NAVAIR

DEPOTALK

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SPECIAL INSERT

Leveraging the independent, on-going initiatives of the Naval Aviation Enterprise

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This month, NAVAIR Depot North Island continues to broaden its integration of leading industry tools aimed at balancing current and future readiness, reducing the cost of operations, improving agility and alignment, and establishing enterprise-driven performance measures to verify and drive continuous process improvement. The new business process that is being added to the Depot's list of actionable tools is the Theory of Constraints (TOC). TOC is based on the belief that any organization has at least one constraint and that any improvements on non-constraints may not yield as significant return on investment (ROI) as working on the constraint.

As North Island embraces and integrates TOC into the organization, it is important to remember that North Island began the AIR*Speed* journey in June 2003 with the introduction of Lean applications within the Components SBT and in August 2003 within the F/A-18 aircraft line. The underlying basis for Lean initiatives continues to be in alignment with what AIR*Speed* promotes today: "Providing cost-wise readiness and dominant maritime combat power to make a great Navy and Marine Corps Team better." As such, Lean processes focus on the removal of waste – defined as anything not necessary (no value added) to produce the product or service, from unnecessary travel to unnecessary work stoppage due to material delay.

Initially the Navy and the Marine Corps were attracted to these industry tools due to a key difference from process improvements of the past (TQL, BPR, etc.); the "stickiness" these tools seemed to have on an organization. Most observers would agree that all process improvement initiatives have some positive impact, but that their effectiveness tends to fade over time. This has not been the case with TOC, Lean, and Six Sigma. Processes, people, culture, and the companies they worked for changed and continue to thrive from these changes. Therefore, several Navy and Marine Corps activities began implementing various *local* cycle-time reductions over the past four years. Today, across the fleet there are more than 16 Navy and Marine Corps aviation maintenance commands that have employed one or more of these business process tools enabled by local initiatives. Enterprise AIR*Speed* will integrate those efforts across the 16 military activities (as well as future maintenance activities) in order to streamline business operations and improve quality in a cost-wise manner. NAVAIR Depot North Island has been given the honor to lead the way, with the task of integrating and implementing Advanced TOC processes into Depot operations, at first within the F/A-18 programs and then additional programs over the coming months and years.

F/A-18 Program Manager Shawn Delaware holds thrice weekly AIR*Speed* status meetings on the floor and in shops in Building 94 with engineers, supervisors and artisans.

The Aviation Intermediate Maintenance Department at Naval Air Station Oceana, Va., was the first maintenance activity to begin Advanced TOC training and implementation. Their efforts, coupled with their investment and employment of Lean and Six Sigma principles (introduced more than two years earlier) is shaping dramatic change across I-level activities in both the Navy and the Marine Corps. Moreover, the Navy and Marine Corps are not alone in this journey. Both the Army and the Air Force have adopted Lean, TOC, and Six Sigma (in some cases, several years earlier), recognizing the tremendous gains that can

be had as proven by successes Pratt & Whitney, 3M, Nike, Motorola, Standard Aero, and Toyota.

What kind of success do these tools bring to the organization?

AIMD North Island employed Basic TOC in late 2002 and by the summer of 2003, they noted the following results:

- Over-aged AWP (Awaiting Parts = G condition) by month decreased from 2.49 percent of total to less than .25 percent;
- Expedited Repairs (EXREPs) per month decreased from 62 to 16;
- Multiple EXREPS per month decreased from 14 to 1.

AIMD Oceana employed Advanced TOC beginning in February 2004 and the following are some of the takeaways from their efforts:

- Potential 404 engine inventory reduction of $67 million due to over-production, "over-Leaning" activities, and under-production during surge operations;
- Reductions in AVDLR (Aviation Depot Level Repair) charges related to high BCM (Beyond Capable Maintenance) rates on flight surfaces by enhancing I-level capability resulting in projected savings of $2 million to $4 million per AIMD (depending on work load);
- Avionics decreased AWP (G condition) by 15 percent while simultaneously reducing the total number of parts by 35 percent (incorrect orders, over-ordering, etc.), which resulted in $2 million savings in the first four months of 2004;
- Labor hour reductions of more than 50 percent;
- Reallocation of PEB consumables from the warehouse to AIMD resulted in $3.5 million in savings and elimination of 98 percent material delay.

AIMD Oceana has additionally applied Lean and Six Sigma to its operations and the following are some of the takeaways from their efforts:

- BRU-32 bomb rack shop is the Navy's center of excellence, reduced back-orders 61 percent;
- BRU-32 inductions reduced from 80 percent to 7 percent due to better build quality identified by Lean and Six Sigma;

Creforms are wheeled next to aircraft thus saving artisans time. Everything they need is within sight of the aircraft.

Creforms looked like this before the innovation of AIR*Speed* techniques

- 404 Engine area reduced backlog by 67 percent;
- 404 Engine area reduced turnaround time (TAT) from 78 to 14 days;
- Reduced F/A-18 Hydraulic Cylinder cycle time by 47 percent.

How do the tools work?

TOC is first and foremost a "systems think" organizational process to enhance supply chain management. TOC practices five focusing steps:

- Identify: Identify the system's constraint. Is it funding, parts, procedures, personnel, etc.?
- Exploit: Decide how to exploit the system's constraint. How do you get more without additional resources?
- Subordinate: Subordinate everything else to exploiting a constraint. Relegates all parts of the system that are non-constraints to the role of supporters/background. Redefines the objectives of every process. Subordinating relieves conflicting priorities for resources and focuses the efforts of the system on things that maximize current performance.
- Elevate: Evaluate alternative ways to increase the capacity of a constraint. For example: Lean Teams; aircraft type teams; aircraft type commanders, Naval Supply, Naval Inventory Control Point, and Defense Logistics Agency become involved.
- Go back to Identify Step: Counteract inertia! This ensures the organization knows where the system constraint is, and ensures it has not migrated elsewhere. This part is critical to a learning organization.

TOC is based on the belief that any organization has a constraint, otherwise, the organization has unlimited capacity. The constraint equals the weakest link. Therefore, any improvements on areas other than the constraint will not give the organization as significant a return as working on the constraint.

Lean is a process improvement strategy focused on the ability to make everything, every day, in the exact quantity required with zero defects. The goal is to achieve perfection through the total elimination of waste in the value stream. The idea is historically linked back to Taiichi Ohno of Toyota and is heavily influ-

enced by Ford and the American supermarket supply chains. Lean uses incremental improvement to constantly expose waste to balance operational flows and standard work.

- Lean identifies seven types of waste and seeks to eliminate them from the system:
- CORRECTION: Repair or Rework. Doing it over. Not getting it right the first time
- MOTION: Any wasted motion to pick up parts or stack parts. Also wasted walking, searching.
- OVERPRODUCTION: Producing *more* than is needed *before* it is needed (batching).
- OVER PROCESSING: Doing more work than is necessary.
- INVENTORY: Maintaining *excess* inventory of raw materials/consumables, Work in Progress, or finished product, managing WIP, etc.
- TRANSPORTATION: Wasted effort to transport materials, parts, or finished product into or out of storage, or between processes.
- WAITING: Any non-work time waiting for tools, supplies, parts, paperwork, engineering, Quality Assurance, Examination and Evaluation, etc.

A significant portion of Lean focuses on institutionalizing the 6S process: sort, straighten, scrub, standardize, sustain an safety.

Sort: Be ruthless and touch everything, asking the question: "Why is this here, and what value does it add to the process?" This is a 'red tag' exercise, where if not needed, it gets physically disposed of, or physically removed from a cell/work area.

Straighten: A place for everything (that is left) and everything in its place. If something is worth keeping, teams have to find a place for it.

Scrub: cleaning is maintenance. Sweep everything. Clean all surfaces. Paint floors, ceilings, etc. By removing layers of grime, stakeholders can more easily detect oil leaks, loose covers (that could jam something later).

Standardize: ask, "How is this worked into the normal everyday habits of everyone, and not just the newbies?" Assign daily, weekly tasks for each machine and area to establish ownership (MY machine).

Sustain: establish machine, area, and overall checklists that are simple and can be performed as audits. Establish metric report outs and contests for improvement and new ideas

Safety: since daily cleaning will expose issues like oil leaks, debris accumulation, excessive coolant splash, and more, safety improvement will become easier to "apply" to an area if the thinking is already modified. Injury is one of the worst wastes!

Lean additionally employs visual management using visual indicators to answer questions such as:

- How many parts do I have? Kanban is a production control system that uses cards or tickets as visual signals to trigger or control the flow of materials or parts and fixed container sizes with set floor space signal need;
- Do I have production problems? Andon lights indicate what machine is down.
- How many have I made? Visual output boards (like score boards);
- What is my production schedule? Visual production schedule boards;
- What does this area do? Street signs and addresses or area name signs;
- Is this part done? Flags, blankets, or special hats placed with/on top of product that is ready to go.

Lean employs the use of work cells. The theory behind this idea is that one-piece continuous flow with all required tools and parts at each work station will lead to the following benefits: reduced cycle time, improved quality, reduced WIP, reduced artisan 'travel' time, eliminating NVA activities. Lean practitioners utilize the following procedures to implement these ideas:

- Arrange workflow for sequential execution and minimum movement. Bring everything to the artisan. Treat them like **surgeons!**
- Can significantly reduce waste associated with wasted motion and inventory.
- Once the part enters, work never stops until it is completed.
- May require more, smaller equipment, but one should ask, "What is more important machine efficiency or system efficiency?" The answer is clear.

Finally, Lean, like TOC, recognizes that the flow of any business process can be impacted by constraints characterized by: interdependencies, bottlenecks, and variability. Once the nature of the constraint is understood, its effect on the goal can then be reduced. Constraints can be:

- Physical (i.e., a long cure time);
- Behavioral (i.e., control, ego or rice bowl)
- Policy (i.e., follow only instruction xx.xxx)

Resources can then be focused to either live with (through con-

Linda Fitzsimmons, Components production control deputy (right), examines a mechanized Components chart in Building 472 with Sarah Porras, Michael McManus, and Arnold Martinez, foreman in the Dynamic Components, Landing Gear and Launchers Production Team Center. Fitzsimmons begins her workday with AIR*Speed* briefings.

trol) or to remove the constraint.

Six Sigma is a process improvement strategy that uses quality improvement as the method for business improvement. Close understanding of customer needs, disciplined use of facts, data, and statistical analysis uniquely drives six Sigma, and diligent attention to managing, improving, and reinventing business processes. Six Sigma drives with a focus on *variation reduction* to produce highly repeatable processes that create customer satisfaction. Six Sigma is a measure of variability:

- +/- 3 Sigma = 93.32% of the population (66,807 defects Parts Per Million - PPM)
- +/- 6 Sigma = 99.9997% of the population (3.4 defects PPM)

Thinking of this in another way, when is 99% is not good enough? 99% Defect Free work means

- 20,000 lost articles of mail per hour;
- Unsafe drinking water for 15 minutes each day;
- 5,000 incorrect surgical operations per week;
- 2 long or short landings at most major airports each day;
- 200,000 wrong drug prescriptions each year;
- No electricity for 7 hours each month;
- X high or low carrier landings per year;
- Y DWO's (defective work orders) per year.

The fundamental principles underlying Six Sigma are: all work is interconnected in a system; there is variation in every process, therefore reducing and controlling variation is key to continuous process improvements; and achieving total process effectiveness and efficiency can be accomplished by decreasing defects and cycle time by increasing first pass quality. By defining, measuring, analyzing, improving, and finally controlling processes, an organization can move toward continued improvements in quality at lower costs.

How Do We Get Better?

As mentioned at the outset, the Depot at North Island began this journey in mid-2003 and is continuing to press forward in 2004. There is significant cultural, policy, procedural, and physical constraints, but all can be broken with persistence. The challenge now is to not only integrate these tools in the production environment but to incorporate them in the supporting competencies of 3.0, 4.0, 7.0, FISC, NAVICP, DLA, and more. AIR*Speed* is the operational enabler that is allowing this transformation. The scope of AIR*Speed* is what makes this effort different from past improvements. The task is now upon the entire value stream of the workforce to accept the changes taking place around the Naval Aviation Enterprise and change from within rather than allow, "outsiders to make the changes for us or to us,"(VADM Massenburg, 2004).

Aircraft mechanic Barbara Oliver blends a lever assembly in Building 472.

Roger Smith seals E-2 and C-2 nose tires in Building 472.

Come to the out briefs during Lean events. If you don't know when or where they are, ask. Events are now being held by Engineering, Facilities, QA, as well as the production lines. If you'd like to participate on Lean teams, ask.

This article attempts to raise the awareness of its readers. The next step is education. There is a great deal of material available with respect to AIR*Speed* tools on the web. The Lean Enterprise Institute is a good source (www.lean.org) as is www.goldratt.com. There is more information at www.nko.navy.mil (click on the learning centers link, then aviation, then aviation ground officers, then skillsoft library, then business strategy and operations, then operations, and choose the class you want to take!). Additionally there may be opportunities to take courses at SDSU or through your Competency Office (QA for example). Finally, the onus is on the Depot for the last and continuing step, execution. All Depot employees can implement and continually practice 6S policy and its procedures without any formal event or training requirement. Raise awareness, educate, and execute to secure Depot excellence and a vibrant future.