CALL SIGNS

USN AEP SOCIETY

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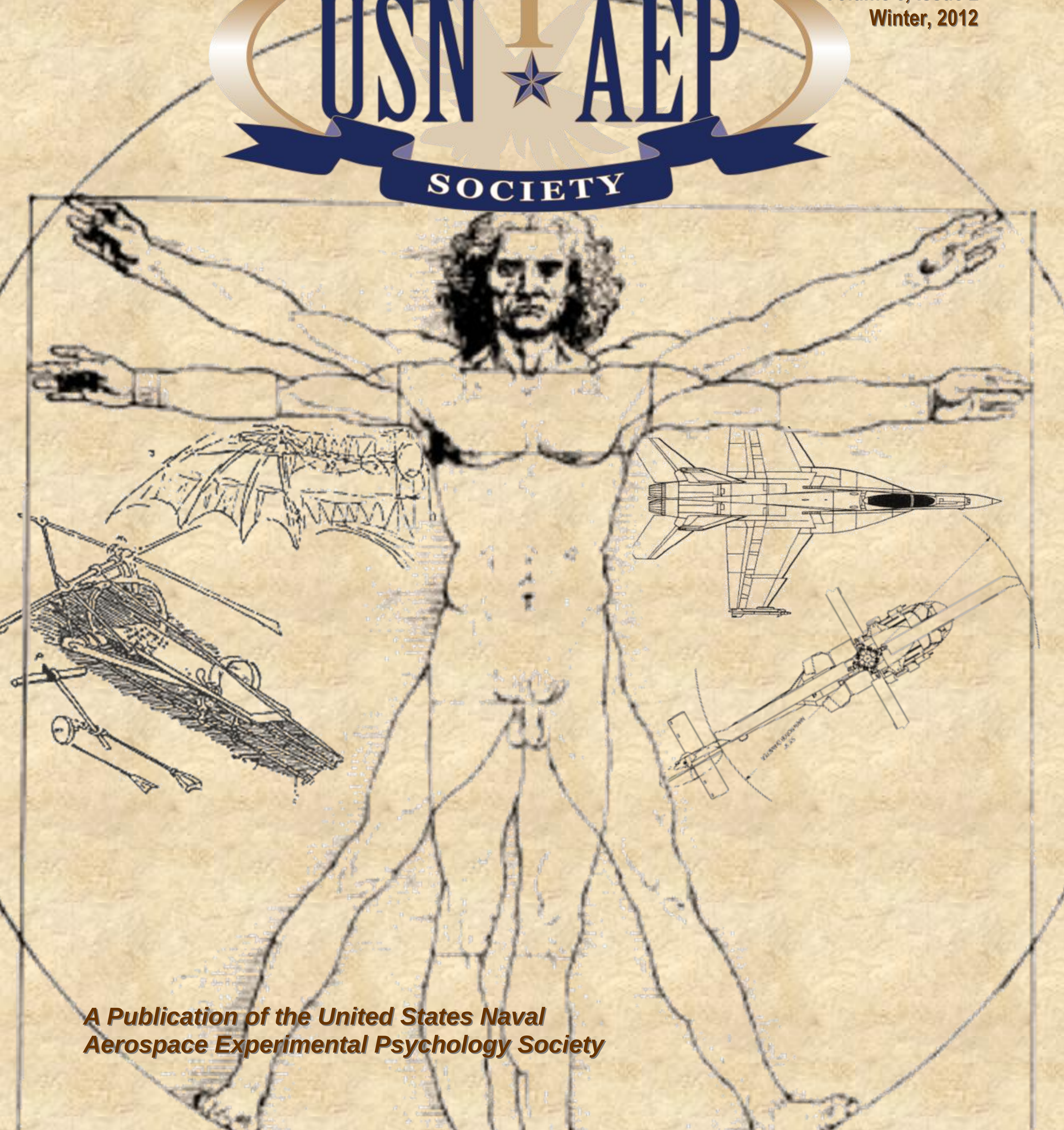

A Publication of the United States Naval Aerospace Experimental Psychology Society

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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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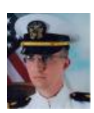

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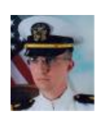

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Message From The President

LCDR CHRIS FOSTER, USNAEPS PRESIDENT
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This past Summer I was honored to assume the presidency of the United States Naval Aerospace Experimental Psychology Society (USNAEPS). Since that time your new Executive Committee has been extremely busy. We are focusing on three key areas this year: review/update of USNAEPS by-laws, establishment of USNAEPS as a non-profit organization, and continued outreach. LT David Combs, USNAEPS Secretary, coordinated the comprehensive review of the organization by-laws to ensure that they are best structured to support our mission and objectives. This review was recently completed and the Executive Committee has unanimously approved the new by-laws, which will soon be posted to our community website. LCDR Will Wells, USNAEPS Treasurer, is leading the effort to establish USNAEPS as a non-profit organization and is in the process of finalizing our application at the time of this writing. LT Stephen Eggan, Call Signs Editor, ably assisted by LT Brennan Cox and LT Combs, has laid out what I believe you will find a very interesting series of Call Signs issues. The first in that series highlights the increasing importance and visibility of Human Systems Integration (HSI) as it relates to meeting Department of Defense mission requirements and the work of all AEPs in one way or another.

In this issue you will hear from HSI experts who employ its principles in a variety of domains, including representatives of other services, officer communities, and civilian scientists who perform work similar to that of AEPs. Given the breadth of HSI as a discipline, broadening our contributor base seemed particularly appropriate for this issue. These contributors will discuss success stories, lessons learned, and even how to enhance your knowledge of HSI should you so choose. LtCol Anthony Tvaryanas, whose article on Boyd's trilogy provides a context for understanding HSI, illustrates that it is not a new concept, and demonstrates the risks we run if it is ignored. Dr. Jim Pharmer discusses the role of HSI in the acquisition process and the role of the Navy HSI Working Group. Next, LCDR Jeff Grubb discusses the Ault report and the role that AEPs should play in the area of HSI with an unfortunate number of *Top Gun* references. Dr. Larry Shattuck provides an overview of the HSI educational opportunities available through the Navy Postgraduate School. Then we have a series of recent AEP efforts in the area of HSI: (1) LCDR Olde discusses manpower issues related to new UAS programs, (2) LT Cox explores the role of HSI in the development of systems to support the selection of aviation candidates, (3) LCDR (sel) Johnson discusses the interconnectivity of the HSI domains applying them to occupational health issues, and (4) CDR Reddix and CDR Folga explain the mission and focus areas of the CNAF HSI working group. As always you can also expect to see updates from fellow AEPs and a few well deserved BZs.

In closing I'll just say that the need for HSI in the work we do as AEPs is not new; however, the organizational interest and increased emphasis on the area is, which is highlighted, as you will read, by striking data demonstrating that 68% of a system's life-cycle costs and 67% of Class A mishaps are directly attributable to HSI issues. The knowledge of aeromedical officers in general, and AEPs in particular in this area (see quote from the AEP Specialty Leader below), is a key differentiator. It shapes how we approach challenges and is one of the important competencies that we bring with us when we transition to a new billet.

With wishes of a happy New Year and thanks as always to the editorial team, I hope that you enjoy this issue of Call Signs.

"AEPs bring the highest levels of specialized, relevant education, operational knowledge, and an experienced-based thorough and comprehensive perspective on HSI - it is the core of our community. Each and every AEP HSI activity has some impact on naval aviation that enables safe and effective flight operations and better allocation of resources across HSI activities. In a constrained fiscal environment and growing challenges in the Navy medical enterprise and unmanned systems, AEPs are uniquely positioned to have a profound and lasting impact on Naval operations."

- CAPT Dylan Schmorrow, AEP Specialty Leader

Human Systems Integration:
Focusing on the Means

BY LT COL ANTHONY TVARYANAS, 711TH HUMAN PERFORMANCE WING (AFRL)

BOYD'S TRILOGY & HUMAN SYSTEMS INTEGRATION: SOME PHILOSOPHICAL CONTEXT

The idea of building military systems to optimize the collective performance of the soldier and their weapon is not new. Ch'i (430-381 B.C.), a recognized expert on warfare whose name is frequently associated with Sun Tzu, author of *The Art of War*, is reported to have declared to the Marquis (i.e., nobleman) Wen of Wei:

> At present, My Lord, during the four seasons you cause animals to be skinned and lacquer their hides and paint them vermilion and blue. You brilliantly decorate them with rhinoceros horn and ivory. If you wear these in the winter you are not warm, and in the summer, not cool.
>
> You make spears twenty-four feet long and short halberds of half this length. You cover the wheels and doors of chariots with leather; they are not pleasing to the eyes, and when used for hunting they are not light.
>
> I do not comprehend how you, My Lord, propose to use them.
>
> If these are made ready for offensive or defensive war and you do not seek men able to use such equipment it would be like chickens fighting a fox, or puppies which attack a tiger. Though they have fighting hearts, they will perish.[1]

This quote demonstrates that concern for integrating the human user and weapon is by no means a unique phenomenon of modern times. Nonetheless, concern for a "man/machine interface crisis" has persisted as a recurring calamity within the defense bureaucracy throughout the latter half of the last century and continues to the very present as evidenced by the Air Force Scientific Advisory Board's F-22 study.

As in the wake of Vietnam, the U.S. military will need to reinvent itself post Afghanistan and begin preparing – during a period of increasing fiscal austerity – for challenges on both ends of a spectrum of conflict that range from irregular warfare to nuclear war. In so doing, it will again debate the veracity of the hypothesis of technological determinism that undergirded defense acquisitions during the prior century. The central issue is perhaps best illustrated by the philosophy of Colonel John Boyd, the legendary maverick and military strategist.

> Boyd's trinity held people first, ideas second, and things third. Often the military has as its first priority the things, the high-tech weaponry. Ideas are second, and people, in that they are trained to be interchangeable parts, a tertiary consideration. That is not meant to seem as heartless as it sounds but merely to point out that we often seem to value the capabilities of our technology more than the people who use it…Boyd was convinced that one's mind was the best weapon, and hence, well-trained and well-educated people, who think well and quickly, were the most important asset, followed by ideas, in turn followed by the equipment they had at their disposal.[2]

Boyd's trinity characterizes the main debate between technologists and members of the military reform movement of the early 1980s, the latter who sought a more balanced perspective on technology. The issues were, and still are, complex, but it is fair to say that the two sides of the debate differed less in their ends and far more in the *means* to accomplish them. What is germane to us today is that the historical roots of Human Systems Integration (HSI) extend back to that debate and the intellectual propositions of the reformers.

Thus, the essentials of an HSI philosophy are succinctly captured in the elements and their ordering within Boyd's trinity. And there is a simple value proposition inherent in this trinity that can serve as the touchstone for those practicing HSI within the defense bureaucracy.

WORSHIPPING AT THE TECHNOLOGICAL ALTAR

What happens when the military bureaucracy is fundamentally wrong in their value proposition – that is,

[1] Sun Tzu (1963). *The Art of War* (S. B. Griffith Trans.). New York, NY: Oxford University Press, p 151-2.

[2] Hammond, G. T. (2001). *The Mind of War: John Boyd and American Security*. Washington, DC: Smithsonian Books, p. 110.

Col John Boyd as a Captain or Major

when they worship at the altar of technology?[3] The military bureaucracy's love of technology is well illustrated by their recent consumptive binge in terms of unmanned systems. Within the Air Force, the MQ-1 Predator has been the vanguard prototype for the modern unmanned aircraft system (UAS). But what makes it fascinating and worth discussing further here is how the attempt to develop a Predator Multi Aircraft Control (MAC) capability reveals the military bureaucracy's inverted view of Boyd's trinity.

Until fairly recently, the Air Force had in place one ground control station designed for controlling up to four Predator remotely piloted aircraft. System developers assembled the MAC ground control station in less than a year and deployed it into full-time action in 2006. Such an aggressive developmental cycle was made possible through the utilization of a mixture of existing computers, prototype display designs, and networking solutions. Human factors engineers and HSI practitioners were not involved until late in the process, and only then for the purpose of observational assessment of the mature design. While the design was acknowledged to be "inelegant," it was nonetheless hailed as an engineering success by the developmental community. However, once in line service, operational crews were not very comfortable with the system design or the doctrine (or lack thereof) for its employment; local leadership soon limited its use to control of only a single or perhaps two aircraft.[4] Within four years, the MAC ground control station was withdrawn from service and delivery of a second MAC ground control station was cancelled. And the military bureaucracy's response to this object lesson has been to "double down" on technology by creating expectations for significant near term advances in automation.[5]

This short case study illustrates the technologists' value proposition: priority was placed first on the technology (things), with both doctrine (ideas) and people a distant secondary consideration. The end result was that technologists failed to successfully field the desired capability with the secondary unintended consequence that they significantly dampened enthusiasm for the technology among the target audience (i.e., the users). The lesson learned is that blind worship at the technological altar can inadvertently result in the worshipping of false idols.

A DIFFERENT APPROACH TO FLY BY

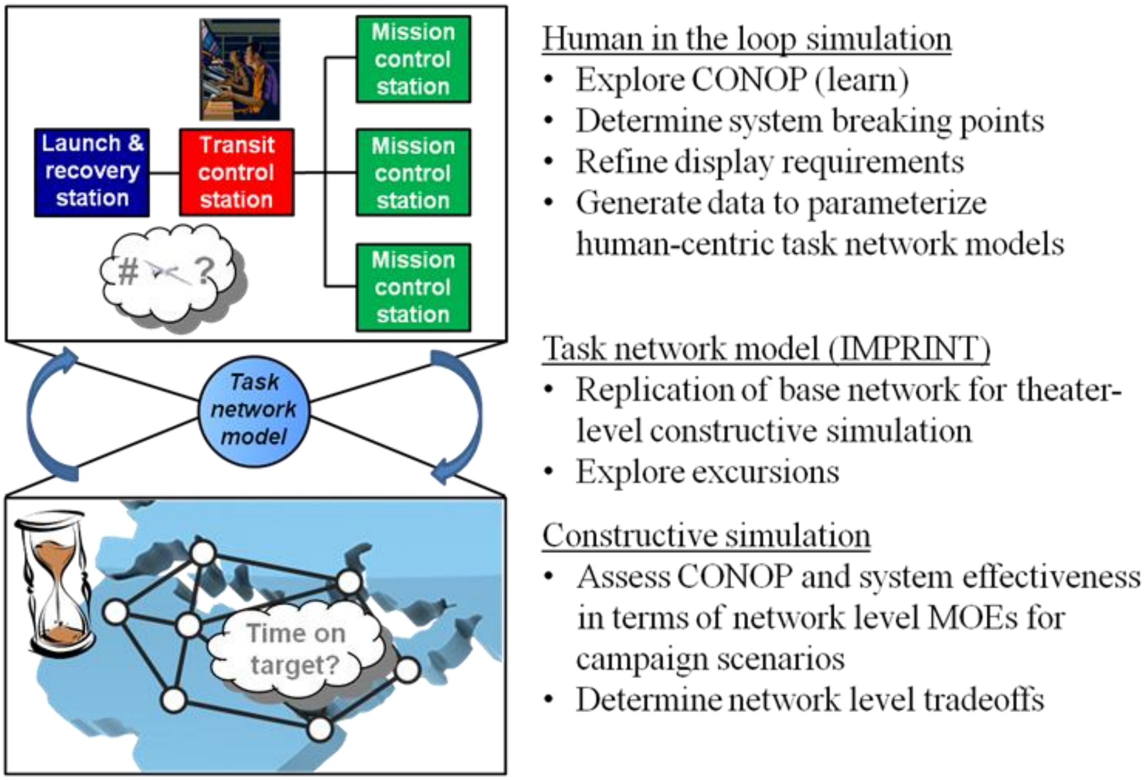
When a plane crashes, the mishap investigators look for evidence of the root cause so as to prevent a recurrence. In a similar vein, when the request for multi aircraft control capability was revised in the MQ-9 Reaper UAS program – specifically for that portion of flight between the airfield and the mission (multi transit operations or MTO) – the HSI practitioners assisting the system developer early in the acquisition process searched for the cause of the failure of the first MAC ground control station. They determined that prior attempts at multi-aircraft operations failed because of the limits of human performance (namely workload), and they recommended that HSI considerations define the critical path to fielding during system development of a future MTO capability.

At the bequest of the HSI team, the MQ-9 system manager assigned responsibility for the development of the prototype MTO human-system interface to the 711th Human Performance Wing (Air Force Research Laboratory). In contrast to the prior technology-centric Predator MAC ground control station development effort, the lab team pursued a human-centric design philosophy that directly reflected Boyd's triad. The lab team identified and engaged with representatives of the anticipated user population; these individuals were included on the team as virtual teammates empowered with veto authority. This hybrid team is now responsible for requirements development and design activities. The team is currently proceeding through a series of iterative learning cycles that each consist of a prototype development activity followed by formative and summative usability testing using human-in-the-loop virtual simulations. As a manifestation of the team's commitment to "putting the human first," it is through these simulations that technology must buy its way into the final design based on its relative contribution

[3]Builder, C. H. (1994). *The Icarus Syndrome: the Role of Air Power Theory in the Evolution and Fate of the U.S. Air Force*. New Brunswick, NJ: Transaction Publishers, pp. 155-157.

[4]Button, K. (2009, Oct. 1). The MAC attack: multi-aircraft control of UAVs by a single pilot won't come easily, experts warn. *C4ISR Journal*, vol. 8(9).

[5]Ibid.



Interrelated use of virtual and constructive simulation.

in supporting the user in their role as a MTO pilot. Likewise, these simulations are used to validate and refine the initial draft CONOPS (i.e., Boyd's "ideas").

Ever cognizant of the importance of not turning a blind eye to the threat posed by human cognitive workload limits, the lab team is using the Army Research Laboratory's Improved Performance Research Integration Tool (IMPRINT) to create task network models of each prototype control station based on data collected from the human-in-the-loop virtual simulations as well as part task activities. These IMPRINT models are then used to gain insight into the prototype design's workload effects across a broader range of potential scenarios and operating environments than could be addressed in the human-in-the-loop virtual simulations. The data from these models are also incorporated into a larger, campaign-level simulation activity that is focused on an operational benefits assessment (OBA) construct. The OBA quantifies the effects of the MQ-9 MTO capability in terms of benefits brought to the end-user. Significantly, by incorporating the results of the IMPRINT modeling and simulation, the OBA will reflect human performance constraints, thereby allowing meaningful technology and manpower tradeoffs. The image above summarizes the project's interrelated use of virtual and constructive simulation.

In stark contrast to the earlier description of the Predator MAC ground control station, this case study illustrates the reformer's alternative value proposition: priority was placed on the user, followed by the CONOPS, and then the technology. While the definitive end result is still to be determined, interim data and user feedback to date has been decidedly positive. Hopefully these and future positive user experiences can offset some of the damage done by the fielding of the Predator MAC ground control station. Additionally, as the Air Force has scant substantive HSI success stories of record, this project offers a unique opportunity to unequivocally demonstrate the value and return on investment of putting Boyd's triad into practice during system development. If successful, we will have charted a preferred approach for the Air Force to fly by for future system development efforts.

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Application of HSI to the Navy Acquisition Process

BY DR JIM PHARMER, NAWCTSD

In systems acquisition, most regard Human Systems Integration (HSI) as key to providing the Department of Defense (DoD) with platforms, systems, and subsystems that meet the requirements of the warfighter. The concept behind HSI is straightforward; in the acquisition process decision makers must consider human operators, maintainers, and support personnel on an equal footing with hardware and software engineering decisions, with the objective of this multi-disciplinary approach being maximization of system (hardware, software, human) performance at the lowest total ownership cost. However, what is meant by "integration" is not as straightforward. For instance, HSI includes at least two levels of integration: 1) Integration among human-related domains and 2) integration between those domains and more traditional acquisition disciplines. This article discusses the issues involved in these two forms of integration and how the Navy is working to ensure a consistent approach to implementing HSI policy, process, tools, and technologies across Navy Systems Commands (SYSCOMs) through the Navy HSI Working Group.

INTEGRATION AMONG HUMAN-RELATED DOMAINS

A number of disciplines are considered to be directly "human-related" with respect to systems acquisition; the Defense Acquisition Guidebook defines the following human considerations in the acquisition decision making process:

Manpower factors are those job tasks, operation/maintenance rates, associated workload, and operational conditions (e.g., risk of hostile fire) that are used to determine the number and mix of military and DoD civilian manpower and contract support necessary to operate, maintain, support, and provide training for the system.

Personnel factors are those human aptitudes (i.e., cognitive, physical, sensory capabilities), knowledge, skills, abilities, and experience levels that are needed to properly perform job tasks.

Training is any activity that results in enabling users, operators, maintainers, leaders and support personnel, to acquire, gain or enhance knowledge and skills, and concurrently develops their cognitive, physical, sensory, team dynamics, and adaptive abilities to conduct joint operations and achieve maximized and fiscally sustainable system life cycles.

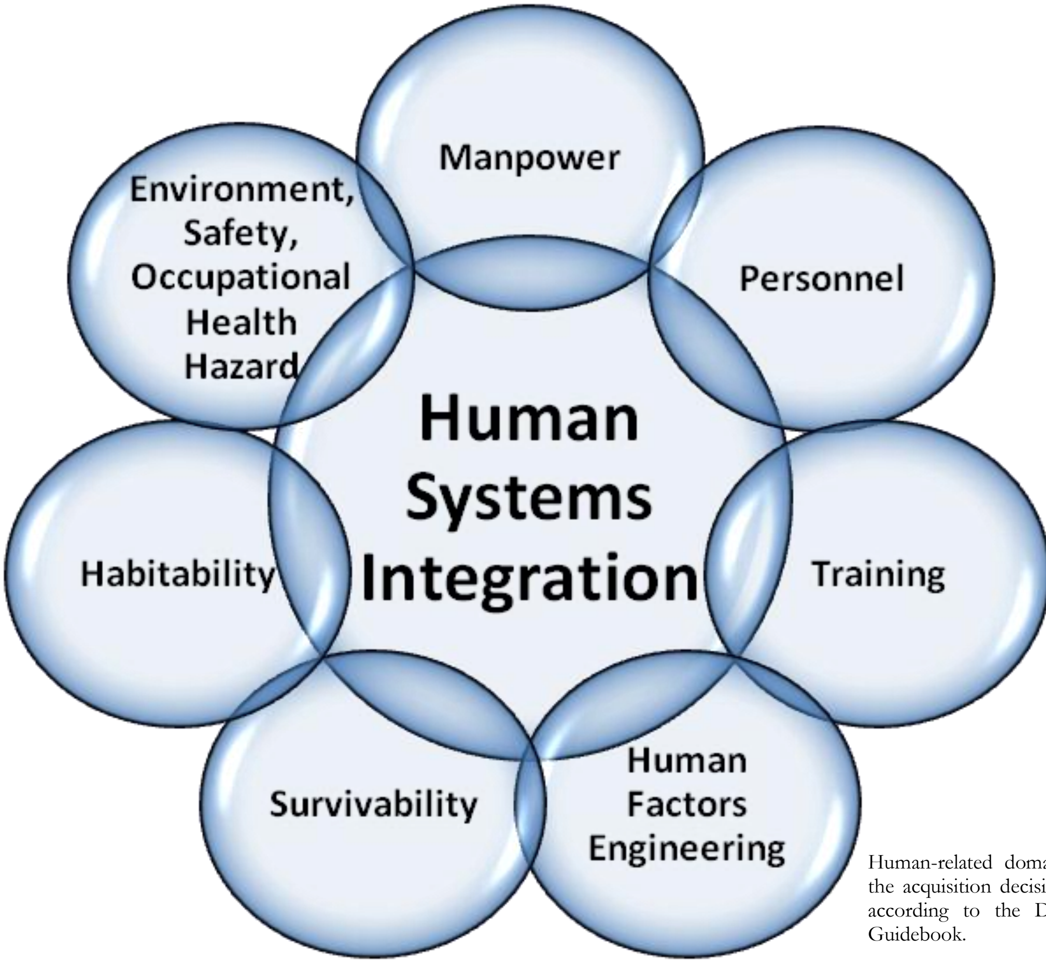
Human factors engineering (HFE) is primarily concerned with designing human-system interfaces consistent with the end-user's cognitive, physical, sensory, and team dynamic abilities (human factors) required to perform system operational, maintenance, and support job tasks. Human factors engineers contribute to the acquisition process by ensuring that the program manager provides for the effective utilization of personnel by designing systems that capitalize on and do not exceed the abilities (cognitive, physical, sensory, and team dynamic) of the user population.

Environment, safety, and occupational health hazard (ESOH) parameters should address all activities inherent to the life cycle of the system, including test activity, operations, support, maintenance, and final demilitarization and disposal. ESOH requirements should be stated in measurable terms, whenever possible.

Survivability factors consist of those system design features that reduce the risk of fratricide, detection, and the probability of being attacked; and that enable the crew to withstand natural and man-made hostile environments without aborting the mission or suffering acute chronic illness, disability, or death.

Habitability factors are those living and working conditions that are necessary to sustain the morale, safety, health, and comfort of the user population.

The need for integration of considerations among the human-related domains described above is highlighted, for instance, by the fact that approximately 68% of the costs of operation and sustainment of a Navy ship are related to human operators, maintainers, and support personnel (GAO, 2003). As such, the Navy could save significant dollars by designing systems that support more effective utilization of its human-related resources. Fortunately, experts in these domains have little difficulty integrating their tasks with one another and discussing how their disciplines interrelate. In fact, some considerations, like those related to Manpower, Personnel, and Training, are quite often regarded together, such as in Navy Training Systems Plans (NTSPs).



Human-related domains to consider in the acquisition decision making process, according to the Defense Acquisition Guidebook.

INTEGRATION OF HSI DOMAINS WITH ACQUISITION DISCIPLINES

The "integration" within HSI that is often underemphasized (and may actually be most important in impacting system performance and total ownership cost) is the integration of human-related domains with more traditional acquisition related disciplines (e.g., Hardware and Software Engineering, Cost Accounting, Systems Engineering, Program Management). This is likely because this form of integration is more challenging to accomplish since it requires a deep understanding of all disciplines by practitioners on both sides and even sometimes translation of terms across disciplines. For example, the term "function allocation" has different meanings to human factors engineers (allocation of function to hardware, software, or human) and systems engineers (allocation of functions to requirements), which can lead to considerable misunderstandings. The good news is that as HSI practitioners are included more in acquisition program decision making, the more they can demonstrate added value to the process and, as a result, the more acceptance they will receive.

While integration within a given acquisition program is challenging, an even bigger task involves ensuring that HSI is implemented consistently across acquisition programs, which for the Navy is being accomplished through its HSI Working Group.

NAVY HSI WORKING GROUP (NHSIWG)

The Navy SYSCOMs are charged with determining the best methods of implementing HSI for their specific acquisitions. Much progress has been made in developing HSI processes, policies, tools, and methods *within* each of the SYSCOMs; however the interdependent nature of the SYSCOMs, evident in such issues as air-ship integration, requires common approaches *between* SYCOMs as well. In recognition of this need, the Navy SYSCOMs have established the NHSIWG to foster common systems engineering approaches in order to deliver naval systems that maximize performance at the lowest total ownership cost. The membership of this working group includes representation from each of the major Navy SYSCOMs (NAVSEA, NAVAIR, SPAWAR, MARCORSYSCOM, NAVSUP, and NAVFAC), as well as representation from other stakeholders, such as the Naval Postgraduate School (NPS), the Navy Safety Center, and Commander Naval Air Forces (CNAF). The NHSIWG consists of:

- **The Navy HSI Steering Group (NHSISG)**, which provides executive level oversight to ensure that the products of the NHSIWG are consistent and support the HSI competency area goals in each SYSCOM.

- **The Navy HSI Technical Working Group (NHSITWG),** which consists of HSI experts from each of the SYSCOMs who work together on developing common HSI processes, analyses, activities and review processes to incorporate into the systems engineering processes implemented during the acquisition of naval systems.

The coordination of policy and process between the SYSCOMs faces challenges with respect to organizational structure, acquisition focus, and acquisition philosophy. However, the NHSIWG continues to work as a team to provide the tools and guidance to support all Navy acquisition programs in implementing HSI. For example, recent and ongoing work of the NHSIWG includes:

1. **Collaboration on the Systems Engineering Technical Review (SETR) process:** SETR is a technical assessment process that evaluates the maturing design over the life of the program. Each of the SYSCOMs has adopted a SETR process to assess the maturity of acquisitions relative to their phase in the acquisition lifecycle. The NHSIWG continually collaborates on development of common approaches for review and implementation of the SETR.

2. **Development of an HSI Appendix to the Naval Systems Engineering Guide:** This Appendix provides an explanation of HSI and how it can be integrated into the systems engineering process. This includes guidance on language for acquisition documents like the Systems Engineering Master Plan (SEMP), the Test and Evaluation Master Plan (TEMP), and the Acquisition Strategy.

3. **HSI Contract Language Guide:** Perhaps the biggest challenge to successful implementation of HSI into an acquisition program is the development of traceable and testable HSI requirements. The Contract Language Guide provides guidance to programs on elements in a contract that will best support the implementation of HSI.

4. **Data Item Descriptions (DIDs):** A DID is a document that defines the format and content of data required of a contractor. The document specifically defines the data content, format, and intended use. A detailed survey of HSI related DIDs is being conducted to determine what gaps may exist, what DIDs should be updated, and potential opportunities for developing new DIDs. Recently, DIDs have been developed for HSI Program Plans (HSIPPs) and HSI Reports (HSIRs) and work is currently ongoing to update the DID for Critical Task Analysis Reports (CTARs) to improve the specificity, traceability, and testability of task analysis requirements.

5. **Review HSI curricula:** As stakeholders to HSI training and education, the NHSIWG regularly reviews and provides feedback to organizations that train HSI processes. Most notably, the NHSIWG supports NPS in the development of curricula for their HSI certificate distance learning courses, as well as their HSI Master's program. It has also supported the Defense Acquisition University in developing HSI modules within core System Planning, Research, Development, and Engineering (SPRDE) courses.

CONCLUSION

The Navy embraces implementing HSI principles and concepts into systems engineering and acquisition processes. However, it faces some unique challenges in developing common approaches to HSI application due to varied perspectives and priorities inherent in each of the SYSCOMs missions. The NHSIWG is chartered to meet these challenges with the task of exploiting opportunities for collaboration among the SYSCOMs to develop common HSI processes. It works collaboratively to develop cross-SYSCOM policy and guidance on contract language, review processes, research and development, and HSI training, as well as the tools to support the consistent implementation of HSI.

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What Viper Didn't Tell Maverick:
The Ault Report and the Role of AEPs in HSI

BY LCDR JEFF GRUBB, NAWCTSD

2011 marked several important anniversaries for Naval Aviation. The Navy's formal celebration of the Centennial of Naval Aviation emphasized the 100th anniversaries of the first shipboard landing and the procurement of the Navy's first aircraft. However, 2011 also marked an anniversary whose importance many Brown Shoes may deny – May 12, 2011 was the 25th anniversary of the release of *Top Gun*. This movie had at least two major effects on Naval Aviation. First, it inspired a generation of wannabes to pursue Wings of Gold, thereby expanding the pool of applicants from which were drawn the aviators who fought in every conflict since Desert Storm. Second, through its ubiquity in pop culture, *Top Gun* became a reference by which both the general public and the Naval Aviation community itself discusses and to some extent understands Naval Aviation. Yes, *Top Gun* was a cheesy "B movie" with more than its fair share of Hollywood drivel, but let the AEP who has not deployed a *Top Gun* allusion in a professional setting cast the first AMRAAM (Advanced Medium-Range Air-to-Air Missile).

In its role as a cultural reference, *Top Gun* arguably reinforced a somewhat limited understanding of the importance of Human Systems Integration (HSI) in solving fleet problems. Although most AEPs will probably not recall any explicit discussions of HSI in the movie, I draw your attention to the scene in which Viper, the Top Gun CO, relates the story of the genesis of the U.S. Navy Fighter Weapons School. According to Viper, low air-to-air kill ratios during the first three years of the Vietnam War prompted the Navy to launch an investigation. The resulting report, commonly referred to as the Ault Report, concluded that Naval Aviators of the era were not sufficiently trained in air combat maneuvering (ACM). Following the recommendations of the Ault Report, the Navy stood up Top Gun and the new crop of ACM-trained Naval Aviators has ruled the skies ever since.

2011 marked the 25th anniversary of the release of *Top Gun*

This is a nice story and one that many AEPs understandably find appealing. Naval Aviation had lost its edge. Smart people in uniforms analyzed the problem and realized that it stemmed from a deficiency in an HSI domain. Development of a new training program, presumably facilitated by experts in the science of learning, solved the problem and restored the supremacy of U.S. Naval Aviation. However, as one might expect of a historical anecdote in a summer movie, Viper's account is incomplete. Examination of the Ault Report reveals not the importance of any one HSI domain, but the importance of integration across HSI domains. This observation has important implications for the career paths of active duty AEPs.

For those who are interested, the Ault Report may be found in .pdf format on the Naval Historical and Heritage Command's website at http://www.history.navy.mil/branches/org4-25.htm. Movie buffs may be surprised by the report's formal title, "Report of the Air-to-Air Missile System Capability Review." Rather than investigating why air-to-air kill ratios were so low, CAPT Ault's team was actually charged with determining why the failure rate of air-to-air missiles was so high. The review team began the conclusion section of their report as follows:

> There is always a hope, in undertaking a review of this nature, that there will be uncovered a few major discrepancies so crucial to system performance that there is little question that corrective action will achieve, at once, a readily measurable, quantum improvement in performance and capability. Such was not to be the case, however, and as the review proceeded, it became clear that the road to improvement lay through a virtual jungle of problems...

For example, for an AIM-7 Sparrow missile to destroy its target, the weapon system had to acquire and track the target, the missile itself had to be fired from within a limited flight envelope, its rocket motor had to ignite properly, and its warhead had to fuse at the appropriate time. Working backward from the kill, in combat the AIM-7 fused properly 74% of the time that it was fired successfully. The rocket motor worked 75% of the time that the aviators pulled the trigger while within acceptable firing parameters. The aviators pulled the trigger while within acceptable firing parameters 68% of the time. Finally, the combined missile and aircraft-based weapon control system successfully acquired and tracked the target about 34% of the time. These factors combined to yield a 13% combat success rate for the AIM-7. The F-4 Phantom carried 4 AIM-7s, but cumulative probabilities would indicate that one would need to fire at least 5 AIM-7s to have better than a 50/50 shot at destroying a target. There is little wonder that air-to-air exchange ratios were so low.

Consistent with Viper's story, the review team noted that some of these failures, especially those stemming from out-of-envelope launches, were attributable to deficiencies in ACM training and that the stand-up of a fighter weapons school would improve combat performance. However, the lack of aircrew training was not the only contributor. Even if ACM training completely eliminated out-of-envelope firings, the cumulative probability of the missile failing to track, ignite, or fuse would still yield an 81% failure rate for the system. Although these failure modes appear to stem chiefly from design or material defects, Ault's team noted that they also had HSI-related causal factors. Missiles were more complex and fragile than previous airborne weapon systems and so required a higher degree of skilled maintenance. With the war and its consequent increase in operational tempo, the Navy faced a shortage of skilled technicians to maintain the missiles and weapon systems. Those sailors who were available had to learn their trades on the job, often without the benefit of training devices or even maintenance manuals. In large part, this meant that sailors were learning their trade on the missiles they were sending into combat. Moreover, the shipboard safety program required that unexpended missiles be removed from the jet, disassembled, and stored below after each sortie. Each cycle of assembly, flight, and disassembly provided multiple opportunities for undertrained and overworked crews to damage or inappropriately assemble the fragile, complicated missiles.

The striking part of the review team's recommendations is how many of them address the same failure mode from different paths. For example, a missile that was designed to be more maintainable might have allowed the maintainers in the fleet to better care for the ordinance. Alternatively, better trained maintainers might have been able to better care for the missiles that already existed. Likewise, more ACM training might have allowed aircrews to better achieve and recognize valid firing positions, but better heads-up firing cues in the cockpit would have helped reduce the number of invalid shots that aircrews took. Naturally, in such situations the review team recommended both solutions, but they also recognized that some solutions were easier and more cost effective to implement than others. Typically, it was not realistic to optimally implement both solutions, especially in the near term. The trick was to strike the best achievable balance of solutions in the short, medium, and long terms. It is this observation that has important career implications for AEPs.

Most AEPs are accessed directly from graduate school and enter the community as experts in a particular field, which typically corresponds to one HSI domain. The community tries to assign AEPs to billets where they can utilize that expertise; however, such assignments are not always possible. Even when the individual AEP's specific academic expertise is well suited to a billet, the standard military rotation cycle ensures that he or she will go to another assignment within roughly three years. Moreover, the vast majority of AEP billets have civilian counterparts. Our civilian colleagues are not under the same rotation schedule and are therefore able to build up specific expertise and institutional memory. Consequently, AEPs are rarely the strongest technical expert in the core subject matters of the commands to which they are assigned. However, by virtue of the fact that AEPs rotate between commands over the course of several tours, they typically have a greater degree of expertise across HSI domains than do their civilian colleagues.

Two years ago, the mid-grade active duty AEPs, led by LCDR Foster, conducted a review of AEP billets to determine if there were viable career tracks within the current slate of AEP billets. Although they did find that some billets could be strung together to make logical career progressions within specific technical domains (e.g., I/O psychology or human factors engineering), the report noted that few AEPs had ever followed those domain-specific paths. In retrospect, this is likely fortunate. As the Ault Report found, the fleet does not have HSI problems. It has operational problems that must be efficiently solved by balancing solutions from different HSI domains. Especially as AEPs progress in rank and attain greater leadership responsibilities, our ability to draw from experience working in multiple HSI domains should place us in an unusually good position to make the judgments that are necessary to strike these balances. As such, the role of the AEP is to own the integration portion of HSI.

Naval Postgraduate School:
Home of the Nation's Premier HSI Education and Training Programs

BY COL(RET) LARRY SHATTUCK, NPS

A profession is only as healthy as its educational underpinnings. Admittedly, Human Systems Integration (HSI) is a young profession. However, there is at least one educational program that stands ready to prepare prospective HSI practitioners to be successful – the Naval Postgraduate School (NPS) has been educating and training students in HSI concepts, theories, and principles since 2004. The program was founded by Dr. Nita Lewis Shattuck at the request of Dr. Hal Booher, former Director of Army MANPRINT and Dr. Robin Keesee, former Director of the Army Research Lab's Human Research Engineering Directorate. Since its inception, the HSI program has expanded to include resident and distance learning opportunities, as well as workshops. The following questions and answers provide more information about the education and training opportunities available at, and through, NPS.

WHAT HSI PROGRAMS ARE OFFERED AT NPS?

The resident Master of Science in HSI degree program is the only one of its kind in the nation. It is an eight-quarter, 24-month program in which students take four courses per quarter. Students also complete a thesis on a topic relevant to at least three of the HSI domains.

The NPS Distance Learning HSI Certificate Program began in 2009 and has become a popular choice for HSI practitioners. Student backgrounds range from novice practitioners to those who have been working in the field of HSI for many years.

The Distance Learning Master of HSI degree program is NPS' newest offering. NPS is the only institution in the nation that offers a distance learning master's degree in HSI. NPS has taken the most important content in the resident Master of Science degree program and crafted a 16-course, 24-month master's degree for HSI practitioners. In this program, students take two courses each quarter for eight quarters. Typically, one course is taught synchronously and one is taught asynchronously (i.e., without any classroom attendance necessary). In lieu of a thesis, students in this program complete a capstone project that addresses an HSI issue in their own organization.

All of these programs are accredited by the Western Association of Schools and Colleges.

WHO IS ELIGIBLE?

NPS HSI programs are open to all U.S. federal government personnel – both uniformed and civilian. Most applicants are from the Department of Defense, but a number have come from the Department of Homeland Security, U.S Coast Guard, NASA, and other federal agencies. U.S. Defense contractors are eligible for enrollment on a space available basis. Members of the international community are also welcome to apply to NPS programs, although there are additional eligibility requirements that apply. Check the NPS website (http://www.nps.edu/or/hsi/) for more information.

WHAT'S THE RIGHT PROGRAM FOR YOU?

The most comprehensive program is the resident Master of Science in HSI – it is by far the most in-depth and thorough. Upon completion, students earn a Master of Science degree and receive NPS Certificates in HSI and Systems Engineering. Students will also develop some impressive analytical skills and hone their scientific writing skills by completing a thesis. By the end of this program students are ready to practice HSI just about anywhere. But, it requires students to spend two years at NPS as a fulltime student. Two years in Monterey, CA is not a bad deal, and although the faculty would love to have all students come to NPS for the resident program, it is understood that it is just not possible for everyone. Typically, the resident students are U.S. or international military officers with an occasional DoD civilian.

The Certificate Program is great for those who already

The Naval Postgraduate School is located in picturesque Monterey, CA.

have a master's degree or a Ph.D. and just want to know a little more about HSI, or for those with a bachelor's degree and are new to the field. It would also be a good fit for those who want a master's degree, but are not sure they have the time to commit to a degree program. If that is the case, students can work through the HSI Certificate Program and if more is desired, they can roll into the distance learning master's degree program.

The distance learning master's degree is the best option if students want a master's degree in HSI, but are not able to get away from their job to go to Monterey for two years. It is not as comprehensive as the resident master's degree, but graduates will be proficient HSI practitioners when they complete the distance learning degree program.

HOW MUCH TIME DOES EACH PROGRAM REQUIRE STUDENTS TO INVEST?

NPS is a highly respected graduate school, and the faculty work hard to ensure the resident and distance learning courses are equivalent. Like most universities, NPS' rule of thumb is that students will spend about 2-3 hours of outside study for every hour in the classroom.

For the distance learning certificate program, students take one course each quarter for four quarters. Most certificate program graduates report spending a total of about 8-10 hours a week on each course; some students report spending as little as five or six hours, whereas a few stated they spent up to 15 hours each week. Those who spent more time admitted they could have gotten by with less, but really enjoyed the material and wanted to learn as much as they could.

The distance learning master's degree students take two courses per quarter and should expect to spend between 16-20 hours each week on coursework. Again, this number will vary depending on the student.

For those who want a master's degree but may not be able to invest 20 hours per week, it is possible to stretch the program out over three or four years instead of completing it in two years.

WHAT KINDS OF THINGS WOULD I LEARN ABOUT?

In the HSI Certificate Program students learn about HSI domains and policies, the manner in which HSI is practiced in the context of system acquisition, and the tools, techniques, approaches, and methods used by HSI practitioners.

In the distance learning Master of HSI degree program, NPS provides much more depth in the domains of HSI and strengthen students' analytical skills. Students will also take courses in three other areas extremely important to HSI practitioners: Systems Engineering, Test & Evaluation, and Cost Estimation.

In the resident Master of Science in HSI, students take all of the courses in the Certificate Program and the distance learning Master in HSI program, plus NPS provides additional depth in Systems Engineering, research methods, statistical analyses, as well as individual, team, and organizational behavior. The thesis gives students the opportunity to put what they have learned into practice on a problem that is timely and relevant to HSI.

HOW MIGHT THIS HELP MY CAREER?

Just about all of NPS HSI graduates – especially contractors and civilians – have stated that the knowledge they gained from their NPS coursework was put to use on the job, sometimes the very week they learned the material. Some graduates reported that they were promoted because of their HSI knowledge or were able to apply for new and better positions. For military members, more knowledge of HSI makes them better advocates for their fellow Warfighters, especially as they work on making current systems better or on developing new systems. In addition, completion of these programs will provide experience that will aid in obtaining acquisition related Additional Qualification Designations (AQDs) and the 4600 HSI subspecialty (SSP) code. And, when the time comes for military personnel to take off their uniforms and enter the civilian workforce, they will find that their HSI education will be highly valued by many employers.

For more information on any of these programs and the workshops offered by the NPS HSI faculty members, contact Col (ret) Larry Shattuck, Ph.D., Program Director, email: lgshattu@nps.edu; tel. 831-656-2473.

Manpower:
Importance of Applying HSI to Unmanned Aerial Systems

BY LCDR BRENT OLDE, PMA-205

Manpower, although it is probably the last thing anyone wants to talk about when discussing new technology, should probably be the first. Manpower constitutes a large majority of the Operating and Support (O&S) costs, which in turn averages 68% of a system's life-cycle costs. Put in perspective, the sticker shock of new aircraft like the Joint Strike Fighter (which may cost $137 million per plane) pales when compared to a $1.1 trillion dollar estimate for the system's life-cycle costs. Complex new systems usually require many people to support them and these people need to be highly trained to operate, maintain, and support these systems. When that system is in service for 20-50 years, early design decisions that influence Manpower, can have costly implications. Manpower should not be overlooked – it is the elephant in the room and if not planned for, will leave a very large mess.

Prior to discussing Manpower, it may be necessary to clarify the difference between Manpower and Personnel. Although these two Human Systems Integration (HSI) domains are tightly coupled, they are distinct. Manpower relates to bodies – how many people it takes to man a system. Those people may be categorized as military, civilian, or contract support (whichever combination provides the most efficient and cost-effective mix), but they are simply the number of bodies required to make the system work. Manpower does not speak to the Knowledge, Skills, and Abilities (KSAs) required of those people to do the job – that is Personnel. A system's Personnel requirements are satisfied by hiring or training fully *qualified* individuals with all the necessary KSAs to do a job. If a program cannot hire or train enough Personnel to run the system, then there is a Manpower shortfall.

Manpower constitutes a large majority of Operating and Support costs, which in turn averages 68% of a system's life-cycle costs.

Since Manpower, Personnel, and Training are intuitively intertwined, it's fairly easy to understand how decisions that impact one HSI domain can influence the other domains (HSI trade-offs). Recent decisions to utilize winged aviators for unmanned systems allowed the government to quickly man systems with personnel who needed minimal additional training. However, as the required Manpower of Unmanned Aerial Systems (UAS) increases due to increased inventory, it may be necessary to establish a UAS training pipeline dedicated to training system operators. Military (officer/enlisted), Civilian, and Contract Support have all been considered to fly unmanned systems; every group has their benefits and limitations. Weighing the HSI trade-offs and finding the most

Boeing's X-45C

Above: An RQ-8A Fire Scout takes off at NAS Patuxent River.
Right: An MQ-8B is maintained at Marine Corps Air Station Cherry Point

efficient and cost-effective mix to operate, maintain, and support a system is a difficult task and requires time and effort to be done correctly, but there will be a high return on that investment over the life-cycle of the system.

Where Manpower, Personnel, and Training trade-offs tend to be relatively apparent, design changes and their implications can be quite unexpected. For example, when the initial designs for a new unmanned system were made recently, the designs had preliminary data for operator workload estimates that were based on assumptions of the current technology's capabilities for automated information integration, or data fusion. As the program progressed, the level of automation possible came into question; this had far reaching implications to the overall manpower and mission capability of the system. If the system was not capable of automating the data fusion, this task then had to be done by hand. This would increase operator workload, and thus require more manpower, more training (originally personnel did not have to be trained to do the task manually), and more operator workstations. If the increase in manpower was unacceptable to senior management, then the mission capabilities and perhaps the entire Program of Record could be re-evaluated. Thus, it is important to understand how the different domains of HSI, such as Human Factors Engineering in the example above (specifically operator workload and levels of automation), interact and impact the overall system.

Another example of unanticipated interdependency revolves around security. Aviation officers usually handle a device called "the Brick." This is a portable hard drive that gets loaded onto an aircraft. However, with UAS the aircraft and the pilot do not need to be collocated. Engineers assumed the maintenance personnel (who are collocated with the aircraft) could load the brick and proceeded with design decisions based on this assumption. However, they did not consider that the maintenance personnel did not have the required security clearance to handle the brick. Now this system may have a manpower shortfall based on the lack of qualified, security cleared personnel to perform the required task.

This sort of example is not uncommon – engineers are focused on getting the system to work and may simply assume warm bodies will be available to man the controls and turn wrenches when needed. Unfortunately, with complex System-of-Systems, interdependencies abound. Changes in one area can ripple across the system with severe implications. The discipline of HSI is intended to identify these interdependencies and assist Program Managers in understanding the cost benefit trade-offs so they can make informed decisions regarding the Program life-cycle costs.

*Note: The term Unmanned Aerial Systems (UAS) is a bit of a misnomer. Unmanned Aerial Vehicles are unmanned, but Unmanned Aerial Systems typically have just as much manpower as manned systems (they just don't put aircrew in the same level of danger and don't have design limitations based on human limitations – e.g., GLOC or fatigue). The U.S. Air Force has reverted back to the term Remotely Piloted Aircraft (RPA) in order to circumvent recurring questions about why "Unmanned Systems" require so much Manpower.

Personnel:
Using HSI to Optimize Aviation Selection

**BY LT BRENNAN COX &
LCDR CHRIS FOSTER, NAMI**

The Personnel domain of Human Systems Integration (HSI) concerns the recruitment, selection, and retention of individuals with the knowledge, skills, abilities, and other characteristics (KSAOs) required to operate, maintain, and support a defense program successfully throughout its life-cycle (Archer, Headley, & Allender, 2003; DoD Instruction 5000.02, Enclosure 8).

Contributions to this domain by military psychologists were initiated during World War I, which coincided with the *Intelligence Testing Movement* and produced most notably the Army Alpha and Beta tests for mass aptitude screening (Yerkes, 1919). As World War II approached, increased availability of aircraft led the Civil Aeronautics Authority (now the Federal Aviation Administration) to fund the National Research Council's Committee on Selection and Training of Aircraft Pilots. In cooperation with the Navy, the Council initiated the "Pensacola Study of Naval Aviators" to evaluate nearly 60 psychological, physiological, and psychomotor tests for determining the KSAOs most predictive of success in Navy flight training (McFarland & Franzen, 1944). Findings from the *Pensacola Project* produced the Aviation Classification Test (ACT) and Flight Aptitude Rating (FAR), which together assessed candidates' general intelligence, mechanical comprehension, spatial apperception, and biographical history – many elements of which remain in today's Aviation Selection Test Battery (ASTB).

The ASTB is the primary tool for selecting candidates into Naval Aviation training. The newly released ASTB-E features computer-adaptive tests of cognitive abilities (reading, math, and mechanical comprehension), aviation and nautical knowledge, aviation-relevant personality traits, a biographical inventory with response verification, and a series of psychomotor tasks that require use of a stick-and-throttle set. This comprehensive selection system, which processes nearly 10,000 applicants per year, is managed by the team of Aerospace Experimental Psychologists (AEPs) stationed at NAS Pensacola's Naval Aerospace Medical Institute (NAMI).

The process of developing, deploying, and maintaining the ASTB exemplifies the importance of a synergistic approach to defense program management, as the Personnel-driven elements of this aviator selection program depend largely on several other HSI domains to satisfy mission requirements. This article summarizes some of the key ways in which the ASTB integrates with other areas under the HSI umbrella to deliver the most effective warfighters to the fleet.

HUMAN FACTORS ENGINEERING (HFE)

The development of any selection system should begin with a job task analysis (JTA), or a detailed examination of the work environment, equipment, and materials used, the job's unique tasks, duties, and responsibilities, and the KSAOs required for performing in these areas. Each work function is then evaluated by its frequency and duration of activity, level of complexity, and acceptable performance standards to determine which elements are critical to the job. Not surprisingly, aircraft designs and the systems and tools with which aviators interact drive many of these requirements.

Human Factors Engineers are responsible for designing and developing aircraft systems that optimize human-machine performance. To do so effectively, they must take into account human capabilities and limitations in order to minimize the aviators' physical and mental workload in flight. The technologies produced by this process greatly influence the areas investigated by job analysts, which in turn inform aviator selection requirements. As aviation technologies markedly change, so too must the requirements for aviator selection. This interplay is evident in the evolution of the ASTB, which began as a paper-and-pencil test for propeller-driven aircraft and has since become a computerized, performance-based test that corresponds with the high-speed and complex aircraft of today.

Relevant HFE considerations in developing the ASTB-E included a comparison of throttle controls versus rudder pedals, a fidelity assessment of the performance-based scenarios, standardization of monitors and displays, and analyses of control stick maneuverability. These HFE concerns and more will continue to be examined as Naval Aviation moves toward an increased use of unmanned aerial vehicles (UAVs); future aviator selection systems will need to be sensitive to both manned and unmanned systems.

The first aviator selection system consisted of little more than a physical examination.

ASTB-E features a series of performance-based tests requiring use of hands-on throttle and stick controllers.

MANPOWER

In addition to minimizing user workload, HSI practitioners are also challenged with designing systems that minimize costly Manpower requirements. Manpower refers to the number and mix of authorized and available personnel needed to accomplish a mission. Once Manpower requirements are established, the next logical step is filling these positions with the most qualified candidates through effective recruitment and selection.

For its part, the ASTB facilitates Naval Aviation Manpower requirements by working closely with the USN, USMC, and USCG to set minimum passing scores (i.e., cut-scores) so that current and future pilot and flight officer billets can always remain filled. One of the challenges of having a continuous selection program is that not all applicants complete the ASTB at the same time; therefore, the pass-rate must be optimized to maintain a steady flow of students in the training pipeline (i.e., cut-scores must be low enough to allow sufficient candidates to pass, but high enough to screen-out unqualified candidates). Data from aviator job analyses inform this process by distinguishing the KSAOs that are necessary upon entry versus those that are highly desired, but trainable.

In practice, this means that all candidates who "pass" the ASTB meet the minimum standards, but those who score higher stand a better chance of being selected. Because the supply of qualified candidates (i.e., those with passing scores) typically outweighs the demand, simply "passing" the ASTB may not be sufficient for gaining entry into the aviation-training pipeline. For this reason, candidates are permitted three opportunities to achieve their maximum score on the test. If in the rare event the demand is greater than the supply, a limited number of ASTB score waivers may be offered to candidates who do not meet the minimum standards, but who otherwise possess the qualities and characteristics considered desirable among student naval aviators. This way, Manpower requirements remain satisfied through a flexible Personnel system.

TRAINING

Training consists of all instructions and resources designed to provide personnel with the KSAOs that are required for successful job performance, but are not necessarily required for selection. The Naval Aviation training program, which consists of Introductory Flight Screening (IFS), Aviation Preflight Indoctrination (API), and then Primary, Intermediate, and Advanced flight training, can take over a year to complete, with per-student costs reaching into the hundreds of thousands (even millions) of dollars. When students fail to complete training, this time and resource-investment is lost. On the other hand, by the time they earn their wings, students' skills are so advanced that their subsequent Feet Replacement Squadron (FRS) training reflects far fewer instances of poor performance. The duration of the training program and its resultant reduction in performance variability makes it nearly impossible for pre-training selection tests to predict performance distinctions among post-training aviators. Therefore, the ASTB was designed to predict how well candidates will perform in aviation training, as successful training completion infers successful fleet performance.

The data from naval aviator JTAs inform both selection and training criteria; therefore, it should come as no surprise that ASTB score components correlate significantly with several flight-training criteria, to include aca-

The final ASTB-E subtest requires candidates to address a series of emergency scenarios while chasing enemy aircraft using the stick and throttle controllers.

demic performance and attrition in API and academic performance, flight performance, and attrition in Primary flight training. Candidates who pass the ASTB and select into training do so with an understanding that they possess the minimum KSAOs required to complete the training program successfully. The training program is then responsible for advancing the students' KSAOs for joining the fleet. Collaboration between AEPs at NAMI, Naval Aviation Schools Command (NASC), and the Chief of Naval Air Training (CNATRA) is critical for optimizing this process (i.e., maximizing the relationship between ASTB scores and training criteria). Data from CNATRA's annual exit survey, for instance, largely informed the decision to incorporate personality, biographical, and psychomotor subtests into ASTB-E, as each of these test components targets specific reasons that students attrite from training (e.g., career interest, motivation, stress management). By streamlining their efforts, experts in the areas of Personnel and Training ensure that all aviators who join the fleet have the "right stuff" to accomplish their mission.

ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH HAZARD (ESOH)

In the unfortunate event of a Naval Aviation mishap, the details of the case are analyzed to determine the causal factors using the Human Factors Analysis and Classification System (HFACS). When HFACS users identify patterns related to mishap susceptibility, this information is incorporated into the (re)design of the aviation system to minimize the possibility of similar events in the future.

Analyses of the HFACS dataset from FY09-10 revealed that 67% of Class A mishaps were directly attributable to human error; the majority of these were skills-based errors, followed by decision errors, violations, and perceptual errors (Fatolitis, Anglero, Walker, & Little, 2012). It stands to reason that should the aviator selection program assess candidates on these factors, the frequency of mishaps attributable to human error would likely decrease over time. With the implementation of ASTB-E, this assumption will be evaluated over the next several years, as the recently added dichotic listening, airplane tracking, and emergency scenario tasks were all incorporated to screen out candidates who are more susceptible to making skill-based and decision errors.

SUMMARY

Teamwork is essential to successful HSI. In the context of Naval Aviation, the ASTB remains the primary driver for aviator Personnel decisions. Optimization of this selection system hinges on information and requirements provided by several other HSI domains, including the HFE, Manpower, Training, and ESOH domains. Advancements in selection testing capabilities and aviation systems, including the transition to unmanned vehicles, will continue to guide the collaborative relationship among these HSI practitioners. Only by working together can we ensure delivery of the most efficient, effective, and user-friendly programs to our current and future fleet operators.

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Human Factors Engineering:
Using HSI to Reduce Potential Occupational Health Issues in the Cockpit

BY LCDR(SEL) BRIAN JOHNSON, USAFA

The focus of the Human Factors Engineering (HFE) domain is to integrate what is known about human capabilities and limitations towards the design, modification, and evaluation of complex systems. The goals of HFE are to increase productivity, safety, and comfort while reducing human error. Although HFE is a distinct human systems integration (HSI) domain, it is interconnected with all of the other HSI domains. For example, effective HFE should reduce Manpower and Training requirements.

HFE can also be used to address occupational health issues. Recently, Aerospace Experimental Psychologists (AEPs) at the Naval Air Warfare Center Aircraft Division (NAWCAD) accomplished this by redesigning an input device in the MH-60. The MH-60 is used for a variety of functions including "anti-submarine warfare, search and rescue, drug interdiction, anti-ship warfare, cargo lift, and special operations" (http://www.navy.mil/navydata/fact_display.asp?cid=1200&tid=500%20&ct=1). Due to obsolescence, the current integrated keyset/force stick component in the MH-60, which is an input device used by pilots and sensor operators to perform a variety of functions, will be replaced by two components; a control display unit and a trackball device. An early look at the new trackball was provided at crew station working groups (CSWGs) and the results of these CSWGs suggested that a 0° orientation of the trackball (from a view looking down, the ball would be facing forward, towards the front of the cockpit and manipulated with the fingers) may introduce undue wrist fatigue.

The AEPs that worked with PMA 265 to address this issue were concerned that the fatigue induced by a 0° orientation may potentially lead to carpal tunnel syndrome (CTS). In order for pilots to operate the trackball in a 0° orientation, radial deviation of the wrist was required when it was operated from both the pilot and copilot seats. Radial deviation of the wrist that is greater than 10° puts significant pressure on the intracarpal (Hedge et al., 1999), which could lead to CTS. To mitigate this issue of fatigue (and reduce the potential for CTS) two experiments were performed. The purpose of Experiment 1 was

MH-60 Seahawk helicopter.

to determine which trackball angle (0°, 12°, or 90°) induced the least amount of fatigue. These angles were selected so that no physical modifications were required to be made to the trackball unit or the center console structure in which it was to be located for the experiment.

Data for Experiment 1 was collected from six active duty MH-60 pilots – all were graduates from the U.S. Naval Test Pilot School. The investigation took place in a MH-60 simulator. Pilots used their fingers to operate the trackball when it was installed at a 0° and 12° orientation; they used their thumb to operate the trackball when it was installed at a 90° orientation. Pilots used the trackball in each of the three orientations for 90 minutes with each session occurring on a separate day. To keep the pilots engaged, scenarios were created that required active use of the trackball to complete the various tasks. Every 30 minutes the scenario was paused and the pilot's "rate of perceived exertion" (RPE), a popular fatigue scale used in exercise science, was measured. Pilots provided RPE ratings for the following body parts: hand, wrist, thumb, finger, shoulder, elbow, and back. The results of Experiment 1 revealed that a 90° oriented trackball operated with the thumb was not the preferred orientation. Fatigue was much higher for the thumb and wrist at this orientation. Generally, a 12° orientation was favored, but a questionnaire revealed that the pilots wanted more cant (i.e., angle) than 12°; Thus, a second experiment was conducted to determine the ideal angle.

In Experiment 2, the trackball was modified with an adapter plate that allowed the trackball unit to rotate inboard from 15° to 35° so the participants could select their preferred angle. Twenty-one aircrew participated in Experiment 2; all were either MH-60 pilots or sensor operators. Initially, participants were asked to sit in the left (copilot) seat of a MH-60 simulator and they were given ample time to adjust the angularity of the trackball. Participants were encouraged to use the trackball from different angles before settling on their preferred angle. After they selected their preferred angle, the angle was locked into place and the participant performed a 25 minute scenario that required repeated use of the trackball. After completing the 25 minute scenario, participants rated their perceived fatigue for their hand, wrist, thumb, finger, shoulder, elbow, back, and forearm using the RPE scale. Then, participants moved to the right (pilot) seat. There they were given ample time to select their preferred angle. After selecting their preferred angle from the right seat, two anthropometric measurements were taken, namely thumbtip reach and bideltoid breadth.

Trackball input device.

Data analyzed from the copilot and pilot seats were strikingly similar – a 25° orientation was the preferred angle. Therefore, the initial recommendation made to PMA-265 was to orient the trackball inboard at a 25° orientation; however, there was notable variance in the data. Aircrew with longer thumbtip reach and wider bideltoid breadth preferred less cant than aircrew with shorter thumbtip reach and narrower bideltoid breadth. Given the variance in the data, the final recommendation to PMA 265 was to orient the trackball inboard at 25° but design it to rotate ± 10° to accommodate 95% of the users.

AEPs made additional modifications to the trackball based on qualitative data that was collected via questionnaires. Specifically, the buttons on the side of the trackball were relocated in order to minimize wrist rotation, and the force required to press the buttons was reduced to minimize fatigue. Finally, the trackball was reshaped to increase comfort and reduce hotspots on the base of the palm.

Flight testing for the trackball is in initial phases and if test are successful, it will be installed in 300 MH-60s. The redesign of an MH-60 input device (see http://pro.sagepub.com/content/54/6/556.full.pdf for a broader review) is just one example of the many ways in which AEPs at NAWCAD are supporting the Warfighter. Furthermore, this project is just one example in which interdependent HSI domains interact to address the human element in a complex system.

The CNAF HSI Working Group

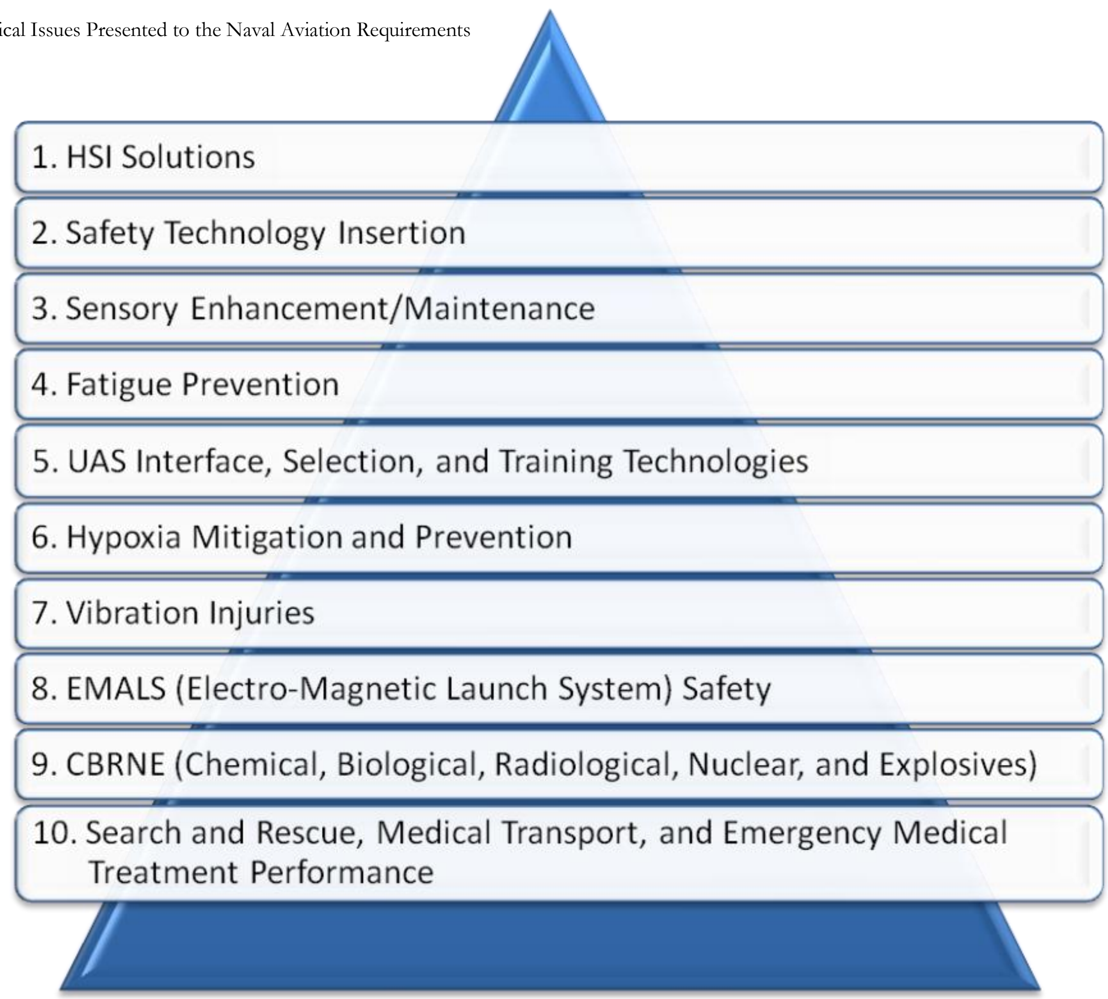
BY CDR MICHAEL REDDIX & CDR RICH FOLGA, NAMRU-DAYTON

CAPT Kris Belland, Commander Naval Air Forces (CNAF) Surgeon, has taken the initiative to establish and chair the CNAF Human System Integration (HSI) Working Group (CNAF HSIWG). The objective of the CNAF HSIWG is to bring the top aeromedical issues pertinent to aviation human performance, safety, and risk management to the table, integrate them into the Naval Aviation Requirements Group's (NARG) top priorities, and discuss how to address those issues from a HSI perspective. Recently, CAPT Belland briefed the naval-aviation top-ten aeromedical issues to the NARG. The image below lists the aeromedical top-10 issues that now have NARG visibility.

The hope of the CNAF HSIWG is that addressing these issues with a HSI perspective will encourage collaborative research advocacy and sponsorship across a broad number of relevant domains that will in turn produce the best outcomes for the Naval Aviation Enterprise and collective DoD-aviation enterprise. To foster these types of activities, CNAF HSIWG has also stood up a panel for the 2013 Aerospace Medical Association annual meeting (ASMA) titled "Human Systems Integration – USN and Naval Aviation Perspective."

The CNAF HSIWG meets monthly via teleconference and includes members from BUMED, COMTHIRDFLT, CNAF, CNAL, CNAP, MCAS Miramar, NAMI, NAMRU-D, NAMRU-SA, NAVAIR, NSC, and ONR. If interested in participating in a meeting, please contact: CDR Mike Reddix (937-938-3875; DSN 798-3875; michael.reddix@wpafb.af.mil).

Top-10 Aeromedical Issues Presented to the Naval Aviation Requirements Group.



Shipmates

Historical Note: Situation Report (SITREP) 1972

BY LCDR (RET) JIM JOHNSON, AEP #9

NOTABLE U.S. & WORLD EVENTS

Forty years ago it was 1972; the Cold War was still hot, the Vietnam War was receding (but far from over), the POW's were still in Vietnam, and the military draft was still in effect (for the final year). President Nixon had a mixed year; he visited China (the first President to do so) improving relations, ordered the "Christmas bombing" of North Vietnam (which cheered up our POW's, but drew criticism at home and abroad), the Watergate scandal happened, and he was reelected. The space program was thriving – Apollo Flights 16 and 17 landed on the moon and the Skylab-Salyut Space Laboratory was launched. The Olympics (marred by the massacre) were held in Munich, West Germany, and the two major stars were Mark Spitz and Olga Korbut.

The weather made headline news in 1972. In July, Hurricane Agnes spawned off the Yucatan Peninsula, crossed the Gulf of Mexico in a northeasterly direction, hit Florida near Panama City, continued northeasterly to the Atlantic Ocean, and then proceeded up the eastern seaboard to New York City leaving in its wake a toll of many lives and more damage than any other storm up to that time. In Northern Virginia Agnes produced high winds, massive flooding, and wiped out the Lake Barcroft dam on Columbia Pike near Falls Church. The high water marks set by the Potomac River can still be seen at the museum in Great Falls.

In college football, our Ohio State gang, viz., Bob Wherry, Norm Lane, Chuck Hutchins, Jim Ashburn, John Ferguson and his wife Joanne was chagrined when *The* Ohio State football team lost to USC in the Rose Bowl following the 1972 season. In the NFL, the Miami Dolphins just kept on winning (16 straight games) and confusing the experts. Some of the "experts" fell into the "gambler's fallacy" trap, i.e., "that coin has turned up heads 15 times in a row, now it is bound to be tails." Miami went on to beat the Redskins in the Super Bowl.

NOTABLE EVENTS IN THE U.S. NAVY

In the U.S. Navy, Admiral Elmo Zumwalt was Chief of Naval Operations (CNO) and his "Z-grams" included the authorization of beards. Beards could be worn by officers who were in positions where appearance was not essential. This caused a dilemma for some Aerospace Experimental Psychologists (AEPs) – and other Naval Officers – who wanted a beard, but also wanted to be considered important. Sideburns, mustaches, and longer groomed hair were also acceptable. Zumwalt also introduced beer-dispensing machines to Bachelors Enlisted Quarters. Not all of these changes were well received by senior naval personnel. More notable history was also made when Captain Alene B. Duerk, NC, Director of the Navy Nurse Corps, was spot promoted to Flag rank in 1972, the first female naval officer to become Admiral.

Although not a discipline at the time, Human Systems Integration (HSI) issues existed in the Navy. Two new aircraft being developed for the Navy were the F-14 Tomcat and the S-3 Viking. The first Viking prototype flew in January 1972. In the Naval Air Systems Command (NAVAIR) two issues associated with the new aircraft were: (1) which stick to choose for the new F-14 fighter aircraft being developed by Grumman and (2) what to do about relief tubes in

An F-14A Tomcat flies over Iraq during routine flight operations.

An S-3B Viking launches from catapult during flight operations aboard USS Abraham Lincoln.

the S-3 ASW aircraft for soon-to-be female aviators . One Admiral who had flown the F-4 in Vietnam preferred the F-4 stick, while other experts preferred a more sophisticated guidance tool.

AEP ACTIVITIES IN 1972

The AEPs were alive, fighting budget battles, and doing well. Then Commander (later Captain) James E. Goodson was the Bureau of Medicine and Surgery Head of Aerospace Experimental Psychology. He was preceded by Captain Thomas J. Gallagher and followed by Commander Richard S. Gibson. These leaders were sometimes known affectionately as the "gFORCES."

Several AEPs were on the move. Joe Funaro was in the process of moving to Rice University to earn his Ph.D. Paul Chatelier moved from the Naval Air Development Center in Warminster, PA to replace Joe in the Research and Development Group at NAVAIR (AIR 340) in Crystal City, VA. Paul, Mary Lu, and their toddler Michael found temporary lodging in the home of Jim Johnson while looking for a place to buy in Springfield, VA. Jim's house in McLean, VA was mostly empty, awaiting the upcoming marriage to Lala. Jim had recently reported to the NAVAIR Systems Acquisition Group (AIR 5313, Crew Station Design Branch) from a Scientific Advisory Team in Norfolk, VA. Tom Jones also shared Jim's home while awaiting his move to the University of South Dakota in pursuit of his Ph.D. The most awful move was experienced by Bob Kennedy whose antique furniture and all household goods, effects, and belongings were destroyed by a train wreck on the way from Bethesda, MD to Point Mugu, CA. He had been stationed on a hardship tour at the Naval Medical Research Institute to be near the Naval Hospital because of his daughter Katy's cancer. Happily, Katy recovered and is currently a Nurse Practitioner in Oncology.

In Pensacola, AEPs were busy and productive. Scanning the articles in Table 1 (Appendix), it can be seen that AEPs were working on a wide variety of topics. A few of the projects were concerned with theoretical issues that could be considered basic research, while many others were very applied in nature, and there was a great deal of AEP involvement in operational aspects of the Navy as well. There was also a strong interest in statistics and methodological improvements in anthropometric measurements. All of the articles (including animal studies) were concerned with prediction of performance of student aviators and a trend toward automated, rather than paper-and-pencil testing can be seen across the articles. Eleven publications were written by unnamed authors in 1972 (Table 2; appendix) – most are historical files, manuals, or military standards about issues concerned with selection and training. Undoubtedly many of the publications in Table 2 were produced by AEPs. Finally, it can be observed in Table 1 that the AEPs writing in Pensacola were concentrating on a wide variety of man machine interface issues and human factors engineering problems – issues that AEPs are still working on today and that may now be considered in the domain of HSI.

RECOLLECTIONS OF A FEW FORMER AEPS

Paul Chatelier recalls that while John P. Charles was recently retired from the Navy, he had not forgotten Naval Aviation. He was at Logicon and diligently preparing the Human Engineering Revolving Manual for Emerging Systems (HERMES).

Curt Sandler was at the Naval Safety Center in 1972 and remembers that Al Schuh had been with him on the staff of the Commander, Operational Test and Evaluation Force in Norfolk from 1967 to mid-1970. Then Al Schuh was replaced by Paul Philhour who left the Navy in 1971. Curt also remembers that by 1972 Manny Correia, Dick Pomarolli, and Paul (Dick) Jenneret were out. Otherwise Curt recalls nothing significant in 1972.

Rick Doll remembers that by 1972 the School of Aviation Medicine had evolved into the Naval Aerospace Medical Research Laboratory (NAMRL) and the Naval Aerospace Medical Institute (NAMI) with NAMRL doing research and NAMI involved with training and operations. There were a couple AEP billets in the Operations Division at NAMI and several billets in NAMRL. The only thing of significance Rick remembers in 1972 is that he broke 90 for the first time on the golf course.

Shipmates

DUINS: Back to School!

BY LCDR TATANA OLSON

One of the first things I noticed when I joined the Aerospace Experimental Psychology (AEP) community was the diversity of its members. While my doctorate is in Industrial and Organizational Psychology, there are AEPs with degrees in Experimental Psychology, Social Psychology, Educational Psychology, Cognitive Psychology, Neuroscience, and Human Factors, to name a few. Additionally, some members joined the community directly from graduate school while others pursued careers first, both within and outside of the military. Complementing this diverse group of scientists is an equally diverse set of billets. Although one may not possess the specific expertise associated with the duties of a particular billet, it is our diverse backgrounds, our foundational training as scientists, our professionalism, and a strong desire to serve that enable us to succeed no matter where we are assigned. As a very wise member of the AEP community has shared with many junior AEPs, we must always strive to "bloom where we're planted." This same sage AEP also encourages us to leverage all of the "tools in the toolkit" available to achieve success.

One such tool is Full-Time Duty Under Instruction, or DUINS. DUINS represents an opportunity to acquire additional knowledge, skills, and experience through degree programs (i.e., Master's and Doctoral degrees) and non-degree programs (fellowships, certificate programs, etc.) with Navy Medicine footing the bill – full pay, allowances, tuition, and fees. Influenced by the needs of the Navy and requirements within specialty communities, DUINS is a tremendous opportunity to strengthen your knowledge and skills within a particular domain relevant to not only the current work AEPs do in the Navy, but in anticipation of meeting future demands. In other words, it is a good deal for all.

Unlike Thornton Melon, played by Rodney Dangerfield in the 1986 movie *Back to School*, my desire to pursue DUINS was not to relive the college life or join the dive team; it stemmed from an observation that neuroscience was playing an increasingly important role in addressing a wide range of issues across the military, from Post-Traumatic Stress Disorder (PTSD) and Traumatic Brain Injury (TBI), to enhancing decision-making under stress and assessing mental workload. As uniformed scientists supporting the warfighter, we are often tasked with developing solutions to problems and capabilities to fill gaps, as well as evaluating the solutions and capabilities proposed by others. I believe brain-based technologies have the potential to enhance human performance and well-being, and I wanted to be able to explore research in this area. Additionally, given the increasing number of research proposals I had seen involving neuroscience, I felt I needed at least a working knowledge of the field and current research in order to (1) evaluate such proposals more effectively should I be in a position to provide research funding or recommendations about funding to military leadership, and (2) better understand and articulate the ethical issues associated with military applications of neuroscience.

To achieve these goals, I opted to pursue a one-year graduate certificate in Cognitive Neuroscience at George Mason University. I chose this program because it was inter-disciplinary, with a curriculum drawing from traditional neuroscience, cognitive psychology, and human factors, all areas that our AEP billets tap into. Now, some of you may be asking why anyone would want to go back to graduate school. Yes, you do have to re-experience the less glamorous parts of graduate school – taking notes and exams, writing papers, group projects, deadlines – while being the token "old" person in the class. Segue to personal anecdote – almost all of the graduate students took notes using a laptop or iPad while I chose to use my trusty notebook and pen. One fellow (very young) graduate student actually said to me, "Hey, the 90s called and they want their pen and paper back." In an exemplary show of personal restraint, I did not strangle him. All kidding aside, there is a tremendous sense of intellectual freedom in exploring topics simply for the sake of curiosity and learning while also being able to draw upon professional experience to identify problems that need solutions. For example, in my Neuroergonomics class, I wrote a paper and research proposal about the feasibility of using electroencephalography (EEG) and functional

LCDR Olson sporting an EEG cap for measuring ERPs

magnetic resonance imaging (fMRI) in a training context to enhance a soldier's ability to detect improvised explosive devices (IEDs). For my Multimodal Displays class, I wrote a review paper on the use of multimodal displays to address spatial disorientation in aviation and proposed several new avenues for research, research that could actually be conducted at a place like NAMRU-Dayton. Additionally, I was able to take not one, but two classes with Dr. Raja Parasuraman, a giant in the field of Human Factors and the founder of the field of neuroergonomics. There is just something so awesome about being able to talk to someone with such a tremendous wealth of knowledge and experience about your research ideas over a couple of beers at a happy hour (yes, there actually is a bar on campus at George Mason where I'm sure many a dissertation has been fleshed out).

Another important aspect of the DUINS experience is the opportunity to augment course work with research activities. I was fortunate enough to have the opportunity to work on a research project examining two of the most critical issues facing many of our service members today – PTSD and TBI. Often referred to as the "signature injury" of OEF/OIF, TBI has affected approximately 320,000 U.S. service members[1]. Among those who have experienced a TBI, 17-30% also develop PTSD, suggesting some relationship between the two[1]. Through the George Mason Psychology Department network, I reached out to Dr. Connie Duncan, the Principal Investigator on a longitudinal research protocol at the Walter Reed National Military Medical Center evaluating the relationships between brain structure and function and the course of PTSD symptoms among service members who had sustained mild TBI or extracranial injury in the OIF/OEF theater of operations. It turns out they were in need of someone to develop a data management system (and I like data) and I was interested in working with this population and applying what I was learning in my classes (i.e., a mutually beneficial relationship). In the six months that I worked on this project, I provided subject matter expertise (e.g., wrote data entry and verification protocols and a data coding manual, analyzed data, and built a database to capture more than 2,000 variables) while learning how to administer neurocognitive assessments and measure and interpret Evoked Response Potentials (ERPs) – of course, it was only fair that I experience them as well! There was a direct translation between what I was learning in the classroom and what I was doing in the lab. The most rewarding part of this experience was working with our wounded warriors. In addition to sustaining a TBI, many of them were also single and double amputees. What was so amazing was that in the midst of their own personal pain and recovery, they still wanted to participate in many hours of research to help their fellow service members….and always with a smile. I was continually inspired by their positive mental attitude and dedication.

At the end of my DUINS, I received a certificate from George Mason University stating that I had met all of the requirements for a graduate certificate in cognitive neuroscience. Technically, true…..but I got so much more out my experience than that. I came away with a better understanding of the importance of human factors, the potential of neuroscience to inform human factors and vice versa, new measurement tools and techniques I could use in future research, and a deeper appreciation for the sacrifices made by our wounded warriors. I have more tools in my toolkit, which I believe will enable me to better support the mission of Navy Medicine, the Navy as a whole, and our warfighters…..but I still take notes with a good old pen and paper.

[1]Tanielian, T., & Jaycox, L. H. (2008). *Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recovery*. Santa Monica, CA: Rand Corporation.

Shipmates

Baggin' Hours: An Account of an Interesting Flight

BY LT TONY ANGLERO, NSC

17 AUGUST 2012

My day started with some disappointment. Upon arriving at work to train an Israeli safety director, I was informed that my big international collaboration was cancelled. "There goes that FITREP bullet" I thought. But, like any dutiful AEP with a suddenly open afternoon, I decided to go flying. I called OPS at HCS-2 (where we fly the mighty H-60) and asked if I could fly. They said there were a lot of check rides that day so I could sit back seat, but I wouldn't get any right seat stick time. So I headed to the squadron and, with a bit of a frown, briefed with a student that was completing FAM8 (i.e., practice Emergency Procedures or "EPs"). We briefed every planned procedure, how it would be verbalized, and where we would be working. Each practice EP would occur during the flight, but when the practice EP would be initiated would not be known to the student pilot. Importantly, we were instructed that each practice EP would be prefaced by the word "simulated."

Thirty minutes into the flight we were approaching the landing pad at Felker (OLF) and I heard, "I got a rotor brake light" unexpectedly over the ICS. I looked up immediately – that was not an EP that was briefed, and the word "simulated" did not precede the announcement! We were hovering about 70 feet over the deck and the crew chief looked up at me and said, "Sir, this is actual." To which I responded, in my calmest possible voice, "Yea, Afirm." What I wanted to say was, "NO $*&T Chief!" The student pilot pulled out the check list and the instructor told the student, "put it down we'll run the check list on the ground."

As we descended the crew chief told me that he wanted me to egress as soon as we touched the ground and man the fire bottle, with the specific instruction that I was to spray foam into the intakes if he gave me anything other than a thumbs up. When we were on the deck I egressed, and there I was with sleeves rolled down, gloves on, and visor down thinking to myself, "I'm about to fight a fire!" and "who the hell's gonna write up this HAZREP!" As I stood there staring at the crew chief and looking for smoke I ran through all my fire training at OIS (now called ODS for you newbies).

A MH-60S flying ahead of an Arleigh Burke-class guided –missile destroyer.

Thankfully, the engine was shut down without incident. I was asked if the CO should send another 60 in the area to pick me up. I told the instructor "I don't know for sure that you needed me today, but I do know that the crew chief was able troubleshoot better knowing that I was at the ready. So unless you or the CO says differently, I'm part of this crew."

So, YES! I got back into the 60 with circuit breakers popping and the pilot telling us that we had a second 60 following us looking for smoke and that we were going to fly lower and slower than usual. We were at only about 60 feet above the deck and traveling at just 80 or 90 knots. At this point I thought, "I'm sitting in the middle of a potential fireball" as circuit breakers popped, and I actually started to wonder if it would be safer to jump out or ride the thing into the ground. IS THIS THE DAY DIANA BECOMES RICH? passed through my mind as we limped through the air.

The ride back was tense and the mission was FUBAR, but the weather was beautiful, clear, sunny, hot, which allowed for the one saving grace of the day to present itself (other than staying aloft, flame free, and making it home, of course). As we were flying over the bay we came across a boat that had a young woman sunbathing in her birthday suit – funny to think that might have been the last image to go through all our heads.

We finally made it back to base and as the field came into sight it was truly fascinating to see all the ground crew that waited for us with fire bottles, and hoses and the EMTs at the ready should something unfortunate happen as we sat down. The ground crew looked as if they had done this a thousand times and a sense of safety washed over me. I felt that no one down there would let me come to harm. I knew that I was going home even if one of them had to drag me out of a wreck. We put the helicopter on the deck and shut down without further incident.

That night I was able to go home with one a hell of a story! Reflecting on this experience, I am reminded of a portion of the sailor's creed that states, "I proudly serve my Navy's combat fighting team with Honor, Courage, and Commitment." We AEPs are all scientists, but we have unique opportunities to do and experience things that others only dream of. We can fly through the clouds and touch the hand of god (or the tops of trees in a Helo). Of course, the danger we are exposed to is the premium we pay for that honor. That day, as I manned the fire bottle, I knew that I had the lives of the crew in my hands, as they had my life in their hands as we flew home and set down.

I was not a "Doc" acting as self-loading baggage on that day – I was not reading a book in the back, I was not asleep – I was an active member of the crew. I am Verizon!

Update from the Front:
Navy Mobile Care Team 6—Supporting Navy IAs in Afghanistan

BY LT ROLANDA FINDLAY, NAMI

The Navy Mobile Care Team (MCT) is a surveillance and preventative behavioral health team directed by the Vice Chief of Naval Operations and the Deputy Surgeon General. Since its inception in 2007, the mission of the MCT has been to support Navy Individual Augmentees (IAs) serving throughout Afghanistan. Specifically, the MCT provides IAs with an opportunity to share field experiences and critical insights gained during their deployment. The feedback received from IAs, positive and negative, is then used to provide recommendations for improvement to command leadership.

Nearing the end of their tour, MCT-6 has completed an unprecedented 40 missions. The team has traveled over 10,000 miles and engaged over 550 Navy IAs through focus groups across the country. Feedback provided through MCT missions have resulted in a number of improvements to Navy policy, guidance, logistics, and training. These changes benefit current and future Navy IAs, not only in Afghanistan, but around the world.

Left to Right: LT Rolanda Findlay, HM2 Kendra Lichtle, CDR Delthenia Mahone, CDR Ruth Goldberg, and HMC (FMF) Phillip Jean-Gilles

Bravo Zulu

CAPT Schmorrow receives Alumni Achievement Award from WMU (Above) and Military Outstanding Volunteer Service Medal (Right).

CAPT SCHMORROW RECOGNIZED FOR ALUMNI ACHIEVEMENT AND VOLUNTEER WORK

- On October 5th, 2012, CAPT Dylan Schmorrow was recognized at Western Michigan University (WMU) by the College of Arts and Sciences with an Alumni Achievement Award. The Alumni Achievement Award is given in recognition of the recipients' tremendous achievements in their fields, and for their service to their former departments. He was nominated for this award by WMU's Philosophy Department. CAPT Schmorrow received his Bachelors of Arts degree from WMU in 1989 with a major in Economics and Psychology and a minor in Philosophy. During this time, the Philosophy Department initiated a graduate program in Philosophy and CAPT Schmorrow was one of the first students to pursue a Master's Degree in that program. He received the Master's degree in Philosophy concurrently with his Ph.D in Psychology in 1993.

- On November 26th, 2012, CAPT Dylan Schmorrow was awarded the Military Outstanding Volunteer Service Medal for outstanding public service with the Boy Scouts of America and Girl Scouts of America organizations from October 2008 to September 2012. As a Cub Scout and WEBELOS Den Leader, as well as a Girl Scout Cookie Manager, for the Vienna Virginia community, he significantly contributed to the development of leadership, teamwork and technical skills in these scouts; directly enriching the lives of dozens of youths. In addition to presenting CAPT Schmorrow with his medal, Mr. Alan Shaffer (the Principal Deputy to the Assistant Secretary of Defense for Research and Engineering) also presented "community service" patches to the Vienna Virginia Pack 833 WEBELOS Den as a reminder that scouting was founded on the premise of "Doing a Good Turn Daily." This ceremony was the culminating event for the WEBELOS Den after an afternoon tour of the Pentagon.

LCDR OLSON RECIEVES AWARD FROM APA; COMPLETES DUINS

- LCDR Tatana Olson was awarded the 2012 APA Division 19 Society for Military Psychology Charles S. Gersoni Military Psychology Award (along with Dr. Jay Goodwin from the Army Research Institute and Col Gary Packard from USAFA) for outstanding contributions to the field of military psychology and service on behalf of the welfare of military personnel. This award was based on the work they did with the Comprehensive Review Working Group on the repeal of DADT.

- LCDR Tatana Olson was awarded a graduate certificate in cognitive neuroscience from George Mason University in May 2012.

Bravo Zulu

CDR Cohn at ONR's 2012 Science and Technology Partnership Conference.

CDR COHN CHOSEN TO SERVE AS ONR'S DEPUTY DIRECTOR OF STEM

- CDR Joseph Cohn was recently chosen to serve as the Office of Naval Research's (ONR) Deputy Director of Research for Science, Technology, Engineering, and Mathematics. In the above photo, CDR Cohn addresses participants at ONR's 2012 Science and Technology Partnership Conference.

NAWCAD AEPs RECEIVE MERITORIOUS UNIT COMMENDATION

- A Meritorious Unit Commendation (MUC) was awarded to NAWCAD for the period Jan 10 – Dec 11. AEPs receiving this honor include:
  - CAPT Sean Biggerstaff
  - CDR Jim Patrey
  - LCDR Brent Olde
  - LT Brian Johnson

CAPT(RET) LILIENTHAL RECOGNIZED BY NASA AND ITEA

- CAPT (Ret) Mike Lilienthal received a Certificate of Achievement from NASA and the International Test & Evaluation Association (ITEA) Publications Award for his work on, Live, Virtual, and Constructive Models and Simulations for Test and Evaluation, which was published as a chapter in the NASA Modeling and Simulation FlexBook, providing principles, problems, and lesson plans to high school teachers. The chapter introduces the concepts of using distributed live-virtual-constructive simulations to support the test and evaluation of complex systems and system-of-systems across the acquisition life cycle to High School students as part of the Science, Technology, Engineering, Mathematics (STEM) initiative.

CDR ALTON PUTS ON O5

- Congratulations to CDR Jeff Alton, who recently put on O5. His pinning ceremony was held on September 21st, 2012.

THREE AEPs SELECTED FOR O4

- Congratulations to LTs Greg Gibson, Brian Johnson, and Jenifer Johnson who were selected to the grade of O4 by the FY 13 selection board.

Calendar: Mark These Dates Down!

January 17-19, 2013
14th Annual Society for Personality and Social Psychology Annual Meeting, New Orleans, LA

March 4-8, 2013
PACOM S&T Conference, Honolulu, HI

April 11-13, 2013
Society for Industrial Organizational Psychology Annual Meeting, Houston, TX

May 6-9, 2013
17th International Symposium on Aviation Psychology Wright State University, Dayton, OH

May 12-16, 2013
Aerospace Medical Association Annual Meeting, Chicago, IL

July 21-26, 2013
15th International Conference on Human-Computer Interaction & 7th International Conference on Augmented Cognition, Las Vegas, NV

September 30-October 4, 2013
Human Factors and Ergonomics Society (HFES) Annual Meeting, Diego, CA

November 9-13, 2013
Society for Neuroscience Annual Meeting, San Diego, CA

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Send articles to the address above or via email to the editor, stephen.eggan@wpafb.af.mil

Appendix

Tables from: Situation Report (SITREP) 1972

Table 1. Authors and titles of articles typed in Pensacola in 1972 (continued on next page).

Ambler, R.K., *Lane, N.E. An advanced pipeline assignment system for NFOs.

*Bale, R.M. Smith, M. J. Ambler, R.K. Factor analysis of undergraduate and postgraduate flight training grades.

Brictson, C.A. Burger, W.J., *Gallagher, T. J. Prediction of pilot performance during initial carrier landing qualification.

*Bucky, S.F. The relationship between anxiety and success in the naval flight program.

*Clark, B. Stewart, J.D. The relationship between motion sickness experience and vestibular tests in pilots and non-pilots.

Clisham, W.F., *Shelnutt, J.B., *Shannon, R.H. The naval flight officer: a conceptual model of his operational position.

*Doll, R.E. Fundamental considerations in conducting research in the operational setting.

*Doll, R.E. Ambler, R.K., *Lane, N.E., *Bale, R.M. Vocational interest differences between students completing the Naval Aviation training program and students voluntarily withdrawing

*Doll, R.E. Gunderson, E. Occupational group as a moderator of the job satisfaction-job performance relationship.

*Doll, R.E., *Lane, N.E., *Shannon, R.H. Clisham, W.F Naval flight officer: function analysis, Vol. I, P-3C navigation/communication.

*Doll, R.E., *Lane, N.E., *Shannon, R.H. Clisham, W.F Naval flight officer function analysis, Vol. II, P-3B tactical/coordinator (TACCO).

*Doll, R.E., *Lane, N.E., *Shannon, R.H. Clisham, W.F. Naval flight officer function analysis, Vol. VIII, F-4 N intercept officer (RIO)

*Doll, R.E., *Lane, N.E., *Shannon, R.H. Clisham, W.F. Naval flight officer function analysis, Vol. III, P-3C tactical coordinator

*Doll, R.E.,*Lane, N.E.,*Shannon, R.H., Clisham, W.F. Naval flight officer function analysis. Vol. IV, RA-5C reconnaissance attack navigator.

*Doll, R.E., *Lane, N.E., *Shannon, R.H. Clisham, W.F. Naval flight officer function analysis, Vol. V, A-6 bombardier/navigator (B/N).

*Doll, R.E., *Lane, N.E., *Shannon, R.H. Clisham, W.F. Naval flight officer function analysis, Vol. VI, EA-6 electronic counter measures officer.

*Doll, R.E., *Lane, N.E., *Shannon, R.H. Clisham, W.F. Naval flight officer function analysis, Vol. VII, E-2B combat information control officer.

*Egan, D.E. Research toward improving performance of pilots using head-up displays.

*Ferguson, J.C.,*Funaro, J.F. Human factors engineering performance criteria program for the Bureau of Medicine and Surgery.

*Ferguson, J.C., *Goodson, J.E. A description of the air-to-air visual acquisition task.

*Fishburne, R.P. A criticism of the human engineering design criteria of the National Aeronautics and Space Administration.

*Gallagher, T. J. A proposed approach for the development of behaviorial objectives for undergraduate pilot training.

*Gallagher, T. J., *Goodson, J.E. Human factors engineering deficiencies on CVA's.

*Gibson, R.S. Effects of part-whole training procedures upon the acquisition of complex skills to be performed under stress.

*Gibson, R.S., *Moroney, W.F. A limited review of the effect of cigarette smoking on performance with emphasis on aviation.

*Gibson, R.S., *Shelnutt, J.B., *Long, G.M. A research proposal for identifying special capability requirements of Radar Intercept Officers.

*Goodson, J.E. Air-to-air visual acquisition of targets, *problem definition and approach."

*Kennedy, R.S. The relationship between habituation to vestibular stimulation and vigilance: individual differences and subsidiary problems.

*Kennedy, R.S.,*Moroney, W.F.,*Bale, R.M.,*Gregoire, H.G, Smith,D.G. Motion sickness symptomatology and performance decrements occasioned by hurricane penetrations in C-121, C-130 and P-3 Navy aircraft.

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*Long, G.M., *Shelnutt, J.B. Individual differences on an auditory detection task: a signal detection theory approach.

*Long, G.M., *Shelnutt, J.B. The use of signal detection analysis as an indicant of individual differences among student aviators.

TABLE 1. Authors and titles of articles typed in Pensacola in 1972 (continued from previous page).

*Moroney, W.F., Automated anthropometric data collection system.

*Moroney, W.F. The use of bivariate distributions in achieving anthropometric compatibility in equipment design, Part I. The requirement. Part II. The development.

*Moroney, W.F., *Lane, N.E. Utilization of anthropometric data in resolving pilot/aircraft incompatibility.

*Moroney, W.F. Smith, M. J. Intercorrelations and selected descriptive statistics for 96 anthropometric measures on 1549 Naval Aviation personnel.

*Moroney, W.F., Zenhausern, R.J. Detection of deception as a function of galvanic skin response recording methodology.

*Shannon, R.H. The effects of instructor bias during primary flight training.

*Shannon, R.H., *Moroney, W.F. A methodology for examining human error aircraft accidents/incidents,

*Shannon, R.H., *Moroney, W.F. An examination of aircraft mishaps attributed to human error in P-3 aircraft.

*Shannon, R.H., Waag, W.L. Toward the development of a criterion for fleet effectiveness in the F-4 fighter community.

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*Shannon, R.H., Waag, W.L. A comparison of human error in the P-3 and F-4 aircraft.

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Smith, M. J., *Moroney, W.F. Bivariate normal frequency distributions: Part I. Tables of percent excluded by restricting either or both variate distributions and procedures for applied use.

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Sobrion, S., *Moroney, W.F. Lynch, V. The effect of mescaline on dominance behavior in rats.

Waag, W.L., *Shannon, R.H. The effects of instructor differences upon student progress in Naval Aviation training.

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*Waldeisen, L.E., *Ramsey, H.R., *Gibson, R.S. Pensacola automated test system: an approach to the automation of psychological research.

* Uniformed or formerly uniformed Naval Aerospace Experimental Psychologist

Table 2. Articles produced by anonymous staff writers in 1972.

Chronological listing of documents and events leading to the selection of Controllers for the Aviation Psychology Automated Testing System (CAPATS), (for the Aerospace Experimental Psychology Department).

Examiner's manual and scoring instructions for the United States Navy and Marine Corps aviation selection tests, and background notes.

Future undergraduate pilot training (UPT) study, Phase III: summary/final, Vol. 2 of 3, Lockheed California report LR 24172-2.

Manual for use of the student pilot prediction system 5. Manual for use of the student NFO prediction system, "and background material."

Military standards, markings for aircrew station displays design and configuration of (and amendment).

MIL-M-18012B (amendment same number), 20 Jul 1964, (amendment, 17 Feb 1972).

Mission analysis on future undergraduate pilot training: 1975-1990; Mission analysis study group AFSC-TR-72-001. Volume 1.

Mission analysis study group, mission analysis on future undergraduate pilot training: 1975 through 1990, Vol. 3, Appendix E: future UPT instructional concepts, Appendix F: future UPT training media. RAFB report AFSC-TR-72-001.

Student Naval Aviator and NFO statistics prepared for the Navy Recruiting Command Recruiting Conference.

Task analysis, critical maneuvers, Training Squadron One (approach turn stall & standard fieldentry); United States Navy NFO commonality inventory. ONR Report.