Team Members: Facilitators: Lt Col Matthew Cox, ACC/A4; Mr. Jeff Combs, ACC/A4; SMSgt Anthony Tomczak, 116 MXG/QA; MSgt John Ace, ACC/A4Y; Team Leader: MSgt Ken Hathaway (116 MXS/ISO) – and 27 other team members from 116 MXG

Air Force Problem Solving Process

OODA – **O**bserve, **O**rient, **D**ecide, & **A**ct
8-Step Problem Solving Model

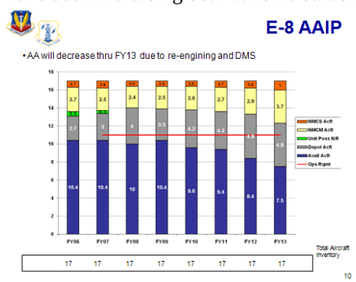
Approval Information/Signatures

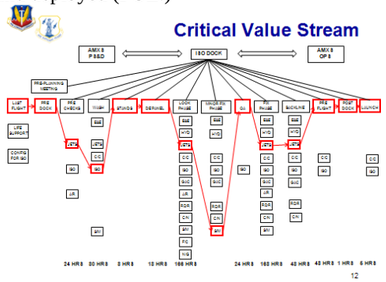
Col Kevin Betz, 116 Maintenance Group Commander

1. Clarify & Validate the Problem

O O D A

E-8 JSTARS aircraft availability must be increased. The E-8 ISO inspection has consistently been the top maintenance and supply (TM and TS) driver. While maintenance performance indicator (M, TM, and TS) rates all trending in the right direction, aircraft availability (AA) has a slight negative trend, and is not projected to meet the operations requirement according to HQ ACC and AFMC aircraft availability projections. By as early as 2010, E-8 aircraft availability will diminish significantly to -1 aircraft even after AFMC AA improvement initiatives. Over the past year, the numbers of sorties per month have been increasing both at home station and deployed (FOL.)

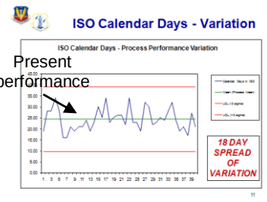


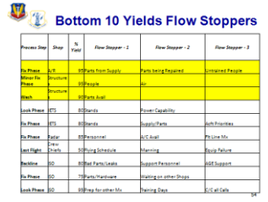


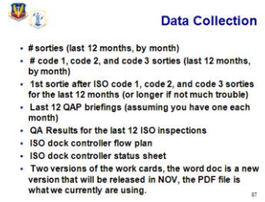
2. Break Down the Problem/Identify Performance Gaps

O O D A

The E-8 ISO process average needs to be reduced from an average of approximately 22 to 14 days, and the range of variation needs to be reduced from an approximate average of 9 days to 2 days (thus 14 +/- 2 days per ISO) with the same or better quality product as at present as measured by number of code 1, 2, and 3 sorties for the first 3 sorties after ISO, and by Ops mission effectiveness rates for the first 3 sorties after ISO.





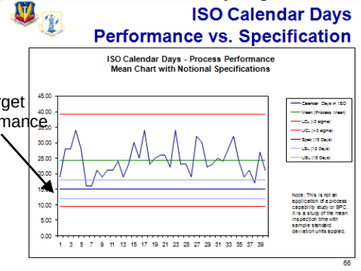


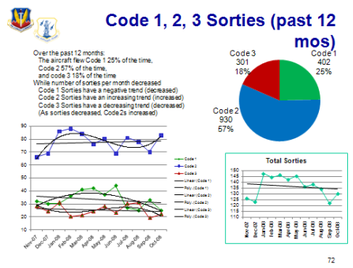
3. Set Improvement Target

O O D A

Accomplishment ISO in 14 +/- 2 calendar days fly-to-fly with the same or better quality product as at present as measured by number of code 1, 2, and 3 sorties for the first 3 sorties after ISO, and by Ops mission effectiveness rates for the first 3 sorties after ISO.

By decreasing the time in ISO between last flight before ISO to first flight after ISO, a potential aircraft availability improvement of as much as .25 may be realized.





4. Determine Root Cause

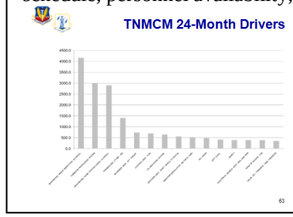
O O D A

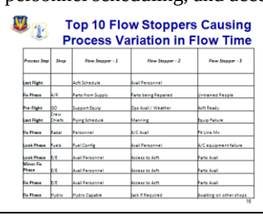
ISO Process root cause analysis:
- Disconnected supply partnership
- Disconnected partnership between flight line – Backshops / ISO
- Uncoordinated sub-processes and unbalanced flow
- Waiting on Quality Assurance after look phase before we can begin fix phase
- ISO is not viewed as a priority
- Engines is frequently the bottleneck; however, QA and other bottlenecks exist

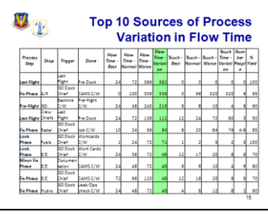
Engine Look Phase Inspection root cause analysis:
- Checklists are redundant and (too generalized), and does not flow
- Problem is that technicians re-inspect others' work after handoff
- Depth of inspection is open to interpretation

Brainstorming resulted with 35 targets of improvement, several of which related to the need for better scheduling of personnel and resources, and the need to control the ISO flow.

Pareto analysis was performed on short and long range drivers, and VSM data uncovered sources of variation such as: aircraft scheduling, parts availability and management, flying schedule, personnel availability, personnel scheduling, and access to the aircraft.





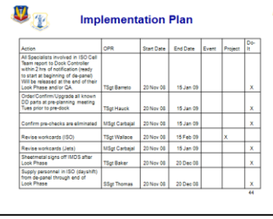


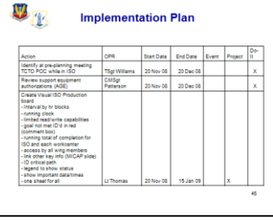
5. Develop Countermeasures

O O D A

ISO Process Countermeasures:
- Remove useless or redundant tasks from work cards
- More ops involvement (schedule for possibility of post dock early or late)
- Better yield % for crew chief for aircraft prep
- Fly on Mondays, ISO start on Tuesdays
- Remove redundant pre-checks
- QA as needed, when needed
- Jet shop start look phase when ISO is moving stands and de-paneling
- Get parts on order before pre-planning
- Complete understanding of the total process along with the roles each shop/person plays
- Develop Visual Control ISO dock communication with work centers
- More people for acft wash
- Remove other bottlenecks: ISO & Structures
- SUTA's/RUTA's on weekends when they have an ISO aircraft (time saved 16 hours)
- Standardize back lines (ie flow out back line itself)
- ISO works the weekends when they have an aircraft
- Reduce the flying schedule during ISO weeks

Engines Countermeasures – What to change: Re-write workcards to inspect the engines in a logical fashion, standardize flow, group by zones -- Expected Benefits (Training, Planning and scheduling, Process discipline, Creating flow, Clear accountability and responsibility)



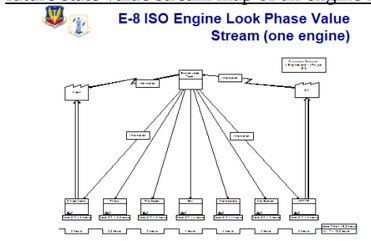


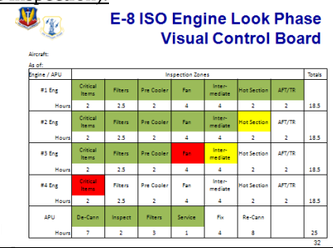
6. See Countermeasures Through

O O D A

6S was accomplished in an event 2 weeks prior to the ISO VSM and proved successful in hangar and workplace layout

Two key Visual Control Board Systems were conceptualized and developed: one for the main ISO process (a web-based control board laid out very similar to the value stream map and which shows the critical path), and the Engine Look Phase Control Board which shows each engine and the aux power unit inspection zone (a spreadsheet similar to the future state value stream map of an engine inspection).

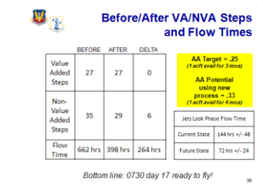


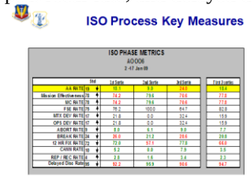


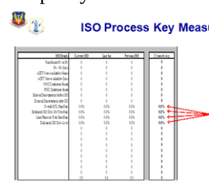
7. Confirm Results & Process

O O D A

- Performance will be confirmed over the coming year by means of the measurement plan (Key Measures below) -- not all implementation steps will be in effect in the next inspection, and some may not be in place until the third inspection. Performance and reasons for any deviations must be tracked over at least a year to ensure process stability.)
- The target to watch for: Anticipated results include a potential .33 aircraft availability improvement. Nominal ISO duration is 17 days (fly to fly with no break pre- or post-ISO)
- Primary performance measures include: aircraft availability (AA), Code 1, 2, and 3 sorties for the first 3 sorties after ISO, and mission effectiveness rates for the first 3 sorties after ISO. Quality measures using existing KTL system will be adjusted to accommodate the new process and tracked for inspection quality and compliance. Other supporting measures include: mission capable rate (MC), flying schedule effectiveness (FSE) rate, deviations, abort rate, fix rate, cann rate, repeat/recur rate, and delayed discrepancy rate.







8. Standardize Successful Processes

O O D A

- Re-write ISO and Engine Inspection Workcards - Remove redundancies; more specific (too generalized); group by zones; and bite-size chunks performed and signed off by a single team (Draft engine workcards have already been written and are expected to be in red-line version by the second ISO inspection after the event)
- Construct an ISO standardization (self-inspection) audit checklist (control plan) that includes an item by item list of requirements for the new process – include critical elements outlined in the ideal future state, countermeasures, and followup of action/ implementation plan items to ensure these elements are in place and working (post ISO, and quarterly reviews)
- Write key elements of the new process into the Wing supplement to AFI 21-101 to address scheduling policy, coordination, and control measures
- Validate the performance by using the Measurement Plan developed by the team, and compiled by the Analysis Shop, and track at relevant maintenance group maintenance and scheduling meeting forums (i.e. daily standup, MPI meeting, scheduling meetings,...)

OODA – **O**bserve, **O**rient, **D**ecide, & **A**ct
8-Step Problem Solving Model

Air Force Problem Solving Process & Related Toolsets

Approval Information/Signatures

1. Clarify & Validate the Problem

O O D A

a. 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)?

b. Does this problem, when solved, address key issues identified during SWOT analysis?

c. 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?

d. 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

O O D A

a. Does the problem require more analysis or does leadership have enough information to execute a solution?
   - Is this simply a leadership directive?

b. If more data is needed, how do we measure performance now?
   - What are the KPIs? What is the performance gap?

c. Does other "non-existent" data need to be gathered?

d. What does the data indicate are the potential root causes?

e. Does the data review indicate a bottleneck or constraint?

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

3. Set Improvement Target

O O D A

a. Is the improvement target measurable? Is it concrete? Is it challenging?

b. 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)

c. The desired target should:
   - Do what? By how much? By when?

d. 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

O O D A

a. 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

b. What is (are) the root cause(s) according to the tools?

c. How will the root cause be addressed?

d. Will addressing these address the performance gap?

e. Can the problem be turned on or off by addressing the root cause?

f. 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

O O D A

a. Develop potential countermeasures
   - Tools and philosophies from Lean, TOC, 6 Sigma and BPR as appropriate

b. Select the most practical and effective countermeasures

c. Build consensus with others by involving all stakeholders appropriately
   - Communicate, communicate, communicate

d. Create clear and detailed action plan
   - SMART actions
   - Reference Facilitation Techniques as appropriate

TOOLS: A3, Action Plans, Timelines, FM Tool

6. See Countermeasures Through

O O D A

a. Which philosophy best prescribes tools that address root cause(s)?

b. Which tools best address root cause(s)?

c. Which method for implementation fits the tool and improvement need?
   - Rapid Improvement Event?
   - Improvement Project?
   - Point Improvement or "Just Do It"?

d. If RIE or Project, create "Charter" and communicate

e. 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

O O D A

a. How are we performing relative to the Observe phase (Steps 1 & 2)?

b. How are we performing relative to Step 3?

c. How are we performing relative to FM Tool projections?

d. 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

O O D A

a. What is needed to Standardize Improvements?
   - Tech Order changes?
   - Air Force Instruction changes?
   - Official Instruction changes?

b. How should improvements and lessons learned be communicated?
   - PowerSteering
   - Key meetings?

c. 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