Sustainment Organizations: People and Teams

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Starting in the 1980's, ICBM experts created and refined a management model to keep complex system sustainment systematically solving problems lead-time ahead. This helps to avoid crisis management and its associated costs and inefficiencies. With most of these key innovators retired or dead, I have been recording this management model using a web site (charlesvono.com) and technical papers and presentations. So far, my papers have covered the entire model, major parts of the model individually, history of the model, and how to start implementing the model. Key enablers of the model are people, tech, and processes. This paper addresses the most challenging of the enablers: people.

Introduction

This paper is a follow-on to several AIAA papers that describe the complex system sustainment management model. Previous papers have provided an overview to both weapon systems[1] and civil systems[2], first steps via implementing sustainment risk management[3], a how-to on observing the system[4], and history of complex systems since the Industrial Revolution[5] to provide context on how this model arose.

These papers have mentioned three key enablers to this approach: people, responsive information management systems, and disciplined processes. This paper expands on the subject of people and the best way to organize their efforts within the management model. It provides examples of how effectively organized people make the process work. It also shows how the process tends to reinforce their human needs for relevance and usefulness.

The paper starts with a short overview of the complex system sustainment management model (the model) placing people as key enablers of the model alongside processes and IT. Sections on individuals, leaders, teams, and organizations explore the relationship between people and the model using the 4 human traits most relevant to the model.

The Complex System Sustainment Management Model

The foundation of the model is the "fundamental theorem of sustainment" [6]. It states that: "An effective sustainment organization will always find ways to affordably detect threats to the system in time to correct them before the mission is impacted." See figure 1. The model is "observe, identify, and fix". In the discussion below and for simplicity, the model is applied to a weapon system.

The activities in the "Fix System" box include long-range planning, short term planning, deployment planning, requesting funding, and flowing funding to programs and projects. Decision-makers need information generated in the "identify risks" to grant funding. These risks are risks to the system's mission; they need to be identified with sufficient lead time to get them fixed before affecting the mission. The mission is viewed in terms of readiness factors, such as reliability or accuracy, to simplify the process of risk identification and explanation. Risks cannot be identified unless the system is sufficiently observed so that data and analysis can point to emerging, unanticipated failure modes of the system.

For instance, monitoring the batteries in the guidance system can predict when replacement will be needed with more precision, and perhaps more economy, than a manufacturer's stated life. Whether this observation is deemed essential is a decision to be made based on trade-offs. However, monitoring the solid rockets for cracks is mandatory since the degradation that leads to cracks is undetectable until it is too late to remedy. The related requirements, such as probability of target destruction, can be discussed in terms of readiness factors like accuracy and reliability.

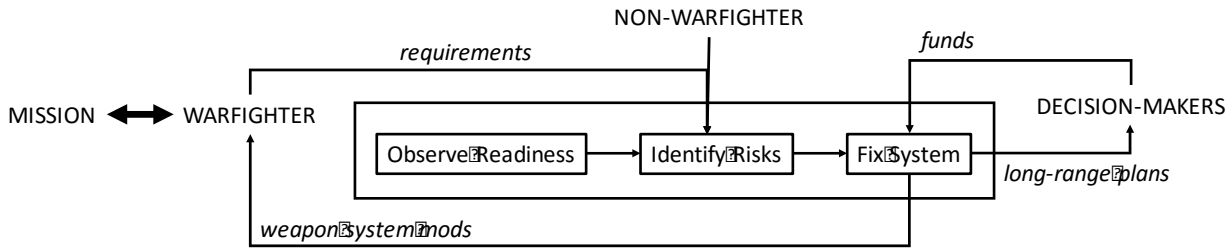

Figure 1: The Weapon System Sustainment Management Model

The model is useful as a common language and a source of requirements to create and improve formal processes and the sustainment team's automated tools[7]. In turn, people, disciplined processes, and responsive automated tools improve the affordability and effectiveness of the sustainment activities. To put it concisely, disciplined people following consistent processes creatively find better processes which are, in turn, supported by upgrades to their automated tools. Key aspects of process discipline are a non-accusatory audit system combined with quick process updates. A key aspect of the tools enabler is quick response that does not bog down process improvements.

This model does not provide an *easy* path to effective and affordable complex system sustainment. In fact, it presents the sustainment team with several impossible tasks: fully define the system in question, fully understand the mission that the system serves, design and execute a program to completely and systematically observe the system, uncover all instances of emerging failure modes with sufficient lead time to mitigate these risks, and obtain all the funds required for the mitigations. Following this model is not easy, but it is necessary. How can the sustainment team, composed of mere humans, execute these tasks? This is answered by looking at the individuals, leaders, teams, and the organization.

Individuals

Since Oliver Evans' flour mill at the end of the 1700's helped introduce the idea of the modern factory, there has been a dawning recognition that machines, processes, and people can be combined to create powerful and useful systems – the domain of today's systems engineer.

Not discussed enough is that fact that a systems engineer has, therefore, a built-in seemingly unsurmountable predicament: Any sufficiently complex system has, as a "subsystem", people. However, most engineers know that people are not engines. They cannot have a spinning governor kludged onto them to reliably ensure their rpm. Great strides have been made in control theory in areas such as modeling, neural networks, and even genetic algorithms. But the feedback loop has not yet been invented (nor ever will be) that ensures convergence and stability of the individual person. And too often, as the person goes, so goes the team. In addition, anyone with even a smattering of team experience has learned that treating people as a problematic subsystem to be fixed carries within it the seeds of its own failure[8].

A common approach to this dilemma is to ignore the people component of the overall system as much as possible. Do what you can in human factors designs with reaction times, common body sizes and types, and basic biology. Seriously enforce the most important rules and processes. But know when to quit.

Unfortunately, many examples abound demonstrating that this eventually results in the overall system "going non-linear" and failing. A fairly recent example was the focus for decades of using scarce resources optimally to mitigate the most pressing risks in ICBM hardware and software while ignoring the growing issues with the combat crews[9]. Often the equipment and the facilities that the crews directly experienced were old and problematic. Such run-down equipment, although perfectly functional, sent a negative message, intentional or not, to the crews about their value to the mission. Eventually, action had to be taken, not only to directly confront the broken morale, but also to improve the systems the crews used every day. In addition, people are now more effectively treated as an important component in sustainment risk evaluation.[10]

My paper, referenced above, "The Rise of Long-lived Complex Systems", recounts the importance of the University of Southern California master's degree program in Systems Management to the development of the sustainment management model discussed herein. This master's degree program applied systems engineering concepts to

management of complex systems. People were not ignored, but included as important factors in success. Coursework relied on experts in the field of management and organizational behavior and the application of systems approaches to management of people. As my paper states, this background among ICBM sustainers was a big factor in the kind of sustainment management model they pursued.

Broadly speaking, people contribute simultaneously in two major areas: personality and competence. In this context, personality includes traits such as cooperation, willingness to learn, and ability to set aside fear. Competence includes knowledge and skills required to perform in their jobs. This paper addresses mainly personality initially and then competence.

Based on my 25 years of first-hand experience with this model, this paper proposes that the following 4 people traits act to ensure best outcomes within the model. People as individuals, as well as humans as a species, are incredibly blind when it comes to self-analysis. So, the expanded discussion below the list is intended to illustrate that these traits are true and understanding them is useful.

1. People tend to be focused on their day and blind to emerging system problems
2. Often while vigorously denying it, people like to please authority figures
3. Humans are incredibly plastic in mind and body, able to adapt, grow, learn
4. Everyone wants to be the hero of their own story

Recall that the fundamental theorem of sustainment states a goal: "An effective sustainment organization will always find ways to affordably detect threats to the system in time to correct them before the mission is impacted." The first two traits are barriers to this goal and the second two traits are the answers to overcoming these barriers.

Blind to emerging problems

The popular science fiction author, the late Douglas Adams, enshrined the first trait in his Hitchhikers Guide to the Galaxy as "SEP" or Someone Else's Problem. There is no limit on the blindness of people if they do not see a problem as anything to do with them. Mr. Adams also addresses what happens if the blindness lifts for a moment: speaking out usually does not result in praise. In such an organization, with no anticipation of future issues, the team members lurch from one crisis to another. They take their cues over what to work on next, within their very busy and confusing day, based on boss' frustrations and any semi-arbitrary rewards/punishment programs that are in place. Thus, people are reinforced in their natural tendency to be blind and dumb to emerging problems. This is a recurring theme in Mr. Adams' writing and his popularity serves to help prove the truth behind the theme.

As further vindication of this concept, a recent and more scholarly book by Clarke Eddy emphasizes the importance of encouraging the identification of experts who can see major systems failures emerging before the rest of us. It provides approaches to determine if your "chicken little doomsayer" is actually a Cassandra with an important message[11]. Sadly, the book was necessary because Cassandras are ignored and so many of these lead-time-away warnings fall on deaf ears.

Pleasing authority

The Stanford Prison Experiment[12], immortalized by a 2015 movie of the same name, is taught in most management schools. There is strong evidence that this experiment did reveal a fundamental human trait. But it is hard to accept because no one wants to believe they could have been as bad as the guards in the experiment. We all want to believe we could be better and stronger than thousands of key managers and leaders in Nazi Germany. But speak to any self-aware company executive and they will tell you about the reality of how an innocent question asked by a company vice president can become informal organization policy overnight. It was the same in the Air Force. I worked hard to avoid this trap with my team as a colonel in the USAF and was not always successful[13]. Even if this is not a rampant problem in an organization, the tendency remains to give people in authority more credit than they deserve in understanding problems you deal with every day, more wisdom to deal with these problems, or other magical powers. This is on display every day in organizations where briefers fail to remind their decision-maker audiences what they are there to talk about and why it matters before jumping headlong into their spiel on a subject only they know very well.

Humans can adapt

There are profound implications to the fact that humans are complex neural networks with bodies. We think of ourselves as logical machines which can attack a problem in a serial, systematic fashion. In reality, we are hormone-

driven pattern-matching machines with a tendency to get tired, irritated, and grouchy. The good news is that we have an ability to view the problem at meta-levels and in-parallel as well as serial and asynchronous, which will lead us to better solutions. And our passions can drive us past fatigue to achieve great results.

Passion is essential for best performance. Passion kicks in when we care about the results. The purpose-driven person produces much more, and much better, than the dispirited or bored. Passion can drive us to become experts at our niche and best exploit our strengths. Angry eruptions are a small price to pay.

Similarly, for the sake of our egos, we would all love to be the hero in the current story. When victories seem rare, hollow, or unimportant, our egos get damaged. We begin to doubt ourselves. The well-documented "impostor syndrome" can find a home and we become even less effective. The good news is, we can change for the better.

The plasticity of body schema in the use of tools is a phenomenon both well-known and widely written about.[14] Humans have the ability to incorporate their tools within the same schema that helps them control their bodies, that is, the same sensory-motor capacities that control movement and posture. For example, you feel you *are* the automobile you are driving. Similar is the plasticity of the brain in its ability to learn new intellectual skills, practice good habits, take on a more positive attitude, improve empathy, or eliminate un-useful behaviors[15]. This can happen if the person is internally motivated or if they are surrounded with individuals who take the correct actions, thus highlighting another distasteful truism that many want to deny: "monkey see, monkey do".

Modeling correct behavior can only go so far without the cooperation of the individual. One necessary ingredient is the internal belief that self-change is possible. Some have had their internal dialogue hijacked by parents or other authority figures and need extra help believing in themselves. Remember this point in the following section when leadership is discussed.

The hero of your story

Even the hijacked have the common human tendency to see themselves as the hero, or at least the protagonist, of their own story. This includes the need to be heard or the need to feel some control over your environment. A caring lady[16], who also happened to be an interior designer, was asked to help at the women's homeless shelter here in Ogden some time ago. She designed and built small carts that contained various selections of curtains, bed sheets, bed spreads, and many other pieces and parts that, when selected and combined, would create a unique and pleasing environment for the homeless woman and her children in their otherwise bland room. Each tiny room became unique. The ladies and their children, when given the cart and told what they could do, were happy beyond understanding. Why? The one thing each and every one of them had completely lost was any semblance of control over their lives. She had restored some of that.

Although all people have an innate desire to be heard and understood, this desire can be tamped down by self-doubt[17], impostor syndrome, fear of failure, or other bad internal scripts. The best leaders know that an unkind word, a blustery display of their own competence, or even the lack of a "thank you" can cause the next person to NOT contribute the very information that the team desperately needs to stay ahead of emerging failure modes. A kind word or a bit of latitude can create motivation at surprising levels.

The model encourages people to stop ignoring problems and see themselves as the heroes to the mission. Its focus on mission is transformative to those people open to growth and challenge. All of this requires a specific model for leadership that emphasizes service and competence.

The Leaders

The model views all the people in the organization as teammates in a team of teams. Critically, within these team, all are encouraged to be leaders, regardless of their position in the organizational tree. In the model, leaders are competent, focused on the mission, and willing to take whatever time is needed to support the people around them with sincere praise, helpful critiques, and appropriate responses to their real needs. Leaders take the time to learn competence and freely teach their skills to others.

On the other hand, managers fearful of being "found out" hoard information, berate subordinates, and obstruct problem identification. We don't need managers who act like that.

In case this sounds like the *empowerment* craze of a few years ago, there is this story: During a flurry of "empowerment" across the USAF, the ICBM Sustainment Chief clarified: "Only one person gets to grab the rudder in this organization and that's me." Effectiveness requires that empowerment cannot be a treat to be given to all. But competence can be widely distributed. And each person can experience increased control over their lives as they increase their competence. Team members must remember that their power to grab the rudder is limited to influencing the boss with real facts and sound logic conveyed in an intelligible fashion.

Helping people move to a mindset that supports sustainment requires the helper (the leader) to have influence over the moved. Influence occurs either by raw power, such as in an organizational chart, or by a continual display of competence. The former can effect a quick change in behavior or ultimate removal from the team. The latter is more permanent as it has a much better chance of effecting a change of heart. My earlier papers have stated that knowing the system's mission is central to making the model work. An additional benefit is that all people issues are made better or completely solved when people focus on the mission[18]. Mission focus leaves little time other, non-useful, activities.

True leaders are characterized by competence, their focus on the mission, and willingness to take whatever time is needed to support the people around them with sincere praise, helpful critiques to build their competence, and appropriate responses to their real needs. Leaders exist at all levels in the organization. Some get known for being really good at this and they do tend to rise eventually to higher positions in an organization.

The Teams

My earlier papers have emphasized the importance of clearly identify the totality of the system that you are working to sustain. For example, the SR-71 spy plane was incapable of achieving its mission without at least two formations of KC-135Q tanker aircraft in the mix. Degradations to the KC-135Q's ability to fly its sorties could seriously degrade or fail the recon mission assigned to the SR-71. Thus, they are part of one system assigned to the mission.

Similarly, it is critical to draw a circle around the totality of the people that you need to ensure your system is sustained, the workforce. For many weapon systems, for instance, this includes not only uniformed military and civil servants, but contractor personnel as well.

It is easy to criticize contractors by saying they "just want more profit". But this implies a pristine motivation on the part of the military organization that often does not exist. Non-contractors may allow themselves to be too invested in their career, move from system to system too much, and work too hard to preserve systems that need to be cancelled or retired. The remedy is the same, a focus on the mission that the system serves. There exist both contractual and interpersonal ways that have been proven to push all team members in that direction. Several are covered in the following section.

For non-military systems, similar conflicts can arise. They need to be dealt with in a similar fashion.

In all systems, decisions are made from "on high" to parcel out pieces and parts of the system to various separate organizations to sustain. For instance, one organization might sustain an aircraft's engines while another sustains its landing gear. These partitions can deliver good results in economies of scale, but make it harder to dole out resources in their most effective manner. And people get further split out into separate teams. It is likely you cannot change this, but must find ways to work within it.

Ultimately, the top criteria in creating and executing an effective sustainment organization is to ensure there is strong organizational continuity to its various sustainment organizations. The unifying element is the *mission that the system serves*, for instance, delivering bombs to target, or persistent recon, or reliable farm equipment. Surprisingly, the organization should *not* be focused on being the most efficient and effective sustainment organization. Organizations can appear very efficient if they simply measure how fast they move their paperwork, how quick their depot throughput is, or how many dollars they can spend and how quickly. Sustainment organizations succeed or fail when the system's mission succeeds or fails. Period.

Most of this paper up to this point has tried to clarify how people as leaders can help people as sustainers to learn the mission, improve their skills, reduce their fears, and become open to sharing their talents. Organizational wiring diagrams can help tackle the other area, competence. So, having identified your workforce and taken leadership steps

to focus people on the mission, the next step is to ensure they are placed into teams that help with preserving knowledge and skills about the system itself, and the means used to sustain it.

For instance, one major problem that sustainers much tackle is design "whys"[19]. As systems grow in age, the *why*[20] of certain design decisions gets lost, vendors and suppliers go out of business, and knowledge of how certain components were built disappears with the retiring workforce. Tests and observations made as recent as a decade ago appear disconnected with current data because testing has subtly changed.

Organizations might be centered on the propulsion system, for instance, to preserve the technical knowledge behind the hardware and software. Other kinds of knowledge that need a special organization to preserve them include risk identification, assessment statistics, and program management. These specialties also need a way to cross-talk to the resident experts. In previous papers, I have explained how members of IPTs are tagged as risk integrators[21] to help the other members of the team identify and explain risks to the system (emerging failure modes). These integrators also have a home in the systems engineering organization to help preserve their skills. This approach should be applied to other specialties as needed.

Teams are also designed to contain complementary skills. Observing readiness works well with teams assigned to their portion of the system working in tandem with system engineer experts in statistics, assessment, testing, and similar disciplines. Similarly, once fixes to mitigate risks are approved, there are special skills in program management, program control, and so on that come into play. System experts are needed as well.

To summarize, individuals need to retain the knowledge of a system that rapidly becomes old technology with each passing year. So, they need to be grouped into areas of sustainment responsibility, such as assessing the system or specific major subsystems.

The Organization

All of this can be achieved via the notional Integrated Product Team structure shown in figure 2. This chart is notional because your organization chart should reflect your needs to sustain your team's competencies.

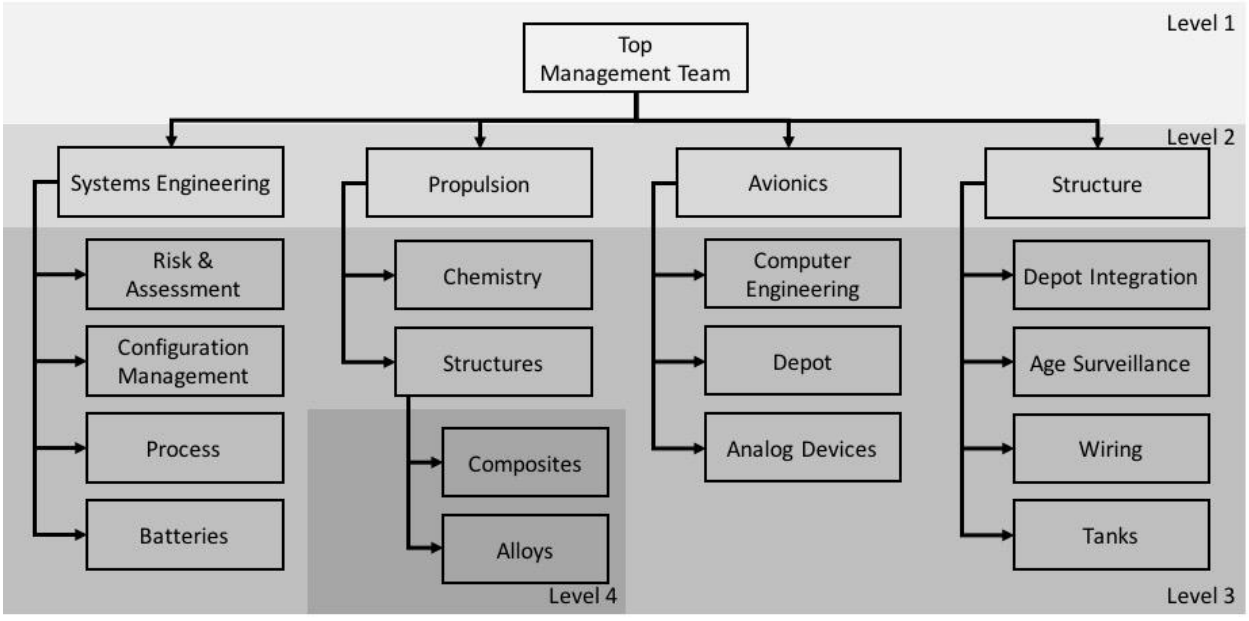

Figure 2: The Integrated Product Team Organizational Structure

Since IPTs are populated by the required experts no matter where they are found, each person found on an IPT organizational chart will also have a home on their company or government organizational chart. The home chart

gives the team member connectivity to their company boss, company objectives, company resources, and other important information that keeps the member grounded in their pay-check, performance-tracking organization.

The IPT organizational chart, on the other hand, is focused on the mission of the system being sustained, and the skills and processes each company or government entity has signed the member up to perform. Another way to say this is that the IPT organization chart will be meaningless to the member unless their home organization boss has clearly stated the goals and rules of their participation in the IPT. Below are a few typical rules.

1) Focus on the mission of the sustained system
2) Support your team with your expertise
3) Follow the IPT processes and support IPT process audits
4) Report your findings up the IPT organization
5) Irreconcilable differences at one level must be raised up to the next level for resolution
6) Participate in active listening to ensure you are getting the best information from your fellow team members
7) Be quick to give credit when credit is due
8) Support cross-talk among IPTs

These rules will have a greater chance of success if following them results in member rewards such as higher performance appraisals, public recognition, or other home organization incentives.

To reiterate, the most important aspect of the IPT organizational chart is its ability to group important skills to ensure critical expertise is propagated, not lost. This happens by creating level 3 and 4 IPTs to incubate, nurse, and grow expertise. It also happens across IPTs, such as risk integrators assigned to each Level 2 IPT meeting as a team to help each other hone their skills.

People as Enablers

Just as calculus tends to the smallest to create its useful processes, a great sustainment organization looks to the individual to see if its mission and organization are creating an environment where emerging failure modes are being discovered and shared lead time away from impacts to the mission.

Are people being given a purpose? Every meeting, especially sustainment risk meetings, are great forums for reminding people that they have a purpose and that purpose is important. The system they support has a critical mission.

When they come forward, are they being heard? Do their words and actions result in real changes?

It is here where the symbiosis of the management model and people is seen. Some examples:

1) Identify Risk: The central action in the model is risk identification. The central activity in that action is the monthly risk meeting. During this meeting, new risks are heard, old risks are reviewed, readiness factors are debated, and missions clarified. Old assessments are discussed and new ones considered. Risk mitigations get approved into full scale mod programs. There is no better meeting for the individual to get a sense of the purpose of the organization, and some of its lore, than this meeting. Individuals leave this meeting with a renewed understanding of purpose and how their contribution fits into the whole.
2) A sense of the whole is also imparted. If the so-called risk has already occurred, then immediate action is ordered. It is no longer a risk. If potential issues are already being worked, for instance, obsolete chemicals, no risk is needed since impacts to mission are already being averted. Yet even these items can be discussed at a risk meeting, along with mission, readiness factors, and priorities, since their implementation sometimes leads to new risks.
3) The meeting is also a living example of how nothing moves forward unless an entire team is working to move it forward: The risk integrator, the subsystem expert, the assessment statistician, the managers, & etc. all play a role in arriving at the best technical, social, political, and economic decision.
4) The assessment team is vindicated not when they are allowed to grab the rudder, but when their diligence is rewarded with an approved risk or a task to complete more testing.

Conclusions

As previously stated, this model does not provide an *easy* path to effective and affordable complex system sustainment. In fact, it presents the sustainment team with several impossible tasks: fully define the system in question, fully understand the mission that the system serves, design and execute a program to completely and systematically observe the system, uncover all instances of emerging failure modes with sufficient lead time to mitigate these risks, and obtain all the funds required for the mitigations.

Asking people to perform impossible tasks can work if the people are inspired to use all their competencies to support the mission, encouraged to speak up, and rewarded for useful behavior. Success is measured by incrementally moving closer to achieving the impossible.

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Civilian systems continue to grow more complex and live longer lives. The largest number of ICBM sustainment experts are no longer available to consult. Of those who are working, many have been (correctly) moved over to the program to create a new ICBM. These trends will continue. There will be no better time to promote, promulgate, and refine the complex system sustainment management model so that when the future hits, we will be ready.

Acknowlegements

The author wishes to acknowledge the United State Air Force whose pioneering efforts in complex system sustainment will help ensure a better future. In addition, I recommend to the reader the very excellent Air Force Sustainment Center's "Art of the Possible"[22] for practical steps to improve sustainment shops.

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[1] Charles Vono, "Fundamentals of Weapon System Sustainment", AIAA SciTech 2016, San Diego, California 4–8 January 2016. Available at the AIAA ARC on-line library or charlesvono.com.

[2] Charles Vono, Justin Kugler, "Application of a Weapon System Sustainment Model to the Space Industry", AIAA SPACE 2016, Long Beach, California 13–16 September 2016. Available at the AIAA ARC on-line library or charlesvono.com.

[3] Charles Vono, "First Steps in Implementing Weapon System Sustainment Model", AIAA SciTech 2017, Grapevine, Texas, 9–13 January 2017. Available at the AIAA ARC on-line library or charlesvono.com.

[4] Charles Vono, "Fundamentals of Sustainment: Affordable Observation and Assessment", AIAA SPACE 2017, Orlando, Florida, 12–14 September 2017. Available at the AIAA ARC on-line library or charlesvono.com.

[5] Charles Vono, "The Rise of Long-lived Complex Systems", AIAA SPACE 2017, Orlando, Florida, 12-14 September 2017. Available at the AIAA ARC on-line library.

[6] This is the "fundamental theorem of sustainment in the sense of "a statement that creates the associated domain of knowledge". This concept is yet unpublished in a conference paper, but can be viewed at my website, charlesvono.com, under the "complex system sustainment blog", key word: "theorem".

[7] My presentation for the October 2017 INCOSE Great Lakes Regional Conference summarized the important attributes of a management model as the pneumonic, SCAMPI: Self-improving – anti-fragile, or at least robust; Constant -- unaffected by changing laws, regulations, or fads; Applicable to the very complex systems employed today; Memorable -- easily called to mind; Practical -- easy to apply, common lexicon; and Integrated -- internally consistent. The January 2016 "fundamentals" paper referenced above discusses why this is true and how the model fits this criteria.

[8] In other words, objectifying people will only serve to upset them, not "fix" them.

[9] "Fact Sheet: Implementing Changes to the Nuclear Enterprise", Defense.gov, (https://www.defense.gov/Portals/1/Documents/pubs/NER-Fact-Sheet.pdf)

[10] This also serves as one illustration as to why the ICBM force is deemed "complex" (that is, non-deterministic) despite the deterministic nature of its fail-safe design, required in all nuclear weapons. The system is composed of more than just the missile and associated launch equipment.

[11] Richard P. Clarke and R. P. Eddy, Warnings, Finding Cassandras to Stop Catastrophes, 2017, HarperCollins Publishers. See also the authors' website, warningsbook.net. For a review and how it pertains to sustainment, see my blog post at my web site, charlesvono.com, "Complex System Sustainment Blog", key word "warnings". Cassandra was a mythical Greek princess cursed to speak true prophecies that no one would listen to.

[12] For a good overview, see prisonexp.org.

[13] Perhaps a more recognizable example is Henry II and Thomas Becket: "Will no one rid me of this turbulent priest?"

[14] See my "retiredcoldwarrior blog" at my web site, charlesvono.com, key word "schema".

[15] Some examples are quickly found in the "Zen and the Art of…" or "The Inner Game of…" books.

[16] My wife.

[17] As an example of self-doubt, in the early 1980s I had the good fortune to work with Dr. C.C. Crawford, the inventor of the Crawford Slip Method (CSM). The CSM helped him improve WWII wartime productivity by obtaining anonymous inputs from huge numbers of people at once. His basement workshop, his personal think tank as he called it, contained 3 ten-foot-long tables end-to-end. The 8-foot-high walls were covered in shelves. The shelves held thousands of boxes each containing a few thousand little slips of paper scribbled on by his workshop participants who knew they would never be identified by name. One morning in his basement think tank, he gestured to the boxes on the walls and said: "Do you know the number one problem I always get from the majority of workshop participants?" I shook my head "no". "They are not sure how to do their job and they are afraid to tell anyone this". For more on the CSM, see H. William Dettmer, Brainpower Networking Using the Crawford Slip Method, Trafford Publishing, October, 2003

[18] Technical people especially, but all people, can be heavily influenced by timecards and job numbers. Employees are repeatedly told that they can only charge hours to the activities they are assigned to and nothing else. You may even find auditors encouraging this black or white approach. What is not said often enough is that some amount of "idle chitchat" or "water cooler talk" is actually essential to good sustainment. These are the situations where you find out things about your teammates that are not on their resume. They are opportunities for encouragement and celebration. Don't encourage teammates to feel chained to their desks. Competence is not maximized by ducking down and hiding at your desk. Even more importantly, solutions to problems don't appear at your desk.

[19] Other major sustainment problems, as discussed in my October 2017 GLRC INCOSE presentation, include loss of original vendors and suppliers, war fighters or operators develop expectations based on capability and not design, the organization's priority to obtain more resources is less, and managers & teams get set in their ways.

[20] Today's model based systems engineering approaches try very hard to capture the "whys" in their data bases and pass these along to sustainment organizations. But even when this approach is finally perfected the need for human experts will always remain.

[21] Identifying risks is the responsibility of all members of the organization. The knowledge of how to capture and communicate this to decision-makers is preserved by a team of risk integrators that are assigned into all teams. Leadership for this group of integrators can flow from both their assigned team and the systems engineering team. See "First Steps" in note 3 above.

[22] Air Force Sustainment Center, Art of the Possible, 30 Jul 2015, www.afsc.af.mil/A0P/. This document is an important product of the USAF reorganization that created the Sustainment Center and should be read by any student of sustainment.