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ON THE COVER
Maintenance Airmen inspect C-17: Tech. Sgt. Shelly Pavcik, 911th Maintenance Squadron aircraft structural maintenance technician, inspects the metal inside a C-17 Globemaster III for any kind of damage during a home station check inspection at the Pittsburgh International Airport Air Reserve Station, Pa., June 30, 2020. Airmen performed the first-ever HSC in the 911th Airlift Wing’s new two-bay hangar. (U.S. Air Force photo by Joshua J. Seybert)
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Greetings LOG Nation!

Continued gratitude and thanks to all who continue to make this Logistics Officer Association all that it is. From providing scholarships to professional development, our 80+ Chapter organization remains engaged, involved, and resilient. Thirty-eight years and still going strong!

As alluded to in the Spring ER edition, our LOA University POCs, Capt Jared “Boyd” Stewart, Chief Learning Officer and Lt Col Jerry Ottinger, Dean LOA University, have been working diligently to provide LOG Nation a Virtual LOA U this October. This year, LOA will host its first Virtual LOA U beginning on 19 October and running through 23 October. Our virtual LOA U will feature live and recorded sessions so mark your calendars and stay tuned for various social media announcements regarding the 5-day lineup.

With the theme “Under Attack: Agile Logistics for the Future Fight” in mind, the Symposium Leadership Team (Col Ken Benton, Lt Col Dara Hobbs, and Ms. Jennifer Fletcher), continue to plan for our March 2021 Symposium in Salt Lake City. While we remain hopeful to meet once again in person to experience all that live Symposia have to offer, we are not ruling out the possibility that next Spring’s SLC event may be virtual. As most know, Symposiums and Conferences continue to be postponed or cancelled in their entirety, many of which are not pursuing virtual events as an option. This much this President knows, whether live or virtual, our Spring 2021 LOA Symposium will provide as advertised – great speakers, great topics, great professional development opportunities and more!

In closing, we say so long to our National ER Editor-in-Chief, Capt Dave Loska. Dave’s passion for our quarterly professional journal was clearly evident and will be missed. Thanks Dave for being the passionate LOA Leader that you’ve been and for taking our ER to new heights. Capt Loska certainly put “exceptional” into our award-winning Exceptional Release! Best wishes to Capt Loska!

Of course, I remain proud to be your LOA President and fellow Loggie colleague. Stay safe...stay well!

Tap a Shoulder!
Let’s Go — Let’s Grow — Let’s Get After It!

Scott Fike
President
Logistics Officer Association
The Logistics Officer Association (LOA) Symposium is this year’s premier event dedicated to enabling interactive exchanges among logistics, acquisition and technology professionals from across the Department of Defense, defense industry and academia. In 2021 there will be a continued focus on Leadership, Innovation, Velocity, Excellence (L.I.V.E.) with the theme of the Symposium being Under Attack: Agile Logistics for the Future Fight.
Editor’s Letter

On my first day in the Air Force, I noticed an Exceptional Release Journal on my MXG deputy’s desk only eight years ago. Part practitioner’s periodical, part academic journal, part newsletter, the ER sews a thread of dialogue, discourse, and growth. I am grateful to be a citizen of a country where freedom of thought and speech is safeguarded. I am appreciative to serve in a service branch that, although those freedoms are fragile, they are valued nonetheless and preserved, in part, through this journal.

As I turn over the Chief Editor’s position, I reflect upon what I have enjoyed the most. I prize that which internally motivates our authors to contribute, share, be heard, get out in front, lead through thought and ideas, and be bold.

I am grateful to many others that similarly value the same, and whose labors, fellowship and mentorship have been some of the most meaningful I have experienced in my life thus far.

Let me be the first to share with you, that the Executive Board has selected Montanna Ewers, a long-time member of the ER editorial team, to be the next Chief Editor. I am confident he has the unique skills and experience to steward the journal to new growth.

Thank you all for the privilege it has been to serve in this role,
Moving forward, looking onward,

Capt Dave Loska
Chief Editor
Exceptional Release Journal
THE VALUE OF
ENSURING THAT OUR
WARFIGHTERS ARE
NEVER ON THEIR OWN.

When mission success is the only option, Northrop Grumman delivers. For over 90 years, we’ve proudly stood shoulder to shoulder with our customers wherever leading-edge thinking was needed. Every day, we’re developing new ways to advance global logistics affordably and effectively, That’s why we’re a leader in innovative logistics solutions.

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While most people may not be familiar with the term ‘Supply Chain Security,’ the Novel Coronavirus 2019 (COVID-19) has provided a harsh introduction to its increasing importance. Governments and businesses have begun taking practical steps to slow the spread of the virus, ease the burden on the public, and support the medical community; however, there are still significant challenges. As COVID-19 continues to spread across the globe, with many businesses and economies shut down, critical supply chains have had to remain operational, posing unique challenges but also providing an opportunity to learn. In an era of power competition where threats to logistics and supply chains are real and the impacts enormous, these lessons learned need to be considered and implemented in order to safeguard the lethality of the Department of Defense (DoD) and bolster the National Defense Strategy.

On December 31, 2019, a pneumonia of unknown cause in Wuhan, China was reported to the World Health Organization Country Office. On April 15, 2020, 106 days later, over 2 million cases of COVID-19 were confirmed with over 129,000 deaths. The world may never know the exact number of cases and deaths as many were unreported. After pandemic declarations and billions of dollars spent, the world is still struggling to contain the virus and recover from the damage.

Beyond the human life costs—economists, traders, and governmental leaders are working to understand the extent of damage COVID-19 will
do to economies, in light of near-total shut down during the pandemic. Eight of the ten worst stock market days ever, happened during COVID-19.\(^2\) Multiple intergovernmental agencies and forums are projecting losses that could extend into the trillions of dollars.\(^3\) Few aspects of life have not been drastically impacted by COVID-19. Millions of people have become unemployed leading to massive impacts socially and economically; however, through all of this turmoil, supply chains keep operating.

**Supply Chain Security**

Supply chain management is defined as the management of goods from the point of origin to consumption. The process of taking wheat from a farm, all the way to the loaf of bread going into a shopping basket is an example of a supply chain. Security, in this regard, is the part of supply chain management that focuses on protecting those goods and processes from disruption\(^4\) and increases resiliency.

The potential impacts of failed supply chain security are so critical that in 2012 the Obama Administration published a national strategy for global supply chain security in an attempt to spur action and unify efforts to tackle the problem.\(^5\) While the impact of this strategy is uncertain at best, its intent was to protect government and business interests from a wide range of risks ranging from natural or man-made threats. Disasters such as typhoons, tsunamis and earthquakes cost companies billions of dollars but man-made issues such as labor strikes and terrorism can damage business just as easily.

Global terrorism against supply chains is a massive issue. In 2017 Maersk, the world’s largest shipping company with a fleet of over 600 container vessels was struck with a ransomware virus that crippled the company for two weeks. In a stroke of luck Maersk was able to restore its operations fairly quickly; however, the attack still cost the company $250-$300 million.\(^6\)

Additionally, human resource issues can threaten supply chains. In 2015, 14,000 longshoremen working at 29 ports on the West Coast went on strike. Those 29 ports move about $1 trillion worth of goods annually. It’s estimated that the strike, that went on for over a week, cost the economy about $2 billion a day.\(^7\)

“The potential impacts of failed supply chain security are so critical that in 2012 the Obama Administration published a national strategy for global supply chain security in an attempt to spur action and unify efforts to tackle the problem.”

“In an era of great power competition, disruption of supply chains can have an enormous effect on the nation’s ability to project power.”
Similarly, nature causes supply chain disruptions, with the potential to stymie corporations and entire economies. The automotive industry in Japan was crippled following the tsunami in 2011, and companies like Subaru were forced to suspend production at certain plants, hurting local economies and strangling shipments for a considerable time.

**COVID-19 and Supply Chain Disruptions**

Impacts of COVID-19 have been seen across almost all supply chains. Military combat readiness has been impacted, disruptions and production line stoppages have occurred at manufacturing facilities, slowdowns in communication and transportation, as well as bare shelves at grocery stores all have made headline stories. Due to the broad, interconnected nature of global supply chains, at every step the possibility for exposure to COVID-19 exists. These impacts to the supply chain are wide-ranging and have a huge impact on governments, militaries, businesses and individuals alike.

Nationwide, the medical community is desperately short on medical supplies to treat critical patients afflicted by COVID-19. In some cases, ventilators are needed in order to sustain breathing for infected individuals facing breathing difficulties. It is estimated that across the world an additional 880,000 ventilators will be needed, 75,000 of those in the United States. Current manufacturers are unable to meet this demand. In a World War II-like move, the Food and Drug Administration (FDA) has approved Ford, General Motors and Tesla to manufacture the needed ventilators. This surge in manufacturing highlights shortages in standard manufacturing capacity and lack of extra supplies to meet increased demand.

Impacts on military readiness can already be felt. For the DoD, it has directly impacted readiness, budget, and the ability to execute the National Defense Strategy. The public firing of the Captain of the USS Theodore Roosevelt, a US Navy aircraft carrier, following a letter pleading for senior leaders to move faster to help his infected crew, highlights the impacts felt by shortages in medical supplies and their effects on DoD readiness. After introduction to the crew, the virus spread rapidly and virtually the entire crew of the carrier was placed into quarantine. The slowed response to the needs of the USS Roosevelt highlight a supply chain that is unable to meet the demand. This inability of medical suppliers and professionals to meet the needs of the sailors has directly impacted DoD readiness and the public perception of the US military.

Long term impacts to military readiness from COVID-19 are also starting to present themselves. The manufacture of the F-35 Lightning II has been delayed and Lockheed Martin is projecting to deliver fewer aircraft than expected in 2020. This disruption, directly attributed to their supply chains, could cost the company up to $375M. Lockheed Martin’s suppliers were unable to deliver due to COVID-19 complications, and F-35 manufacturing lines were impacted. Disruptions such as these may have long term implications on military readiness as fewer aircraft enter service and delays in delivery could impact the Air Force’s and Navy’s ability to project power.

On the business side, public and commercial transportation has either been canceled or severely reduced, thus making it difficult for essential workers to get to their jobs. Most subway and metro services have been cut back and bus lines operating on limited schedules. Commercial airlines are struggling to continue operations with reduced ridership, while the responsibility to protect the safety of crews and
passengers grows. Airlines are accomplishing this by issuing aircrews masks and gloves and have reduced in-flight services. Additionally, the International Air Transportation Association has advised airlines to begin testing travelers for illness before allowing them to fly. Anyone who has flown in the cramped economy section of commercial travel remembers just how many people were pressed within 6 feet of them, so continuing operations as normal is not an option. Airline carriers have taken drastic steps in order to continue to operate, yet struggle to remain fiscally solvent.

Critical hallmark stores such as grocers struggle to maintain stock on shelves while balancing strategies to continue point of sale operations and concurrently reducing risk to employees and consumers. Panic buying of supplies causes stock outages, which forces companies to limit item purchase amounts. Stock outages not only reduce sales, but limiting how much of a specific item can be bought puts the onus of control on the business rather than the individual or community. Additionally, new methods of sale include minimizing touchpoints between customers, employees, and the items they carry in order to reduce risk of exposure. These methods help to increase safety, but further slow sales and throughput while adding costs.

Companies that focus on inventory and home delivery such as Amazon should be thriving, and while their stock prices have significantly risen, time has shown that they are struggling to keep up with the surged demand. Unlike planned surges such as the holiday season, COVID-19 came without much notice. Manufacturing and distribution infrastructure didn’t have enough time to ramp up production, increase supplies, and add temporary workers to help with the additional workload. Furthermore, COVID-19 represents a real threat to those warehouse workers. Workers at more than 50 warehouses (of the over 500 facilities operated by Amazon) have tested positive for COVID-19.

While the CDC says that the risk of contracting COVID-19 through receipt of a package is low, it is possible. Studies have found that the virus can survive for up to 24 hours on cardboard and 2-3 days on plastic. Additionally, it takes an infected person 2-14 days to begin showing symptoms; if they show symptoms at all. It is currently believed that anywhere from 17% to 25% of carriers don’t know they have COVID-19. The potential to spread infections despite no symptoms forces preventative steps to be taken, even if no evidence of infection is present.

The possibility exists that the critical supply chains that are delivering goods, and medical supplies could be one of the vectors of the virus. The warehouse worker could be infecting the delivery driver, who carries the virus out into the world. While businesses and governments continue to work against these challenges and secure the supply chains, there are already lessons that can be learned. The need to be able to execute the National Defense Strategy in great power competition despite challenges to the supply chains grows more critical.

**Lessons Learned and How to Implement**

The National Defense Strategy specifically calls for modernizing of key capabilities and outlines the need for “Resilient and Agile Logistics”. This need calls for logistics to be able to sustain under persistent multi-domain attack. While COVID-19 represents a threat that few could have predicted, the lessons learned and our experiences will help ensure the safety and security of both civilian and DoD personnel in the future.

As the size and scope of the COVID-19 pandemic became better understood, steps (and missteps) were made, in order to protect personnel, equipment, systems, and community, from infection and disruption. While these counter-measure tactics may be specific to countering COVID-19, the principle methods and philosophy of their defense remain sound. It is through these methods that we must understand the results in order to apply best practices, to future threats.

Future challenges may be outside the biological domain. Computer viruses such as those that attacked Maersk threaten governments and businesses daily. Insider threats like those of spies or saboteurs can delay and disrupt production and distribution ensuring that products do not arrive at their destination. Counterfeit products can be as innocuous as purchasing a cheap knockoff, or they could be maliciously placed by a foreign competitor.
to damage equipment or give the competitor a subtle advantage. Counterfeit service providers could gain access to systems in order to read product information, gain intelligence, or launch attacks.

These threats have the potential to delay, disrupt, or even destroy supply chain performance and capabilities. In an era of great power competition, disruption of supply chains can have an enormous effect on the nation’s ability to project power. Learning from COVID-19 teaches us some fundamental lessons for future mitigation:

- **Early Identification and Resolution** – In 106 days, COVID-19 spread to over 2 million people and caused over 129,000 deaths. Early identification and accurate evaluation of threats, whether they are natural or man-made, followed by quick action is crucial. Governments and businesses cannot afford to react to everything; however, failing to react appropriately after identification can be fatal. Dire to any security strategy is early identification and evaluation. Further, timely resolution of the problem will reduce the total resources required before it becomes a global pandemic. Early identification of computer viruses, counterfeit products, or illegitimate vendors help secure the supply chain promptly.

- **Unified Effort** – We must also learn from mistakes. One fault is that as individual states within the United States declared an emergency, cooperation gave way to competition for limited resources. Without a strong guiding hand to equitably balance needs, states began campaigns to secure limited resources for themselves. In order to avoid this within the military, the DoD needs a “Joint Logistics Enterprise Integrator” with the authority to strategically engage government, military and businesses. This integrator would, in turn, equitably balance limited resources between branches, Combatant Commands, other governmental bodies, and international partners. While the Chairman of the Joint Chiefs of Staff is the Global Integrator, the DoD needs a “Logistics Integrator” in the form of a functional Combatant Command. Combining the Defense Logistics Agency and TRANSCOM and designating the TRANSCOM Commander as the Defense Logistics Integrator would provide that unity of effort to ensure cooperation, rather than competition.

- **Better Infrastructure Security** – Steps being taken by transportation companies and grocery stores to isolate and reduce the risk to employees give the next method of increasing supply chain security. High-risk yet critical positions have been identified and businesses activated systems and processes. Identification of critical infrastructure and systems where we can increase security to those key nodes will help to maintain the resiliency of the supply chain. Logistics command and control, drivers, pilots, and information systems, are all critical parts of supply chain infrastructure and all are at risk of compromise unless additional steps are taken.

- **Layered/Redundant Defenses** – In order to protect a supply chain from deep intrusion and corruption, we must take our next lessons from the mistakes of Amazon, the USS Roosevelt, and Maersk. Deep intrusion into the USS Roosevelt and Maersk’s systems effectively shut them down. In order to defend against similar situations, layered and redundant processes and systems are needed. Maersk was saved by a stroke of luck when one of their systems in Africa happened to be offline when the virus struck. The redundant offline system was able to back up the entire enterprise. The USS Roosevelt didn’t have any layered or redundant defenses to COVID-19 and the entire ship’s crew was put on quarantine. In the case of Amazon, every step of the supply chain process can spread the infection, potentially taking the infection deeper into the system. In order to combat this, additional protection measures should be employed at each step with redundant backups. The stroke of luck that saved Maersk gives us one example of how to model these defenses. Every step that has the potential to compromise the supply chain should have steps to rapidly identify, sanitize, and counter disruptions immediately starting with redundant back-ups processes.

- **Invest in Risk Management** – Stock outages at grocery stores and lack of ventilators to treat infected patients are indication of a surge in demand without the supplies or manufacturing capacity to meet that demand. This is a risk
management problem. Having excess supplies or excess capacity is extremely costly when not needed; however, in cases like ventilators, lacking them can lead to a greater death rate. This is something the DoD should watch closely. If the Pentagon wants to protect itself from shortages such as these, not just in medical but in other supply chains too, it needs to continue to invest in new production methods, increase war reserve materials and other long-lead time/slow production items like aircraft parts. Current spending to combat COVID-19 will inevitably have to be paid for in reduced budgets; however, as a DoD and a nation, if we want to preserve lethality, we cannot afford to withhold risk management and sustainment spending.

Conclusion
Supply chain disruptions happen; however, COVID-19 has given the DoD and the world direct insights into the challenges of supply chain security. These challenges not only threaten people and systems, but they risk the nation’s security and the DoD’s ability to execute the National Defense Strategy. In an era of great power competition, and the need for logistics that can sustain under persistent multi-domain attacks, the DoD needs to take a hard look at the lessons from COVID-19 and apply them to improve supply chains’ security.

Without effective supply chains, businesses, governments, societies, and military operations fail. If the supply chain does not work, wheat from the field never becomes bread in a basket. Without spare parts, fuel ships, planes and tanks stand still. Without food or water, people cannot work. Without bullets and bombs, the DoD cannot fight. Without medical supplies, doctors and nurses cannot save lives. Without secure supply chains, the world stops. These five lessons: the need for early identification and resolution, unified effort, better infrastructure security, layered and redundant defenses, and investments in risk management will increase supply chain security and better prepare the DoD and the nation to counter present and future threats to logistics and supply chains.

“These five lessons: the need for early identification and resolution, unified effort, better infrastructure security, layered and redundant defenses, and investments in risk management will increase supply chain security and better prepare the DoD and the nation to counter present and future threats to logistics and supply chains.

ABOUT THE AUTHOR
Maj McLean is a career Logistics Readiness Officer currently assigned to the Defense Logistics Agency with an upcoming assignment to attend the Advanced Study of Air Mobility (ASAM) Course. He was commissioned through Texas Tech University in 2008 and has a Masters of Science in Supply Chain Management from Syracuse University. Prior to this assignment, he was the Executive Officer of the 635th Supply Chain Operations Wing and has served as a Squadron Director of Operations, Flight Commander, Installation Deployment Officer, African Air Advisor, and Combat Advisor.
References


Air Force Senior Airman Zachary Anderson and Staff Sgt. Michael Zitelli perform a basic post-flight operations inspection on a C-17 Globemaster III while wearing personal protective equipment at the Pittsburgh International Airport Air Reserve Station, April 7, 2020. Photo By: Joshua Seybert, Air Force
We have a saying here in the 377th Logistics Readiness Squadron (LRS): “It’s not enough to be good at the mission, we want you to be good at life.” Intentionally cultivated, this mindset enables our logistic leaders and teams to successfully perform no matter the circumstance. During this pandemic, the great men and women of the 377 LRS consistently demonstrate benchmark installation support through innovation and adaptation. They incorporated many incredible benchmarks from fellow LRSs, industry best practices, and communication technologies to ensure Sustinendum Victorium (Victory through Sustainment), mission assurance for Team Kirtland, and continued growth of camaraderie and connectedness. The spotlighted areas include Ground Transportation (GT), Traffic Management (TMO), Vehicle Management (VM), and an internal operational approach. (Figure 1)

Cultivating a unit with an ability to adapt at a moment’s notice does not happen overnight. It takes months of preparation, conversation, and teaching within the topics of strategic foresight and risk mitigation. To this end, the GT team has proven one of the installation’s most valuable assets during the pandemic response. Handpicked to receive and distribute over $100K of supplies, the GT team planned support to over 100 mission partners and 23,000 personnel within 48 hours. To streamline the delivery and staging process, the GT team utilized the Theory of Constraints to quantify an optimal work in progress (WIP) and throughput. Implementing best practices from food banks and relief centers, the
GT team designed standardized boxes of supplies to meet either short-term or long-term demands. Following additional best practices from Home Depot and Chick-fil-A, the team created a no-hassle drive-through distribution point that allowed for a no-contact delivery. To date, the team has successfully distributed over 162,000 disinfectant wipes, 15,100 ounces of hand sanitizer, 500 rolls of paper towels, and 230 spray bottles of disinfectant.

The TMO at Kirtland AFB adapted to a COVID-19 contested environment with precise timing and teamwork. TMO Airmen collaborated with the 377th Medical Group to devise a quarantine system for inbound cargo ranging from 24 to 72 hours. As the logistics experts for the base, the 377 LRS drafted an Installation Commander Directive with guidance and procedures regarding the receipt and distribution of goods and services. This effort safeguarded installation personnel from potential contagion on or within the packaging and standardized the approach to last-mile

**Figure 1. 377 LRS Operational Approach to COVID-19 with three Lines of Effort**
delivery. To meet mission requirements of three wings and five MAJCOMs, TMO strategically rotated four two-person teams to ensure redundancy and effective communication without any transportation discrepancies. To posture for inevitable recovery operations, TMO tested and verified its ability to clear any backlog with a two-day surge once a month.

As an additional connection point for the installation, the 377 LRS VM team underwent significant personnel and process adjustments to sustain, and then exceed, mission capable (MC) rates and mission essential levels (MEL). As the installation’s response measures unfolded, a visible decrease in vehicle usage, accidents and unscheduled maintenance occurred. After analyzing the resulting WIP and throughput, the VM team implemented a weekly, split team schedule with an optimal mix of general and specialized maintenance. These adjustments enabled the fleet to reach a 94% MC rate, (6% improvement and the highest in 15 months) and benchmarks in MEL sustainment. To ensure a COVID-free vehicle posture, the Customer Service section implemented strict protocols to disinfect every vehicle touchpoint at every changeover in the chain of custody and educated all unit Vehicle Control Officers on proper vehicle cleaning procedures.

Perhaps most importantly, the 377 LRS used this time to foster strategic connection and reinforce teamwork. Utilizing social media technology, the squadron holds weekly professional development events and “all calls” with Airmen and families, monthly resiliency small groups, and “growth challenges” in physical fitness and education. The 377 LRS also teamed with its New Mexico teammates (27 LRS and 49 LRS) for an Officer Professional Development on “Leadership during a Pandemic” and virtual roadshow with the Air Force Personnel Center (AFPC). Finally, our strong squadron Spouse Group used creativity and just a couple of sewing machines to support our Airmen. LRS cardholders teamed with the spouses to procure the necessary materials and mass-produced over 200 face cloth coverings within 75 hours.

The Air Force places many demanding tasks on our logisticians that may sometimes go unnoticed. However, in times like these, we see that crisis breeds transparency. Logisticians around the globe have responded to this challenge with a united display of character, expertise and dedication to the mission. We hope this article helps highlight the efforts of all logisticians and our collective ability to adapt, succeed, and prevail. Finally, from us to you, “Day or night, we bring the fight!”
77 LRS’ Process to Assemble the Standardized Boxes of Supplies

27 LRS, 49 LRS and AFPC team meet on Zoom for Officer Professional Development 23 Apr 2020

ABOUT THE AUTHORS

Officers of the 377th Logistics Readiness Squadron: 2LT Jeremy Gaudlitz, 2LT Joshua S. O’Donnell, 2LT Jessica Graham, 1Lt Max Brown-Bass, Capt Jamal Alford and Lt Col Dan McGuire
I was nine years old watching cartoons with my two older brothers when my dad barked those two infamous words: “Family Meeting!” The hair on our necks jolted to the position of attention. We were old enough to know this meant one of us—probably me—hadn’t picked up our dirty socks... again. Or we had eaten all my dad’s Lucky Charms... again. It was neither. No, it was much worse. With a smirk on his face my dad exclaimed, “Christmas is cancelled.” We gasped and our jaws locked in place as our adolescent brains tried to process the gravity of the proclamation. You may be thinking, “There are not enough dirty socks in the world to be left on the floor and not enough Lucky Charms to be eaten for a father to cancel Christmas!” As our tear ducts began to churn, my father continued, “Well, not canceled, but it’s going to look a bit different this year. We are taking a trip.”

In August of 2005, Hurricane Katrina devastated Louisiana. It claimed over 1200 lives, and thousands of others were without electricity, running water, or homes. Houses that weren’t destroyed were filled with several feet of mud and debris. My dad, a man of deep compassion and a heart for serving others, felt compelled to do something.

Our ears perked up with hints of hope as we subdued our initial thoughts of dread and dismay. I immediately began to run through the potential destinations; would it be Disney World, maybe a cruise, or maybe even an African safari? I was wrong on all accounts. “We are heading to Louisiana and are going to spend the week cleaning houses.” This family meeting was a roller coaster ride of emotions.

In August of 2005, Hurricane Katrina devastated Louisiana. It claimed over 1200 lives, and thousands of others were without electricity, running water, or homes. Houses that weren’t destroyed were filled with several feet of mud and debris. My dad, a man of deep compassion and a heart for serving others, felt compelled to do something.

Leader’s Love: Transforming Crisis into Opportunity in the Wake of COVID-19

By: 1Lt David Lane

Image Above: Tech. Sgt. Veryon Moore, 62nd Aircraft Maintenance Squadron (AMXS) integrated flight control systems craftsman; Senior Airman Tyler DiNoto, 62nd AMXS integrated flight control systems journeyman, front right; and Staff Sgt. Bertrand Foley, 62nd AMXS communication, navigation and mission systems craftsman, move a generator away from a C-17 Globemaster III at Joint Base Lewis-McChord, Wash., April 14, 2020. Airmen wear protective masks to protect themselves and others from the spread of COVID-19 while continuing to perform their duties. (U.S. Air Force photo by Senior Airman Tryphena Mayhugh)
The family meeting continued with my dad explaining the situation down south: families that wouldn’t spend Christmas in their own homes and kids that wouldn’t wake up to presents under the tree. He said we, as a family, were going to spend the week of Christmas helping storm-devastated families clean out their homes. It didn’t take long for us to get excited about this prospect, and we began to tell our friends at school. Those friends then told their parents. Before my dad knew it, he was leading over 40 members from our community on a trip to serve the affected population in Louisiana. The trip was so successful, he led a second trip over spring break, and over 60 people from our community joined in the adventure.

I don’t claim to be an expert on leadership; I’m still a lieutenant trying to figure out how to earn the salute of the enlisted men and women who have been serving since I was in diapers. However, in my short experience, I’ve come to believe all the conventional leadership traits, so many experts contend are critical to success pale in comparison to this one: love. Before you begin with the sighs, I don’t mean the romantic buy-the-girl-chocolate-on-Valentine’s-Day love or the “I love pizza” kind of love (although both are important in their own way).

Rather, I mean the type of love that sees clearly and responds effectively. The type of love that empathizes with the plight of others and selflessly reacts with pragmatic service. The type of love that uses discipline—not as an excuse to assert power, but as a tool to guide another toward a more gratifying and fruitful life—because their inherent worth is what fuels your genuine concern for them. The type of love that sacrifices your present happiness for others’ future joy. The type of love that can envision what ought to be, then communicate and implement strategies to get there. The type of love that is contagious and spreads through a community like wildfire. This is the type of love my father demonstrated in that infamous family meeting, and this is the type of love the military ought to cultivate in its leaders. My father saw a need in the wreckage of a hurricane, and he used it as an opportunity to love his kids and community by showing them the joy that comes from sacrificial service and selfless compassion. Love may not always look or feel good at first. In fact, it may look like having to tell your kids that Christmas is canceled. But love genuinely desires the best for all involved without concern for one’s own interests; after all, my dad sacrificed his own Christmas break, too.

The COVID-19 pandemic has given the military its most ironic enemy: an invisible nemesis that can’t be killed by bombs and bullets but by seclusion and sanitation. It’s a crisis of purpose; the military wants nothing more than to jump into action and attack. Yes, there is plenty of contingency planning and logistical work that can be done and is being done, but for a large majority of the fighting force this enemy is teaching us a new lesson; slow down, rest, and love our people in new and meaningful ways. In the wake of the pandemic, the critical question becomes “How do we transform a crisis into an opportunity to reassess our organizational priorities and processes to become a more effective fighting force?” I’d argue the answer starts with investing in our people by loving them.

In the Air Force, we’re afraid to use the word love except when declaring our feelings for family days, deadline extensions, and coffee. What would happen if we began loving our people in the truest sense of the word?

Let’s reclaim love’s meaning and make it the new standard—because we are called to be leaders, and leaders do love.

ABOUT THE AUTHOR

Lt David Lane is a Logistics Readiness Officer stationed at MacDill AFB. He currently serves as the Distribution Flight Commander for the 6th Logistics Readiness Squadron, directing the distribution of cargo, passengers and personal property for 2 Wings, 2 Combatant Commands and 52 Coalition Partners. His leadership efforts for his flight of 100+ military and civilian personnel are integral to supporting 24 KC-135’s valued at $1 billion and their mission to provide unmatched air refueling capabilities for the Department of Defense.
In February 2020, the 20th Fighter Wing (20 FW) and 20th Maintenance Group (20 MXG) at Shaw AFB made a historic move by separating the previous 20th Aircraft Maintenance Squadron (20 AMXS) into three independent Fighter Generation Squadrons (FGS). The former 20 AMXS was home to almost one thousand maintainers commanded by Lt Col Anthony Bryant leading and managing all aspects of training and equipping a squadron while ensuring three Aircraft Maintenance Units (AMUs) were fully supporting three independent Fighter Squadrons (FS).

Each subordinate AMU was elevated to a squadron with a Major assuming command of each – 55 FGS led by Maj Stephanie July, 77 FGS led by Maj Claire Vazquez, and 79 FGS led by Maj Evin Greensfelder. The reorganization’s main objective was to create a more lethal and combat-ready fleet by flattening the organizational structure to create squadrons of a more manageable size (approximately 300 personnel each). Col Hall Sebren, 20 MXG Commander, envisioned separate FGSs while deployed to Balad Air Base as an AMXS Commander in 2010. His squadron was roughly 800 personnel between six AMUs, “There was no way I could know everything in terms of people and production.” Col Sebren foresaw that this concept could essentially be translated to any MDS when implemented. For the fighter community, the idea is the entire unit deploys and moves forward, remains until the work is complete, and then returns home. This change ensures the commander at home is the same commander while deployed.

Image Above: 378th Expeditionary Operations Group conducts integrated combat turns for effectiveness: Airmen assigned to the 378th Expeditionary Operations Group conduct an integrated combat turn to test their capability to rapidly land, refuel, weapons reload and take off at Prince Sultan Air Base, Saudi Arabia, July 3, 2020. The integrated combat turn allows the fighter jet to spend less time on the ground and more time in combat operations. (U.S. Air Force photo by Master Sgt Benjamin Wiseman)
Col Sebren broached the idea of separating 20 AMXS to Col Derek O’Malley, 20 FW Commander, in early December 2019, and the idea quickly became a reality after it was approved by General James M. Holmes, Commander of Air Combat Command in early January 2020. The separation concept was clear-cut, easy to articulate to masses, and would inevitably give squadron commanders the one thing they all wanted and want more of – time. Time to focus on people AND production.

Lt Col Anthony Bryant, former 20 AMXS Commander, endorsed the split from the very beginning stages of planning,

“Moving to a Fighter Generation Squadron was about putting the mission and Airmen first! Having 300 members versus one 1,000 allows the commander to better understand the challenges associated with our #1 resource...Airmen! This will allow them to make informed decisions in preparing them to execute the mission.”

The FGS organizational structure gives commanders more oversight of production efforts and drives overall squadron deployment readiness. “I want this to pick-up and go to someplace we have never been and be able to operate without an MXG structure, so the [FGS] commander becomes that ‘mini MXG’ in [a] deployed environment,” stated Col Sebren, "If [commanders are] only thinking of it in terms of how you [operate] at home you are not thinking about it correctly,” he added. FGS commanders will deploy with their squadrons paired with their respective FS. (See Figure 1). In this way, pilots can focus on their mission, and maintainers can focus on their mission. If the Air Force adopts this concept, we could also eliminate some standing AMXS/MXS tours, which will also help reduce the overall deployment burden the maintenance community balances.

Figure 1: 377 LRS Operational Approach to COVID-19 with three Lines of Effort
Maj Claire Vazquez, 77 FGS Commander, stated, "As our FGS is next-in-line to deploy, going as a squadron vs. an AMU or flight will pay dividends. FSs deploy as a complete package, and we’re mirroring their efforts – having the commander accompany the unit ensures you have a commander and staff at the location where their unit’s primary mission is occurring, and furthermore that commander already knows their people, processes, and [limitations]. There’s no gap in communication and action when it comes to either maintenance or personnel issues, when previously the deployed and home station commanders would be coordinating across multiple geographic areas and time zones."

Each new FGS commander has the appropriate experience and authority to manage his/her own manning, fight for critical equipment resources, strengthen the relationship between operations and maintenance, better care for Flightline Airmen, and oversee daily production efforts. The reorganization did not induce additional manpower or resources and converted the traditional Officer-in-Charge (OIC) position to mimic that of the FS counterparts. (See Figure 2) AMU OICs were promoted to Directors of Operations (DOs) and only focus on sortie generation. The internal organization remained unchanged across all three squadrons after the separation.

"We are used to running 250-person AMUs as ‘just’ a Captain job, when most other types of functions in the Air Force that’s actually a squadron," stated 20 MXG Deputy Commander, Lt Col Stacey Ferguson. With maintenance organizations typically being the largest squadrons in a flying wing, a smaller squadron allows the commander valuable “face time” and fostering relationships with Airmen of all ranks that perhaps was not possible for a commander leading a squadron with upwards of one thousand personnel.

Col Sebren’s concept to reorganize the traditional fighter AMXS was influenced primarily by former Air Force Chief of Staff, General John Jumper’s philosophy that the Air Force needs to, “Go back to what we are good at – which is flying and fixing” and liberating maintenance commanders from the administrative burden that inherently stems from simply being too large.

The reorganization’s main objective was to create a more lethal and combat-ready fleet by flattening the organizational structure to create squadrons of a more manageable size ...

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Figure 2

55th Fighter Generation Squadron Leadership Example

Key: New Position | Old Position Used
FGS commanders physically reside in the squadron building, whereas the previous squadron commander’s office was located in a central hangar between all three AMUs, limiting his/her overall access. FGS commanders not only have the bandwidth to be involved in production decision making but have more time to interact with Airmen on the flightline and gain a better understanding of daily challenges, limitations, and resource holes maintainers contend with to accomplish the mission. (See Figure 3)

55 FGS Commander, Maj Stephanie July stated, “Residing in the same building as the Airmen has given more light to the issues they face in regards to manning, resources and personnel issues. There is an inherent connection that occurs when leadership is visible and accessible. As the previous

20 AMXS Director of Operations, I knew there were areas for improvement, but my time was split between the production efforts for three AMUs. Sitting in the seat as an FGS commander, I am seeing how much more attention and focus the squadron leadership team has to address these concerns and resolve issues.”

The 20 MXG’s vision is straightforward: keep it simple. Simplify the organizational structure to give a voice to every Airman and the means to be heard so that maintainers can focus on what they are good at – producing sorties. Decreasing the overall size of a squadron will intrinsically allow commanders to not only take care of people better but identify their problem areas and fight for appropriate resources, in turn ensuring our overall combat readiness is our number one priority always.

Figure 3
Our world is an ever-evolving, profoundly complex place; change in life, or business, is a veritable certainty. Just as susceptible to organizational change, the United States Air Force works to remain on the cutting edge of technology by constantly exploring new and innovative means to accomplish our mission. Our adversaries prowl tirelessly for any advantage they can muster, and we must do the same. On occasion, the most profound advantages arise not from new technology, but from something as unassuming as an innovative process management philosophy. The 92nd and 141st Maintenance Groups at Fairchild AFB recently navigated a process in which radical change proved vital to mission success; the only other alternative was mission failure.

Fairchild AFB faced a massive consolidation of a majority of the Air Force’s active-duty KC-135 fleet, bringing the number of aircraft assigned from 44 to 63 tails in just eight months – creating a burning platform. For the Total Force maintainers at Fairchild, this meant the old ways of generating sorties and accomplishing scheduled maintenance were no longer effective. This new reality manifested itself most apparently in the periodic inspection (PE) dock.

Historically, the Fairchild AFB PE dock completed an average of 14 inspections annually, each lasting an average of 52 calendar days under a traditional five-days-per-week legacy construct with two eight-hour shifts per day. Although this pace sufficiently maintained the operations of a 44-aircraft fleet,
there were significant inefficiencies in process management. With the increase to 63 total assigned aircraft, the PE inspection schedule forecasted 19 inspections in FY20 and 30 inspections in FY21. The legacy construct could not keep pace with the required inspections and would, in essence, result in one of two scenarios: greatly increase worker production by extending shifts or grounding aircraft for overdue PE inspections. Leadership at all levels considered neither option palatable nor acceptable – the process had to change.

In the fall of 2018, with the situational urgency firmly fixed and understood, the PE inspection dock completed a value stream mapping event to diagram the entirety of the inspection process. Perhaps most important to the effort was the composition of the team charged with charting the new process. Our group comprised a Total Force Integrated (TFI) collection of all ranks, skill levels, and affected maintenance specialties. The team’s diversity, supported by the creative freedom afforded by Group leadership, was arguably the most crucial component to the success of the endeavor. Using the Air Force Sustainment Center’s “Art of the Possible” process as a guide, we created a streamlined flow for each section and broke it down into four distinct phases. The new process yielded tremendous results during the first three months; our team successfully executed the new inspection flow three times, achieving an average of 32 calendar days per inspection. Though a noteworthy improvement, there was still much work to be done.

While our TFI team labored on the initial revamp of the KC-135 PE process, Headquarters Air Force (HAF) teamed up with Goldratt Consulting to visit, analyze, overhaul, and ultimately implement the Theory of Constraints (TOC) principles at a number of Air Force bases across the country. As the preeminent TOC consulting firm in the nation, Goldratt Consulting is named after the godfather of TOC, Dr. Eli Goldratt. TOC is a methodology for identifying the most significant limiting factors (i.e., constraints) preventing the achievement of a goal and then systematically eliminating the constraints until they are no longer the limiting factors.1 The burning platform of additional aircraft and criticality of the tanker mission created a rich target for application at the field level, and HAF named Fairchild AFB as the first testbed for TOC implementation.

Partnered with proven industry leaders from Goldratt Consulting, Fairchild’s team re-chartered an event that examined the PE inspection process through the lens of TOC methodology. The overarching directive was straightforward: allocate required resources to all individual tasks and only concurrently work what your resources allow. In simplest terms, it is more efficient to throw your full weight behind a finite number of tasks and work each consecutively, than to spread your resources thin and attempt to work them all simultaneously. The most significant difference between previous process improvement efforts and this new TOC event was the lenses of Little’s Law, resource pooling, and aggressive scheduling with buffers.
Before changes can be implemented, the authentic work requirement must be determined, which proved reasonably simple. The requirement is calculated using a basic equation called Little’s Law. Little’s Law is comprised of only three variables: work-in-process (WIP), throughput, and lead time. WIP is the average number of aircraft undergoing inspection at any given time; throughput is the average rate at which aircraft enter the inspection dock, and lead time is the average time an aircraft spends in the inspection dock. The terms relate to one another inside the equation WIP = throughput x lead time.

Our resources only effectively allowed the PE dock to conduct one aircraft inspection at a time (WIP = 1). Throughput was a known and easily determined value based on a calendar-day and schedule. Calculating the throughput with a 365-day calendar produced a calendar day limit per aircraft. Knowing our parameters and the requirement for 19 inspections in FY20, we determined throughput to be 19 calendar days (throughput = one aircraft entering inspection every 19 calendar days). Applying Little’s Law to these known values resulted in a lead time of 19 calendar days. Furthermore, the team determined there needed to be at least one reconstitution day between inspections. Accounting for this additional day generated our ultimate advertised goal of 18 calendar days.

The application of resource pooling, specifically referring to manpower, yielded three distinct team concepts. First, the “core” team is comprised of personnel dedicated and assigned to specified inspection areas who continually work critical path inspection items (i.e., those inspection items that, if delayed, would delay the entire process). Second, the “floaters” teams are personnel focused on lagging areas or constraints within the process, whenever and wherever they may be found. Third, the “full kit” teams manage the administration of the process to include Maintenance Information System (MIS) documentation, tool accountability and checkout, and bench stock and parts delivery. The “full kit” teams allow the “core” team members to remain working in their areas without leaving the aircraft in search of parts, tools, and other support.

Our improvement efforts also optimized these teams by scheduling personnel shifts with the goal of more effective resource pooling. The legacy inspection process was organized around a standard five-day workweek with an eight-hour shift each day. The PE dock initially operated both a day and a swing shift, which produced 16 hours of scheduled work time daily. However, due to skill level shortages, specifically in qualified 7-level technicians, all personnel were consolidated onto one shift. This manifested itself in a scheduled four-day work week with ten-hour days. This solution offered three effects: it consolidated critical skills onto one shift where they could be more flexibly applied to constraints or lagging areas; it provided increased momentum throughout the workday, as well as increased hands-on maintenance time over the course of the PE inspection; and it aligned the active duty and Air National Guard duty schedules.

"The final improvement technique proved the most difficult to implement: aggressive scheduling with buffers."
The final improvement technique proved the most difficult to implement: aggressive scheduling with buffers. It required a rigorous contraction of all four phases of the process into a 18 calendar day construct, achieved by eliminating waste in a variety of forms, not by asking Airmen to work faster or less safely. The compressed process flow encapsulated the inspection within the 18 calendar day objective, ensuring the ability to accomplish the required 19 PE inspections per year.

The continual rigor applied to the planning event gave birth to a four-phased process flow. The first phase, “Pre-Check,” was allotted one workday, while the second phase, “Inspection,” was allocated two days with an additional buffer day. The third and longest phase, “Fix,” was mapped at four days with an additional two-day buffer. The final phase, “Backline,” was allotted one day with no buffer. The event surprisingly kindled an entirely novel way of thinking about aircraft maintenance. It shattered the long-held belief that all tasks must be worked simultaneously, even at the risk of thinning out resources. Instead, when efficiency and speed are at a premium, a better tactic is to focus resources for maximum effect by only working what can be adequately resourced. Once complete, resources may be shifted to the next task in the flow (Figure 1).

"The best process in the world, if not followed, is as useful as no process at all."
The results of our first proof-of-concept inspection were astounding. The teams completed the totality of the PE inspection in 22 calendar days (Figure 2), a new all-time low, and 31% better than the previous 32-day average. The “Inspection” phase alone was completed within the two-day schedule, a 38% reduction in inspection time as compared to previous averages. There were also substantial qualitative benefits. The introduction of the new shift schedule and the ability to forecast daily requirements via the process flow resulted in an increase in the Airmen’s morale and an increased capacity to train our newest Airmen. This morale boost then produced positive effects on the execution of the PE inspection, ultimately yielding a better product to the flight line maintainer and the aircrews. Most importantly, the proof-of-concept inspection provided leadership with concrete data as to why the team had not yet met the 18 calendar day goal. It revealed previously undiagnosed constraints, which could be addressed and avoided during subsequent iterations, facilitating a steady march towards the 18 calendar-day goals.

Though confidence is high that we have averted the crisis in FY20, formidable obstacles still loom just over the horizon. The FY21 PE inspection forecast of 30 aircraft presents our next challenge. Now our leadership can more accurately understand our resource requirements, from parts to manpower, via subsequent PE inspections under the TOC construct. Armed with this data, and assuming resources remain steady, we can calculate our maximum annual throughput; this allows us to better understand the gap between maximum throughput and the 30 aircraft-inspection requirements. This analysis provides their leadership with actionable information to be used for acquiring additional resources and petitioning for increasing manpower authorizations if required.

As part of the newly developed TOC-based process, standardization is a prime directive. Bringing the process to maturity means continued metrics tracking, understanding the constraints and effective countermeasures, and creating easily understood and repeatable processes. Standardization also requires that we build quality into the current process. Focusing on technician job knowledge, skill, and proficiency drives quality into the PE inspection process. This is where the 141st Maintenance Group offers extraordinary value. Our experienced ANG partners provide practical process insights, thorough quality samplings, and assistance in alleviating the training demand by working directly with our newest Airmen. Ultimately, standardization not only solidifies the process to achieve the desired results but also

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**Figure 2**

<table>
<thead>
<tr>
<th>PE Inspection Results</th>
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<tbody>
<tr>
<td><strong>Pre-Check</strong></td>
</tr>
<tr>
<td>Baseline</td>
</tr>
<tr>
<td>First Revamp</td>
</tr>
<tr>
<td>TOC Target</td>
</tr>
<tr>
<td>TOC Actual (9 Total)</td>
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ensures a survivable process that will endure beyond the current workforce and leadership. The application of these critical lessons learned will prove vital to process normalization.

Each lesson we have learned over the course of this journey serves as a guidepost, navigating us towards a mature process capable of achieving our goals. We deem three specific ideas foundational to the realization of this construct – leadership involvement, process integrity, and creativity. All three components work together harmoniously to create the most effective, efficient process possible. The absence of any single principle ripples through the entire organization and inhibits an organization from meeting its goals.

Leadership involvement throughout the TOC construct renders leadership to a truly supporting role. A vast majority of the work necessary to create the process is accomplished by those responsible for execution – the Airmen and Noncommissioned Officers. Leadership exists as an accountability tool and a driving force, monitoring progress, and milestones to ensure that the process outcomes meet designed intent. Their involvement must not be overbearing but instead must afford the team significant autonomy and flexibility to make process-related decisions without a cumbersome approval process.

The fear in any work center is the survivability of newly implemented initiatives beyond current leadership. As a leader rotates to a new assignment, with them often go the programs and initiatives, they created during their tenure. However, the grassroots nature of the TOC process enables processes to not only survive current leadership but continue to thrive. I served as the Maintenance Flight Commander for over a year and was concerned that as I rotated to a new position, the process would falter. Much to my relief, the PE dock team continued refining and improving the process, far beyond what I had hoped. Their efforts yielded a comprehensive “playbook” to export to other maintenance communities throughout the Air Force.

The essence of process integrity is remaining true to the collaborative work of the team. The best process in the world, if not followed, is as useful as no process at all. The team’s ability to adhere to the process is a direct reflection of their confidence in it. Meticulous planning builds that confidence. Task by task, section by section, subject matter experts determines the entire course of the flow, de-conflicting every possible constraint from the pre-check to backline phases. This work gives every Airman on the floor ownership over their individual tasks, not because the process was imposed upon them, but because they determined their own sequences and priorities. This course has been theirs to chart, and they require less and less leadership involvement over time.

The beauty of TOC methodology lies in its flexible application. Existing simply as a math problem, derived from Little’s Law, the requirements are also easily deduced. Whether applied in the maintenance complex or a deployment processing line, TOC is equally suited for both the

"Bringing the process to maturity means continued metrics tracking, understanding the constraints and effective countermeasures, and creating easily understood and repeatable processes."

"I also believe in the creative power of our Airmen... our job as leadership is to elicit those solutions by giving them the encouragement, freedom, and flexibility to succeed, even at the risk of occasional failure."
maintainer and logistician. Anywhere a process exists, TOC can markedly improve throughput.

Creativity remains the hallmark of the Fairchild TOC process. Though published guidance was a consideration during implementation, our leadership afforded us the freedom to explore alternative methods—almost every facet of the TOC process bucks against the maintenance community’s cultural norms. From shift schedules to resource pooling, all creative solutions began as ideas with their own perceived risks and benefits. Several creative ideas did not make the cut, either because they assumed too much risk or they did not boost efficiency and effectiveness. Furthermore, creative ideas from those nearest the process – the Airmen – are often the most effective. Their experience with the tactical execution of the PE inspection provided the bedrock from which the team fostered better ideas.

Being tasked and trusted to lead this effort has been a highpoint in my career. Although I served as a Senior Noncommissioned Officer with 12 years as an enlisted maintainer, none of that time quite prepared me for the challenge of implementing a brand new PE inspection process. I am grateful to have had the chance to work with a team of incredibly professional, creative, and devoted Airmen. I believe in this process and the TOC methodology because I have personally witnessed the improvements. I also believe in the creative power of our Airmen. They generate solutions for the tactical problems we encounter; our job as leadership is to elicit those solutions by giving them the encouragement, freedom, and flexibility to succeed, even at the risk of occasional failure.

As I prepare to transition to my next duty station, I reflect on this experience. The increased demand for PE inspections in the coming years drove a remarkable process transformation. Although many things have changed in the PE dock in the last year, and personnel is still adjusting to the new way of business, one element has remained constant: the Airmen’s willingness and enthusiasm to accomplish the mission. I remain amazed and pleased at the progress they have made, and am humbled to have been a part of the journey. Through the ingenuity of our TFI Airmen, we have beaten the odds and emerged ready to tackle tomorrow’s challenges head-on. The PE Inspection TOC process stands as a testament to the Airmen who execute it.

References:
2. [https://www.process.st/littles-law/](https://www.process.st/littles-law/) (Little’s Law)
Armed and Tested

ARL
Advanced Rail Launcher

AAP
Air-to-Air Pylon

AGP
Air-to-Ground Pylon

Weapons Bay Adapters

MTS-3060A™
SmartCan Gen 2
Universal O-Level Armament Tester
for Smart & Legacy Systems

MTS-235
F-35 Alternate Mission Equipment Test Set

MT1888 Series
Eye-Safe Laser Target Simulator

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During your workday, have you ever asked yourself, why do we do - what we do - in the way that we do it? Oftentimes, it is these questions that spark a search into technologies that can make our processes different, better, and/or more efficient.

Background:
As a mobility pilot, I had frequent interactions with maintainers as we worked through aircraft issues. I was often told by the maintainer that the duration of the repair was parts + xx minutes, and then they would drive away from the airplane. Sometime later, they would reappear with the parts and begin the repair. It was like the ‘parts’ piece of the equation was behind a curtain that I did not fully understand. What I did understand was there was a lot of manpower in the number of maintainers and aircrew waiting for those parts. I also kept hearing about and reading articles that the maintenance career field was losing the more experienced personnel at a high rate (Losey S., 2019), and this loss of experience was plaguing the A.F. fleet-wide mission capable rate—which is currently at 70.27% (Everstine, 2020). These issues made me think that we need a different way to get parts out to the aircraft to make a maintainer’s work more streamlined. We need maintainers to perform tasks they were trained to do and minimize the time everyone was waiting for consumable parts. With a more streamlined process, the mission-capable rates could increase, and the overall national security could improve. As the 2018 Summary of the
National Defense Strategy warns, we are currently living in a more complex and volatile global security environment than we ever have (Mattis, 2018). China, Russia, North Korea, Iran, and non-state terrorist groups are all named as threatening peace and security (Mattis, 2018). The USAF needs to be ready to face these threats by streamlining even seemingly simple processes.

**Autonomous Rovers: A Solution**

Although there are many possible methods to improve the efficiency and effectiveness of maintainers, autonomous rovers are a relatively new solution to aid undermanned maintainers and to increase aircraft mission-capable rates. Industry partners across the U.S. have incorporated the use of autonomous rovers to streamline processes like transporting packages, meals, and groceries, to tackle the time-intensive ‘last mile’ of delivery (Glaser, 2017). Amazon’s Scout, Marble’s temperature-controlled rover, Starship Technologies’ 6-wheeled rover, and Maren-Go’s all-terrain vehicle are all current examples of autonomous rovers fulfilling the delivery role. Starship Technologies, as seen in Figure 1, is tackling the food delivery market with its six-wheeled rover, which travels four mph with a radius of three to four miles (Hawkins, 2019). Their rovers navigate sidewalks around college campuses such as George Mason University, Northern Arizona University, University of Pittsburgh, and Purdue University (Hawkins, 2019). The rovers successfully scale curbs to deliver food, groceries, and packages weighing up to 20 pounds (Hawkins, 2019). Additionally, Maren-Go’s autonomous rover, Figure 2, can carry a payload of up to 340 lbs (Thobaben, 2020).

The best part is the ordering, which is through an app. The user selects the meal or item they want from a restaurant of their choosing. Then the rover goes to the restaurant and gets loaded with the meal. Once loaded, the rover’s lid locks, and then starts traveling towards the user. The user is updated on the status and location of the rover and is provided a unique code to unlock the rover at the rendezvous point.

Now let’s change the location from an American college campus to a USAF flight line. The maintainer determines they need a tool or part for the aircraft they are servicing. They place an order through the app, which is received at the Consolidated Tool Counter (CTK) or the supply/parts location. The CTK or supply location personnel call a rover to their site, gather the tools or supplies, and then load the rover. The maintainer is updated when the tools or parts are en route to the aircraft’s parking spot and goes to meet the rover parked outside the aircraft. The app provides the maintainer a unique code to open the rover, thus checking out the tools or parts to that individual and maintaining accountability. What a solution! The time it takes the Expediter to ferry the individual from the aircraft to get tools or parts is replaced with a technology that can do the mundane but necessary tasks.

How many Expediter hours or miles can be saved using the rover? Theory of Constraints talks of exploiting the bottleneck in the system. A spaghetti diagram taken of the Expediter’s route about the airfield can be seen in Figure 3. The Expediter drove 158 miles per 24 hour period. The utilization, or rate that the Expediter was actively transporting a maintainer, tool, or part, and the miles driven are displayed in Table 1.

<table>
<thead>
<tr>
<th>Aircraft Serviced</th>
<th>Percentage of 24-Hours Spent Driving</th>
<th>Equates to Hours Driving</th>
<th>Average Miles per 24-Hour Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>KC-10</td>
<td>43.8%</td>
<td>10.5</td>
<td>158 miles</td>
</tr>
<tr>
<td>C-17</td>
<td>35.0%</td>
<td>8.4</td>
<td>90 miles</td>
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</table>
The main constraint in the process is the Expediter and the multiple trips to the CTK and parts location. A model built using the Simio program, Simulation Modeling framework based on Intelligent Objects (Simio, 2020), ran multiple simulations of the process augmented with rovers. When a rover is added to the model, in order to replace the trips to get tools and parts, not only does it reduce the Expediter’s driving time by 7.2 hours in every 24-hour period, but the miles driven are reduced 69.7%. This equates to an annual savings of 2,628 hours and a savings of 39,201 fewer miles driven, as seen in Table 2. Depending on the model, the rover delivers the item in a minimum of 11 minutes, an average of 11.4 to 23 minutes, and a maximum of 29 minutes.

**Return on Investment:**

There are several costs associated with the Expediter. One cost is the Expediter’s time in an hourly wage, and the other cost is the vehicle’s operating expenses. Using the rover to augment the Expediter, there is a decrease in both the Expediter’s hours transporting and the total distance driven by the vehicle.

At an average hourly rate for a USAF aircraft mechanic of $25.45 (PayScale, 2020), and with 7.2 hours saved daily, a total of $66,882.60 is saved each year when the rover performs the tools and parts ferrying. Looking at the expediter vehicle costs, the van is driven 154 miles currently, and if one rover is added to the process, the miles driven decreases to 46.6 miles per 24-hours. The savings in vehicle operating costs is $6,515.60/year. The personnel and vehicle savings together equals an annual savings of $73,398.20, as seen in Table 3.

The Maren-go, autonomous rover company, provided a quote for their Airfield Autonomous Rover, and between the software and hardware, the total cost for one rover is $152,330. Additional rovers are a fraction of the start-up costs at a

**Table 2: Expediter Hours and Miles Saved Each Year When Augmented With One Rover**

<table>
<thead>
<tr>
<th>Aircraft Expediter Augmented With Rover(s)</th>
<th>Hours Transporting Saved</th>
<th>Miles Transporting Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Expediter</td>
<td>2,628.0</td>
<td>39,201.0</td>
</tr>
</tbody>
</table>

**Table 3: Total Personnel Salary and Vehicle Cost Savings/Year**

<table>
<thead>
<tr>
<th>Total Saved/Year</th>
<th>Case Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel Salary Savings (Avg Aircraft Mechanic)</td>
<td>$66,882.60</td>
</tr>
<tr>
<td>Vehicle Costs Savings</td>
<td>$6,515.60</td>
</tr>
<tr>
<td>Total Yearly Savings</td>
<td>$73,398.20</td>
</tr>
</tbody>
</table>
unit cost of $47,000 per additional rover, and if purchased, a rover of that cost would be paid for in the savings of the Expediter operator and vehicle in just over two years. If two or three rovers were purchased, the Return on Investments is listed in Table 4.

**Table 4: Return on Investment Per Aircraft**

<table>
<thead>
<tr>
<th>ROI</th>
<th>Case Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Rover</td>
<td>2.1 Years</td>
</tr>
<tr>
<td>2 – Rovers</td>
<td>2.5 Years</td>
</tr>
<tr>
<td>3 – Rovers</td>
<td>2.9 Years</td>
</tr>
</tbody>
</table>

**Conclusion:**
The United States of America’s military has approximately 13,000 aircraft. Incorporating autonomous rovers for ferrying tools and parts can streamline maintenance operations across the Department of Defense. Streamlining the process to inspect and repair the aircraft is critical. Requiring highly trained personnel to ferry individuals around the flight line to get tools and parts is a non-value added task. It is time to adopt the right technologies for the right jobs. It is time to capitalize on autonomous capabilities to fill the tasks they are capable of performing, like ferrying tools and parts. As the USAF innovates for the Flight Line of the Future (FLoF), rovers can make it the Flight Line of Today. It is time to release our highly trained personnel to do the job they are trained to do, to fix the USAF’s aircraft and to ensure U.S. security.

"It is time to adopt the right technologies for the right jobs. It is time to capitalize on autonomous capabilities to fill the tasks they are capable of performing, like ferrying tools and parts."

**ABOUT THE AUTHOR**

**Maj Mary Ashley Stanton**, a Senior Rated Pilot with over 3,100 hours in the C-17 and C-21 aircraft, is a recent graduate of the Advanced Study of Air Mobility, where she obtained her Masters of Science in Operations Management. Her graduate research project included a detailed study of autonomous vehicles on the flight line titled Autonomous Rovers: Flight Line Delivery of Maintenance Tools and Parts. Her complete work can be viewed at [https://discover.dtic.mil/](https://discover.dtic.mil/). The academic advisor for the project was Lt Col Jason Anderson, Ph.D., and the sponsor was BG Linda Hurry, AF A4, Director of Logistics, Deputy Chief of Staff for Logistics, Engineering, and Force Protection.
References


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Just a few hours east of MacDill AFB, in Palm Beach, FL, is located the coveted Mar-a-Lago Resort. Sometimes referred to as President Trump’s Winter White House, the President, First Lady, Vice President, and other top government officials visit here throughout the year.

Upon official tasking, a support team of various career fields within the 6th Logistics Readiness Squadron (6 LRS) readies themselves and all appropriate equipment before traveling to Palm Beach, FL, to prepare for the arrival and departure of Air Force One. This support team is comprised of Aerial Transporters, Vehicle Maintainers, and Fuels Specialists. Additionally, Aerospace Ground Equipment Specialists from the 6th Maintenance Squadron join the LRS team on these missions.

“It can be challenging and rewarding fixing POTUS support vehicles in the field,” said TSgt Justin Reasbeck, a 6 LRS Mission Generating Vehicular Equipment Maintainer. “We start preparing by building a support kit that has spare parts for the most common parts that we anticipate will break. Monthly, we accomplish systems checks on each vehicle assigned there and identify any maintenance issues.”

The diverse skill set of MacDill’s LRS members is easily showcased through POTUS support. From testing the jet fuel to fleet servicing Air Force One, the 6 LRS Airmen work diligently to ensure our nation’s top leaders travel safely and precisely. With each successful mission they accomplish, the teamwork of these professional Airmen truly captures the synergy from the broad spectrum of logistics career fields.
The 6 LRS supports not just the President’s arrival to Palm Beach but even missions involving the Vice President’s or the First Lady’s movements to various locations throughout Florida. To date, MacDill’s LRS has completed 11 presidential team transportation taskings since November 2019.

“Presidential support is a no-fail mission,” said SSgt Chad Brotherton, a 6 LRS Aerial Transporter. “It requires proper coordination, communication, and acute attention to detail. It’s a rewarding experience that gives me a great sense of involvement and self-pride.”

Providing world-class logistics support to the President of the United States is just one of the many things the 6 LRS brings to the fight, and our team stands by ready to support any customer.

“6 LRS Airmen work diligently to ensure our nation’s top leaders travel safely and precisely.”
Lockheed-Martin Patriot Advanced Capability-3 (PAC-3) missiles were loaded onto a United Arab Emirates Air Force (UAEAF) C-17 Globemaster III in the early morning hours of Sunday, January 26, 2020, at Dover AFB. The loading and delivery of the missiles was a culmination of a long-running process between the US and the UAE governments. Present to witness the activity was Dr. Bruce D. Jette, Assistant Secretary of the Army for Acquisition, Logistics, and Technology. As a Senior Executive Service-4, Dr. Jette is responsible for all logistics-related matters for the Department of the Army, including all sales to foreign nations.

With tensions spiking in the Middle East and US allies in the region seeking aid, the safe and secure process of delivering munitions such as the PAC-3 missiles is imperative. That specialty is exactly what the Airmen of the 436th Aerial Port Squadron’s In-transit Munitions Facility (IMF) handle on a daily basis. From receiving the missiles to the precision build-up of the PAC-3s on pallet trains, the IMF team ensures the safety and proper storage of all cargo that flows through their possession. “The Airmen at IMF stay poised to provide support to our nation and its allies at a moment’s notice,” says MSgt Perry Hardy, NCOIC of IMF. “Knowing that...
the munitions we handle are headed to protect US interests, as well as defend and deter enemy aggression, gives us a sense of pride and accomplishment in the work we do on a daily basis. “SrA Steven Landgren added: “Support starts here. If it wasn’t for the work we do, munitions wouldn’t be properly transported and ultimately never make it to the warfighter.” The PAC-3 missiles bound for the UAE were no exception to their record of flawless execution.

Building partnership capacity between the UAE and the US was at the forefront of all operations on the morning of the PAC-3 loading. Dr. Jette and his team arrived at the IMF and witnessed the process of pulling the missiles out of a secure bunker, transitioning them to a 60K “Tunner” loader, and finally, physically pushing the 14,460-pound pallet trains of munitions onto the aircraft. Crushing the loading operations during this mission was the Airmen of the Super Port’s Ramp Services, led by SSgt Darren Johnson. Since the C-17 was owned and operated by an Emirati crew from the 15th Strategic Airlift Squadron, the communication and teamwork involved between the Super Port load team and the UAE loadmasters were vital to overall mission accomplishment.

At the conclusion of the loading process, Dr. Jette generously coined and recognized Airmen from both countries. He also took the time to speak with the load team and thanked them for their hard work. Dr. Jette articulated the relevance of the mission to deter regional threats to the UAE, specifically Iran, and thereby protect American interests and lives in the region. The US-UAE partnership is essential to stability in the AOR, and much of the mission would not be accomplished if not for the Airmen who make the crucial mobility piece possible.

From receiving the missiles to the precision build-up of the PAC-3s on pallet trains, the IMF team ensures the safety and proper storage of all cargo that flows through their possession.

ABOUT THE AUTHOR

2Lt Maria Anderson is a Logistics Readiness Officer assigned to the 436th Aerial Port Squadron, Dover AFB. She was commissioned a 2Lt in 2019, and Dover is her first duty assignment, where she is an Assistant Flight Commander.