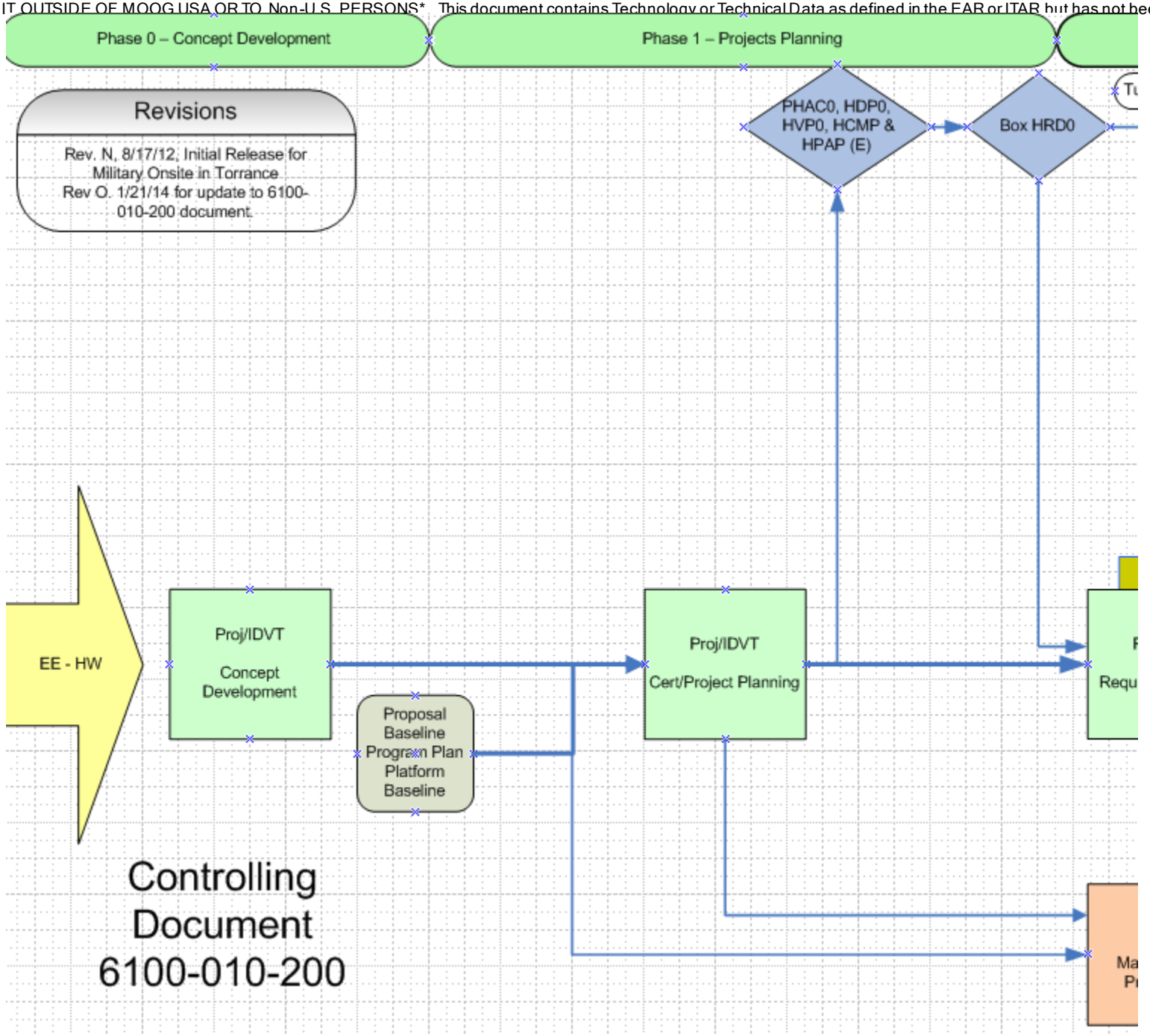
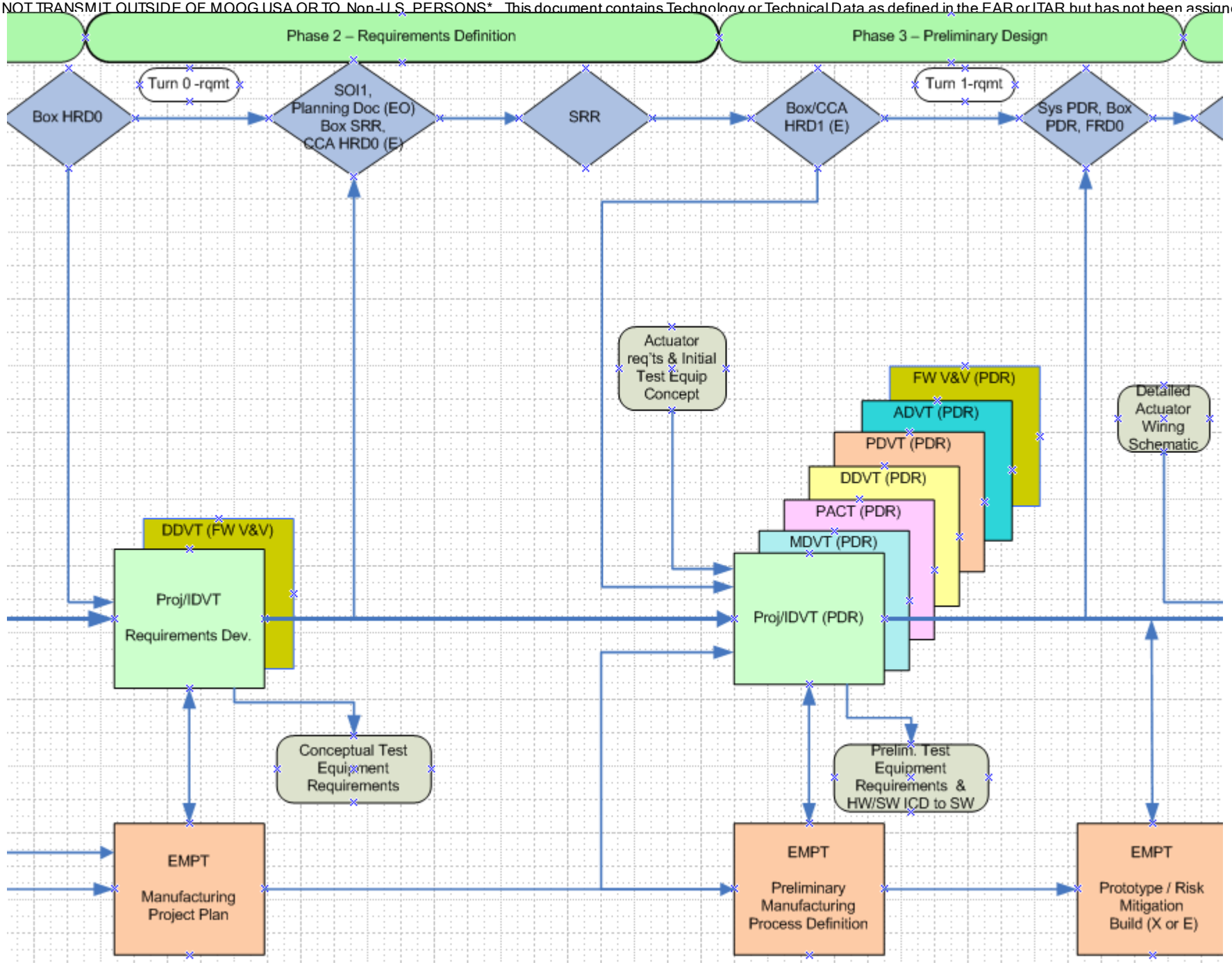
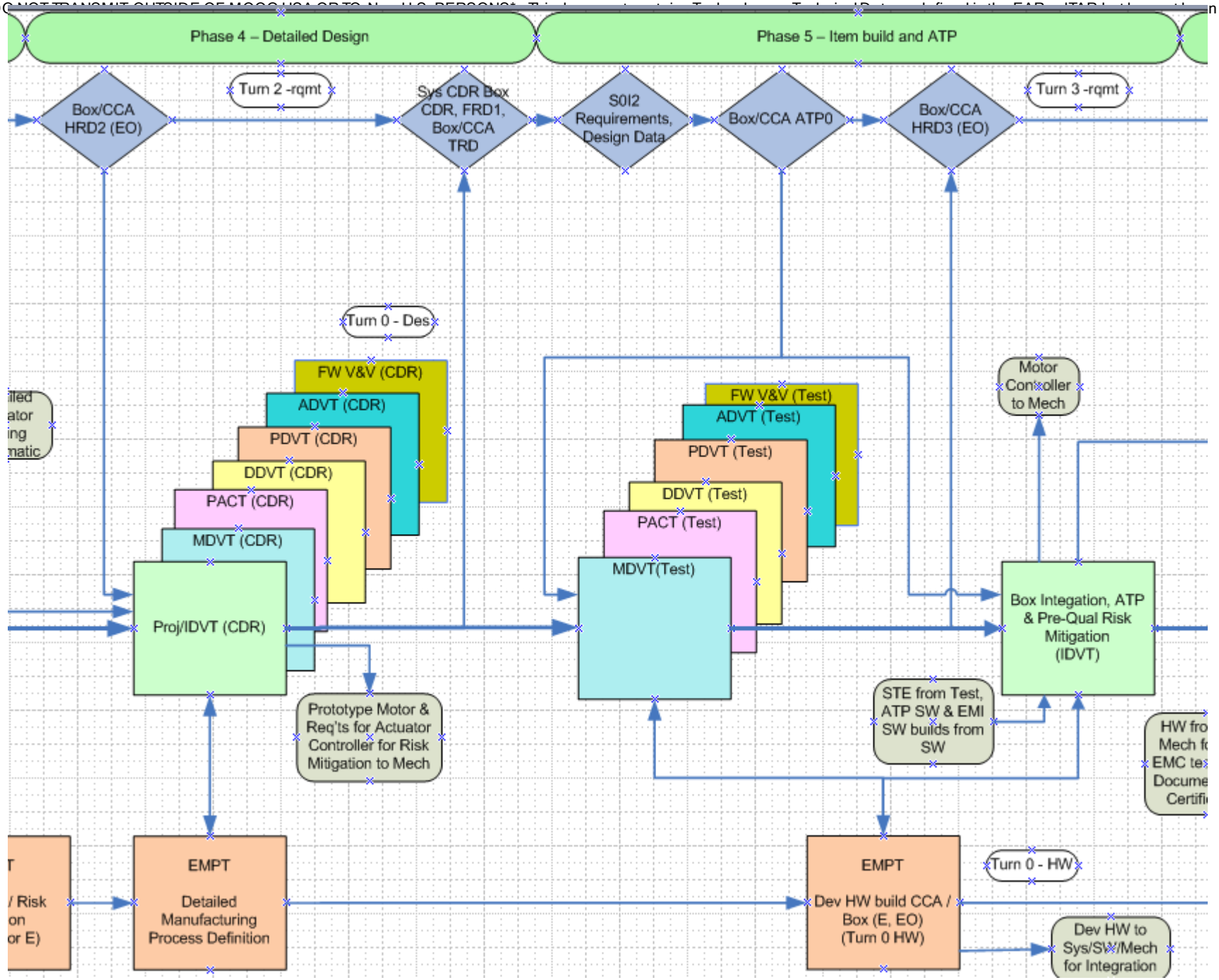
ACG Electronics Swimlane

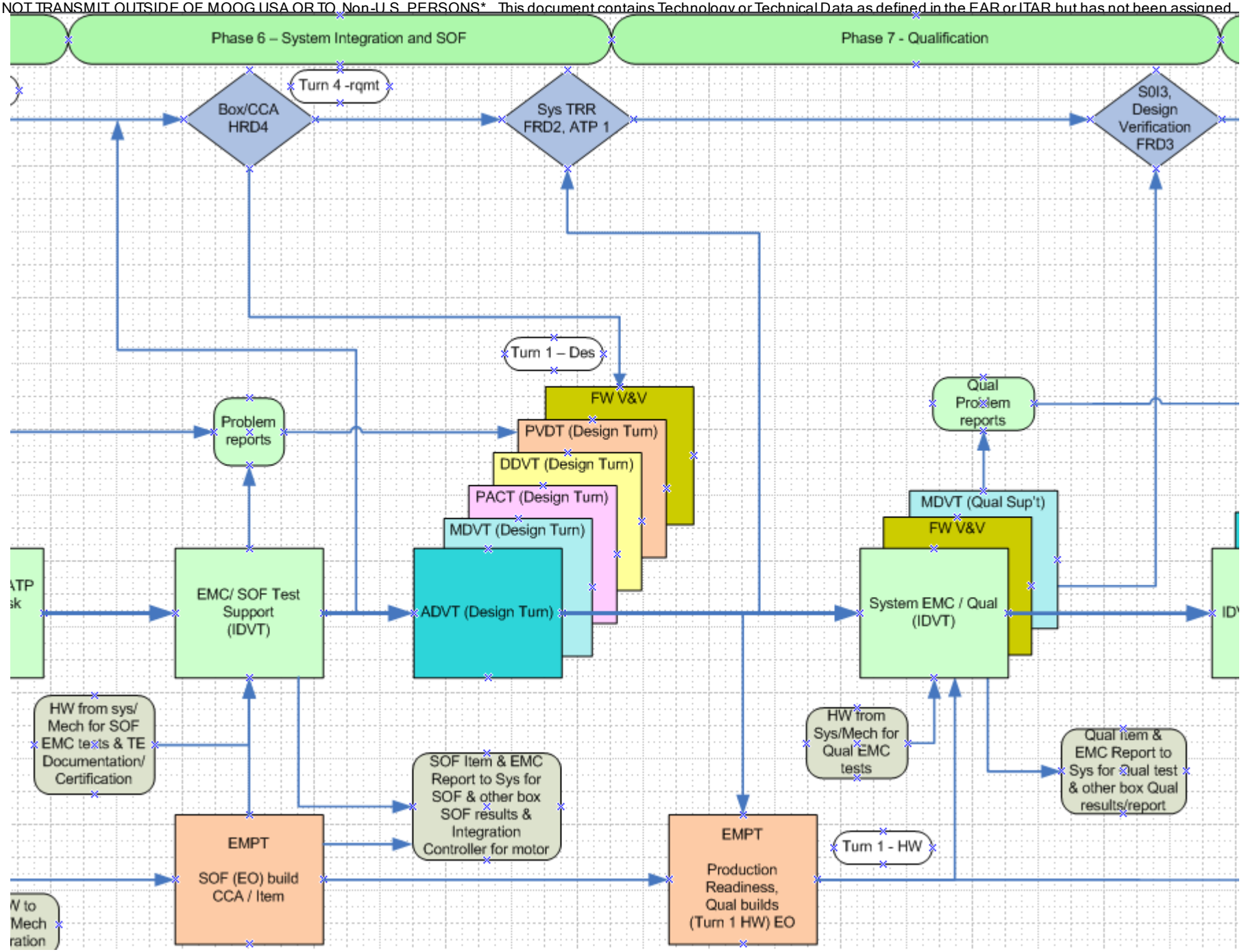
(Common Development Process)

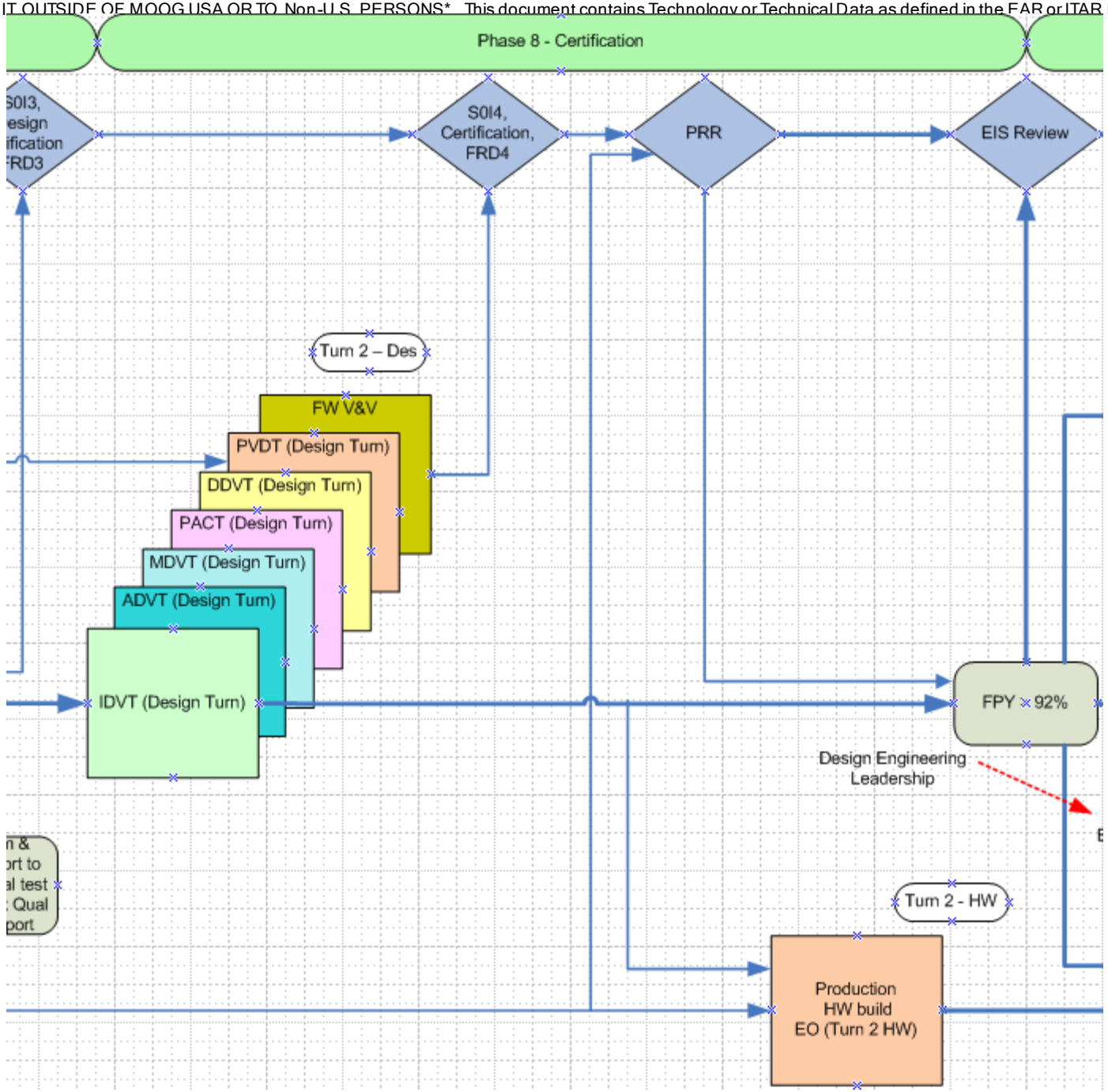
Revised: January 21, 2014











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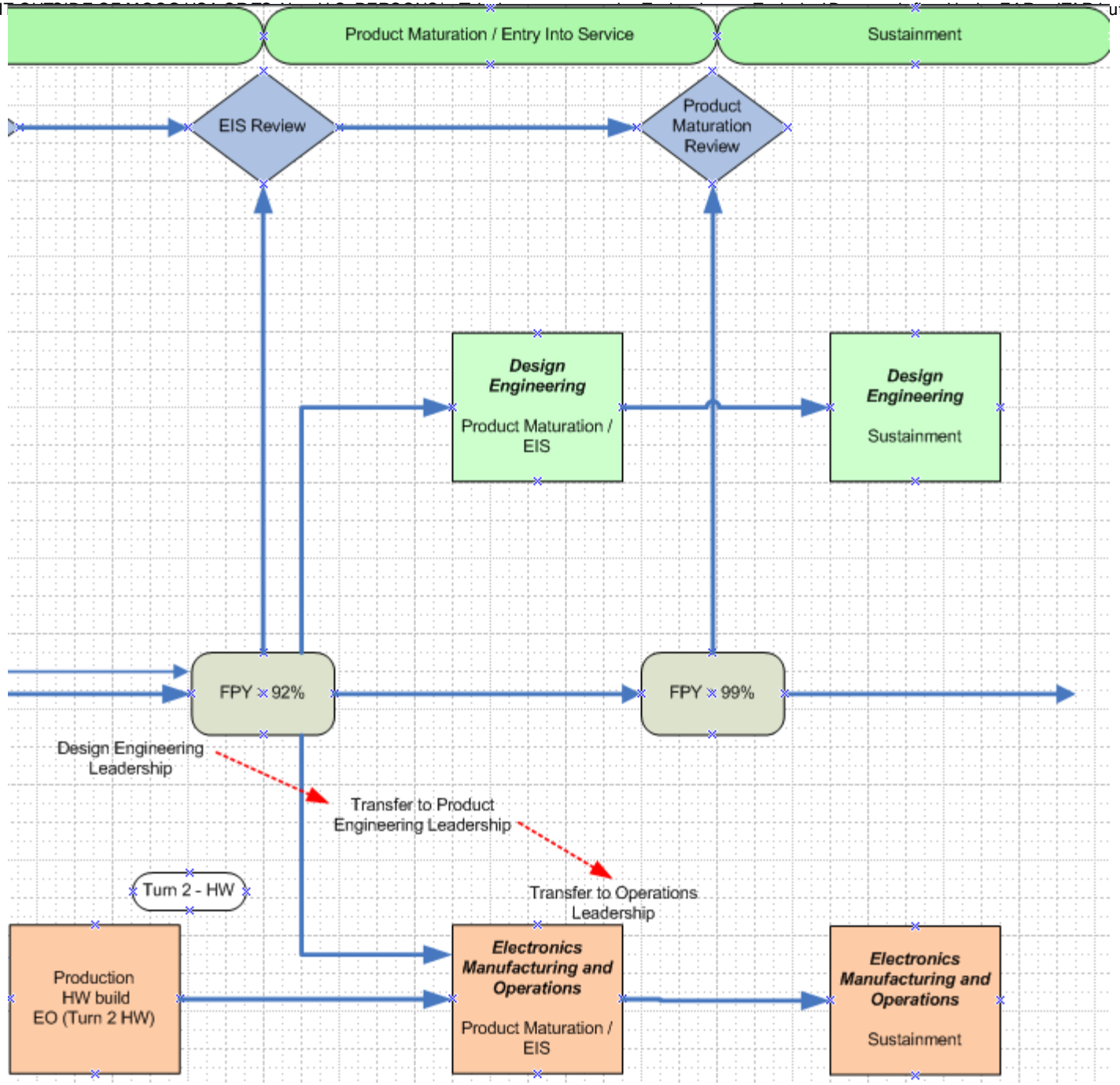

EE Work Packages Summary

Phase	Work Package	
1 (1152 hrs)	Project Planning	IDVT WP1
2 (2712 hrs)	Requirements Definition	IDVT WP2
		DDVT WP3
	Manufacturing Project Planning	EMPT WP4
3 (6574 hrs)	Preliminary Design	IDVT WP5
		DDVT WP6
		Fwr V&V WP7
		ADVT WP8
		PDVT WP9
		PACT WP10
		MDVT WP11
	Preliminary Mfg Process Definition & Prototype/Risk Mitigation Build	EMPT WP12

Phase	Work Package	
4 (12462 hrs)	Detailed Design	IDVT WP13
		DDVT WP14
		Fwr V&V WP15
		ADVT WP16
		PDVT WP17
		PACT WP18
		MDVT WP19
	Detailed Mfg Process Definition	EMPT WP20
5 (6456 hrs)	Item Build and ATP	IDVT WP21
		DDVT WP22
		Fwr V&V WP23
		ADVT WP24
		PDVT WP25
		PACT WP26
		MDVT WP27
	Dev HW Build CCA/Item	EMPT WP28

Phase	Work Package	
6 (3650 hrs)	System Integration and SOF	IDVT WP29
		DDVT WP30
		Fwr V&V WP31
		ADVT WP32
		PDVT WP33
		PACT WP34
		MDVT WP35
	SOF Build CCA/Item	EMPT WP36
7 (2520 hrs)	Qualification	IDVT WP37
		Fwr V&V WP38
		MDVT WP39
	Production Readiness, Qual Builds	EMPT WP40
8 (3652 hrs)	Certification Support	IDVT WP41
		DDVT WP42
		ADVT WP43
		PDVT WP44
		Fwr V&V WP45
		PACT WP46
		MDVT WP47
	Production HW Build	EMPT WP48
Product Maturation / EIS		IDVT WP49
		EMPT WP50
Sustainment		IDVT WP51
		EMPT WP52

IDVT	Item Design Verification and Test
DDVT	Digital Design Verification and Test
Fwr V&V	Firmware V&V
ADVT	Analog Design Verification and Test
PDVT	Power Design Verification and Test
PACT	Packaging Design Verification and Test
MDVT	Motor Design Verification and Test
EMPT	Electronics Manufacturing Process and Test

Assumptions – High Voltage EM Box with 90% Reuse, 6 Unique CCAs, DO-254 Level A design, Microprocessor and PLD, BLDC Motor design with reuse of magnetic design (pole/slot)

PH 3 – Preliminary Design Work Packages

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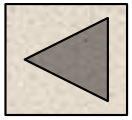

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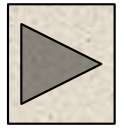

Preliminary Design – PDVT WP9

Inputs

Requirements
Box Requirements - HRD
CCA Requirement – HRD
Plans
DTC targets and DFMAT plans
Grounding Approach
Risk Mitigation Plan
Program IMS & ETCs
High Voltage Control Plan
Guidelines
Platform Functional Elements Guidelines & Checklists

Tasks / ETC

Design/Analysis
Perform Design trades (120)
Generate CCA Block diagram, Area, power est (120)
Grounding Scheme (40)
Generate Source Control Drawing as needed
Magnetics Design (120)
Generate Library models (60)
Generate Schematics (100/60)
Generate BOM, DTC and Obsolescence report (60)
Perform preliminary parts placement (80)
Perform Design Analysis / sim – Stress, derating (80)
High Voltage Risk Identification (40)
Program High Voltage Guideline (20)
Update CCA HRD(80)
Generate CCA Test equipment requirements (40)
Reviews and other support
Prototype / Risk mitigation plan and testing (80/80)
Generate DFMAT compliance report (40)
Support Reliability / FMEA analysis (20)
Capture design data in repository (40)
Support Peer Review with EMC and SMEs (40)
Prepare PDR package (80)

Deliverables

1. Requirements - CCA HRD, update as required (E release) Doors REV
2. Requirements – Preliminary Compliance Matrix (with MOC defined) (E release)
3. Trade Study if needed – project memo
4. Area, power estimates if needed – project memo
5. Schematic Preliminary Peer review with SME – project memo
6. Schematic Preliminary (E release – if needed for prototype)
7. BOM (E release – if needed for prototype)
8. BOM - DTC compliance & Obsolescence summary project memo
9. ABOM – long lead items if needed project memo or spread sheet
10. High Voltage Guideline
11. PDR review package – as required
12. PDR PDVT checklists

Resources (1220 hours)
- PDVT (880 hrs)
- Components (120 hrs)
- PWB design (140 hrs)
- EE Tech (80 hrs)

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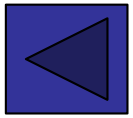

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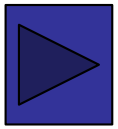


Phase 3 Exit Criteria

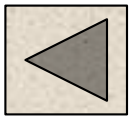
Phase 3 – Preliminary Design

1. ☐Complete, ☐N/A: Requirements - Box HRD update as required (E release) Doors REV
2. ☐Complete, ☐N/A: Requirements – Preliminary Compliance Matrix (with MOC defined) (E release)
3. ☐Complete, ☐N/A: Requirements - Box level requirements check list – clear case
4. ☐Complete, ☐N/A: Trade Study – if needed, project memo
5. ☐Complete, ☐N/A: Peer Review documentation with SME, project memo
6. ☐Complete, ☐N/A: Test Equipment req't document, project memo
7. ☐Complete, ☐N/A: DFMAT review with MFG, project memo
8. ☐Complete, ☐N/A: Requirements - CCA HRD, update as required (E release) Doors REV
9. ☐Complete, ☐N/A: Area, power estimates if needed – project memo
10. ☐Complete, ☐N/A: Schematic Preliminary Peer review with SME – project memo

Phase 3 Exit Criteria

Phase 3 – Preliminary Design, cont…

11. ☐Complete, ☐N/A: Schematic Preliminary (E release – if needed for prototype)
12. ☐Complete, ☐N/A: BOM (E release – if needed for prototype)
13. ☐Complete, ☐N/A: BOM - DTC compliance & Obsolescence summary, project memo
14. ☐Complete, ☐N/A: ABOM – long lead items if needed, project memo or spread sheet
15. ☐Complete, ☐N/A: FRD1 REV update
16. ☐Complete, ☐N/A: Packaging - Preliminary 3D CAD model, (no release)
17. ☐Complete, ☐N/A: Packaging - Preliminary board DXF to CAD, (no release)
18. ☐Complete, ☐N/A: Packaging - Preliminary Assembly Drawing, (E release)
19. ☐Complete, ☐N/A: Packaging – Preliminary Analysis – Thermal, Vib, Fatigue,up
20. ☐Complete, ☐N/A: Packaging - Peer Review with SME, project memo
21. ☐Complete, ☐N/A: PDR review package – as required



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Phase 3 Exit Criteria

Phase 3 – Preliminary Design, cont…

21. ☐Complete, ☐N/A: Prelim. Top-level Assembly drawings – E released
22. ☐Complete, ☐N/A: Prelim. Motor Envelope
23. ☐Complete, ☐N/A: Prelim. Stator and Rotor Dims & weight
24. ☐Complete, ☐N/A: Prelim. Motor Design Data
25. ☐Complete, ☐N/A: Prelim Performance Analysis
26. ☐Complete, ☐N/A: Prelim Thermal analysis
27. ☐Complete, ☐N/A: Prelim. Stress analysis
28. ☐Complete, ☐N/A: Mechanical Components Design
29. ☐Complete, ☐N/A: Peer review Documentation (project)
30. ☐Complete, ☐N/A: Motor PDR package (project)
31. ☐Complete, ☐N/A: Prototype Motor BOM and detailed drawings as required (E release)
32. ☐Complete, ☐N/A: High Voltage Guideline (E release)
33. ☐Complete, ☐N/A: PDR Design Checklists completed

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Phase 4 – Detail Design Work Packages

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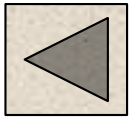

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Detailed Design – PDVT WP17

Inputs

Requirements
Box Requirement - HRD
CCA Requirement – HRD
Design Documentation
Preliminary design data & doc's
Risk mitigation test results
Plans
DTC targets and DFMAT plans
Guidelines & Checklists
High Voltage Control Plan
Program IMS & ETCs

Tasks

Requirements
Finalize block diagram (80)
Update CCA HRD (120)
Design
Finalize schematic (240)
Magnetic design (360)
Generate EDP (40)
Perform board layout / trace route (360)
Analysis
Finalize Design Analysis, Stress, Loop Stability (320)
Support Reliability / FMEA analysis (40)
Generate requirement to design compliance matrix (160)
2D&3D HV analysis (HV) (120/60)
Components
Finalize BOM, DTC and Obsolescence (80)
Generate library models as needed (40)
Test
Finalize prototype risk testing (120)
Reviews / Reports
Schematic, layout and tracing routing review (80)
Update DMFAT compliance report (40)
Prepare CDR package (60)
Generate SDRL documents (60)
Prepare design doc – HDD (160)

Deliverables

1. Design trade study – if needed, project memo
2. Estimate - Area, power if needed, project memo
3. Block diagram (Card), MRE document (EO release)
4. Requirement CCA card HRD – if needed
   (EO release) REV Doors – clear case
5. Schematic Peer Review – project memo
   – results of review with SME
6. Schematic checklist
   error report completed and resolved – team center
7. Schematic (E release until built – EO release prior to qual)
   data base in team center
8. Board layout guidelines for each CCA, (EDP) – team center
9. Board layout Peer Review, part placement and
   trace routing checklist – project file
10. CCA assembly drawing (E release until built
    – EO release prior to qual)
11. BOM – (E release until built – EO release prior to qual)
12. Analysis (initial / final after qual)
    – Sensitivity and Derating, project memo
13. Test Procedure (E release)
14. CDR review package – as required
15. 2D & 3D HV Analysis Report – (E-Release)
16. PDVT CDR Checklist

Resources :
- PDVT (1880)
- Components (120)
- PWB design (360)
- PACT (60)
- EE Tech (120)

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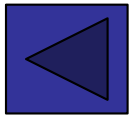

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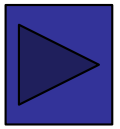

Revised: January 21, 2014

Phase 4 Exit Criteria

Phase 4 – Detailed Design

1. ☐Complete, ☐N/A: Block diagram (Box and Card) MRE document (EO release)
2. ☐Complete, ☐N/A: Requirement - Box HRD (EO release) REV Doors - clear case
3. ☐Complete, ☐N/A: Requirement - Pin Assignments (ICD / Box pins) spread sheet – project file
4. ☐Complete, ☐N/A: Requirement derived justification, link in Doors – clear case
5. ☐Complete, ☐N/A: Requirement tracing and review check list, clear case
6. ☐Complete, ☐N/A: Design trade study – if needed, project memo
7. ☐Complete, ☐N/A: Estimate - Area, power if needed, project memo
8. ☐Complete, ☐N/A: PLD source code review checklist – Clear Case
9. ☐Complete, ☐N/A: PLD source code traceability – Clear Case
10. ☐Complete, ☐N/A: Functional test Benches, Captured in Clear Case
11. ☐Complete, ☐N/A: Functional PLD and post route simulation results, captured in project file
12. ☐Complete, ☐N/A: Requirement CCA card HRD – if needed (EO release) REV Doors – clear case
13. ☐Complete, ☐N/A: Requirement FRD2 REV, (EO release) – clear case
14. ☐Complete, ☐N/A: PLD Design – PLD source code, Captured in Clear case
15. ☐Complete, ☐N/A: Schematic Peer Review – project memo – results of review with SME
16. ☐Complete, ☐N/A: Schematic checklist, error report completed and resolved – team center
17. ☐Complete, ☐N/A: Analysis (initial / final after qual) – Derating / signal integrity/ timing analysis project file / clear case
18. ☐Complete, ☐N/A: Detailed Installation Drawings (EO)
19. ☐Complete, ☐N/A: Detailed Interface Control Documents (EO)
20. ☐Complete, ☐N/A: Detailed Design Drawings (Team Center)
21. ☐Complete, ☐N/A: Detailed Part Lists (BOM's) (Team Center)
22. ☐Complete, ☐N/A: Schematic (E release until built – EO release prior to qual), data base in team center
23. ☐Complete, ☐N/A: Board layout guidelines for each CCA, (EDP) – team center

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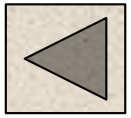

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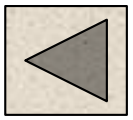
Phase 4 Exit Criteria

Phase 4 – Detailed Design, cont…

24. ☐Complete, ☐N/A: Board layout Peer Review, part placement and trace routing checklist – project file
25. ☐Complete, ☐N/A: CCA assembly drawing (E release until built – EO release prior to qual)
26. ☐Complete, ☐N/A: Box - Top Level Assembly Drawing, E release until built – EO release prior to qual, data base in team center
27. ☐Complete, ☐N/A: Box - Drawing (3 D exploded view – PDF format, models and drawings in team center
28. ☐Complete, ☐N/A: Box - Installation Drawing, E release until built – EO release after customer approval, data base in team center
29. ☐Complete, ☐N/A: Box - Drawing - torque definitions, data base in team center
30. ☐Complete, ☐N/A: Box - Detailed Size/volume, weight report, memo or power point
31. ☐Complete, ☐N/A: Box - Peer Review — results of review with SME, project memo, project file
32. ☐Complete, ☐N/A: Box - Packaging check list / standards, project file
33. ☐Complete, ☐N/A: BOM – (E release until built – EO release prior to qual)
34. ☐Complete, ☐N/A: Analysis (initial / final after qual) – Sensitivity and Derating, project memo
35. ☐Complete, ☐N/A: Test Procedure (E release)
36. ☐Complete, ☐N/A: CDR review package – as required
37. ☐Complete, ☐N/A: BOM - DTC compliance and Obsolescence report memo or spread sheet
38. ☐Complete, ☐N/A: Detailed 3-D Envelope Model (Team Center)
39. ☐Complete, ☐N/A: Detailed Performance Analysis – Thermal, Vib, Fatigue, Stack up Project Memo
40. ☐Complete, ☐N/A: DTC Analysis summary – Project Memo
41. ☐Complete, ☐N/A: Detailed Weights – Project Memo
42. ☐Complete, ☐N/A: 2D& 3D HV Analysis Report – (E Release)
43. ☐Complete, ☐N/A: CDR Design Checklists completed



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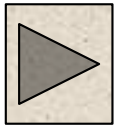

Phase 5 – Item Build and Test Work Packages

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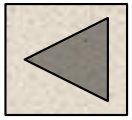

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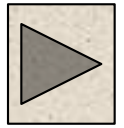

Item Build and Test – PDVT WP25

Inputs

Design Data
- CCA Gerber files
- Box Req't & Design Doc – HRD & HDD
- Board req't & Design Doc - CCA HRD &HDD
- Released Schem's, BOM, CCA & box Assy's

Plans
- Program IMS & ETCs
- CCA DTC target/actuals and DFMAT plans
- Test concept / Risk mitigation plan

Hardware
- Assembled CCAs
- CCA/Box Devel Test equipment & Test SW
- CCA/Box Development test plan
- Lab equipment for test & troubleshooting

Tasks / ETC

Build
- Support CCA build / procurement activities (40/5/10)

Documents
- Develop CCA test procedure (60/10)
- Generate design changes, support generation of rework instructions, retest, & update the design drawings (80/5/10/10)
- CCA test coverage analysis as appropriate (60)

Test and Integrate
- Test CCA (120/80)
- Document CCA test results
- Update test procedure as required (80)
- Perform robustness / risk mitigation testing as appropriate (80/40 (environmental, voltage, frequency, etc.)
- CCA Integration into Box (40)
- Perform PWB, CCA, Component, Assy, & Box Level HV altitude tests (200/200)

Deliverables

1. Document Test results project file – spread sheet or memo
1. Document Test coverage and test limits project file
2. Risk Mitigation test report – if needed project memo
3. Board test procedure document (E Release)
4. HV Altitude test reports (E Release)

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Resources :
- PDVT (760 hrs)
- Components (10 hrs)
- PWB design (10 hrs)
- EE Tech (350 hrs)

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Phase 5 Exit Criteria

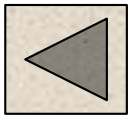
Phase 5 – Item Build & Test

1. ☐Complete, ☐N/A: Document Box ATP (E release with box test software)
2. ☐Complete, ☐N/A: Document Test results, project file - data spread sheet or memo
3. ☐Complete, ☐N/A: Document Test coverage and test limits, project file
4. ☐Complete, ☐N/A: Document SOF ATP (E release)
5. ☐Complete, ☐N/A: Box / System SOF EMC test procedure (E release)
6. ☐Complete, ☐N/A: HALT / HASS procedure – if required (E Release)
7. ☐Complete, ☐N/A: Successful completion of SOI #2, audit summary in clear case
8. ☐Complete, ☐N/A: PLD design – PLD source code tracing, E released
9. ☐Complete, ☐N/A: Functional test benches updated -captured in Clear Case

Phase 5 Exit Criteria

Phase 5 – Item Build & Test, cont…

10. ☐Complete, ☐N/A: Functional PLD and Post Route simulation results captured in project file and captured in Clear Case
11. ☐Complete, ☐N/A: PLD design – PLD source code review and tracing review, Clear Case/DOORS
12. ☐Complete, ☐N/A: Risk Mitigation test report – if needed, project memo
13. ☐Complete, ☐N/A: Board test procedure document (E Release)
14. ☐Complete, ☐N/A: Fit check – Project Memo
15. ☐Complete, ☐N/A: Thermal survey – Project Memo
16. ☐Complete, ☐N/A: Initial vibe – Project Memo
17. ☐Complete, ☐N/A: Board test procedure document E Release
18. ☐Complete, ☐N/A: Motor ATP if required (E Release)
19. ☐Complete, ☐N/A: DTC Actuals – Project Memo
20. ☐Complete, ☐N/A: Test Results – Project Memo
21. ☐Complete, ☐N/A: High Voltage / Altitude Test Reports (E Release)



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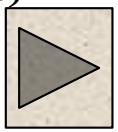

Phase 6 – System Integration and SOF Work Packages

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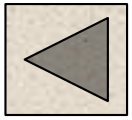

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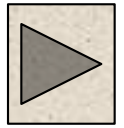

System Integration and SOF – Design Turn [PDVT] WP33

Inputs

Requirements

Design requirements updates causing Design turns in CCAs

Design Documentation

Updated Hardware Allocation from System **Hardware**
SOF CCA Build Hardware
Integrated Box from Build & Test

Tasks / ETC

Test
Support SOF testing as required
Reviews
Support System review and validation of changes (60)
Support peer review of test results
Hold CCA PRR (60)
Documents
Create, update and resolve Problem reports (120)
Update design documentation:
schematics, BOM, stability and transient analysis, derating, updated requirements (120)
Update CCA Test Procedure, as necessary (40)
Update HRD, as required (40)
Update 2D & 3D HV analysis (40/40)
Update PWB, CCA, Component, Assy, & Box Level HV altitude tests (40/40)

Deliverables

1. Problem reports under configuration control clear quest
2. Updated CCA schematic – as required – EO release for qual
3. Update CCA BOM – as required – EO release for qual
4. Update CCA Assembly Drawing – as required – EO release for qual
5. DFx (M,A,T) at Box level report review project memo with MFG WP
6. Updated HRD, EO release new REV
7. Updated 2D & 3D HV analyses – as required (E Release)
8. Updated HV Altitude test reports – as required (E Release)

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Resources (hrs)
- PDVT (520)
- PACT (40)
- EE Tech (40)

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Phase 6 Exit Criteria

Phase 6 – System Integration & SOF

1. ☐Complete, ☐N/A: Problem reports under configuration control, clear quest
2. ☐Complete, ☐N/A: Updated ATP – as required, EO release - REV
3. ☐Complete, ☐N/A: SOF EMC test procedure, EO release
4. ☐Complete, ☐N/A: SOF EMC Test report SDRL
5. ☐Complete, ☐N/A: SOF Environmental qual test procedure, EO release
6. ☐Complete, ☐N/A: SOF Environmental qual test report, SDRL
7. ☐Complete, ☐N/A: DFx (M,A,T) at Box level report, project memo
8. ☐Complete, ☐N/A: Updated HRD & FRD, EO release new REV
9. ☐Complete, ☐N/A: Updated CCA schematic – as required – EO release for qual
10. ☐Complete, ☐N/A: DFx (M,A,T) at Box level report review project memo with MFG WP
11. ☐Complete, ☐N/A: FW V&V TRR Checklist
12. ☐Complete, ☐N/A: DFx (M,A,T) at Box level report review project memo with MFG WP
13. ☐Complete, ☐N/A: Updated Motor Req'ts Doc

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Phase 6 Exit Criteria

Phase 6 – System Integration & SOF, cont…

14. ☐Complete, ☐N/A: Update CCA BOM – as required – EO release for qual
15. ☐Complete, ☐N/A: Update CCA Assembly Drawing – as required – EO release for qual
16. ☐Complete, ☐N/A: PLD Design –PLD Source code, EO released / clear case
17. ☐Complete, ☐N/A: PLD FCI – EO Release
18. ☐Complete, ☐N/A: SOF Environmental qual test report, Support SDRL
19. ☐Complete, ☐N/A: Code review and tracing checklist, Clear case
20. ☐Complete, ☐N/A: Functional PLD and post route simulation results, captured in project file
21. ☐Complete, ☐N/A: PLD Elemental Analysis Report
22. ☐Complete, ☐N/A: Updated FRD,TB & Test Cases developed, update through cert phase - clear case
23. ☐Complete, ☐N/A: Updated Motor ATP (EO)
24. ☐Complete, ☐N/A: Updated Motor documentation (EO)
25. ☐Complete, ☐N/A: Production Readiness Review complete
26. ☐Complete, ☐N/A: Update 2D & 3D HV Clearance Reports – (E Release)
27. ☐Complete, ☐N/A: Update High Voltage / Altitude Test Reports (E Release)
28. ☐Complete, ☐N/A: Design checklists completed

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Phase 8 – Certification Work Packages

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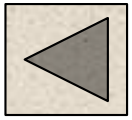

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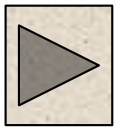


Certification Phase – Design Turn [PDVT] WP44

Inputs

Problem Reports
V+V actions / issues
Blue / Red label problem list
Power Quality Inputs

Qualification Data
Environmental test issues
EMI test issues

DFX Inputs
Manufacturability DFX inputs
DTC updates

Requirements
CCA design requirements updates

Tasks / ETC

Requirements
Update requirements – as required (40)
Update compliance matrix / HVR (40)
Insure that CCA is compatible with Aircraft capability and has been verified. (40)
Insure power requirements compatible with SW / FW (40)

Design Changes
Evaluate design and manufacturability DFX inputs (40)
Evaluate Qual changes and incorporate (40)
Update Schematic / BOM (40)
Update Analysis (performance / Stress) (40)
Update part placement and trace routing instructions (40)
Update design documentation / description (40)
Update CCA Test Procedure, as necessary (40)
Update 2D & 3D HV analysis (40/40)
Update PWB, CCA, Component, Assy, & Box Level HV altitude tests (40/40)

PWB Updates
Review part placement changes (40)
Review trace routing changes (40)

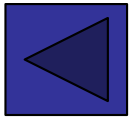
Problem Reports
Close out all PRR actions (40)

Production
Support production Hardware Build / readiness review (40)

Deliverables

1.Updated CCA Drawing Package, EO release
   a) Schematic
   b) BOM
   c) Assembly Drawing
2.Updated CCA Test Procedure
3.Updated Analysis, Project Memo
4.Updated 2D & 3D HV analyses – as required (E Release)
5.Updated HV Altitude test reports - as required (E Release)

Return to summary page



Resources (hrs)
- PDVT (680)
- PACT (40)
- EE Tech (40)

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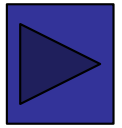

Revised: January 21, 2014

Phase 8 Exit Criteria

Phase 8 – Certification

1. ☐Complete, ☐N/A: Problem reports closed or deferred – clear quest
2. ☐Complete, ☐N/A: Successful transition of design to production evidence that PRR Checklist is complete and actions are closed (Project Memo)
3. ☐Complete, ☐N/A: HW accomplishments summary (EO)
4. ☐Complete, ☐N/A: Successful SOI #4 review audit report in clear case
5. ☐Complete, ☐N/A: Updated CCA Drawing Package, EO release
    a. ☐Complete, ☐N/A: Schematic
    b. ☐Complete, ☐N/A: BOM
    c. ☐Complete, ☐N/A: Assembly Drawing
6. ☐Complete, ☐N/A: Updated CCA Test Procedure
7. ☐Complete, ☐N/A: Updated Analysis, Project Memo
8. ☐Complete, ☐N/A: Updated Drawings & Models, EO release
    a. ☐Complete, ☐N/A: BOM
    b. ☐Complete, ☐N/A: Assembly Drawing
    c. ☐Complete, ☐N/A: Chassis
    d. ☒Complete, ☐N/A: Mechanical Subassemblies
9. ☐Complete, ☐N/A: Updated Analysis, Project Memo
10. ☐Complete, ☐N/A: Resolved Problem reports
11. ☐Complete, ☐N/A: Updated ATP Motor/Actuator, as needed (Actuator support only)
12. ☐Complete, ☐N/A: Motor PRR Complete
13. ☐Complete, ☐N/A: Updated Motor Req’ts Doc
14. ☐Complete, ☐N/A: Updated Motor documentation (EO)
15. ☐Complete, ☐N/A: Update 2D & 3D HV Clearance Reports - (E Release)
16. ☐Complete, ☐N/A Update High Voltage / Altitude Test Reports (E Release)
17. ☐Complete, ☐N/A Design review checklists

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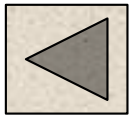

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Product Maturation/EIS and Sustainment Work Packages

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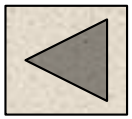

Return to swimlane

Design Engineering – Product Maturation/EIS (FPY > 92%) WP49

Inputs

Manufacturing Data

FPY (supply chain, CCA, Box)
Product cost data
NC history
RURs
Parametric ATP Data
Supplier quality rating
Supply chain sourcing strategies

Program/Design Data

Customer demands (design change, new features, etc)
Obsolescence Status, Errata
Fielded MTBUR, DMC

Tasks / ETC

Lead Tasks

Conduct EIS Review (entry event when FPY > 92%)
Program Reviews (Moog with Moog customers)
Lead RCCAs as required.
Develop solutions to design problems
Actively work to reduce NCs and improve FPY
Review ATP Limits with respect to FPY, NCs and parametric data and make changes as appropriate
Lead Cost/Product/Process improvement initiatives as required
Lead Delta Qualification/Certification, QBS, etc activities as required
Create and Maintain problem reports

Support Tasks

CRB Support
Drawing, BOM, ATP, HASS, etc updates as required
Review supplier performance data as required
Support Reliability Testing activities (i.e. ongoing Proof of HASS, etc)
Support Supply Chain transitions as required
Review Parametric test data for shifts and out of family trends

Deliverables

1. Refresh Strategy
2. Support Weekly Manufacturing-Design meetings
3. Updated drawings, BOMs, ATP, HASS, ATP Limits, etc as required
4. Delta Qual documents as required

Return to summary page

Resources (hrs)
- Project/IDVT (100% LOE)

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Design Engineering – Sustainment (FPY > 99%) WP51

Inputs

Manufacturing Data

FPY (supply chain, CCA, Box)
Product cost data
NC history
RURs
Parametric ATP Data
Supplier quality rating
Supply chain sourcing strategies

Program/Design Data

Customer demands (design change, new features, etc)
Obsolescence Status, Errata
Fielded MTBUR, DMC

Tasks / ETC

Support Tasks

CRB Support
Program Reviews (Moog with Moog customers)
Support RCCAs as required
Develop Refresh Strategy working with Program team, customer and manufacturing engineering
Cost/Product/Process improvement initiatives as required
Drawing, BOM, ATP, HASS, etc updates as required
Delta Qualification/Certification, QBS, etc activities as required
Support Reliability Testing activities (i.e. ongoing Proof of HASS, etc)
Support Supply Chain transitions as required
Review Parametric test data for shifts and out of family trends
Review ATP Limits with respect to FPY, NCs and parametric data and make changes as appropriate
Create and Maintain problem reports

Deliverables

1. Refresh Strategy
2. Support Weekly Manufacturing-Design meetings
3. Updated drawings, BOMs, ATP, HASS, ATP Limits, etc as required
4. Delta Qual documents as required

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Resources (hrs)
- Project/IDVT (25% LOE)

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Phase 1 – MFG Work Packages

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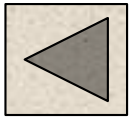

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Requirements Definition - Mfg Project Plan WP4

Inputs

Requirements
Spec/SOW
Box HRD
Proposal Baseline
DTC Targets
Schedule
Updated quantities and milestones
Plans
Quality flow down
Proposal EMCP0
Cert/Project Plan
Preliminary product structure

Tasks / ETC

Project Preparation
Review Proposal Baseline including budgets (8)
Review product relative to platforms for synergy (4)
Review plan for magnetic sourcing (4)
Review plan for cable assemblies sourcing (4)
Review plan for mechanicals including box (8)
Design Requirements & Standards
Capabilities gap analysis
(capacity, equipment, processes, materials, etc) (8)
Review DTC targets versus plan/actuals (8)
Defined prototype and production build locations
Update EMCP1 (32)

Deliverables

1. DTC feedback to project team
2. EMCP1(MFG plan)

Resources (hrs)
-Operations Lead (28)
-Prod/Proc Engineering (32)
-Supply Chain (16)
-76 hours total

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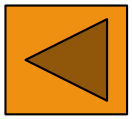

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Phase 3 – MFG Work Packages

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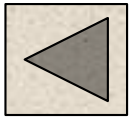

Return to swimlane

Revised: January 21, 2014

Preliminary Design – Prelim. Mfg process definition WP12

Inputs

Requirements
Preliminary CCA Design Info
Updated quantities and milestones
Updated Box HRD

Plans
EMCP1
Revised project plan/scope changes

DFX
Revised DTC Targets

Tasks / ETC

Requirement Reviews
Review preliminary block diagrams /allocations (24)
Review preliminary BOM and schematics(32)
Review preliminary Box design (24)

Plans
Updated EMCP2 (32)
Review risk management plan (16)
Review DTC targets versus plan/actuals (16)

DFX
Conduct DFx (M,A,T) reviews (40)

Deliverables

1. DFx (M,A,T) at Box level summary
2. DFx (M,A,T) at CCA level summary
3. Process flow diagram
4. DTC feedback to project team
5. EMCP2

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Resources (hrs)
-Operations Lead (36)
-Prod/Proc Engineering (128)
-Supply Chain (20)
-184 hours total

Return to swimlane

Preliminary Design – Prototype/Risk Mitigation Build

Inputs

Requirements
Preliminary CCA Design Info
CCA Risk Build data as required
Updated quantities and milestones
PDR materials

Plans
EMCP2
Revised project plan/scope changes

DFX
Revised DTC targets

Tasks / ETC

Requirement Reviews
Review preliminary design box and CCA (80)

Plans
Updated and released EMCP3 (24)
Refine AWs, TWs if required to support product and process engineering per EMCP (180)

DFX
Review DTC targets versus plan/actuals (16)
Conduct DFx (M,A,T) reviews (80)

Deliverables

1. DFx (M,A,T) at Box level summary
2. DFx (M,A,T) at CCA level summary
3. AWs and TWs if required
4. Prototype/risk mitigation CCAs, as required
5. Product/Process/Ops PDR materials
6. DTC feedback to project team
7. EMCP3

Return to summary page

Resources (hrs)
-Operations Lead (24)
-Prod/Proc Engineering (340)
-Supply Chain (16)
-380 hours total

Return to swimlane

Phase 4 – MFG Work Packages

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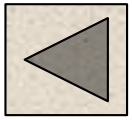

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Detailed Design - Mfg Process definition WP20

Inputs

Project
Revised project plan
/ scope changes
Plans
EMCP3
Latest AW, TW
Requirements
CCA TRDs
Detailed Design Package
Revised DTC Targets
Special test Reqs (HASS, etc)

Tasks / ETC

Design Support / Reviews
Review detailed drawings box and CCA (120)
Review DTC targets versus plan/actuals (32)
Review TRD (Test Requirement Docs) (32)
Drawings
Update EMCP4 (24)
Refine AW with CEM Process Engineering (160)
Refine TW with CEM Product Engineering (160)
Production
Visit CCA CEM and audit per strategy (300)

Deliverables

1. MFG - DFMAT – Peer review with MFG project memo / action resolution
2. MFG - EMCP4 (MFG plan update)
3. CDR review package – as required

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Resources (hrs)
-Operations Lead (40)
-Prod/Proc Engineering (748)
-Supply Chain (40)
-828 hours total

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Phase 5 – MFG Work Packages

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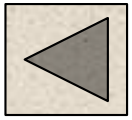

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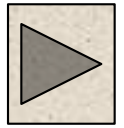

Item Build & Test – Dev HW Build CCA/Item WP28

Inputs

Design Data/Requirements
CCA Dev Test Procedure
Released PLD code
Box ATP test requirements
Box ATP limits justification
Box ATP

Plans
EMCP4
Revised project plan/scope changes
Latest AW, TW
Revised DTC Targets

Hardware/other
POB hardware, tooling
CCA Dev Test Fixtures

Tasks / ETC

Build
Liaison with CEM (120)
Update box and CCA AWs & TWs if required (200)
Conduct POB and report (280)

Documents
Update EMCP5 (8)

Test
Support box and CCA Test Procedures as required (200)
Support Des Engineering testing (24)

Reviews / Reports
Validate DTC actuals (40)
Review DTC targets versus plan/actuals (24)
Support MRB (120)

Deliverables

1. DFx (M,A,T) at Box level summary
2. DFx (M,A,T) at CCA level summary
3. Hardware CCA (turn0), QTY based on project need
4. Hardware box (turn0), Qty based on project need
5. Updated AW, TW if required
6. Proof of build report – Project memo
7. DTC feedback to project team - Project memo
8. EMCP5

Return to summary page

Resources (hrs)
-Operations Lead (80)
-Prod/Proc Engineering (856)
-Supply Chain (80)
-1016 hours total

Return to swimlane

Phase 6 – MFG Work Packages

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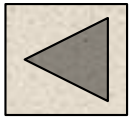

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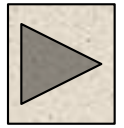

System Integration and SOF – SOF Build CCA/Item WP36

Inputs

Requirements
Revised project plan/scope changes
Revised DTC Targets

Design Documentation
EMCP5
Latest AW, TW
POB report from turn0 hwr

Tasks / ETC

Test
Support Des Engineering testing (30)

Reviews
Support MRB (60)

Documents
Updated EMCP6 (16)

Production
Update box and CCA AWs (turn0 hardware plus cuts and jumper) & TWs as required (80)
Liaison with CEM (160)
Review DTC targets versus plan/actuals (24)

Deliverables

1.SOF LRU build
QTY based on project
2.DFx (M,A,T) at Box level report
project memo
3.EMCP6

Return to summary page

Resources (hrs)
-Operations Lead (16)
-Prod/Proc Engineering (338)
-Supply Chain (16)
-370 hours total

Return to swimlane

Phase 7 – MFG Work Packages

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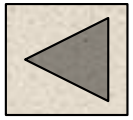

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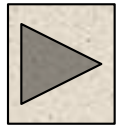

Qualification Phase – Production Readiness Qual Builds WP40

Inputs

Design Documentation
SOF design and BOM update
Assembly Drawings
Plans
Revised project plan/scope changes
Revised DTC Targets

Tasks / ETC

Qualification Build
Liaison with CEM (320)
Update box and CCA AWs & TWs if required (100)
Coordinate cable builds (80)
Production Readiness Review
Support box and CCA Test Procedures as required (180)
Support DTC targets versus plan/actuals (40)
Support MRB (120)
Plans
Updated EMCP7 (16)
Reviews
DFX reviews (24)

Deliverables

1. Qualification LRU's
QTY based on project
2.DFx (M,A,T) at Box level summary memo MFG WP
3.EMCP7

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Resources (hrs)
-Operations Lead (-)
-Prod/Proc Engineering (-)
-Supply Chain (-)
-880 hours total

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Revised: January 21, 2014

Phase 8 – MFG Work Packages

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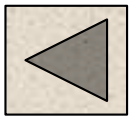

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Certification Phase – Production Hardware Build WP48

Inputs

Reports
POB report from turn1 hwr

Project
Revised project plan/scope changes

DFX Inputs
Revised DTC Targets

Requirements
EMCP7
Latest AW, TW

Tasks / ETC

Production
Liaison with CEM (240)
Develop plan for production (120)
Develop plan for sustaining engineering (40)

Reviews
Review DTC targets versus plan/actuals (16)
Support MRB (120)

Plans
Update EMCP8 (16)

Deliverables

1. Successful transition of design to production
2. Product engineers are trained
3. Documentation to support build/test - released
4. Updated AW, TW if required MFG
5. EMCP8

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Resources (hrs)
-Operations Lead (24)
-Prod/Proc Engineering (512)
-Supply Chain (16)
-552 hours total

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Revised: January 21, 2014

Product Maturation/EIS and Sustainment Work Packages

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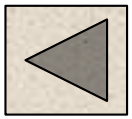

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Manufacturing Engineering – Product Maturation/EIS (FPY > 92%) WP50

Inputs

Manufacturing Data

FPY (supply chain, CCA, Box)
Product cost data
NC history
RURs
Parametric ATP Data
Supplier quality rating
Supply chain sourcing strategies

Program/Design Data

Customer demands (design change, new features, etc)
Obsolescence Status, Errata
Fielded MTBUR, DMC

Tasks / ETC

Support Tasks

Develop Plan for Every Part (P4EP)
CRB support
Supplier performance review meetings
Support RCCAs as required
Create and Maintain problem reports

Process Data

Process parametric data from CCA and Box ATP
Lead test equipment maintenance and upgrade activities

Deliverables

1. Generate Incident Database
2. Generate parametric data summary
3. Lead weekly Manufacturing-Design meeting 'Product Yield Top Concerns'
4. Conduct Monthly Manufacturing Review meeting with LRU team (FPY, NC, on Hold, cost, etc)
5. Update TW, AW as required

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Resources (hrs)
-Product/Proc Eng (50%/25% LOE)
-Supply Chain (25% LOE)
-QE (5% LOE)

Return to swimlane

Manufacturing Engineering – Sustainment (FPY > 99% WP52

Inputs

Manufacturing Data

FPY (supply chain, CCA, Box)

Product cost data

NC history

RURs

Parametric ATP Data

Supplier quality rating

Supply chain sourcing strategies

Program/Design Data

Customer demands (design change, new features, etc)

Obsolescence Status, Errata

Fielded MTBUR, DMC

Tasks / ETC

Lead Tasks

Conduct Product Maturation Entry Review (entry event when FPY > 99%)

Lead RCCAs as required

Create and Maintain problem reports

Support Tasks

CRB support

Supplier performance review meetings

Process Data

Process parametric data from CCA and Box ATP

Lead test equipment maintenance and upgrade activities

Deliverables

1. Maintain Incident Database
2. Maintain parametric data summary
3. Lead weekly Manufacturing-Design meeting 'Product Yield Top Concerns'
4. Conduct Monthly Manufacturing Review meeting with LRU team (FPY, NC, on Hold, cost, etc)
5. Update TW, AW as required

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Resources (hrs)

-Product/Proc Eng (25%/10% LOE)

-Supply Chain (10% LOE)

-QE (5% LOE)

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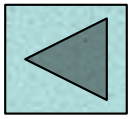
Acronyms

A	
ADVT	Analog Design Verification and Test
ATP	Acceptance Test Procedure
ALT	Altitude
AW	Assembly Worksheet
ABOM	Advanced Bill of Material
A&T	Assembly & Test
B	
BOM	Bill Of Materials
BLDC	Brushless Direct Current
C	
CCA	Circuit Card Assembly
CDR	Critical Design Review
CR	Change Request
CM	Configuration Management
CERT	Certification
CEM	Contract Electronics Manufacturer
D	
DDVT	Digital Design Verification and Test
DFx (M,A,T)	Design for x where x can be Manufacturing, Cost, Assembly and Test, etc
DTC	Design To Cost
DFMAT	Design for Manufacturability, Assembly and Test
DUT	Device Under Test
DEV	Development
DMC	Direct Maintenance Cost



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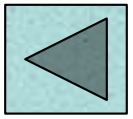
Acronyms (continued)

E	
EE	Electrical Engineering
EMPT	Electronics Manufacturing Process and Test
EDP	Electronics Design Plan (Special Instructions used for PWB Layout definition)
EO	Engineering Order: form and procedure for implementing design changes
EMC	Electromagnetic Compliance (Compatibility)
EMI	Electromagnetic Interference
EM	Electro-Mechanical
ETC	Estimate To Complete
EVMS	Earned Value Management System
EMCP	Electronics Manufacture Control Plan
F	
FCI	Firmware Configuration Index
FRD	Firmware Requirements Document
FW V&V	Firmware Verification and Validation
FEs	Functional Elements
FMEA	Failure Mode Effects Analysis
FDD	Firmware Design Drawing
FW	Firmware



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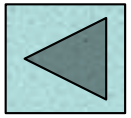
Acronyms (continued)

H	
HALT	Highly Accelerated Life Test
HAS	Hardware Accomplishment Summary
HASS	Highly Accelerated Stress Screens
HCMP	Hardware Configuration Management Plan
HDP	Hardware Development Plan
HDD	Hardware Description Document
HEPG	Hardware Engineering Process Group
HVP	Hardware Verification Plan
HRD	Hardware Requirements Document
HW	Hardware
HV	High Voltage
HVR	Hardware Verification Report
HVCP	Hardware Verification Cases and Procedures
HVS	Hardware Verification Standards
HVTCP	Hardware Verification Test Cases and Procedures
HVTP	Hardware Verification Test Procedures
HCMP	Hardware Configuration Management Plan
HPAP	Hardware Process Assurance Plan
HRS	Hardware Requirements Specification

I	
ICD	Interface Control Diagram
IDVT	Item Design Verification Test
IP	Intellectual Property
IPT	Integrated Product Teams
IR&D	Internal Research and Development
IO	Input /Output
IMS	Integrated Master Schedule



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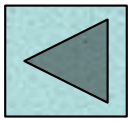
Acronyms (continued)

K	
Kt/Ke	Torque constant (Kt)/Voltage constant (Ke)
L	
LRU	Line Replaceable Unit
M	
MDVT	Motor Design Verification and Test
MECH	Mechanical
MOC	Means of Compliance
MBS	Moog Business System
MRB	Material Review Board
MFG	Manufacturing
ME	Mechanical Engineering
MTBUR	Mean Time Between Unscheduled Removal
P	
PHAC	Plan for Hardware Aspects of Certification
PLD	Programmable Logic Device
PRB	Program Review Board
PACT	Packaging Design Verification and Test
PDVT	Power Design Verification and Test
PDR	Preliminary Design Review
PRR	Production Readiness Review
PN	Part Number
PWB	Printed Wire Board
PPL	Preferred Parts List
PR	Problem Report
POB	Proof of Build
PROD	Production
PROC	Procedure



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Acronyms (continued)

Q	
QA	Quality Assurance
QUAL	Qualification
QTP	Qualification Test Procedure
QTY	Quality
R	
RQMT	Requirement
REV	Revision
Rtt/Ltt	Terminal to Terminal Resistance and Inductance
S	
SOF	Safety Of Flight
SOI	State of Involvement
SDRL	Subcontractor Data Requirement List
SRR	System Requirements Review
SW	Software
STE	Standard Test Equipment
SYS	System
SME	Subject Matter Expert
SOW	Statement Of Work
SSMP	System Safety Management Plan
SPEC	Specification

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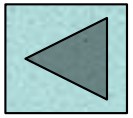
Acronyms (continued)

T	
TRD	Test Requirements Document
TRR	Test Readiness Review
TB	Test Bench
TEMP	Temperature
TWs	Test Worksheet
TE	Test Equipment
V	
V&V	Verification and Validation
VHDL	Very High-level Design Language
VIB	Vibration
W	
WP	Work Package
WO	Work Order
WBS	Work Breakdown Structure



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