# CALL SIGNS

USN AEP SOCIETY

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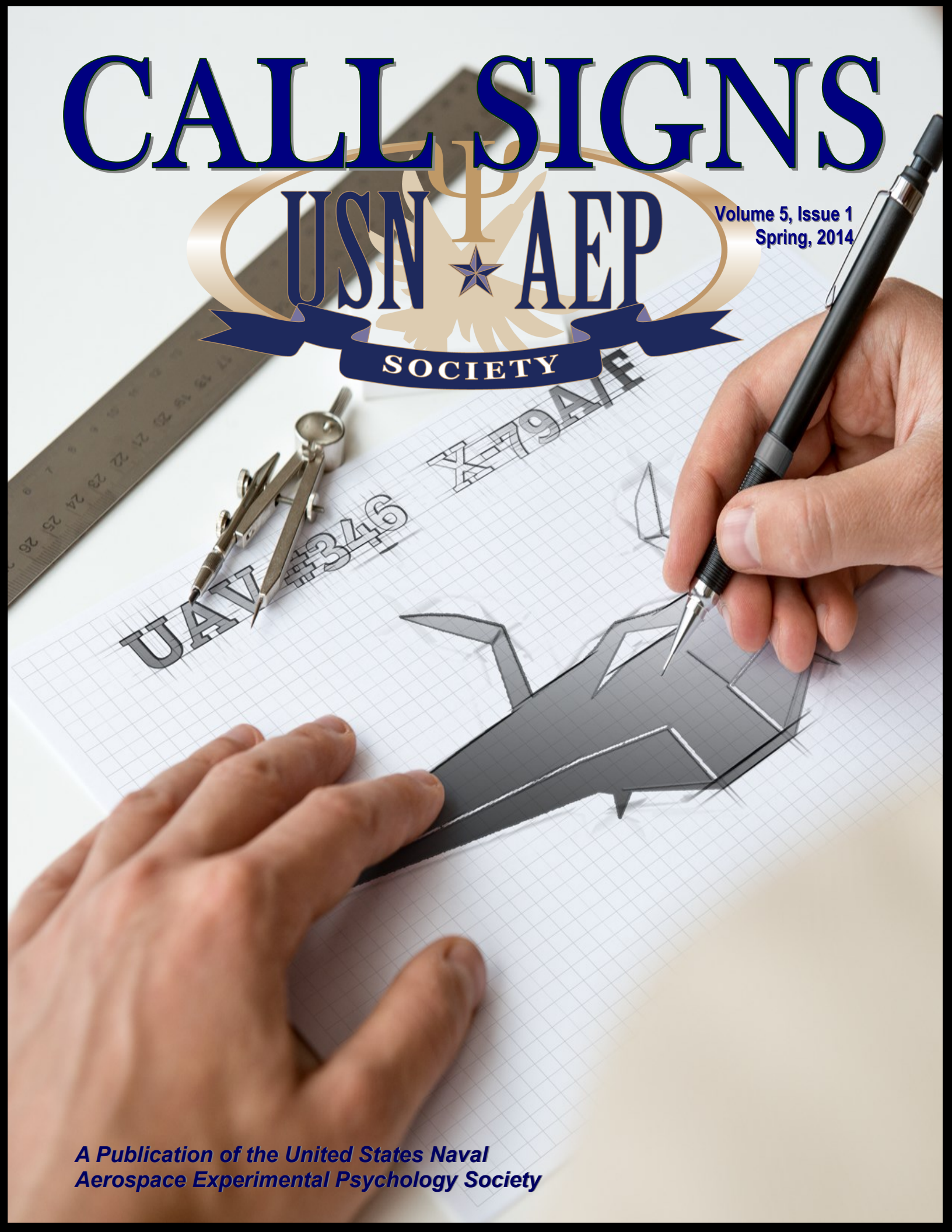


*A Publication of the United States Naval Aerospace Experimental Psychology Society*

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## About the USN ★ AEP Society

As military transformation continues to affect today's and tomorrow's Department of Defense and the Navy Medical Service Corps, the need to promote the role of Aerospace Experimental Psychologists as leaders and innovators in aerospace psychology continues.

Naval Aerospace Experimental Psychologists offer a unique combination of education, knowledge, skills, and experiences to address current and emerging challenges facing the Navy, joint, and coalition environments.

The U.S. Naval Aerospace Experimental Psychology Society (USNAEPS) is an organization intent on:

- Integrating science and practice to advance the operational effectiveness and safety of Naval aviation fleet operators, maintainers, and programs
- Fostering the professional development of its members and enhancing the practice of Aerospace Experimental Psychology in the Navy
- Strengthening professional relationships within the community

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# Message From The President

## LCDR TATANA OLSON, USNAEPS PRESIDENT

As we leave Spring and move into the Summer months, it is hard to believe that it has been almost a year since I assumed the Presidency of USNAEPS. The Society has accomplished a lot in the past year:

- The USNAEPS Historian, LCDR Jeff Grubb, along with LCDR Chris Foster and LTJG Eric Vorm, have played critical roles in representing the AEP community in the development of a display at the Naval Aviation Museum in Pensacola that will chronicle the rich history of the Navy aeromedical community. Significant progress has been made in the preliminary design for the exhibit, and it's quite impressive!

- USNAEPS received its official notification from the IRS of tax exempt status in February. This means that USNAEPS can accept financial contributions from potential donors, contributions the Society can use to fund important initiatives. This year alone, USNAEPS supported the Navy Luncheon at the Aerospace Medical Association Annual Scientific Meeting, recruiting efforts at the Society for Industrial and Organizational Psychology Annual Meeting, and upgrades to the USNAEPS web site. Additionally, achieving tax exempt status will enable the Society to apply directly for government and foundation grants should the need or opportunity arise.

- Thanks to the diligent efforts of our Membership Coordinator, LT Kirsten Carlson, we have received updated membership information from approximately 50% of the members solicited, most important of which are education and areas of specialization. This information will enable the Society to more efficiently identify individuals with specific skills and expertise should assistance be requested. A perfect example of this was a request for international reviewers from the Polish Journal of Aviation Medicine and Psychology (PJAMP) with expertise in pilot selection, spatial disorientation, vision, and flight simulator performance. Several USNAEPS members answered the call. This partnership is a great example of scientific collaboration with our international partners and will serve to expand the visibility of aeromedical research across a broader audience. Also, stay tuned for the introduction of a new USNAEPS page on Linked In, which will provide greater opportunities for professional networking and development.

- The Winter 2013 Issue of *Call Signs* unveiled a new "look" for the newsletter, thanks to the graphic design talents of Co-Editor, LTJG Eric Vorm. This new look includes more streamlined articles and graphics, which will make reading each issue more enjoyable than it already is!

Speaking of the newsletter, it is with great pleasure that I introduce the 9th (Spring, 2014) issue of *Call Signs*. This issue turns an eye to the future. As the Navy continues to adapt to an evolving fiscal and global environment, it will face many new challenges. Gandhi once said that "the future depends on what you do today." This issue highlights a number of emerging challenges across several key research domains and discusses the vital roles AEPs are playing (and can play) in addressing those challenges today to help prepare the Navy for what lies ahead. Not surprisingly, automation is featured prominently in this issue. In his *Sailing Directions*, the Chief of Naval Operations (CNO) clearly stated that in the next 10 to 15 years, "Unmanned systems in the air and water will employ greater autonomy and be fully integrated with their manned counterparts." This underscores the importance of understanding the human factors considerations associated with the integration of manned and unmanned capabilities. In addition, this issue addresses the expansion of Live-Virtual-Constructive (LVC) training to close the gap between the capabilities of our platforms and the capabilities of our training programs, a "system of systems" approach to the Naval Integrated Fire Control-Counter Air (NIFC-CA) Program, and emerging opportunities for the AEP community within the newly formed Defense Health Agency (DHA).

It's often said that the reward for work well done is the opportunity to do more. I think this issue of *Call Signs* shows that not only is there much more work to be done, but that AEPs will continue to play an important role in enhancing the safety and performance of our warfighters and the systems they rely on well into the future.

In closing, within the next few months, a new President will take the helm, and there will be a number of new faces on the USNAEPS Executive Committee. I would like to take this opportunity to thank the current Executive Committee for their hard work and dedication, and express my sincere appreciation to all of the USNAEPS members for their continued support of this Society. Whether it's providing insight into the historical roots of our community, contributing articles to the newsletter, or sharing professional opportunities, it is your active engagement that contributes to the success of USNAEPS. So, stay engaged and have a safe and enjoyable summer!

# Considerations for Airspace Integration

**BY LT JOSEPH W. GEESEMAN, AEP#148**

A tacocopter? Burrito bomber? A sushi squadron? Yes, yes, and yes – all of these food delivery systems are in existence and enjoying varying levels of success. What do they all have in common? All of them are *unmanned* aerial systems (UASs) that deliver food to hungry customers seeking a novel dining experience. Other companies, such as Amazon, are sincerely considering employing the use of UASs in their daily operations. These ideas may seem far-fetched, but UASs are here to stay and will only become more ubiquitous as technology becomes more advanced.

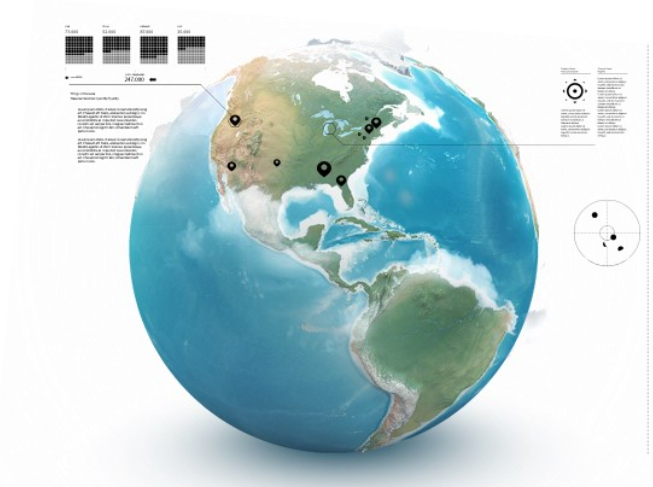
A fast approaching objective for the use of UAS that is more pertinent to the aviator is the integration of unmanned systems into the national airspace system for parcel delivery. No, not to your door as Amazon may envision, but rather, large shipments of parcels across long distances. Don't worry, this won't happen overnight, but a general consensus among interested parties is that FedEx and UPS will be leading the charge. It will be a tedious and difficult road to navigate, but it will be traversed. What needs to be done to integrate these unmanned platforms into the national airspace system?

On December 30, 2013, the Federal Aviation Administration (FAA) selected six test sites across the country for UAS research based on geography, climate, location of ground infrastructure, research needs, airspace use, safety, aviation experience, and risk. The six locations and/or entities selected are the University of Alaska, the state of Nevada, New York's Griffiss International Airport, the North Dakota Department of Commerce, Texas A&M University, and Virginia Polytechnic Institute and State University (Virginia Tech). With the establishment of these test sites, the advancement of UAS integration into national airspace should proceed much more quickly and as a cooperative effort. The current status quo is for operators and researchers to keep all UASs within the line of sight, less than 400 feet above the ground, during daylight conditions, inside Class G (uncontrolled) airspace, and more than five miles from any airport or other location with aviation activities (Dorr & Duquette, 2014). While one day testing of this sort will need to move beyond these restrictions to advance the technology--the current laws, seem are appropriate given the limits of unmanned systems as they currently stand.

Although the hype in current media occasionally inflates realistic safety and privacy concerns regarding "drones," the truth of the matter is a little less exciting. The problem is that these systems are often incorrectly anthropomorphized, and as a result - feared. It wasn't too long ago that a different automated system, the ATM, was introduced into society with much resistance and fear. It will take time and a lot of success before UAS is accepted as, perhaps, a means of transportation.

While the human component of the autonomous system can be disregarded, it is arguably the most critical facet of the system. It is true that UAS are platforms that can be used for surveillance and attack missions, but without the human in the loop, neither of these missions could be completed. The technology to support something that seems as simple as computer vision is far behind what is depicted in the media. Our ability to perceive something like a corner of a room is extremely difficult for a computational program to "see." It is human experience with corners, shading, and our parallax that allow us to perceive the corner of a room rather than a flat surface with three different shades of paint.

Limitations in computer vision are only one piece of the puzzle that currently constrains the utility of UAS. Most major research programs across most branches of the Department of Defense are interested in advancing UAS capability. Similar to all current software, UASs require regular software upgrades. With a constricting DoD budget, it isn't feasible to stovepipe each system and have each aircraft manufacturer provide software updates unique for each platform. The Pentagon began, in 2009, pushing for a solution for UAS interoperability. The solution (ucsarchitecture.org) is an approach similar to the AppStore where individuals can write their own



code in a common programming language and submit it to the DoD for testing and integration. This approach spreads incentive across many researchers (e.g., academia, private) rather than solely on a commercial entity and should thrust UAS technology to advance at much faster rate.

Currently, over 1200 UAS variants are identified ranging in sophistication from balsa wood and simple propeller engines to stealth technology and jet-propulsion. These systems are often outfitted with some sort of payload to accomplish a mission (e.g., attack weapons, reconnaissance sensors). The UAS of the future very well may be the wingman of the future - capable of air-to-air tactical missions. At a recent Community of Interest meeting on UAS in California, RDML Mathias W. Winter, Program Executive Officer for Unmanned Aviation and Strike Weapons stated, "It is a logical, long-range plan to have operational manned and unmanned systems. I can't speak for UPS, FedEx, and the commercial sector, but the future of Naval Aviation will still include manned platforms."


Imagine a battlefield twenty or thirty years into the future where a possible terrorist hotbed suspected of nuclear activity must be monitored for an extended period of time. Rather than sending manned flight after manned flight, it would be much more cost-effective and beneficial to send an unmanned system that can remain aloft for a prolonged period of time with a much more effective sensor analysis software suite. Perhaps this system will link with smaller ground patrol systems that can remain deployed for the same amount of time by recharging their batteries via sunlight and can detect radiation emissions; thus, producing a more robust picture of the surveillance area without unnecessarily irradiating our special operations soldiers. Additionally, unmanned submersibles may patrol the local littoral zone to track any attempt to move the nuclear device offshore. With all of these systems linked together providing a complete battlefield assessment, we will be able to take the dull, dirty, and dangerous away from manned missions. Take a moment to think of the technologies required to satisfy this hypothetical situation that the Aerospace Experimental Psychology (AEP) community could support.

First, the sensors and sensor integration software of the aircraft must be displayed in a meaningful way so the operator can make timely and effective decisions. If the system processes information with a higher level of autonomy, research must be provided to produce the algorithms that dictate what is relevant and what is dismissible by the system when monitoring the suspected terrorists. The ground and underwater systems will require "visual" systems that allow them to navigate their environment and avoid obstacles or potential adversaries. What if the future of autonomy leads to the system gaining the ability to strike if a threshold of some measure is passed (e.g., target identification, radiation levels, activity identification)? What level of "certainty" must the system reach before it can engage the enemy? Would the system use face recognition or some other method of target identification? What are the ethical implications of such a system?

There are number of technological advancements that would need to be solved in order to meet the needs of the previously mentioned scenario. Some problems of encryption and data transfer are outside the scope of our community. Other research areas that range from aiding in the development of scene analysis software to pondering the ethics of fully automated and *armed* aerial systems are well within the scope of the AEP community which should enable us to support the Navy and DoD needs in automation well into the future.

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# Autonomy, Artificial Intelligence, and the Future

**BY LCDR BRENT OLDE, AEP#122**

I believe there is a common misconception (or possibly just an over simplification) when it comes to thinking about autonomy. People tend to categorize systems as either autonomous or not, with no middle ground; when in fact there are levels of autonomy; For example, Parasuraman outlines 8 levels of autonomy (Parasuraman & Sheridan (2005).

1. Automation offers no aid; human in complete control.
2. Automation suggests multiple alternatives; filters and highlights what is considered to be the best alternatives.
3. Automation selects an alternative, one set of information, or a way to do the task and suggests it to the person.
4. Automation carries out the action if the person approves.
5. Automation provides the person with limited time to veto the action before it carries out the action.
6. Automation carries out an action and then informs the person.
7. Automation carries out an action and informs the person only if asked.
8. Automation selects method, executes task, and ignores the human (i.e., the human has no veto power and is not informed).

To illustrate, ponder the question as to whether your car's brake system is autonomous or not. You would likely conclude that since braking requires pressure from your foot to the pedal, then it is clearly a manual task. However, if you are driving on ice and your car starts to skid, your car's system will automatically engage its Anti-Lock Braking System (engaging and disengaging your brakes – effectively pumping the brakes for you). You did not request your car to perform this action, nor does your car inform you that it has performed this action during or even after the fact – this type of automated response would be categorized at the highest level of automation. So here's an example that spans the range from manual to highly automated, all in the same car subsystem. We would not say the car was autonomous just because it had one automated subsystem, but as more and more systems become automated there comes a tipping point where the human's main role transitions from direct control to being a supervisor, present mainly to take action when the automation breaks down or encounters unique unanticipated circumstances.

To achieve a high level of autonomy, a system requires Artificial Intelligence (AI) to be built into the system. AI is another concept I believe people think of in the extreme - assuming you need "HAL- (the ultra sentient AI from "2001: A Space Odyssey") like" capability to have AI. AI, however, does not have to be as good as HAL in order to be effective AI. It really just has to make some of the decisions that the human would make. For example, the self-driving Google car needs to perceive its environment (through sensors) and know to stay between the lines, stop and go based on traffic lights and road signs, and maintain distance between other cars- all tasks that the human used to control but have now relinquished to the computer.

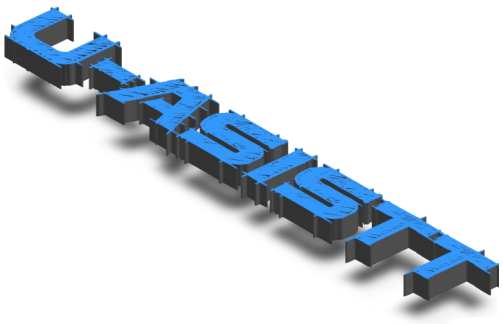

Just like Human Intelligence, Artificial Intelligence has varying degrees of "Intelligence". The more activities the system can perform on its own and its ability to adapt to new environments or situations, the more "Intelligence" is ascribed to the system. Animals go extinct because they cannot adapt to their changing environment - it's not an easy task and it's no wonder that it's a difficult thing to get a computer to do. It's not uncommon for an automated system to perform well on one task but fail at another, very similar task. Thus, most automated systems are focused on narrow, specific tasks and tend to be "brittle" or break easily when sensor input is unique or unanticipated. The challenge, and what makes a system seem human-like, is the ability to be flexible and adaptive to novel situations.

In my current job at the Office of Naval Research (ONR), I have the privilege to see (and even direct) some of the many Science and Technology efforts devoted to taking AI and Autonomy to the highest levels and then attempt to integrate them into future Naval systems. These programs encompass unmanned vehicles (Sea, Surface, Air), human and animal replicas, big data reduction for decision support, and intelli-

**"The pace of technological advances continues to progress at an extraordinary rate and its impact on how the Navy will train and fight will have dramatic impacts in the not-to-distant future."**

gent tutors, just to name a few. ONR recently published a series of articles under their Innovation publication titled: *Mysteries of Artificial Intelligence* (Winter 2014, Vol. 11) which provides a more in-depth discussion of these programs and can be found here: http://www.onr.navy.mil/Science-Technology/Directorates/office-innovation/Innovation-Newsletter.aspx. However, I would like to highlight a couple of the programs in this article.

As discussed earlier, there is a tipping point where a system moves from being automated to one that has autonomy - where the human operator's role is primarily to act as a supervisor. Most unmanned systems are more like remotely controlled robots than truly autonomous systems, however this field is advancing quickly and as such, user interfaces must evolve from direct control to a supervisory role. This requires a paradigm shift in how we think about system command and control. The interfaces must be designed towards understanding what the human operator needs to know, when they need to know it, and when they need to override the built in system autonomy. This is a very different mindset from assuming the human operator is constantly engaged and physically controlling the system. This is the issue an ONR program called Unmanned Aerial Systems Interface, Selection and Training Technologies (U-ASISTT) is attempting to tackle. The program will look at new user interfaces designed for UAS supervisory control and provide future system design recommendations that are based on scientifically founded principles.




Another ONR program is currently addressing the Navy's need to have a training capability that would mimic and expand current gaming technology with the intent of ultimately allowing warfighters to jump online and train in a synthetic environment - anytime, anywhere. There are quite a few hurdles to overcome before the military could utilize such technology namely: security, connectivity, and interoperability. In addition, there are manning and coordination issues to work through. For example, to have a large, complex distributed training event you need to have all the key players represented - not an easy logistical task. However, if the key players could be provided through fully autonomous Computer Generated Forces (CGF), then the anytime, anywhere goal becomes more manageable. ONR is working on new methods to improve and generate CGF, to make them more intelligent and autonomous, and eventually lead to the anytime, anywhere training objective. There are also some other benefits of this technology, like pitting CGF verse CGF for Monte Carlo testing purposes; if the intelligent algorithm used to run the CGF perform at near human levels of intelligence, then it would be possible to use them to actually control an unmanned system.

The pace of technological advances continues to progress at an extraordinary rate and its impact on how the Navy will train and fight will have dramatic impacts in the not-to-distant future. This provides exciting opportunities for AEPs and other scientists in uniform. The future is here; let's make sure we help make it a smooth transition.

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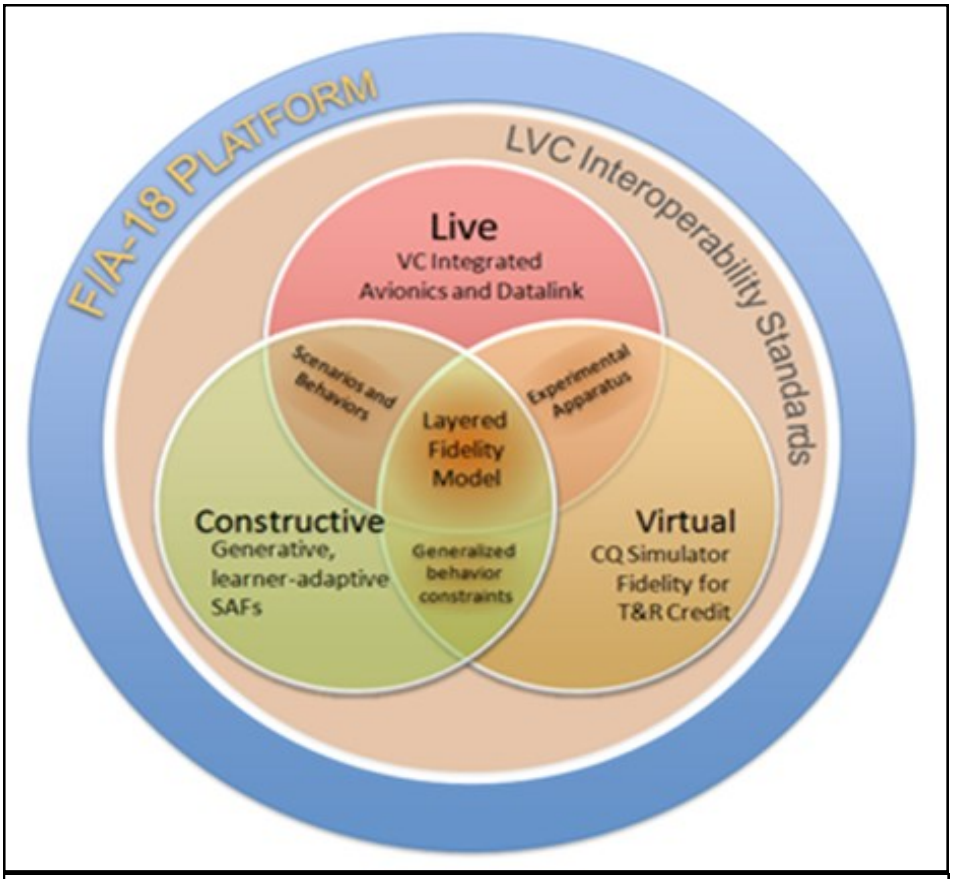
# Live-Virtual-Constructive (LVC) Training

**BY CDR HENRY PHILLIPS, AEP #119**

In Vision for Naval Aviation 2025, Chief of Naval Air Forces VADM Buss wrote, "The cost to operate present and future platforms - combined with advanced capabilities that are rapidly exceeding the capabilities of our current training ranges - demands that we innovate in combining *live, virtual, and constructive* training." Live-Virtual-Constructive (LVC) training is a rapidly expanding area of training research and capability development across services. At its most basic, it can be conceptualized as real-world platforms and operators (Live) interacting with networked simulators (Virtual) and synthetic forces (Constructive). Picture a range-based training event involving an air combat element of multiple platforms providing overwatch and close air support to a ground-based force, integrated with fires from surface vessels in littoral waters, facing an enemy force of similar structure and capability. Now imagine that fewer than 25% of the actors in this scenario consist of live actors on the training range, while another 25% of the players are participating in simulators thousands of miles away. Imagine that the remaining 50% of the training scenario actors are entirely synthetic forces, existing only on the instruments of the live and virtual participants, reacting autonomously to scenario developments. Imagine how well the LVC environment developed to support an event like this would have to work to provide training that transfers to the operational environment. Now imagine that in some places, this is already happening, and that the scenario above is just the tip of the iceberg in terms of how LVC training will be used to support integrated training requirements across the Department of Defense (DoD).




*ONR LVC Training Fidelity Program Pillars*

This article will highlight ongoing research and capability deployment in LVC training across the Army, Marine Corps, Air Force, and Navy. This is not intended to serve as a comprehensive list, but rather as a sample of the complementary research efforts and tools deployed and under development to support LVC training requirements for US military forces.

Army: The US Army's Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) has fielded the LVC Integrating Architecture (LVC-IA), a deployable LVC-enabling system which integrates ground forces, aviation assets, and C4I functions through a Tactical Operations Center. LVC-IA integrates the Aviation Combined Arms Tactical Trainer (AVCATT), the Close Combat Tactical Trainer (CCTT) and the Mission Training Complex within the Army's Integrated Training Environment. Ground forces conduct virtual training via the Dismounted Soldier Training Center (DSTC). LVC-IA was originally fielded at Fort Hood in 2012, and has since deployed at four other sites. LVC-IA has been highly successful, and has enabled the delivery of distributed virtual training in exercises involving aviators, tankers, infantry, and command elements. The Army Research Laboratory (ARL) Human Research and Engineering Directorate (HRED) has numerous capabilities in development designed to integrate and augment LVC-IA capabilities.

Marine Corps: The USMC is working toward development of an LVC Training Environment (LVC-TE) as delineated in the Marine Corps Training and Education Modeling and Simulation Master Plan 2010 to support ground, air, and surface combat elements, as well as command and control nodes at force integration levels up to and including the Marine Air Ground Task Force (MAGTF). USMC Program Manager Training Systems (PM TRASYS) is currently directing efforts for a test-case integration of fielded training systems including Deployable Virtual Training Environment/Virtual Battlespace 2 (DVTE/VBS2), the Combined Arms C2 Training Upgrade System (CACCTUS), the Supporting Arms Virtual Trainer (SAVT), and the Squad Immersive Training Environment (SITE) to support integrated LVC training and effectiveness assessments for LVC assets in ground, air, Joint Terminal Attack Control (JTAC), and command elements as part of Large Scale Exercise (LSE) 14 for the First Marine Expeditionary Force (I MEF) later this year. Headquarters Marine Corps Combat Development and Integration (HQMC CD&I), in conjunction with Training and Education Command (TECOM) plans to leverage the lessons learned in this exercise to shape ongoing work in the refinement of its vision for LVC-TE. Current efforts are focused on establishing downstream training needs for LVC-TE components aligned to MAGTF-level Training and Readiness (T&R) and aviation simulator requirements captured in the Marine Corps Aviation Plan (AVPLAN).

Air Force: Air Force Research Laboratory (AFRL), 711th Human Performance Wing (711 HPW) Warfighter Readiness Research Division (RHA) researchers on the LVC Pilot Program are leveraging over 10 years of progress toward the establishment of LVC operations and training standards by developing pod-based subsystems that support data security and transmission requirements between ground systems and other airborne pods. This group is also working on rule sets for data transmission between simulators, a minimum set of throughput, latency, waveform designs, and data link parameters needed to support airborne LVC training across platforms. In 2013, 711 HPW/RHA placed LVC enabling kits at 3 different bases, and is working on enabling LVC training opportunities using tactical data links such as Link 16.

711 HPW is also midway through a 5-year effort entitled LVC Immersive Decision Making Environments (LVC IDMEs), focusing on improved training effectiveness for remotely piloted aircraft (RPA) operators and Homeland Defense agents. This program focuses on the application of cognitive science and integration of auditory, visual, and tactile cueing, as well as increased entity realism, and experimental validation of live-virtual environment differences.

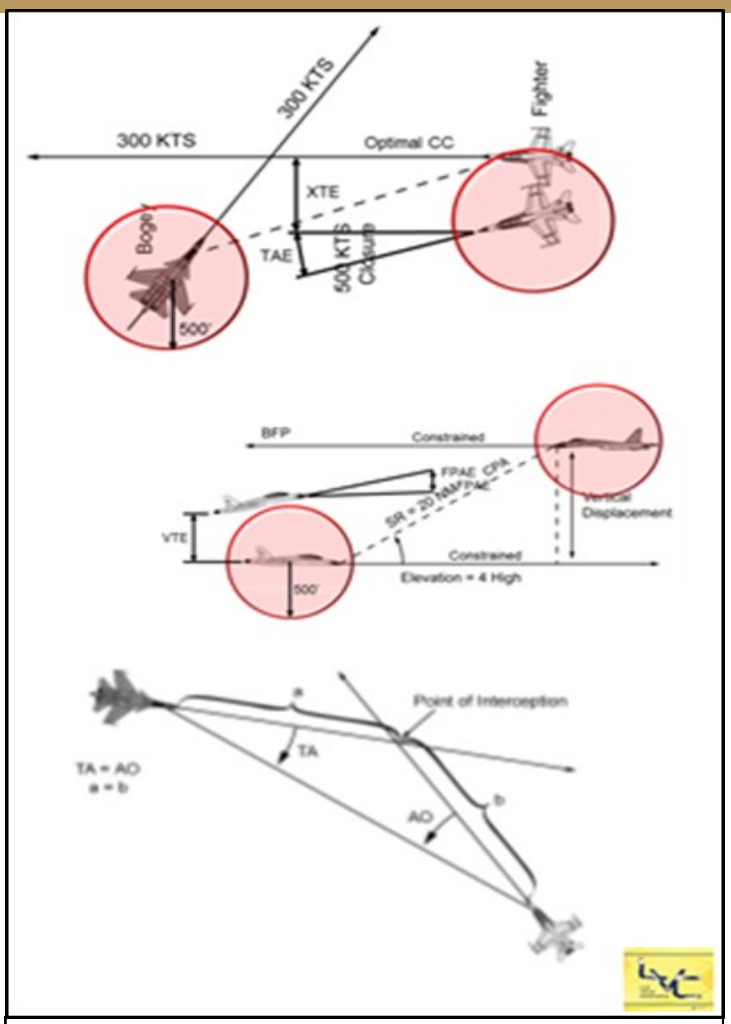



*Illustration of separation minimums incorporated into projections for future L-V sorties.*

In addition, the 711 HPW/RHA's LVC Sensor Integration and Data Fusion for Operations and Training (SIDFOT) program is being used by Special Weapons and Tactics (SWAT) medics for LVC-enabled distributed training using sensor-equipped mannequins, remotely connected to mannequins at medical sites. This capability reduces planning time by 1.5 hours, has been demonstrated in lab settings and wooded areas, and enables detailed actor tracking and enhanced after-action review (AAR) reporting designed to assess triage, infiltration, exfiltration, and time to locate targets. The transition plan envisions an integrated environment for medical and law enforcement personnel to train and conduct operations research for increase tactical effectiveness.

Navy: In FY12 the Office of Naval Research (ONR) funded the Live, Virtual, and Constructive Training Fidelity (LVC TF) program as an Enabling Capability under its Future Naval Capabilities (FNC) Program. The objective of the LVC TF program, which continues through FY16, is to improve

our understanding of the impacts of merging virtual and constructive entity representations onto avionics displays on safety and training, define the fidelity necessary to achieve more Training and Readiness (T&R) in virtual simulators, and developed constructive semi-automated forces (SAF) that demonstrate tactically realistic and learner aware behaviors. Payoffs of this program will include the ability to enhance fleet readiness, lower total ownership costs, improve safety, and reduce security risks. The program is organized into three pillars.

The first, Virtual and Constructive Representations on Live Avionics Displays (VCR LAD), will develop implementation guidance for the integration of virtual and constructive entities on aircraft displays over range communications to produce safe and effective training during blended LVC events. The LVC symbology design principles and networking guidelines delivered will enable safe and effective training exercises without an increase in cognitive workload, misinterpretation, data inconsistencies, and other Virtual/ Constructive (VC) induced artificialities.

*A CH-47F pilot conducts a tactical platoon air assault mission in the Aviation Combined Arms Tactical Trainer (AVCATT) at Simmons Army Airfield, N.C.*

The second pillar, Cognitive Fidelity Synthetic Environments (CFSE), This effort focuses on developing a systematic methodology rooted in theory to support identification of simulator attribute (e.g., Visual, Motion, Aural) fidelity needed to provide Training and Readiness (T&R) credit in the synthetic environment. This effort specifically focuses on providing data-driven identification of cost-effective simulator design and fidelity improvements to simulate Carrier Qualification (CQ) training. The developments under this effort will extend to other simulated training environments and migrate to other class devices to improve Live, Virtual, and Constructive (LVC) Mobility Capabilities Based Training and Readiness Matrices (CBTRM) training and Fleet Synthetic Training (FST) and thus will be of critical value to the warfighter.

The third pillar, Tactics and Speech Capable Semi-Automated Forces (TACSAF), supports LVC training by delivering autonomous, coordinated and realistic synthetic force behaviors in LVC environments for integration into the government owned synthetic force program, Next Generation Threat System (NGTS). The capability developed contains two key components: the Training Executive Agent (TXA), which decreases workload by dynamically adapting synthetic force behaviors; and the Trainable Automated Force (TAF), which generates newly constructed forces from simulated/range data. The TACSAF deliverables will enable live or virtual trainees to train with tactically realistic forces while also decreasing operator workload, and facilitate easier customization and adaptation of training content.

The Naval Air Warfare Center Training Systems Division (NAWCTSD) has numerous efforts underway to expand LVC security and data-sharing capabilities. One such effort to expand connection capabilities in Live-Virtual communications reliability and security is the Smart Antenna Algorithm for Automated Frequency Deconfliction (SAA-AFD), a capability that optimizes and automates the process of selecting frequencies for Digital Radio Management System (DRMS) tower radio connections during Fleet Synthetic Training (FST) events using the Navy Continuous Training Environment (NCTE). This tool provides improved voice communication reliability, fewer blocked channels, and increased capacity for live participants in FST training events, among other benefits. The DRMS system was also developed at NAWCTSD.

NAWCTSD is also developing a suite of tools to help simulation developers implement interoperability requirements, including the Federation Agreement Compliance Test Tool (FACTT). These tools will make it easier for developers to build systems that are fully compliant with High-Level Architecture/Distributed Interactive Simulation (HLA/DIS) standards. NAWCTSD is also designing the Distributed Training Network Guard (DTNG), which when implemented, will serve as a cross-domain solution to bridge different security and classification levels for simulation and training data exchange. The Communications Net Guard (CNG), also in development, will provide the same capability for voice communications. These tools are important LVC enablers, since they improve our capabilities to connect remotely located simulators and training devices with each other. The capabilities to share data and communications across devices remotely located and at different security levels will broaden the scenario and exercise options available to force planners, operational leaders, and researchers. The result will be more effective training solutions.

The Navy is working toward an end state consisting of a seamless training environment that enables robust, realistic, and cost effective training by integrating LVC training systems to support the effective and efficient generation, deployment, and utilization of maritime forces. Naval LVC capabilities in development target goals of interoperability, persistence, security, real-world representativeness, appropriate multi-level fidelity, geographical independence, sufficient capacity, affordability, and after-action review and debrief capability. Setup of LVC-enabling capabilities must be transportable, timely, and efficient. The demonstration goal reported by the Office of Naval Research includes realistic training replicating operational environments with Joint and Systems-of-Systems assets including Joint Stand Off Weapon (JSOW); Naval Integrated Fire Control / Counter Air (NIFC-CA); Anti-Access Area Denial (A2AD); and counter-Fast Attack Craft / Fast Inshore Attack Craft (FAC & FIAC) capabilities in a Naval Strike and Air Warfare Center (NSAWC) training event.

Source: parsons.com

LVC efforts and capabilities across DoD services have expanded significantly over the last twenty years. The confluence of increased exercise requirements, fiscal constraints, limited range availability for live training, and increased simulation fidelity and capability combined with more sophisticated synthetic agent modeling have all contributed to the rapid expansion of funding, requirements, and progress in this area. This is a trend that shows no signs of slowing. Researchers and training stakeholders would do well to build and maintain awareness of capabilities and ongoing research in this area.

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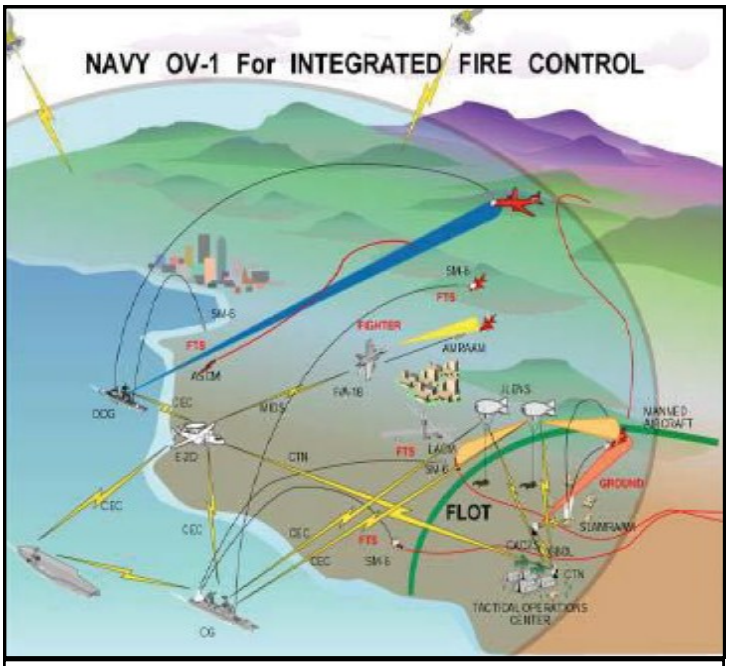
# Addressing Human Factors within a System of Systems Framework: Naval Integrated Fire Control-Counter Air Program

**BY LCDR PETE WALKER, AEP#131**

***Sometime in the not too distant future…***

Flying undetected hundreds of miles away from the Carrier Strike Group, an F-35 Lightning II Joint Strike Fighter (JSF), using a combination of advanced radar, electronic support measures, and infrared cameras spots a potential target. The information is quickly transmitted throughout a data network via the Tactical Targeting Network Technology (TTNT) with assistance from the E-2D Advanced Hawkeye Intelligence, Surveillance, and Reconnaissance (ISR) platform. Integration and interpretation of the data by the Strike Group Commander, allows the Carrier to quickly and decisively forward commands via a "kill-chain" request: From the Sea (FTS), From the Air (FTA), and From the Land (FTL). Multiple assets with differing capabilities are assigned different tasking orders. For example, the Arleigh Burke-class DDG-51 destroyer, the JSF, F/A-18 E/F Super Hornet tactical fighter, or future unmanned vehicles, will all be available to the strike group over vast distances.




*Naval Integrated Fire Control-Counter Air (NIFC-CA)*

The above scenario reads more like a science fiction novel than an actual concept of operations (CONOPS). However, leadership from the current Chief of Naval Operations, ADM Jonathan Greenert, and OPNAV N98, RDML Mike Manazir, has paved the way for this new concept of distributed networking and information sharing. The prototype for this new CONOPS is the Naval Integrated Fire Control-Counter Air (NIFC-CA) program.

The NIFC-CA program is a systems engineering effort to extend the battle space out to the maximum range of our assets. The CONOPS was designed with the intent to include targets beyond normal detection ranges of the shooter. To accomplish this, the NIFC-CA project relies on improved situational awareness and advanced networking capabilities. Each unit within the strike group would be networked through a series of data links to provide unique information to the strike group commander providing complete battle space awareness.

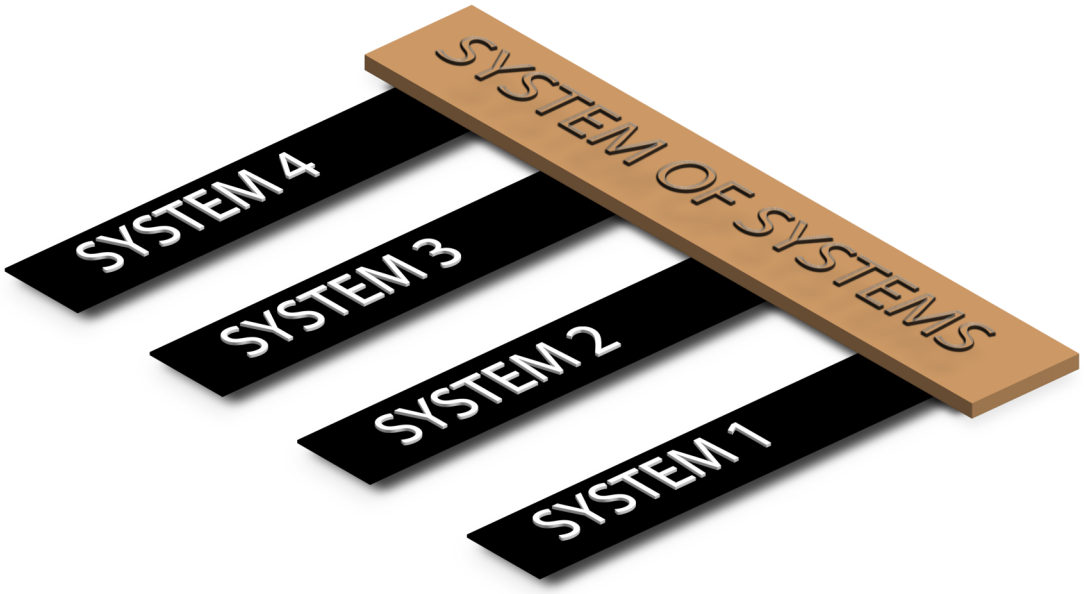
NIFC-CA exploits capabilities that already exist within current systems, optimizing current and emerging technologies in component system upgrades, and integrates them together. This innovative approach to engineering has been termed a System of Systems (SoS) approach to reflect the fact that current (and previously independent) systems are better optimized and integrated within a larger system to provide unique capabilities unavailable to the system in isolation.

While the SoS for NIFC-CA has its own internal requirements and resources, the component systems are designed independently to achieve their own unique mission requirements. Therefore, each component system is not subordinate to the SoS, but rather is designed to collaborate with the superordinate system. As can be seen in the illustration below, each subordinate system operates as a single entity. However, each of these subsystems can be coordinated via the SoS to achieve unique goals.

**Human Factors within a System of Systems Approach**

In theory, this innovative engineering approach may provide extraordinary advantages over the design and acquisition of

systems to meet these requirements in isolation. However, one concern that has yet to be addressed is how the integration of systems within systems might affect Human Systems Integration (HSI) and its influence on the design and acquisition of the separate systems within the program. For the NIFC-CA program specifically, there are several HSI concerns that will ultimately need to be addressed. In this paper, we will focus on two specific issues: *Scalability* and *Robustness*.




*System of Systems architecture: an arrangement of systems that results when independent and useful systems are integrated into a larger system that delivers unique capabilities. (DoD Defense Acquisition Guidebook)*

**Scalability**

As discussed previously, one of the inherent acquisition advantages of the SoS approach, and specifically the NIFC-CA program, is that each system within the system has been originally designed to accomplish its own specific missions. That is, the integration of singular systems within the larger system does not require a redesign. Rather, NIFC-CA will leverage currently existing capabilities within each system to improve upon the larger system as a whole.

The integration of multiple singular systems, however, also poses a potential limitation of these systems from an HSI, and specifically human factors, perspective. That is, the original system may have been designed to account for HF issues, but the integration of the original system into a larger integrated system has not.

Most existing systems have been designed with a focus on a single individual or a single team of individuals to execute their mission with maximum effectiveness. The NIFC-CA program, however, will require a focusing of distributed teams with a singular mission. In order to achieve the mission at maximum effectiveness then, teamwork should be *scalable*. Here, the term scalable is used to describe the notion that the duties and responsibilities of a team within a single system should be similar to those duties and responsibilities of the team within the larger system.

For example, let's examine the role of the E-2C Hawkeye and its role as an early air warning, airborne battle management and command and control asset to the Carrier Strike Group. The E-2C uses computerized radar, Identification Friend or Foe and electronic surveillance sensors to detect, identify, and verify a target as hostile or friendly. From a human factors perspective, these tasks are typically conducted as an isolated team/crew with limited networked communication to and from and the Strike Group Commander.

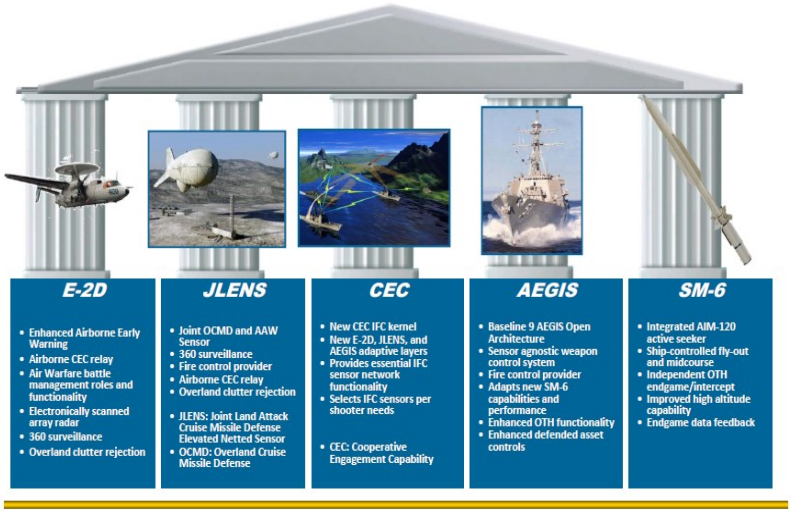
The NIFC-CA program, however, attempts to employ networked command and control center. Specifically, data obtained directly from advanced radar and sensors are streamed directly to the carrier strike group. Real-time streaming of information from assets such as the E-2D Advanced Hawkeye provides increased battle space awareness for the Strike Group Commander.

The E-2D couples a newly designed electronically scanned radar, sensors, avionics, processors, software and displays to provide airborne early warning command and control. The sharing of information between assets and the Strike Group Commander requires a distributed teamwork. For example, there has to be some level of assurance that the sight picture for the team/crew aboard the E-2D is shared by the Strike Group Commander.

Again, because the original design and acquisition of the E-2D was focused on its own mission and not the integration of that platform within the NIFC-CA program, it might be assumed that there will be a lack of scalability across and between platforms. While it may not be necessary for each member of the distributed team to process all the actions of

every other member of the team, it is necessary for each member to have access to that data and in a similar format.

Scalability is achieved in NIFC-CA through data-links. Every asset in the battle group is connected to every other asset through quick exchanges of information using mechanisms such as the TTNT. Through these types of technological innovations, the carrier strike group is able to project its power for hundreds of miles inland. The TTNT ensures that each member of the distributed team shares a common situational awareness picture.




*Proposed Systems within the Naval Integrated Fire Control-Counter Air Program*

**Robustness**

An additional concern from a Human Systems perspective is the ability of the NIFC-CA program to maintain operational effectiveness in the absence of a single or multiple subordinate systems. Here, the term robustness is used to describe a system that operates at or near full functionality even in the case where one or multiple systems may have been compromised.

In today's CONOPS, the F-18 Super Hornet acts as the long range weapons delivery vehicle. Operating in a strike capacity, the Super Hornet possesses the ability to project the power of the Carrier Strike Group far into hostile enemy territory. However, in the case where the asset becomes lost or unavailable, the mission may suffer.

In the NIFC-CA program, the Super Hornet will no longer be required to guide the weapons onto the target. Rather, the ordinance will be guided via the data links from other assets such as the E-2D and/or F-35 JSF. Here again, each independent component system will rely on the networking of information from all of the other cooperative systems.

In addition, NIFC-CA has been designed such that there are multiple redundant systems that can achieve the goals of the subordinate system. So, while the Super Hornet possesses the desired long range strike capacity to eliminate targets miles away from the Carrier Strike Group, other assets possess a similar capability. For example, the Unmanned Carrier Launched Surveillance and Strike (UCLASS) aircraft will assist in this role by offering limited strike capability while assisting in the data transmission role as well.

So, the NIFC-CA program has been designed to be robust in its ability to perform the mission. That is, multiple independent systems cooperate to increase the performance of the superordinate system as a whole.

**Collaborative Systems**

The potential limitations described above are overcome within the NIFC-CA program through the design of collaborative systems. That is, each system is built to perform a singular role. However, these roles are leveraged through integration in the design of the superordinate system.

As discussed previously, the E-2D Advanced Hawkeye was designed for the purposes of networking information, performing early air warning, and projecting the force of the battle group miles into hostile territory. However, each of these mission requirements, while necessary to the platform in their own right, are combined with additional system requirements from other assets to assist NIFC-CA. In other words, engineering and acquisition professionals are encouraged in the design process to design features that are compatible with one another. By doing so, the SoS approach ensures that the systems are collaborative as a whole.

**The Way Ahead**

NIFC-CA is an ambitious, yet potentially revolutionary approach to force projection. As discussed, this CONOPS offers a method to exponentially increase the area of coverage of the Carrier Strike Group. However, NIFC-CA only captures a single piece of the NIFC concept. Plans for both sea and land-based elements that together would form an overarching battle network are already underway. In totality, NIFC promises to change the manner in which the Navy project's its force abroad.

# The Defense Health Agency (DHA): A New Paradigm for Military Medicine

**BY CAPT SEAN BIGGERSTAFF, AEP #99**

When LCDR Olson first approached me about writing an article about the future of Navy Medicine for this issue of Call Signs, I wasn't sure what to focus on. I quickly realized, however, that one couldn't talk about the future of Navy Medicine without having an understanding of the Defense Health Agency (DHA), so I thought this was a good place to start. Being "inside the beltway" and working in a facility that houses 3,500 medical personnel, all three Surgeon Generals, BUMED, our Corps Chief, the Offices of the Assistant Secretary of Defense for Health Affairs (ASD(HA)), and the new Combat Support Agency for DoD (the DHA), my first thought was that it is transparent what this co-location and creation of the DHA means for our community. However, I look back at my own career and realize that 10 - 15 years ago, I would not have even known there was an ASD HA! In addition, many of us have not worked in a medical command. As such, this article will provide a brief summary of the "stand up" of the DHA and highlight some potential opportunities for the AEP community in all the change that is occurring.

DEFENSE HEALTH AGENCY

**The DHA**

The creation of the DHA is really the first big step in the consolidation of medical support to our forces into a single command (i.e., Joint Medical). The organization stood up officially this past fall, with Lt Gen Douglas Robb (USAF) as the first DHA Director. There were many goals of this consolidation. One was to separate out the function of the ASD (HA) as a policy and headquarters function from the execution/day-to-day operations of the Military Health System (MHS). So, the entire execution component of medical services (formerly known by the acronym TMA or Tricare Management Activity) moved into the DHA. All of the healthcare that you and your family receive comes from this organization. The bulk of the work that the DHA does is in the Health Care Operations Directorate, where initiatives that impact direct care reside. In addition to the consolidation of healthcare, the DHA was mandated to consolidate functions that are common across the MHS Enterprise, the so-called "Shared Services." The goal was to create efficiencies and save taxpayer dollars. The Shared Services mandated by Congress to be consolidated were Contracting, Information Technology, Logistics, Pharmacy, Facilities Planning, Public Health, Medical Acquisition, Budget and Resource Management, Medical Education and Training, and Medical Research, Development, and Acquisition. So, many of the personnel in the Army, Navy, and Air Force who currently perform these functions will, over the next two years, move into the DHA.

**AEP Areas of Interest**

The areas that are most likely to directly impact AEPs as Medical Service Officers are the three shared services of Medical Acquisition (MA), Education and Training (MET), and Research, Development, and Acquisition (RDA). Within the new DHA organization, the Director was designated as the Component Acquisition Executive and an office was created with the responsibility of being the Milestone Decision Authority (MDA) for medical products. Those of you at

NAVAIR and NAWC will especially appreciate the importance of this decision. For medical products (and R&D products), there is now a MDA that will use the DoD 5000 series processes to make decisions about the continued development, production, and support of medical products. This has highlighted the need for the medical community to adopt more rigorous processes such as formal requirements generation (i.e., participating in the Joint Capabilities Integration Development System (JCIDS)) to create the documents (e.g., ICDs, CDDs, CPDs) that allow products to move from Science to Advanced Development and fielding. Another area that will likely be addressed in the near future is more formal Operational Testing and Evaluation of medical products and systems.

*DHA Headquarters in Falls Church, VA*

All of the shared services were originally going to try to reach their Initial Operating Capability (IOC) in October of 2013 at the stand-up of the DHA. However, some of the shared services, specifically MET and RDA, were more complicated than the others and their IOC had to be delayed. I serve as the Chair of the RDA working group that is developing the Concept of Operations (CONOPs) for the RDA Directorate. The CONOPs for the RDA was approved by the Surgeon Generals of each of the Services and the ASD (HA) on 16 April 2014. The new Director of RDA will be a flag/general officer who will rotate between the Services and be dual-hatted as the Deputy Director of the U.S. Army Medical Research and Materiel Command (USAMRMC), which is a 7,000+ person organization that runs all of the Army's Medical R&D and acquisition programs. With the Defense Medical Research and Development Program (DMRDP), which is the program I am associated with, and the Army program combined, the approximate level of funding for medical R&D at that command will be ~$2B annually. The first RDA Director will be a Navy Admiral. At IOC, there will be a relatively small staff at the headquarters with a new Deputy Position, possibly a Chief of Staff Position (I currently hold this position), as well as uniformed scientists serving as the Advanced Development Program Manager (my billet), the Science and Technology Director (currently an Air Force BSC billet), and the Clinical Infrastructure Program (currently an Army Physician Billet). There will also be additional civilians in the headquarters. The RDA director will be responsible for the planning and execution of the Joint DMRDP funding, which in FY14 received ~$1.6B in funding. To run the DMRDP, RDA directorate will utilize 0-6-led committees we have created (called Joint Program Committees (JPCs)) that work in specific technical areas such as Military Operational Medicine (MOM) or Combat Casualty Care (CCC) to plan, execute, and manage our research investments. The IOC for the RDA directorate is scheduled for 1 June 2014. The movement toward Full Operational Capability will likely take a year or two, and will involve the movement of additional billets, resources, and functions into the RDA Directorate.

The third area of interest to AEPs involves the changes that are occurring in the Education and Training arena. This goes beyond just the MET directorate, but I will discuss this group first. At this time, the MET has not set its official IOC date and is in the process of finalizing its CONOPs. However, the plan at this point is to consolidate some of the officer training programs (DMRTI and JMETC) and the enlisted training centers in San Antonio (METCs). The MET Director will be a flag officer who is located in San Antonio, TX. There will be a deputy position (Current Acting Deputy is CAPT Alan Nordholm, a Research Psychologist that some of you might know), and a large teaching staff that will move into the DHA. Service-specific training will stay where it is today, so NMOTC will not be included in the DHA. With the creation of the DHA, there are other things that have happened in the medical training world of importance. Medical modeling and simulation is being viewed as a Shared Service. ASD HA has established a Joint Project Office for Medical Modeling and Simulation (JPO-MMS), which will be responsible for acquir-

ing joint medical training devices/ systems for the DoD. The JPO-MMS is located at PEOSTRI in Orlando, FL. It will be stood up over the next two years. The DMRDP program is working with the JPO-MMS to help align our medical R&D program in modeling and simulation with their acquisition needs and problem areas. We are also providing SMEs to the JPO to support their "smart buys" of new technologies. In addition, the focus on M&S has been elevated to the highest levels in the MHS. It has highlighted the need for a better model for identifying requirements, capability gaps, and priorities in this area. I am part of a multidisciplinary team that is looking across the spectrum (requirements to procurement) for how to structure the HA/DHA M&S functions. Part of that effort is a new Capabilities Based Assessment (CBA) for Medical Modeling and Simulation, which will begin in the next few months.

**"The creation of the DHA is a once-in –a-lifetime event and one of the biggest changes that has ever happened to Military Medicine."**

**Opportunities for Medical Service Officers**

I deliberately did not title this section "Opportunities for AEPs." As I have told many of you before, when you move into the Joint arena, you may bring the skills you learned as an AEP to the job, but the job is not just an Aeromedical one or a Navy one. There is tremendous opportunity, but your impact will be in the broader medical arena. You can support the development of training systems for Army and Special Operations Medics, you can oversee the funding of battlefield diagnostics for Traumatic Brain Injury, you can develop new concepts for prosthetic design, you can support Operational T&E of new medical devices, and, yes, you can even develop concepts and technologies for evacuation and enroute care. There are a number of areas in which I believe AEPs can contribute near- term to the success of the DHA. On the Science and Technology side, we could become more involved with the JPCs. Part of the CONOPs for the RDA Directorate is the requirement for the Services to provide representatives for these groups. I believe the Navy needs increased involvement in these efforts. Our strengths would be useful in the CCC, MOM, and Medical Modeling and Simulation JPCs and working groups. In advanced development and acquisition, there is a push (both in the Navy and the DHA) to utilize acquisition qualified/experienced officers to support medical product development and acquisition. We have a strong need for that in our own DMRDP program (the bulk of our core funding is 6.4 to 6.7 dollars). We are establishing a process to use Integrated Product Teams (IPTs) and more rigorously utilize the DoD 5000 series in medical acquisition. In addition, the DHA and Services have the need for acquisition qualified individuals for all acquisition efforts. In the training world, the JPO-MMS has the need for both SME support to the eventual IPTs they will be forming for larger acquisition efforts. The governance and management structure that will be created to manage Medical Modeling and Simulation across the MHS will provide an opportunity to get exposure to the overarching planning, policy, and management of M&S for both General Medical Education (GME) as well as Combat Casualty Care. There is opportunity here in both the Joint/DHA and Navy side of the house. I also believe there is opportunity right now to get involved with T&E or at least to begin advocating for approaches and best practices in that arena.

I have heard the most senior leaders of Military Medicine, military and civilian, repeatedly say over the last six months how the creation of the DHA is a once-in–a-lifetime event and one of the biggest changes that has ever happened to Military Medicine. There is still a lot of change to come and lots of pending movement of resources and personnel to make it all work, but, as some of you know, my philosophy is that there is opportunity in chaos. Please feel free to contact me if you are interested in discussing potential opportunities.

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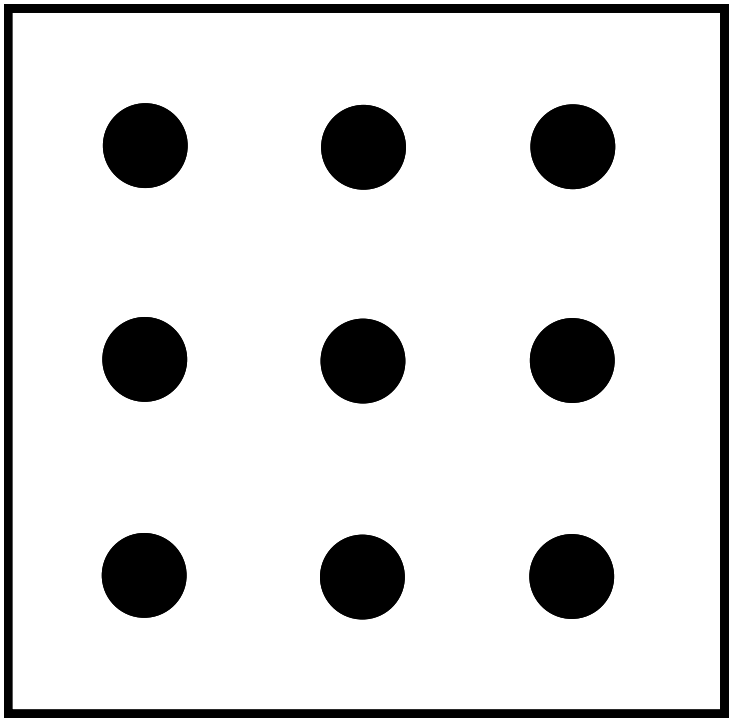
*"The door is always open!"*

# TALOS: Working Outside the Box

**BY LT STEPHAN EGGAN, AEP#143, AND CHELSEA HAMASHIN, SORDAC JATF-TALOS, USSOCOM**



We often fail to solve challenges because we impose imaginary boundaries, restrictions and constraints on how to achieve the solution.

Take for example the pictured classic brain teaser. The challenge is to draw four or fewer straight lines that go through all nine dots without lifting the pencil.

It seems impossible, but the key is to think outside the box. It is common to approach the problem with the assumption we must draw all the lines within the box. However, the challenge did not include that limitation. Once freed from the restrictions of the imaginary boundaries, the solution is more easily seen. The challenge can be solved with four, three or even one line.

The take-away from this puzzle is it is important to look beyond the existing definition of a problem to solve it and question whether boundaries are real or perceived. Pushing boundaries and causing small changes may create exponential impacts.

The USSOCOM Joint Acquisitions Task Force team tasked to build the Tactical Assault Light Operator Suit, or TALOS, is taking this outside-the-box approach to answer the challenge, which was put forth by USSOCOM's commander, Adm. William McRaven.

McRaven announced TALOS on May 15, 2013, at the annual Special Operations Forces Industry Conference (SOFIC). His vision is to drastically improve the ground operator's survivability in direct action activities that present the greatest personal risk. "With all the advance in modern technology, I know we can do better" to protect our SOF Operators, said McRaven at the 25th Annual SO/LIC Symposium & Exhibition.

The vision of TALOS is to "develop a peerless warfighting system with superior protection, enhanced human performance, surgical lethality and heightened situational awareness by August 2018," said Michael Fieldson, a USSOCOM program manager. To develop that end-state product, the JATF-TALOS team conducts extensive market research and has built broad networks with subject matter experts to identify and integrate the state-of-the-art technologies necessary for this purpose built system. The eclectic team consists of uniformed military, engineers and acquisition professionals divided into distinct functional areas:

Power and Energy

Mobility and Agility

Survivability

Human Factors

Operator Interface

Processing and Control

Offensive Systems

Command, Control, Communications and Intelligence (C3I)

The exact technologies and capabilities TALOS will integrate are in development, but the vision requires advanced communications and displays, innovative power solutions, revolutionary armor, a powered exoskeleton, thermal management and physiological, cognitive and medical status monitoring devices.

Encouraged by USSOCOM's Acquisition Executive, Jim Geurts, TALOS is also operating as a pilot to pioneer a new, faster, more agile acquisition process.

He saw a need to streamline its acquisitions process in order to realize the end-state product in the required timeframe, which necessitate employing non-traditional methods and tactics.

For example, the TALOS effort operates as an open and "unclassified effort to achieve technology and material solutions with industry, government and academia," said Fieldson. The team actively pursues unprecedented outreach and collaboration with traditional and non-traditional partners to push technological boundaries. "Their efforts at engaging industry have created a marketplace for technology that has application not only to TALOS, but other SOF applications as well. This allows us to quickly respond to the needs of our SOF Warriors," said Geurts.

The JATF-TALOS team's innovative process will be demonstrated at the 2014 SOFIC in Tampa this May. The team will provide attendees with a unique opportunity to contribute to the TALOS vision. TALOS will have an onsite build challenge that will encourage cross-collaborative teams to come together to design and build TALOS concepts. The teams will have tools at their disposal including clay, mannequins, power tools, 3D printers and 3D modeling and simulation capabilities to facilitate idea generation. As an incentive to participate, the teams with the most innovative ideas will be recognized and rewarded throughout the Conference. Rewards will range from coins to an invitation to the June 2014 first-generation prototype exoskeleton roll out event. The JATF-TALOS team will continue to harvest innovative ideas through these nontraditional means and provide opportunities for any technology developers to join the TALOS network.

The JATF-TALOS team will also kick-off a Rapid Prototyping event that will run through June. Subject matter experts from industry, academia and government with expertise in each TALOS functional area will visit USSOCOM to design, sketch and conceptualize a blueprint for the TALOS end-state product. The JATF-TALOS Team will launch prize challenges, a popular mechanism among industry for innovative technology development methods, to reach a broad spectrum of non-traditional solution providers and accelerate innovative problem-solving. Prize challenges differ from traditional contracted efforts. The open participation format contrasts with the traditional request for proposal process and facilitates broader industry participation.

The prize challenges will accelerate the transition from designs to working prototypes. Contest participants may build from designs provided by the JATF-TALOS team, modify these designs or even fabricate entirely new designs. Judging panels, safety protocols and performance tests will determine which prototypes best satisfy TALOS capability objectives and earn the designers monetary awards. The expanded number of skilled competitors expedites delivery of the world's most advanced assault suit to SOF.

In less than one year, the outside-the-box methods of TALOS have already led to astounding progress. In June, the TALOS team will roll out three first-generation prototype exoskeletons that will serve as the foundation for follow-on functional technologies. The roll-out event will highlight the prototypes and kick-off of integration leading to a fully functional, ballistically sound, First Article Prototype Combat Suit in 2018.

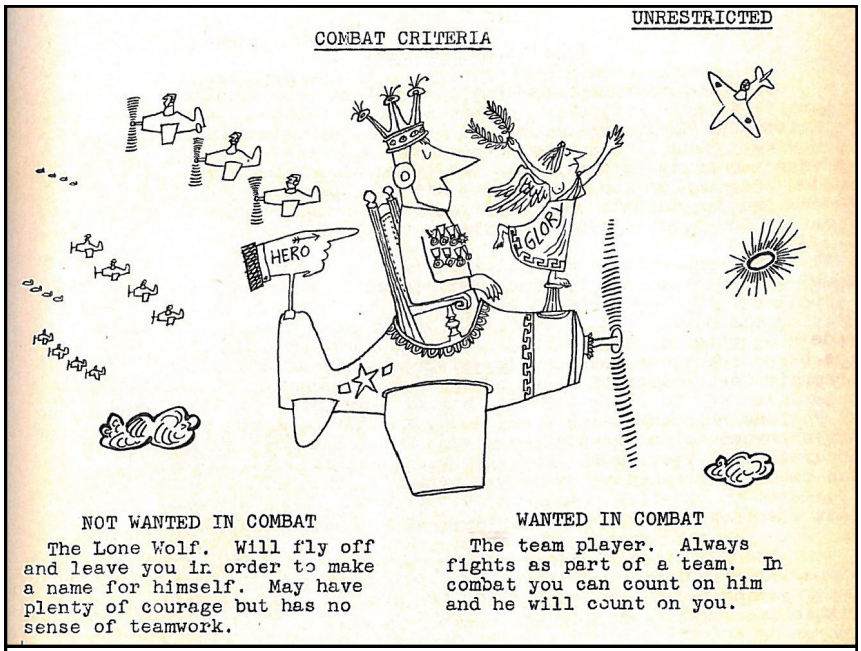
The development of TALOS is a priority, not only to produce a platform that will maintain a global advantage against near-peer competitors and threats to national interests, but also for the innumerable spinoffs hoped to benefit homeland security, police, firefighters, first responders and health care (especially wounded warriors).

The team will continue to work outside the traditional box and push the boundaries to find innovative solutions to the meet the challenge on target, on time.

# Flying From the Beginning: The First Days of Navy Aerospace Experimental Psychology

**BY LCDR JEFF GRUBB, AEP #124**

Aerospace Experimental Psychologists (AEPs) fly. This is not merely a statement of a fact, but a declaration of one of our most defining characteristics. There are other communities of uniformed, Ph.D. level behavioral scientists. AEPs themselves commonly work alongside civilians who are recognized experts in aviation human systems. Neither our educational attainment, our active duty status, or even the technical focus of our day jobs makes us unique. Rather, we are that subset of uniformed behavioral scientists that regularly interacts with Naval Aviation by going up on missions. Currently, the Navy sends all student AEPs through an abbreviated flight syllabus and all AEP billets are flight coded, thereby permitting designated AEPs to draw conditional flight pay. The rationale behind this somewhat costly arrangement is that regular first-hand experience with the flight environment allows AEPs to better understand fleet aviation requirements. This enhanced understanding ensures that the technical solutions that AEPs generate are practical and aligned with the Fleet's actual needs. But has this always been the case? When did the Navy recognize the need for AEPs to fly? A series of memoranda stored in the National Archives indicates that flight experience has been an important consideration from the earliest days of the community.




*A drawing from the BUMED Newsletter, Aviation Supplement, Vol. 7, No. 5 (1945) illustrating the Combat Criteria study, one of the early works of AEP's*

The AEP community was borne in the run-up to WWII. As Petho (1993) summarized, the Civil Aeronautics Board and the National Research Council stood up the Committee on the Selection and Training of Civilian Pilots under the direction of Dr. John G. Jenkins, later LCDR John G. Jenkins, in the Fall of 1939. Though primarily interested in civil aviation, the committee included a handful of Army and Navy representatives and the latter successfully argued for the committee to fund a team from Harvard University to conduct selection research on prospective Naval Aviators at Naval Air Station (NAS) Pensacola. By the spring of 1940, the Navy began offering commissions to members of the Harvard team and by that summer there were at least three psychologists from the project who had been commissioned as H-V(S) officers, or Officers of the Volunteer Reserve Assigned for Special Service to the Medical Corps. As the workload involved in validating candidate selection measures increased, the Navy commissioned more psychologists and distributed them to the primary training bases at NAS Pensacola, NAS Jacksonville, and NAS Corpus Christi. By the end of November 1941, the battery of tests for aviation selection had matured sufficiently that the Bureau of Aeronautics, (BuAir, forerunner to NAVAIR) directed that scores on the test be used in conjunction with other data to assess the fitness of flight students already in training. The Navy published its first official test scores on 26 December 1941, thereby completing development of the first version of the test we now know as the Aviation Selection Test Battery (ASTB).

It is unclear whether early aviation psychologists flew as part of their duties during the development of the first ASTB. They were certainly assigned to primary aviation training bases and would have had to regularly interact with the squadrons to collect the data that was necessary to validate the test and derive test scores, but existing sources do not describe the technical details of the test development. Early aviation psychologists' activities, however, quickly expanded beyond the ASTB to include research on basic human performance limitations, human factors, training, and selection for other aviation related jobs. In particular, the success of the pilot selection test effort

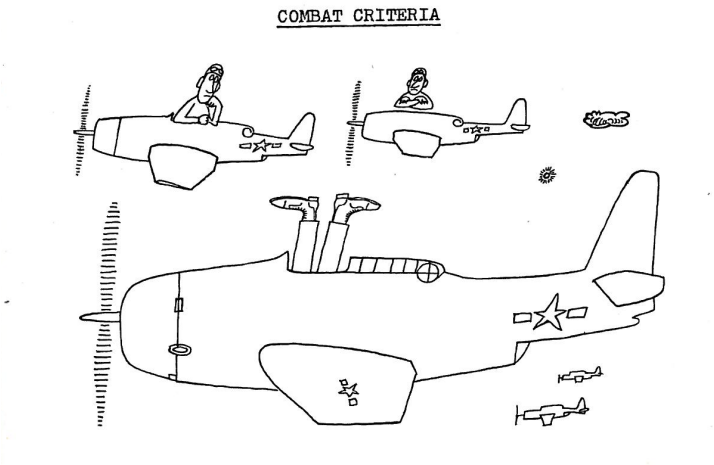
prompted the Navy to ask for a similar selection test for aerial gunners, and it is in this research program that we find the first evidence of AEPs taking flight.

Aircraft of the era famously bristled with machine guns to defend themselves from enemy fighters. Consequently, the crews of most WWII Naval aircraft contained one or more enlisted personnel whose duties included aerial gunnery. Aerial gunnery was a demanding task. The gunnery platform (i.e. the gunner's own airplane) moved with six degrees of freedom, none of which was under the control of the gunner. From this wobbly perch, the gunner had to hit targets that move in three dimensions and shoot back. Moreover, all of this was happening in the era before aircraft designers paid much attention to human factors considerations, so gunners had to solve these complex aiming problems from cramped and often minimally suitable gun stations.

In the early 1940s becoming an aerial gunner was a haphazard affair. Though Naval aircrews had included gunners for more than 20 years the Navy had apparently never formalized the training, let alone the selection of gunners. LCDR Jenkins wrote that a Commander Morehouse (first name unknown), who worked in the BuAir's Training Division, had been recently instructed to stand up formal courses for aerial gunners. These gunners were to be drawn from personnel with a variety of aviation-related ratings and those who were still in training. LCDR Jenkins' observed that it was possible to set height and weight limitations for gunners, but that other important considerations were as yet unexamined. All the same, he noted that the head of the Medical Research Section, a LCDR Carson, expected that BuAir would likely convene a board to discuss the establishment of a selection test for aerial gunners.

This initial planning culminated in a 9 May 1942 memo from a CAPT Durgin (first name unknown), BuAir's Director of Flight, to the Director of Training authorizing the Medical Research Section to conduct a study to develop a selection test for gunners. In the memo, CAPT Durgin states that the project would likely require additional support from psychologists and statisticians and that such support might include recruiting additional H-V(S) officers into the Training and Medical Research divisions. The project kicked off with a planning meeting in which LCDR Jenkins met with LCDR Carson and Dr. Morris Viteles, a civilian at the University of Pennsylvania. The three researchers discussed how the test could be validated, the logistics of conducting the research, and factors that they felt would likely predict student success. It was recommended that prospective gunners be between 18 and 24 years old, between 5'4" and 5'10" tall, and weigh between 130 lbs. and 160 lbs. Because of the required combination of athleticism and small stature, the researchers speculated that jockeys might be good candidates. For more psychological factors, the group had no specific a priori recommendations but did have a number of hypotheses. In particular, they speculated that "…motivation, toughness, stability, and concentration," were likely to be important traits.

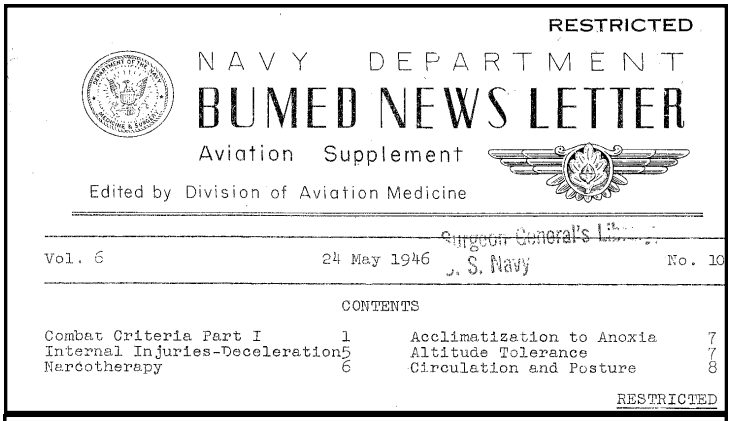
Soon after, the group sent a memo to the Director of Training Division to request assistance in formally assembling a research team. This included formally bringing Dr. Viteles and Dr. Jack Dunlap, the Director of Research for the National Research Council's Aircraft Pilots Committee, aboard as "Consultants to the Surgeon General." Additionally, Carson recommended securing the services of Dr. Paul Horst, a selection specialist then working for Proctor and Gamble and who Carson wrote would be an excellent field manager for the project. In contrast to Viteles and Dunlap, Carson specifically noted that assuming a mutually agreeable salary could be worked out, Horst might agree to a commission as an H-V (S). Regardless of Horst's eventual status, Carson recommended that an additional 2 H-V(S)s with appropriate selection training be procured to serve as assistants on the project.




With the plan approved and documented, the project team moved quickly in conducting an initial task analysis which included getting copies of the draft gunnery training manual and coordinating a visit by the team to the Naval Training Station at Norfolk to observe and participate in gunnery training exercises. Importantly, the team was permitted to use the training devices and engage in live-fire exercises in flight.

The team quickly traveled to Norfolk to conduct the analysis. Upon arrival, they performed a static examination of a PBM-1 Mariner. The Mariner was a large flying boat akin to its more famous contemporary, the PBY Catalina. Importantly, the PBM was equipped with a variety of gunner stations, thereby making it something of a one-stop shop for examin-

ing the scope of conditions under which Naval aerial gunners had to work. Although the team did not observe anything that would unduly impose physical limitations on the operators of the nose and crown turrets or for those of the waist and tunnel guns, the team observed that the tail gunner had to be small. In part, this was because the tail gun could only be reached by crawling through a narrow passage. Additionally, the tail gunner was so far aft of the aircraft's wing that heavy gunners would make the airplane excessively tail heavy. The team observed that this was an important consideration because it was desirable to have the gunners be interchangeable. Beyond the obvious utility of being able to assign any gunner to any position, the team noted that sitting in the turrets for long periods would be very uncomfortable and fatiguing. Swapping gunners between positions would help keep the crew fresh on long flight.



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NAVY DEPARTMENT

BUMED NEWS LETTER

Aviation Supplement

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*A sample of topics from BUMED Newsletter, 1946*

The team began the following day by visiting the 3-A-2 Trainer. This device was an early analogue gunnery simulator that consisted of a wooden mock-up of a machinegun and two projectors that were set before a projection screen. One projector would play a film of an aircraft maneuvering to attack a bomber as it would appear from the bomber. A second projector, which was slaved to the mock machinegun, would display a gun sight to provide feedback as to where the trainee had aimed. If the trainee pulled the trigger before the target was within effective range, the system played a gong sound. If the target was in range, the system played a machinegun sound.

Jenkins noted that although this setup was ingenious, it had a significant potential to impart negative training. He observed that because early trigger pulls resulted in a gong sound, team members learned to wait until the target was perhaps too close before firing. Operationally, waiting that long would permit a hostile target to similarly close to well within machinegun range with potentially devastating consequences.

Having received static gunnery training in the 3-A-2, the team boarded the PBM-1 for a live-fire exercise. When the aircraft reached a safe distance from Norfolk, it began dropping flares to act as targets. One-by-one, Jenkins, Carson, Viteles, and Dunlap took turns firing on flares from the bow, waist, and tail guns. Although the team observed that the guns required considerable strength to prime, they were remarkable easy to maneuver. In contrast to their experience with the 3-A-2, the team members found that they tended to commence firing the before effective range was reached.

Following this experience, the team reframed many of its initial assumptions. Rather than focusing on height, weight, and what might be called moral qualities, as they had in their initial meeting, the hot wash from the flight focused on strength, dexterity, and the ability to accurately estimate the required lead on the target. In other words, the first-hand exposure to the flight environment helped to better define the problem, and informed future directions of investigation.

The story of Jenkins, Carson, Viteles, and Dunlap is one of many since the early days of AEP history that exemplifies why flying is such an integral part of our heritage, and why it should remain so in the future. Perhaps nothing could summarize this better than the words of LCDR Jenkins himself:

"… careful note must be made of one significant motivating influence of the wartime period. In the main, Psychologists were not permitted to remain in their laboratories, or to work upon military problems in the comfortable isolation of their own campuses. Characteristically, they were transported bodily to the military establishment and compelled to live in day-to-day contact with military folk and military problems.

As they sweated out tours of duty, they began to work up on certain problems- in a very large number of cases- simply because the problems forced themselves on their attention, day after day. Their problems, if you please, arose from the persistent demands of the environment rather than from the pressure of some systematic conviction of professional nicety. You will readily understand that the voice of the military environment became audible because the trained investigators were there in the military environment itself. Had they remained in their laboratories and in their studies, the voice of the military environment would have been at best muffled and not improbably distorted beyond recognition."

Jenkins, J.G. (1948). Chapter II: Aviation psychology in the United States Navy. Review of Educational Research, 18, pp. 532-42.

Petho, F. C. (1993). A history of Naval Aviation Psychology during WWII. Proceedings of the 35th Annual Conference of the Military Testing Association, pp. 1-6.

Shipmates

# The Day "Bob" Learned Why AEP's Fly

**BY LCDR JEFF GRUBB, AEP# 124**

So, I've got this friend—"Bob." He's an insufferable aerospace enthusiast who figured out that he could use his excessive psychology and neuroscience education to get the Navy to support his airplane habit. All that he had to do was sign on as an AEP. As the Navy's uniformed experts on aviation human systems, AEPs have license to routinely weasel into close proximity with high performance aircraft. Indeed, AEPs are not only allowed to fly in Naval aircraft; they are required to do so.

After several years as an AEP, Bob was fairly pleased with how well his scheme was working. In addition to providing him with a string of excuses to hang out with airplanes at work, the Navy had paid him enough that he was even able to buy an airplane of his own. However, he often worried about his scheme's long-term viability. The Navy accepted this working arrangement on the assumption that he would develop solutions to aviation human systems problems. The longer he hung out with airplanes, however, the more he suspected that viable solutions already existed for almost every such problem. For example, people are infamously bad at maintaining spatial orientation in degraded visual environments. Consequently, in the 1920's, engineers developed gyroscopic attitude and direction indicators to prevent disorientation during flight in such conditions. All high performance military aircraft were so equipped by WWII, and subsequent work by aviation psychologists led to the adoption of a standard instrument arrangement that simplified using those instruments. Training syllabi in both military and civil aviation were modified to emphasize the importance of instruments for safe flight. If aviators are smart enough to follow their training and use their instruments, (and the Navy's Aviation Selection Test Battery is designed to ensure that Naval Aviators are) then there should not be any mishaps caused by spatial disorientation. No mishaps would indicate no problems and no problems would mean no excuses for geeks with airplane habits to hang out around airplanes. Bob worried that someday someone would see through his scheme and make him get a real job.

When he was troubled by such thoughts, Bob calmed himself by perusing *Approach*, the Naval Safety Center's aviation safety magazine. Each edition featured Grandpa Pettibone commenting on some boneheaded thing that a Naval Aviator had recently done to cause unintended death or destruction. Despite decades of work and the delivery of numerous solutions, human factors issues continue to kill aviators and wreck airplanes. Thus, each of Gramps' gripes represented job, or at least scheme security. Bob would conclude that he would always have an excuse to hang out around airplanes. He would also reaffirm his goal to never be the subject of an *Approach* article. Occasionally, he might additionally ponder why intelligent people who are highly trained and well-equipped are still crashing perfectly good airplanes, but he never did this for long as it interfered with his daydreaming about airplanes.

At the same time that Bob bought his airplane, several student AEPs were working their way through training. The AEP training officer contacted Bob to see if he could provide a brief about his current command and perhaps help out with the human factors portion of the curriculum. Here was an excuse to fly his new airplane from Orlando to Pensacola and walk through the National Museum of Naval Aviation. All that Bob had to do was talk about airplanes, which he was given to do anyway.

As the appointed day approached, Bob watched the weather intently. He had an airplane, but he did not yet have an instrument rating. The weather guessers were predicting that a cold front would pass over Florida on the day of the trip, bringing low clouds and poor flying weather. Uncharacteristically, the weather guessers were correct. When Bob awoke, the front had placed a wall of low clouds between Orlando and Pensacola. He called the AEP training officer and pushed the brief back a few hours to see if things would clear

up. When the weather did not improve, he called again to see if he could delay another hour. By 1100 EST, he had to make a final decision. The front was still 75 miles north of Orlando, but the cloud base had risen to marginal VFR heights. Bob is reasonably smart. At least his Ph.D. and his ASTB scores would indicate so. He is also well versed in common human errors in aviation and has made a career of preaching the gospel of sound aeronautical decision making. However, he decided to try it anyway.

The first leg of his original flight plan had involved flying directly over Leesburg International Airport and its associated Class D airspace. As he took off, Leesburg was reporting overcast at 2000 ft. Not wanting to overfly the airport that low, Bob decided to fly around Leesburg to the west. The new plan was to fly from his base to the center of Lake Apopka, a major lake northwest of Orlando over which he had done much of his civilian pilot training. From there, he knew that he would be able to easily spot Lake Harris just a few miles farther to the northwest. The Class D airspace around Leesburg only extended to the middle of Lake Harris, so if he flew west of Lake Harris he was guaranteed to avoid both Leesburg and its airspace. Ocala, just northwest of Leesburg, was already reporting clear sky, so if he could just circumnavigate Leesburg he would have it made.

"Bob's" beautiful red airplane

As he approached the center of Lake Apopka, he could clearly see Lake Harris off his nose and altered course to the left so that he could pass to the lake's west. He could also clearly see the overcast ceiling at not more than 1500 ft., with stray clouds scattered about below it. After surveying the clouds for a moment, Bob glanced back to find Lake Harris once again on his nose. Assuming that he had been inadvertently drifting right, he turned the airplane to the Lake's left and went back to worrying about the clouds. A moment later he again found the lake directly ahead. Frustrated, he again corrected to the left and went back to worrying about clouds.

After several such cycles, Bob glanced down at his panel-mounted GPS. The GPS indicated a large airport bearing 45° left at about 20 nm. There should not have been anything at that location. Looking more closely, the airport's identifier code read, "MCO." MCO, better known as Orlando International Airport, should have been almost directly behind him. Faced with these data, he naturally concluded that his GPS was malfunctioning. He checked his directional gyro. It read 180°, again nearly the opposite direction of his intended course. As the name implies, a directional gyro is like a compass, but its orientation is provided by a gyroscope. The advantage of this system is that it responds quickly and accurately to changes in heading. The disadvantage is that the gyro must be regularly synchronized with the directional gyro with a magnetic compass. Although he had only been airborne for 15 minutes and had never previously seen more than a few degrees of precession over the course of an hour, he diagnosed precession. He grabbed the knob to adjust the directional gyro and glanced at his magnetic compass to determine his actual heading. It read 180°. Momentarily stunned, he looked into the distance and through the haze could make out downtown Orlando just to the left of the nose of the airplane. The GPS, directional gyro, and compass were not only in agreement, they were right.

At this point, a discussion of Florida's geology is warranted. The Florida peninsula has large deposits of limestone, which tends to dissolve with rain. This causes sink holes, which eat parking lots, houses, and the occasional Floridian. When sink holes fill with rain water and alligators, surviving Floridians refer to them as lakes. Many of these lakes are rather large. In marginal conditions, "Fly to the left of the big lake," is a remarkably unspecific plan. Making a heroic effort to sound nonchalant, Bob called the tower at his base and requested clearance to land.

If this were an *Approach* article, and I'd like to stress that it is NOT, Grandpa Pettibone would now expound on failures to adhere to training and bad head work. I suspect that the typical reaction of an AEP reading such an analysis would be to smirk and wonder how anyone who had undergone the appropriate training could be so stupid. Prior to the incident, that is what Bob would have thought. However, this incident has left him humbled and much more appreciative of the human factors involved. In particular, he never would have

believed that he would be susceptible to "Get-There-itis." He had sat through many lectures on its danger. Indeed, as he pushed his takeoff time twice, he specifically told himself he wouldn't fall victim to it. In the end, he had rationalized a launch into suspect conditions by telling himself that the weather was fine a short distance away. Similarly, he never would have believed that he could become disoriented by almost 180° while flying in nominal VMC over his own practice area. However, the distraction provided by the cloud base in conjunction with a meteorologically shortened visual horizon was enough to prevent him from maintaining spatial SA. Between his training and the instrumentation in his airplane he was already equipped with solutions to both problems that he encountered and yet the solutions did not prevent the problems from occurring. Reading about such problems allows one to know that they exist, but experiencing them gives one a very different appreciation of their magnitude and severity.

But why did it take this long for Bob to come to such an appreciation? After all, he got into this mess because he had convinced the Navy to pay him to fly in their airplanes and he'd been doing so for several years. I think that the level of engagement in the flight was the decisive factor. Although he usually was at pains to actively participate in his Navy flights, there was never any hard requirement that he do so. For example, when riding along on a TRAWING 6 low level navigation flight, he knew the outcome of the flight would be the same regardless of whether he spent it following along on the map or concentrating on not having to use his air-sick bag. Since he wasn't actually responsible for navigating the airplane but he was responsible for the disposition of his stomach contents, he had never acquired a full appreciation of how easy it is to get lost while airborne.

All AEPs know not to be "self-loading baggage" when they fly, but it turns out that baggage status is a continuous rather than a dichotomous variable. It is one thing to stay awake, pay attention, and observe what the regular crew is doing on a flight, but unless we do our homework, ask questions, and at least try to predict what will happen on the flight and why, such observations are akin to listening to a radio program broadcast in a foreign language. That is the lesson that was driven home the day I… I mean Bob, got lost over his own practice area.

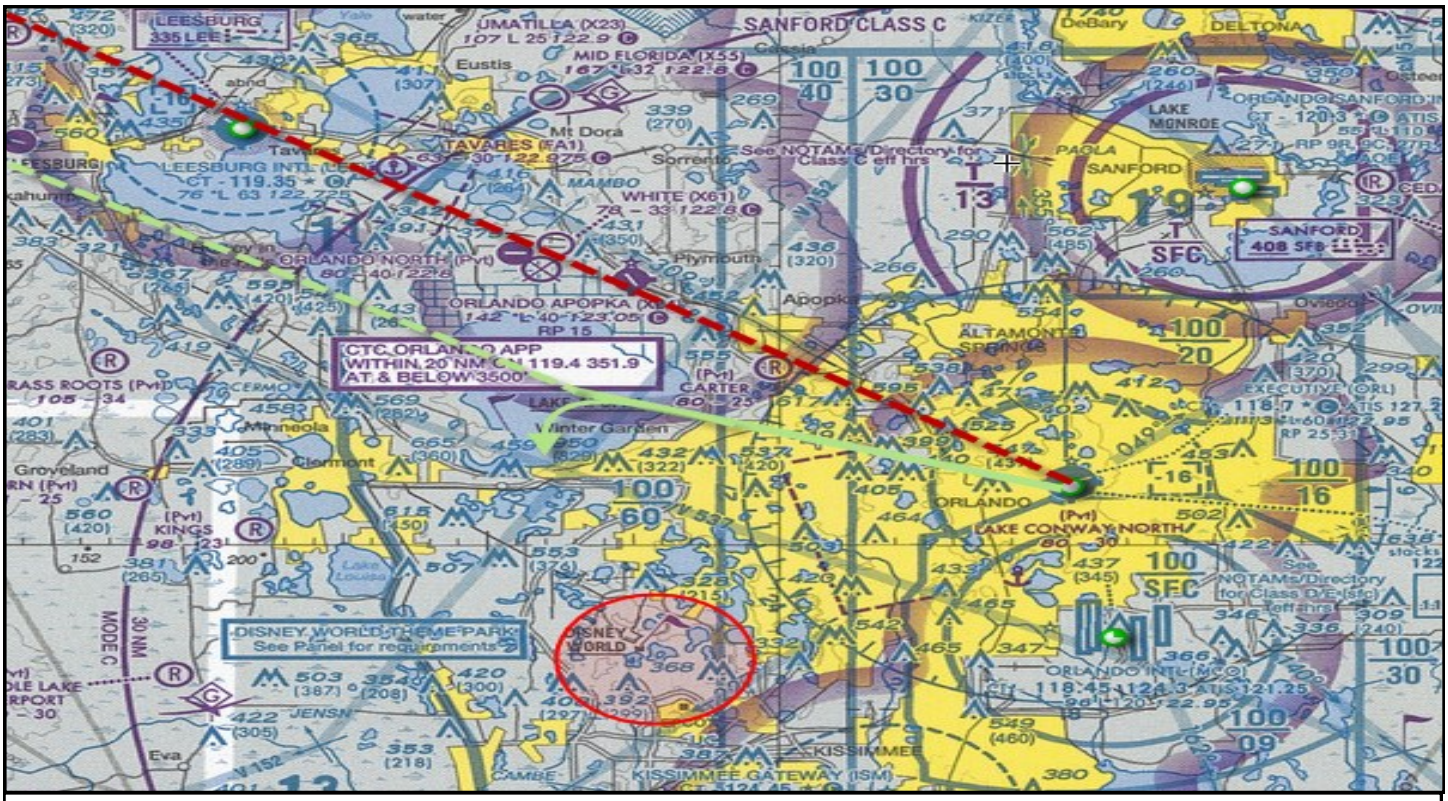


Figure 1. Flight path of "Bob." The red dashed line represents his original planned route. The green dashed line represents his planned route as amended due to low ceilings over Leesburg. The solid green path represents his actual flight path.

Shipmates

# The Way It Was: Anthropometrist by Default

**BY CAPT (RET) BILL MORONEY, AEP#46**

In 1967, Tom Holohan, AEP # 28, who went on to become a Navy physician, encouraged me to consider the AEP program. I was a member of the Fall 1968 Flight Surgeon Class and went through the standard military training and flight training courses. Subsequently, I was assigned to NAMI and NAMRL. My first "fleet tour" was the Navy Missile Center, NAS Point Mugu. Next, I taught at the Naval Postgraduate School in Monterey and the Naval Aviation Safety School (from which I "graduated"). After that it was off to the Naval Air Test Center (Patuxent River Maryland) and finally the Naval Air Development Center (Warminster, PA). After 22 enjoyable and rewarding years, we (It's a team effort, and I was blessed with a supporting wife and family) left the Navy (as an 0-6) and took a teaching position in the Psychology Department at the University of Dayton.

In reflecting on my career, I realized that, as a technophile, I emphasized applications and was always on the lookout for opportunities to support the fleet. I tended to take advantage of opportunities that came my way and on occasion made the opportunities happen. I think that I flew in 34 or 35 different types of aircraft while on active duty, including USAF, Army, and NASA birds. I flew a variety of mission types; among the more memorable are: hurricane penetrations, target presentations (to US NAVY and others), high altitude ( yes, the earth is curved), reconnaissance flights, laser designator and helmet mounted display development (the Google Glass of the mid 70s in a tinted visor) and Air Combat Maneuvering flights. On the management side, perhaps the most significant AEP community related event was the establishment of the AEP billet at NPS. While in the Navy, I authored/coauthored 24 papers and 10 Technical and research reports; these were critical for my transition to a civilian teaching career. On the personal development side, I learned a lot about leadership, integrity, and team support.

Fortunately, as a junior officer I benefited from the mentorship provided by multiple mentors, particularly during my formative two tours with Bob Kennedy (AEP # 10). I hope that I have paid that mentorship forward to other AEP's.

But enough background, I was asked to share how one event influenced my Navy and civilian careers, so I chose to describe my first major assignment in the Navy. You may remember that during your physical entrance exam in Pensacola, your stature was measured and then you sat in a wooden chair with a 90° seatback angle and caliber type devices were used to measure selected body dimensions (e.g. sitting height, shoulder height, buttock knee length, shoulder breadth) with a tenth of an inch accuracy. The device may have looked like something out of the 1600s but it was really from the 1960s. During the 1960s, a series of similar devices had been developed and distributed to naval medical facilities, where data were collected from aviation officer candidates, Navy/USMC aviators and occasionally recruits with extreme dimensions.

*Winging, Spring 1969*

After receiving my wings, I was assigned the "straightforward" task of writing a report which would summarize the anthropometric data collected on some 7000 naval personnel. I remember moving dusty boxes of Hollerith cards, AKA IBM punch cards, which were 80 columns wide and had 10 characters per column from storage to my office. These data had accumulated over several years. My initial review of the descriptive statistics revealed some discrepancies, and so I became a data detective. Allow me to provide some selected discrepancies. The reported anthropometric

dimensions of some individuals fell below or beyond the standards for acceptance into naval aviation and commissioning.

Other individuals exceeded the mean anthropometric dimension by several standard deviations (e.g. Fig 1: Excessive Shoulder width). While others had anthropometric ratios that suggested anorexia or obesity (Fig 2: Height to weight ratios). Finally, some individuals had "unnatural" differences between sitting height (seated distance from buttocks to top of head ) and trunk height (seated distance from buttocks to top of shoulder). The data suggests that the Navy had an individual who quite literally flew with his heart in his mouth, because based on his data the top of his head was 8 inches below his shoulders (Fig 3: Sitting Height-Trunk Height). A separate analysis indicated that some individuals were measured at different times and their anthropometric dimensions never changed, except for their weight.

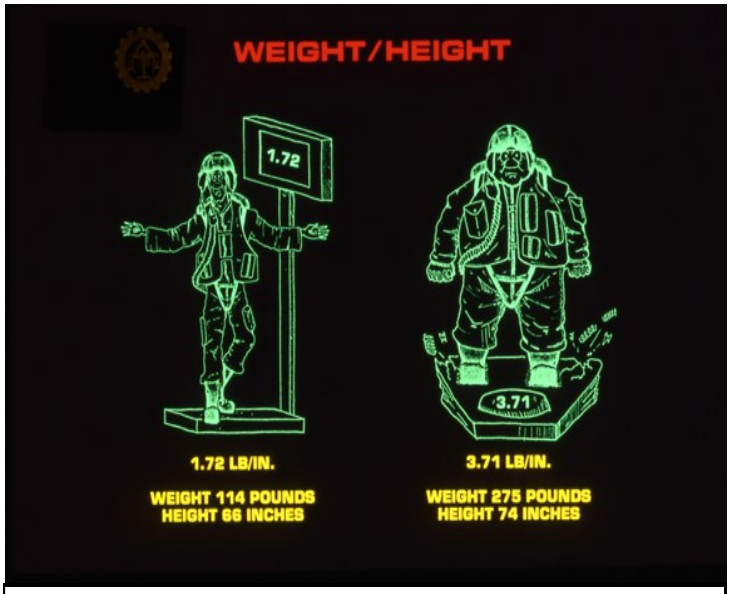


*Figure 2*

It became apparent that some facilities met a paper requirement by simply re-copying and resubmitting the form which already existed in the individual's medical record. These types of "data" were even received from facilities that had no measuring device. One of the more interesting findings was that individuals measured at one naval medical facility had consistently longer thumb tip reach (distance between the back of your shoulder and the tip of your thumb when the arm is extended in a horizontal position) then individuals measured at other facilities. A visit to the medical facility provided an explanation. Apparently the tape measure, which was calibrated in tenths of an inch had broken. It was repaired by simply overlapping the broken parts and securing them with adhesive tape, thus introducing a constant but unreported error.

Armed with these findings, I recommended that a report based on these data would be inappropriate and misleading. This was apparently the wrong answer; so I was summoned to the Bureau of Medicine and Surgery to explain my recommendation.

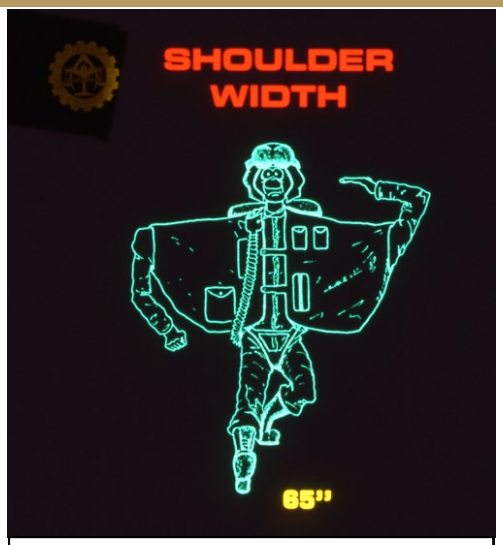


*Figure 1*

As a new naïve LT, I remember describing the problems and then being told to fix them. When I inquired about the Navy's anthropometrist, I was appointed the Navy's "anthropometrist by default."

Over the next 15 or so years this assignment led to a host of amazing opportunities and experiences. I expanded my horizons as a psychologist as I was required to become knowledgeable about anthropometry. Ultimately this proved valuable when I sought a career in teaching human factors/ ergonomics. I also got to climb into a lot of cockpits and would try to get some time in the aircraft. During this time I met professional anthropometrists from academia as well as other services/other countries. These interdisciplinary connections were invaluable in many ways throughout my career and led to long-term friendships. As part of my work, a cockpit restriction process, which was based on anthropometric capabilities and limitations, was institutionalized. The data used for this process has also been used in accident investiga-

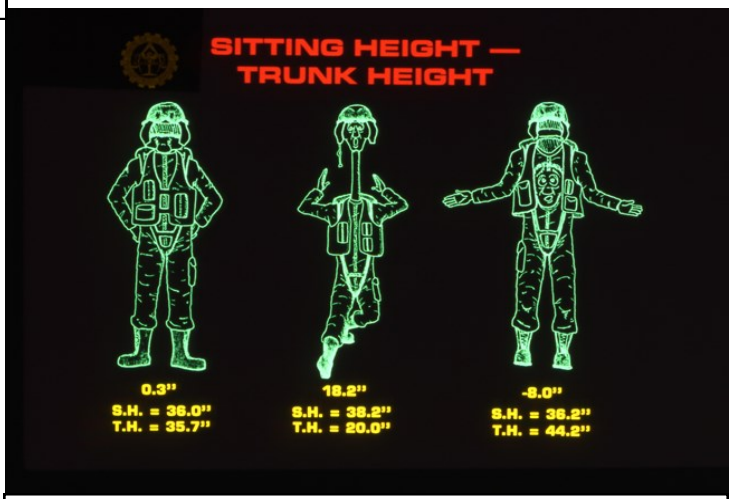


*Figure 3*

tions and in selecting uniform sizes for returning Vietnam POWs.

I had the pleasure of learning about physical and mathematical modeling thanks to people like Alvah Bittner, whose efforts strongly influenced the Computer-Aided Design (CAD) models currently used in the design of cockpits, automobiles, and workstations, as well as to evaluate anthropometric compatibility. I was fortunate enough to author at least 13 publications in proceedings of professional organizations (HFES, AsMA,SAE,etc), seven technical reports and four theses. I also had multiple presentations to DoD groups locations including TAGs/ AGARD. The publications were important to have on my resume when I applied for an academic position.

On August 5th, 1986, US Patent #4,603,486, Automated Anthropometric Data Measurement System (AADMS) was recorded, and I am one of the 4 co-holders. (FYI: Robert "Hawkeye" Hughes (CAPT, MC, Retired) is also a co-holder.) As you may be aware, patents are not that common among psychologists and this patent along with a previous Invention Disclosure carried weight within the School of Engineering. Throughout my career there was an increased awareness of the need for a systems approach to problems. Most problem areas have multiple facets and one needs to discern which facets are the most critical.

While most of my work has been based on science and to some extent art, I became more sensitive about political implications of my work. Cockpit and anthropometric dimensions are primarily physical. However, the sociological and equal opportunity implications must also be considered. While these considerations were beyond my pay grade, cockpit compatibility did provide a unique opportunity to meet very senior officers in the Pentagon and discuss gender based cockpit restrictions. Cockpits had been designed for an all male population (1964 and prior anthropometric data), so small bodied personnel (mostly female) could not be accommodated. This work contributed to changes in cockpit design so that individuals of both genders could be accommodated. A related aside: While it may be interesting to discuss one's work with members of the press, I would recommend caution when political issues arise. I was fortunate enough to meet the Press with a Public Affairs Officer in attendance. I would recommend that to any readers who find themselves in similar situations.
I concluded my career with qualification as a forensics expert in the area of anthropometry, as well as a credentialed Certified Professional Ergonomist, based in part on my experience in anthropometrics.

Anthropometry is an area in which we have made progress, albeit at glacial speeds. When our son, now a EA-18G pilot, had his induction physical at NAMI in 2000, his anthropometric data were collected on the same anthropometric device on which I had worked on in 1969. However, his data were not entered into Hollerith cards but into his computer records and NATOPS Jacket.

*CAPT (ret) William Moroney is a Professor Emeritus at the University of Dayton, and a board-certified professional ergonomist (CPE). He retired from the Navy after 22 years on active duty. He and his bride of 46 years reside in Dayton, OH and have three grown children.*

The moral of this part of my history is that the future is mostly unpredictable, but when you are given lemons, make the best lemonade that you can, you never know where the road will lead.

By the way: A similar situation lead to my interest in questionnaire design, which is the one course that I still teach. But that's another story…

Fly Navy!

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**Special thanks to Fred Guill of NAVAIR for creating the graphics included in this story.*

Shipmates

# La Joie de Voyage (The joy of travel)

**BY LTJG ERIC VORM, AEP#149**

Even before joining the Navy, I always had what you might call "wanderlust"- a strong desire or impulse to explore the world. I had grown up listening to stories of family members who had traveled abroad extensively. I can scarcely remember a family reunion or holiday get-together that did not include a photo album or slide carrousel from a recent journey. We would sit and watch for hours, listening to stories of far off places and the adventures of travelling to mysterious countries. And I would go to bed dreaming of one day following in their footsteps.

Fast forward to today, and flying is part of everyday life. Although, I have to say, the first few months of flying after winging, while somewhat exciting, was not what I would consider worthy of much attention. Some of the notable stops included Milton, Florida; Lake Charles, Louisiana; and Midland, Texas. Over time I began to learn about other flight opportunities that could take me to somewhat more favorable places. Soon I found myself flying to places like Key West and Ft. Lauderdale, Florida; Las Vegas, Nevada… and also Midland, Texas.

Then, this past March, I finally hit the jackpot. I managed to talk my way onto the crew of a flight out of Jacksonville, Florida that would take me to one of the most exotic locations I could imagine- Indonesia. Within an hour of confirmation, I immediately began clearing my schedule, cancelling business meetings, and looking through the closet for my favorite Tommy Bahama shirt.

An hour after that, the flight was cancelled.

The next morning I arrived to find an email from the scheduling officer waiting for me.

"Hey, Doc. Sorry about all the cancellations" the email read. "But I think I can make it up to you."

He went on to explain that the flight I was originally on had been cancelled because of a last-minute modification that took precedence, and he wanted to know if I was willing to go on it instead. I didn't have to think long when I heard where they were going- Dijon, France.
Still, I did have some reservations that made me stop and consider whether the trip would be worth it. The drive would be around 11 hours round trip, plus the hotel room I'd have to get in Jacksonville in order to make the early morning ramp time, plus food and lodging in France- all of which are expenses for which I would not be reimbursed. As a first-tour flyer, my flight pay is relatively meager. I quickly did the math, and it just didn't add up.

It was at this point that I began to imagine the words of my late grandfather, a WWII flyer and long-time aviation enthusiast.

"It's not about the money" he would growl. "It's about the experience. It's a PRIVILEGE to fly!"

I could never argue with that logic. It had always been my dream to jaunt off to foreign places and see the world on a grand scale. And so before I knew it, there I was, cruising at 36,000 feet, assisting the crew as they worked to ferry a group

*LT David Combs (AEP# 146), and LTJG Eric Vorm (AEP#149)on the runway in Dijon, France*

of non-descript government workers across the Atlantic for various non-descript activities (very hush-hush). And as far as military trans-Atlantic flights go, this one was tops!

I learned a great deal about weight and balance issues when the passenger group arrived with several tons of extra cargo that required several last-minute adjustments to fuel consumption and trim. This trip also taught me a bit about foreign relations. It seemed the maintenance worker in charge of emptying the chemical toilet from the aircraft was so interested in watching us unload our cargo that he forgot to connect the hose to the truck. The resulting pool of liquid waste on the runway seemed a disingenuous gift for us to leave immediately upon our arrival… though, oddly enough, none of the runway workers seemed to think all that much about it.

And so we were off on a wild, 24-hour adventure in France. It was eight o'clock in the morning, and I was determined to see the sights, eat exotic foods, and speak in a foreign language. Within a few short hours, I doing all of those things… or trying, at least.

French has been my second language since Miss Crawford's 7th Grade French class. I can still vividly remember a faded and creased poster on the wall of the dingy classroom. It featured a group of 1970's teenage students, decked out in corduroy bell bottoms and tight, plaid shirts. The poster read "Parler français et laissez le bon temps rouler!"

Speak French, and let the good times roll!

I have, more or less, been a student of French since then… though not a very good one. I took French a few times in high school, and a few more times in college. I toured with a musical group through Belgium and France for a summer (ask me about it sometime), which is where I asked my wife to marry me. Over the years I joined clubs and tried a few online services to continue learning, but always half-heartedly.

When my wife and I decided to have children, we agreed that we should raise them to be bilingual, which meant that we both had to increase our speaking ability. After securing the home equity loan it took to purchase the full package of Rosetta Stone language software, we set about becoming a bi-lingual family. Months went by and my wife diligently practiced, ticking off lesson after lesson. Meanwhile I continued on my routine of half-hearted apathetic (or was it just pathetic?) learning, until it fell off my radar entirely, somewhere around the time my first child was born.

"Bonjour, Papa!" my son, now six years old, says as he greets me. Today is Thursday-French day in our house. We exchange greetings and other minor small talk in French; the typical give-and-take conversations of early learners. And I feel pretty good about myself. After all, I am speaking a foreign language in

my kitchen with my own son. What could be more rewarding?

And then my wife enters the room.

I am quickly marginalized and ignored as the speed and complexity of the conversation elevates to near fluency levels. I resign to reading the paper, and quietly wonder to myself just how long it has been since I bothered to even open Rosetta Stone.

Sometime later my son pops his head around the corner and says, "Je parle plus bien français que vous!" in a 'nanny-nanny, boo-boo' tone.

I speak French better than you!

He runs off giggling, feeling an obvious sense of satisfaction at having obtained power over me. Who knows what else he'll be saying to me in just a few short years.

It is thoughts like these that occasionally distract me as I wander through the Rue de Liberté, a busy outdoor walking mall lined with cobblestone and packed with cafes and dress shops. At one end is an enormous cathedral, one of several in only a few city blocks. Their spires and towers dominate the modern office buildings which have crept up around them. I am not alone. A colleague and friend of mine, David, has made the trip as well. For several hours we wander through the streets, snapping pictures and admiring the juxtaposition of medieval and modern, all while pinching ourselves repeatedly. Surely this all must be a dream.

We meander in and out of shops, and up and down long, winding alleyways lined with windows adorned with flowers and ivy. Eventually we find our way to an outdoor café in the large open courtyard of the city government center. While I had managed to sheepishly avoid revealing my French deficiency fairly well up until now, I knew that was all about to change. Our waiter, a middle-aged looking man with short, wispy dark hair who smelled of cigarettes, handed us our menus. We said thank you, at which point, realizing he was dealing with English speakers, he literally ran to get someone else to wait on us.

Ordering lunch actually went mercifully well- as it turns out, pizza means the same thing in both languages. Still, my French phrasing was awkward enough to attract the attention of other patrons around us, and the appearance of green sprigs of spinach on my pizza was a bit of a surprise… I was certain I had used the word for sausage. Not bad, all things considered, I told myself. I may not be able to keep up with my six year old, but at least I can order a decent lunch, mostly.

The remainder of the day was spent riding trollies, snapping more pictures, and filling our bags with the finest mustards, chocolates, and wines we could find- which, as it turns out, is remarkably easy to do… it is France, after all. We did everything to experience the culture and vibrancy of the city, and I managed to avoid any situation that would require me to speak more than a few words- until dinner.

As before, I decided on a strategy that was certain not to fail. I would simply order something on the menu that I recognized, and do my best to appear like I knew what I was doing while ordering. It was at this point, either out of jet-lagged fatigue, or just plain old arrogance, that I turned to my colleague and assured him, "don't worry, Dave. I've got this. Trust me."

The waiter arrived.

"Duex plats de pâtes, s'il vous plaît" I said, confidently. Two plates of pasta, please.

The waiter paused, as if expecting more. He subtly cleared his throat, then asked, in perfect English, "nothing else?"

I gave the man my best European-style dismissive wave, and returned to my conversation with Dave. I think I may have noticed a slight roll of the waiter's eyes as he walked away.

When he returned, it was clear, the joke was on me. There, sitting before us, were two steaming bowls of plain, spiral pasta noodles.

They were tri-color.

We did our best to appear casual so as to avoid any more unwanted attention, though I couldn't help but notice the glances, whispers, and giggles of nearby patrons. Grudgingly, we ate our dry, plain noodles in near silence, and to his credit, Dave was a great sport. He only rubbed it in my face a little bit.

Still, sitting there, enveloped in the culture, surrounded by the sights and sounds of the beautiful city of Dijon, I could not suppress the overwhelming sense of gratitude for just being there. Again, my grandfather's words echo through my head and remind me of just how few people have an opportunity to travel to such a place, and what a privilege it is to fly. And considering this perspective, I had to concede that, my wounded pride aside; it had been an amazing day.

Spinach pizza and dry noodles may not have been the best French cuisine I could have sampled, but in retrospect, adventure never tasted so good.

Shipmates

# Reflections: The Career of CAPT Russ Shilling

**BY LT DAVID COMBS, AEP#146; LTJG ERIC VORM, AEP#149; LT JOE GEESEMAN, AEP#148; AND LCDR TATANA OLSON, AEP#126**

On 28 Feb 2014, the AEP community bid "Fair Winds and Following Seas" to CAPT Russ Shilling in a retirement ceremony at the Defense Advanced Research Projects Agency (DARPA). This unique retirement ceremony marked the end of a remarkable career that included teaching at the U.S. Air Force Academy and Naval Postgraduate School, developing the first program in the Department of Defense to use virtual reality to treat PTSD, playing an instrumental role in establishing the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury, and working with Sesame Street to develop programs to help military families cope with multiple deployments, injured family members, and the loss of loved ones. He is an example of the breadth of contributions AEPs can make if they seek out opportunities…..even if sometimes those opportunities may seem a little off the beaten path.

***From Aspiring Professor to Naval Officer***

Russ Shilling, the doctoral student, always assumed he'd be a professor. He completed an undergraduate degree in General Psychology at Wake Forest University and moved on to graduate work at the University of North Carolina at Greensboro in Experimental Psychology with a Neuroscience focus.

The bulk of his graduate work focused on Auditory Psychophysics. Specifically, Russ was interested in temporal processing in human hearing. During this time, his research involved designing and developing video games with embedded psychophysical testing. Since this was in the 1985-1987 time frame, they had one of the first ever touch screen game systems, which Russ learned to program.

As he began to wrap up his doctoral work, Russ had no shortage of prospects. As he recounts, "I had been offered a couple of Postdoctoral Fellowships, to include one in England and another at Boys Town National Research hospital. I was sitting in the library one afternoon working on my dissertation. I took a break from writing and saw an advertisement in the APS Monitor for Navy Aerospace Experimental Psychology. I called the recruiter and found out that not only was it an exciting prospect, it also paid a lot better than the post docs in those days—actually, I'm sure it probably still does. I drove to the recruiter's office in Raleigh, NC. It didn't take long before I was down in Pensacola for interviews. To make it even better, when I got back to North Carolina, the recruiter took me out to the airport where the local command had a T-34B. They took me up, did some aerobatics over rural North Carolina and, to put it mildly, I was hooked immediately."

After taking care of the recruiting process, Russ quickly found himself at Officer Indoctrination School (OIS), the name of which as since been changed to Officer Development School- (ODS) which he noted, "like a lot of AEPs, I was expecting it to be tougher than it was. I'd probably seen one too many war movies and was expecting it to be a bit more like that. All in all, it was an interesting time. Thankfully, I made it though nicely and moved on to Pensacola."

***Pensacola, Flight School, and an Interesting First Tour***

Upon arrival in Pensacola, Russ was stashed and got to work on several projects the local AEPs had for him until it was time for school to begin.

Russ didn't struggle with Aviation Preflight Indoctrination (API)—but, the swim quals were another matter. "The academics were pretty straightforward. But, I wasn't a strong swimmer. I actually took swimming lessons while I was finishing my dissertation. I was apprehensive. I certainly remember the helo dunker. I got lost a couple of times in there. My vision isn't all that good. Underwater it's even worse, so, I'm basically blind even without a blindfold. Otherwise, It was a good time; I enjoyed training and even got the MSC award for my class."

After completing training, then LT Shilling went on to his first tour… in Orlando, which was something of a surprise. "At the time, it was normal to stay in Pensacola for a first tour. But, I was split off and sent to Orlando. It was a little slow at first; They actually didn't have much for me to do and

I tend to be impatient.. But, as it turned out, and I was very fortunate in this case, a lab nearby had a full audio lab with equipment that no one really knew how to use except me. Eventually, I figured out how to get myself over there and was able to do spatial audio work for the next several years which was exciting."

*Air Force Academy Chapel, Colorado Springs, CO*

This process of getting himself moved from one set of tasks to another was a critical lesson for the new LT. "I had to figure out how to navigate Navy bureaucracy to make sure I could work with the equipment, but this was a great lesson in how to get things done in the military system. It was also my first lesson in patience! Once I got into the audiology lab, things were really great. I was the protocol officer most of the time I was in Orlando. I had pretty much every collateral duty in the building and I really learned a lot."

***Carving out Colorado***

LT Shilling's next stop was the United Stares Air Force Academy (USAFA) in Colorado Springs. Interestingly, the AEP community didn't have a billet at USAFA at that time. How did LT Shilling make that happen as a first tour LT? "There was a DoD HFE TAG (Department of Defense Human Factors Engineering Technical Advisor Group) meeting in Colorado Springs. When I was at the meeting, I mentioned to someone how we didn't (and still don't) have a billet at the Naval Academy. One of the folks who worked at the Air Force Academy overheard me and noted they had a Navy exchange program billet, but the person in it wasn't a PhD psychologist and that they'd love to have one. So, here I am in my first tour trying to get a new billet stood up! It turned out very well. They recoded the billet and I was headed to Colorado Springs. Of course, I had planned to be a professor at some point in my career, so, oddly, this was actually right on track with where I probably would have been had I never joined the Navy. Funny how things work out like that. I had a great time in Colorado. I advanced from assistant to associate professor and promoted to LCDR. taught a lot of interesting classes, was a lab director for a while (which meant I got to hold a lot of unique positions in the department). I even met my wife. We were married in the Air Force Academy Chapel, and had them play "Anchors Aweigh" on the Academy pipe organ.

LT Shilling's time at USAFA was a critical juncture for him. Not only did he stand up a new billet, lead research, and teach great classes, he also managed to lead audiology research he was passionate about and pick up interesting training in the process. "Since I was interested in how sound and emotion worked together, and how that could be used for simulation, I was able to convince USAFA to send me to the THX course. THX was LucasFilms quality assurance system that is commonly used in movie theaters. George Lucas created it because he was unhappy with the way his movies sounded in theaters. Essentially, in the course they train you to design home theater systems. I was thinking that you could use the same concepts for the home theater system so it could fit onto a Navy ship. A lot of the work was psychoacoustics, so it was right up my alley. I really got along with the engineers. In a lot of ways, those engineers, and this THX course, put me on the path that I ended up following most of my Navy career."

***More Teaching: NPS and Army Video Games***

After USAFA, LCDR Shilling was off to Monterey, California for a tour in the Operations Research Department at the Naval Postgraduate School (NPS). Interestingly, his move to NPS wasn't necessarily encouraged at the time.

"To be honest, I was told that USAFA wasn't necessarily the best place for me to go career- wise. Two back-to-back teaching assignments are usually not conducive to promotion, but, I knew I loved teaching, and I loved the work I was doing and wanted to continue with it, even if that meant not promoting So, I went to NPS and found myself in the Operations Research department, though I did most of my work with the MOVES institute (Modeling Virtual Environments and Simulation)."

LCDR Shilling's arrival at NPS was perfect timing. The AEP who was fascinated by video games, sound, and training arrived at NPS "right as they were standing up the America's Army video game project. It was being designed and constructed as a recruiting tool for the Army to give potential

recruits a sense of what it was like. This was a full-blown first person shooter video game created by veteran game producers. Basically, they had hired a bunch of video game developers from all the big names like Electronic Arts, Konami, -- all the big names in the industry. But, instead of contracting the work out, we set up our own video game development facility at NPS. I ended up being the sound engineer for the entire game for the next four years. We released the game in July 2001."

LCDR Shilling's work on The America's Army game is still paying dividends to this day. As he noted, America's Army "is still updated and is still going to this day. It has around seven to ten million registered users." In addition to still being an active recruiting tool over a decade after its first release, Russ's work was also important because "it [America's Army] helped kick off a movement in which the U.S. Government and DoD began to see the value of video games for "serious" applications. Up to this point, they hadn't really believed that video games were a viable path for education and training. I was really in the right place at the right time when I arrived at NPS."

LCDR Shilling also won a somewhat unusual award (for an AEP, anyway). "One really great part of my time at NPS was that the THX folks I mentioned earlier had set me up with the folks from Lucas Film Skywalker Sound. So, I had those folks giving me tips for the video game." This collaboration paid off-- Game Spot Magazine awarded America's Army the award for best sounds in a video game. It was also the first videogame to be Dolby Digital certified.

As if Shilling needed any more reasons to be proud of his time at NPS—some of his work even made it to Hollywood. "As it turned out, the movie 'Minority Report' needed hovercraft sounds. So, a sound engineer from Lucas Film and I went out to various bases and recorded LCACS. They used our sounds in the movie and we used them for simulations."

***The Beltway***

LCDR Shilling began to transition himself away from bench level research into research management in his next tour at the Office of Naval Research (ONR). "It went better than I might have thought. I was expecting to not be able to get much done in Washington D.C. What I found was that once I was in D.C., as long as I advocated for what I believed in, I could get the programs going that I felt would be valuable. I was in a position to both pick up existing programs and stand up things I wanted. When I got there, I took over a big part of the medical research portfolio. Mostly, I worked a lot with medical care, medical training, flight safety gear, things like that. I also took over the National Bone Marrow Registry. It was a steep learning curve. The portfolio really hadn't been overhauled since the start of the wars. So, I found myself having to completely reorganize things based on what needs were coming out of theater. I really had a lot of freedom. So, we were able to see what we felt was needed and go do it. Every now and again we ran into resistance, but we found ways to advocate for what we felt was best and then get it done. I think my proudest moment at ONR was standing up the virtual reality therapy for posttraumatic stress program-- which has since transitioned to 50-60 medical clinics. It was the first new therapy for PTSD since the war began. At that time, there was not much research on PTSD and this was the first new therapy going. This was about 2005 and it was about to become a big deal. In addition, we also got a program going on pandemic influenza. At the time, I was postulating that this might one day be a big deal, so we stood up one of the first modeling programs on the topic. And I picked up CDR, so, that was nice too."

After ONR, CDR Shilling moved across the Potomac River to the U.S. Naval Research Laboratory—the heart of U.S. Navy Research. Surprisingly, that tour was soon cut short. In 2007, a $900 million congressional appropriation was made for psychological health and traumatic brain injury, of which $300 million was earmarked for research.

"So, I got pulled out of NRL by Navy BUMED and DoD Health Affairs and supported that work the rest of my time at NRL. I ended up having three jobs, one at NRL, my ONR portfolio, and this new health affairs work in Falls Church. About a dozen of us (Officers and Veterans Administration) were tasked with expediting an investment plan for the funding."

It was also during his time at NRL that CDR Shilling was introduced to some people who connected him with Sesame Street.

*Murray Monster introduces the newest member of the Sesame Street family, CAPT Russ,'In a video message to CAPT Shilling at his retirement ceremony.*

### *Elmo, Emmys, and DARPA*

The wars in Iraq and Afghanistan were clearly difficult endeavors for the American warfighter. However, the scars of war are not borne by the warfighter alone. War is a family matter, and the children of warfighters sometimes bear some of the most difficult scars. CDR Shilling set out to aid the littlest members of the U.S. fighting force.

"We kicked off a program for kids about dealing with the stresses of a parent's multiple deployments, parental injury, and finally, helping children cope with the death of a parent or a loved one. We essentially funded Sesame Street to create DVD kits to go out to families. Eventually, this was adjusted to get the videos onto the iTunes store and android-based apps so people could just download them as they wanted. On the side, Sesame Street was able to transform the content we created into primetime PBS specials. Overall, the content was Emmy nominated, won a Parent's Choice, and nine Golden Eagle Awards.

During his work with Sesame Street, CDR Shilling was selected for what many view as the capstone billet for an AEP—the Defense Advanced Research Projects Agency (DARPA)—which was a thrill for him.

"This was a really terrific moment in my career. It made me very happy to get into DARPA. At that point, I was able to get with the Psychological Health program and I also picked up a major Science, Technology, Engineering, and Mathematics (STEM) education program. I was appointed to co-chair a White House panel on video game technology which also works with the Department of Education. This really brought a lot of things together. I can tell you, that billet at DARPA is not one you can take for granted. You really have to have some solid experience before you try to get in there. Having a background in program management, at least from my perspective, is a real leg up. Having a clear idea of what you want to get done is critical. And, you really have to have an idea—one that can possibly fail—but something high risk, high reward." The STEM education games have been played millions of times and have won numerous awards, and his psychological health program is in consideration for adoption in VA call centers and for clinic use.

### *Final Thoughts*

As CAPT Shilling (or CAPT Russ, as he's known on Sesame Street) steps out of an active duty role, the AEP community honors his 20 years of service to the community—and more importantly—the nation. With this in mind, Call Signs asked CAPT Shilling to conclude this reflection piece with some advice that he wished he had known when he first joined the community. He passes that perspective on to us now:

*CAPT Russ Shilling and his namesake, CAPT Russ. Uncanny resemblance, don't you think?*

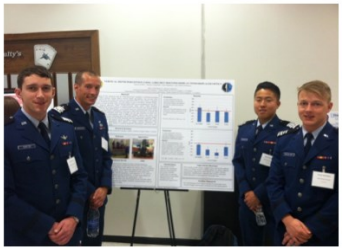
"First things first, I'd say getting mentors is very important. I remember I was probably on the phone once a week with a senior AEP when I was new to the community. I'd say pick up a few mentors and absorb as much information as you can from them.

Second, plan your career. Don't just sit back. Plan things out, figure out where you fit, and try to do those things. Needs of the Navy are critical—but—we do have a lot of flexibility. Be entrepreneurial. Making the community look good will make you look good. It's a whole process. But, I'd really stress entrepreneurship. Create the billets you want!

Finally, I'd say stand up for yourself. You can have a respectful disagreement, even argument, with leadership. You can push for the things you want. You might have to do a lot of convincing. But, it's worth the effort."

# Bravo Zulu

Cadets Barrett Stehr, Jon Schneider, Matt Croghan, Grant Urbon, and Garrett Manley.



Cadets Joshua Griffin, Andrew Carpenter, Kyle Mesecher, and Jacob Nicholson.

Cadets Ken Appel, John Pierce, Kaleb Young, and Joseph Dunham.

**Human Factors at the Colorado Springs Undergraduate Research Symposium (CSURF) 2014**

Cadets Libby Taylor, Allen Frankenberger, and Max Jones.

Cadets Will Madsen, Kyle Antoszewski, John Davis, and Erin Bleyl.

Cadets Cami Richan, Blake Abrecht, and Alex Goebel.

LCDR Brian Johnson mentored 23 U.S. Air Force Academy Cadets who presented their human factors research projects at the Colorado Springs Undergraduate Research Forum on April 12th

CDR Cohn published a paper entitled Time Course of Cortical Networks Involved in Working Memory in the Journal *Frontiers in Human Neuroscience* as part of an ongoing project at the Office of Naval Research.

LT Cox was awarded the Navy and Marine Corps Commendation Medal for outstanding management of the Aviation Selection Test Battery, command legal office, and Aerospace Experimental Psychologist training programs.

LT Stephen Eggan received Navy and Marine Corps Commendation Medal EOT award from NAMRU-D.

LT Cox was awarded $18,500 by the Deputy Surgeon General Clinical Investigation Program to conduct a research study on "Evaluating the Role of Fluid Intelligence in Naval Aviation Selection and Training Performance." This research will served to investigate the role of fluid intelligence as it pertains to aviation academics and training performance, and will possibly serve as a platform for future work on the ASTB and related tests. Bravo Zulu, LT Cox, et al!!!

CAPT (Ret) Dylan Schmorrow was selected to serve as a principal member of Advisory Board for the Brain Hackers Association. Brain Hackers is a non-profit organization (http://www.brainhackers.net) whose primary mission is to improve the well-being of its participants through activities that promote an awareness of brain science and the relevance of brain science to everyday activities. The organization advances national priorities concerning education and training in Science, Technology, Engineering and Math (STEM).

# Bravo Zulu

CDR Deb White won the Sonny Carter Memorial Award at this year's Aerospace Medical Association Navy Luncheon. The Sonny Carter Memorial Award recognizes the Medical Corps or Medical Service Corps Officer who has made the most significant contribution towards improving the health, safety, and welfare of operational forces by promoting communication and teamwork among the aeromedical communities. The Sonny Carter Award recipient is judged not only on accomplishments in the last year but also on a career history of aeromedical community involvement. Criteria for selection include: resourcefulness and dedication in promoting and accomplishing operational medical support; demonstrated leadership in forming and promoting teamwork among the various aeromedical specialties; demonstrated professionalism, integrity, unselfishness and respect for all aeromedical communities; demonstrated communication skills, and embodiment of the spirit of cooperation.

LCDR Pete Walker, pictured above (center) with Professor Ian Davidson (UC-Davis; left) and Professor Jieping Ye (Arizona State University; right) spoke at the University of Texas at Austin as part of the University's public Colloquia Series. The group presented work on their Office of Naval Research funded project Guided Learning in Dynamic Environments (GLIDE) which focuses on next-generation machine learning algorithms. The project has generated several peer-reviewed publications including Best Paper Runner-Up at Knowledge Discovery and Data Mining in 2012 and 2013.

# Bravo Zulu

LT David Combs received a Mid Tour Navy and Marine Corps Achievement Medal for his assistance with the OSD HSCB Modeling Program.

On May 1st Lieutenant Commander Hank Phillips [AEP #136] was promoted to Commander in Orlando, Florida at the Naval Air Warfare Center Training Systems Division (NAWC-TSD). Commander Phillips' wife Mimi Phillips along with his daughters Ella and Annie Grace changed his rank devices and cover after he had been administered his oath by the NAWC-TSD Commanding Officer, CAPT Steve "SNAK" Nakagawa. CAPT (Ret.) Dylan Schmorrow [AEP #104] served as the event's guest speaker and highlighted CDR Phillips' dedication to duty and compared his attitude and success to that of Rowan from the famous "The Message to Garcia" article. CDR Phillips was noted for consistently taking on difficult tasks for his Commands, the Navy and particular the Naval Aerospace Experimental Psychologist Community throughout his entire naval career. In particular his unique ability to take on difficult tasks and do whatever it takes to get it done, without having to ask lots of questions on how to solve the problem at hand was discussed. Additionally, CAPT Schmorrow highlighted CDR Phillips ability to do so in the face of adversity and how he always finds a way to get results and get the job done. CDR Phillips unique ability to always take the initiative to accomplish a daunting and difficult task without questions or objections and graciously accomplish the task was recognized. CAPT Nakagawa provided additional remarks focused on the increased responsibility and accountability this promotion brought with it. CDR Phillips concluded the event by recognizing, and thanking, his family, friends and coworkers for their constant support. Congratulations CDR Phillips!

LCDR Olde completed a program in Systems Engineering, earning a Masters degree from the Naval Post-graduate School in Monterey, California.

# Calendar: Mark These Dates Down!

- **8th international conference on Augmented Cognition:** 22-27 June; Crete, Greece
- **American Psychological Association Annual Convention:** 7-10 August; Washington, D.C.
- **Military Health System Research Symposium:** 18-21 August; Location TBD
- **Human Factors and Ergonomics (HFES) Annual Meeting:** 27-31 October; Chicago, IL
- **Society for Neuroscience Annual Meeting:** 15-19 November; Washington, D.C.
- **AMSUS, the Society of Federal Health Professionals annual continuing education meeting:** 02-05 December; Washington, D.C.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