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# Corrective Action

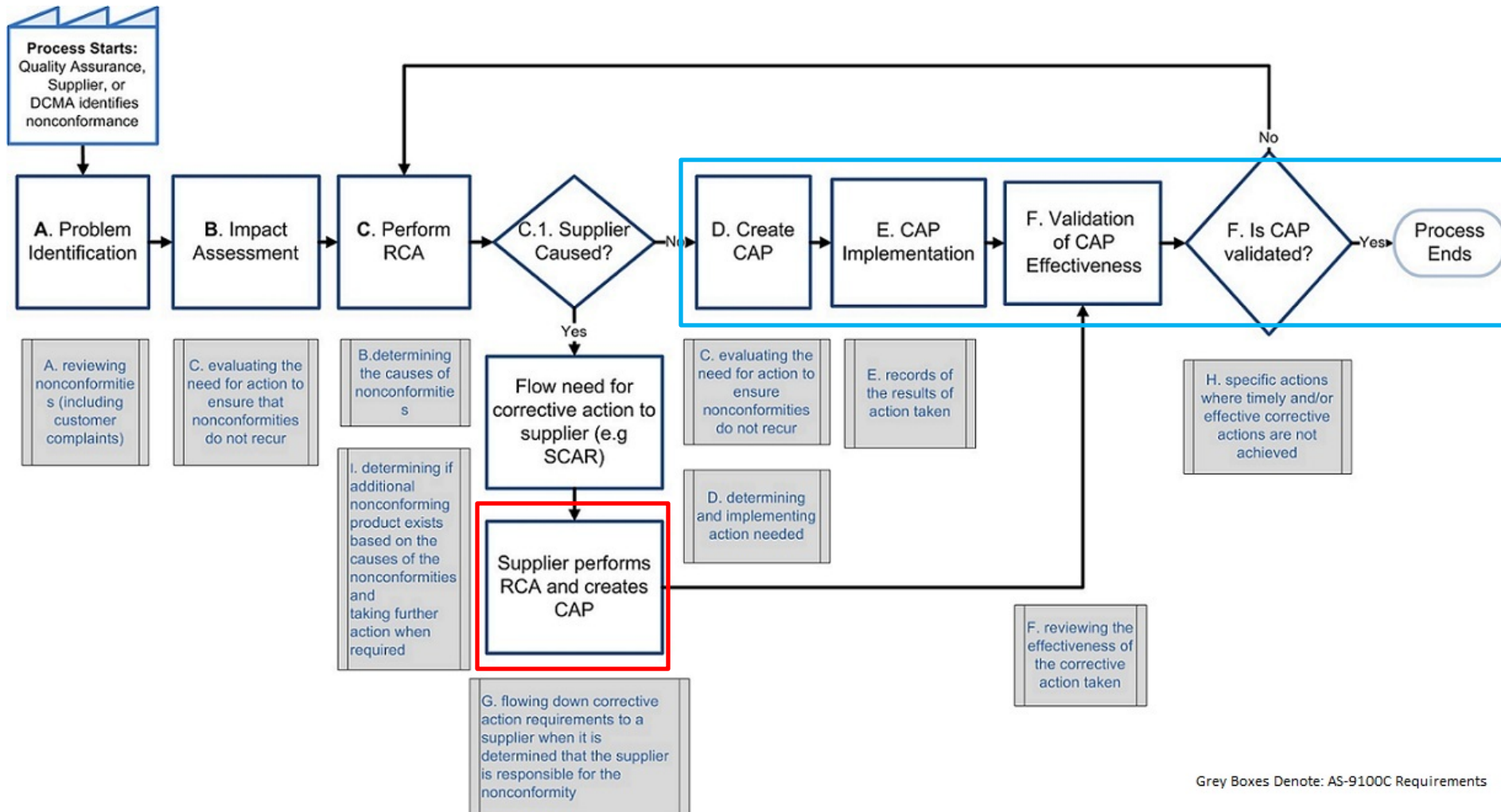
## Corrective Action Plan Development



# Agenda – Corrective Action Plan Development

- **Corrective Action Plan Definition**
- **Discovery Tools**
  - Identify the Problem
  - Define the Problem
  - Investigate the Problem
  - Analyze the Problem and Determine Cause(s)
- **Creating the Corrective Action Plan**
  - Generate and Implement Solution
  - Verify Results and Document
  - Monitor and Measure Corrective Action Process
- **Closing the Corrective Action Plan**
- **Summary**

# Corrective Action Process Flow



# CAP Definition

- **Corrective Action Plan (CAP)** - A plan developed that documents actions taken (Tasks) to prevent recurrence and documents Estimated Completion Date (ECD) and effectivity points.

# Corrective Action Plan (CAP) Development

Once a problem has been identified requiring formal corrective action and the cause(s) has been determined, a corrective action plan (CAP) will be developed that prevents recurrences of the anomaly(s). The proposed corrective actions should be reviewed for feasibility and economic practicality.

# Validation and Effectiveness of CAP

CAP owner performs validation by reviewing objective evidence to determine if **the** completed actions have achieved expected results.

Validation of CAPs is required and will be documented:

- Document the objective evidence to demonstrate corrective action validation. Attach all applicable artifacts that support the evidence.
  - If the completed corrective actions are effective (i.e. original problem has been eliminated), document the CAP as validated.
  - If the corrective actions are not effective before validation phase is complete, coordinate with respective parties to modify the CAP, perform further root cause analysis and perform re-validation activities.
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- For Supplier CAPs, if the same issue is determined to have reoccurred after validation is completed, Reject the CAP and create a new CAR labeled as “recurrence”.

# Corrective Action Process Flow

Inputs	Corrective Action	Outputs
Nonconforming Products or Services	✓ Identify the Problem	Implemented and Verified Corrective Action Plan
Non-compliant Processes or Capabilities	✓ Define the Problem	Improved Capabilities or Products
Audit Findings	✓ Investigate the Problem	Costs Reduced, Schedule or Quality Improved
Customer Complaints	✓ Analyze the Problem and Determine Cause(s)	Customer Satisfaction
Management Directives	Generate and Implement Solution	Record of Corrective Action and Verification
Program Monitoring or Reviews	Verify Results and Document	Capabilities and Processes Conform to Requirements
Requirements noncompliance (i.e., regulatory or contractual)	Monitor and Measure Corrective Action Process	

✓ **Discovery Tools**





# CAR Definition & Criteria

- **CAR** - document to formally request corrective action from the responsible supplier/special process source as defined by LM Command Media
- A **Finding** is significant when the discrepancy/condition is:
  - Repetitive
  - Indicates a continuing negative trend
  - Affects Safety of Flight
  - Contributes to production line impacts
  - Customer directed
  - Teaming effort
  - Systemic in nature
  - Producibility issue
  - First Article Inspection (FAI) supplier escapes or supplier failure to notify SQM prior to commencing FAI
- The Supplier's CAR response should be evaluated to insure root cause(s) have been identified and corrective action will improve process and prevent recurrence

# ***Root Cause Analysis and Corrective Action***



- **Root Cause Analysis** - the process of applying the cause and effect principle to solve problems. A root cause analysis program should be a systems approach to finding effective solutions to prevent problems from occurring or recurring.
- **RCA Tools** provide means to conduct systematic analysis of a problem to identify cause and effect relationships and identify appropriate solutions to eliminate non-conformances
- **Corrective Action:** Action(s) taken to eliminate the cause of non-conformances in order to prevent recurrence
- **Root Cause Analysis** helps ensure
  - Continuous improvement
  - Efficient use of resources
  - Focus on actions that are most impactful

***Root Cause + Effective Corrective Action =  
Problem Elimination!***

# Getting Started on the Corrective Action Plan



## **Now, we'll**

- Generate and Implement Solution (CAP)
- Verify Results and Document
- Monitor and Measure Corrective Action Process

## **A Corrective Action Plan**

- Provides a structured approach to problem solving
- Generates credibility
- Shows supplier leadership their teams expectations, commitment and progress to scheduled goals
- Shows LM leadership a structured way forward to solving a problem

**A Corrective Action Plan is a Powerful Tool**

# Charter Summary for:

## Problem Statement:

- One or two sentences that describe the team's task and sets direction for the team
- Tells why CAP needs to be done, not what the solution might be

## Objectives / Deliverables:

- Major goals/objectives (i.e. SMART objectives)
- What the sponsor(s) or CAR wants of the CAP
- Linkage to organizational objectives, programs excellence plans, performance measures, Target Zero objectives, etc.

## CAP Scope Information (as appropriate):

- Provides the framework for the CAP
- Helps to clarify and document the limitations, and other relevant factors that may affect the team's efforts and may include the following:
  - ROIC Impact
  - Process boundaries (i.e., start and end)
  - List any commandments (i.e., Non-negotiable policies and positions)
  - List any monuments (i.e. Machinery, systems, etc. that cannot be moved or altered)
  - Customer Value

**Champion:** member of senior mgmt

**Sponsor:** process authority

**CAP Owner:** Suppliers should create the Plan, the SQE remains responsible for the effectiveness of the Plan.

## Team Members/Action Owners:

- What Lockheed Martin resources are needed
  - IPT/Engineer
  - Buyer
  - Lead
  - ECATs
  - Advanced Quality
- What Supplier resources are needed
  - Engineer
  - Program Manager
  - Quality Manager

**Ensure the Charter Is Established – Actions Will Support**

# Elements of a Plan

There's more than one way to format a Plan.



The Plan elements include:

- **Finding/Issue** - be as specific as possible: requirement violated, AS9100 clause failed, CAR
- **Root Cause** (Adjust if data requires)
- **Short Term** – Containment/Corrective Actions
  - Who will perform
  - Expected Completion Date
- **Long Term** Corrective/Preventive Actions
  - Who will perform
  - Expected Completion Date
- **Objective Evidence** that will close the action (for each action)
- **Expected Results** – Positive change
- **Validation** – Supplier and LM
- **Metrics** – Going forward, what will show sustainment

**Create the Plan – Designed to Solve the Issue**



# CAP Example

## Improper bearing installation

Issue #	Issue	Root Cause	Containment / Short Term CA	Long Term CA/PA	POC Supplier	POC LM	ECD	Objective Evidence	Expected Benefit	Metrics
1	Orders accepted w/o capability (FTB)	Inadequate mgmt review	1. Added sign-off by mgmt along with completing the Bid, Contract, and Amendment Review checklist	2. Incorporate a process to review capability prior to accepting POs	Pres	SQE	1. 6/2/2014 2. 6/17/2014	Completed PO review form dated prior to PO acceptance	No PO would be accepted w/o access to capability	Supplier disclosure and/or rejections (no. of QARs)
2	Planning (work instruction) did not include instructions/specifics for bearing installation per spec	Inadequate planning	1. Review and update work instruction and integrate into the job traveler (control build)	2. Review and update work instruction for all assembly part numbers 3. Establish LM Aero critical assembly review process	Planner	1.2SQE 3. Tech Support	1.12/31/2014 2. 1/15/2015 3. 1/15/2015	1. Joint review of the work instructions 2. Joint review of the work instructions 3. Processes implemented	Work instructions are adequate and easy to follow and meet requirements	Number of PN on hands and number of PN reviewed
3	Acceptance assembly part testing was not conducted	Inadequate planning flow down	1. Outsource testing to American Precision and MPT review test results/FAI 2. Include testing procedure in the job router	3. Review and update work instruction for all assembly testing	Pres Planner	SQE	1. 6/27/2014 2. 12/31/2014 3. 1/15/2015	1. Test Results 2. Joint review of the work instructions 3. Joint review of the work instructions	Test procedures are adequate 100% compliance	Right the first time all the time Zero nonconformance
7	Lack of a capable bearing installation process	Misunderstanding of the requirements	1. Temporary outsource the parts to LM Aero approved source 2. Procured 20 ton hydraulic press 3. Calibrate gage for press 5. LM support needed for process development and test	4. Develop and implement a capable bearing installation process	Planner QM	SQE Tech Support	1. 6/5/2014 2. 6/4/2014 3. 10/1/2014 4. 1/15/2015 5.10/1/2014	3. Calibration record 4. CpK value based on test results (axial, torque, load) 5. Validated test results; production plan	Reliable and capable in-house process	CpK Trend data of test measurements Test results

# Corrective Action Plan: Things to Consider



- Actions should be Specific, Measurable, Achievable, Realistic and Time-Bound (SMART)
  - Consider the overall supplier/POC work load
  - Ensure time to provide quality response
  - Consider program needs, without losing Quality (can an action be broken into smaller elements to support needs?)
- Does the POC have the skills to perform the task? (If you can't find the needed skills, ask for help.)
- Does the overall Plan achieve the objectives?

# Corrective Action Plan: Things to Consider



- Will the solution cause new problems?
- What's the level of difficulty of implementing the solution?
- How much time will it take to implement?
- What is the cost of implementation?
- Is the solution transferable to other processes or areas? Where else can I use this solution? Who else can you this solution?



# Corrective Action Plan: Things to Consider



## Establish the logistics

- How often will be team meet?
- How/when will the plan be statused?
- Where/what nomenclature standard will be used to store objective evidence?
- Who will approve objective evidence, how will it be presented?



# **Common Issues with Effective and Ineffective Solutions**

# Common Issues: Effective / Less Effective Solutions



## Lack of Procedural Compliance (Tribal Knowledge)

- ☑ Controlled builds (Product Audit):
  - LM/Supplier requirements/drawing review
  - Work instruction updates with pictures, dimensions, details that ensure accuracy, links to spread sheets to record variable data, inspector call outs, Mechanical Engineer call outs
  - Witnessed build (Supplier ME/LM SQE/DMCA as appropriate)
- ≠ Updates to procedures that will not be used
- ≠ Training as the only fix

# Common Issues: Effective / Less Effective Solutions



## Test Inadequacies or Contradictions in Supplier/LM Test

- ☑ Joint collaboration on ATP/FT discrepancies. Supplier visit to Factory, or LM engineering visit to supplier.
- ☑ NFF –2<sup>nd</sup> like condition SQE speak to Engineer to determine if additional testing is required, 3<sup>rd</sup> like condition meet with SQM Program Integrator, PQE, SQE, Supplier SCM, Buyer, LM Engineering
- ☑ Detailed Test procedures (similar to Work Instructions)
- ☑ Detailed Test set up and configuration (Pictures/Required data entry)
- ≠ Finger point to/from supplier and factory
- ≠ Increase number of ATPs/Inspections

# Common Issues: Effective / Less Effective Solutions



## **Producibility concerns** (Supplier design and Build To Print)

(Process takes too long, overly complex, undefined design, lack of clear requirements)

- ☑ Clarify requirements with LM Engineering
  - SPAR – Supplier Problem and Resolution
  - SATR – Supplier Aircraft Tooling Report
  - Request For Engineering Action/Engineering Change Proposal
  - POIS - Production Outsource Information Sheet
- ☑ Design of Experiment-DOE- (based on Root Cause Analysis)
- ≠ Email acceptance, verbal direction of design change from LM engineer, buyer, or others
- ≠ 1st Cause versus Root Cause resolution
- ≠ Training as the only fix
- ≠ Add inspection as a long term fix
- ≠ Swaptronics

# Common Issues: Effective / Less Effective Solutions



## Operator Error (Often not Root Cause)

- ✓ Detailed planning readily available to the operators
- ✓ Clear, easy to understand Work Instructions (photos, videos)
- ✓ Shop aids, mylars
- ✓ Automation
- ✓ Operator input to Work Instructions
- ✓ Adequate supervision
- ✓ Tooling
- ✓ Appropriate working environment (e.g. lighting, clean room)
- ✓ Mistake proofing, alarms, warnings
- ✓ Process redesign
- ✓ Operator Certification
- ≠ Training as the only fix
- ≠ Fire the operator
- ≠ Add inspection as a long term fix

# Common Issues: Effective / Less Effective Solutions



## Special Processes Requirements not followed / not understood

- ✓ Detailed requirement definition and test methods
- ✓ Special process audits and PSP
- ✓ Hire experts in the field/Increase operator certification
- ✓ Outsource to approved expert
- ✓ Advanced Root Cause tools (not just 5 whys)
- ✓ FMEA/Risk analysis
- ✓ Variation Management
- ≠ Training as the only fix
- ≠ Unnecessary procedural changes
- ≠ Inspection as a long term fix

# Common Issues: Effective / Less Effective Solutions



## Lack of Requirements Management

- ☑ Contracts check list to ensure Supplier meets LM/GSI and other contract requirements (QX and PO)
    - POIS - Production Outsource Information Sheet review (Build to Print)
    - EMAP Training
  - ☑ Supplier order contracts check list to ensure requirements flow down – Compliance matrix
  - ☑ Supplier Configuration Management system implementation/ validation
- ≠ I'll give the supplier a call



# Common Issues: Effective / Less Effective Solutions



## Lack of Quality Culture/Management Commitment/Lack of Customer Focus

- ✓ LM Executive Reviews/Bi Weekly Reviews
- ✓ Supplier establish Quality Steering Committee/LM participate
- ✓ JAG participation
- ✓ Corporate, top down management /communication
- ✓ Effective employee engagements
- ✓ Focus on reducing Cost of Poor Quality

≠ Ineffective all hands

≠ Blame/Replace the Quality Manager

# Common Issues: Effective / Less Effective Solutions



## Lack of Product Containment

- ✓ Kaizen Product deep dive – stop ship/line stop if issues found
  - ✓ Product Inspection Plans (PIP)
  - ✓ Process Mapping
  - ✓ Place supplier personnel at LM factory
  - ✓ Internal CARs/CAR Reviews
  - ✓ Sub Tier Management
    - PFMEA at Sub tiers
    - CARs to Sub tiers
- ≠ Create work-arounds that do not address root cause
- ≠ Increased inspections as a long term fix
- ≠ Fire the operator

# Common Issues: Effective / Less Effective Solutions



## Sub-tier nonconformities

- ✓ Supplier Performance Scorecards – Rolled up to management
- ✓ Waves of Assessments – Performance Improvement (SIA)
- ✓ Part Specific improvements in Process Control – Planning and Execution plus Verification of Build
- ✓ Monthly Executive contact on Top 10 Suppliers
- ✓ Red Day Supplier Meetings
- ✓ Red Team Engagements
- ✓ Supplier Performance Improvement Projects - Executive Level monthly dialogue
- ✓ Special Process Audits
- ✓ Controlled Builds
- ✓ Industry Audits ( NADCAP etc.)
- ✓ Supply Chain Mapping – beyond 1<sup>st</sup> Tier
- ≠ Desk top review of sub tiers
- ≠ Increased receiving inspections

# Common Issues: Effective / Less Effective Solutions



## Lack of Control of Monitoring and Measuring Equipment/Calibration Issues

- ☑ Automated system (Requires knowledgeable personnel to maintain and enforce)
- ☑ Implement tool control program/process
- ☑ Tool recall system
- ☑ Add Work Instruction element to record tool calibration expiration date. Lock out for tools with expired calibration date.
- ☑ Remove excess/unused tools
- ≠ Training as the only fix
- ≠ Email to employees

# Common Issues: Effective / Less Effective Solutions



## Ineffective Corrective/Preventative Actions

- ☑ Use appropriate RCCA tool
- ☑ Set Standards for QAR/CAR response; systemic review
- ☑ Grade submitted responses to standards – mentor individuals, address systemic findings
- ☑ Management/peer review prior to submitting new responses
- ☑ Advanced Quality Tools: Metrics/Trending/Key Characteristics/Process Control Documents
- ☑ Create effective CAP!!!!!!
- ≠ Change to procedure that is not followed
- ≠ Focus on Quality Score versus preventing nonconformities

# Executing



Executing a plan consists of the processes used to complete the work defined in the project plan to accomplish the project's requirements.

Execution process includes

- Direct and manage project execution
- Quality assurance of deliverables
- Ensure assignment are understood
- Distribute metrics, progress status
- Manage stakeholder expectations
- Test the deliverables against the initial design – adjust as required

*Project Management Body of Knowledge*

**Play the Plan – Structured Approach**

# Monitoring and Controlling



Processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project.

Monitoring and controlling includes

- Measuring the ongoing project activities ('where we are')
- Monitoring the project variables (cost, effort, scope, etc.) against the project management plan and the project performance baseline (*where we should be*)
- Identify corrective actions to address issues and risks properly (*How can we get on track again*)
- Influencing the factors that could circumvent integrated change control so only approved changes are implemented

# Monitoring and Controlling Things to Consider



- How often will the project team meet? What is the agenda for this meeting?
- Consider leadership briefings. What management level is required to ensure goals are met? What is the frequency of these meetings?
- What information will be used to show progress, request help? Build the Briefing Template
- Is the Plan effective? What changes would improve the Plan?

**Make it Visible – Periodic Leader Meetings Are Effective**



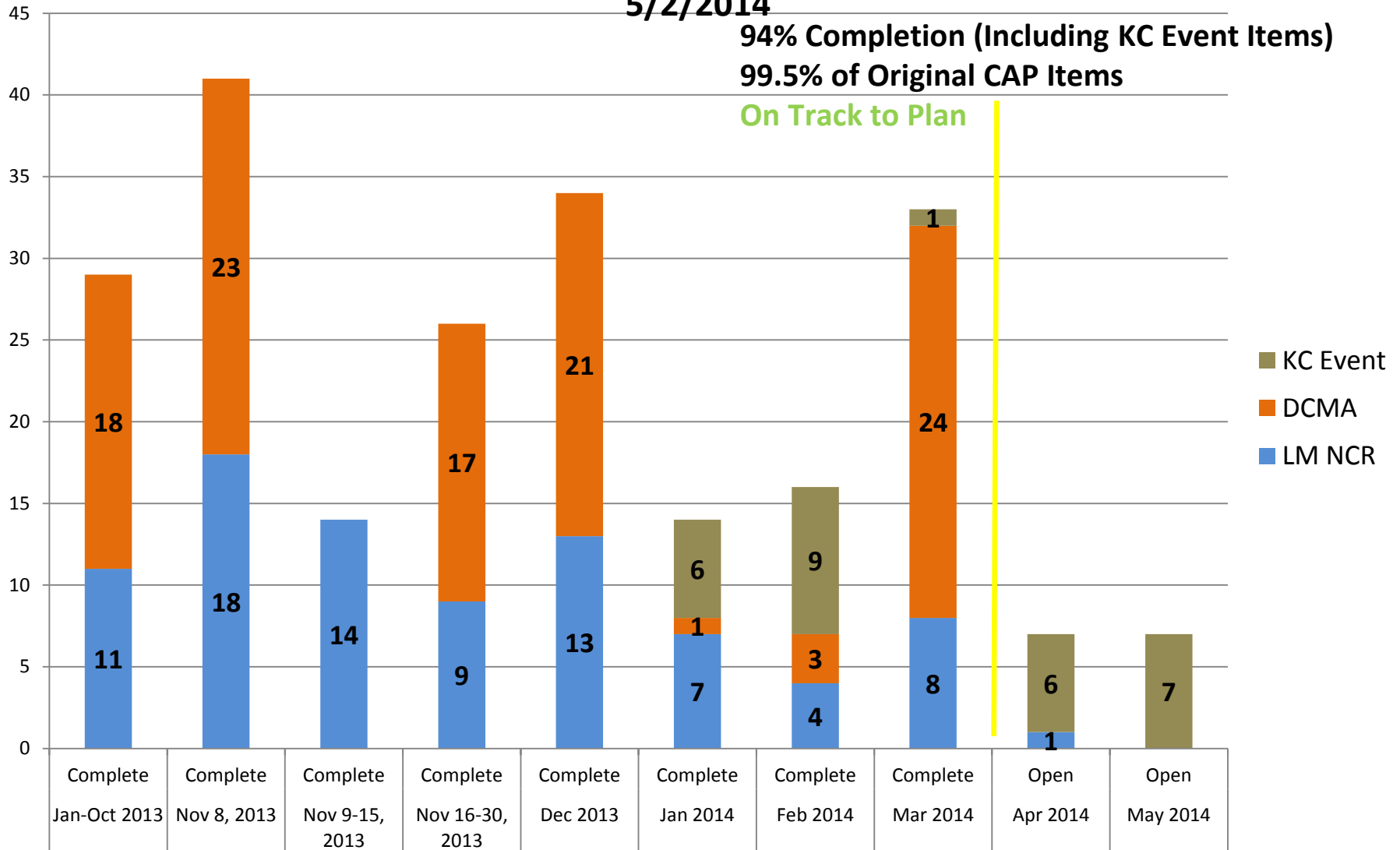
# Overall CAP Assessment

5/2/2014

94% Completion (Including KC Event Items)

99.5% of Original CAP Items

On Track to Plan



Track to the Schedule – Understand Delays

# Closing



- Closing includes the formal acceptance of the project and the ending thereof.
  - Administrative activities include the archiving of the files and documenting lessons learned.
- Project close: Finalize all activities across all of the process groups to formally close the project or a project phase

# Event Closure: XXXXXXXX



Part: Initiator(s): Engineering Affected P/N: S/N(s) Affected Aircraft: Number of QARs:	Sub Component: _____ Program: XXX Date Raised: 10/22/2013 Last Update: 02/12/2014
<b>1. Description:</b> _____ ECD: 22 Oct-13 Completion Date: Units Reported as XXXX Faults. This can cover various fault conditions	<b>5. Corrective Action/Preventative Action</b> ECD: _____ Completion Date: CA Affectivity: _____
<b>2. Assessment:</b> _____ ECD: 30 Oct-13 Completion Date: Initially believed to be overstress induced by switching pump loads as fault condition could not be induced. Investigation on subsequent returns into timing/sequencing has shown fault	<b>6. Implementation Plan</b> ECD: _____ Completion Date:
<b>3. Containment Plan:</b> _____ ECD: 24- Feb-14 Completion Date: No mechanism identified at this stage	<b>7. Communication Plan/ Lessons Learned</b> ECD: _____ Completion Date:
<b>4. Root Cause</b> _____ ECD: 14- Mar-14 Completion Date: No mechanism identified at this stage	<b>8.Validation</b> ECD: _____ Completion Date:





## Closing Things to Consider

- Does the objective evidence meet expectations? Go back to re-evaluate later – is there evidence that the process has matured? What do the metrics show?
- Objective evidence shows the issue is verified – has the issue been prevented from future occurrence?
- When is the CAR ready for closure? Ensure validation of effectiveness.
- What follow up will show the effectiveness of the plan? Re-test the process to ensure no reoccurrences exist.

**Prevention Is Required to Close**

# Summary



- Corrective Action Plans (CAP) are a requirement
- A CAP must prevent reoccurrence of the issue
- Ensure the CAP is created by the resources who can own and complete the tasks
- Establish expected results, objective evidence, metrics at CAP creation
- Monitor the CAP, make corrections if required
- Make it visible – distribute status to the appropriate level of Supplier and Lockheed Martin Management
- Close the CAP with results

**A Corrective Action Plan is a Powerful Tool**