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18 MXG F-15 Phase Process

VSM/8-Step Problem Solving Event, 4-7 May 10

Approval Information/Signatures
Maj Christopher Iriarte, 18 EMS/CC
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1. Clarify & Validate the Problem

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Problem Statement Clarified:

- "The way we've always done it."
- Training – many new people, trainees, little experience on the aircraft, little experience in phase, different MDS experience
- No downtime to fix problems or to train people (back-to-back phases)
- Getting support is a big issue (people and equipment)
- Tools – have to borrow tools and equipment, change kits, etc. from other squadrons and sections
- Communication – internally needs improvement
- Growing aircrew training requirement

Go See Results: Waste Types Identified/Observed: 35

Manning and Experience: Of 53 people assigned, only 12 experienced people total (3 on day shift, 5 on swing shift, 4 on mid shift); 5 experienced leaving in 6 months (1 on day shift, 1 on swing shift, 3 on mid shift)

VSM Results: (see VSM on next page) 42 steps, 11 VA steps, 31 NVA steps, 8 critical steps, 22.7 hr wait time, 250 hr avg time, 12 potential improvements

2. Break Down the Problem/Identify

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Performance Gaps

Total – 1.42 AA reduction over the next year (due to Mods and Transfers)

Avg time to phase: 12.5

VOC: Phase capacity (sorties): 6163; Contract proposal (sorties): 8052

Gap (sorties): 1889; Phase delta (number of phases): -3.6

17 Phases per year scheduled; **We need to produce 21 phases per year**

200 duty days available; 17 phases x 12 day phase = 204 days

No additional days available to accomplish **4 additional phases**

Required reduction in Phase time is 12 - 7.6 = 4.4 days

3. Set Improvement Target

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Targets:

- Phase time reduction target: 4.4 days

- Must be consistently at 9.6 days (back-to-back, 20% variation, 80% capacity)

- Must be able to produce 21 phases per year

- Theory of Constraints, critical path, and bottleneck analysis identified 16 potential improvement areas (future state concepts): Tools & Eq Availability & Scheduling, Cap Hydro Lines, Depanel, NLG Actuator, Damper, Tows, Fix Phase, Training, Communication, Production Board, Doors, Panel Rack, AGE Layout, Tools Layout, Equipment Reliability, Bench Stock (common use).

4. Determine Root Cause

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Root Cause Analysis... What to change:

- Training
- Tools and Support Equipment Scheduling and Availability
- Cap Hydraulic Lines during Canopy Change
- Communication (Phase Process/Production Board, Status, and Sign In/Out)
- Equipment Reliability
- Nose Landing Gear Actuator and Damper Change
- Hangar Layout
- Common Use Bench Stock

5-Whys Results/Themes: training management and control, lack of experienced personnel, communication, lack of standard work, lack of standard process

5. Develop Countermeasures

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Action Plan (summary):

- Depanel – en masse
- NLG Actuator/Damper – rotatable
- Canopy Change – cap hydraulic lines
- Fix Phase – planning, task assignments, control
- Training – refine required training list by trainee
- 7-Level Inspection – New standard – 24 hours max
- Quality Assurance – Hit zones separately, zone concept
- Panel Racks – organized by area
- Aircraft Tow for Engine Run
- Qualified Engine Run Personnel
- A/R Cross-Utilization Training – APG to A/R for common inspections
- Runscreen – fix
- Re-Panel – en masse, only repanel with all bodies
- Tools – Coordinate with support
- Communication – Create production/status board visible to all
- Hangar Door – fix
- Phase Flow Policy Letter – policy letters and AFI Sup
- Floor Layout – Develop better hangar layout
- AGE – Dedicated AGE (Jacks, mule, etc.)
- Bench stock – coordinate with supply

6. See Countermeasures Through

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Linked methods to countermeasures (line by line in action plan); includes a range of the following: Shop/Squadron/Group Policy Letters, Flight Level Agreements, SOPs, JDI, Standard Work, Flow Sheet with Milestones and Required Timing, Cell Design, Error Proofing, Visual Management, and a follow-on event to conduct a 6S event in the Phase Dock bay, and an RIE to accomplish the Floor Layout.

7. Confirm Results & Process

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- Results will be confirmed over the coming months; scheduled 30-60-90-day followups; use results chart for comparison; track in the Flight, Squadron, and Group level
- Key measure is the time it takes to perform an F-15 Phase; standard is 9.6 days (this means 9.6 day average with no greater than 20% variation, or standard deviation, which will represent process operation at 80% of expected capacity for the future state system)
- Once completed, 6S Audit sheet utilized to ensure standard work
- Floor Layout confirmed by supervision checklists against floor layout standard published in policy
- Way ahead includes a follow-up in Jan-Feb 2011 to ensure the process is performing as expected, and to make adjustments if needed
- Results must be checked against baselines of the number of people assigned, training and experience levels, and must not result in a decrease in quality or increase in safety related incidences.

8. Standardize Successful Processes

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No later than 90-day follow-up point, transfer process standard, standard work documents, flow, and diagrams from flight level to the Group Level by adding to the local supplement to AFI 21-101. Working level documents, checklists, and procedures may remain at a lower level, but the time required to perform a phase, dock layout, and process flow/production flow must be included in the local supplement to ensure longevity. Afterwards, the process may be reviewed as part of the normally scheduled annual review for the AFI supplement.

Kadena F-15 Phase Process AFSSO 21 8-Step



Charter - Problem Statement Clarified UNCLASSIFIED

- “The way we’ve always done it.”
- Training – many new people, trainees, little experience on the aircraft, little experience in phase, different MDS experience
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- Growing aircrew training requirement

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F-15 Phase Background Info UNCLASSIFIED

- Intensive preventive maintenance inspection
- Required every 400 flight hours
- Average 10 days to complete
- 56 people, 6 AFSCs, 24/7 3-shift operation, 5 days a week, 5,376 total manhours per a/c, (91,392 manhours/year)
- 93 inspection work cards, 372 total inspection items
- Identifies an average 175 preventive maintenance actions
- May include engine changes, canopy change, structural repairs, time compliance technical orders, and mods
- Extensive forms and documentation review
- 17 phases per year (back-to-back through the year)
- Enables 6,800 flying hours for the 18th Wing

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F-15 Phase Performance (Oct 09 – Apr 10) UNCLASSIFIED

	Total Days	Phase Days	# of GIGs
Min	5	5	90
Max	26	20	312
Median	12	10	164
Mode	12	10	178
Avg	12.5	9.7	177.2
Std Dev	3.9	2.7	55.9
Variance	15.3	7.1	3120.1
Harmonic Mean	11.0	8.9	161.2

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Aircraft Availability (AA) Impacts FY10 UNCLASSIFIED

- Suite 6 Mod – 1 week per a/c, 2 a/c per wk, 26 wks (6.5 mos)
- Aircraft Transfers – 4 a/c in from Langley, 4 a/c out to ANG
 - Transfer Prep (outgoing a/c) – 1 a/c, 4 wks (x4 = 4 a/c, 4 mos, or 1 a/c month for 4 months)
 - Transfer Insp (incoming a/c) – 1 a/c, 1 wk (x4 = 4 a/c, 4 wks, or 1 a/c week for 1 month)
- Aggregate AA Impact
 - Suite 6 Mod – 1 a/c reduction over the next year (AA=-1)
 - Transfers – .42 a/c reduction over the next year (AA=-.42)
 - Total – 1.42 AA reduction over the next year

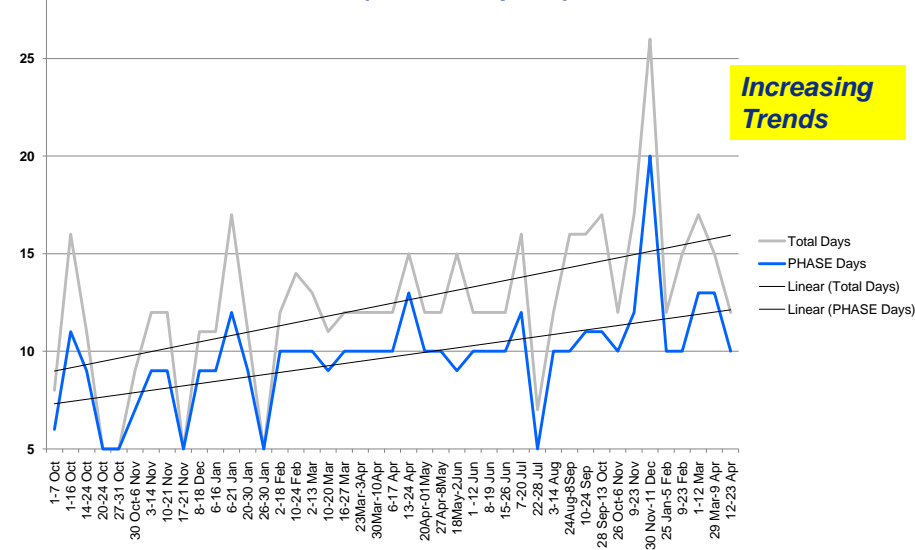
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Phase Time Historical Trend UNCLASSIFIED

(Oct 09 – Apr 10)

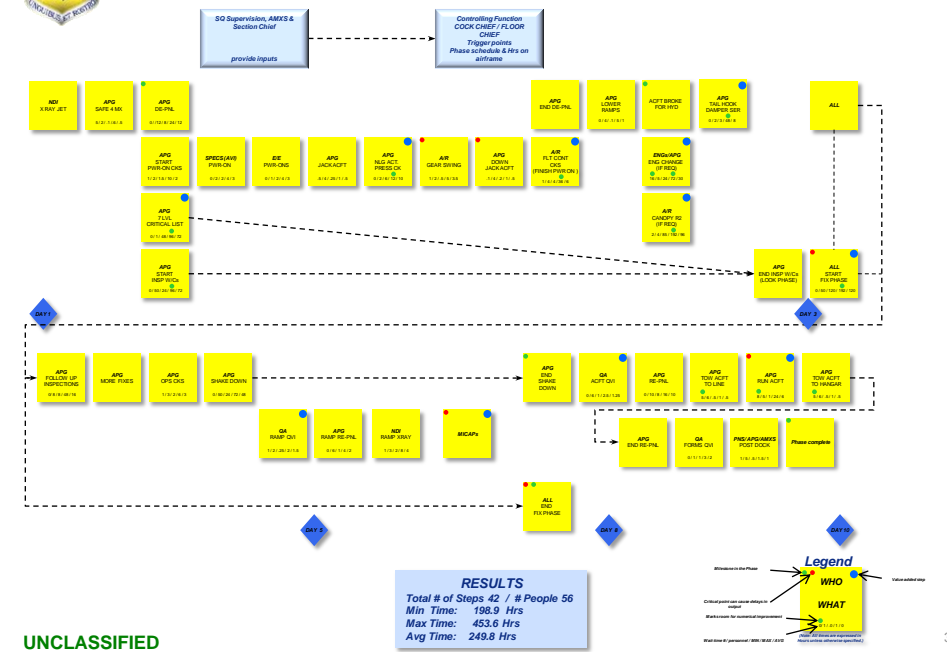


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18 EMS/ Phase inspection Current State UNCLASSIFIED



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Kadena F-15 Phase Process AFSSO 21 8-Step



Gap Analysis

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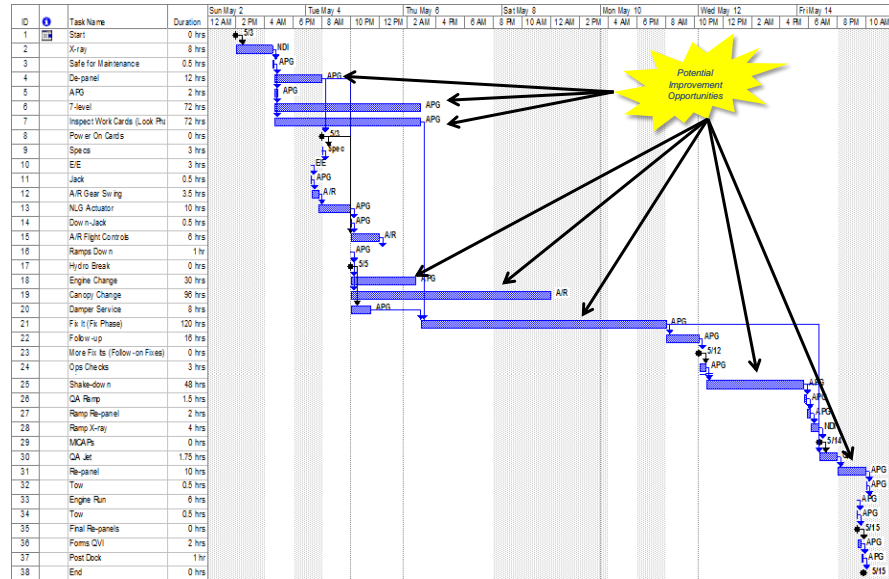
- 17 Phases per year scheduled (single dock, 12-day phase)
- **We need to produce 21 phases per year**
- 200 duty days available
- 17 phases x 12 day phase = 204 days
- No additional days available to accomplish 4 additional phases
- Phases must be consistently at 9.5 days (back-to-back, no variation, 100% capacity)
- Phases must be consistently at 7.6 days (back-to-back, 20% variation, 80% capacity)
- **Required reduction in Phase time is 12 - 7.6 = 4.4 days**

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F-15 Phase Gantt Chart – Current State

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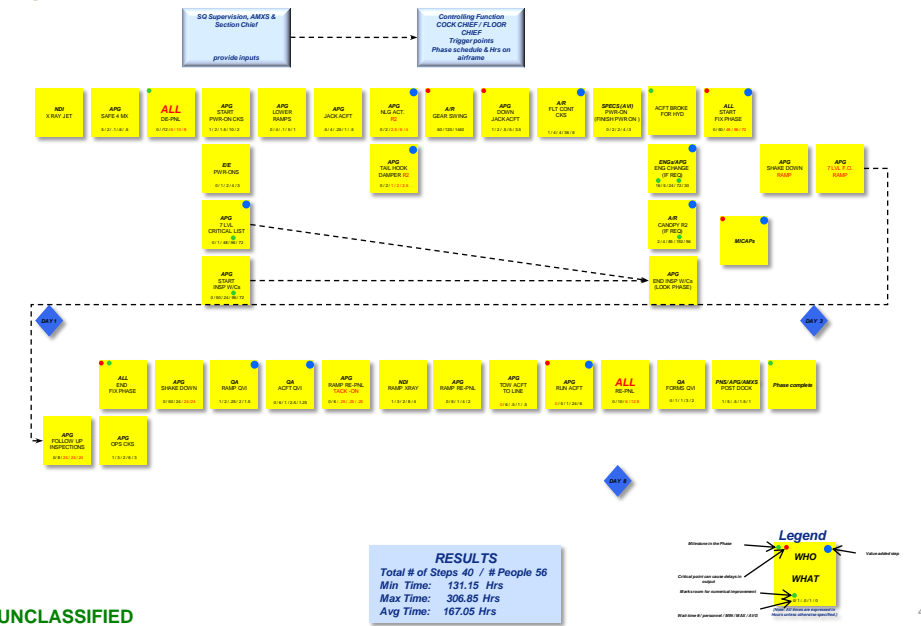


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18 EMS/ Phase inspection Future State

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Current and Future State Tools Used and Principles Applied

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- Value Stream Maps
- Process Walk / Go See
- Waste Walk
- Bottleneck Analysis
- Critical Path
- Gap Analysis
- Root Cause Analysis
- Action Plan
- Standard Work
- Variation Reduction
- Visual Management
- Error Proofing
- KPIs and Metrics
- Performance Management

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What to change... Root Cause Analysis and Improvement Opportunities

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- Training
- Tools and Support Equipment Scheduling and Availability
- Cap Hydraulic Lines during Canopy Change
- Communication (Phase Process/Production Board, Status, and Sign In/Out)
- Equipment Reliability
- Nose Landing Gear Actuator and Damper Change
- Hangar Layout
- Common Use Bench Stock



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Results

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	Current State	Future State	Delta	% Delta
Wait Time	0.95	0.20	-0.75	79%
# People	56	56	0	0%
Min Time	8.3	5.5	-2.8	34%
Max Time	18.9	12.8	-6.1	32%
Avg Time	10.4	6.9	-3.5	33%
# Steps	42	40	-2	5%
# VA	11	11	0	0%
# NVA	31	29	-2	6%
# Critical	8	9	+1	-13%

Note: times are expressed in number of days
 Note: add 2.5 to Current and Future State times for full (end to end) phase time

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OODA – Observe, Orient, Decide, & Act
8-Step Problem Solving Model

Air Force Problem Solving Process & Related Toolsets

Approval Information/Signatures

1. Clarify & Validate the Problem

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- Does this problem, when solved, help meet needs identified by the organization?
 - Is it linked to the SA&D of organization?
 - Does it help satisfy customer needs (VOC)?
- Does this problem, when solved, address key issues identified during SWOT analysis?
- Has this problem been identified and directed by a Value Stream Map at the appropriate level?
 - What does the “Future State” need?
 - What resources have been identified to address this issue?
- What opportunities were identified or observed by the process or problem area “walk”?
 - Will addressing or improving these issues deliver results that relate to #a or #b?
 - Will addressing or improving this problem deliver the desired future state from #c?

TOOLS: SA&D, Voice of Customer, VSM, Go & See

2. Break Down the Problem/Identify Performance Gaps

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- Does the problem require more analysis or does leadership have enough information to execute a solution?
 - Is this simply a leadership directive?
- If more data is needed, how do we measure performance now?
 - What are the KPIs? What is the performance gap?
- Does other “non-existent” data need to be gathered?
- What does the data indicate are the potential root causes?
- Does the data review indicate a bottleneck or constraint?

TOOLS: KPI/Metrics, Performance Gap Analysis, Bottleneck Analysis

3. Set Improvement Target

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- Is the improvement target measurable? Is it concrete? Is it challenging?
- Is the target “Output Oriented”?
 - What is the desired output?
 - Should be “things to achieve”; should avoid “things to do”
 - Will be addressed by Action Plans (Step 5)
- The desired target should:
 - Do what? By how much? By when?
- If it is a Process Problem, what is the future state?
 - How will it be realized?

TOOLS: Ideal State, Future State Mapping, SMART

4. Determine Root Cause

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- What root cause analysis tools are necessary?
 - Why are these tools necessary?
 - What benefit will be gained by using them?
 - Who will need to be involved in the root cause analysis?
 - 10 heads are better than one
 - Remember “cultural” issues related to problem
- What is (are) the root cause(s) according to the tools?
- How will the root cause be addressed?
- Will addressing these address the performance gap?
- Can the problem be turned on or off by addressing the root cause?
- Does the root cause make sense if the 5 Whys are worked in reverse?
 - Working in reverse, say “therefore” between each of the “whys”

TOOLS: 5 Whys, Brainstorming, Pareto, Affinity, Fishbone, Control Charts

5. Develop Countermeasures

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- Develop potential countermeasures
 - Tools and philosophies from Lean, TOC, 6 Sigma and BPR as appropriate
- Select the most practical and effective countermeasures
- Build consensus with others by involving all stakeholders appropriately
 - Communicate, communicate, communicate
- Create clear and detailed action plan
 - SMART actions
 - Reference Facilitation Techniques as appropriate

TOOLS: A3, Action Plans, Timelines, FM Tool

6. See Countermeasures Through

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- Which philosophy best prescribes tools that address root cause(s)?
- Which tools best address root cause(s)?
- Which method for implementation fits the tool and improvement need?
 - Rapid Improvement Event?
 - Improvement Project?
 - Point Improvement or “Just Do It”?
- If RIE or Project, create “Charter” and communicate
- What training or education is needed? By Whom?

TOOLS: 6S & Visual Mgt, Standard Work, Cell Design, Variation Reduction, Error Proofing, Quick Changeover, TPM, RIE

7. Confirm Results & Process

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- How are we performing relative to the Observe phase (Steps 1 & 2)?
- How are we performing relative to Step 3?
- How are we performing relative to FM Tool projections?
- If we are not meeting targets, do we need to return to Step 4?
 - Most problem solving “breakdowns” occur relative to improper root cause identification

TOOLS: KPIs/Metrics, Performance Mgt, SA&D, Standard Work, Audit

8. Standardize Successful Processes

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- What is needed to Standardize Improvements?
 - Tech Order changes?
 - Air Force Instruction changes?
 - Official Instruction changes?
- How should improvements and lessons learned be communicated?
 - PowerSteering
 - Key meetings?
- Were other opportunities or problems identified by the Problem Solving Process?
 - Restart OODA Loop

TOOLS: Checkpoints/Standardization Table, Report Out Theme Story, Broad Implementation, CPI Mgt Tool

