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THE EXCEPTIONAL RELEASE
THE PROFESSIONAL MILITARY LOGISTICS JOURNAL / ISSUE 155
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ON THE COVER
Mission Readiness: Senior Airman Clayton Roppa, 911th Aircraft Maintenance Squadron crew chief, inspects the bottom of a C-17 Globemaster III during a pre-flight inspection at the Pittsburgh International Airport Air Reserve Station, Pa., Oct. 1, 2021. Pre-flight inspections are conducted before every flight to ensure aircraft mission readiness. (U.S. Air Force photo by Joshua J. Seybert)

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Greetings LOG Nation!

The Fall ER is packed with some amazing topics from across our Logistics Enterprise! LOA, our chapters, and most importantly you have continued to accelerate change by staying mission focused through this long COVID-19 pandemic, never letting it define how we project airpower and provide humanitarian efforts to those in need. While we continue to wear masks and telework, you have risen to the occasion by always looking for ways to innovate, discovering constraints, and getting at better efficiencies, thus producing amazing logistics support to our Nation.

Let’s talk annual LOA Symposium which will celebrate our 40th Anniversary! Mark your calendars now, March 15th – 18th 2022 in Salt Lake City, Utah! Working closely with the Symposium Leadership Team (Col Chris Carmichael and Ms. Andrea Truman), we are pleased to announce our theme — “Logistics: Accelerating Change and Sustaining Dominance”. We must be agile and innovative to an ever-changing logistics landscape. LOA is excited and looking forward to bringing you a variety of dynamic topics and guest speakers, knowing we need to sustain our logistics dominance now and in the future. Your Executive Board has been busy this Summer, so let me share a few things they are doing to advance LOA in many different realms.

Ms. Jenna Fletcher, your Vice President, has announced the annual call for the LOA National awards and scholarships. Last year, we awarded over $9,000 in scholarships to 9 very deserving Airmen and Civilians in our communities. We are committed to award the same this year!

Jondavid DuVall, your Chief Operating Officer has been working with the Royal Australian Air Force Chapter LNOs in the United States to stand up an RAAF Logistics Officer Association Chapter. The RAAF LNOs have received approval to proceed. We expect to finalize the chapter bylaws in the next few weeks once key personnel are back in Australia. Super exciting!!

This year we are excited to continue our long tradition of Professional Development with LOA University on 15 March 2022. This will be a jam-packed day you don’t want to miss! We have also partnered with the National Defense Industrial Association’s Logistics Management Division to co-locate the NDIA Logistics Conference with us! This partnership will be an amazing opportunity for Senior Leaders to come together with industry and discuss strategic issues facing the Logistics/Sustainment Enterprise as well as the Defense Industrial Base.

In closing…WOW! Log nation is on the move and accelerating our efforts to meet our warfighter and Nation’s call. As always, I am amazed to see all the efforts that LOG Nation is doing I’m proud to be your LOA President. Stay safe…stay strong!

Jason Kalin
President
Logistics Officer Association
Editor’s Letter

What a quarter we’ve had as logisticians…

I personally saw logistics on full display at Al Udeid Air Base, where we received, fed, comforted, triaged, manifested, and processed forward over fifty-seven thousand evacuees from Kabul, ultimately concluding as the US’s largest evacuee airlift operation, and the most compressed evacuee airlift in all of history. Operation ALLIES REFUGE was not set up to be the operation it turned into. We were set up for something along the lines of an impossible task, but we succeeded with adaptability, teamwork, and a whole lot of “get it done” attitude. Please allow me a brief shout out to the C-17 crews, the 8 EAMS, and my 579 AEW partners. There were some tense moments, friends, but we did the thing, and we did it damn well.

From there, you all took the longer-term efforts of providing sustained lodging, comfort, and processing functions. Whether it be your varied roles helping the Department of State in Operation ALLIES WELCOME at Joint Base McGuire-Dix-Lakehurst or Ramstein Air Base, or specific functions like Task Force Holloman, logisticians are in high demand. Congratulations, and I am proud to be your teammate.

LOA itself continues to charge forward. LOA University went on this quarter, with several panels discussing everything from accelerating change to writing effective records to take care of your Airmen. LOA also furthered conversations with other professional organizations, strengthening its relationships with Women in Defense Logistics and the Association of Marine Corps Logisticians, as well as forging a partnership with the Royal Australian Air Force.

We’ve gone multinational, team!

Our fall edition is a fantastic collection of technical and conversational writing. Authors showcase health-monitoring wearable tech, the “aloha” style of logistics, and research into non-destructive investigation and the impacts of quantum dot tech. They also give us practical examples of legacy systems reengineering, both in weapons and deployment systems, as well as leadership of civilian logisticians. Lastly, we have a thorough review of current intellectual property acquisitions strategies, making a case that attention on agile acquisitions is no reason to stray from certain basic acquisitions principles.

This is your Exceptional Release. Please reach out with any questions. And again, please consider writing for us. The conversation can’t start unless you state your opinion. You can contact me directly via editor@loanational.org, LinkedIn, or Facebook.

Thank you again for the opportunity to serve as your editor.

Montanna J. Ewers
Chief Editor
Exceptional Release Journal
Home for the Holidays:
AFSOC’s Dilemma, Lengthening Deployments, and the Most Valuable Resource of Our Most Valuable Resource

By: Capt Frank Marquette and Lt Col Tim Breitbach

Intro
As we enter our twentieth year of continuous military operations in the Middle East, the question for service members is not if they will be tasked to deploy but rather when. This process has continuously been refined over multiple iterations of deployments in the Middle East and currently operates under the Air and Space Expeditionary Force (AEF) structure, which was designed to provide predictability to units, Airmen, and their families. While the AEF structure works well overall, this one-size-fits-all approach does not work equally well for the unique nature and limited size of Air Force Special Operations Command (AFSOC). AFSOC Airmen typically fall into the enabler category, and this article addresses the effects of deploying enablers multiple times in a calendar year. We first demonstrate that a shift is needed from the current mindset that shorter deployments are always better. Second, we show that a great amount of time can be bought for a relatively low cost.

AFSOC’s Dilemma, Lengthening Deployments, and the Most Valuable Resource of Our Most Valuable Resource

The Cost of Doing Business
All Airmen deploying to USCENTCOM, with the exception of the aircrews who physically fly aircraft into theater to rotate the airframes, follow the same process of traveling via aggregated airlift, commercial airlines, or AMC’s channel missions. Once in theater, it is the responsibility of the Air Mobility Division (AMD) under the Central Command’s Deployment and Distribution Center (CDDOC) to transport the deployer the last mile to their final deployment location, if she or he is traveling via aircraft. This last step is typically when the delay in transportation occurs, due to the limited number of available aircraft to move cargo and passengers into and out of combat zones. To manage expectations and provide predictability for planners, AMD advertises a three-day movement window for deployers. This means that when requesting air transportation from the AMD, the deployer must be available starting at 0001 hours on the first movement day and can be moved anywhere in the theater to gain efficiencies in terms of aircraft utilization. The individual is not guaranteed to be at their final location until 2359 hours on the third movement day. If commanders have a requirement for the inbound deployer and outbound redeployer to have

Two CV-22B Osprey tiltrotor aircraft assigned to the 8th Special Operations Squadron approach for landings above northwest Florida, Nov. 16, 2020. The Osprey combines the vertical takeoff, landing and hover capabilities of a helicopter with the long-range, fuel efficient and speed characteristics of a turboprop aircraft. (U.S. Air Force photo by Staff Sgt. Joseph Pick)
at least one guaranteed day of turnover, this translates to a possible seven-day period where either the deployer or redeployer is in the AMD system. This is the worst-case scenario, and it is possible that the inbound deployer arrives on the first movement day, and the outbound redeployer departs on the first day of the movement window.

Therefore, the AMD process creates a maximum seven-day window, and a minimum of three days, to guarantee one day of turnover. One day of turnover is a conservative estimate. The expected number of days in the movement-turnover window is five. Table 1 (below) shows this worst case, best-case and expected values. This is typically viewed as the cost of deploying, and commanders expect to lose some time in the deployment of Airmen into and out of theater.

The Cost of Shorter Deployments

When the whole deployment process is combined—from home station, to conducting turnover, to the redeployment of the relieved Airmen—the real-world average is a 11-day window, during which both the deployer and redeployer are away from home-station. The strategic lift would be scheduled by the AMD based off the worst-case scenario because of how far out it is booked, thus 11 days. Figure 1 (below) outlines this timeline.

Table 1: Model of Movement and Turnover Schedule at Forward Deployed Locations

<table>
<thead>
<tr>
<th>Case</th>
<th>Inbound Deployer</th>
<th>No Travel</th>
<th>Outbound Redeployer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worst</td>
<td>Day 1</td>
<td>Day 2</td>
<td>Day 3</td>
<td>7</td>
</tr>
<tr>
<td>Best</td>
<td>Day 1</td>
<td></td>
<td>Day 3</td>
<td>3</td>
</tr>
<tr>
<td>Expected</td>
<td>Day 1</td>
<td>Day 2</td>
<td>Day 4</td>
<td>5</td>
</tr>
</tbody>
</table>

Movement Window

***Both the best case and expected scenarios assume that no turnover will be done on a travel day. So, if any travel is accomplished that day, it’s a lost day for anything else.

When deploying enablers, the time commitment can be shortened or lengthened based off the availability of the follow-on forces.

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While this transportation and turnover method applies to both enablers and Airmen under the AEF model, the movement windows are not the same. Those who are deployed under the AEF cycle have a 6-month deployment commitment before they can be relieved. This six-month commitment is not flexible because their replacements are preparing for the deployment based on forecasted schedule. Therefore, with few exceptions, AEF deployments timelines are inflexible.

Enablers are a different story due to their smaller numbers. When deploying enablers, the time commitment can be shortened or lengthened based off the availability of the follow-on forces. This is even easier when the Airmen deploying to relieve the outgoing cycle come from the same unit and have the same in-garrison command team, as is common within AFSOC.

This situation creates a costly fallacy for the in-garrison command team. To care for their Airmen, some commanders may schedule deployments that are shorter in duration in an attempt to manage burnout of their forces. But what shorter deployments mean in reality is that deployment frequency increases, assuming demand for the given capability remains unchanged. This is where the time lost in transit, the core focus of this analysis, starts to compound.

Tactical air control party specialists from the 146th Air Support Operations Squadron at Will Rogers Air National Guard Base, Oklahoma City, make visual contact with an A-10 Thunderbolt II from the 442nd Fighter Wing, Whiteman Air Force Base, Knob Noster, Missouri, during a training event at Razorback Range, Fort Chaffee Maneuver Training Center in Fort Smith, Ark., and Hog Military Operating Area, Mansfield, Ark., July 11, 2017. The close air support training event, called Sooner Strike, was coordinated by the 146 ASOS and enabled Airmen in the air and on the ground to share techniques and accomplish both mission qualification training and continuation training with several aircraft common to TACP missions. (U.S Air National Guard photo by Senior Airman Brigette Waltermire)
Using a 1:1 deploy-to-dwell ratio, common for AFSOC Airmen, a six-month deployment would mean that airmen spend an average of 22 days in transit to and from the AOR over a two-year period. Compared against airmen on a 90-day cycle, the shorter duration doubles the amount of time spent in transit while providing the same amount of coverage. Thus, Airmen on a 90-day deployment cycle would spend more than three weeks extra in transit over a two-year period.

This article is not arguing that all deployment cycles should be as long as possible for the sake of transportation optimization, as there are myriad reasons for which commanders might choose to put their forces on shorter deployment cycles (combat fatigue, training, etc). Rather, it aims to help commanders better evaluate both dollar and human when considering the impact of their decisions. There could be other options such as conducting analysis on who actually requires turnover due to position or responsibilities, such as commanders or staff officers versus Airmen who have deployed to the same location multiple times.

One such example is when the analysis is applied to a real-world example of current deployment rotations. When compared to the current model, our proposed model would bring 95% of the redeployers back to home station 23% faster. These results are calculated using a group of 100 redeployers with 5% meeting the requirement for additional turnover. Table 2 (shown below) lays out this cost-versus-time comparison. The opportunity cost of the five redeployers not filling the seats on the already-scheduled movement would cost the DoD $13,338. In addition to the missed empty seats, commercial tickets would have to be purchased for the deployers at an estimated $9,098. The total cost for redeploying the 95 Airmen early and finding alternative transportation for the five that require additional turnover is $22,486. The bottom line is that this roughly $23K buys back the commander 280 duty days across his 95 redeployers.

### Table 2: Time vs. Cost Comparison

<table>
<thead>
<tr>
<th>Current Model</th>
<th>Proposed Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Pax on Aggregated Airlift</td>
<td>100</td>
</tr>
<tr>
<td>Number of Pax using Commercial Airlift</td>
<td>0</td>
</tr>
<tr>
<td>Opportunity cost of empty seats on Aggregated Airlift</td>
<td>$</td>
</tr>
<tr>
<td>Cost of Commercial Tickets</td>
<td>$ –</td>
</tr>
<tr>
<td>Additional Cost</td>
<td>$ –</td>
</tr>
<tr>
<td>Total Time Recovered</td>
<td>0</td>
</tr>
</tbody>
</table>

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### ABOUT THE AUTHORS

**Capt Frank Marquette** serves as an Air Force Logistics Readiness Officer. Prior to serving as the Deployment and Distribution Flight Commander as well as the Material Management Flight Commander at Cannon AFB, NM, he was the Director of Logistics for the 1st Air Support Operations Group.

**Lt Col Tim Breitbach** is an Air Force Logistics Readiness Officer. Prior to his current assignment in the US Forces Korea J4, Camp Humphreys, he was an Assistant Professor at the Air Force Institute of Technology (AFIT). He remains an adjunct professor at AFIT.
Lieutenant General Gene Kirkland retired from the Air Force this summer. Thinking about his years of service leads me to reflect on our time working together when Capt Gene Kirkland was my first Air Force supervisor. Despite lots of great supervisors, leaders, and training, the example he set and lessons he emulated over two decades ago were some of the best I’ve received in how to be a great first line supervisor.

The example he set and lessons he emulated over two decades ago were some of the best I’ve received in how to be a great first line supervisor.

Ownership: I walked into the Logistics Plans shop as a GS-07 fresh out of college. I didn’t know how to spell Air Force let alone a single thing about Support Agreements. But it was clear from day one that I was the Chief of Support Agreements and responsible for getting the program back on track. I wasn’t an intern put in the corner and told to sit and watch. I was able to learn by doing. I am sure I made a ton of mistakes, but I don’t remember those. However, I do remember my first update briefing to the Logistics Group Commander. I still remember creating those slides, the pre-brief to Capt Kirkland and both the praise and feedback I received that day.

Opportunity to Learn: That said, one of the most impactful aspects of that time was the freedom and encouragement I was given to sit in on absolutely any meeting or event. I attended almost every meeting Logistics Plans had that first year. This exposure was invaluable, and this was the first critical step to providing me breadth and an understanding of the bigger picture.

Time: You can imagine that as a new civilian responsible for a program and with exposure to so many other processes that I might have questions. Capt Kirkland and the Superintendent allowed me to ask as many questions as I wanted or needed. In fact, I kept a running list and had dedicated time once a week with the Superintendent to ask anything I wanted. I still have a product from one of those meetings: an organizational chart I drew that went from GS-07 Chief of Support Agreements to the President of the United States. In retrospect I can only imagine how painful that might have been at the time for a senior master sergeant who had other things to do.

Inclusion: Only in retrospect do I realize how unusual this was. I was the only civilian in the Group—and the only GS civilian in the Group—but was completely embraced into the Flight, Squadron, and Group as an Airman and future leader. I attended all military ceremonies. I was invited to Officer Calls and Logistic Officer Association events. And every time Capt Kirkland sat down with or sent Company Grade Officers to training, I was included.

Expertise: Last but not least, Capt Kirkland set an example of expertise and excellence. Despite a background in maintenance and munitions, he quickly learned all areas of Logistics Plans. He could create a Schedule of Events and speak with authority about War Reserve Materiel inspections. This is a fine balance which he was able to find. Trust your experts and let them do their jobs, but develop expertise and a firm foundation yourself.

I think these lessons apply at all levels and for both military and civilian. They were especially valuable for a new civilian and I would assume for a new Airman as well. My guess is I was the first civilian Capt Kirkland had ever supervised and nobody gave him an AFI of what to do or a copy of the career field pyramid. He just did what came naturally: to be involved and to think beyond the needs of the moment and what would contribute to building a Logistician for tomorrow.

Thank you, Lieutenant General Kirkland, for over 30 years of service to our Air Force—and a personal thank you for the foundation you set in my career. I don’t know that it would have been the same without you as my first supervisor.
How Wearable Tech Puts Bombs on Target

649 MUNS Partners with AFRL for Testing Wearable Devices

By: 2Lt Trey Bell

At the beginning of 2020, COVID-19 changed the work environment for everyone. Quarantines, lockdowns, and stop movement orders affected the entire Air Force. As the Air Force’s sole owner of the standard air munitions package mission, the 649th Munitions Squadron (MUNS) could not allow that effect to ripple around the world to Combatant Commanders and Allies. Despite COVID-19 challenges, we needed to find better solutions to adapt and overcome obstacles in order to accomplish our mission.

As a result, the 649 MUNS is paving the way in these challenging times by using wearable technology to combat our new reality. They entered into Defense Innovation Unit and Air Force Research Laboratory’s (AFRL) Rapid Analysis of Threat Exposure (RATE) study in October 2020, using Garmin Fenix 6 watches and an Oura Ring to capture biometrics. The goal of the RATE algorithm is to support healthcare personnel and critical DoD staff to maintain mission capability during the COVID-19 pandemic. The RATE algorithm has been able to identify COVID-19 up to 48 hours in advance of clinical suspicion. RATE offers a less costly and invasive alternative for personnel and Medical Treatment Facilities, providing continuous, biometric-driven monitoring.

The 649 MUNS enrolled 225 participants into the RATE program. Across the DoD, the study identified over 440 positive COVID-19 cases, including asymptomatic cases, before clinical COVID-19 testing. This study helped limit the spread of COVID-19, exponentially decreased the number of members placed into quarantine, and helped the squadron maintain mission effectiveness. Per Lt Col Naomi Franchetti, the 649 MUNS Commander:

We need to be ready 24/7 for our country, and wearables are an effective way to enhance the ‘human’ weapon system and positively impact mission readiness. Because of these devices, we detected and segregated those with potential illness, limiting the spread amongst the squadron and creating persistent readiness through early prediction. In addition, I wanted Airmen to have the tools to be their best self in-and-out of work. Airmen saw improvements in their sleep and fitness by monitoring their biometrics and positively adjusting their behaviors based on the data.

Image Above: Airman Katiha Falcon, 649th Munitions Squadron, wears a smartwatch Dec. 3, 2020, at Hill Air Force Base, Utah. Airmen from 649th MUNS are wearing watches and rings for a study with the Defense Innovation Unit that will allow detection of illnesses such as COVID-19 within 48-hours. (U.S. Air Force photo by Cynthia Griggs)
Enhancing the human weapon system while maintaining mission effectiveness opened the door for another opportunity, the AFRL Physical Activity/Physical Fitness Assessment Beta Study. This study could pave the path for monitoring Airmen’s fitness and health via wearable devices while offering a potential alternative to the current periodic physical fitness assessment. The 649 MUNS has the first 200 members enrolled into the study, where their fitness metrics are tested for predictive validity with the current Air Force fitness assessment.

This study tracks the member’s daily fitness, provides workout guidance, and enables physical activity choice architecture where members may choose workouts they prefer (e.g., hiking, running, weightlifting, etc). This moves away from the normal one-size-fits-all mentality and provides flexibility to the Airmen with individualized information. This is a major step to enhance a culture of fitness and make it part of an Airman’s lifestyle versus something they do just for an assessment. Finally, this study should reinforce to our Airmen the vital relationship between their physical activity, health, and resilience. The 649 MUNS started this four-month study in September 2021. Dr. James Christensen from AFRL’s 711th Human Performance Wing is an advocate for the study:

Rapid advances in commercial wearable devices have created an opportunity for the Air Force and Space Force to dramatically enhance our culture of fitness and readiness. The partnership of AFRL, AFPC, and 649 MUNS will accomplish the first steps towards evaluating the effectiveness of this new approach that we anticipate will have tremendous benefits for our Airmen and Guardians.

Any new or different approach can be met with resistance, criticism, and concerns. These changes are no different. Some of the major concerns include GPS tracking and data privacy and protection. Airmen need to understand that these programs are completely voluntary, do not track GPS location, and data is encrypted and only attached to an Airmen’s username. The purpose behind the studies and programs are to introduce the change, receive feedback, and adjust as required for potential adoption across the Department of the Air Force.

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These innovative programs are empowering Airmen with tools to solve next generation problems in our Air Force. Air Force Chief of Staff, General Charles Q. Brown, Jr. challenged all Airmen to “accelerate change or lose.” These programs are changing how we view and take care of the Air Force’s most important asset - the human weapon system. With the challenges this next decade will bring, wearable technology will make our Airmen more efficient, healthier, more resilient, and safer in the workplace. By changing the way we looked at readiness and enhancing Airmen’s quality of life at work and home, the 649 MUNS was able to maintain mission readiness, increase resiliency, and not lose to a pandemic. Like its motto, the squadron is ‘always ready’ (SEMPER PARATUS) for whatever the future may hold.

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ABOUT THE AUTHOR

2Lt Trey Bell is the Production Flight Commander for the 649th Munitions Squadron. He was commissioned through the United States Air Force Academy in 2020 and can be reached at trey.bell1@us.af.mil.

2Lt Trey Bell, 649th Munitions Squadron, checks the Rapid Analysis of Threat Exposure data collected from the squadrons’ smart watches Dec. 3, 2020, at Hill Air Force Base, Utah. Airmen from 649th MUNS are wearing watches and rings for a study with the Defense Innovation Unit that will allow detection of illnesses such as COVID-19 within 48-hours. (U.S. Air Force photo by Cynthia Griggs)
Intellectual Property (IP) Strategies in Major System Acquisitions: What are We Missing?

By: Mr. Christopher A. Monsey

The object of this discussion is to fill an existing need in acquisition literature. The goal of this effort is to help people with little to no experience or understanding of how to create an effective intellectual property and data acquisition strategy and plan and how to translate that strategy/plan into an effective economic strategy/plan, negotiation/conflict resolution/leverage strategy/plan, or acquisition strategy/plan that enables the program to “own the technical baseline” (create effective insight and control over design agent decision making), and create an effective life cycle sustainment plan (LCSP) aligned contract.

Common Failure Modes in IP Strategies
DoD program offices are now required to create a so-called IP Strategy. However, much confusion exists on what an IP Strategy should include, how the IP strategy inter-relates with acquisition and sustainment decisions/tasks, and most importantly how to address no bid responses, objectively abusive contractor practices (particularly associated outrageous prices for data produced from government funded development or use of “prior art”/obvious variations of the prior art), or unaffordability/high conflict with vendors over data and data rights. Programs are often at a loss on how to get contractors to “yes” at an affordable price, deters no-bids or outrageous price responses to program requests for technical data, what the elements of an IP strategy should include, and how to address data rights (particularly for so called specifically negotiated rights licenses and software licensing).

Often, programs use a template that isn’t very useful given it is too vague and is generally ignored by both program offices and sustainment activities. There is a vague WHAT but no HOW. LCSPs often have a section on data acquisition that calls for acquisition of data as a general principle while having a risk section saying the program data acquisition strategy is likely high risk. In other words, “Here is the plan but we do not believe this plan will work.” In even simpler words: no plan.

Acquisition and LCSPs often encounter resistance from contractors. Contractors and the Government often do not agree on the meaning of contract language written by the government program office. Acquisition plans, sustainment plans, and program/Air Force/MAJCOM expectations are very different than the expectations our contractors have. Often, contractor revenue models are misaligned with LCSPs and uniquely governmental combat logistics sustainment needs arising from 10 USC 2464/2466 (core organic and fifty-fifty limitations on outsourcing depot support). An IP strategy must be driven by economic, negotiation/conflict resolution, combat logistics/warfighter needs, and leverage a strategy/plan, not the other way around.

What can we do to address this gap in linking policy with execution level activities? Get back to basics: the Investor/Buyer Value Acquisition Negotiation Game, the People, Their Moves, and the Object of the Game.

To those who are uninitiated in the mysteries of how to create deals and negotiation plans to achieve effective investment/buyer outcomes [e.g., return on investment], acquisitions may seem confusing and in the too hard to worry about category. But this is really not the case. With a little application the average person can become sufficiently knowledgeable to play this game after learning some fundamentals and understanding this game.

Much confusion exists on what an IP Strategy should include...

An IP strategy must be driven by economic, negotiation/conflict resolution, combat logistics/warfighter needs, and leverage a strategy/plan, not the other way around.
The investor/buyer game can be analogized to chess or other games. Game theory is useful in understanding how to effectively engage in a negotiation or cooperative/non-cooperative play with other game players. Game theory comprises the theory of knowledge (epistemology) of modeling the strategic interactions between two or more players in a situation with a set of rules/norms or influences and a set of potential outcomes (desirable or not). Game theory is often used in economics. Economics is the body of knowledge concerned with the creation and use of wealth to achieve various organizational, buyer, or investment objectives. Thus, game theory can be useful to aid in developing an economic and negotiation strategy/plan.

**Game Theory Definitions**

Games generally can be a situation where two or more entities interact with each other with known payouts or quantifiable consequences. We can use game theory to help determine the most likely outcomes. To do this, we must start with some concepts and definitions associated with game theory.

- **Game**: any set of circumstances that has a result dependent on the actions of two or more decision makers.
- **Players**: Decision-makers within a given context.
- **Payoff/Expected Outcome**: the expected outcome an entity receives from a given outcome. Payoffs can include dollars, policy outcomes, combat capability, enablement of various tasks/decisions, or expected “utility”.
- **Information**: Data or information available to the players at a given point of the investor/buyer game.
- **Equilibrium**: The point in a game where the players have made their decisions and an outcome has either occurred or is about to occur.

Chess comprises a playing board and “material” in the form of pieces. These pieces have various capabilities or abilities to achieve effects on the playing board.

**Strategy/Plan**: Strategy comprise ends and means. A plan is how the means are used to achieve the ends. A plan generally is a sequence of actions the entities will take for a given set of circumstances.

**Basics of Strategy: Ends and Means**

A strategy is merely ends and means. A plan is **HOW** to use the means to achieve the strategic ends. A vague plan = no plan.

**Game Pieces**

The investor/buyer value acquisition and negotiation game has various potential pieces. The game board or environment that the game pieces operate within includes various contextual elements such as the Federal Acquisition Regulation and processes that the various players must comply with. The environment can also be associated with the markets that a part or system is being procured from.

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**Basics of Strategy: Ends and Means**

A strategy is merely ends and means. A plan is **HOW** to use the means to achieve the strategic ends. A vague plan = no plan. Execution level personnel must both understand the ends and have the means to accomplish their assigned ends. Such ends must include ends from different life cycle entity perspectives.

Life cycle entity perspectives (which arise from missions, objectives, tasks/decisions that the life cycle entity needs to perform or achieve) can include institutional Air Force, sustainment, program office, industry, operational/field, major command (MAJCOM) ends. Meanwhile, Combatant Commander (CCDR), Enterprise, or institutional Air Force (as well as DoD and Congressional) ends comprise affordability, sustainability, interoperability, accountability (legally enforceable contracts), agility, enabling of life cycle entity tasks/decisions, and effectiveness from the enterprise view. Program needs often focus on cost, schedule, and performance. MAJCOM ends comprise creating trained and resourced capabilities for presentation to CCDRs to execute assigned strategic, operational, and tactical objectives. MAJCOMs are particularly sensitive to anything that impacts their flying hour or equivalent budgets and exercises. Institutional leaders need to be aware of when programs seek to trade off long term MAJCOM and institutional interests/ends in favor of short-term program interests so the institutional leaders can veto program decisions that are good for the program but bad for the Space or Air Force. Adverse tradeoffs often result in severe damage to the Space or Air Forces’ ability to control costs, enable obsolescence management, and enable rapid upgrades (e.g., by not ordering at least a copy of government funded developmental task technical data or software outputs). OEM ends comprise maximizing shareholder value/share price for publicly traded companies and profit (or ability to go public on the stock markets) for privately held companies.
The Essence of Total Life Cycle Management

Basic and essential functions of total life cycle management comprise integrating, coordinating, synchronizing, and enabling the various life cycle entities to perform their tasks to achieve the desired ends with the available ends. Uncoordinated actions by life cycle entities generally have an adverse effect on material readiness and affordability and commonly result in a failure to achieve *UNITY OF EFFORT*.

A failure to ensure unity of effort is fundamentally a leadership and command and control failure. A life cycle manager is effectively leading an orchestra of life cycle entities that must be brought into harmony with effective economic strategies (e.g., Return on Investment (Roll), use of effective negotiation and conflict resolution paradigms [e.g., integrative/interest-based vs. distributive/position-based paradigms], effective data ordering approaches, and alignment of reasonable contractor revenue models with initial and sustainment needs.

**Data Acquisition Strategy and Plan**

An IP Strategy and Plan, preferably called a Data Acquisition and Licensing Strategy (DALS) and Data Acquisition Licensing Plan (DALP), starts with defining business and economic objectives or ends. For example, a DALP must ENABLE various life cycle entities to perform their tasks and decisions, reduce or eliminate government funded rework needed to generate data needed to enable various tasks/decisions, reduce or avoid unnecessary conflict with our vendors which creates significant transaction friction/drifts off the best vendors, ensure affordability/sustainability/maintainability, and align contractor revenue models with Government acquisition and sustainment strategies/plans.

Core components of such a strategy and plan comprise 1) a list of life cycle entities; 2) business objectives/ends for each entity; 3) risks the strategy and plan must address; 4) the tasks/decisions that they must perform; 5) data inputs/outputs from each of those tasks/decisions; 6) means available to achieve the ends including leverage resources/leverage tactics, types of LCSPs that are optimized for different classes of parts/systems and leverage conditions, and ordering methods that might be employed to increase data deliveries aligned with leverage conditions and investor vs buyer status at the part/software object level.

The DALP must provide a **FEASIBLE** and **ACTIONABLE PLAN** explaining *HOW* the identified business objectives will be enabled, risks effectively managed, conflict with vendors managed, leverage resources effectively identified/created/employed, negotiation paradigm, and data orders will be executed. Such a plan must identify the economic strategy (e.g., RoI for both OEMs and the Government), leverage conditions, negotiation paradigm that is most suited to where the program is in a life cycle, and a parts breakdown of system modules or parts with Source of Developmental Funding (SDF) status identifiers.

**Investor vs. Buyer**

One major blunder that programs make is they create a one size fits all LCSP that is not aligned with leverage conditions and investor vs. buyer status. Treating all parts the same, when they are not the same from an investor vs. buyer perspective, creates major conflicts between the government and contractors. Thinking like buyers when we are investors and thinking like investors when we are buyers leads to decisions that create unnecessary and damaging conflict with our vendors.

**A Visual Life Cycle Sustainment Plan: A SDF Map**

Maps have helped travelers find their way for thousands of years. Unfortunately, programs do not have a map to find their way through economic, control, intellectual property, and life cycle obstacles. A parts/software object map tied to SDF status can provide a visual LCSP that implies one of four different LCSPs associated with investor, buyer, no investment/mere engineering, and mass market commercial item status. For example, different SDF status identifiers comprise developed exclusively at government expense (yellow), developed substantially at contractor expense (orange), developed exclusively at private expense (red), no significant development expense/design produced from “mere engineering” using data available to the public without limitation (e.g. what patent law calls “the prior art” and obvious variations of the prior art), Small Business Innovation Research (SBIR) parts (blue), OEM asserted Independent Research And Development (IRAD) parts (striped red), developed on a previous program and modified on the current program (striped green), and mass market commercial items (pink).

Thinking like buyers when we are investors and thinking like investors when we are buyers leads to decisions that create unnecessary and damaging conflict with our vendors.
Four vs. One Life Cycle Sustainment Plan

Programs often discover that a one size fits all LCSP is an abject failure. Instead, programs can use the SDF coded part breakdown map to imply one of four basic types of LCSPs that can be employed in each weapon system acquisition effort. For example, parts that the government paid all or substantial developmental costs for (green and yellow) imply a sustainment plan comprising a maximum data order via one of five ordering methods (see below), an organic Depot Source of Repair (DSOR)/core organic maintenance, and organic supply chain management.

Fundamentals of Data

Data inputs ENABLE those tasks and decisions. Data outputs are important particularly when the Government is paying for those tasks and decisions given the cost of data largely is the cost of the tasks and decisions that generate the data. A failure to order at least a COPY of the Government funded task data and decision outputs can result in a need to pay for rework to recreate the government funded task data outputs that a contractor can refuse to deliver outside of a high leverage phase.

Economic and Negotiation Strategy/Plan Must Drive the DALS/DALP

Investors only care about two things: Economics and Control (E&C). Investors get E&C while buyers don’t. Why do programs bundle incompatible deliverables together and thus trash their ability to get their needs met? Acquisition convenience. Contracting officers often bundle deliverables to make it easier for source selections and contract administration. Thus, conventional contracting thinking can create major data acquisition failures.

Creating leverage. Leverage is often simply having a better alternative. Thus, understanding what potential alternatives are and how to get them is critical to creating leverage. Moves away from the negotiating table are often more important than moves at the table. Negotiation doctrine uses a term Best Alternative To a Negotiated Agreement (BATNA). A lack of a BATNA leads to extremely adverse negotiation outcomes, particularly when the parties are relating to each other in a distributive negotiation paradigm. Distributive negotiation paradigms require high leverage and coercive power where the party with the greater leverage imposes terms on the weaker part who has no choice but to accept a very bad deal.

Reducing leverage needs. Often, program data acquisition requests include objectively unreasonable data requests. These unreasonable data requests require high leverage to get a contractor to agree (assuming it is even possible for a contractor to satisfy such requests). Such unreasonable government data orders include the “Big Ask” where the government orders all data regardless of who paid for development. The “Big Ask” Threatens contractor revenue models where they have invested in some of the parts and forcing them to enable full and open competition damages their ability to get RoI. Many contractors have good and bad relationships with their suppliers. It is easier for them to get data from suppliers they have good relationships with vs. ones they have bad relationships with. OEMs have data for parts that an OEM developed in house; thus, it is easier for them to say “yes” to a data order versus data orders for parts that a supplier developed. Asking for too much data all at once exceeds the capacity of the OEM to generate data; thus, they necessarily must respond with a “no bid”. Understanding the easier-to-get-to-yes data vs. the harder-to-get-to-yes data is important, as that knowledge allows a program to unbundle their data orders and get the easier-to-get-to-yes data FIRST and work to get the harder-to-get-to-yes data LATER. Understanding what creates conflict is critical to reducing conflict and thus reducing leverage needed to get the contractor to yes at a reasonable price.
Pricing of Technical Data or Software
The cost of the data is the cost to create it. The cost to create it is largely the cost of the tasks and decisions that generated the data. Thus, understanding the tasks/decisions and their cost is critical to understanding what is fair and reasonable. When a program seeks to order data already produced, even at government expense, it must understand generally how much the OEM invested in the development or engineering of a given part, as that is the sunk cost from the OEM.

Most parts have relatively little or no development costs associated with their creation. Engineers select and vary known designs using known variations. That is engineering. Development is really INVENTING where the design solution wasn’t known or could not be selected and varied. Accordingly, the price of any given data is the cost of the tasks/decisions generating it as well as any legitimate licensing cost to use licensed data as a starting point in the development/engineering process.

When programs seek to acquire data during sustainment, they should first obtain a cost estimate for reverse engineering a given part that correlates with data a program is seeking. Generally, programs should not pay much more than the cost of reverse engineering and qualifying a given part. Understanding who are the best sources of reverse engineering for a given technology is critical to ensuring the best alternative cost estimate is used.

Understanding what creates conflict is critical to reducing conflict...

Data Ordering
DoD currently uses two basic approaches for data orders: recurring use Data Item Descriptions (DIDs) from the DTIC ASSIST database and data accession lists (DAL), and the DFARS 227 deferred ordering clause. Both ordering methods are deeply flawed and are one reason why the DoD components have major difficulty in getting their data needs met at an affordable price.

Understanding who are the best sources of reverse engineering for a given technology is critical to ensuring the best alternative cost estimate is used...

The starting point for technical data is MIL-STD-31000, Technical Data Packages. This standard prescribes four basic types of Technical Data Packages (TDP) and prescribes four DIDs to be used to order these data packages (conceptual, developmental, production, and commercial). The conceptual TDP correlates with the first of three baselines, a functional baseline, prescribed in the EIA 649-1 standard for configuration management and reviews for defense programs. A functional baseline/conceptual level TDP essentially lists the functions associated with a given system we are seeking to acquire. The developmental TDP correlates to the allocated baseline in the EIA STD 649-1. The allocated baseline describes design elements allocated to each function in the functional baseline. The production baseline correlates with the product level TDP (formerly known as Level 3 Drawings). Commercial TDP is supposed to be ordered for commercial items.

This data ordering approach does not selectively order product or developmental data just for parts the Government paid development costs on. It orders all data for all parts. This creates inherent conflict with OEMs. There are cases where all this data is needed for configuration management or technical/design reviews under EIA 649-1A or IEEE STD 15288.02, respectively. In those cases, a specifically negotiated rights license could be negotiated to allow the manufacturing or developmental data associated with parts developed exclusively at private expense to be used for various program functions, such as design reviews or baseline audits. For parts developed substantially or exclusively at private expense, an alternative ordering method can be used (e.g., order Form, Fit and Function (FFF) technical data which can be used with a FAR 11.104 Name Brand or Equal acquisition).

New ordering methods include modifying an integrated Master Schedule (IMS) to add in “data produced from task” so that a contractor must list data outputs of the tasks in the IMS. Then include a Contract Line Item Number (CLIN) ordering a COPY of all data listed in the data produced from task column. Not Separately Priced (NSP) from the CLIN that funded the task generating the data. Delivery schedule can state delivery no later than 30 calendar days or the end of the month following the month that the tasks/decisions were performed. Programs can also use the DFARS 227 deferred ordering clause to place an order for the “raw” data listed in this data produced from task column.

Fort Meade, MD - Jaylene Carteret, an Air Force Life Cycle Management Center, Business Systems Division senior program manager, and one of two Air Force participants in the Hack Acquisitions program, or HACQer, discusses an upcoming pitch meeting with a commercial technology company with Maj. David Rothweil, Defense Innovation Unit director of acquisition pathways in Mountain View, Calif., March 26, 2019. The Hack Acquisitions program selects pairs of program officers to spend months at DIU learning how to employ underutilized acquisition authorities and prototyping methods at their home stations. (U.S. Air Force photo by J.M. Eddins Jr.)
Another new method to order data includes adapting the Statement Of Objectives (SOO) to Statement Of Work (SOW) approach from MIL-HDBK-245D, DoD Handbook for Drafting a SOW. One can also use a Statement Of Sustainment Objectives (SOSO) to data provisioning plan where a contractor must propose a data provisioning plan to ENABLE the Space or Air Force to achieve its sustainment objectives. SOSOs can include ensuring the government gets a copy of the data produced from government funded developmental tasks, enabling a list of entities to perform specified tasks/decisions, ensuring return on Government investment as well as compliance with 10 USC 2464/2466 organic core workload and the 50/50 limitation on outsourcing depot workload. The program can then include a source selection factor to rate proposals that show a good understanding of the Government’s SOSOs and provide an effective data provisioning plan higher than those that do not show good understanding or actually show significant risks to the SOSOs.

Another missing data ordering approach includes creating “shopping lists” for data needed by different entities to perform their tasks/decisions. Some guidance exists including the Army’s Essential DIDs and Contract Data Requirements List (CDRL) Drafting Guidebook which lists what the Army believes are minimum essential DIDs. The Air Force Sustainment Center’s Judge Advocate has prepared a default data order to enable various life cycle entities to perform their tasks/decisions including manufacturing, depot support, and software sustainment or maintenance tasks/decisions. Naval Air Systems Command (NAVAIR) has also created a detailed data ordering guide in their Data Rights SAVE tool. Space and Missile Center has some guidance on software acquisition in their SMCI 63-104 software acquisition instruction. Assistant Secretary of the Navy (Research, Development and Acquisition) has a Software Process Improvement Initiative (SPII) guidebook on software acquisition which is aligned to the IEEE 12207 software life cycle acquisition standard, which includes a detailed list of software development tasks and data produced from those tasks for all entities associated with software development efforts.

Brig. Gen. Vanessa Dornhoffer (Right), mobilization assistant to commander for the Ogden Air Logistics Complex, receives a briefing on code from Morgan Jensen, a member of the 39th Software Engineering Group’s Software Organizational Development Office team Jan. 15, 2021, at Hill Air Force Base, Utah. Dornhoffer and other officials visited the team during a ceremony to commemorate the opening of a reconditioned facility that will accommodate approximately 125 50,000 employees. (U.S. Air Force photo by Alex R. Lloyd)

Determining Fair and Reasonable Prices for Technical Data

The cost of data is the cost to initially create it or the cost to re-create it. The initial development/engineering tasks are a starting place for pricing of data. If the government paid for the tasks that generated data of interest, the government should not be forced to pay for it over again or be denied access or use of that government-funded data. Programs should also avoid paying more than the cost to recreate the data, which often is far less than prices demanded by contractors. An example scenario follows:

A depot wished to bring antenna repair in house. It asked the contractor for the data, and the contractor demanded millions of dollars for the technical data in question. The depot contacted Naval Surface Warfare Center Crane Division and asked for a rough order of magnitude estimate for reverse engineering the antenna, cable, connectors, and electronics box with several circuit boards and a power supply. Crane estimated the cost to reverse engineer and qualify it as less than $100,000.

Thus, the fair and reasonable price of the data was not millions of dollars but the cost of obtaining the data from an alternative source via reverse engineering. Note: cost should not be the only factor considered in whether reverse engineering should or should not be done. Capability must also be considered. If the DoD needs capability and the OEM is refusing to enable the needed capability, including depot activation for core organic workload, then the program should pay for reverse engineering even if the depot (or an alternative spare parts replenishment source) is more costly. Cost should never be the driving factor when needed capability should be used to determine our way ahead (regardless of what is stated in the DFARS PGI on acquisition of replenishment parts when data is not available, as that PGI is outdated and now only guidance versus its previous status as a regulation under the Defense Acquisition Regulation).

Summary

Canned IP Strategies that are being used by programs generally are not useful. We need to get back to basics and focus on ENABLING the life cycle entities to perform their tasks/decisions as well as aligning our acquisition plans and sustainment plans with reasonable contractor revenue models and actual engineering tasks/decision inputs and outputs. A back-to-basics approach is needed to ensure effective and feasible DALS/DALPs or IP Strategies.

Cost should never be the driving factor when needed capability should be used to determine our way ahead...
Alyssa Heaton, a computer scientist in the 309th Software Engineering Group, checks out software upgrades as she “flies” in an F-16 simulator over Las Vegas, Nevada. The 309th Software Engineering Group has a positive and direct impact across multiple essential platforms such as the A-10, F-16, F-22, F-35, Ground Based Strategic Deterrent, Space Systems, and Command and Control. (U.S. Air Force photo by Alex R. Lloyd)

ABOUT THE AUTHOR

Mr. Christopher A. Monsey is assigned as a Senior Intellectual Property, Supply Chain/Depot Activation, and Acquisition Legal Advisor to the Air Force Sustainment Center (AFSC) Legal Office. The AFSC legal office provides legal support to commanders, staff, and personnel assigned to the Air Force Sustainment Center, Oklahoma City Air Logistics Complex (ALC), Ogden ALC, and Warner-Robins ALC. Mr. Monsey provides advice on creating affordable, sustainable, agile, effective, and legally enforceable acquisitions. He advises requiring activities on developing effective data acquisition approaches optimized for low leverage sustainment conditions that mitigate risks of no-bid or excessive/high pricing responses to Air Force requests for technical data or software. He also provides data acquisition strategies for initial weapon system acquisitions that prevent avoidable follow-on sole source contracts and avoid loss of Government developmental investment. Mr. Monsey is a registered patent attorney with electrical, radio frequency communication systems, integrated circuit electronic design automation tools, mechanical, software, and artificial intelligence system expertise. He formerly served as an IP and acquisition counsel for the Navy Office of General Counsel (OGC) at Naval Surface Warfare Center, Crane Division and a private practice patent/litigation attorney for Dickstein, Shapiro, LLP, Washington, DC. He also has served as an Air Force judge advocate in a variety of active duty, Air National Guard, and reserve assignments. He also has prior enlisted service as a depot aircraft maintenance/battle damage repair/expeditionary logistics technician at the Oklahoma City Air Logistics Complex (OC-ALC), an aircraft crew chief for two tactical fighter squadrons, and as a flight operations manager for two Airborne Warning and Control Squadrions (AWACS) and the 89th Airlift Wing.

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1. For example, elements of this game include the different entities (e.g., prime integrators, subcontractors, piece part suppliers/OEMs, potential secondary sources, Government depots or Federal labs with various types of R&D or expertise, companies that can provide reverse engineering expertise, various elements within a program office (e.g., program engineers, sustainment engineers/logistics specialists, equipment managers, program managers, contracting officers, financial managers, lawyers), sustainment organizations (e.g., depot, field, supply chain), SAF/AQ, AFMC/A4, Congress, the public, universities that might engage in activities such as reverse engineering parts, providing expertise, trade associations (e.g., Modifications and Replacement Part Association (MARPA)/Aeronautical Repair Station Association, Federal regulators (e.g., FAA, NTSB), AF Safety Center, trade journals/patent systems that provide detailed manufacturing technical data or manufacturing process information that can be used to enable creation of secondary sources, etc.).
Island Logistics

By: Maj Naomi J. Donovan

Maritime logistics is a unique challenge for Active Duty, Guard/Reserve, National Guard, and Industry Partners. Living on an island, geographically separated from large-scale supply and manufacturing, creates big logistical waves. The military will need to surf these waves with revolutionary practices to stay above water. Island logisticians are faced with two key issues: local civilian participation and the speed of supply. Operating in the state of Hawaii, about 2,000 miles from the US mainland, just takes... time. Working alongside an island community with its own culture and system is integral to maintaining supply timelines. Building relationships within the military services and commercial businesses while navigating the logistical waters is something our military members are doing every day, all while living on an island paradise.

A Strategic Island

The island of Oahu in Hawaii is home to more than 100,000 military personnel and dependents who make up a little over 8% of Hawaii’s population and a civilian force of almost 3%. The headquarters for the US Indo-Pacific Command is located at Camp H.M. Smith. Under the combatant command, logistics integrates the Air Force, Navy, Army, Marine Corps, Coast Guard, and Hawaii National Guard. The Pacific region is vast and a dynamic driver to the global economy. The area includes some of the most populous nations in the world as well as some of the smallest of island nations. The world’s busiest international sea lanes and largest ports are in the Pacific waters. Hawaii has been a strategic military base of operations during three major wars in the twentieth century: WWII, Korea, and Vietnam. The Pearl Harbor location was the site of the surprise bombing in December of 1941, which caused the US to join the allies in WWII, and so will continue to symbolize the need for military preparedness. A military and logistics presence in Hawaii is a strategic certainty for now and for future military operations.

Island of Oahu

The local community of Oahu has a deep and rich history. Oahu is known as “The Gathering Place” and is the third largest Hawaiian island. The main contribution to the Hawaiian culture is that of the Polynesian people and is often referred to as “Aloha life”. Moments and time with people are to be cherished. Community time is valued above other matters. The pace is slow and easy; however, for those not from an island lifestyle this incites impatience,
particularly for military who focus on a real-time agenda. Immediate solutions and a fast turn time are not part of the way of life on the island. Still, the community is involved with the military logistics operations. The helping hand is certainly appreciated and employed by military services. Recently, the 599th Transportation Brigade partnered with a local shipping company, Young Brothers, LLC to upload cargo and equipment from 3rd Marine Regiment, US Marine Corps Base, Kaneohe Bay onto their Ho’omaka Hou barge at the Honolulu Harbor piers. The equipment was headed from Oahu to the Big Island of Hawaii for training at the Pohakuloa Training Area. The Young Brothers barge was headed to the Big Island for commercial purposes, and it happened they had space. The military solidified a contract via Naval Supply Systems Fleet Logistics Center Pearl Harbor for military equipment transportation. This agreement saved the military days of planning and execution. The contract fulfillment with the Young Brothers was thousands less than it would have been if it was an internal military logistics movement. Continuing to build and nurture relationships with local businesses yield valuable results. Whether it be through cargo vessels, local manufacturing, purchasing from resident companies or partnering with native establishments, working together is mutually beneficial. 

### Speed of Supply

Working military operations out of the Pacific theater puts pressure on the speed of supplies in the ocean of logistics. Aircraft parts, materials, and equipment are just a few of the supplies that must be transported from facilities on the mainland to the island of Oahu. This is especially true for Major Paul Ellis, Acting Commander for the 15th Aircraft Maintenance Squadron. “The speed of logistics is constrained due to over-sea travel. Our C-17 fleet at Joint Base Pearl Harbor-Hickam, and the Air Mobility Command’s en route mission, are both utilized at a high operational rate.” These critical parts and pieces, to ensure mission capability, are packaged and loaded via either cargo ship or air transportation. Commercial air and sea are used more often than military shipping.

Industry partners, who the military leans on heavily, work just as hard to ensure a safe and reliable supply chain for the islands of Hawaii. The standard expectation of delivery time, 24-48 hours, does not hold for Hawaii. Waiting more than 72 hours for an aircraft part that is coded “Mission Impaired Capability Awaiting Parts” is not uncommon. A typical aircraft grounding condition resupply rate is 24-48 hours on the mainland. While living on an island, the mission impact is measured in much longer wait times. Even for a commercial partner using the Amazon Prime 2-Day special, under 48 hours is not a probability. Greater patience is required for military logistics operations to ride the island waves.

### Future

The Joint Logistics Enterprise of the future should drive planning, investments, and networking to ensure readiness in an island environment. If there is a reduction in forces in the Asia-Pacific region, perhaps further down-sizing from Okinawa or South Korea, it would likely result in a large-scale logistics transfer movement to Hawaii. Withdrawing personnel and defense assets from the area would challenge the military and its partners with maritime logistics, planning, and traversing international waters. The US maritime industry currently operates within international water trade routes. The US military relies on US-flagged vessels, both those engaged in domestic and in international trade, to support overseas military operations in wartime. There is no guaranteed future access to international routes. Our current environment demands that military operations need imaginative logisticians to fight for today and tomorrow. Innovative approaches will reduce the challenges that accompany island logistics, flying over the seas, and maritime navigation.

The deep sea of logistics needs discipline, planning, carrying out movements, and steady supply timelines, while maintaining military personnel and equipment. This will take education, new ideas, and partnerships. At a National Defense Transportation Systems level, the public-private partnership is a key to solving the logistics challenges in Hawaii. Industry partners, who the military leans on heavily, work just as hard to ensure a safe and reliable supply chain for the islands of Hawaii. The standard expectation of delivery time, 24-48 hours, does not hold for Hawaii. Waiting more than 72 hours for an aircraft part that is coded “Mission Impaired Capability Awaiting Parts” is not uncommon. A typical aircraft grounding condition resupply rate is 24-48 hours on the mainland. While living on an island, the mission impact is measured in much longer wait times. Even for a commercial partner using the Amazon Prime 2-Day special, under 48 hours is not a probability. Greater patience is required for military logistics operations to ride the island waves.

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Maj Naomi J. Donovan is the Chief of Maintenance Requirements for the Directorate of Logistics, Engineering & Force Protection at Headquarters Pacific Air Forces, Joint Base Pearl Harbor-Hickam, as an Individual Mobilization Augmentee for Air Force Reserve Command. She aids in executing the National Defense Strategy and supporting the objectives of United States Indo-Pacific Command. She also enables maintenance ready capabilities to protect and defend the United States, its territories, and allies.

“...The real challenge is for you... to be able to think about these questions, ponder these questions and... with your partners between military services, between the military and the private sector, between modes of transportation, to talk about what the solutions might look like as we get ready for the threat that may be here sooner than we think – or perhaps, if we don’t act, sooner than we are prepared for.”

Coming up with new strategies for operational logistics and improving where the baseline is today will help deal with supply transportation times. Putting effort into local relationships will enhance island logistic capabilities. Ongoing deployment of materials and members are essential to support military operations on Oahu and the Pacific theater, and they’re essential to respond effectively to emergent threats. Enjoying the “Aloha lifestyle” as a logistician is the perfect balance of work and hang-time. Island logistics are critical to the readiness of today’s military.

Our current environment demands that military operations need imaginative logisticians to fight for today and tomorrow.

ABOUT THE AUTHOR

Maj Naomi J. Donovan is the Chief of Maintenance Requirements for the Directorate of Logistics, Engineering & Force Protection at Headquarters Pacific Air Forces, Joint Base Pearl Harbor-Hickam, as an Individual Mobilization Augmentee for Air Force Reserve Command. She aids in executing the National Defense Strategy and supporting the objectives of United States Indo-Pacific Command. She also enables maintenance ready capabilities to protect and defend the United States, its territories, and allies.

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Novel Quantum Dot Technology Shows Promise in Simplifying Vehicle and Structural Surface Inspections

Previously Published in the Society of American Military Engineers (SAME) Magazine

By: 1Lt Michael Sherburne, 1Lt Candice Mueller, Maj John Brewer, Dr. Thomas Weber, and Dr. Hengky Chandratalim

Accelerate Change or Lose. Imagine sometime in the 2030s, a war breaks out and vehicular assets undergoing years of continuous use need to be quickly checked for structural integrity in order to help ensure their safe operation. This future is edging ever closer as a new nanomaterial-based technology has the potential to produce real-time 2-dimensional (2D) surface maps of an asset’s structural health.

Colloidal quantum dots applied as a paint shows promise to be used in next-gen optical deformation (strain) sensors. Initial capabilities can be seen in a recent study published by a team of government researchers. This technology can be used in both military and the commercial industry applications.

Recently, a team of researchers from both the Air Force Institute of Technology and Los Alamos National Laboratory published their work in the American Chemical Society’s Materials & Interfaces journal highlighting their novel work in characterizing the deformation (strain) sensing properties of a polymer paint impregnated with a nanomaterial called Colloidal Quantum Dots (CQDs). These are the same materials used in your QLED television displays but used for sensing strain instead. To adapt CQDs to this technological use case, light is used to excite the dots and the excited dots emit a specific wavelength of color based upon the diameter of the dots themselves. Hence, the word ‘quantum’ as in ‘quantum dots’ because their emission wavelength is quantized. They also are known as artificial atoms. What is unique about the researchers’ work is that they used an adhesion-enhancing interfacial layer between the paint and the surface to be measured. This allows the paint to be used in realistic environments outside the laboratory. Some of the applications could be aircraft, ships, ground vehicles, buildings, and bridges. In addition, all the materials employed to bring this technology into reality are commercially available.

The motivation behind the development of the paint came from a need from an Air Force maintainer to help simplify their Non-Destructive Inspection (NDI) process. During the time, part of the research team was investigating using colloidal quantum dots for fast x-ray detection. However, one of the researchers heard that there is the possibility in which quantum dots could be used to measure strain at a macro scale. After further investigation, it was determined that the dots do change

Image Above: Airman First Class Seth Hardy, 319th Aircraft Maintenance Squadron nondestructive inspection journeyman, scans the wing of an RQ-4 Global Hawk with a mobile automated scanner system on Grand Forks Air Force Base, N.D., March 25, 2021. The MAUS inspection sends sound waves through the wing composite to identify potential defects on the interior of the aircraft. (U.S. Air Force photo by Airman 1st Class Ashley Richards)
their wavelength of emission with an applied strain. A team was assembled, and a preliminary study was conducted to see if CQDs could be used to sense strain at a macro scale. A primary concern in the study was that the signal-to-noise ratio would be too low to detect any changes using basic equipment. Fortunately, the study was successful and it motivated additional efforts into applying this technology for the Warfighter.

Since the quantum dots are applied within a polymer-based paint, they could be used on any surface. In addition, the paint with its interfacial layer is no more than ~20 micrometers thick. This has an advantage towards other NDI technologies that require certain materials to work well. In addition, the thin coating makes it viable for use on platforms that have concerns with weight. Since the paint measures deformation locally, it could be utilized with a rastering (deliberate scanning method) type camera or another method to make a real-time 2D strain surface map. This can be done affordably and is projected to be around 10 times less expensive than another 2D strain surface map technology called Digital Imaging Correlation (DIC) when comparing similar spatial resolutions. In addition, DIC requires a painted speckled surface, the use of two cameras which must be carefully calibrated, and measurements cannot be done in real-time. Spatial resolution of the CQD loaded paint has been demonstrated with the basic setup to be at most 1.34 micrometers. However, the researchers believe the spatial resolution can be improved due to the quantum dots being approximately 10 nanometers or less in diameter. This means nanometer spatial resolution is possible.

However, improvements would need to be made to both the excitation and measurement technology. In addition, it has been postulated that this nanomaterial-based strain-sensing paint could be used to detect crack formations by measuring the strain fields occurring around cracks. However, this capability would be further in the future from the strain-surface measurement applications due to the additional research and development that is required. In addition to the 2D strain surface map, a camera that can take spatial measurements such as the Microsoft Kinect could be utilized to place a 2D surface map onto a 3D model of the object under test. This would have a great deal of use when comparing data over consecutive measurements. In addition, specialists could remotely view deformation of a vehicle or structure from the data collected from their technicians and possibly through a virtual reality headset.

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There are quite a few ways one could use this optical NDI. Since the paint is an epoxy, it could potentially be integrated within composite materials with fiber optics used to both excite and collect the emission of the paint layer. In addition, the paint could be applied on the other side of a material’s surface that is optically transparent to its wavelength of emission and optically transparent to the wavelength of light used to excite the paint layer. This would allow the paint to be utilized to measure strain within materials or in hard to access areas.

One must also consider the environmental concerns when it comes to nanomaterials. The most well-established quantum dot material has been cadmium selenide. In fact, the previous work done with quantum dots, in addition to not using an interfacial adhesive layer being used for strain sensing, may have been unable to go much further than the laboratory due to using cadmium in their studies. Unfortunately, cadmium is highly toxic and is a known carcinogen. Cadmium is usually used in nanotechnology research due to being well-established and affordable, but newer and safer materials are catching up. Fortunately, less toxic indium-based quantum dots are being sold commercially and were used in the researchers’ study.
Looking forward to implementing this technology across a fleet, there are many logistical considerations to process. Generally, once the paint is applied to a structure of interest, a baseline scan would have to be collected. Then, after a regular maintenance interval or when damage is expected, the structure would be scanned again. Any permanent deformation in the structure should demonstrate a measurable change from the baseline. Researchers expect that a crack could be detected by varying the load from the baseline configuration and measuring stress field variations. If a component was repaired or replaced, a new coating of CQD loaded paint would be applied and a new baseline would need to be collected on the affected part and the local area surrounding it to establish an accurate baseline for future scans.

While operational uses of this paint are still years away, this technology competed in the 2021 Air Force’s Spark Tank. For those who have not heard of Spark Tank before, it is similar to the television show Shark Tank, except oriented toward new ideas or proven concepts from the Air Force’s own members that can help the Air Force. Senior leaders liked the possibility that the paint could revolutionize NDI across the Department of Defense and it won Top-2 in the inaugural Air Force Material Command’s Spark Tank. From there, the idea placed in the Top-15 out of over 300 submissions in the overall Air Force’s Spark Tank. The researchers are presently looking to secure funding and partnerships with Industry to complete their next phase of research that will allow them to transition the technology to the Warfighter.

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ABOUT THE AUTHORS

The Air Force and Los Alamos National Laboratory team has been investigating the use of colloidal quantum dots on an interfacial layer as a novel optical sensor for sensing deformation. After documenting promising results, the team is now focused on further studies to transition the technology. The team has made recent major accomplishments: publication of their American Chemical Society peer-reviewed paper which also helped in the team’s pitch at the last year’s annual Air Force Spark Tank. This earned them a spot in the Top-15 semifinals Air Force wide. Any questions regarding this technology may be sent to 1st Lt Michael Sherburne at michael.sherburne.3@us.af.mil.

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Logistics Command and Control: Keeping the War Fighter Safe and Ready

By: Capt Ryan Traster

“I need parts!” Anyone who has stepped into an Aircraft Maintenance Unit has heard this simple phrase. It is a recurring challenge that is fought daily by maintainers and logisticians across our flightlines throughout the Air Force. As logisticians, we are always working toward a safe environment while simultaneously executing the mission at hand. One fleet that has had to deal with its fair share of challenges is the B-1. These challenges recently presented an opportunity for the enterprise to come together and find solutions to a major problem. Throughout the article I will reference “the enterprise.” This encompasses Oklahoma City Air Logistics Complex (OC-ALC), B-1 Program Office, Defense Logistics Agency (DLA) Aviation, Propulsion Directorate, Supply Chain, Air Force Global Strike Command, and contractors. Each of these organizations played a role in finding solutions to the issues that will be discussed. The interactions between these organizations exemplify logistics command and control (Log C2) in action.

Initial Incident

On 1 May 2018, Midland International Air and Space Port received a surprise visitor. A B-1, stationed out of Dyess Air Force Base, TX, made an emergency landing after an engine fire indication. Fortunately, all aircrew were safe. Upon further investigation it was determined that the warnings were the result of a ruptured Augmenter Fuel Filter Housing (AFFH). The AFFH is critical for providing filtered fuel to each of the four B-1 GE F101 engine After-Burner (AB) nozzles.

The incident resulted in a Class A mishap and review of current procedures and processes. The goal of the review was to prevent a similar incident from occurring again. After analyzing the AFFH, engineering specialists determined that a crack would propagate in the outside wall, resulting in fuel seepage. The enterprise responded by implementing 400-hour recurring inspections on all AFFHs as well as a Time Compliance Technical Order (TCTO) requiring pressure checks. Additionally, all similar types of AFFHs were removed from service in favor of another type of AFFH.

As a result, there was a long-term plan established to purchase Generation 3 housings. However, this would not be implemented until 2021.

More Cracks

Fast forwarding to 8 April 2021, a B-1 from Ellsworth AFB, SD, declared an In-Flight Emergency (IFE) due to a failed AFFH. The enterprise responded with the utmost care and attention. Immediately, daily teleconferences were implemented to ensure all options were explored with the key stakeholders and decision makers. The Log C2 spanned from the Bomber Program Executive Officer (PEO) across DLA, the Engine PEO, Supply, OC-ALC, and the supporting experts. All AFFHs were inspected prior to their next flight. Additionally, the AFFH that ruptured was analyzed by a team of engineers. Their analysis determined that the cracks from this AFFH would not have been caught by the inspections that were implemented in 2018.

Image Above: A B-1B Lancer with a Joint Air-to-Surface Standoff Missile (JASSM) undergoes pre-flight procedures prior to a captive carry external weapons demonstration flight at Edwards Air Force Base, California, Nov. 17. (Air Force photo by Giancarlo Casem)

Image Above: Ruptured AFFH

One fleet that has had to deal with its fair share of challenges is the B-1. These challenges recently presented an opportunity for the enterprise to come together and find solutions to a major problem.
Rapid Response with Logistics Command and Control

In response to this finding, the enterprise implemented two different TCTOs to meticulously inspect the AFFHs. In order to ensure maximum safety, the TCTOs directed all AFFHs be removed from aircraft and inspected at OC-ALC. This required OC-ALC to stand-up a new production/inspection process machine. The inspections include X-ray, fluorescent penetrant inspections, and dimensional inspections to check for cracks. In total, 320 AFFHs were inspected and 114 AFFHs were returned to service. In order to minimize the impact on field units, the AFFHs on depot aircraft were inspected and then taken to the field and switched with the field assets, in order to inspect those assets. The most impressive part of this effort was that it took only 30-days to complete. The first AFFH was delivered in five days and the production machine increased its production capability by 550%. This was a massive unplanned workload that required a high level of urgency, agility, and responsiveness.

A key part of this success was the continuous communication among teammates. The entire enterprise had daily calls, daily SITREPs, and inclusive decision making from the PEO down and the mechanic up. Everyone involved had a clear understanding of what was going on. This allowed key players to move with speed throughout the duration of the operation. For example, as soon as an asset arrived on base, DLA and the 76th Commodities Maintenance Group (CMXG) were in communication to get the asset moved to the production machine. This quick communication among team players ensured there were no wasted minutes.

In order to expedite the process, DLA, the 448th Supply Chain Management Wing, and field units created a delivery system with drivers on call 24/7, moving assets back and forth as soon as they were ready. No time was squandered on assets waiting for pick-up and delivery. Additionally, logisticians and engineering experts were always on call, ready to provide guidance. The entire enterprise was on-call and marching toward a common goal.

Adapting to New Challenges

On 8 May 2021, there was another situation that required a rapid response. A reassembled and inspected AFFH ruptured while on the test stand. This led to an investigation inquiring whether the prescribed procedures were followed, and it was determined that all procedures were followed correctly. This incident also required the test stand to be fully recalibrated. The recalibration was completed one day ahead of schedule—another example of the urgency that the team moved with during this period.

The engineers determined the rupture resulted from low cycle failures, meaning there were small cracks present that could not be detected due to the design and material used in the AFFHs. Both styles of AFFHs were designed similarly and manufactured out of cast aluminum. Engineering determined that cast aluminum led to issues with varied wall thickness, porosity, and metal fatigue—issues that would be corrected in the Generation 3 housings. The Generation 3 AFFHs were machined out of a solid aluminum block, a design solution to provide more consistent wall thickness, minimize porosity, and eliminate metal fatigue. However, these Generation 3 AFFHs were not yet ready for delivery as the contract had just been awarded and was not expected to begin delivery until October 2021. Fortunately, Log C2 worked quickly to support the rapid production of safe and reliable AFFHs.

The inspections include X-ray, fluorescent penetrant inspections, and dimensional inspections to check for cracks.

It took everyone in the enterprise to find creative solutions to reach a common goal.
On 19 May 2021, an enterprise-wide phone call took place. A plan was developed which allowed the B-1 fleet to stay mission ready while maintaining safe and reliable aircraft. The decision was made to implement a new buy of 121 AFFH Generation 3 heads from Pall Aerospace. Meanwhile, OC-ALC would receive the AFFH heads and assemble a new AFFH using the internal components from the Generation 1 AFFHs. In order to speed-up this process the first article test was completed in one day, 600% faster than the usual time it takes. In just 47 days, the enterprise produced 120 assets and returned 30 aircraft to mission-ready status. This allowed the B-1 enterprise to bridge the gap of missing AFFHs until the rest of contract was filled.

Final Thoughts
Now our B-1 maintainers can say, “I do have the parts!” That is the case for AFFHs at least. Not only that, they confidently present our pilots a safe and reliable aircraft. None of this would have been possible without teamwork across the B-1 enterprise. It took everyone in the enterprise to find creative solutions to reach a common goal. Not everything went perfectly however, the team remained flexible and was continually able to adapt to changes. It was awesome seeing the enterprise come together to meet the warfighter’s needs when they needed it most.

Image Above: A 9th Expeditionary Bomb Squadron B-1B Lancer sits on the flightline at Andersen Air Force Base, Guam, May 1, 2020. Approximately 200 Airmen and four B-1s were deployed to Dyess AFB, Texas, deployed to the Pacific in support of the Bomber Task Force. The BTF is deployed to Andersen AFB to support Pacific Air Forces’ training efforts with allies, partners and joint forces; and strategic deterrence missions to reinforce the rules-based order in the Indo-Pacific region. (U.S. Air Force photo by Senior Airman River Bruce)