MSR ChecklisT

1. Identification: -
2. TITLE: DETAILED DESIGN Review Checklist
3. DESCRIPTION and intended use

The objectives of the Detailed Design Review (DDR) are to demonstrate that:

the Mission System detailed design is sufficiently mature to proceed to the build phase;

the specifications, drawings and Software development documentation have been appropriately defined;

that building block end product designs satisfy their parent requirements;

that enabling product requirements have been adequately defined;

that the building blocks are either ready for further development, adequately defined for procurement, or adequately defined for fabrication;

the approaches to the next phase have been appropriately planned and that risks are identified with appropriate mitigation plans in place; and

the Supportability of the Mission System has been adequately addressed and the implications of the Mission System preliminary design on the Support System have been identified and incorporated into the applicable Contract plans.

This MSR Checklist sets out the Commonwealth’s requirements and minimum expectations for the conduct of a DDR.

1. INTER-RELATIONSHIPS

The DDR shall be conducted in accordance with the System Review Plan (SRP), and shall be consistent with the:

Systems Engineering Management Plan (SEMP);

Integrated Support Plan (ISP); and

Verification and Validation Plan (V&VP).

Primarily, the DDR demonstrates how the mature design solution for the Mission System, as captured by the hierarchy of specifications and design documentation defined in the Mission System Technical Documentation Tree (MSTDT), will:

satisfy the requirements embodied in the System Specification (SS) and Support System Specification (SSSPEC); and

allow the Commonwealth to achieve the capability defined by the Operational Concept Document (OCD).

Note: The Status column in the following three tables indicates whether or not the associated Checklist items are able to be tailored by the Contractor in its SRP, based on the following definitions:

1. Mandatory items are not to be tailored;
2. Highly Desirable items should not be tailored, but may be tailored depending upon the specifics of the Contract and the Contractor’s internal processes; and
3. Optional items may be tailored, based upon the specifics of the Contract and the Contractor’s internal processes.

Notwithstanding the Status assigned to each Checklist item, the items are to be included in the SRP if they are applicable.

1. Review Entry Criteria

| Item | Entry Criteria | Status |
| --- | --- | --- |
|  | 1. All data items required to be delivered before, and linked to, the DDR have been delivered and the Commonwealth Representative considers the data items to be suitable for the purposes of conducting DDR. | 1. Mandatory |
|  | 1. All technical documentation as defined by the MSTDT and required to inform DDR, has been developed and delivered in accordance with the CDRL, the MSTDT and the Contractor’s plans. | 1. Mandatory |
|  | 1. The Contractor has reviewed Contract plans (including the Performance Measurement Baseline) to assess their consistency with the system requirements. | 1. Highly Desirable |
|  | 1. Action items from any previous System Reviews affecting DDR have been successfully addressed or action plans agreed with the Commonwealth Representative. | 1. Mandatory |

1. Review Checklist

| Item | Checklist Item | Status |
| --- | --- | --- |
|  | 1. Were all entry criteria satisfied before starting DDR? | 1. Mandatory |
|  | 1. Has the impact of Approved CCPs been assessed? | 1. Highly Desirable |
|  | 1. Have all Commonwealth Representative review comments against data items been adequately addressed? | 1. Mandatory |
|  | 1. Have changes to the Mission System Functional Baseline (FBL) and the Support System FBL since the last review been identified and captured in the design? | 1. Mandatory |
|  | 1. Are there any outstanding unresolved issues with the Mission System or Support System requirements (eg, requirements annotated with TBD) in either the Mission System FBL or the Support System FBL? | 1. Mandatory |
|  | 1. Has a consistent Configuration Baseline been established for all documents associated with DDR? | 1. Mandatory |
|  | 1. Where, as a result of the refinement of the design, any proposed change to an SS or SSSPEC requirement is in conflict with the FPS, has an Application for a Deviation been proposed for Commonwealth Representative Approval? | 1. Mandatory |
|  | 1. Has traceability been established, both downward and upward, between the Mission System FBL and the lowest-level Configuration Items (CIs) in the final design solution? | 1. Mandatory |
|  | 1. Are Acceptance Verification criteria agreed with the Commonwealth Representative? | 1. Mandatory |
|  | 1. For the set of Mission System Hardware CIs and Software CIs (including those elements of the Support System embedded within the Mission System):    1. has it been determined that the final design solution expressed as the set of Hardware and Software CIs will meet the overall Mission System FBL;    2. has the behaviour of the set of system components in each state and mode, including failure modes of the CIs, been identified;    3. for each of the key system performance measures, have the budgeted performance allocations across CIs been identified and does the final design allows these budgets to be met; and    4. have any remaining areas of requirements variances, voids and conflicts been identified and an approach defined to address them? | 1. Mandatory |
|  | 1. For each Mission System Hardware CI (including those elements of the Support System embedded within the Mission System):    1. will the final Hardware CI detail design satisfy the performance characteristics of its specification;    2. has all firmware been identified, together with the strategies for its support over the LOT;    3. have all physical and functional interfaces between the Hardware CI and other items of equipment, Software, and facilities been defined; and    4. have the risks associated with the production and installation of the Hardware CI and the mitigation strategies to address them been identified? | 1. Mandatory |
|  | 1. For each Mission System Software CI (including those elements of the Support System embedded within the Mission System), the Contractor shall present the detailed design (including rationale) of the Software CI to include:    1. the determination as to whether all interfaces between the Software CI and all other CIs both internal and external to the system meet their final functional and interface requirements;    2. the determination as to whether the final top-level Software design embodies all the functional and interface requirements;    3. the determination as to whether the approved design methodology has been used for the top-level design;    4. the determination as to whether the appropriate Human Engineering principals have been incorporated in the design;    5. the determination as to whether timing and sizing constraints have been met throughout the top-level design;    6. the determination as to whether logic affecting Materiel Safety has been incorporated in the design;    7. the assignment of Software CI requirements to specific Software units, the criteria and design rules used to accomplish this assignment, and the traceability of unit designs to satisfy Software CI requirements, with emphasis on the necessity and sufficiency of the units for implementing unit design requirements;    8. the overall information flow between Software units, the method(s) by which each unit gains control, and the sequencing of units relative to each other;    9. the design details of the Software CI and units including data definitions, timing and sizing, data and storage requirements and allocations;    10. the detailed design characteristics of all interfaces, including their data source, destination, interface name and interrelationships; and, if applicable, the design for direct memory access. The Contractor shall also give an overview of the key design issues of the interface Software design, and indicate whether data flow formats are fixed or subject to extensive dynamic changes; and    11. the detailed characteristics of any data base or significant data storage elements. Data base structure and detailed design, including all files, records, fields, and items. Access rules, how file sharing will be controlled, procedures for data base recovery/ regeneration from a system failure, rules for data base manipulation, rules for maintaining file integrity, rules for usage reporting, and rules governing the types and depth of access shall be defined. Data-management rules and algorithms for implementing them shall be described. Details of the language required by the user to access the data base shall also be described. | 1. Mandatory |
|  | 1. For each Support System Hardware and Software CI that must interface with the Mission System in the operational environment:    1. identify the behaviour of each of the Support System CIs that interface with the Mission System in each of its applicable states and modes, including the failure modes of the CIs that may impact upon the Mission System;    2. determine whether all interfaces between the Mission System and Support System CIs meet their functional and interface requirements;    3. determine that the final design for each of the Support System CIs provides the capability of satisfying the performance characteristics of its specification;    4. establish compatibility of the Support System CI operating characteristics in each mode with the overall Mission System design requirements; and    5. determine the risks associated with the deployment and production of the Support System CIs and the mitigation strategies to address them. | 1. Highly Desirable |
|  | 1. Have additional Technical Performance Measures (TPMs) been identified since PDR? 2. Has the status of all TPMs been reported against their respective progress? | 1. Mandatory |
|  | 1. Have the results of significant trade studies been presented, for example:    1. sensitivity of selected mission requirements versus realistic performance parameters and cost estimates;    2. operations design versus maintenance design, including Support and Test Equipment (S&TE) impacts;    3. system centralisation versus decentralisation;    4. automated versus manual operation;    5. Reliability, Availability and Maintainability (RAM);    6. commercially-available items versus new developments;    7. existing inventory items versus new development;    8. testability trade studies (eg, allocation of fault detection/isolation capabilities between elements of built-in-test, on board/on-site fault detection/isolation subsystem, separate S&TE, and manual procedures);    9. size and weight;    10. desired propagation characteristics versus reduction interference to other systems (optimum selection frequencies);    11. performance/logistics trade studies;    12. Life Cycle Cost (LCC) reduction for different computer programming languages;    13. functional allocation between hardware, Software, firmware and personnel/procedures;    14. LCC/system performance trade studies to include sensitivity of performance parameters to cost;    15. sensitivity of performance parameters versus cost;    16. cost versus performance;    17. design versus manufacturing consideration;    18. make versus buy;    19. Software-development schedule;    20. on-equipment versus off-equipment maintenance tasks, including S&TE impacts; and    21. common versus special-to-type S&TE. | 1. Mandatory |
|  | 1. Have the results of Commonwealth-directed trade studies been presented, and have the implications for the requirements and design of the Mission System and, where applicable, the Support System been addressed? 2. Have the agreed outcomes from Commonwealth-directed trade studies presented at previous reviews been incorporated into the requirements and design for the Mission System and, where applicable, Support System? | 1. Optional |
|  | 1. Packaging and Mounting: 2. Do the final mechanical and packaging designs of consoles, racks, drawers, printed circuit boards, connectors, etc allow the system requirements to be met? 3. Do the final equipment layout drawings (including three-dimensional / computer-aided design models, if applicable) indicate that the system design can be accommodated within the available space/facilities? 4. Have power distribution and grounding design aspects been addressed? 5. Is the packaging design compatible with the Level Of Repair Analysis (LORA) decisions and maintainability considerations? | 1. Mandatory |
|  | 1. Design Producibility and Manufacturing: 2. Review the status of all producibility (and productivity) efforts for cost and schedule considerations. 3. Review the status of efforts to resolve manufacturing concerns identified in previous technical reviews and their cost and schedule impact to the production program. 4. Review the status of Manufacturing Technology programs and other previously recommended actions to reduce cost, manufacturing risk and industrial base concerns. 5. Identify open manufacturing concerns that require additional direction/effort to minimise risk to the production program. 6. Review the status of manufacturing engineering efforts, tooling and test equipment demonstrations, proofing of new materials, processes, methods, and special tooling/test equipment. 7. Review the intended manufacturing management system and organisation for the production program in order to show how their efforts will effect a smooth transition into production. | 1. Highly Desirable |
|  | 1. Growth, Evolution and Obsolescence: 2. Have the likely areas for future system change or expansion over the LOT been considered and reviewed since PDR? 3. Have the final design solution and architecture been considered to ensure the solution is robust over the LOT? 4. Has the purchasing strategy been assessed to ensure that COTS elements of the solution subject to rapid change in the marketplace are acquired using just-in-time principles? 5. Has the robustness of the final design with respect to areas of likely growth and change over the LOT, including likely changes to user requirements and changes to hardware or Software technology solutions been addressed? | 1. Mandatory |
|  | 1. Design Reliability: 2. Review the most recent predictions of hardware and Software reliability and compare against requirements specified in hardware development specifications and Software requirements specifications. For hardware, predictions are substantiated by review of parts application stress data. 3. Review applications of parts or CIs with minimum life, or those which require special consideration to ensure their effect on system performance is minimised. 4. Review applications of redundant CI elements or components to establish that expectations have materialised since the PDR. 5. Review updates to the Failure Mode, Effects and Criticality Analysis (FMECA) as a result of design changes since the PDR. 6. Review detailed Hardware CI reliability demonstration plan for compatibility with specified test requirements. The number of test articles, schedules, locations, test conditions, and personnel involved are reviewed to ensure a mutual understanding of the plan and to provide overall planning information to activities concerned. 7. Review the failure data reporting procedures and methods for determination of failure trends. 8. Review the thermal analysis of components, printed circuit cards, modules, etc. Determine if these data are used in performing the detailed reliability stress predictions. 9. Review on-line diagnostic programs, off-line diagnostic programs, S&TE, and preliminary technical orders (and/or commercial manuals) for compliance with the system maintenance concept and specification requirements. 10. Review Software reliability prediction model and its updates based upon test data and refined predictions of component usage rates and complexity factors. | 1. Mandatory |
|  | 1. Design Maintainability: 2. Review the most recent predictions of quantitative maintainability and compare these against requirements specified in the Hardware CI Development Specification and Software Requirements Specification. 3. Review Preventive Maintenance frequencies and durations for compatibility with overall system requirements for both the Mission System and Support System and maintenance planning criteria. 4. Identify unique maintenance procedures required for each CI during operational use and evaluate their total effects on maintenance concepts. Confirm that the Mission System is optimised from a maintenance and maintainability viewpoint and conforms with the maintenance concepts. This shall include a review of provisions for automatic, semi-automatic, and manual recovery from hardware / Software failures and malfunctions. 5. Identify that design-for-maintainability criteria have, in fact been incorporated. 6. Determine if accessibility requirements are sufficient to enable parts to be removed and maintenance to be performed including the use of S&TE (eg, parts, assemblies, and other items are so placed that there is sufficient space to use test probes, soldering irons, and other tools without difficulty and that they are placed so that structural members of units do not prevent access to them or their ease of removal). 7. Review detailed plans for verifying that items meet maintainability requirements. Supplemental information is provided and reviewed to ensure a mutual understanding of the plan and to provide overall planning information to activities concerned. | 1. Mandatory |
|  | 1. Logistics Engineering (Transportability): 2. Confirm that the design of Hardware CIs (for both the Mission System and any Support System Components that may need to be deployed with the Mission System) meet Contract requirements governing size and weight to permit economical handling, loading, securing, transporting, and disassembly for shipment within existing capabilities of military and commercial carriers. Identify any updates since PDR to the list of potential oversized and overweight items. Identify any updates since PDR to the list of system/items defined as being hazardous. Confirm that packaging afforded hazardous items complies with Hazardous Chemicals and Dangerous Goods regulations. 3. For those Hardware CIs identified as requiring special temperature and humidity control or those possessing sensitive and shock susceptibility characteristics, confirm that special transportation requirements will be available for use. 4. Review Transportability Analysis to confirm that transportation conditions have been evaluated and that these conditions are reflected in the design of protective, shipping, and handling devices. In addition to size and weight characteristics, confirm that analysis includes provisions for temperature and humidity controls, minimisation of sensitivity, susceptibility to shock, and transit damage. 5. Review design of special materials handling equipment, when required, and action taken to acquire equipment. 6. Identify equipment to be test loaded for transportability via the transportation modes identified in the Mission System FBL and Support System FBL. | 1. Mandatory |
|  | 1. Logistics Engineering (Parts Standardisation and Interchangeability): 2. Determine that every reasonable action has been taken to fulfil the standardisation requirements for use of standard items (standard item with NSN should be first preference). Accordingly, the following criteria shall be evaluated:    1. data sources that were reviewed;    2. factors that were considered in the decision to reject known similar, existing designs; and    3. factors that were considered in decisions to accept any existing designs which were incorporated, and the trade-offs, if any, that had to be made. 3. Confirm that maximum practical inter-changeability of parts exists among components, assemblies, and Hardware CIs. | 1. Mandatory |
|  | 1. Human Engineering: 2. Review detail design presented on drawings, schematics, mockups, or actual hardware to determine that it meets human performance requirements and accepted human engineering practices. 3. Demonstrate by checklist (eg, MIL-STD-1472) or other formal means the adequacy of design for human performance. 4. Review each facet of design for human/machine compatibility. Review time/cost/effectiveness considerations and forced trade-offs of human engineering design. 5. Evaluate the following human engineering/biomedical design factors:    1. operator controls;    2. operator displays;    3. maintenance features;    4. anthropometry;    5. safety features and emergency equipment;    6. workspace layout;    7. internal environmental conditions (noise, lighting, ventilation, etc);    8. Training Equipment; and    9. Personnel accommodations. 6. Have biomedical considerations (eg, life support and crew station requirements) been addressed? | 1. Mandatory |
|  | 1. Electromagnetic Environmental Effects: 2. Review Contractor electromagnetic design of all Hardware CIs. Determine compliance with requirements of the Contract, regulatory requirements and Hardware CI specifications. 3. Review system EMC including effects on the electromagnetic environment (inter-system EMC) and intra-system EMC. Determine acceptability of final EMC design and residual risks in meeting contractual EMC requirements. 4. Confirm Mission System design for EMC with the Support System Components that are either embedded within the Mission System or interface with it. 5. Review EMC test plans. Determine adequacy to confirm EMC design characteristics of the system/Hardware CI/subsystem. | 1. Mandatory |
|  | 1. System Safety: 2. Have all Mission System Materiel Safety issues that affect the requirements and design of the Mission System and Support System, including those identified through hazard analyses, been addressed? 3. Has an analysis of failure modes been undertaken to determine the safety implications of those modes? 4. Review CI detail design for compliance to safety design requirements. 5. Have the identified hazards and their risk classifications been agreed by the Commonwealth Representative? 6. Review Acceptance verification requirements to ensure adequate safety requirements are reflected therein. 7. Evaluate adequacy of detailed design for safety and protective equipment/devices. 8. Review CI operational maintenance safety analyses and procedures. 9. Ensure the safety authority has reviewed the evidence supporting the draft Safety Case Report. | 1. Mandatory |
|  | 1. System Security: 2. Have all Mission System security issues been addressed in the final design of the Mission System and Support System, including in relation to physical security, Emanation Security (EMSEC), Information and Communications Technology (ICT) security and cyber security? 3. Have appropriate security evaluations, Certifications and Accreditations taken place or been programmed into Contract plans and schedules? 4. Review unique security requirements and the techniques to be used for implementing and maintaining security within the Hardware and Software CIs. | 1. Mandatory |
|  | 1. Regulatory: 2. Confirm that appropriate Mission System regulatory issues have been addressed in the design of both the Mission System and the Support System. For example, consider:    1. Australian Communications and Media Authority (ACMA) regulatory requirements,    2. environmental requirements,    3. EMI/EMC regulatory requirements,    4. Materiel Safety requirements,    5. system security requirements (eg, for Certifications and Accreditations), and    6. ADF regulatory / assurance framework requirements. | 1. Mandatory |
|  | 1. Environmental: 2. Review detail design to determine that it meets natural environment requirements of the hardware Development Specification. 3. Ensure that studies have been accomplished concerning effects of the natural environment on, or interactions with, the Hardware CI. Studies that have been in progress shall be complete at this time. 4. Have the ranges and extremes of environmental requirements been specified and addressed in the final Hardware CI designs? 5. Have thermal design aspects been addressed? 6. Have corrosion prevention/control considerations been addressed? | 1. Mandatory |
|  | 1. Assignment of Official Nomenclature: 2. Determine whether official nomenclature and approval of nameplates have been obtained to the extent practical. 3. Ensure that approved nomenclature has been reflected in the Development and Product Specifications. 4. Identify problems associated with nomenclature requests together with status of actions towards resolving the problems. | 1. Mandatory |
|  | 1. Codification: 2. Determine whether all Mission System CIs that will require Codification have been identified, including any modified CIs that may require extant Codification Data to be updated. | 1. Highly Desirable |
|  | 1. Verification & Validation (V&V): 2. Review updating changes to all specifications subsequent to the PDR, to determine whether the specifications adequately reflect these changes. 3. Review all available V&V documentation for currency, technical adequacy, and compatibility with requirements specifications. 4. For any development model, prototype, etc, on which testing may have been performed, examine test results for design compliance with hardware development, Software requirements, and interface requirements specification requirements. 5. Review quality assurance provisions/qualification requirements in Hardware CI product, Software requirements, or interface requirements specifications for completeness and technical adequacy. 6. Review all Verification documentation required to support verification requirements of Hardware CI product specifications for compatibility, technical adequacy, and completeness. 7. Inspect any breadboards, mockups, or prototype hardware available for test program implications. 8. Review Software test descriptions to ensure they are consistent with Software test plans and they thoroughly identify necessary parameters and prerequisites to enable execution of each planned Software test and monitoring of test results. | 1. Mandatory |
|  | 1. Maintenance and Maintenance Data: 2. Review status of unresolved Maintenance and Maintenance data problems since the PDR. 3. Review updates to FMECA since PDR to confirm that all Mission System Corrective Maintenance tasks have been identified, are achievable, and are consistent with Maintenance concepts. 4. Review updates to RCM analyses since PDR to confirm that all Mission System Preventive Maintenance tasks have been identified and, are achievable, and are consistent with Maintenance concepts. | 1. Mandatory |
|  | 1. Spare Parts and Government Furnished Material (GFM): 2. Confirm that the range and quantity of Spares (including GFM items) identified to be held in the Mission System (eg, on a ship) will fit into the allocated space. | 1. Mandatory |
|  | 1. Support and Test Equipment (S&TE) and Training Equipment: 2. Confirm that the range and quantity of S&TE identified to be held in the Mission System (eg, on a ship) will fit into the allocated space. 3. Review the reliability and maintainability of S&TE and Training Equipment, which have been designed (including the integration of existing components) under the Contract (ie, not off-the-shelf solutions). | 1. Highly Desirable |
|  | 1. Have all risks identified prior to DDR been reported against? | 1. Mandatory |
|  | 1. Does the Contractor’s proposed solution for both the Mission System and Support System represent a minimised LCC solution, as demonstrated in accordance with the Approved governing plan for LCC (eg, LCC Management Plan (LCCMP))? | 1. Mandatory |
|  | 1. Have any Contractor-provided proposals to reduce LCC been addressed (eg, as documented in the LCC Report and Model (LCCRM))? | 1. Highly Desirable |
|  | 1. Are Contract plans and schedules (including the Performance Measurement Baseline) consistent with the system requirements and design? | 1. Mandatory |
|  | 1. Does the Contractor's management of technical requirements with subcontractors and vendors allow the Contract needs to be achieved? | 1. Mandatory |
|  | 1. Does the Contractor's management of subcontractors and vendors allow visibility of objective progress to be reported in the Earned Value Management System? | 1. Mandatory |

1. Review Exit Criteria

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| Item | Exit Criteria | Status |
|  | 1. All checklist items have been addressed to the satisfaction of the Contractor and the Commonwealth Representative. | 1. Mandatory |
|  | 1. All major problem and risk areas in relation to the detailed design for the Mission System, including in relation to the required design maturity to achieve the objectives of DDR, have been identified and resolved and, for minor problems and risks, corrective action plans have been recorded and agreed by the Commonwealth Representative. | 1. Mandatory |
|  | 1. The detailed design for the Mission System is consistent with the requirements, balanced, achievable, and able to support the production, installation and Verification activities of the subsequent phases. | 1. Mandatory |
|  | 1. The implications of the Mission System detailed design for the Support System design have been identified and incorporated into the applicable Contract plans. | 1. Mandatory |
|  | 1. Plans for the next phase are deemed to be realistic and achievable by both the Contractor and the Commonwealth Representative. | 1. Mandatory |
|  | 1. Plans for the measurement and analysis program for the next phase have been agreed by the Commonwealth Representative, including the measures to be collected, associated collection methods, and analysis techniques. | 1. Mandatory |
|  | 1. The plan for achievement of work for the next phase is reflected in the Performance Measurement Baseline and the reporting levels and variance analysis thresholds have been agreed and documented in the Earned Value Management Plan. | 1. Mandatory |
|  | 1. All risks identified during the course of DDR have been documented and analysed. | 1. Mandatory |
|  | 1. The risks with proceeding to the next phase are acceptable to the Commonwealth Representative. | 1. Mandatory |
|  | 1. All major action items have been closed. | 1. Mandatory |
|  | 1. All minor action items have been documented and assigned with agreed closure dates. | 1. Mandatory |
|  | 1. Review Minutes have been prepared, Approved, and distributed in accordance with the Contract. | 1. Mandatory |