A THINKING CULTURE ACCELERATES THE RATE OF CHANGE:

John Boyd, David Marquet and the Future of United States Military

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Wright Flyer Papers

Air Command and Staff College

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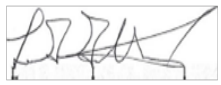
Foreword

It is my great pleasure to present another issue of the Wright Flyer Papers. Through this series, Air Command and Staff College presents a sampling of exemplary research produced by our resident and distance-learning students. This series has long showcased the kind of visionary thinking that drove the aspirations and activities of the earliest aviation pioneers. This year's selection of essays admirably extends that tradition. As the series title indicates, these papers aim to present cutting-edge, actionable knowledge—research that addresses some of the most complex security and defense challenges facing us today.

Recently, the Wright Flyer Papers transitioned to an exclusively electronic publication format. It is our hope that our migration from print editions to an electronic-only format will foster even greater intellectual debate among Airmen and fellow members of the profession of arms as the series reaches a growing global audience. By publishing these papers via the Air University Press website, ACSC hopes not only to reach more readers, but also to support Air Force–wide efforts to conserve resources.

Thank you for supporting the Wright Flyer Papers and our efforts to disseminate outstanding ACSC student research for the benefit of our Air Force and warfighters everywhere. We trust that what follows will stimulate thinking, invite debate, and further encourage today's air, space, and cyber warfighters in their continuing search for innovative and improved ways to defend our nation and way of life.



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Abstract

It is all about thinking. Air Force legend Colonel John Boyd prophetically declared, "He who can handle the quickest rate of change survives." Six decades later, General Charles Brown, Chief of Staff of the United States Air Force, declared the Air Force must "Accelerate Change or Lose." General Brown claims that while the United States spent decades engaged in non-peer conflicts, China and Russia sought to nullify the Air Force's ability to project power globally. The United States Air Force's risk of eclipse by these or other rivals continues to rise. This article explores how a group from Aviano Air Base, Italy, accelerated the rate of change by transforming a stagnant bureaucracy into a culture of empowered Airmen strategically aligned with organizational priorities. The group relied on incremental changes to create a culture of scientific thinking echoing the motto of "we learn" embraced by the crew on the Santa Fe, detailed by CAPT David Marquet in his book *Turn the Ship Around*. The article also identifies how two large Navy organizations (Navy Personnel Command and Southwest Regional Maintenance Center) utilized similar principles to transform their cultures. The article concludes with specific recommendations to help the AF Accelerate the Rate of Change by fostering a learning culture. Failing to accelerate change will jeopardize national security.

Introduction: Statement of the Problem

"We cannot solve our problems with the same thinking we used when we created them."

—Albert Einstein

John Boyd once said, "He who can handle the quickest rate of change survives."[1] Six decades later, Gen Charles Q. Brown, Chief of Staff, declared the Air Force must accelerate change or lose.[2] General Brown claims that while the United States spent decades engaged in nonpeer conflicts in Iraq, Afghanistan, China, and Russia have aggressively pursued systems and technologies to negate the Air Force's strategic advantages. If left unchecked, their rapid rate of innovation will nullify the Air Force's ability to project power globally.[3]

Fortunately, Boyd left the blueprints to accelerate the rate of change. This article explores how a group from Aviano Air Base, Italy, transformed a stagnant bureaucracy into a culture of empowered Airmen strategically aligned with organizational priorities. Their transformation philosophy merges David Marquet's "Leader-Leader Model" with Boyd's passion for thinking scientifically to create an innovative culture of empowered Airmen. This article also demonstrates that the transformation philosophy can apply to many other types of military organizations by discussing how two large Navy organizations (Navy Personnel Command and Southwest Regional Maintenance Center) utilized similar principles to transform their culture, and concludes with specific recommendations for the Air Force to accelerate the rate of change.

Literature Review. An Intellectual History of the Methodologies used in the 31 MDG.

Despite bureaucratic inertia and cultural dogma, Boyd emerged as the most innovative individual in USAF history, helping to end the Cold War by engineering air superiority. After the Korean War, Air Force leaders believed supersonic bombers capable of self-defense via long-range missiles would entirely replace air-to-air combat. During this period, Boyd was an instructor at the Advanced Flying School, Nellis Air Force Base, Nevada, and one of the few Airmen willing to question the strategic airpower dogma of the time.[4] He developed new tactics and taught fighter pilots how to think during air-to-air combat. Boyd's methods reversed the tides of aerial combat during the Vietnam War when his flying school protégé Capt Everett Raspberry taught the new techniques to the 8th Tactical Fighter Wing. The techniques anchored Operation Bolo, a highly successful aerial

combat mission that downed seven MiG-21s, eliminating 44 percent of the enemy fleet. Before leaving the Advanced Flying School to pursue an engineering degree, Boyd published the *Aerial Attack Manual*, which became the bible of air-to-air combat. Boyd's passion turned to understanding the science of aerial combat, and he conceived the physical theory of Energy Maneuverability (E-M).[5] Utilizing E-M, he led the development of the F-15, F-16, and F-18, helping to end the Cold War by providing an asymmetrical air superiority advantage.[6] Still, Boyd's most significant contributions arguably came later in life.

As Boyd neared retirement, his obsession turned to strategic warfare and teaching individuals how to think during combat. Boyd condensed his theories into a six-hour brief called Patterns of Conflict that he gave hundreds of times to congress members, Pentagon officials, and sister services.[7] During this brief, he introduced maneuver warfare and taught a new way of thinking called the Orient, Observe, Decide, Act (OODA) loop. Both the Marines and the Army were receptive to the brief and embraced maneuver warfare. Even Secretary of Defense Dick Cheney consulted with Boyd on maneuver warfare while developing the plans for Operation Desert Storm.[8] Boyd succeeded in altering the patterns of thought for the entire Department of Defense.

David Marquet also influenced his crew's patterns of thought. In his 2013 book, *Turn the Ship Around*, he outlined how he transformed the *Santa Fe*, a nuclear class submarine, from the worst ship in the squadron to the best.[9] The Navy assigned Marquet to the *Santa Fe* one month before its departure. He lacked technical mastery, and the crew was programmed to follow orders mindlessly. With a technically incompetent Captain giving orders to disengaged sailors, the submarine's chances of success were slim. Marquet realized he had to abandon the traditional leader-follower model. The crew was in survival mode, actively seeking to do the bare minimum, hoping to avoid errors and punishment.[10] Marquet understood his crew needed to shift the culture from error avoidance to achieving excellence. He created a new culture by setting specific goals and delegating adequate control. Instead of punishment, Marquet coached the crew, helping them to identify and apply the proper lessons. As a result, the crew became obsessed with achieving excellence through collective learning. The Santa Fe termed this new approach the *Leader-Leader Model* because the Captain delivered clear intent, ensured competence, and trusted each sailor to execute their duties.[11] Marquet turned the ship around by creating a culture of learning through and respecting people. Despite Marquet's philosophy having a broad market penetration, organizations struggle to implement the Leader-Leader Model and establish a learning culture.

In 2010, Mike Rother, a researcher from the University of Michigan, cracked the code to implementing the Leader-Leader Model and creating a learning

culture while studying the Toyota Production System. Rother observed the secret of Toyota's unparalleled success was understanding that organizational routines build habits, habits build culture, and culture produces results.[12] Thus, Toyota specifically develops routines to foster a culture similar to the Santa Fe's. Since Eastern culture permeates both Patterns of Conflict and the Toyota Way (lean), it is not surprising the two methods are extremely similar. Chet Richards, one of Boyd's disciples, noted both rely on a culture thinking coupled with the principles of mutual trust, mission orders, individual responsibility, harmony, flow, and time manipulation. Before passing away, Boyd recognized these similarities and encouraged Richards to begin publishing articles and consulting with businesses. Richards believed lean could impact American business the same way maneuver warfare affected the US military.[13] Ironically, Richards found most businesses did not have the culture required to sustain lean transformations and sooner or later resorted to old habits.

Richards was not the only business consultant to notice this trend. In 1998, Rother, released his first breakthrough process improvement book, *Learning to See. Learning to See* attempted to unlock the secrets of Toyota's success. The book helped industry usher in the lean manufacturing phenomenon by highlighting tools, such as process mapping, takt time, Kanban, heijunka.[14] This phenomenon drove companies to hire consultants like Richards, who scrabbled to apply lean methodologies in hopes of imitating Toyota's success. Unfortunately, many companies experienced short-term success boosting quarterly numbers and then experienced stagnation or decline with only a few companies making a full transition to lean manufacturing.[15] The Air Force mirrored industry, launching various programs such as Total Quality Management (TQM), Air Force Smart Operations for the 21st Century (AFSO21), and the current CPI program.

Noticing this trend, Rother realized implementing lean tools was inadequate to maintain long-term results and returned to Toyota, hoping to uncover the secret of their success. Rother discovered lean tools were just the tip of the iceberg, and Toyota's success stems from a culture of systematic scientific thinking propagated by effective coaching to guide the implementation of efficient routines.[16] Armed with this discovery, Rother distilled Toyota's methods of developing a culture of scientific thinking into the Toyota Kata model.[17] In Japan, kata are structured routines typically used in martial arts to develop new habits. The Toyota Kata model teaches organizations how to utilize structured routines to form a culture of scientific thinking. Toyota Kata contains three different routines: improvement kata, coaching kata, and starter kata.

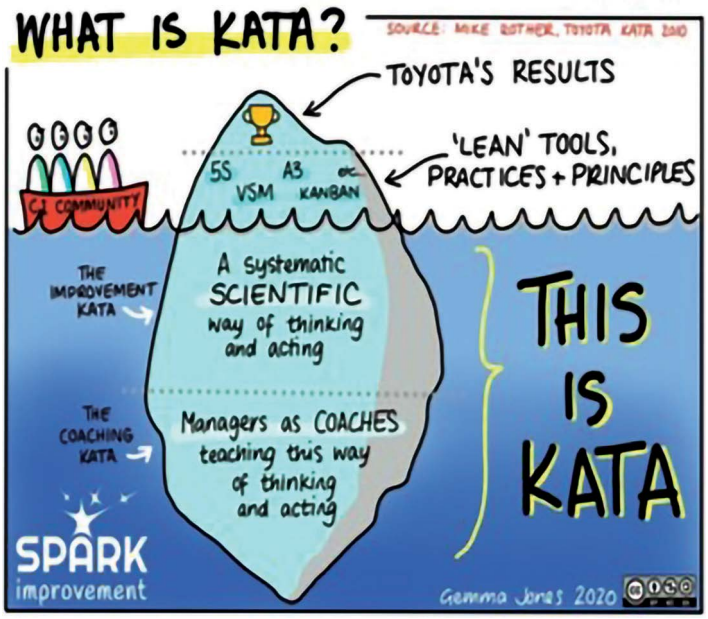


Figure 1. What is Kata?

The purpose of improvement kata is to create unity of effort by aligning improvement initiatives with enduring priorities. The first step in the model is establishing Challenge Conditions. Challenge Conditions are an organization's enduring priorities designed to vector future improvement efforts. The next step is to grasp the current condition by objectively analyzing strengths and weaknesses to understand the operational environment.[18] The third step is establishing Target Conditions. Target Conditions are specific, measurable, achievable, time-based (SMART) goals designed to move the organization closer to the challenge condition and generate a sense of urgency. To drive innovation, Target Conditions ought to be readily achievable but solutions unknown. At Toyota, if a solution is known, it would already be implemented. The final step is to conduct experiments. Experiments follow the scientific method of forming and testing a hypothesis, followed by analyzing the results. If the experiment accomplishes the target condition, the organization creates a new target condition.[19] If the experiment fails to meet the target condition, the organization designs a new experiment.

Before Rother published *Toyota Kata*, Boyd walked an audience through one of Toyota's most famous kata cycles during a Question-and-Answer session at Air University. Boyd began by asserting that the Toyota Production System was

brilliant and explained how Toyota Vice-President Taiichi Ono coached Shiago Shingo through the improvement kata. Ono's Challenge Condition was the ability to manufacture numerous vehicles with one production line. The Current Condition was Toyota could only produce one vehicle per production line without stopping production four to six hours to change manufacturing dyes specific to each vehicle. Ono tasked Shingo with the Target Condition of changing the dyes in under ten minutes. Shingo proceeded to experiment with different techniques until he not only met the ten-minute threshold but reduced the time to under one minute.[20] In this short vignette, Boyd unknowingly captured the essence of both the improvement and coaching katas.

Toyota Kata relies on experienced coaches teaching the improvement kata to learners. Coaches are responsible for the learner becoming proficient in the improvement kata by providing procedural guidance while allowing the learner to struggle. The coach's primary objective is to facilitate the learner's ability to think scientifically, not reaching the target condition. Coaches utilize the six questions displayed in figure 2 to guide the learner through the improvement kata.[21] The starter kata involves a coach walking a learner through several rapid improvement kata cycles solidifying the habit of scientific thinking.[22] The improvement kata generates clarity, while the coaching and starter katas guarantee competence.

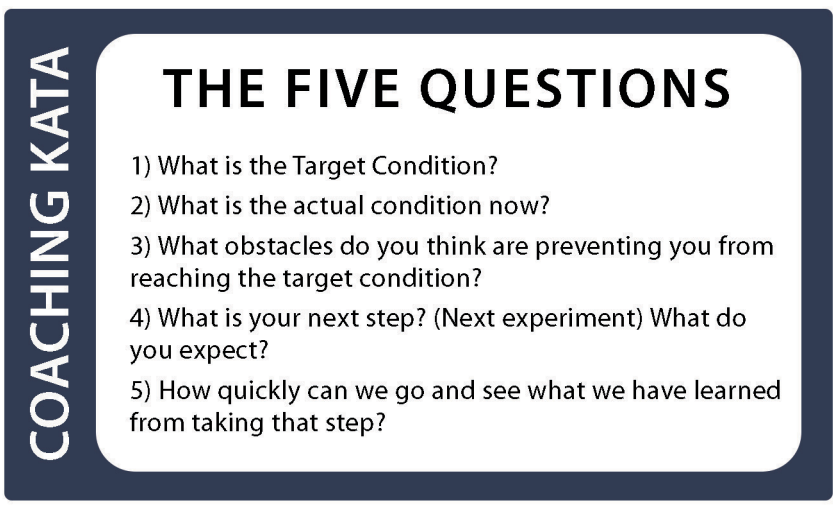


Figure 2. Five Coaching Questions

Toyota Kata, coupled with the Leader-Leader Model, provides the ideal framework to change organizational culture. According to organizational

psychologist Edgar Schein, a group's culture is defined as a pattern of shared basic assumptions learned by a group as it solved its problems.[23] Thus, one reason for Toyota Kata's success is that the problem-solving process is the ideal location to drive culture change. Executing the improvement kata forces organizations to alter their shared basic assumptions by creating new habits, behaviors, and beliefs while solving problems. Every repetition adds bulk to the iceberg moving the organization closer to the desired culture. The Leader-Leader Model creates an ideal cultural end state for organizations to emulate. At the same time, Toyota Kata reinforces the leader's ability to give control and enables followers to accept control. As followers accept control, they transition into cognitively engaged leaders willing to shoulder responsibility. Toyota Kata and the Leader-Leader Model are two sides of the same culture coin.

Conversely, traditional leadership development methods have failed to produce an actively engaged workforce across America, despite thousands of books and entire industries devoted to leadership development, as evidenced by a 2020 Gallup poll that found that only 36 percent of workers are engaged on average.[24] Traditional leadership development focuses on enhancing leader's capabilities by studying iconic leaders or various leadership models. Such subjects are of immense importance; however, to be effective, two actions must occur. First, the leader must change his or her behaviors. Second, the improved leader must inspire or motivate his or her organization to change as well. Toyota Kata bridges the chasm between leadership development and worker engagement by systematically teaching leaders how to establish new routines to create new assumptions and form a new culture. In addition to exceptional leadership, Marquet's efficient management accelerated the cultural transformation.

Marquet utilized basic process improvement methodologies to create operational efficiencies to give his crew time back. For example, he used lean principles to streamline processes by eliminating non-value-added steps, TQM to eliminate top-down monitoring systems, and visual management principles to standardize maps.[25] Marquet incentivized his crew by giving time back as efficiencies increased, demonstrating leadership and efficient management go hand-in-hand. The Santa Fe was fortunate to have an experienced Captain versed in various process improvement methodologies to coach their transformation. However, many Air Force organizations lack the essential process improvement skills to manage efficiently. By design, Air Force CPI relies on trained experts (Green or Black Belts) to help units solve problems instead of empowering frontline supervisors with training to solve their own problems. Evidenced by AIR FORCE INSTRUCTION 38-401, *Continuous Process Improvement* established training targets of 5 percent Green Belt and 1 percent Black Belt.[26] In the author's opinion, only training a

small percentage of the population adds unnecessary barriers to innovation. These "CPI experts" will often face the same challenges as the lean consultants discussed above; when a well-intended leader assigns them a problem outside of their unit to fix. The Green Belt Course would benefit every frontline supervisor because it contains basics process improvement methodologies increasing their management acumen. Perhaps another reason why CPI is not widespread is the fundamental mismatch between the purpose of CPI and the Air Force's organizational structure.

The fundamental purpose of process improvement is to maximize value to the customer while demonstrating respect for people. One of the forefathers of process improvement, Eliyahu Goldratt observed many companies were utilizing lean tools to increase efficiencies in a single department. Yet, improvements failed to boost the bottom line and often produced excess inventory harming the bottom line. Goldratt encouraged managers to gage the true success of a process improvement effort by measuring the impact on the bottom line.[27] Similarly, Tesla CEO Elon Musk argues profits will follow a product if the value of the output is greater than the value of the input.[28] The case Both Goldratt and Musk are making is a business's purpose is to maximize value to the customer. Musk also explains that government organizations complicate value assessment because they are essentially monopolies disconnected from consumer feedback.[29] This generates a scenario where all government organizations are divorced from the output value, but the military is also divorced from the input value. For CPI to maximize value within the Air Force, leaders must create a method to assess the value differential.

Mark Friedman teaches government organizations how to calculate output value in his book, *Trying Hard is Not Good Enough*. Friedman proposes that most government agencies try hard and hope for the best but cannot determine output value because of a lack of feedback.[30] Collecting feedback in a public organization is a proactive process that starts by defining how success is measured. Organizations must answer these questions to determine output value. Who are our customers? How can we measure if our customers are better off? How can we measure if we are delivering services well? How are we doing on the most important of these measures?[31] Understanding the answers to these questions will help an organization develop parameters to understand the value of their output and vector process improvement efforts by establishing Challenge Conditions.

The next step to calculate value is assessing the value of inputs accurately. The structure of military compensation promotes inefficiency by masking the value of labor. In 2020 wages and salary accounted for 44 percent of the US's GPD, making payroll one of the major expenses on a company's bottom line.[32]

According to the 2015 census, 59 percent of the US labor force received an hourly wage.[33] Paying hourly wages drives organizations to maximize the value of labor as an input to avoid paying overtime. Yet, the 24/7 commitment required by the Profession of Arms necessitates salary as the form of compensation. This arrangement is vital during deployments or when an unexpected mission requires the unit to flex. However, paying a salary for day-to-day operations dilutes the value of inputs and promotes organizational inefficiency. In the author's opinion, the Air Force compounds the inefficiency problem because many leaders focus only on mission accomplishment, not how efficiently the unit operates. Additionally, a common practice is to reward increases in efficiency with additional tasks or decreased manning: these practices drive disengagement and de-incentivize efficiency. Units that maximize value by defining the output value and valuing Airmen's time will form a culture of achieving excellence through cognitive engagement.

Air Force Commanders are constantly required to balance competing priorities to achieve organizational harmony. Similarly, Toyota strives for excellence by continually improving processes through harmonizing daily operations and improvement efforts. Rother explains the non-Toyota way of thinking separates normal daily management and improvement efforts. Conversely, the Toyota way of thinking teaches normal daily management equals process improvement.[34] Separating these efforts generates intraorganizational friction by forcing departments to compete for resources and seek outcomes favorable to their area of responsibility. Combining these efforts aligns resources, minimizes waste, and decreases intraorganizational friction. This same concept applies to an Air Force Commander's four major responsibilities: executing the mission, improving the unit, managing resources, and leading people. An organization striving to achieve excellence will promote harmony among these responsibilities and eliminate intraorganizational friction.

In summary, the principles taught within *Toyota Kata* will produce a culture of empowered Airmen devoted to learning and driven to achieve excellence by maximizing value. This philosophy embodies General Patton's famous leadership ideal, "don't tell people how to do things, tell them what to do and let them surprise you with their results," and is supported by literature from academic fields of leadership development, continuous process improvement, and organizational psychology.

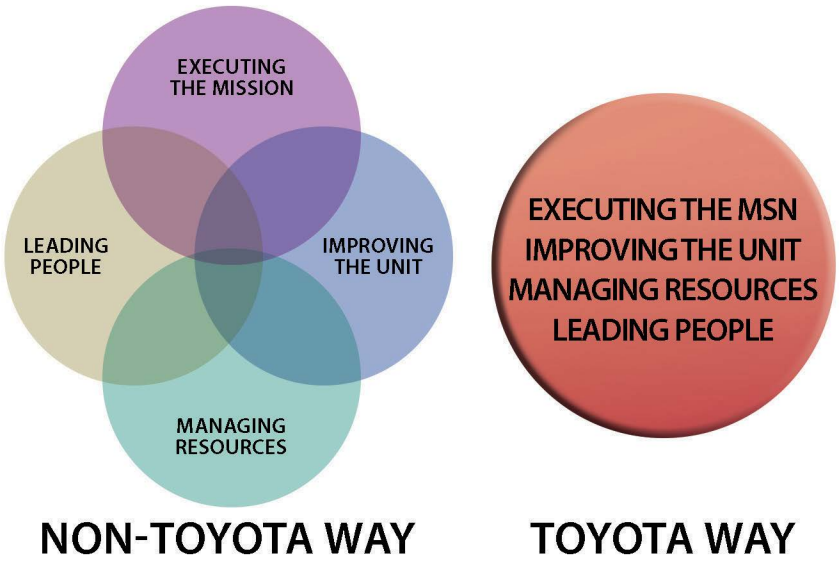


Figure 3 (7) Non-Toyota Way and Toyota Way

Achievements and Limitations. Review of the 31 MDG CPI Tactics and Qualitative Data.

The 31st Medical Group, Aviano Air Base, Italy, executed this strategic philosophy to transform their culture. In 2015, the MDG implemented the Air Force Medical Service's (AFMS) Lean Daily Management (LDM) program with great initial success. However, after a few years, the program stagnated when mandatory improvement events started including trivial topics like pencil accountability and turning off lights. In early 2017, the group commander realized the program was not adding value to patients and canceled the program. A few months later, the commander assembled a new CPI team challenged with rebuilding the CPI program. The team began experimenting with structural changes to incentivize innovation and foster a culture of thinking. They believed well-designed incremental improvements would overcome bureaucratic inertia while minimizing organizational fear ignited by drastic change. The incremental improvements were not part of a master plan rather opportunistic experiments based on the current operating environment; some succeeded, some failed.

Note: LDM is the perfect example of applying lean tools without the driving culture behind the tool's development. LDM was a widely successful program at Lackland AFB, but when standardizing across the entire AFMS, the driving culture did not transfer to every clinic.

The foundation of the MDG's transformation was the Strategic Plan conducted in the fall of 2017 for 2018. In addition to developing consensus on mission and vision statements, the plan introduced strategic objectives, measures, and flight goals. The objectives served as Challenge Conditions vectoring process improvement efforts. At the same time, measures and flight goals served as Target Conditions. Each objective was assigned a champion from the executive staff, responsible for setting 1-3 measures and assigning a Point of Contact (POC) to facilitate each measure. At the group level, instituting objectives and measures allowed the executive staff to identify performance gaps or opportunities and provide a POC broad control to accomplish a specific task. This approach cut through bureaucratic red tape by clarifying the commander's intent and creating organizational alignment to achieve measures. All measures were briefed and tracked by the commander during the monthly Executive Committee Meeting, and a weekly CPI meeting provided a forum for deep dives into specific initiatives. In 2018, the executive staff realized 31 measures were too many and aimed to have one measure for each objective. Each subsequent Strategic Plan built on this foundation and shifted the focus from rehashing mission and vision statements to identifying high-quality measures. Most objectives remained consistent from year to year, whereas measures built on the prior year's success. For example, the CPI objective was to Utilize CPI and Empower Innovation and the 2018 Measure was to have a certified Green Belt in each squadron by 31 December 19. The Green Belts produced in 2018 created a CPI backbone that enabled the 2019 CPI Measure of having each member of the MDG complete a foundational CPI training called "Yellow Belt."

The MDG customized a mandatory AFMS process improvement program to harmonize internal CPI efforts with headquarters' expectations. In 2018, AFMS launched the Daily Management Program, another mandatory CPI plan. The program's purpose was to align process improvement efforts and standardize information flow by establishing a series of structured huddles. Each morning, every flight would conduct a huddle utilizing a standardized script and management whiteboard; information would flow through a series of escalating huddles, eventually ending with the group commander. Hoping to avoid the pitfall of tool implementation, the commander allowed flight's autonomy to customize boards and the flexibility to conduct daily or weekly huddles depending on operational needs. Eager to integrate the boards into the budding CPI culture, the CPI team facilitated a coaching session with each flight to help verify success by defining a

few vital mission outcomes.[35] The CPI team helped flights maximize value by developing an artificial bottom line. The bottom line was composed of Target Operating Conditions designed to maximize value and incentivize efficiency. Input Target Conditions were based voice of the business and the voice of the Airman. The voice of the customer and the voice of the Air Force drove Output Target Conditions.

Voice of the Customer Conditions are designed to capture the value of goods or services delivered. The conditions must be realistic and balanced with the other Target Conditions. Generally, there will be a condition for production, quality, and customer satisfaction.

Voice of the Business Conditions are centered around the needs of stakeholders. Conditions are usually concentrated on financial inputs and the safety concerns of an organization.

Voice of the Air Force Conditions are unique Air Force driven requirements. Depending on the organization, these obligations may provide no value to the customer but are required outputs. Examples are CBTs, readiness training, contingency response plans, PME, career-broadening. Note: organizations closer to the mission may have considerable overlap with the Voice of the Customer Conditions.

Voice of the Airmen Conditions are designed to incentivize efficiency by valuing Airmen's time. When Airmen cross into the blue, they understand long hours may be required and are ready to make sacrifices to accomplish the mission. Regrettably, many Airmen like sailors get caught in the downward evolutionary spiral created by inefficient bureaucracies.[36] Airmen Target Conditions return time to members as they efficiently meet the other conditions. For example, one section aimed to limit ActiveDuty hours to 45 hours per week 80 percent of the time. Another section gave a comp day to each member every other week. Perhaps the best example was the Medical Services Flight's adoption of the RESET Ramstein care model (For more information, watch the RESET Ramstein YouTube video). The RESET model incentivizes provider care teams to deliver exceptional patient care by giving the teams a Gold day after meeting well-defined Operational Target Conditions. Gold days are non-clinic days that staff could utilize for personal errands, professional study, special projects, or relaxing. This flight proved by focusing on value; patient care and staff satisfaction could increase simultaneously.

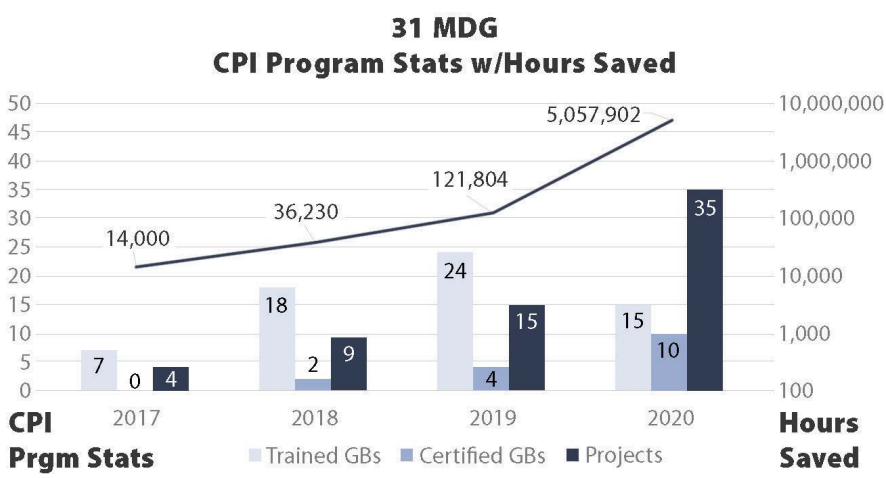
Traditionally, each successful improvement kata cycle requires a new target condition. However, well-set Operational Target Conditions are standards to construct an artificial bottom line. Thus, Operational Target Conditions are adjusted to maximize value and not reset after accomplishment. Frequently resetting Operational Target Conditions would lead to Burnout, frustration, and fatigue.

Another example of incremental improvement is the progression of flight goals development and tracking. In 2017, the group commander challenged each flight to develop flight goals aligned with strategic objectives. The only requirement was completion. In 2018, the commander asked flights to establish

goals in conjunction with their squadron commander and expected squadron commanders to mentor flights. In 2019, flight goals were briefed to the group commander monthly tracked via a Heads Up Display (HUD). The briefing provided the commander with situational awareness of the clinic's struggles and triumphs, creating cross-collaboration opportunities. Each briefing consisted of a CPI Team Lead, squadron commander, and Flight Leadership. See the progression of flight goals from 2017 to 2019 and the HUD in figure 10. Executing such a program overnight would likely be viewed as micromanaging and generate insurmountable organizational pushback. However, gradual implementation while building culture eased organizational fear.

Initially, the MDG relied on the wing for CPI training, but this changed as group personnel volunteered to instruct Green Belt training and eventually became certified Green Belt instructors. Internal training capabilities allowed the MDG to schedule and train Green Belts on demand. Green Belt Trainees often chose to tackle strategic measures or flight goals as projects. During a group commander's call in 2018, the CPI Team Lead formally introduced Toyota Kata. The CPI team then added kata-to-grow to the Green Belt curriculum and 2019 Strategic Off-Site. Kata-to-grow is an interactive training designed to introduce the improvement kata, coaching kata, and starter kata to school-age children or Airmen. Additionally, each member of the MDG also received a kata overview with their Yellow Belt Training. During the COVID-19 pandemic, the CPI team created an online yellow belt course and encouraged members to complete the Air Force Green Belt training online.

Table 1: 31 MDG Historical CPI Data Provided by the 31 FW CPI Process Manager



The entire CPI program experienced exponential growth between 2017 and 2020. In 2018, the MDG completed nine projects saving 36,000 hours, trained 18 Green Belts, and certified two Green Belts. In 2020, during the COVID-19 pandemic, the MDG completed 35 projects saving 5,057,902 hours, trained 15 Green Belts, and certified ten Green Belts and one Black Belt, as depicted in chart 3.[37] The MDG accounted for 1.4 percent of USAFE's personnel but produced 18 percent of the command's certified Green Belts. The MDG's outsized production led to the 31st Fighter Wing winning the MAJCOMS 2020 Innovation Madness Award with a cash prize of $155,000.[38] These numbers are merely an attempt to quantify the underlying culture of innovation and empowerment developed at the MDG, but are wholly inadequate to capture the net effect. For example, the MDG was the first Air Force MTF to acquire in-house COVID-19 testing capabilities. It also empowered Airmen to launch an Air Force pilot program called the Comprehensive Operational medicine for Battle Ready Airmen (COBRA) initiative. COBRA is an innovative approach to maintain a healthy force by focusing on the leading cause of missed work (musculoskeletal injuries). An astute Special Forces doctor realized all Airmen could benefit from having increased access to dietitians, physical therapists, and athletic trainers afforded to special operators and developed the CONOPS. The MDG is currently testing the hypothesis that the COBRA concept will increase Airmen's readiness enough to offset additional staffing costs.

Disclaimer: In the spring of 2017, a technical glitch with SharePoint erased historical data. As a result, this article only used data after August 2017 to minimize recall bias and avoid building a historical strawman. However, it is necessary to provide a cross-section of the group's CPI status before the transformation. As of August 2017, the MDG had five trained CPI Green Belts, two certified Green Belts, and one trained Black Belt collectively working on four projects. The MDG was fortunate to have incredibly talented leaders who undoubtedly contributed to the program's success. The transformation spanned the command of three Wing Commanders, three Group Commanders, and numerous squadron commanders, building the case the CPI program results were not because of the command climate alone.

Analysis: Assess if the Experiences of the 31 MDG may be Extrapolated to the AF.

The author believes any unit in the Air Force may replicate the experiences of the 31 MDG and sought to prove this hypothesis. Since Toyota Kata is a well-established discipline and closely aligns with the methods and philoso-

phy described above, the author reached out to Mike Rother to study the hypothesis. Rother graciously offered to help and connected the author with a list of Navy members currently experimenting with Toyota Kata. The author uncovered The South West Regional Maintenance Center (SWRMC), and Navy Personnel Command (NPC) are actively building kata cultures.

After retiring from the Navy in 2003, John Robison spent two years working as a lean manufacturing consultant before rejoining the Navy as SWRMC's Executive Director. Robison oversees 2,000 personnel responsible for more than $1.2B in ship maintenance and overhauling activities.[39] Roughly three years ago, Robison teamed with the University of Michigan's Kata Program called Coaching for Improvement to start SWRMC's kata journey. SWRMC connected the author with Ericka Cashin, who is currently overseeing the production department's kata Program. Cashin is also a Lt Col in Air Force Reserves with 14 years of AD and has completed the Air Force CPI Black Belt Training. According to Cashin, the production department has a formal kata program with Challenge Conditions anchored to the NAVSEA's strategic points. Tactically the department assigns coaches and learners to solve problems identified by frontline personnel.[40] Historically, kata cycles were completed and tracked utilizing whiteboards. Unfortunately, sections erased boards after their executive staff brief. As a result, Cashin is currently working on an incremental improvement to standardize how katas are captured by digitizing the entire process. This improvement will also help quantify the value of Toyota Kata in the production department.

As the NPC Deputy, Gary Peterson launched Toyota Kata in the Navy Personnel Command in 2019. Peterson retired in February 2020 and was unsure of the program's status, and said in his initial email response, "the results were modest and isolated… and despite significant personal effort, I'm not aware of widespread growth."[41] The author turned to Rother for mentorship, and he responded, "An interesting thing about Toyota Kata is that success with Toyota Kata can mean that Toyota Kata disappears. That is, Toyota Kata is about starter kata for practicing scientific thinking. The goal is not the kata, but the thinking and skill that practicing them leave behind. Each organization should ideally build on the fundamentals that practicing the starter kata imparts to develop their way. Ultimately Toyota Kata is developing your way by building on some fundamental scientific thinking patterns and routines you learn from practicing starter kata. That means the practice routines (starter kata) may disappear or evolve. Success with Toyota Kata is characterized by the thinking patterns that practice leaves behind, not by the practice methods themselves."[42] Encouraged by Rother's optimism, the author pushed Peterson

for an NPC contact to follow up on the status of Toyota Kata. Peterson connected me with Keith Moran, the LSS MBB leading the CPI program at NPC.

Before retiring, Peterson asked Moran to assume the role of the NPC's kata champion. Moran was introduced to kata concepts and received formal Kata Training while working at Amazon. According to Moran, Amazon was dedicated to developing a Toyota Kata culture but struggled to expand its training program fast enough to keep up with its expansion rate. At the NPC, it was as Rother expected. Toyota Kata was flourishing at the NPC. Before COVID-19, Moran instructed a kata course every week and successfully trained over 180 members from 89 various career fields.[43] The quarantine halted Moran's ability to teach, but he still coaches sailors through kata projects and is chomping at the bit to resume courses. This study cannot calculate the impact Toyota Kata had on the 180 members, but it is evidence Toyota Culture is expanding.

The research reveals that Toyota Kata was effectively implemented in two very different career fields: maintenance and administrative. The Navy's success bolsters the author's hypothesis that Toyota Kata is compatible within the military. The research failed to uncover concrete examples of operators successfully implementing kata, yet the lack of data does not disprove the thesis, only begs for exploration. After all, the author of the Aerial Attack Study promoted the Toyota Production System.

Conclusion: Proposal for Future Research and New Lines of Inquiry

As Richards was struggling to facilitate lean transformations, he found solace in Boyd's admonition that "you can't change big bureaucracies until they have a disaster." However, with Toyota Kata, this is no longer true, and the Air Force can change before the disaster. General Brown acknowledges structural changes are necessary but realizes the key is creating a culture of empowered Airmen with a sense of urgency. The improvement kata enables leadership to vector innovation by forming compelling Challenge Conditions and creates a sense of urgency by developing SMART Target Conditions. Kata empowers Airmen by giving adequate control while effective coaching ensures competency. Each successful kata cycle will generate more confident, empowered Airmen cementing the habit of scientific thinking.

The Toyota Kata movement is gaining momentum within the process improvement community with podcasts, blogs, YouTube channels, and entire conventions dedicated to teaching the art of scientific thinking. Conversely, the Air Force has not officially added Toyota Kata to any CPI certificate programs and continues to lead a tools-based CPI approach. Based on this anec-

dotal evidence and the fact cutting-edge organizations like Amazon are adopting Toyota Kata, it is safe to say the Air Force is much slower to adopt Toyota Kata principles than industry and the Navy.

The improvement kata and the DoD's Joint Planning Process (JPP) share a philosophical framework, establishing an argument for developing the habit of scientific thinking early in an Airmen's Career. The JPP entails problem framing (operational design) and strategy development (operational art).[44] Problem framing encompasses the first three steps of the Improvement Kata. Establishing an ideal end state and defining objectives is generating Challenge Conditions. Understanding the operational environment and identifying centers of gravity and decisive points is grasping the current condition. Established lines of operation and effort serve as Target Conditions. While the operational art focuses on Courses of Action development and analysis, mirroring kata's experimentation step. The author recommends further research into the similarities between the JPP and Toyota Kata to assess the benefits of introducing scientific thinking early in an Airmen's Career.

The Air Force must accelerate the rate of change to ensure the force can Fly, Fight and Win with airpower anytime, anywhere (challenge condition). Still, the Air Force has not upgraded thought patterns from those used to create the problems (current state). Leaders must drive culture change by creating new patterns of thought (target condition). A few experiments that may help accelerate the rate of change are; add Toyota Kata to CPI curriculum; promote Green Belt training for all frontline supervisors; beta test Toyota Kata throughout an entire wing; introduce Toyota Kata at basic training for officers and enlisted; send members through the University of Michigan's Kata Training; utilize Toyota Kata principles during strategic planning sessions; or issue Toyota Kata, Turn the Ship Around and Boyd, the Fighter Pilot Who Changed the Art of War to every airman after taking the oath.

Notes

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

1. Coram, *Boyd: The Fighter Pilot Who Changed the Art of War*.
2. Brown, "Accelerate Change or Lose."
3. 4 Brown, "Accelerate Change or Lose."
4. Coram, *Boyd: The Fighter Pilot.*
5. Coram, *Boyd: The Fighter Pilot.*
6. Whittle, "Welcome to the Suck."
7. Coram, *Boyd: The Fighter Pilot.*

8. Coram.

9. MindSpring, "Greatness" by David Marquet.

10. Marquet, *Turn the Ship Around!*

11. Marquet, *Turn the Ship Around!*

12. Rother, *Toyota Kata: Managing People for Improvement, Adaptiveness, and Superior Results*.

13. Coram, *Boyd: The Fighter Pilot*.

14. Rother and Shook. *Learning to See: Value-Stream Mapping to Create Value and Eliminate MUDA*.

15. Rother, *Toyota Kata*

16. Gemma, "So What Is Kata?"

17. Rother, *Toyota Kata*.

18. Rother, *Toyota Kata*.

19. Rother, *Toyota Kata*.

20. Kirk, "Colonel John Boyd Pt 2"; Kirk, "Colonel John Boyd Pt 3."

21. Rother, *The Toyota Kata Practice Guide*.

22. Rother, *The Toyota Kata Practice Guide*.

23. Schein, *Organizational Culture and Leadership: 4th Ed*.

24. Harter, "Historic Drop in Employee Engagement Follows Record Rise."

25. Marquet, *Turn the Ship Around!*

26. AFI 38-401, *Continuous Process Improvement*.

27. Goldratt and Cox, *The Goal:A Process of Ongoing Improvement*.

28. Create Quantum Wealth, "GET OUT OF THE WAY! - Elon Musk On Govt Constraints | Create Quantum Wealth 2020."

29. Create Quantum Wealth.

30. Mark Friedman, *Trying Hard Is Not Good Enough: How to Produce Measurable Improvements for Customers and Communities*. Santa Fe, NM: Parse Publishing, 2009.

31. Friedman, *Trying Hard Is Not Good Enough*.

32. FRED, "Compensation of Employees: Wages and Salary Accruals/Gross Domestic Product Download."

33. Anna Robaton, "Most Americans Are Hourly Workers."

34. Rother, *Toyota Kata*

35. Davis and Casey, "A Model of Air Force Squadron Vitality."

36. Marquet, *Turn the Ship Around!*

37. Bingham, "Wyvern Innovator."

38. Bingham.

39. SWRMC, "WHO WE ARE."

40. Cashin, discussion with author.

41. Peterson, discussion with author.

42. Rother, email correspondence with author.

43. Moran, discussion with author.

44. Reilly, *Operational Design: Distilling Clarity from Complexity for Decisive Action*.

Abbreviations

AFMS	Air Force Medical Services
COA	Courses of Action
COBRA	Comprehensive Operational medicine for Battle Ready Airmen
HUD	Heads Up Display
JPP	Joint Planning Process
LDM	Lean Daily Management
NPC	Navy Personnel Command
OODA	Orient, Observe, Decide, Act
POC	Point of Contact
SMART	Specific, Measurable, Achievable, Time-Based
SWRMC	Southwest Regional Maintenance Center
TQM	Total Quality Management

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