on these requirements.

2 REFERENCE DOCUMENTS

MIL-STD-756	Reliability Modelling and Prediction
MIL-STD-1543	Reliability Program Requirements for Space and Launched Vehicles
RSA-MIL-STD-3	Acquisition Baseline, Standards for
RSA-MIL-STD-8	Minimum requirements for Software Development
RSA-MIL-STD-10	Manuals, Technical : General Style and Format Requirements
RSA-MIL-STD-122	Documentation, User System, General Requirements for (SA Army)
RSA-MIL-STD-128	Training, User System, General Requirements for (SA Army)

3 DEFINITIONS

3.1 ARMSCOR'S PROGRAMME MANAGER

The person, or his delegated representative, designated by ARMSCOR to assume the programme management responsibility for user and CONTRACTOR interfaces.

3.2 CERTIFICATION

Legal recognition by the certification authority that a product, service, organisation or person complies with the requirements. Such certification comprises the activity of technically checking the product, service, organization or person and the formal recognition of compliance with the applicable requirements by issue of a certificate, license, approval or other documents as required.



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3.3 CERTIFICATION FOR SAFETY OF FLIGHT

The definition in §3.2 applies.

In addition certification of a product for safety of flight involves:

- i. The process of assessing the design of a product to ensure that it complies with a set of standards applicable to that type of product so as to demonstrate an acceptable level of safety;
- ii. The process of assessing an individual product to ensure that it conforms with the certified type design; and
- iii. The issuance of a certificate required by national laws to declare that compliance or conformity has been found with standards in accordance with items (i) or (ii) above.

3.4 CONCEPT PHASE

The period during which comprehensive system studies and experimental hardware efforts are accomplished. Activities that are included are:

- Feasibility assessment;
- Logistic support estimate;
- Trade-off studies; and
- Cost-effectiveness and utility studies.

The product of this phase is normally the functional baseline.

3.5 CONTRACTOR

The party with whom the order has been placed by ARMSCOR, and includes the CONTRACTOR's successors, legal representatives and permitted assignees.

3.6 CONTRACT BASELINE

A document or set of documents formally designated and fixed at a specific time during a configuration item's (CI's) life cycle forming the basis for contracting and control. Baselines, plus approved changes to those baselines, constitute the current basis for control.

RSA-MIL-STD-3 identifies and defines the following six baselines:

- Statement of Requirements Baseline (SRBL);
- Functional Baseline (FBL);
- Allocated Baseline (ABL);
- Product Baseline (PBL);
- Manufacturing Baseline (MBL); and
- Operational Support Baseline (OSBL).

3.7 DEFINITION PHASE

The objective of the Definition Phase is to identify and analyse major system alternatives,



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examine risky sub-systems and determine whether to proceed with development. The product of this phase is normally the Allocated Baseline.

3.8 DEVELOPMENT PHASE

The purpose of the Development Phase is to provide the design documentation necessary for production and the integrated logistic support documentation necessary to fully support the system. This is done by completing detailed design and demonstrating that reliability, producibility, supportability and performance requirements have been met. The product of this phase is normally the Product Baseline.

3.9 PRODUCTION PHASE

The primary objective of the Production Phase is to produce and deliver an effective, fully supported system at an optimal cost within the timescales.

3.10 QUALIFICATION

The process of objectively demonstrating whether an entity is capable of fulfilling specified requirements.

3.11 QUALITY RECORD

A quality record provides objective evidence of the extent of the fulfilment of the requirements for quality or the effectiveness of the operation of a quality system element. The following are examples of quality records:

- Test data;
- Qualification reports;
- Calibration data; and
- Inspection reports.

3.12 SEGMENT PLAN

A Segment Plan is an engineering management plan which covers all the phases in the acquisition process of a specific sub-programme (see FIGURE 1 on page 49 for the relative position of segment plans in the plan tree).

Such a plan, agreed upon between the contracting parties, constitutes a memorandum of agreement between the parties and cover aspects such as:

- Major acquisition milestones and schedules;
- Key milestone schedule;
- Interface milestone schedule;
- High level Work Breakdown Structure (WBS);
- High level Contract WBS (CWBS);
- Deliverables;
- Client-furnished equipment (CFE);
- Mandates, policies, values;



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- Technical conditions;
- Resource requirements and cash flow;
- Contract phasing; and
- Security.

3.13 USER

The delegated representative of the end user of the system(s)/equipment.

3.14 VALIDATION

Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

3.15 VALUE SYSTEM

A collection of elements, including goals, limitations, evaluation factors and criteria for decision-making, which provides a basis for rational decision-making.

3.16 VERIFICATION

Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled.

4 GENERAL REQUIREMENTS

4.1 DOCUMENT BREAKDOWN

Part 1 : Contract Conditions, Technical, Standard for Highly complex programmes

Part 2 : Contract Conditions, Technical, Standard for Medium complex programmes

Part 3 : Contract Conditions, Technical, Standard for Non-complex programmes

Part 4 : Contract Conditions, Technical, Standard for Production programmes

Part 5 : Contract Conditions, Technical, Standard for Commercial Off-the-shelf (COTS) procurement

Part 6 : Contract Conditions, Technical, Standard for Maintenance programmes

Part 7: Contract Conditions, Technical, Standard for Refining an Operating Baseline for Existing Systems.

4.2 SELECTION GUIDELINES

When these requirements are used for contracting, the following selection guidelines should be considered in order to select the most applicable contracting base (Parts 1 to 7) for compiling specific CONTRACT conditions (see Parts 1 to 7):

4.2.1 Part 1 should be used when:

- The programme's technical complexity is high, i.e. many complex interfaces, multi-



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discipline, unknown/untried technologies, etc;

- Technical and financial risks are medium to high;
- System complexity and/or system CONTRACTOR maturity requires a well-structured engineering process and detailed Armscor management;
- System level 5 or higher is involved.

4.2.2 Part 2 should be used when:

- The programme's technical complexity is high, i.e. many complex interfaces, multi-discipline, unknown/untried technologies, etc;
- Technical and financial risks are medium to high;
- System level 5 or higher is involved;
- Management of the system engineering process is delegated to the CONTRACTOR because his maturity does not require in-depth Armscor management;

OR

- The technical complexity is medium;
- Technical and financial risks are low to medium;
- System level 5 or lower is involved;
- The system complexity does not require in-depth Armscor management.

4.2.3 Part 3 should be used when:

- The technical complexity and risks are low, i.e. single-discipline, known technologies, simple or well-defined interfaces;
- There are well-defined and developed components for complex items;
- The system engineering process requires minimal Armscor involvement.

4.2.4 Part 4 should be used when:

- The scope of the ORDER is limited to production.

4.2.5 Part 5 should be used when:

- The scope of the ORDER is limited to procurement of commercial off-the-shelf items (COTS).

4.2.6 Part 6 should be used when:

- The scope of the ORDER is limited to maintenance.

4.2.7 Part 7 should be used when:

- The scope of the order is limited to the refining of an Operating Baseline for existing systems.



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4.3 TAILORING

Since it is seldom possible to apply such a detailed set of conditions as is, tailoring normally becomes necessary. To assist with tailoring the separate parts of A-STD-61 are available in electronic format.

The basic procedure for tailoring these sets of requirements is as follows:

- i. Select the part (i.e. Parts 1 to 7) of these sets of requirements that is most applicable to the programme and use it as a basis for tailoring.
- ii. Select those individual requirements that need to be upgraded/downgraded and replace them with the relevant requirements from the remaining parts (without change).
- iii. Update general or unique specifications, reporting frequencies and/or people responsible, if required (example : MIL-STD-756 for general components or MIL-STD-1543 for space systems, changing from monthly to two-monthly; replacing programme manager with quality assurance representative, etc.).
- iv. Update those requirements which need to be adapted for use in the specific CONTRACT.
- v. Add special requirements which are not included in the standard set of requirements.

5 DETAILED REQUIREMENTS

See Appendix 1 of Parts 1 to 7 for the detailed sets of standard CONTRACT conditions.

6 NOTES

- 6.1 Documents applicable only to certain Arms of the Service e.g. RSA-MIL-STD-122 and RSA-MIL-STD-128 for the SA Army or RSA-MIL-STD-10 for the SA Air Force, are not referred to in parts 1 to 7 of the standard contract conditions.
- 6.2 **MINIMUM REQUIREMENTS FOR SOFTWARE DEVELOPMENT**
When tailoring contractual requirements for software development, minimum requirements as described in RSA-MIL-STD-8 must be adhered to.
- 6.3 Guidelines for tailoring of A-STD-61 for technology development are provided in the form of Annexures to Part 1, Part 2 and Part 3. Programme managers must select the part most relevant for the specific technology programme.
- 6.4 When a CONTRACTOR subcontracts, using the technical contract conditions of A-STD-61, the name ARMSCOR must be replaced by the CONTRACTOR's own name.

**APPENDIX 1:
CONTRACT CONDITIONS, TECHNICAL
HIGHLY COMPLEX PROGRAMMES**

TABLE OF CONTENTS

1	GENERAL	17
1.1	APPLICABILITY OF DOCUMENTS	17
1.2	DOCUMENTS	17
1.2.1	Applicable Documents	17
1.2.2	Reference Documents	18
1.3	DEFINITIONS	18
1.4	GENERAL NOTES	19
2	ENGINEERING MANAGEMENT	19
2.1	ORGANISATION	19
2.1.1	Programme/Project Management Organisation	19
2.1.2	List of Major Sub-contractors	19
2.1.3	Appointment of Personnel to Committees, Boards and Work Groups	20
2.2	PLANNING	20
2.2.1	Information for Summary Work Breakdown Structure	20
2.2.2	Contract Work Breakdown Structure (CWBS)	20
2.2.3	Work Breakdown Structure (WBS) Dictionary and Statement of Work (SOW)	20
2.2.4	Plan Tree and CONTRACT Data Requirements List (CDRL)	20
2.2.5	Programme Master Plan (PMP)	21
2.2.6	Programme Report	21
2.2.7	Cost and Schedule Planning and Control	21
2.3	CONTROL	21
2.3.1	Establishment of Resource Management Control Systems	21
2.3.2	Resource Management System Demonstration and Audit	22
2.3.3	Reporting	22
2.3.4	Monthly Progress Meetings	23
2.3.5	ARMSCOR's Representatives Facilities	23
3	SYSTEM ENGINEERING PROCESS	23



UNCLASSIFIED

3.1	MISSION REQUIREMENTS ANALYSIS	23
3.2	FUNCTIONAL ANALYSIS	24
3.3	REQUIREMENT FLOWDOWN AND ALLOCATION	24
3.4	TRADE-OFF STUDIES	25
3.4.1	Trade-off Trees	25
3.4.2	Value System	25
3.4.3	Sensitivity Analysis	25
3.4.4	Trade-off Study Reports	25
3.5	SYSTEM SYNTHESIS	25
4	CONFIGURATION DEFINITION AND MANAGEMENT	26
4.1	GENERATION OF SPECIFICATIONS	26
4.2	CONFIGURATION MANAGEMENT REQUIREMENTS	27
4.2.1	General	27
4.2.2	Configuration Management Plan	27
4.2.3	Baseline Management	27
4.2.4	Configuration Identification	27
4.2.5	Configuration Management Records and Reports	28
4.2.6	Configuration Control	28
4.2.7	Configuration Verification	29
4.2.8	Security of Data	29
4.2.9	Handover of Documentation to ARMSCOR	30
5	TECHNICAL PERFORMANCE ACHIEVEMENT	31
5.1	RISK MANAGEMENT	31
5.1.1	Risk Management Programme Plan (RMPP)	31
5.1.2	Risk Abatement Plans (RAPs)	31
5.1.3	Risk Reduction Report (RRR)	31
5.2	TECHNICAL PERFORMANCE MEASUREMENT (TPM)	31
5.3	FORMAL REVIEWS	32
5.3.1	Technical Review Agenda	32
5.3.2	Technical Review Data Package	32



UNCLASSIFIED

5.3.3	Technical Review Meeting Minutes	32
5.4	VERIFICATION AND VALIDATION OF DESIGN	33
5.4.1	Qualification Principles	33
5.4.2	Test and Evaluation and Qualification Planning	33
5.4.3	Design Qualification	33
5.4.4	Simulation Model Validation	33
5.4.5	Specification Validation	34
6	OPERATIONAL FEASIBILITY AND OPTIMISATION	34
6.1	ENGINEERING SPECIALTY INTEGRATION	34
6.1.1	Reliability Engineering	34
6.1.2	Maintainability Engineering	35
6.1.3	System Safety	36
6.1.4	Standardization and Parts Control	36
6.1.5	Human Engineering	37
6.1.6	Electro-magnetic Compatibility (EMC) and Electro-magnetic Interference (EMI)	37
6.1.7	Value Engineering	38
6.1.8	Nuclear, Biological and Chemical Protection (NBC)	38
6.1.9	Thermal Analysis/Design	38
6.1.10	Classification of Characteristics and Failures	38
6.2	SYSTEM AND COST EFFECTIVENESS	38
6.2.1	System Effectiveness Models	38
6.2.2	Life Cycle Cost (LCC)	39
6.2.3	System Cost Effectiveness Analysis	39
6.3	LOGISTIC ENGINEERING	39
6.3.1	Logistic Support Analysis (LSA)	40
6.3.2	Interchangeability and Compatibility	41
6.3.3	Codification	41
6.3.4	Logistic Support Analysis Report	41
6.4	PRODUCTION ENGINEERING	41
6.4.1	Production Engineering Analysis	42



UNCLASSIFIED

6.4.2	Production Processes	43
6.4.3	Production Plan	43
6.4.4	Production Readiness Review (PRR)	43
6.5	SOFTWARE ENGINEERING	43
6.5.1	Establishing a Software Development Environment	44
6.5.2	System Requirement Analysis	44
6.5.3	System Design	44
6.5.4	Software Requirements Analysis	45
6.5.5	Software Design	45
6.5.6	Coding and Unit Testing	45
6.5.7	Unit Integration and CSCI Testing	46
6.5.8	CSCI/HWCI Integration and Testing	46
6.5.9	Software Version Description (SVD)	46
6.5.10	Software Development File (SDF)	46
7	QUALITY MANAGEMENT	46
7.1	CONTRACTOR'S QUALITY MANAGEMENT SYSTEM	46
7.2	QUALITY PLAN	46
7.3	QUALITY REPORTS	47
7.4	RIGHT OF ACCESS	47
7.5	ACCEPTANCE AUTHORITY	47
7.6	QUALITY OF SUPPLIES	47
7.7	CONTROL OF INSPECTION, MEASURING AND TEST EQUIPMENT	47
7.8	ACCEPTANCE / FORMAL TEST AND EVALUATION	47
7.9	ACCEPTANCE	47
7.10	SOFTWARE QUALITY ASSURANCE	48
7.11	QUARANTINE SYSTEM	48
7.12	CORRECTIVE AND PREVENTIVE ACTION SYSTEM	48
7.13	CONTROL OF QUALITY RECORDS	48
	ANNEXURE A: REFERENCES	50
	ANNEXURE B: TAILORING GUIDELINES FOR TECHNOLOGY DEVELOPMENT	53



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1 GENERAL

1.1 APPLICABILITY OF DOCUMENTS

This document forms ARMSCOR's standard for technical contract conditions.

Where any of these conditions are in conflict with any special terms, conditions, stipulations or provisions incorporated in any documents in the ORDER, the following order of precedence of documentation shall prevail:

- i. Special terms and conditions of the ORDER;
- ii. ARMSCOR's general conditions of CONTRACT (e.g. A-STD-0020);
- iii. ARMSCOR's standard technical contract conditions;
- iv. RSA Military standards and directives;
- v. DOD Military standards and directives;
- vi. Other interpretive documents.

1.2 DOCUMENTS

The following documents, of the issue in effect on the date of request for proposal or as stated in the ORDER, form part of these conditions of the ORDER to the following extent:

1.2.1 Applicable Documents

Conformance required to the extent specified in the ORDER:

ACT No 6, 1983	Machinery and Occupational Safety Act
DOD-STD-2168	Defence System Software Quality Program
ISO 9001	Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation and Servicing.
ISO/IEC 12207	Information Technology: Software Life Cycle Processes
MIL-STD-461	Control of Electro-magnetic Interference Submissions and Susceptibility - Requirements for
MIL-STD-462	Electro-magnetic Interference Characteristics, Measurement of
MIL-STD-470	Maintainability Program for Systems and Equipment
MIL-STD-490	Specification Practices
MIL-STD-498	Software Development and Documentation
MIL-STD-882	System Safety Program Requirements
MIL-STD-973	Configuration Management
MIL-STD-1369	Integrated Logistic Support Program Requirements
MIL-STD-1388-1	Logistic Support Analysis



UNCLASSIFIED

MIL-STD-1388-2	DOD Requirements for a Logistic Support Analysis Record
MIL-STD-1629	Procedures for Performing a Failure Mode Effects and Criticality Analysis
RSA-MIL-PRAC-175	Life Cycle Cost Management of Complex Systems, Practice for
RSA-MIL-PRAC-190	Praktyk vir die Kwalifikasie van Stelsels
RSA-MIL-SPEC-47	Item Information Requirements for Codification
RSA-MIL-STD-0001	Ergonomic Requirements for Military Equipment and Factories, Standard for
RSA-MIL-STD-3	Acquisition Baseline, Standards for
RSA-MIL-STD-51	Quality Assurance Plans, Standard for
RSA-MIL-STD-58	Acquisition of Complex Systems, Reporting Standards for
RSA-MIL-STD-105	The Engineering of Reliable and Maintainable Systems
RSA-MIL-STD-119	Standardization Plan
RSA-MIL-STD-120	Standardization & Parts Control Programme Requirements
RSA-MIL-STD-176	Configuration Management, Standard for
RSA-MIL-STD-184	Configuration Management Plan, Preparation of
RTCA/DO-160	Environmental Conditions and Test Procedures for Airborne Equipment
RTCA/DO-178	Software Considerations in Airborne Systems and Equipment Certification
Forms	
DD 1376	Recommended Spare Parts List (RSPL)
K217	Modification Proposal
K225	Inspection/Release/Acceptance Certificate
K226	Inspection Rejection Note
K227	Concession (Waiver)
K228	Deviation Permit
K-FORM-0029	Application for the use of non-standard items during project development

1.2.2 Reference Documents

To be used as guidelines only - refer to Annexure A.

1.3 DEFINITIONS

The definitions in paragraph 3 of the main part of A-STD-61 are applicable.



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1.4 GENERAL NOTES

- 1.4.1 Where practical, different deliverable documents may be consolidated into one document for cost-effective reasons. This note does not allow for any changes to contractual requirements with regard to content or authorisation.
- 1.4.2 The CONTRACTOR can obtain contracted technical documentation from ARMSCOR where copyright is vested in ARMSCOR.
- 1.4.3 In subcontracting, the CONTRACTOR shall make the relevant technical contract conditions applicable. (Refer to paragraph 6.4 in the main part of A-STD-61).

2 ENGINEERING MANAGEMENT

2.1 ORGANISATION

2.1.1 Programme/Project Management Organisation

The CONTRACTOR shall, prior to commencement of work or as agreed upon with ARMSCOR's programme manager, establish and maintain a programme / project management infrastructure with:

- A clear ARMSCOR interface;
- Single-point accountability and authority;
- Short communication channels;
- Effective control capability; and
- Assured technology transfer (e.g. transfer from Research and Development facilities to production facilities).

This infrastructure shall be reconciled with the Contract Work Breakdown Structure (CWBS) agreed upon, using a responsibility matrix, which forms part of the relevant segment plans, and shall take cognizance of the fact that different skills are needed as the programme / project progresses through the acquisition process and life cycle of the system.

The CONTRACTOR's programme/project management infrastructure and his resources plan shall be disclosed to ARMSCOR's programme manager, prior to ORDER placement in order to ensure suitability and adequacy of the organisation to successfully execute the programme.

The CONTRACTOR shall, prior to ORDER placement, establish a staffing plan for key personnel for approval by ARMSCOR's programme manager. Curriculum vitae for key personnel shall be supplied to ARMSCOR's programme manager on request.

2.1.2 List of Major Sub-contractors

The CONTRACTOR shall, prior to ORDER placement, compile and agree with ARMSCOR's programme manager on a list of all major sub-contractors to be employed.



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The CONTRACTOR shall maintain an updated list of approved sub-contractors.

This list shall be supported by a statement of work which relates to the Work Breakdown Structure agreed upon.

2.1.3 Appointment of Personnel to Committees, Boards and Work Groups

The CONTRACTOR shall appoint capable and skilled personnel to committees, boards and work groups required for the proper execution of the ORDER.

2.2 PLANNING

2.2.1 Information for Summary Work Breakdown Structure

The CONTRACTOR shall on request supply sufficient information to ARMSCOR's programme manager for the development of a Summary WBS, see FIGURE 1 on page 49.

2.2.2 Contract Work Breakdown Structure (CWBS)

Using the relevant parts of the Summary WBS, the CONTRACTOR shall, prior to placement of ORDER, develop and agree with ARMSCOR's programme manager on the CWBS and, where applicable, the extended CWBS, using MIL-STD-881 as a guideline.

This CWBS shall form the basis for contracting, cost control, schedule control and technical control, and shall be maintained by the CONTRACTOR for the duration of the programme.

Each task in the resulting programme CWBS shall be assigned a code that preserves and communicates the CWBS sub-division/summation logic.

2.2.3 Work Breakdown Structure (WBS) Dictionary and Statement of Work (SOW)

The CONTRACTOR shall use inputs from ARMSCOR's Summary WBS, specific requirements for design, manufacturing, test, quality assurance, hardware, software and other technical inputs from the System Engineering process to establish:

- A WBS Dictionary, and
- A Statement of Work (SOW) based on MIL-HDBK-245.

The WBS Dictionary and SOW shall be prepared and agreed upon prior to placement of ORDER.

2.2.4 Plan Tree and CONTRACT Data Requirements List (CDRL)

The CONTRACTOR shall submit, with his proposal, a plan tree (see FIGURE 1 on page 49) using RSA-MIL-STD-57 as a guideline and shall develop, define and agree upon, as required by the ORDER, all plans which shall form part of the basis for contracting, controlling and reporting between ARMSCOR and the CONTRACTOR.

This plan tree shall be reconciled with the WBS, and the specification tree (see FIGURE 1 on page 49).

The plans identified in this plan tree, together with all other relevant documentation, shall be reflected in the Contract Data Requirements Lists (CDRL), using DI-A-23434 as a guideline, and shall be supported by data item descriptions (DID's).



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2.2.5 Programme Master Plan (PMP)

The CONTRACTOR shall establish and maintain, using RSA-MIL-STD-57 as a guideline, a programme master plan. The CONTRACTOR shall derive the relevant segment plans from his PMP. The Segment Plans shall be traceable in the plan tree (see FIGURE 1 on page 49), for:

- System engineering and management segment;
- System integration segment;
- System test and evaluation segment;
- Other integration/interface segments; and
- All hardware segments in the programme.

These plans are to be approved by ARMSCOR's programme manager according to the baselines agreed upon.

ARMSCOR's programme manager shall supply the relevant parts of the Programme Master Plan (PMP) to the CONTRACTOR's programme manager, who shall prepare the relevant segment plans.

The planning horizon for the segment plans shall be compatible with the Master Plan unless otherwise agreed upon.

The level of detail of planning for the phase to be contracted shall be provided by the CONTRACTOR to allow ARMSCOR effective control.

The CONTRACTOR's programme manager shall make visible all management reserves. These reserves shall be traceable to the identified risks and planning uncertainties.

2.2.6 Programme Report

The CONTRACTOR shall submit to ARMSCOR progress reports for all segments for which he is contractually responsible, at such intervals as agreed upon, and using RSA-MIL-STD-58 as guideline. Such reports shall cover in detail all aspects of the progress made and the problems encountered with the segment.

This report shall be the major review point for the Segment Plan and shall provide the necessary input and motivation to the relevant Configuration Control Board (CCB) if the plan is to be updated.

2.2.7 Cost and Schedule Planning and Control

The CONTRACTOR's cost and schedule planning and control system shall make visible both the planned and actual costs involved with each work breakdown structure element down to the agreed level of the WBS.

2.3 CONTROL

2.3.1 Establishment of Resource Management Control Systems

The CONTRACTOR shall, prior to ORDER placement, establish and agree with ARMSCOR's programme manager on control systems, using RSA-MIL-HDBK-56 as a guideline.



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The control system shall at least:

- Relate costs, schedule and technical accomplishment to the plan and indicate the planned and expected completion costs, schedule and technical accomplishment for each WBS element;
- Be valid, timely, visible and auditable; and
- Supply ARMSCOR's programme manager with information at an agreed upon level of summarization.

2.3.2 Resource Management System Demonstration and Audit

Before placing the ORDER, the CONTRACTOR shall demonstrate to ARMSCOR's programme manager his resource management system, using RSA-MIL-HDBK-56 as a guideline.

ARMSCOR's programme manager shall have the right to request audits of the CONTRACTOR's resource management system, using AFSCP-173-5 as a guideline.

2.3.3 Reporting

The CONTRACTOR shall establish and agree with ARMSCOR's programme manager on a monthly reporting system which meets the requirements laid down in RSA-MIL-STD-58 and shall contain at least the following:

- Costs, schedule and technical performance against plan, as well as estimates at completion, to the level of the WBS agreed with ARMSCOR's programme manager;
- CONTRACTOR's programme manager's Management Summary;
- Major problems and corrective action plans; and
- Potential problems and risk reduction strategies.

The following other periodic reports may also be required:

- Configuration Management Reports (see Section 4.2.5);
- Risk Reduction Reports (see Section 5.1.3);
- Reliability Reports (see Section 6.1.1.1);
- Maintainability Reports (see Section 6.1.2.2);
- System Safety Reports (see Section 6.1.3.2);
- Ergonomic System Analysis Reports (see Section 6.1.5.2);
- EMC / EMI Test Reports (see Section 6.1.6);
- Life Cycle Cost Reports (see Section 6.2.2.1);
- Logistic Support Analysis Report (see Section 6.3.4); and
- Quality Report (see Section 7.3).



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2.3.4 Monthly Progress Meetings

The CONTRACTOR shall convene monthly progress meetings, scheduled in collaboration with ARMSCOR. The CONTRACTOR's programme manager, the Segment managers for the programme and persons selected by ARMSCOR's programme manager shall attend these meetings.

The monthly progress report shall reach ARMSCOR at least four working days before the meeting date and shall be the basis for review at this meeting.

Minutes of meetings shall reach ARMSCOR not later than 2 weeks after the meeting.

2.3.5 ARMSCOR's Representatives Facilities

The CONTRACTOR shall make available, to ARMSCOR's representative(s), if and when required at his own and/or his sub-contractor's works:

- Suitable partitioned office accommodation conforming to the Environmental Regulations for Workplaces enacted in terms of the Machinery and Occupation Safety Act, Act No 6, 1983;
- Secure documentation storage facilities; and
- Equipment which is necessary for ARMSCOR's acceptance/formal testing and evaluation.

3 SYSTEM ENGINEERING PROCESS

The CONTRACTOR shall apply the systems engineering process and formalize outputs of this process, using The System Engineering Management Guide of the Defence Systems Management College as a guideline. The CONTRACTOR shall describe how he will perform the system engineering function in a System Engineering Management Plan (SEMP) using RSA-MIL-STD-57 and RSA-MIL-STD-182 as guidelines.

The systems engineering process to be followed and phased in accordance with RSA-MIL-STD-3 shall include at least the following functions:

3.1 MISSION REQUIREMENTS ANALYSIS

The CONTRACTOR shall utilise the output of a user requirements statement as an input for the system engineering process as agreed upon with ARMSCOR's programme manager. This includes the following:

- The constraints;
- Scope of the desired solution;
- Mission objectives;
- Measures of effectiveness/system attributes;
- Operational environment;
- Mission and life profiles; and



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- Mission process flow.

3.2 FUNCTIONAL ANALYSIS

The CONTRACTOR shall identify and analyse system functions and sub-functions. The functional analysis shall be documented in an acceptable format, as:

- i. Functional flow block diagrams (FFBD's) using DI-GDRQ-81224 as a guideline.
- ii. Where applicable:
 - Time line sheets, using DI-S-3608 as a guideline;
 - N2 charts;
 - Data flow diagrams; and
 - State transition diagrams.

3.3 REQUIREMENT FLOWDOWN AND ALLOCATION

The CONTRACTOR shall allocate the system level requirements to a level at which a specific hardware and/or software routine fulfills the required functional/performance requirement. The flow down of system requirements to lower levels shall be based upon the system hierarchy and the specification tree established for the system during the Definition Phase.

The CONTRACTOR shall prepare and agree with ARMSCOR's programme manager upon Requirement Allocation Sheets (RAS's) using DI-GDRQ-81222 as a guideline for all functions/requirements identified.

The RAS shall be maintained throughout the life of the system to provide a historical record, as well as the current status. Each requirement shall be related to the system elements of:

- Equipment;
- Facilities;
- Personnel;
- Procedural data; and
- Computer programmes.

All analysis resulting in allocation shall be documented using the following framework as a guideline:

Summary:	Objective, approach, results.
Introduction:	Relating to requirement source.
Problem areas:	Unresolved areas and any analysis still required.
Discussion:	The analysis conducted, models used, graphic and tabular summaries of the data, resulting margins, parameter ranges, accuracy of results, validity of simulations, etc.
Traceability / allocation matrix:	A matrix to support the RAS's generated for the system.



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3.4 TRADE-OFF STUDIES

The CONTRACTOR shall conduct trade-off studies throughout the Concept, Definition and Development phases to select the configuration that best satisfies programme requirements, such as mission performance, life cycle cost, relevant cost elements, schedule, reliability, maintainability and readiness.

3.4.1 Trade-off Trees

The CONTRACTOR shall develop trade-off trees to aid him in the selection of the best options for the programme. The trade-off trees must be approved by ARMSCOR'S programme manager.

3.4.2 Value System

The CONTRACTOR shall establish with ARMSCOR's programme manager a value system upon which the selection of the configuration that best satisfies programme requirements, can be made.

These selection criteria shall include:

- Mandatory requirements to be met before it can be given further consideration;
- Attributes which are not mission limits; and
- System attributes shall be weighed and the weights agreed upon with ARMSCOR's programme manager.

3.4.3 Sensitivity Analysis

Where necessary or required by ARMSCOR's programme manager, the CONTRACTOR shall conduct a sensitivity analysis to determine the sensitivity of a decision to the change in the value of attributes or system parameters and/or value system.

3.4.4 Trade-off Study Reports

The CONTRACTOR shall document all trade-off studies in the form of reports, using DI-S-3606 as a guideline, that:

- Include a trade-off tree;
- Describe alternative candidates; and
- Provide justification for the selection.

These reports shall be traceable through the traceability/allocation matrix to the:

- Requirement from which they originate; and
- The new requirement imposed on the system, resulting from the trade-off study.

3.5 SYSTEM SYNTHESIS

The CONTRACTOR shall document, in a suitable form agreed upon with ARMSCOR's programme manager, a set of schematic diagrams, physical and mathematical models, computer simulations, layouts, detailed drawings and similar engineering graphics, the performance, configuration and arrangement of the chosen system and its elements and the technique for their test, support and operation.



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These documents shall illustrate intra- and inter-system and item interfaces, permit traceability between the elements at various levels of the system detail, and provide means for complete and comprehensive change control.

The documentation shall be the basic source of data for developing, updating and completing:

- The system, configuration item and critical item specifications;
- Interface control documentation;
- Consolidated facility requirements;
- Contents of operational procedural handbooks, placards and similar forms of interactional data;
- Task loading of operational personnel;
- Operational computer programs;
- Specification trees; and
- Dependent elements of WBS's.

The system schematic block diagram, inboard profile and envelope drawings shall be given engineering drawing numbers and shall be maintained by the CONTRACTOR throughout the life of the programme.

These drawings shall form part of the baseline configuration and shall be placed under configuration management once system level trade-off studies are completed and the system configuration has been defined.

4 CONFIGURATION DEFINITION AND MANAGEMENT

4.1 GENERATION OF SPECIFICATIONS

Specifications identified in the specification tree for the system shall be generated in accordance with MIL-STD-490, and shall utilize the outputs of the system engineering process (e.g. RAS's, design sheets, etc). Specifications shall be approved and presented in accordance with the Configuration Management Plan for acceptance. All specifications generated by the CONTRACTOR shall be traceable in the specification tree for the system.

The system concept, system and sub-system design and final configuration, interface definition and requirements, as well as any special processes and material shall be specified in accordance with MIL STD-490. These specifications shall be developed to be in phase with the requirements set out in RSA MIL-STD 3. Verification methods and test categories shall be documented in terms of verification cross reference matrices detailed in MIL-STD-973.

Specifications for computer software elements shall be specified in accordance with MIL-STD-498. The software source code on electronic media which is derived from these specifications shall be under formal configuration management.

Site requirement, setting-to-work and installation specifications shall be developed where



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applicable using MIL-STD-490 type B4 specification format as a guideline.

The CONTRACTOR shall identify, define, document and control all functional and physical interfaces for which he is contractually responsible in accordance with MIL-STD-973 and RSA-MIL-STD-176. The CONTRACTOR shall develop system segment interface control documents, using DI-CMAN-81314 as a guideline, for approval by ARMSCOR's programme manager.

4.2 CONFIGURATION MANAGEMENT REQUIREMENTS

4.2.1 General

The CONTRACTOR shall be able to demonstrate prior to placement of the ORDER an integrated configuration management system conforming to MIL-STD-973 and RSA-MIL-STD-176, tailored to satisfy the requirements of the ORDER.

ARMSCOR shall have the right to carry out periodic audits of the CONTRACTOR's configuration management system, including independent Physical and Functional Configuration Audits.

4.2.2 Configuration Management Plan

The CONTRACTOR shall establish, implement and maintain a Configuration Management Plan, phased in accordance with RSA-MIL-STD-3 and using RSA-MIL-STD-184, RSA-MIL-STD-176 and MIL STD 973 as guidelines. The Configuration Management Plan must conform to the requirements of the programme's Configuration Management Plan.

4.2.3 Baseline Management

The CONTRACTOR shall use the initial contracted baseline as the point of departure for configuration and change management.

The CONTRACTOR shall formalize and maintain a Master Record Index (MRI) using K-STD-0003 as a guideline from the initial baseline which shall include all applicable baseline documents listed in RSA-MIL-STD-3 and be kept under configuration / change control.

4.2.4 Configuration Identification

4.2.4.1 Configuration Items

The CONTRACTOR shall identify, not later than the end of the Definition Phase, configuration items (CI) for configuration management, for approval by ARMSCOR's programme manager.

The CONTRACTOR shall identify configuration items and classify failures and characteristics in accordance with MIL-STD-973 and RSA-MIL-STD-176.

4.2.4.2 Numbering System

The CONTRACTOR shall develop a numbering system, which shall be approved by ARMSCOR's programme manager, for the identification of configuration items and their corresponding documentation and shall ensure configuration traceability.



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The CONTRACTOR's numbering system for CI's shall be traceable to the relevant WBS.

4.2.4.3 Specification Tree

The CONTRACTOR shall develop a specification tree (see FIGURE 1 on page 49) using UDI-E-20235 as a guideline, and which shall define the primary items of hardware and software to be used on the programme and shall relate to the WBS and plan tree.

The specification tree is to be agreed upon with ARMSCOR's programme manager and shall be completed in terms of the Configuration Management Plan. This shall be reflected in the relevant CDRL and be supported by DID's.

4.2.4.4 Documentation Plan

For every CI the CONTRACTOR shall establish a configuration identification in the form of technical documentation listed in a documentation plan, in accordance with RSA-MIL-STD-184. Requirements for technical documentation should be supported by DID's.

4.2.5 Configuration Management Records and Reports

The CONTRACTOR shall maintain configuration records and reports as agreed upon with ARMSCOR's programme manager. Reports agreed upon shall be presented to ARMSCOR at agreed intervals and shall contain at least the following:

- A configuration change status report which contains full details of approval and implementation on all engineering changes, deviations and concessions (waivers);
- A MRI indicating the full document detail and status;
- Build history records for all contractual hardware items. The build history records shall contain at least the following:
 - An index agreed upon with ARMSCOR's programme manager;
 - As-built MRI;
 - Full technical information on each deviation and concession (waiver) from the MRI applicable to the item, as well as all serial/lot numbers of the equipment to which these deviations / concessions (waivers) have been applied;
- Test / Inspection results.

4.2.6 Configuration Control

The CONTRACTOR shall control changes to approved baseline documents, including all CWBS's, specifications, plans and other formally released contract documentation, in accordance with MIL-STD-973.

4.2.6.1 Engineering Changes

The CONTRACTOR shall classify engineering change proposals (ECP's) into class I or class II in accordance with MIL-STD-973.

The CONTRACTOR shall submit, with sufficient supporting documentation, to ARMSCOR on form K217, or an agreed upon alternative, class I engineering change proposals for consideration and decision-making and class II changes for concurrence of classification.



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4.2.6.2 Deviations

The CONTRACTOR shall classify all deviations as critical, major or minor in accordance with MIL-STD-973.

The CONTRACTOR shall submit to ARMSCOR on form K228, or an agreed upon alternative, critical, major or minor deviations for consideration and decision-making (unless otherwise delegated).

4.2.6.3 Concessions (Waivers)

The CONTRACTOR shall classify all concessions (waivers) as critical, major or minor in accordance with MIL-STD-973. The CONTRACTOR shall submit to ARMSCOR on form K227, an agreed upon alternative, critical, major or minor classified concessions (waivers), for consideration and decision-making (unless otherwise delegated).

4.2.6.4 Configuration Control Board (CCB)

The CONTRACTOR shall establish a CCB qualified to advise the CONTRACTOR's programme manager. ARMSCOR's programme manager shall be entitled to attend these board meetings.

The CONTRACTOR's CCB shall be responsible for:

- Reviewing and determining a need for change (unless the change originated from ARMSCOR);
- Determining total change impact;
- Approving submission of a change proposal to ARMSCOR, including Specification Change Notices (SCN's) and Interface Revision Notices (IRN's); and
- Approving changes to sub-contractors' controlled baselines and documents.

Minutes of the CCB shall accompany all proposed changes.

4.2.6.5 Material Review Board (MRB)

The CONTRACTOR shall establish a MRB composed of qualified technical representatives to advise the CONTRACTOR's programme manager on the disposition of non-conforming material.

4.2.7 Configuration Verification

The CONTRACTOR shall plan and agree with ARMSCOR's programme manager and execute formal technical audits in accordance with MIL-STD-973. These audits shall be phased in accordance with RSA-MIL-STD-3

The physical configuration audit shall be conducted prior to qualification testing. The functional configuration audit shall include an audit of qualification tests on CI's.

4.2.8 Security of Data

4.2.8.1 Archive

The CONTRACTOR shall maintain an archive for the storage and safekeeping of all formal development, build and production documentation for a period agreed upon with



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ARMSCOR.

This shall include masters of each previous and present issue of each document pertaining to the programme.

4.2.8.2 Physical Security

i. Documentation

The CONTRACTOR shall maintain a duplicate set of masters of all documentation at a secure remote site. The CONTRACTOR shall, at least once monthly, transfer a master of all new or updated documentation to the secure site.

ii. Computer Software

The CONTRACTOR shall maintain at all times at least three copies of all operating systems, utilities, compilers, application programs, command and/or data files required for the development, production and operation of equipment.

Copies of both source and object data shall be retained in machine readable form and shall include:

- As many copies of all the software as are required for the development, production and operation of the system;
- At least the following back-up copies of all software, including software currently under development:
 - One copy shall be retained at the development site and shall at no time be older than one week;
 - One copy shall be retained at a secure remote site (not less than 500 metres from the development site) and shall at no time be older than one week;
 - One copy shall be retained at a secure remote site (not less than 500 metres from the development site) and shall at no time be older than two weeks.

The CONTRACTOR shall have a strategy in place to prevent loss of usefulness of computer software due to technology changes and ageing affecting the format of stored data or storage media.

4.2.9 Handover of Documentation to ARMSCOR

The CONTRACTOR shall retain masters of all documentation relating to the system developed by the CONTRACTOR until the date on which all CONTRACTOR involvement in any form whatsoever ceases or until otherwise instructed.

On that date, the CONTRACTOR shall hand over to ARMSCOR a complete set of all masters of documentation in a suitable medium acceptable to ARMSCOR.



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5 TECHNICAL PERFORMANCE ACHIEVEMENT

5.1 RISK MANAGEMENT

5.1.1 Risk Management Programme Plan (RMPP)

The CONTRACTOR shall prepare and maintain a Risk Management Programme Plan (RMPP) using RSA-MIL-HDBK-55 as a guideline for submittal to and approval by ARMSCOR's programme manager before the System Design Review (SDR).

This plan shall describe programmatic aspects (intended actions) of risk identification, risk assessment, risk reduction and risk management functions to be performed by the CONTRACTOR.

5.1.2 Risk Abatement Plans (RAPs)

A Risk Abatement Plan (RAP) using RSA-MIL-HDBK-55 as a guideline shall be prepared for each high-risk item by the CONTRACTOR and submitted to ARMSCOR's programme manager for review and approval, as each such risk is identified.

The plan and activities described in the RAP shall be implemented by the CONTRACTOR and monitored by a special task force of experts from all disciplines involved in the design, test and production of the critical-risk item.

5.1.3 Risk Reduction Report (RRR)

The CONTRACTOR shall submit to ARMSCOR at agreed intervals a RRR for each medium- or high risk item.

These RRR's shall report against the relevant RMPP and RAP and be prepared using RSA-MIL-HDBK-55 as a guideline.

5.2 TECHNICAL PERFORMANCE MEASUREMENT (TPM)

The CONTRACTOR shall develop with ARMSCOR's programme manager's approval on a Technical Performance Measurement Plan (TPM Plan) initiated in the Concept Phase and expanded during the Definition and Development Phases, using RSA-MIL-STD-57 as a guideline.

The TPM Plan shall include at least the following tasks:

- i. The CONTRACTOR shall establish a TPM Parameter List for tracking from the Requirements Allocation Sheet (RAS). Parameters selected shall be limited by the following criteria:
 - Shall be the significant qualifiers/determinants/drivers of the total system performance;
 - A direct measure of values derived from results of tests or analysis of functional performance; and
 - Time-phased values and tolerance bands predicted for each parameter and substantiated during design and development.
- ii. The CONTRACTOR shall establish the status of each parameter in the agreed upon TPM Master Parameter List by design analysis, simulation, environmental test,



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prototype test or other tests and by summation models from parameter values of lower elements.

These results shall be compared with and/or measured against the relevant planned parameter profiles established for the system throughout the Definition and Development Phases where necessary and shall be extended to the Production and Deployment Phase where appropriate.

- iii. A TPM report using DI-S-3619 as a guideline shall be submitted to ARMSCOR at agreed upon intervals and shall be presented at technical programme reviews.

5.3 FORMAL REVIEWS

The CONTRACTOR shall plan and conduct formal technical reviews, phased in accordance with RSA MIL-STD-3 and using the guidelines laid down in MIL-STD-973, RSA-MIL-HDBK-176, MIL-STD-1521 and RSA-MIL-HDBK-36. These reviews shall be done at systems level as well as for each CI identified. See section 6.4.4 for Production Readiness Review.

ARMSCOR's programme manager reserves the right to include additional members of his choice on the Technical Review Board.

5.3.1 Technical Review Agenda

Technical Review Agendas shall be prepared, using DI-ADMN-81249 as a guideline, and containing at least the item identification, date, location, time of review and individual topics being reviewed. This agenda shall be submitted to all parties involved at least 14 days prior to the technical review.

5.3.2 Technical Review Data Package

The CONTRACTOR shall submit, together with the agenda, to all the members of the Technical Review Board the relevant documentation.

The documentation submitted, shall contain at least the following:

- Specifications;
- Configuration and layout drawings;
- Analysis and simulation reports;
- Trade-off study reports;
- Functional flow and system schematic diagrams;
- Plans;
- Reliability, maintainability and availability data;
- Survivability and vulnerability data;
- Verification data;
- Documentation Record Index (DRI) / Master Record Index (MRI); and
- Any other relevant documents specified in RSA-MIL-STD-3 and agreed upon between ARMSCOR's programme manager and the CONTRACTOR.

5.3.3 Technical Review Meeting Minutes



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The CONTRACTOR shall prepare and distribute minutes of technical review meetings, using DI ADMN-81250 as a guideline, to all members of the Design Review Board and other persons as may be deemed necessary and agreed upon with ARMSCOR's programme manager.

The minutes shall at least include the following:

- Summary of significant comments, findings, decisions and directions provided at the meeting, with rationale where appropriate;
- Meeting agenda;
- List of data package contents;
- List of attendees;
- Action items with responsibilities and due dates; and
- List of presentation material.

5.4 VERIFICATION AND VALIDATION OF DESIGN

5.4.1 Qualification Principles

The CONTRACTOR shall qualify the design of all systems and items in accordance with the principles set out in RSA-MIL-PRAC-190 (Part 1), section 4. The qualification process shall be an integral part of the system assurance process - as described in RSA-MIL-PRAC-190 (Part 1), section 5. The essential elements of the process shall be clearly addressed in the CONTRACTOR's Quality Assurance Plan.

5.4.2 Test and Evaluation and Qualification Planning

The CONTRACTOR shall establish with ARMSCOR's Programme Manager's approval upon a test and evaluation plan to demonstrate conformance to design and qualification requirements. The test and evaluation plan shall be documented by way of the CONTRACTOR's Programme Plan, System Engineering Management Plan (SEMP) and/or the Test and Evaluation Master Plan (TEMP). The TEMP shall conform to the requirements of section 4.5 of RSA-MIL-PRAC-190 Part 1.

NOTE:

RSA MIL-STD-257, RSA-MIL-STD-105, part 6 and DOD-5000.3-M-1 may be used as guidelines in developing the TEMP

5.4.3 Design Qualification

The CONTRACTOR shall, before the start of the Industrialization Phase, formally qualify the design as specified in the development specification and depicted in the TEMP. The qualification report shall be presented to ARMSCOR's programme manager for approval.

5.4.4 Simulation Model Validation

Simulation models employed by the CONTRACTOR in cases where it is not possible or cost effective to test shall be formally validated before they are used to establish or to optimize parameters or to verify a selected design.

The validation programme for the simulation model shall be designed to demonstrate that



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the model portrays the actual situation and interacts properly with its real world environment.

5.4.5 Specification Validation

The CONTRACTOR shall validate that all the development and product specifications generated, sufficiently specify:

- The system to meet the next higher level specifications; and
- The qualification test methods (in paragraph 4 of the specification, according to the format of MIL-STD-490) before inclusion into the relevant baseline.

NOTE:

Qualification test methods or reference thereto, for each requirement shall be an integral part of development specifications. The CONTRACTOR shall address all requirements in part 3 of the specification. This will preferably be done by way of a qualification cross reference matrix. The development specification must define a standard for successful qualification by specifying the type and extent of testing

6 OPERATIONAL FEASIBILITY AND OPTIMISATION

6.1 ENGINEERING SPECIALTY INTEGRATION

The CONTRACTOR shall integrate engineering specialists into the design process at an early stage, using The System Engineering Management Guide of the Defence Systems Management College as a guideline, and phased in accordance with RSA MIL-STD-3.

6.1.1 Reliability Engineering

- 6.1.1.1 The CONTRACTOR shall prepare and maintain a Reliability Programme, using the relevant parts of RSA MIL-STD-105 (or MIL-STD-1543 for space and launch vehicles) as a guideline. The CONTRACTOR shall disclose, prior to placement of ORDER, the Reliability Programme Plan, to ARMSCOR's programme manager, using RSA MIL-STD-105, Part 11 Task 303, (or MIL-STD-1543 for Space and Launch Vehicles) as a guideline.

The reliability tasks shall include the following, where applicable:

- Failure reports, analysis and corrective action system (FRACAS);
- Reliability modelling using RSA MIL-STD-105 part 3 as a guideline;
- Reliability prediction, using MIL-STD-756 (MIL-HDBK-217 for Electronic Equipment) and RSA MIL-STD-105 part 4 as a guideline;
- Failure modes, effects and criticality analysis (FMECA) using MIL-STD-1629 as a guideline. A FMECA plan in accordance with MIL-STD-1629 task 105 shall be disclosed to ARMSCOR's programme manager. Outputs from the FMECA shall result in a Critical Item List (CIL);
- Sneak circuit analysis;
- Electronic parts / circuit tolerance analysis;



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- Reliability critical items;
- Environmental stress screening (ESS). The CONTRACTOR shall disclose the conditioning plan in accordance with KA 2945/3 to ARMSCOR's programme manager;
- Reliability Test Plan using RSA-MIL-STD-105 part 6 as a guideline;
- Reliability Development / Growth Test Programme using MIL-HDBK-189 and RSA-MIL-STD-105 part 6 as a guideline;
- Reliability Qualification Test and Demonstration programme. The CONTRACTOR shall disclose the Reliability Qualification and Demonstration Plan to ARMSCOR's programme manager, using RSA-MIL-STD-105 part 2 as a guideline;
- Production Reliability Acceptance Test (PRAT) using RSA MIL-STD-105 part 11 task 320 as a guideline; and
- Additional tasks mentioned in RSA MIL-STD-105, part 10, section E using RSA MIL-STD-105, part 11 as a guideline.

6.1.1.2 Reliability Reporting

The CONTRACTOR shall at intervals as agreed with ARMSCOR's programme manager and phased in accordance with RSA MIL-STD-3 provide the following reports:

- Reliability Report using DI-R-7080 as a guideline;
- Reliability allocations, assessment and analysis reports using DI-RELI-81496 & DI-R-7095 as guidelines;
- Failure summary reports using DI-RELI-80255 as a guideline;
- Reliability Demonstration report using DI-RELI-80252 as a guideline;
- ESS Test and Corrective Action Report using KA2945/3 as a guideline; and
- Environmental Compatibility Report which considers the system's operating environment using MIL-STD-810 as a guideline.

6.1.2 Maintainability Engineering

6.1.2.1 The CONTRACTOR shall prepare and maintain a Maintainability Programme using MIL-STD-470 as a guideline. The CONTRACTOR shall disclose to ARMSCOR's programme manager the Maintainability Programme Plan in accordance with MIL-STD-470 Task 101, prior to placement of the ORDER.

The Maintainability Programme shall include the following, where applicable:

- Maintainability Analysis using MIL-STD-470 Task 205 as a guideline;
- Maintainability Concept / Plan which considers the end user's maintenance concepts and policies;
- Maintainability Prediction using MIL-HDBK-472 as a guideline;
- Equipment Integration;
- Data Collection / Analysis using MIL-STD-470 Task 104 as a guideline; and



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- Maintainability Demonstration Test Plan using MIL-STD-471 as a guideline.

6.1.2.2 Maintainability Reports

The CONTRACTOR shall, at intervals agreed with ARMSCOR's programme manager, and phased in accordance with RSA MIL-STD-3, provide the following reports:

- Maintainability Allocation, Assessment and Analysis Report using DI-R-3535 as a guideline; and
- Maintainability Demonstration Report using MIL-STD-470 Task 301 as a guideline. The demonstration shall include compatibility with the user's maintenance concept and support system, including the system's operational environment.

6.1.3 System Safety

6.1.3.1 The CONTRACTOR shall prepare and maintain a System Safety Programme using MIL-STD-882 (or MIL-STD-1574 for space and launch vehicles) as a guideline. The CONTRACTOR and ARMSCOR's programme manager are to agree upon a System Safety Programme Plan, using DI-SAFT-80100 as a guideline before placement of ORDER. The System Safety Programme shall include, where applicable:

- System Safety Analysis - emphasizing design aspects;
- Accident Risk Assessment using MIL-STD-1574 as a guideline;
- Safety Testing and Demonstration;
- Safety Audit;
- Mishap Reporting and Investigation; and
- Safety of Flight requirements in accordance with RTCA/DO-160 and RTCA/DO-178.

6.1.3.2 System Safety Reports

The CONTRACTOR shall at intervals, as agreed upon with ARMSCOR's programme manager and phased in accordance with RSA-MIL-STD-3, provide the following reports:

- System Safety Engineering Reports using DI-SAFT-80104 & DI-SAFT-80105 as guidelines;
- Hazard Report;
- Accident Risk Assessment Report using DI-SAFT-81300 as a guideline; and
- System Safety Testing and Demonstration using MIL-STD-882 Task 207.

6.1.4 Standardization and Parts Control

The CONTRACTOR shall implement a Standardization and Parts Control Programme in accordance with RSA-MIL-STD-120. This programme shall include a Standardization Plan, agreed upon with ARMSCOR's programme manager, before the start of the Concept Phase and updated for each subsequent phase, in accordance with RSA-MIL-STD-119. The Standardization Plan shall include, where applicable:

- Sub-contractors Parts programme;
- Parts control plan using K-STD-0034 as a guideline;

UNCLASSIFIED



- Parts failure analysis and corrective action;
- New part documentation and qualification;
- Standardization status report, using K-DID-0031 as a guideline;
- Parts selection list, using K-DID-0035 as a guideline; and
- Application for the use of non-standard items (K-FORM-0029).

Preference shall be given to servicing equipment, spares or materiel for maintenance of systems that have been codified in accordance with the National Codification System (NCS) or the NATO Codification System (NATOCS) and the requirements as laid down in RSA-MIL-SPEC-47.

6.1.5 Human Engineering

The CONTRACTOR shall define and, after agreement with ARMSCOR, apply human engineering principles in accordance with RSA-MIL-STD-0001, tailored to fulfil the requirements of the ORDER.

6.1.5.1 Ergonomic Plans

The following plans shall be submitted to ARMSCOR's programme manager for approval:

- Ergonomic Programme Plan using RSA-MIL-STD-0001, Appendix A, DID-0001-01 as a guideline;
- Ergonomic Test Plan using RSA-MIL-STD-0001, Appendix A, DID-0001-07 as a guideline; and
- Ergonomic Dynamic Simulation Plan using RSA-MIL-STD-0001, Appendix A, DID-0001-09 as a guideline.

6.1.5.2 Ergonomic System Analysis Report

The CONTRACTOR shall submit to ARMSCOR human engineering system analysis reports at the agreed upon intervals using RSA-MIL-STD-0001, Appendix A, DID-0001-03 as a guideline.

6.1.6 Electro-magnetic Compatibility (EMC) and Electro-magnetic Interference (EMI)

The CONTRACTOR shall ensure that Client-furnished equipment (CFE) and materiel designed and/or purchased by the CONTRACTOR are not detrimentally affected by electro-magnetic emissions generated:

- Within the materiel; and
- By its intended operating environment.

Any deviations beyond the control of the CONTRACTOR shall be made visible to ARMSCOR in writing.

Stray emissions of equipment supplied/designed by the CONTRACTOR shall not exceed those specified in MIL-STD-461 or such standard or specification as agreed upon and shall be tested in accordance with MIL-STD-462. RSA-MIL-HDBK-121 shall be used as a guideline for the implementation of MIL-STD-461 and 462. The CONTRACTOR shall submit a TEMP to ARMSCOR's programme manager for approval. The TEMP shall



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include an EMI test plan, using DI-EMCS-80201 as a guideline.

The CONTRACTOR shall submit, at agreed upon intervals, to ARMSCOR's programme manager EMI and EMC test reports using DI-EMCS-80200 as a guideline.

6.1.7 Value Engineering

The CONTRACTOR shall optimize designs with regard to form, fit, function and life cycle cost by applying value engineering principles, using AMCP-706-104 and RSA-MIL-PRAC-175 as a guideline. Decision taking should be recorded and shall be traceable to the relevant specification and ARMSCOR's value system.

6.1.8 Nuclear, Biological and Chemical Protection (NBC)

The CONTRACTOR shall develop with ARMSCOR's programme manager's approval, during the development phase, a plan indicating how conformance to the ORDER, with regard to nuclear, biological and chemical protection of the system shall be achieved (including Nuclear Electro-magnetic Pulse (NEMP) protection).

6.1.9 Thermal Analysis/Design

6.1.9.1 Thermal Analysis

The CONTRACTOR shall optimize component design, selection and layout by conducting a thermal analysis using MIL-HDBK-251 as a guideline. The analysis shall make visible the impact of thermal design on item reliability.

6.1.9.2 Thermal Design

Components shall not be thermally stressed in its operational environments beyond specified limits. Test results shall be presented at the relevant Technical review.

6.1.10 Classification of Characteristics and Failures

The CONTRACTOR shall classify all design characteristics and failures into critical, major or minor using DOD-STD-2101 as a guideline. The CONTRACTOR shall, with ARMSCOR's programme manager's approval, incorporate such classification into the various specifications, performance standards, engineering drawings, inspections and test procedures.

6.2 SYSTEM AND COST EFFECTIVENESS

6.2.1 System Effectiveness Models

The CONTRACTOR shall develop and obtain ARMSCOR's programme manager's approval for system effectiveness models, using The System Engineering Management Guide of the Defence Systems Management College as a guideline, which shall demonstrate the capability of the system to meet its mission objectives whenever such models can contribute significantly to the decision process. These models shall allow the input parameters to be varied individually so that their relative effect on total system performance and life cycle cost can be determined.

Parameters in the effectiveness model shall correlate to parameters expressed in the performance characteristics allocated to system functions.



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6.2.2 Life Cycle Cost (LCC)

The CONTRACTOR shall, during the concept phase, establish and obtain from ARMSCOR's programme manager approval for cost parameters which consider the acquisition cost and cost of ownership of the system and/or sub-systems for which design and/or logistic responsibility is contracted, using the Life Cycle Cost Management principles in section 4 of RSA-MIL-PRAC-175 as a guideline. Discrete cost elements (e.g. unit production costs and operating and support costs) shall be translated into design-to-cost requirements.

The CONTRACTOR shall develop at the beginning of the Concept Phase, a Life Cycle Cost Management Plan (with the approval of ARMSCOR's programme manager) in accordance with section D2 of RSA-MIL-PRAC-175. The LCC Management Plan shall be based on the processes described in section 5 of RSA MIL-PRAC-175 and shall identify all relevant Life Cycle Cost Elements (LCCE) and the manner in which they will be established and maintained. Inputs from and to LCC management of higher level systems will be handled in the LCC Management Plan as well as the processes to influence LCC during all life cycle phases.

NOTE: The LCC estimate is only one of the LCCE's at each baseline.

Outputs from life cycle cost (LCC) and design to cost (DTC) studies shall be used in the cost effectiveness analysis for the system.

The design approach shall specifically include LCC and DTC to the extent agreed upon with ARMSCOR's programme manager and shall form an integral part of the relevant baseline.

6.2.2.1 Life Cycle Cost Reports

The CONTRACTOR shall submit, at intervals as agreed upon with ARMSCOR's programme manager, LCC and DTC reports, using RSA-MIL-PRAC-175 Appendix D3 and D4 as a guideline, containing:

- Management summary;
- Latest forecast of LCC against baseline established and agreed, and giving reasons for deviations; and
- Proposed corrective actions.

6.2.3 System Cost Effectiveness Analysis

The CONTRACTOR shall conduct system cost effectiveness analysis to ensure that engineering decisions, resulting from the review of alternatives or engineering change proposals, are made only after considering their impact on system effectiveness and life cycle cost, using the principles and processes described in RSA-MIL-PRAC-175, Section 4 and 5. Where possible, this task shall be integrated with value engineering. (See paragraph 6.1.7)

6.3 LOGISTIC ENGINEERING

The CONTRACTOR shall perform, phased in accordance with RSA-MIL-STD-3, logistic engineering as part of the engineering effort to develop and achieve a supportable and cost-effective system, using MIL-STD-1369 as a guideline and shall comply with the



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logistic support philosophy, policy and other guidelines supplied by ARMSCOR's programme manager.

This support to the system shall include at least:

- Logistic Support Analysis and Planning Define, quantify and document requirements to ensure availability of Support timeously.
- Supply Support Spares, repair parts, CFE, consumables, inventories and distribution channels.
- Test and Support Equipment Hardware and software for diagnosis, checkout and calibration.
- Transportation and Handling Packaging, preserving, storing and transporting.
- Personnel and Training Skill level definition, training aids, course development and training.
- Facilities Buildings, standard equipment and utilities for equipment maintenance and overhaul.
- Publications Technical Manuals for installation, checkout, operation, maintenance and modification.
- Data Reliability and maintainability data, collection procedures, test and demonstration.

6.3.1 Logistic Support Analysis (LSA)

The CONTRACTOR shall perform Logistic Support Analysis (LSA) in accordance with MIL STD 1388 1A to:

- Influence the system design to obtain optimum supportability (front-end analysis); and
- Identify the logistic resources.

During the first iterations of the system concept development, the CONTRACTOR shall perform only those LSA tasks necessary to determine system life cycle costs (LCC) of the various system concepts under consideration in the programme Concept Phase.

The outputs of the LSA of the final system design shall be recorded as LSA Records (LSAR) which shall be in accordance with MIL-STD-1388-2B.

The CONTRACTOR shall develop Integrated Logistic Support Plans (ILSP's) in accordance with MIL-STD-1369. These plans shall be based upon the user's maintenance concepts for development and installation of the logistic systems.

The CONTRACTOR shall ensure that specific requirements with reference to CONTRACT deliverable logistic product are in support of and fulfil the requirements of the user's support systems and policies.

The CONTRACTOR shall develop, with ARMSCOR's programme manager's approval, a logistic demonstration plan in accordance with MIL-STD-1369. This plan shall be integrated with the TEMP where necessary.

The CONTRACTOR shall develop, with ARMSCOR's programme manager's approval, a



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Logistics Plan for Pre-operational Support (LPPS) covering all development and qualification testing as well as commissioning of the system, using DI-L-3302 as a guideline.

6.3.2 Interchangeability and Compatibility

The CONTRACTOR shall ensure that items and parts bearing the same number are fully interchangeable with regard to form, fit and function.

Any assembly, sub-assembly module or part which requires setting up, re-alignment or matching to restore full system capability, shall be identified and clearly highlighted in technical and maintenance manuals.

6.3.3 Codification

The CONTRACTOR shall submit a report for ARMSCOR's consideration giving a Recommended Spare Parts List (RSPL) (DD 1376) of items to be codified in support of the system. These items shall be stocked or purchased. The item information for these items must be that of the original manufacturer.

The LSA, system architecture, other relevant engineering data and the proposed levels of support (maintenance) shall be used to motivate the items proposed.

All servicing equipment, spares and materiel as agreed upon with ARMSCOR for maintenance, including all associated equipment and items, shall be codified in accordance with RSA-MIL-SPEC-47, the National Codification System (NCS) and/or the NATO Codification System (NATOCS). The agreed equipment/spares and materiel shall be supported by the necessary documentation (i.e. product specifications, drawings, etc.)

In the event of servicing equipment, spares or materiel that have not been codified, the CONTRACTOR shall submit with his quotation, or as detail becomes available during the Development Phase, item information for codification.

6.3.4 Logistic Support Analysis Report

The CONTRACTOR shall, at agreed intervals, report on a plan, based upon MIL-STD-1388-1A, Appendix A, Table II, for the generation of Logistic Support Analysis information required for each milestone in the acquisition process. These Logistic Support Analysis reports shall also clearly demonstrate to what extent actual results achieved, meet, or will meet the major LSA objectives. These reports must not be confused with Logistic Support Analysis Record (LSAR) reports.

6.4 PRODUCTION ENGINEERING

The CONTRACTOR shall perform production engineering, phased in accordance with RSA-MIL-STD 3 as an integral part of the system engineering process, using The System Engineering Management Guide of the Defence Systems Management College as a guideline.

The CONTRACTOR shall submit a Production Engineering plan to ARMSCOR's programme manager for approval at the commencement of each programme phase. The plan shall sufficiently address the way in which Process Qualification will be performed and validated, using RSA-MIL-PRAC-190 Part 2 and DOD-5000.38 as a guideline.

The CONTRACTOR shall qualify all production processes prior to commencement of



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production, taking cognisance of the importance of each process based upon the classification of characteristics.

6.4.1 Production Engineering Analysis

The CONTRACTOR shall conduct production engineering analysis using MIL-STD-1528 as a guideline and shall at least include:

- Produceability analysis;
- Production engineering inputs to system effectiveness, trade-off studies and life cycle cost analysis;
- Consideration of the materials, tools, test equipment, facilities, personnel and its capabilities and procedures which support manufacturing in the development and production phases; and
- Identification of critical produceability requirements and its inclusion into the programme risk analysis.

The analysis shall begin in the Concept Phase and shall be performed to:

- Establish estimates of production, including process capability required, compared with actual capabilities, and agree upon a corrective action plan with ARMSCOR's programme manager;
- Assess previous production experience and problems encountered on similar programmes;
- Identify, develop and document new technology or special processes;
- Assess production feasibility and identify risk areas;
- Develop production costs and schedules;
- Define production risk mitigation approach and associated milestones;
- Define tooling requirements;
- Define a production test plan;
- Establish process control and inspection requirements;
- Establish personnel skills and training requirements;
- Evaluate existing facilities and equipment to establish any modifications or new resources for manufacturing;
- Develop a manufacturing assembly sequence chart;
- Define produceability criteria; and
- Identify trade-off areas to reduce risk or cost.



UNCLASSIFIED

6.4.2 Production Processes

The CONTRACTOR shall demonstrate to ARMSCOR's programme manager before production may commence (during the Industrialization Phase) the adequacy of his production processes and the process control methods introduced to meet the requirements of the ORDER.

6.4.3 Production Plan

The CONTRACTOR shall establish and agree with ARMSCOR's programme manager prior to the Production Readiness Review (PRR) upon a Production Plan, using DI-MISC-80074 as a guideline.

The Production Plan shall be included in the CDRL and shall at least address:

- Manufacturing concepts and methods;
- Sufficient information to supporting organisations to support their planning efforts;
- Manufacturing organisations;
- Make or buy decisions;
- Sub-contracting;
- Resource and manufacturing capability; and
- Production planning, defining schedules, lead times, phasing, production controls and assembly sequences.

6.4.4 Production Readiness Review (PRR)

The CONTRACTOR shall, prior to the start of production, conduct a Production Readiness Review (PRR), using DOD 5000.38 as a guideline. The PRR shall at least evaluate the criteria detailed in DOD 5000.38 (Encl 1).

A PRR report shall be prepared at the conclusion of the review, to identify:

- Team members and their specialities;
- Summaries of findings;
- Potential problems; and
- Conclusion and recommendations.

6.5 SOFTWARE ENGINEERING

The CONTRACTOR shall have a software Development Management System which conforms to MIL-STD-498 with the necessary controls to ensure that the Software product meets the contractual requirements. The Management System shall address Software from the product and system point of view during the Software Development Life Cycle (SDLC).

The CONTRACTOR can agree with ARMSCOR to use ISO/IEC 12207, instead of MIL-STD-498, for Software development. Should this be the case, the DIDs from MIL-STD-498, as specified below in the sub-paragraphs of 6.5, shall be used as guidelines.

Software developed shall be phased in accordance with RSA-MIL-STD-3. The Software development process shall at least include the following:



UNCLASSIFIED

6.5.1 Establishing a Software Development Environment

The CONTRACTOR shall establish a Software development environment to address:

- Software engineering environment;
- Software test environment;
- Software development library;
- Software development files; and
- Non-deliverable Software.

The CONTRACTOR shall develop a Software Development Plan (SDP) which shall at least describe the development process up to commissioning, standards/methodologies to be followed, all phases/builds during development, reviews that will take place, etc, using DI-IPSC-81427 as a guideline. Software quality assurance and software configuration management shall be adequately addressed, either included into the SDP, or separately addressed in the program's Quality Assurance Plan (QAP) and Configuration Management Plan (CMP).

The CONTRACTOR may use non-deliverable Software in the development of deliverable Software as long as the operation and support of the deliverable Software after delivery do not depend on the non-deliverable Software. Otherwise the CONTRACTOR shall ensure that provision is made that ARMSCOR has or can obtain the same Software. The CONTRACTOR shall ensure that all non-deliverable Software used on the project performs its intended functions.

6.5.2 System Requirement Analysis

The CONTRACTOR shall conduct an analysis of the requirements and interfaces to be met by the system and the methods to be used to ensure that each requirement has been met. This shall be documented into a System/Subsystem Specification (SSS), using DI-IPSC-81431 as a guideline.

Unless specifically otherwise required in the CDRL, requirements concerning system interfaces may be included in the SSS or in Interface Requirements Specifications (IRs), using DI-IPSC-81434 as a guideline.

The SSS shall be formally reviewed (refer paragraph 5.3 on Formal Reviews) and presented to ARMSCOR for approval.

6.5.3 System Design

The CONTRACTOR shall conduct the system's design, defining the system-wide design decisions (that is, decisions about the system's behaviour design and identifying the different Computer Software Configuration Items (CSCIs)) and the system's architectural design. The result shall be documented in a System/Subsystem Design Description (SSDD), using DI-IPSC-81432 as a guideline.

Unless specifically otherwise required in the CDRL, design pertaining to interfaces may be included in the SSDD or in Interface Design Descriptions (IDDs), using DI-IPSC-81436 as a guideline.

The CONTRACTOR's system engineer responsible for the overall system shall approve the SSDD. The SSDD shall be formally reviewed (refer paragraph 5.3 on Formal



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Reviews) and presented to ARMSCOR for approval.

6.5.4 Software Requirements Analysis

The CONTRACTOR shall define and record the Software requirements to be met by the CSCI, the methods to be used to ensure that each requirement has been met and the traceability between the CSCI requirements and system requirements. The result shall be documented in Software Requirements Specifications (SRSs), for each of the CSCIs identified in the SSDD, using DI-IPSC-81433 as a guideline.

Unless specifically otherwise required in the CDRL, requirements concerning CSCI interfaces may be included in SRSs or in IRSs.

The SRS shall be formally reviewed (refer paragraph 5.3 on Formal Reviews) and presented to ARMSCOR for approval.

6.5.5 Software Design

6.5.5.1 Preliminary Design

The CONTRACTOR shall conduct a top-level design for each of the SRSs, defining the CSCI-wide design decisions (that is, decisions about the CSCIs behaviour design and other decisions affecting the selection and design of the Software units comprising the CSCI) and the CSCIs architectural design.

The CONTRACTOR shall compile a Software Test Plan (STP) to describe the Software test environment for testing, identifying tests to be performed and provide schedules for testing, using DI-IPSC-81438 as a guideline.

The CONTRACTOR shall conduct a Preliminary Design Review (PDR) with minutes of all relevant comments and action items outstanding. The STP should also be reviewed at the PDR.

6.5.5.2 Detailed Design

The CONTRACTOR shall develop a detailed design for each of the SRSs and top-level designs, describing each Software unit.

Unless specifically otherwise required in the CDRL, design pertaining to interfaces may be included in Software Design Descriptions (SDDs), using DI-IPSC-81435 as a guideline, or in IDD, using DI-IPSC-81436 as a guideline.

The CONTRACTOR shall develop test cases to allow for unit testing once developed.

The CONTRACTOR shall conduct a Critical Design Review (CDR) for all CSCIs identified with minutes of all relevant comments and action items outstanding. This includes reviewing of the test cases.

6.5.6 Coding and Unit Testing

The CONTRACTOR shall develop the code from the design and perform structural and functional tests against test cases. The results of unit testing shall be recorded into the appropriate Software Development File (SDF).

The CONTRACTOR shall compile a Software Test Description (STD) (or Acceptance Test Plan (ATP) Document), using DI-IPSC-81439 as a guideline, for CSCI testing and



UNCLASSIFIED

acceptance.

The CONTRACTOR shall conduct technical code reviews, looking at the integrity of the code as well as the adherence to maintainability coding standards (indents, comments, headers, etc). Track shall be kept of issues raised at these reviews and it shall be recorded for reference and included in the SDF. If the test cases were not examined during the CDR, it shall be reviewed at the code reviews.

6.5.7 Unit Integration and CSCI Testing

The CONTRACTOR shall integrate the units and perform functional CSCI testing against the formal STD or ATP.

The CONTRACTOR shall perform a Test Readiness Review (TRR) before CSCI testing to ensure that all relevant issues have been addressed.

The CONTRACTOR shall generate a test report which must be included or referred to in the SDF. ARMSCOR shall approve the format beforehand; otherwise DI-IPSC-81440 must be used as a guideline. The CONTRACTOR shall present the test results to ARMSCOR for acceptance.

6.5.8 CSCI/HWCI Integration and Testing

The CONTRACTOR shall integrate the CSCI/HWCIs and perform functional testing against system requirements. The CONTRACTOR shall conduct a TRR before formal testing commences to ensure readiness for formal testing/acceptance.

6.5.9 Software Version Description (SVD)

The CONTRACTOR shall ensure that each formal build shall be accompanied by a SVD, using DI-IPSC-81442 as a guideline, which identifies and describes a Software version consisting of one or more CSCIs. The SVD shall address all changes installed (if an update) and possible problems and known errors.

6.5.10 Software Development File (SDF)

The CONTRACTOR shall maintain SDF's as described in MIL-STD-498, which shall be under formal configuration management.

7 QUALITY MANAGEMENT

7.1 CONTRACTOR'S QUALITY MANAGEMENT SYSTEM

The CONTRACTOR shall maintain a Quality Management System and demonstrate its conformance to ISO 9001 before commencement of CONTRACT.

ARMSCOR shall have the right to carry out periodic audits of the CONTRACTOR's management of quality, as well as specific product and CONTRACT audits.

7.2 QUALITY PLAN

The CONTRACTOR shall establish and maintain Quality Plans, phased in accordance



UNCLASSIFIED

with RSA-MIL-STD-3. The Quality Plan shall conform to RSA-MIL-STD-51, where applicable. The Quality Plan shall be approved by ARMSCOR's programme manager and shall conform to the requirements of ARMSCOR's Programme Plan and Program Level Quality Plan.

7.3 QUALITY REPORTS

The CONTRACTOR shall submit to ARMSCOR, in an agreed upon format, at intervals agreed upon with ARMSCOR's programme manager a report, containing:

- Management summary;
- Product / System quality conformance;
- Process quality conformance;
- Level of conformance to ISO 9001;
- Outstanding corrective actions; and
- Summary of latest internal audit reports.

7.4 RIGHT OF ACCESS

ARMSCOR or persons designated by him shall have free access to all relevant sections of the place or places where work is performed to fulfil the requirements of the ORDER, for the purpose of conducting/witnessing any audits, inspections or tests.

7.5 ACCEPTANCE AUTHORITY

ARMSCOR shall be the acceptance authority in terms of the ORDER.

7.6 QUALITY OF SUPPLIES

The CONTRACTOR shall be responsible for all controls, reviews, audits, inspections and tests necessary to demonstrate the acceptability of all MATERIAL/WORK covered by the ORDER.

7.7 CONTROL OF INSPECTION, MEASURING AND TEST EQUIPMENT

The CONTRACTOR shall ensure and demonstrate the adequacy of inspection, measuring and test equipment used by the CONTRACTOR to demonstrate conformance to the specified requirements. Inspection, measuring and test equipment shall be calibrated and used in a manner which ensures that the measurement uncertainty is known and is consistent with the required measurement capability. Traceability to national calibration standards shall be maintained and on request, be demonstrated.

7.8 ACCEPTANCE / FORMAL TEST AND EVALUATION

Acceptance/Formal test and evaluation shall be undertaken at a venue agreed upon with ARMSCOR's programme manager. The CONTRACTOR shall notify ARMSCOR of such acceptance/formal test and evaluation dates at least five (5) working days or such periods agreed prior to the date of such acceptance/formal test and/or evaluation.

7.9 ACCEPTANCE

MATERIEL shall be accepted by ARMSCOR's programme manager or his representative



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by means of an Inspection Release Certificate (form K225) or an agreed upon alternative, once the following conditions have been met:

- Certificate of Conformance / Analysis has been issued providing objective evidence that the MATERIEL conforms to the requirements of the ORDER and has been controlled in terms of the quality plans agreed upon. The certificates shall be issued and signed by an authorized representative of the CONTRACTOR agreed upon with ARMSCOR's programme manager, and shall include all concessions (waivers) and deviations from the ORDER; and
- ARMSCOR's programme manager or his representative has satisfied himself that the MATERIEL conforms to the ORDER.

MATERIEL which is found not to conform to specified requirements shall be rejected by means of an Inspection Rejection Note (form K226). The reasons for rejection and the requirements necessary for re-submission will be stated on the Inspection Rejection Note.

7.10 SOFTWARE QUALITY ASSURANCE

The CONTRACTOR shall, when software development is included in the ORDER, update his Quality Management System to also conform to DOD-STD-2168.

7.11 QUARANTINE SYSTEM

The CONTRACTOR shall provide and maintain a quarantine system.

Any MATERIEL which is found on inspection not to conform to specified requirements, shall be placed in quarantine and shall be marked or labelled.

Items placed in quarantine shall only be released for use when a concession (waiver) has been authorised in terms of the ORDER.

Items, for which application for a concession (waiver) has been refused, shall be released from quarantine for disposal or rework purposes only.

Adequate records of all items placed in and removed from quarantine shall be kept. These records shall be made available to ARMSCOR on his request.

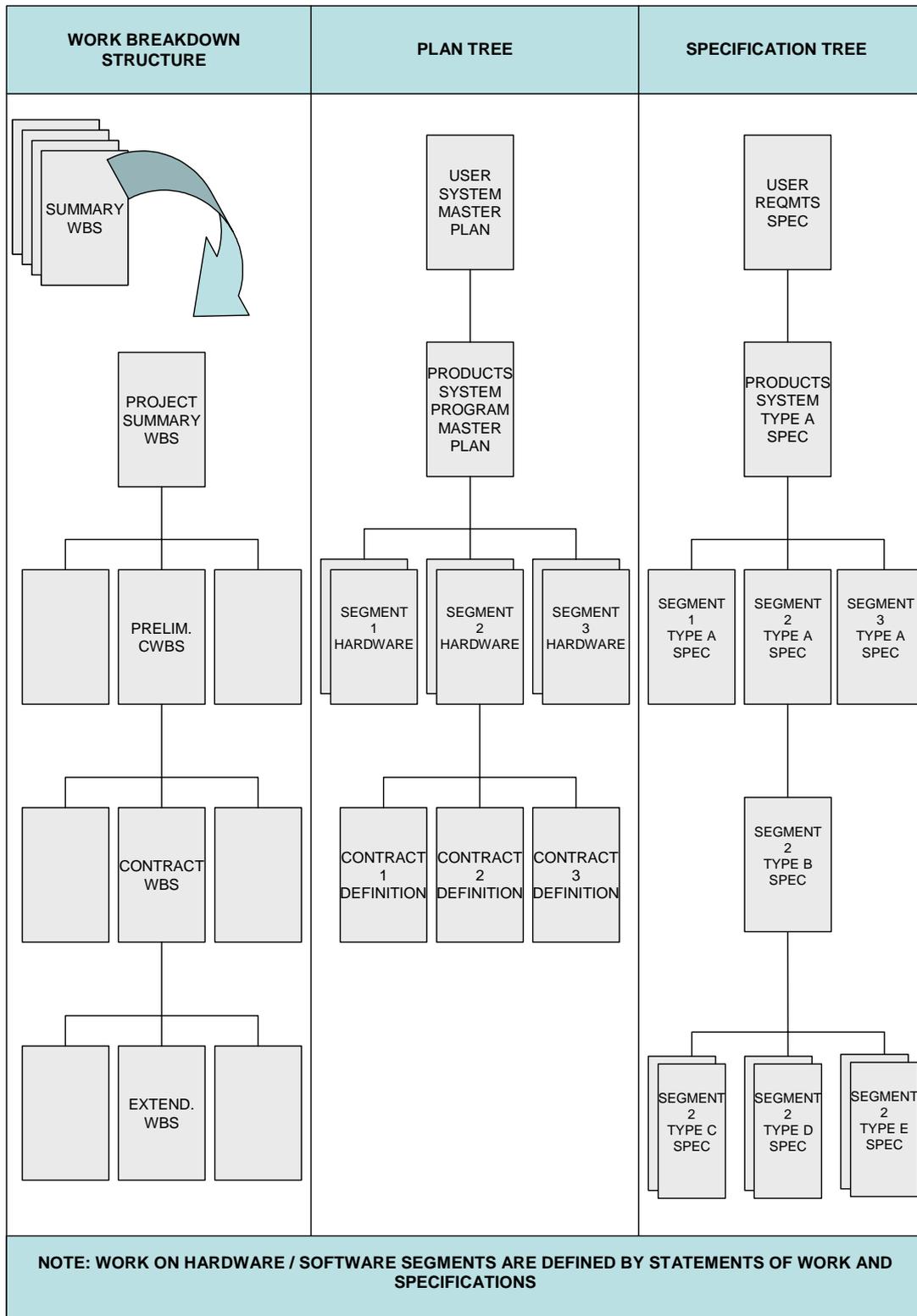
7.12 CORRECTIVE AND PREVENTIVE ACTION SYSTEM

The CONTRACTOR shall provide and maintain a corrective and preventive action system. The CONTRACTOR shall act promptly on corrective action requests issued by ARMSCOR.

7.13 CONTROL OF QUALITY RECORDS

The CONTRACTOR shall provide and maintain a quality record system. Quality records shall be maintained to demonstrate conformance to specified requirements and the effective operation of the quality system. Pertinent quality records of sub-contractors shall be an element of this data.

FIGURE 1: TYPICAL PLAN TREE, SPECIFICATION TREE AND WORK BREAKDOWN STRUCTURE RELATIONSHIP FOR COMPLEX SYSTEMS



ANNEXURE A: REFERENCES

AFSCP-173-5	Cost / Schedule Control System Criteria - Joint Implementation Guide
AMCP-706-104	Engineering Design Handbook, Value Engineering
A-STD-0020	Armcor's General Conditions of Contract
DI-A-23434	List, Data Requirements
DI-ADMN-81249	Conference Agenda
DI-ADMN-81250	Conference Minutes
DI-CMAN-81314	System / Segment Interface Control Specification
DID-0001-01	Ergonomic Programme Plan
DID-0001-03	Ergonomic System Analysis Report
DID-0001-07	Ergonomic Test Plan
DID-0001-09	Ergonomic Dynamic Simulation Plan
DI-EMCS-80200	Electro-magnetic Interference Control Plan
DI-EMCS-80201	Electro-magnetic Interference Test Plan
DI-GDRQ-81222	Requirements Allocation Sheets
DI-GDRQ-81224	Functional Flow Diagrams
DI-IPSC-81427	Software Development Plan (SDP)
DI-IPSC-81431	System / Sub-system Specification (SSS)
DI-IPSC-81432	System / Sub-system Design Description (SSDD)
DI-IPSC-81433	Software Requirements Specification (SRS)
DI-IPSC-81434	Interface Requirements Specification (IRS)
DI-IPSC-81435	Software Design Description (SDD)
DI-IPSC-81436	Interface Design Description (IDD)
DI-IPSC-81438	Software Test Plan (STP)
DI-IPSC-81439	Software Test Description (STD)
DI-IPSC-81440	Software Test Report (STR)
DI-IPSC-81442	Software Version Description (SVD)
DI-L-3302	Logistic plan for Pre-operational Support
DI-MISC-80074	Manufacturing Plan
DI-RELI-81496	Reliability and Maintainability Allocations, Assessments and Analysis Report
DI-R-7095	Reliability Prediction and Documentation of Supporting Data
DI-RELI-80252	Reliability Test Reports



UNCLASSIFIED

DI-RELI-80255	Failure Summary and Analysis Report
DI-R-3535	Reliability and Maintainability Allocations, Assessments and Analysis Report
DI-R-7080	Reliability Status Report
DI-S-3606	System / Design Trade-off Study Reports
DI-S-3608	Time Line Sheets
DI-S-3619	Technical Performance Measurement Report
DI-SAFT-80100	System Safety Program Plan
DI-SAFT-80104	System Safety Engineering Report
DI-SAFT-80105	System Safety Engineering Report
DI-SAFT-81300	Accident Risk Assessment Report (ARAR)
DOD-5000.3-M-1	Test and Evaluation Master Plan
DOD-5000.38	Production Readiness Review
DOD-STD-2101	Classification of Characteristics
KA2945/3	Reliability Qualification and Testing Requirements
K-DID-0031	Standardisation Status Report
K-DID-0035	Parts Selection List
K-STD-0003	Standaard vir MRI's
K-STD-0034	Parts Control Plan
MIL-HDBK-189	Reliability Growth Management
MIL-HDBK-217	Reliability Prediction of Electronic Equipment
MIL-HDBK-245	Preparation of Statement of Work (SOW)
MIL-HDBK-251	Reliability / Design Thermal Applications
MIL-HDBK-472	Maintainability Prediction
MIL-STD-470	Maintainability Program for Systems and Equipment
MIL-STD-471	Maintainability Verification / Demonstration / Evaluation
MIL-STD-490	Specification Practices
MIL-STD-756	Reliability Modelling and Prediction
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-881	Work Breakdown Structures for Defence Material Items
MIL-STD-882	System Safety Program Requirements
MIL-STD-1369	Integrated Logistic Support Program Requirements
MIL-STD-1521	Technical Reviews and Audits for Systems, Equipment and Computer Software
MIL-STD-1528	Manufacturing Management Program



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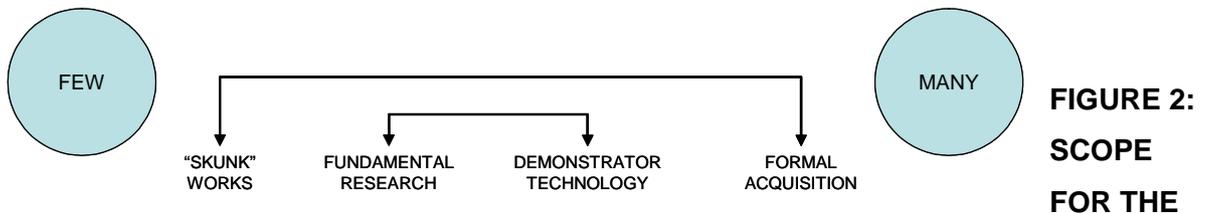
MIL-STD-1543	Reliability Program Requirements for Space and Launch Vehicles
MIL-STD-1574	System Safety Program for Space and Missile Systems
MIL-STD-1629	Procedures for Performing a Failure Mode Effects and Criticality Analysis
RSA-MIL-HDBK-36	Technical Reviews and Audits - Guideline for the use of MIL-STD-1521
RSA-MIL-HDBK-55	Acquisition of Complex Systems, Risk Management, Guide for
RSA-MIL-HDBK-56	Acquisition of Complex Systems, Resource Management, Guide for
RSA-MIL-HDBK-121	Electro-magnetic Compatibility - Guidelines for Implementation of MIL-STD's 461 and 462
RSA-MIL-PRAC-175	Life Cycle Cost Management of Complex Systems, Practice for
RSA-MIL-PRAC-190	Praktyk vir die Kwalifikasie van Stelsels
RSA-MIL-STD-57	Acquisition of Complex Systems, Planning Standards for
RSA-MIL-STD-58	Acquisition of Complex Systems, Reporting Standards for
RSA-MIL-STD-105	The Engineering of Reliable and Maintainable Systems
RSA-MIL-STD-176	Configuration Management, Standard for
RSA-MIL-STD-182	Systems Engineering Management Plan (SEMP), Preparation of
RSA-MIL-STD-184	Configuration Management Plan, Preparation of
RSA-MIL-STD-257	Test and Evaluation Master Plan (TEMP) Preparation of
UDI-E-20235	Specification Tree
-----	"System Engineering Management Guide"; The Defence Systems Management College, Fort Belvoir, Virginia, 1983.

ANNEXURE B: TAILORING GUIDELINES FOR TECHNOLOGY DEVELOPMENT

Although contracts, for the fulfilment of technology projects, should not be "loaded" with "unnecessary" technical contract conditions which monopolise the time and energy of the researches, it is indeed necessary to consider what the minimum requirements should be under specific circumstances.

The two extremes of the spectrum, as depicted by FIGURE 2, that currently exist are:

- a "skunk works" environment, where flexibility and in-time rate adjustments are the norm, vs.
- a typical development program, where fixed baselines are formally identified and managed against fixed timescales; and this will form the basis of control which will be exercised over the program.



APPLICATION OF STANDARDS ON PROJECTS

Given the window of the technology environment within the abovementioned spectrum, one can now look at:

- "Fundamental" research on the one side, vs.
- Technology projects, of which the deliverables have advanced beyond the stage of research/study, up to the point where a physical demonstrator will be built. (Indications that the project will move into Acquisition).

An objective which should at all times be adhered to in the Technology environment is the maintenance of good engineering practices and disciplines, which should result in logically structured and available results.

Thus, taking into consideration the "nature" of research and the ability of the relevant Research-and Development authority, appropriate standards and requirements should be applied.

Other obvious valid aspects are things such as accountability/transparency and "propagation" of Technology.

NOTE: One or more, of these aspects may implicate that stricter requirements than normal apply under certain circumstances.

Taking into account all of the above principles, the following matrix is suggested as a point of departure:



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TABLE 1: TAILORING MATRIX FOR TECHNOLOGY DEVELOPMENT

Par #	Paragraph Heading	Tailoring Guide
1	GENERAL	
1.1	APPLICABILITY OF DOCUMENTS	Applicable
1.2	DOCUMENTS	Applicable
1.2.1	Applicable Documents	Applicable
1.2.2	Reference Documents	Applicable
1.3	DEFINITIONS	Applicable
1.4	GENERAL NOTES	Applicable
2	ENGINEERING MANAGEMENT	
2.1	ORGANISATION	Applicable
2.1.1	Programme / Project Management Organisation	Tailored Application
2.1.2	List of Major Sub-contractors	Applicable
2.1.3	Appointment of Personnel to Committees, Boards and Work Groups	Applicable
2.2	PLANNING	Applicable
2.2.1	Information for Summary Work Breakdown Structure	Applicable
2.2.2	Contract Work Breakdown Structure (CWBS)	Tailored Application
2.2.3	Work Breakdown Structure (WBS) Dictionary and Statement of Work (SOW)	Tailored Application
2.2.4	Plan Tree and Contract Data Requirements List (CDRL)	Tailored Application
2.2.5	Programme Master Plan (PMP)	Tailored Application
2.2.6	Programme Report	Tailored Application
2.2.7	Cost and Schedule Planning and Control	Not Applicable
2.3	CONTROLLING	Applicable
2.3.1	Establishment of Resource Management Control Systems	Not Applicable
2.3.2	Resource Management System Demonstration and Audit	Not Applicable
2.3.3	Reporting	Tailored Application
2.3.4	Monthly progress meeting	Tailored Application
2.3.5	ARMSCOR's representative facilities	Applicable



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TABLE 1: TAILORING MATRIX FOR TECHNOLOGY DEVELOPMENT		
Par #	Paragraph Heading	Tailoring Guide
3	SYSTEM ENGINEERING PROCESS	
3.1	MISSION REQUIREMENTS ANALYSIS	Not Applicable
3.2	FUNCTIONAL ANALYSIS	Not Applicable
3.3	REQUIREMENT FLOWDOWN AND ALLOCATION	Not Applicable
3.4	TRADE-OFF STUDIES	Not Applicable
3.4.1	Trade-off trees	Not Applicable
3.4.2	Value system	Not Applicable
3.4.3	Sensitivity Analysis	Not Applicable
3.4.4	Trade-off study reports	Not Applicable
3.5	SYSTEM SYNTHESIS	Tailored Application
4	CONFIGURATION DEFINITION AND MANAGEMENT	
4.1	GENERATION OF SPECIFICATIONS	Tailored Application
4.2	CONFIGURATION MANAGEMENT REQUIREMENTS	Applicable
4.2.1	General	Applicable
4.2.2	Configuration Management Plan	Applicable
4.2.3	Baseline Management	Tailored Application
4.2.4	Configuration Identification	Tailored Application
4.2.5	Configuration Management Records and Reports	Tailored Application
4.2.6	Configuration Control	Tailored Application
4.2.7	Configuration Verification	Tailored Application
4.2.8	Security of Data	Tailored Application
4.2.9	Handover of Documentation to ARMSCOR	Applicable
5	TECHNICAL PERFORMANCE ACHIEVEMENT	
5.1	RISK MANAGEMENT	Tailored Application
5.1.1	Risk Management Programme Plan (RMPP)	Not Applicable
5.1.2	Risk Abatement Plans (RAPs)	Not Applicable
5.1.3	Risk Reduction Report	Not Applicable



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TABLE 1: TAILORING MATRIX FOR TECHNOLOGY DEVELOPMENT

Par #	Paragraph Heading	Tailoring Guide
5.2	TECHNICAL PERFORMANCE MEASUREMENT (TPM)	Tailored Application
5.3	FORMAL REVIEWS	Tailored Application
5.3.1	Technical Review Agenda	Applicable
5.3.2	Technical Review Data Package	Tailored Application
5.3.3	Technical Review Meeting minutes	Applicable
5.4	VERIFICATION AND VALIDATION OF DESIGN	Applicable
5.4.1	Qualification Principles	Tailored Application
5.4.2	Test and Evaluation of Qualification Planning	Tailored Application
5.4.3	Design Qualification	Tailored Application
5.4.4	Simulation Model Validation	Tailored Application
5.4.5	Specification Validation	Tailored Application
6	OPERATIONAL FEASIBILITY AND OPTIMISATION	
6.1	ENGINEERING SPECIALTY INTEGRATION	Applicable
6.1.1	Reliability Engineering	Tailored Application
6.1.2	Maintainability Engineering	Not Applicable
6.1.3	System Safety	Tailored Application
6.1.4	Standardization and Parts Control	Not Applicable
6.1.5	Human Engineering	Not Applicable
6.1.6	Electro-magnetic Compatibility (EMC) and Electro-magnetic Interference (EMI)	Tailored Application
6.1.7	Value Engineering	Not Applicable
6.1.8	Nuclear, Biological and Chemical Protection (NBC)	Not Applicable
6.1.9	Thermal Analysis / Design	Not Applicable
6.1.10	Classification of Characteristics and Failures	Not Applicable
6.2	SYSTEM AND COST EFFECTIVENESS	Not Applicable
6.2.1	System Effectiveness Models	Not Applicable
6.2.2	Life Cycle Cost (LCC)	Not Applicable
6.2.3	System Cost Effectiveness Analysis	Not Applicable
6.3	LOGISTIC ENGINEERING	Not Applicable



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TABLE 1: TAILORING MATRIX FOR TECHNOLOGY DEVELOPMENT

Par #	Paragraph Heading	Tailoring Guide
6.3.1	Logistic Support Analysis (LSA)	Not Applicable
6.3.2	Interchangeability and Compatibility	Not Applicable
6.3.3	Codification	Not Applicable
6.3.4	Logistic Support Analysis Report	Not Applicable
6.4	PRODUCTION ENGINEERING	Not Applicable
6.4.1	Production Engineering Analysis	Not Applicable
6.4.2	Production Processes	Not Applicable
6.4.3	Production Plan	Not Applicable
6.4.4	Production Readiness Review (PRR)	Not Applicable
6.5	SOFTWARE ENGINEERING	Applicable
6.5.1	Establishing a Software Development Environment	Tailored Application
6.5.2	System Requirement Analysis	Applicable
6.5.3	System Design	Tailored Application
6.5.4	Software Requirements Analysis	Tailored Application
6.5.5	Software Design	Tailored Application
6.5.6	Coding and Unit Testing	Applicable
6.5.7	Unit Integration and CSCI Testing	Tailored Application
6.5.8	CSCI / HWCI Integration and Testing	Tailored Application
6.5.9	Software Version Description (SVD)	Tailored Application
6.5.10	Software Development File (SDF)	Tailored Application
7	QUALITY MANAGEMENT	
7.1	CONTRACTOR'S QUALITY MANAGEMENT SYSTEM	Tailored Application
7.2	QUALITY PLAN	Tailored Application
7.3	REPORTS	Tailored Application
7.4	RIGHT OF ACCESS	Applicable
7.5	ACCEPTANCE AUTHORITY	Applicable
7.6	QUALITY OF SUPPLIES	Applicable
7.7	CONTROL OF INSPECTION, MEASURING AND TEST EQUIPMENT	Applicable

TABLE 1: TAILORING MATRIX FOR TECHNOLOGY DEVELOPMENT		
Par #	Paragraph Heading	Tailoring Guide
7.8	ACCEPTANCE / FORMAL TEST AND EVALUATION	Applicable
7.9	ACCEPTANCE	Applicable
7.10	SOFTWARE QUALITY ASSURANCE	Applicable
7.11	QUARANTINE SYSTEM	Not Applicable
7.12	CORRECTIVE AND PREVENTIVE ACTION SYSTEM	Applicable
7.13	CONTROL OF QUALITY RECORDS	Applicable

APPENDIX 2: ABBREVIATIONS

ABL	Allocated Baseline
ARAR	Accident Risk Assessment Report
ATP	Acceptance Test Plan
CCB	Configuration Control Board
CDR	Critical Design Review
CDRL	Contractor Data Requirements List
CFE	Client-furnished equipment
CI	Configuration Item
CIL	Critical Item List
CMP	Configuration Management Plan
COTS	Commercial Off-the-shelf
CSCI	Computer Software Configuration Item
CWBS	Contract Work Breakdown Structure
DID	Data Item Description
DRI	Documentation Record Index
DTC	Design to Cost
ECP	Engineering Change Proposal
EMC	Electro-magnetic Compatibility
EMI	Electro-magnetic Interference
ESS	Environmental Stress Screening
FBL	Functional Baseline
FFBD	Functional Flow Block Diagram
FMECA	Failure Modes, Effects and Criticality Analysis
FRACAS	Failure Reports, Analysis and Corrective Action System
IDD	Interface Design Description
ILSP	Integrated Logistic Support Plan



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IRN	Interface Revision Notice
IRS	Interface Requirements Specification
LCC	Life Cycle Cost
LCCE	Life Cycle Cost Elements
LPPS	Logistics Plan for Pre-operational Support
LSA	Logistic Support Analysis
LSAR	Logistic Support Analysis Record
MBL	Manufacturing Baseline
MRB	Material Review Board
MRI	Master Record Index
NATOCS	NATO Codification System
NBC	Nuclear, Biological and Chemical
NCS	National Codification System
NEMP	Nuclear Electro-magnetic Pulse
OSBL	Operational Support Baseline
PBL	Product Baseline
PDR	Preliminary Design Review
PMP	Programme Master Plan
PRAT	Production Reliability Acceptance Test
PRR	Production Readiness Review
QAP	Quality Assurance Plan
RAP	Risk Abatement Plan
RAS	Requirement Allocation Sheet
RMPP	Risk Management Programme Plan
RRR	Risk Reduction Report
RSPL	Recommended Spare Parts List



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SCN	Specification Change Notice
SDD	Software Design Description
SDF	Software Development File
SDLC	Software Development Life Cycle
SDP	Software Development Plan
SDR	System Design Review
SEMP	System Engineering Management Plan
SOW	Statement of Work
SRBL	Statement of Requirements Baseline
SRS	Software Requirements Specification
SSDD	System/Subsystem Design Description
SSS	System/Subsystem Specification
STD	Software Test Description
STP	Software Test Plan
SVD	Software Version Description
TEMP	Test and Evaluation Master Plan
TPM	Technical Performance Measurement
TRR	Test Readiness Review
WBS	Work Breakdown Structure