

appendix C

SDF-Derived Major Milestone Review Criteria

This appendix provides a strawman outline for the contents of the first three Major Milestone Design Reviews. Not all the identified activities and outputs are necessarily pertinent to every development program or each tier of development on any particular program. Therefore, this appendix is intended only as a guide and must be tailored to meet the needs of any specific program effectively.

The reader will notice that nearly the same activities and output data are identified for each of the three reviews. This is in keeping with the application of the SDF to each element of the system hierarchy.

I. First Major Design Review

A. System-Level Requirements Development

1. Customer-to-Contractor Specification Correlation Matrix — Confirm Traceability
 - a. Identification of all TBDs, TBSs, and TBRs and assessment of criticality
 - b. Identification of requirements ambiguities
2. Identification of all other requirements and constraints impinging on the system
 - a. Technical
 - b. Cost
 - c. Schedule
3. Verification Matrix identifying verification method and location in system build-up
4. Definition of System Context
 - a. Definition of all program phases
 - b. Identification and characterization of all external interfaces by program phase
 - 1) High rate data

- 2) Low rate data
- 3) RF signals
- 4) Test and diagnostic interfaces
- 5) Timing, sync signals
- 6) Primary and redundant power
- 7) Mechanical and thermal interfaces
- 8) Etc.
- c. Definition of all environments by phase
- d. Identification of all critical events by phase
- e. Identification of all modes and states by phase
- f. Operations Concept
 - 1) Logistics plan
 - 2) Maintenance plan
 - 3) Operability plan
 - 4) Etc.
- g. Mission timeline
- 5. System Specification Tree
- 6. System Plan Tree
- 7. Functional Definition of the System Architecture (used to correlate system-required functionality and performance with new and heritage designs implemented)
 - a. Functional block diagram for each program phase
 - 1) Functions required with associated performance traced from top-level system specification
 - 2) Inputs
 - 3) Outputs
 - 4) Noise sources
 - 5) Control functions identified

B. Synthesis

Design

- 1. Parametric Analyses Leading to Baseline Architecture
- 2. System Configuration Description
 - a. System block diagram — Electrical architecture
 - b. System layout/drawing(s) — Mechanical architecture
 - c. System drawing tree
 - d. System ICD tree
- 3. Identification of New Technologies Implemented
 - a. Risk assessment and mitigation approaches
 - b. Tailoring required for system application
- 4. Identification of Heritage Elements Implemented
 - a. Internal interfaces identified and characterized by phase
 - b. Changes required to meet system application

5. System Budgets
 - a. Technical: mass, power, baseband, RF, memory, throughput, etc.
 - b. Cost and schedule
 - c. Present margin, contingency, and reserve and location in the system
6. Subsystem Specifications
 - a. Traced from system specification
 - b. Listing of TBDs, TBSs, TBRs
 - c. Identification of all other known requirements issues
 - d. Allocation of functionality, performance, cost, schedule
7. Identification and Characterization of Internal Interfaces
 - a. High rate data
 - b. Low rate data
 - c. RF signals
 - d. Test and diagnostic interfaces
 - e. Timing, sync signals
 - f. Primary and redundant power
 - g. Mechanical and thermal interfaces
 - h. Etc.
8. System Risk Analysis
 - a. Identification — Internally and externally driven
 - b. Assessment of likelihood and potential impacts to system
 - c. Mitigation approach(es)
9. Configuration Control System
 - a. Configuration control board
 - b. Action item status
 - c. Change notice status
 - d. System database status: wire lists, budgets, etc.
 - e. Interface control
 - 1) Internal
 - 2) External
 - 3) ICD status
10. Operations Concept
11. System Optimization
 - a. Sensitivity analyses — How sensitive is the system to potential changes?
 - b. Requirements impact assessment

System Verification

1. System Simulation
 - a. Correlation to specification
 - b. Margin
 - c. Etc.
2. FMECA (Failure Modes Effects Criticality Analysis)
3. FDIR (Failure Detection, Isolation, and Recovery)

4. Specialty Engineering
 - a. EMI/EMC
 - b. Reliability, maintainability, affordability, other “ilities”
 - c. Logistics
 - d. Etc.
5. Testability Evaluation
6. Producibility Evaluation
7. Development Testing
 - a. Identification
 - b. Status
 - c. Results
8. Test Planning
 - a. Test plan tree
 - b. Status

C. System-Level Trade Analyses

1. Review of Key System Trades
 - a. Listing of key trades
 - b. Trade criteria
 - c. Sensitivity analyses
 - d. Change impact: Are previous trade selections still valid?

II. Second Major Design Review

- Review Action Items from previous review
- Review any relevant changes since last review

A. Subsystem-Level Requirements Development

1. System-to-Subsystem Specification Correlation Matrix — Confirm Traceability
 - a. Identification of all TBDs, TBSs, and TBRs and assessment of criticality
 - b. Identification of requirements ambiguities
2. Identification of all other requirements and constraints impinging on the subsystem
 - a. Technical
 - b. Cost
 - c. Schedule
3. Verification Matrix identifying verification method and location in subsystem build-up
4. Definition of Subsystem Context
 - a. Identification and characterization of all external interfaces by program phase

- 1) High rate data
- 2) Low rate data
- 3) RF signals
- 4) Test and diagnostic interfaces
- 5) Timing, sync signals
- 6) Primary and redundant power
- 7) Mechanical and thermal interfaces
- 8) Etc.
- b. Definition of all environments by phase
- c. Identification of all critical events by phase
- d. Identification of all modes and states by phase
- e. Operations Concept
 - 1) Logistics plan
 - 2) Maintenance plan
 - 3) Operability plan
 - 4) Etc.
- f. Mission timeline
5. Subsystem Specification Tree
6. Subsystem Plan Tree
7. Functional Definition of the Subsystem Architecture (used to correlate system-required functionality and performance with new and heritage designs implemented)
 - a. Functional block diagram for each program phase
 - 1) Functions required with associated performance traced from system spec.
 - 2) Inputs
 - 3) Outputs
 - 4) Noise sources
 - 5) Control functions identified

B. *Synthesis*

Subsystem Design

1. Parametric Analyses Leading to Baseline Architecture
2. Subsystem Configuration Description
 - a. Subsystem block diagram — Electrical architecture
 - b. Subsystem layout/drawing(s) — Mechanical architecture
 - c. Subsystem drawing tree
 - d. Subsystem ICD
3. Identification of New Technologies Implemented
 - a. Risk assessment and mitigation approaches
 - b. Tailoring required for system application
4. Identification of Heritage Elements Implemented
 - a. Internal interfaces identified and characterized by phase
 - b. Changes required to meet subsystem application

5. Subsystem Budgets
 - a. Technical: mass, power, baseband, RF, memory, throughput, etc.
 - b. Cost and schedule
 - c. Present margin, contingency, and reserve and location in the system
6. Subsystem Specifications
 - a. Traced from system specification
 - b. Listing of TBDs, TBSs, TBRs
 - c. Identification of all other known requirements issues
 - d. Allocation of functionality, performance, cost, schedule
7. Identification and Characterization of Internal Interfaces
 - a. High rate data
 - b. Low rate data
 - c. RF signals
 - d. Test and diagnostic interfaces
 - e. Timing, sync signals
 - f. Primary and redundant power
 - g. Mechanical and thermal interfaces
 - h. Etc.
8. Subsystem Risk Analysis
 - a. Identification — Internally and externally driven
 - b. Assessment of likelihood and potential impacts to system
 - c. Mitigation approach(es)
9. Configuration control system
 - a. Configuration control board
 - b. Action item status
 - c. Change notice status
 - d. Subsystem database status: wire lists, budgets, etc.
 - e. Interface Control
 - 1) Internal
 - 2) External
 - 3) ICD status
10. Operations Concept
11. Subsystem Optimization
 - a. Sensitivity analyses — How sensitive is the system to potential changes?
 - b. Requirements impact assessment

Subsystem Verification

1. Subsystem Simulation
 - a. Correlation to specification
 - b. Margin
 - c. Etc.
2. FMECA (Failure Modes Effects Criticality Analysis)
3. FDIR (Failure Detection, Isolation, and Recovery)

4. Specialty Engineering
 - a. EMI/EMC
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 - c. Logistics
 - d. Etc.
5. Testability Evaluation
6. Producibility Evaluation
7. Development Testing
 - a. Identification
 - b. Status
 - c. Results
8. Test Planning
 - a. Test plan tree
 - b. Status

C. Subsystem-Level Trade Analyses

1. Review of Key System Trades
 - a. Listing of key trades
 - b. Trade criteria
 - c. Sensitivity analyses
 - d. Change impact: Are previous trade selections still valid?

III. Third Major Design Review

- Review Action Items from previous review
- Review any relevant changes since last review

A. Sub-Subsystem Level Requirements Development

1. Subsystem-to-Sub-Subsystem Specification Correlation Matrix — Confirm Traceability
 - a. Identification of all TBDs, TBSs, and TBRs and assessment of criticality
 - b. Identification of requirements ambiguities
2. Identification of all other requirements and constraints impinging on the Sub-Subsystem
 - a. Technical
 - b. Cost
 - c. Schedule
3. Verification Matrix identifying verification method and location in Sub-Subsystem build-up
4. Definition of Sub-Subsystem Context
 - a. Identification and characterization of all external interfaces by program phase

- 1) High rate data
- 2) Low rate data
- 3) RF signals
- 4) Test and diagnostic interfaces
- 5) Timing, sync signals
- 6) Primary and redundant power
- 7) Mechanical and thermal interfaces
- 8) Etc.
- b. Definition of all environments by phase
- c. Identification of all critical events by phase
- d. Identification of all modes and states by phase
- e. Operations Concept
 - 1) Logistics plan
 - 2) Maintenance plan
 - 3) Operability plan
 - 4) Etc.
- f. Mission timeline
5. Sub-Subsystem Specification Tree
6. Sub-Subsystem Plan Tree
7. Functional Definition of the Sub-Subsystem Architecture (used to correlate sub-subsystem required functionality and performance with new and heritage designs implemented)
 - a. Functional Block Diagram for Each Program Phase
 - 1) Functions required with associated performance traced from sub-subsystem spec.
 - 2) Inputs
 - 3) Outputs
 - 4) Noise sources
 - 5) Control functions identified

B. *Synthesis*

Sub-Subsystem Design

1. Parametric Analyses Leading to Baseline Design
2. Sub-Subsystem Configuration Description
 - a. Sub-subsystem block diagram — Electrical design
 - b. Sub-subsystem layout/drawing(s) — Mechanical design
 - c. Sub-subsystem drawing tree
 - d. Sub-subsystem ICD tree
3. Identification of New Technologies Implemented
 - a. Risk assessment and mitigation approaches
 - b. Tailoring required for sub-subsystem application
4. Identification of Heritage Elements Implemented
 - a. Internal interfaces identified and characterized by phase
 - b. Changes required to meet sub-subsystem application

5. Sub-Subsystem Budgets
 - a. Technical: mass, power, baseband, RF, memory, throughput, etc.
 - b. Cost and schedule
 - c. Present margin, contingency, and reserve and location in the sub-subsystem
6. Lower Level Specifications (if required)
 - a. Traced from subsystem specification
 - b. Listing of TBDs, TBSs, TBRs
 - c. Identification of all other known requirements issues
 - d. Allocation of functionality, performance, cost, schedule
7. Identification and Characterization of Internal Interfaces
 - a. High rate data
 - b. Low rate data
 - c. RF signals
 - d. Test and diagnostic interfaces
 - e. Timing, sync signals
 - f. Primary and redundant power
 - g. Mechanical and thermal interfaces
 - h. Etc.
8. Sub-Subsystem Risk Analysis
 - a. Identification — Internally and externally driven
 - b. Assessment of likelihood and potential impacts to sub-subsystem
 - c. Mitigation approach(es)
9. Configuration Control System
 - a. Configuration control board
 - b. Action item status
 - c. Change notice status
 - d. Sub-Subsystem database status: wire lists, budgets, etc.
 - e. Interface control
 - 1) Internal
 - 2) External
 - 3) ICD Status
10. Operations Concept
11. Sub-Subsystem Optimization
 - a. Sensitivity analyses — How sensitive is the sub-subsystem to potential changes?
 - b. Requirements impact assessment

Sub-Subsystem Verification

1. Sub-Subsystem Simulation
 - a. Correlation to specification
 - b. Margin
 - c. Etc.
2. FMECA (Failure Modes Effects Criticality Analysis)
3. FDIR (Failure Detection, Isolation, and Recovery)

4. Specialty Engineering
 - a. EMI/EMC
 - b. Reliability, maintainability, affordability, other “ilities”
 - c. Logistics
 - d. Etc.
5. Testability Evaluation
6. Producibility Evaluation
7. Development Testing
 - a. Identification
 - b. Status
 - c. Results
8. Test Planning
 - a. Test plan tree
 - b. Status

C. Sub-Subsystem-Level Trade Analyses

1. Review of Key Sub-Subsystem Trades
 - a. Listing of key trades
 - b. Trade criteria
 - c. Sensitivity analyses
 - d. Change impact: Are previous trade selections still valid?