CALL SIGNS

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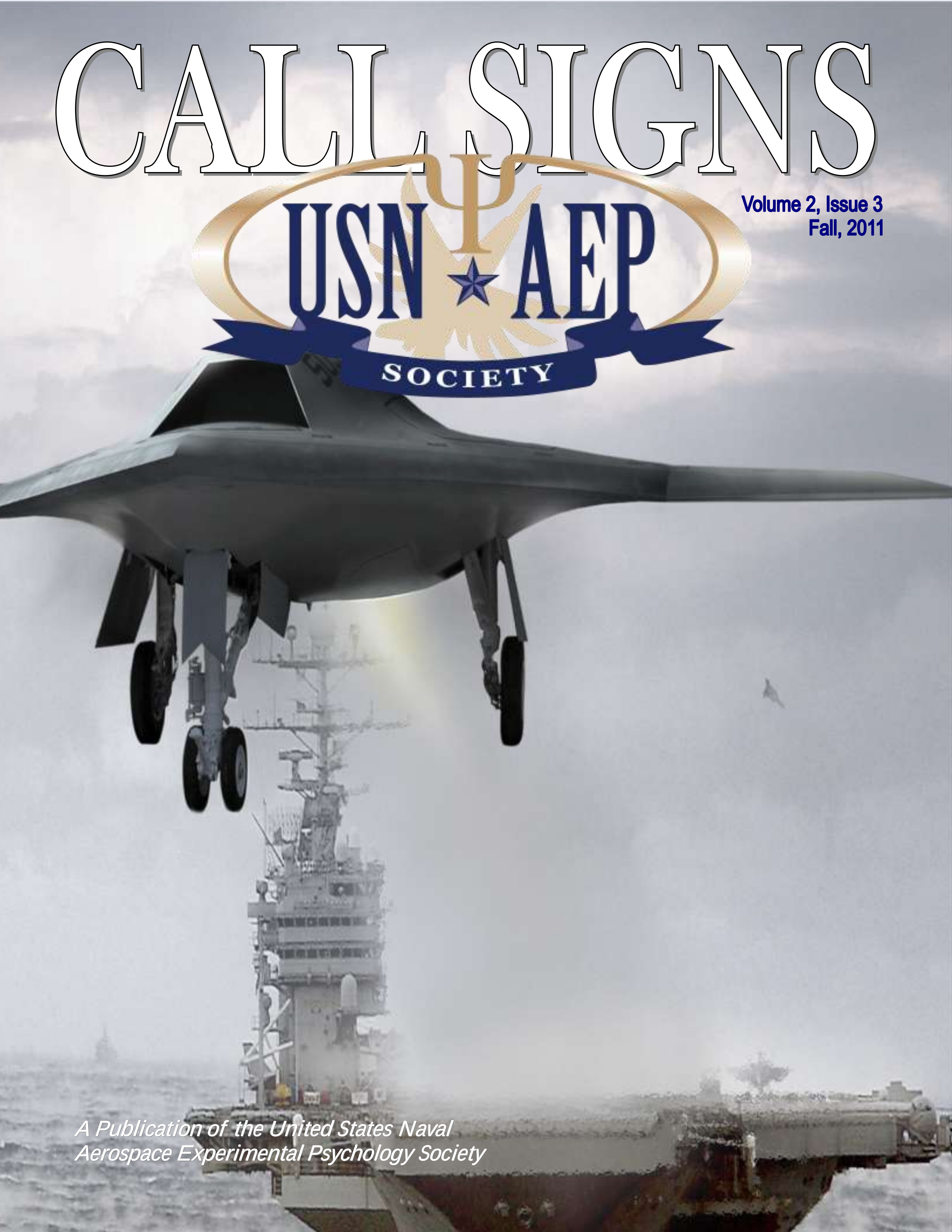

A Publication of the United States Naval Aerospace Experimental Psychology Society

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About the USN ★ AEP Society

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

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

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

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

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Message From The President

CDR JOSEPH COHN, USNAEPS PRESIDENT
HUMAN & BIOENGINEERED SYSTEMS DIVISION, OFFICE OF NAVAL RESEARCH

Greetings and welcome to the fifth issue of the United States Naval Aerospace Experimental Psychology Society's Newsletter, *Call Signs*. This issue focuses on an emerging warfighting capability, unmanned air systems (UAS), from the perspective of selecting, training, and equipping an effective UAS operator community. Unmanned systems have come a long way from their humble beginnings as 'remote controlled' aircraft flown in the Pacific during World War II, and the early UASs flown over Vietnam in the 1960s, to become the sleek, sensor-intensive systems that will soon be capable of landing aboard aircraft carriers[1]. Importantly, while the technologies underlying UASs have continued to advance, our ability to match the operators' capabilities to these technical marvels has not kept pace. We continue to experience mishaps, many of which are due to human factors errors resulting from the complexities that arise at the 'interface' between the human operator and UAS technologies[2]. A critical challenge, then, is ensuring that our future UAS operator communities can effectively interact with their UAS platforms to successfully and safely perform their missions. This, in turn, translates into a Manpower, Personnel, Training, & Education (MPT&E) challenge.

As a community, Aerospace Experimental Psychologists (AEPs) are uniquely positioned to address this challenge. AEPs, assigned to organizations like the Naval Medical Operational Training Center and the newly established Naval Aerospace Medical Research Unit – Dayton, will continue to play a critical role in identifying and measuring the core knowledge, skills, abilities, and other characteristics (KSAOs) associated with the unmanned flight environment. AEPs assigned to our Naval Air Systems Command (NAVAIR) billets – NAWC-TSD, PMA 205, and NAVAIR 4.6 - will continue to refine the fundamental science and technology (S&T) questions, from the warfighter's perspective, to deliver better training and human machine interface design. AEPs assigned to the Office of Naval Research will continue to play a vital role in developing much needed research programs, which align with these S&T questions and focus on transitioning warfighting capabilities to UAS-related programs of record. AEPs assigned to other organizations, like the Defense Advanced Research Projects Agency (DARPA), Chief of Naval Air Training (CNATRA), OPNAV N1, and the Naval Safety Center may soon find themselves in unique positions to influence future policy and technology development. Of course, all AEPs will have the opportunity to play a crucial role in reaching out to our sister services and gathering lessons-learned from their UAS experiences to ensure that our efforts are focused, efficient, and aligned.

In this issue, we are fortunate to have RDML (s) Chip Miller, OPNAV N2/N6's new Director for Intelligence, Surveillance, and Reconnaissance (ISR) capabilities, share with us the Navy's vision for UASs. Supporting this vision, we have articles from a number of AEPs, covering such issues as UAS operator assessment and selection, operator training, and interface design. We also provide updates from two recent UAS working group and panel events. And, of course, we have all the great AEP community news and articles that you have come to expect from your newsletter.

As Secretary of the Navy Mabus charged in a recent memo[3], the Department of the Navy must develop a culture that embraces unmanned systems. This requires developing and implementing an effective UAS MPT&E strategy. For over 65 years, AEPs have met the ever-evolving challenges of naval aviation. As we move into a new era of unmanned air systems, we remain ready to answer the call once more.

[1] Hirschberg, M. (2010). To boldly go where no unmanned aircraft has gone before: A half-century of DARPA's contribution to unmanned aircraft. In *Proceedings of the 48th AIAA Aerospace Sciences Meeting*, Orlando, FL.
[2] Tvaryanas, A.P., Thompson, W.T., & Constable, S.H. (2005). The U.S. military unmanned aerial vehicle (UAV) experience: Evidence-based Human Systems Integration lessons learned. In *NATO RTA Meeting Proceedings.*
[3] Secretary of the Navy Ray Mabus, Memorandum for Distribution on Secretary of the Navy Unmanned System Goals, 17 November 2010.

Navy Vision for Unmanned Air Systems

BY RDML(S) CHIP MILLER, OPNAV N2/N6 DIRECTOR, ISR CAPABILITIES

The wars in Iraq and Afghanistan have elevated popular awareness of unmanned systems and their value to modern warfare. A decade's long combat environment has produced a Joint Force with a deep appreciation for Intelligence, Surveillance, Reconnaissance, and Targeting (ISR&T) capabilities that create situational awareness and enable commanders at all levels to rapidly respond to fleeting battlefield opportunities. Today, Unmanned Aerial Systems (UAS) not only provide a "God's eye" view of areas of interest, but in many cases, can single-handedly transition from finding to fixing to finishing targets. They can now complete in seconds and minutes a detect-to-engage sequence that in the past may have taken hours or days.

Unmanned systems have long captured our imagination. Navy experimented with Remotely Piloted Vehicles (RPVs) in the 1930s and by WWII, used manned aircraft to guide television-equipped assault drones against Japanese merchant ships in the Solomon Islands. In the 1960s, Drone Anti-Submarine Helicopters (DASH) carrying torpedoes launched from FRAM destroyers. In the 1980s, Israeli UAS successes, coupled with aviation losses in Lebanon and Libya, regenerated the U.S. Navy's interest in unmanned aircraft to reduce pilot risk, enable target spotting, and achieve timely battle damage assessment. Efforts ultimately led to the fielding of small Pioneer and Hunter RPVs for battleships and amphibious ships in the late 1980s and 1990s. All told, the Navy spent $3.5B on unmanned air systems between 1954 and 1999.

The imperative to improve ISR&T for overland ground force operations in Iraqi and Enduring Freedom supercharged advances in DoD unmanned capabilities. At the start of the war in Iraq in 2003, the Navy and Marine Corps had between ten unmanned aircraft of one type (Pioneer). We now have 880 systems of six types ranging from one pound micro vehicles to 32,000 pound high altitude flyers. The Navy operates 90 air vehicles with substantial endurance: a dozen Fire Scout, 75 Scan Eagle, and two Broad Area Maritime Surveillance Demonstration (BAMS-D) aircraft. These three platforms alone have logged almost 25,000 combat flight hours to date.

In responding to urgent operational needs and Chief of Naval Operations' calls for "speed to Fleet," the Navy sent unmanned aircraft into combat zones, in some cases before they had reached initial operational capability. BAMS-D was sent to the Arabian Gulf region in 2009 while it was still serving as Navy's first prototype high-altitude, long endurance aircraft. The deployment was slated for six months, but proved so essential to the maritime component commander that BAMS-D is still there, flying 22 hour missions every few days. High value ships do not transit the Strait of Hormuz without a BAMS-D airborne.

Navy's newest rotary wing unmanned aerial vehicle (UAV) is also in the fight. Fire Scout deployed on USS Halyburton (FFG 40) earlier this year for a successful Special Operations proof of concept overseas, then participated in Operation Unified Protector in Libya. Two more FFGs will deploy in 2012 with Fire Scouts aboard ready to support operational tasking. Another Fire Scout detachment deployed to Afghanistan in May 2011 and continues to provide high-demand full motion video coverage for Army units in remote valleys in northern Afghanistan. Ironically, Fire Scout has yet to officially reach initial operational capability.

Scan Eagle systems have also seen significant action ashore and afloat supporting Navy Special Warfare forces, Marine Corps units, and surface combatants executing counterinsurgency, counterterrorism, infrastructure protection, and counter-piracy missions. Altogether these operations have offered Navy inestimable battlefield experience that will strengthen our programmed fleet of unmanned systems.

So what does the future hold? A first priority is ensuring any new ISR&T systems introduced to the Fleet integrate with existing capabilities. Unmanned and manned systems are designed to complement one another — one will free the other from the "dull, dirty, distant, and dangerous," yet both must operate effectively together as an interdependent network in order to achieve common mission objectives. Navy will capitalize on Sailors who are experts in particular maritime missions to integrate new UAV capabilities into the Fleet. No separate and distinct unmanned aviation track will be created. HSL and HSM pilots, aircrewmen, and maintainers, for instance, will operate Fire Scout in composite aviation detachments aboard ships. BAMS air vehicle and mission payload operators will come from the P-3 community. BAMS mission monitoring and control will be performed from Main Operating Bases that also support P-8A aircraft. Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS) systems will be part of traditional carrier air wings.

In terms of readiness, Naval Air Forces will absorb large unmanned fixed and rotary wing air systems into their aviation type commander responsibilities. For smaller unmanned air systems, including man-portable variants, type commanders such as Navy Special Warfare Command and Navy Expeditionary Combat Command will be responsible for their subordinate units' man, train, and equip needs.

Once in the Fleet, Navy's unmanned concepts of operation will be a hybrid of the other Services. Given our need for both long-duration, wide area surveillance and shorter-range organic tactical support for ships, Navy will combine both land-based, remote split operations emphasizing reachback (similar to USAF) and sea-based, direct support operations at the forward edge (similar to Army).

Broad Area Maritime Surveillance (BAMS) will start flying missions for the Fleet in 2016.

Fire Scout is a good example of a direct support asset because it will feed raw ISR data to a Littoral Combat Ship or Special Operations Forces unit. BAMS, on the other hand, will be launched and recovered for wide area missions from places like Guam and the Arabian Gulf, and will be subordinate to higher echelon commands such as CTF 57/72, theater patrol, and reconnaissance task forces. Vehicles like UCLASS are designed to both collect ISR and execute time sensitive strikes, so they exercise a blend of operational and tactical functions. UCLASS multi-intelligence data will be sent to reachback centers, while onboard data links will allow it to share targeting data in near real time with other net-centric airborne platforms.

In terms of ISR exploitation, analysis, and dissemination, Maritime Component Commanders and their Maritime Operations Centers (MOCs) will perform operational-level-of-war intelligence fusion as part of a more extensive federated exploitation effort. In the BAMS example, ISR data fed to storage sites "in the cloud" will be accessible by Task Force commander intelligence nodes, Navy Information Operations Centers, MOCs, the Office of Naval Intelligence, and joint forces. Some ISR data will be used immediately for tactical decision making; other ISR data will be available for pattern analysis, detailed target system evaluations, collateral damage estimates, and battle damage assessments.

The world of unmanned systems is not without its challenges. Near term difficulties exist in certifying unmanned air systems to operate in national airspace, improving interoperability and use of common systems among platforms, miniaturizing components, developing high-efficiency and reliable power plants, protecting data links, increasing onboard processing of ISR data, and developing automated tools to exploit and share exponentially large volumes of collected data. We must also minimize total ownership costs. These challenges can and will be solved through strong and steady collaboration with our joint, industry, and international partners.

As the Navy moves forward with unmanned systems over the next decade or so, it will evolve a force that will be increasingly persistent, autonomous, interoperable, survivable, and multifunctional. Skeptics might say we cannot afford to build this kind of fleet in an age of austerity. In fact, we cannot afford not to. Threats are increasingly potent, deep knowledge on things that count is harder to come by, and our enemies are more difficult to find, fix, close, and finish. We need unmanned systems with high endurance, adaptability, and lethality. This is not solely about reducing human risk, but applying a more effective capability at lower cost against our greatest challenges. While unmanned systems will grow to be a larger fraction of our total force, they will be most effective when used in concert with the Navy's advanced manned capabilities like the Joint Strike Fighter, E-2D, P-8A, and MH-60. As Naval Aviation celebrates its centennial, it is fitting that we are crossing another warfighting threshold with a mix of capabilities that will give commanders better options to reduce surprise, deter or preempt actions by those who wish us harm, and promptly deal with crises that affect our national security interests.

SUMMARY OF THE NAVY'S FAMILY OF UNMANNED AIR SYSTEMS

Fire Scout. As many as 168 will be bought to support LCS SUW and ASW mission packages. Fire Scout MQ-8B enjoys a five-hour endurance at over 100 nm from its host ship. An endurance upgrade MQ-8C is planned that will use a larger airframe, increase payload capacity, and extend on station time to eight hours. Sensors/payload include EO/IR/FMV, laser designator, Automatic Identification System (AIS), communications relay, and possible limited signals intelligence capability.

Fire Scouts are currently deployed in Afghanistan to support the Army and are flying from select frigates to support SOF missions, but were originally designed to deploy with Littoral Combat Ships.

Scan Eagle. Navy Special Warfare uses these light 35lb EO/IR/FMV catapult-launched UAVs for missions ashore. U.S. Fleet Forces contracts a small number of air vehicles for select surface platforms, mainly DDGs, though Scan Eagles have flown from LHA and LSD class ships as well. Scan Eagles have exposed naval commanders to the leap in effectiveness that is possible using organic ISR coverage.

Small Tactical Unmanned Air Systems (STUAS). Four times larger than Scan Eagle with a 10-hour endurance, integrated EO/IR turret, laser designator, and small cargo bay, RQ-21A STUAS was envisioned to meet Navy Special Warfare, Navy Expeditionary Combat Command (NECC), and amphibious ship requirements. The USMC will buy 32 systems (4 air vehicles per system) and could operate them from LHA, LHD, and LPD when not ashore supporting expeditionary operations. The marines will deploy the first STUAS in 2014/15 timeframe.

Shadow UAS. Built to replace Pioneer in 2007, the USMC currently operates 48 RQ-7B Shadow air vehicles operated by VMU squadrons. Shadows operated in Iraq from 2007 to 2008 and have been flying missions in Afghanistan since 2009. The 375lb UAS has EO/IR/FMV, laser designator, and a six-hour endurance. A re-winging effort will extend Shadow endurance to nine hours. A limited number may be weaponized or have wide area focal plane array sensors in the future.

Broad Area Maritime Surveillance (BAMS). These wide-area maritime surveillance aircraft fly for 24 hours and are improved versions of baseline Global Hawk theater ISR assets. Over 60 BAMS are planned over the life of the program with 20 total active at any one time on as many as five global orbits. First birds IOC in 2016. Sensors/payload include EO/IR/FMV, 360 degree SAR/ISAR, AIS, and ESM. Increment 2 may become communications relay-capable. Increment 3 will be a signals intelligence collector.

Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS). Designed to fill a long-standing gap in persistent ISR coverage organic to aircraft carriers, a small number of UCLASS are set to join a Carrier Strike Group by 2020. UCLASS will have an ISR sensor suite and limited precision strike capability. Two X-47 demonstration aircraft are conducting flight testing and intend to land on a carrier in 2013. UCLASS is an outgrowth of the Joint Unmanned Combat Air System (JUCAS).

X-47B Demonstrator flying with landing gear up in 2011. X-47 lessons learned will be factored into a future Unmanned Airborne Carrier-launched Surveillance and Strike (UCLASS) UAS in the 2020 timeframe.

Small Unmanned Air Systems. Navy Special Forces and NECC units such as EOD and Seabees use hundreds of smaller fixed and rotary wing UAS such as Wasp and T-Hawk. Navy Riverine units are considering procuring man-portable Aqua Puma. All of these small UAS can fly about an hour and generate day and night ISR coverage out to several miles.

Special thanks to Rear Adm. (select) Miller for contributing this article. Rear Adm. (select) Miller hails from York, Pa., and graduated from the U.S. Naval Academy in 1981. After designation as a Naval Aviator in March 1983, his first flying assignment was as a flight instructor with VT-19 in Meridian, Miss., and his first fleet assignment was with VA-56, flying the A-7E in USS *Midway* (CV 41) in Yokosuka, Japan. After transitioning to the FA-18 in 1986, subsequent operational tours included

Strike Fighter Squadron 25 in USS *Constellation* (CV 64), department head tour with Strike Fighter Squadron 131 in USS *Dwight D. Eisenhower* (CVN 69) and executive officer of USS *Carl Vinson* (CVN 70).

Miller's command tours include Strike Fighter Squadron 34 where he led the Blue Blasters on their first-ever FA-18 deployment, USS *Nashville* (LPD 13) and USS *George H.W. Bush* (CVN 77). Under his command, *Bush* achieved many "firsts," including earning three consecutive retention excellence awards and flying both enlisted warfare excellence pennants.

Miller's shore tours include FA-18 test director at VX-5 in China Lake, Calif., Special Aviation Programs Analyst on the staff of the Chief of Naval Operations (N80); executive officer of Strike Fighter Weapons School Atlantic; deputy director of Naval Operations at the Combined Air Operations Center during Operation *Allied Force*; special assistant for Research and Development, Science and Technology; Operational Testing in the Office of Legislative Affairs for the Secretary of Defense; and, aircraft carrier requirements officer for Commander, Naval Air Forces.

Miller is currently serving as director, Intelligence, Surveillance and Reconnaissance Capabilities Division in the Office of Chief of Naval Operations (OPNAV N2/N6F2).

UAS Operator Selection: A Case for Change

BY LCDR CHRIS FOSTER, NAMI, LCDR HENRY L. PHILLIPS, NAVAIR 4.6, & DR. RICK ARNOLD, NAMRU-D

The future of Naval Aviation will be vastly different than it is today. One of the most revolutionary changes will be the increased use and expanded mission set of unmanned aerial systems (UAS). Today, UASs account for less than 5% of Naval Aviation's warfighting capability, but this is expected to increase exponentially over the next couple of decades. Currently, the envisioned role of unmanned aircraft (UA) is to augment and support manned aircraft by providing increased persistence in, and situational awareness of, the battlespace through enhanced intelligence gathering, sharing, and utilization.

This increased reliance on UASs represents a tremendous change to how the Navy accomplishes its mission. This year is the centennial anniversary of Naval Aviation and for 100 years, there was no need to distinguish between "aviation" and "manned aviation" - they were synonymous. However, unmanned systems make different demands on their operators and mission commanders than manned aircraft; there is a clear shift towards cognitive and perceptual tasks in information-rich, distributed, collaborative mission environments. Thus, the transition to increased reliance on UASs to accomplish missions, historically the domain of manned systems, will require a paradigm shift in the way we select, train, and fight.

While attention needs to be paid to all of the ways in which UASs change the way we do business, this article will focus on the importance of developing a standardized and valid selection system designed to identify UAS personnel with the greatest likelihood of training and operational success. Any effective selection system requires a comprehensive understanding of the job in question, which is best accomplished through a thorough Job-Task Analysis (JTA). JTA information is used to derive the knowledge, skills, abilities, and other personal characteristics (KSAOs) required to perform a particular job and informs the design and development of the appropriate selection system. The design of the selection system must also be influenced by considering a number of other factors, such as level of standardization required, acceptable level of test validity, selection system security requirements, and geographic dispersion of the applicant pool. This list is not meant to be exhaustive, but does serve to highlight a number of the considerations included in the design of a selection system.

THE PIONEER SUCCESS STORY: EFFECTIVE JTA UTILIZATION IN SELECTION TEST DEVELOPMENT AND VALIDATION

In the late 1990s, several active duty and retired AEPs at the Naval Aerospace Medical Research Laboratory (NAMRL; LT Sean Biggerstaff, LT Hank Williams, & Dr. Dave Blower) were involved in the development and validation of a selection test battery for RQ-2 Pioneer operators. One critical component of NAMRL's test development approach was the execution of a JTA for the Pioneer operator crew position, which identified skills such as mental rotation, time estimation, hand-eye coordination, selective auditory attention, and psychomotor multitasking as critical to the job performance of Pioneer operators. In the early 2000s, AEPs at the Naval Aerospace Medical Institute (NAMI; LT Hank Phillips and LT Rick Arnold) conducted a follow-on validation study of the NAMRL selection test. They found that it predicted Pioneer flight training grades with a validity coefficient of r=.59, indicating that the selection test was an extremely good predictor of performance. This finding implies that the effective use of a JTA ensured that the NAMRL selection test measured traits that would be predictive of successful Pioneer operator training and operational performance.

UAS SELECTION: CURRENT STATE AND FUTURE DIRECTIONS

With the retirement of the Pioneer UAS in 2007 and the advent of more highly automated UASs, it is uncertain whether tests such as those proven effective for Pioneer will be effective for selecting operators of new and emerging unmanned systems such as AACUS (Autonomous Aerial Cargo/Utility System), BAMS (Broad Area Maritime Surveillance), Fire Scout, or UCLASS (Unmanned Carrier Launched Airborne Surveillance and Strike). To address this uncertainty, former AEPs Rick Arnold of NAMRL and Hank Williams of Naval Air Warfare Center, Aircraft Division (NAWC-AD), in collaboration with researchers at Naval Air Warfare Center, Training Systems Division (NAWC-TSD), recently conducted a large-scale JTA for crew positions spanning multiple current and future UASs, including BAMS, BAMS-D, Fire Scout, Raven-B, Shadow, and Scan Eagle, among others. The study has recently concluded, and preliminary results suggest that operators of these newer systems are required to possess a very different skill set than their Pioneer predecessors.

Shift in UA Platform KSAO Requirements. Although analyses are still ongoing, preliminary results suggest that UAS operator KSAOs related to communication, teamwork, and decision-making play the most significant roles in current UAS operations. Across all platforms studied, the top rated operator KSAOs included such traits as: Oral Comprehension, Oral Expression, Teamwork Skills, Written Comprehension, Dependability, Accountability, Self-Discipline, Critical Thinking, and Task Prioritization. In contrast, a skill such as hand-eye coordination, which is of critical importance to Pioneer operators flying essentially large remote-controlled aircraft, ranked 59th of 67 KSAOs rated in the recent study. These emerging results suggest that effective selection tests for future UAS operators will differ greatly not only from tests proven effective for selecting UAS operators a mere decade ago, but also from tests used to select pilots for manned aviation.

Factors Driving Different KSAOs for Manned and Unmanned Platforms. The scope and extremity of the observable differences between KSAO requirements for manned versus unmanned aircraft will vary greatly across platforms depending on factors such as the types of interfaces and inputs used by the crew, the size and organization of the crew compartment itself, and differences in task allocations across crew positions. For example, some UAs, such as the Shadow, require the Air Vehicle Operator (AVO) to control the UA using a stick similar to that used in manned aircraft. Others, such as

Two Sailors wait for the signal to release the RQ-2B Pioneer prior to a flight demonstration at the Webster Field Annex of NAS Patuxent River.

BAMS, will rely on keyboard and mouse inputs alone for air vehicle control. Presentation of information, organization of displays, ambient noise levels, physical layout, distance between crew members, and other ergonomic factors will also differ greatly between a UA mission control station, where space is a relatively minor limiting factor, and the crew compartment of even a large airborne platform such as the P-3. These differences in spatial constraints, as well as the complexities introduced by asking crewmembers to perform mission tasks from outside the aircraft, often with a significant lag between information arrival from the air vehicle and successful delivery of operator inputs to the air vehicle, may limit the volume and scope of the mission tasks for which each crewmember can be responsible. These differences will likely dictate that a UA crew will have to be generally larger than would a manned crew on station to perform a given mission profile for a fixed period of time. Finally, many UA platforms are anticipated to have increased endurance and lengthier mission durations that will necessitate additional crews and maintainers for UA squadrons. Together, these factors will demand a different set of KSAOs and make UA manpower requirements greater, relative to manned vehicles with similar missions.

Specific KSAO Differences between Manned and Unmanned Platforms. Given the differences in organization, control, crew station layout, and crewmember task profiles across platforms, some KSAOs will be more critical for UA operation than they are for manned platforms with similar mission profiles. Among these are spatial aptitude, vigilance, critical thinking, teamwork aptitude, task prioritization, and aptitude for divided attention.

Spatial aptitude will be critical because the AVO will lack many visual and physiological cues regarding his or her motion relative to the earth. For example, whereas a manned cockpit crewmember can rely on cues such as line of sight to a window and acceleration forces, the AVO will have to rely on sensor information to determine motion and orientation of the UA. Vigilance will be important given the anticipated duration of UA missions. Some vigilance requirements may be attenuated in future UA models through automated attention cues, but for today's UA vehicles, mission success often depends upon the AVO's ability to maintain vigilance on a monitoring task providing little stimulation or feedback for long periods, followed by shorter periods of increased activity. Critical thinking skills are essential for manned aviation, for example, when emergencies must be resolved in extremely short periods of time. These skills will also be essential for UA operations as emergency scenarios will likely be more challenging to resolve when they occur in UAs, due to the AVO's absence from the immediate environment in which the emergency is taking place. Teamwork aptitude will be critically important for AVOs since they will be operating in groups in virtually every mission profile and will be embedded in relatively large squadrons, even when deployed in forward areas. Task prioritization and ability to divide attention are always important for those operating in dynamic environments, but the added complexities of information-delivery lag and mission-task compartmentalization across UA crewmembers will make it even more important for AVOs to quickly recognize an optimal order of task performance, and to possess or develop the aptitude to function under conditions requiring the rapid division of attention across competing tasks.

Summary. The KSAOs underlying successful AVO performance will differ in important ways from manned platforms in general, as well as across UA platforms

UAV capabilities will demand a different set of operator knowledge , skills, and abilities compared to manned vehicles with similar missions.

themselves. The success of the Pioneer selection system illustrates the importance of relying on an effective JTA. The results of the JTA recently concluded by NAMRL and NAWC-AD provide the baseline for developing the selection system(s) necessary for the next generation of UASs. This leads to the question of what the next generation selection system might, and should, look like. This question is considered in the next section.

THE FUTURE OF UAS SELECTION: REMOTE, SECURE, ONLINE TEST ADMINISTRATION

A number of factors that should be considered in the design of a selection system were identified earlier in this article. This section will review these factors and illustrate how the scope and envisioned mission of the various UAS communities should inform decisions about any future UAS selection system.

1. Level of standardization required. Considerations in this area include number of candidates to be screened, number of examiners required to screen candidates, and the likelihood that non-standard test administration will result in perceptions of unfairness or inequality in the selection process. Currently, the Aviation Selection Test Battery (ASTB) is administered to more than 10,000 candidates per year. Given projected UAS manning requirements, there is every expectation that a future UAS selection test will be administered to a substantially larger number of candidates. This will necessitate a high level of standardization.
2. Acceptable level of validity. Determination of an acceptable level of validity should be driven by factors such as industry standards, desirability of the job (i.e., likelihood of faking and size of applicant pool), and criticality of on-the-job errors (i.e., safety of self and others, UAS costs, damage to property, impact to mission, etc.). The high-level focus on, and expanding scope of, the UAS mission is expected to continually raise job interest in the various UAS communities, increasing the size of the applicant pool. Given that up to 50% of UAS mishaps have been historically attributed to human factor errors, these factors increase the importance of the development of a valid selection system.
3. Selection system security requirements. Security requirements should be driven by the cost to develop and maintain the selection system and the motivation of the candidate pool to be selected for the position (i.e., the extent to which faking or cheating is a concern). Both are expected to be high for UAS selection tests, necessitating the development of appropriate selection system security.
4. Geographic dispersion of applicant pool. As with the ASTB, it is expected that UAS applicants will be geographically dispersed, increasing substantially the benefits to be derived from the development of remote test administration capabilities.

The Naval Medical Operational Training Center (NMOTC; formally Naval Operational Medicine Institute or NOMI) has developed a secure, web-based test delivery platform called the Automated Pilot Examination (APEX) system, which is currently used to deliver the ASTB, the instrument used to select candidates for manned flight training. The APEX platform is capable of delivering computer-adaptive (i.e., tailorable for each examinee) versions of multiple-choice exams as well as forced-choice personality tools. It can also deliver reaction-time-driven assessments using keypad, mouse, or stick-and-throttle inputs, and can deliver audio test content via headphones. (An updated version of the ASTB utilizing all the above capabilities has been developed by NMOTC and is awaiting release.) The KSAOs identified above as relevant to UA platforms could be easily assessed using the APEX system, with no redesign of system capabilities required beyond development of any new test content.

CLOSING THOUGHTS

It is important not to lose sight of the potential value of an effective personnel selection system in the face of the rapidly changing manpower requirements of unmanned systems. Identification of the optimal student population early on in the process can yield significant training savings in terms of budget, operator development time, and in avoiding costly mishaps downstream.

The role of UASs is evolving and growing rapidly. Successfully integrating their capabilities into the Naval Aviation arsenal requires recognition that UASs represent a fundamental shift in how we fight, and must drive appropriate changes to how we select those to be entrusted with the critical UAS mission set. This article has laid out some of the important work that has already been done in this area and made the case for the design of a standardized, valid, secure, and geographically distributed selection system based on a comprehensive job-task analysis that identifies the KSAOs critical to success.

UAS Training Requirements and Observations

BY LT LEE W. SCIARINI, NAWC-TSD

Crawl-Walk-Run is an oft-repeated phrase used to describe the training approach employed throughout the Department of Defense (DoD). While a gross simplification of the cognitive processes of knowledge and skill acquisition, this descriptor is easily generalized to the various training schoolhouses throughout the Naval Aviation Enterprise (NAE). However, this simplistic model may not completely fulfill the training requirements for the multitude of tasks that must be learned and practiced in order to safely and effectively operate extremely complex systems such as highly automated unmanned aircraft. Fortunately, there has been considerable scientific interest in developing models of skill acquisition, including knowledge acquisition (declarative, procedural, and conceptual memory) and the progression through levels of skill development (Dreyfus and Dreyfus, 1980; Foley & Hart 1992; Hoffman, 1996). By design and incremental developments, current Naval Aviator and Flight Officer training closely mirrors these models of skill acquisition and is being pursued as the approach for training unmanned aircraft system (UAS) operators.

As of 2010, the NAE's inventory of UASs (Table 1) is small compared to their manned counterparts. However, the projected inventory shift from manned to unmanned aircraft systems is significant and will require a considerable shift in operator training paradigms. The existing training approach touched on above effectively meets the Navy's needs for manned aviation as well as the current need for UAS operators as the majority of UAS operators are selected from the existing pool of trained pilots. Once designated for UAS training, rated pilots receive specific training for UAS platforms that are similar to the manned aircraft that they are qualified to fly. For example, operators for the MQ-4C Broad Area Maritime Surveillance (BAMS) UAS are currently selected from a pool of experienced P-3C aviators and will be selected from P-8A crews as the P3-C is phased out of service. Similarly, Fire Scout operators will be selected from the ranks of MH-60 aviators. Unlike their fixed wing counterparts, while at sea, Fire Scout operators will have the additional task of flying missions in the MH-60. This plan of transitioning aviators from manned to unmanned systems will result in operators trained for a specific UAS only and capable of accomplishing a potentially narrow mission set. While able to meet current needs, this stovepipe approach will not be an effective or efficient method of selecting and training UAS operators as the number and operational significance of UAS platforms increases.

Table 1. Current Naval UAS Inventory.

Group	System	Quantity
III	Shadow	28
IV	Fire Scout	7
IV	BAMS-D	2
IV	Reaper	4
V	UCAS-D	2

Source: Government Accountability Office analysis of DoD data (2010).

Currently, as revealed by a recent survey of Naval UAS training, all UAS operator training for UAS categories group III and above is conducted by the original equipment manufacturers (OEM) or via contractor support services (CSS). This paradigm is a result of the concurrent weapon system / training system acquisition approach and the fact that a majority of UAS platforms have entered or are approaching the production phase of the acquisition process. This training method is advantageous during acquisition as it is capable of rapidly adapting to modifications made to specific platforms and it adequately fills the need to have proficient operators who are also intimately familiar with the intended mission. However, this approach will pose several limitations for future UAS operator training. For example, it will not efficiently meet the expanding needs of manning UASs in the Navy (compare Tables 1 and 2) with Navy-owned steady state training.

Table 2. Projected Naval Air Vehicle Operator Needs.

Group	System	Quantity
IV	Fire Scout	241
IV	BAMS	114
V	UCAS-D	?

Source: Government Accountability Office analysis of DoD data (2010).

Additionally, current UAS training solutions do not have the capacity for integrated training in support of fleet and ground combat operations or the joint training called for in accordance with DoD training guidance. Further, while UAS operations in national airspace may eventually be commonplace, current UAS operations are subject to numerous restrictions that constrain the capability to effectively utilize training and operational locations for live training. Another limitation is the high operational tempo that is resultant of the demands of developmental and operational testing. Finally, the need to adhere to strict schedules to achieve specific milestones restricts the availability of vehicles and qualified operators to conduct integrated or joint training with the units they are designed to support.

The need to overcome training challenges presented by the large scale introduction of UASs to the DoD has not been ignored. For example, OPNAVINST 3710.7U (12.7) states that UAS flight crew training and qualification requirements shall be formally established by instruction to include syllabus requirements for each operator position. Additionally, the Chairman of the Joint Chiefs of Staff published instruction (CJCSI) 3255.01, which identifies the minimum qualification requirements needed to operate the different UAS groups. These requirements range from the minimum Basic Unmanned Qualification Level One (BUQ-I) to a maximum BUQ level four (BUQ -IV; see Table 3). These qualifications are designed to build on previous modules and require the mastery of preceding levels before subsequent levels can be granted.

The BUQ level approach defined in CJCSI 3255.01 mirrors the training pipeline for manned Naval Aviation and supports the common UAS training pipeline which has been discussed extensively throughout the DoD. However, this approach focuses on traditional aviation requirements, and the subtle nuances and glaring differences between manned and UAS operator training requirements must be addressed for credible steady state training as prescribed by 3710.7U. While both the CJCSI and the OPNAVINST identify the overarching need for UAS crewmember training, they are purposefully vague as to prescribing a standard set of UAS training requirements. The limitation to general guidance can most likely be attributed to the disparity in control of the various platform types despite the fact that all platforms share some commonality in how they operate. This is clearly highlighted in a 2010 report to the NAE Total Force, which concluded that CNATRA, CNATT, and NASC possessed sufficient courseware, facilities, and instructor support to meet BUQ training requirements *if* the need was *urgent* and *significant* provided that UAS training was deferred to specific Fleet Replacement Squadron (FRS) locations. Ultimately, this demonstrates that the Navy is exceptionally capable of meeting the manned aviation training called for by the BUQ levels, but will require significant effort to achieve similar steady state training for UAS operators.

Other aspects of training will need to be addressed as well. For example, the Crew Resource Management (CRM) program (OPNAVINST 1542.7C, 2001) clearly states that all Naval Aviation communities and personnel involved in flying as an aircrew member in naval aircraft shall receive integrated CRM training. It is not a coincidence that CRM has been credited for driving down the mishap rate in the Navy and Air Force. The Air Force Military Airlift Command examined five years of mishap data prior to instituting CRM (1985) and then compared it with data from the following five-year period, demonstrating a significant reduction in mishaps (Table 4).

Similarly, in 1987, the Navy began providing Aircrew Coordination Training (precursor to CRM) to all helicopter training squadrons. Eventually, CRM was expanded to the A-6/EA-6 Intruder training squadrons. The Naval Safety Center reported a significant reduction in helicopter and A-6 Intruder mishaps (FAA.gov, 2011; Table 4).

According to OPNAVINST 1542.7C, UAS crews are required to complete an introductory CRM qualification course. Paradoxically, CRM training, as understood by operators of manned aircraft, may not be the correct approach for UAS operators. For example, a difficulty, importance, frequency (DIF) analysis was recently conducted as part of a UAS training requirements analysis (Sciarini, 2011). This effort asked subject matter experts (SMEs) with experience in manned and unmanned aircraft to provide DIF ratings for tasks performed while conducting UAS operations. Interestingly, CRM was the only task area to receive a maximum score for each DIF element (Figure 1).

In the spirit of CRM training, it is encouraging that SMEs rated the importance and frequency of CRM at the

Table 3. CJCSI 3255.01 UAS Groups I-IV Basic Unmanned Qualification Level Requirements.

Qualification Level	Requirements Description	Group 1	Group II	Group III	Group IV	Group V
BUQ-I	Aviation knowledge and UAS skills to fly VFR in Class E, G, and restricted or combat airspace < 1200' AGL	X	X	X	X	X
BUQ-II	Aviation knowledge and UAS skills to fly VFR in Class D, E, G, and restricted or combat airspace < 18,000' MSL		X	X	X	X
BUQ-III	Aviation knowledge and UAS skills to fly VFR in all airspace <18,000 MSL				X	X
BUQ-IV	Aviation knowledge and UAS skills to fly in all weather conditions and classes of airspace up to Flight Level (FL) 600					X

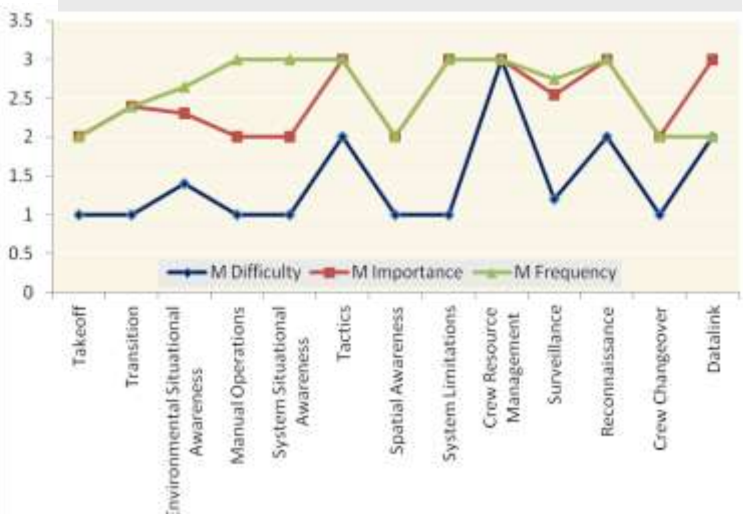
Table 4. CRM Effectiveness.

Organization	Aircraft	Reduction
US Navy	Helicopters	28%
US Navy	A-6 Intruders	81%
US Air Force	USAF MAC	51%

top end of the scale. It is notable that the SMEs with considerable experience operating manned and unmanned platforms rated performing UAS CRM at the top of the difficulty scale. While potentially spurious, we must consider the possibility that this high rating could be due to the possibility that current CRM training for UAS may not be correctly tailored to the needs of UAS crews. As highlighted by past shortfalls of CRM training in other domains, Kanki, Helmreich, & Anca (2011) suggest that merely replacing "UAS operator" with "aviator" and delivering existing CRM training would have a low probability of success. The authors propose that using aviation experience as a template and then customizing the CRM training with domain-specific skills to include relevant examples and case studies for the demonstration concepts would significantly improve UAS CRM training.

It can be argued that the most sophisticated and flexible component of an aircraft is the human pilot. The traditional arrangement of having an aviator co-located with an aircraft allowed designers to take advantage of their capabilities and rely on these characteristics to overcome system limitations, emerging situations, and non-nominal events without needing a complete understanding of the human. The rapid introduction of UASs has displaced this sophisticated component of the aircraft system without a complete replacement or even understanding of lost capabilities. The fact that UAS crews are

Figure 1. UAS areas rated at least "important" and performed at least "frequently."



expected to operate multiple and perhaps heterogeneous vehicles, hand aircraft off to remote operators, and perform in work shifts as unmanned vehicle endurance will far outpace human limitations must not be overlooked. As these demands on UAS operators are mitigated through engineering and human factors solutions, it will be critical that operator training captures the limitations and opportunities these new paradigms of flight operations introduce. It is an exciting time in which automation will become increasingly adaptive and perhaps eventually give way to artificial intelligence. The constructs that decades of researchers have explored in order to understand human-system interactions are foundational to understanding how to optimally train our UAS force. However, we must be prepared to challenge fundamental theories and existing training paradigms if we are to have a dominant UAS force that shapes the battlespace in the ways that are expected and yet imagined.

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Designing UAS Control Means Developing UAS Autonomy

BY LCDR JEFF GRUBB, NAWC-TSD

On January 2, 1967, the Vietnam People's Air Force (VPAF) launched most of its MiG-21 fighters to intercept a formation of USAF F-105 fighter bombers. Consistent with the doctrine and training provided by their Warsaw Pact allies, the VPAF pilots flew the intercept under strict ground control. In effect, the ground controllers made the tactical decisions and the pilots acted primarily as "meat servos," actuating the aircraft controls to execute the controllers' orders. Over the previous year, this doctrine had allowed the VPAF to successfully execute hit-and-run attacks on American bomber formations and then retire before being engaged by escort fighters. However, when the MiGs broke through the overcast weather on this day, the VPAF pilots discovered that what had looked like bomber formations on the ground controllers' radar screens were in fact formations of fighters. While their ground controllers struggled to understand what was happening, the VPAF pilots were forced to improvise countermeasures for the unexpected threat. In the ensuing confusion, the USAF shot down 7 MiG-21s, representing almost half of the VPAF's inventory, without suffering any losses. Although this engagement, the culmination of the USAF's Operation Bolo, is a favorite topic for war college theses and cable TV programs, this author believes that it contains underappreciated lessons for the designers of control systems for uninhabited air systems (UASs).

The recent Department of Defense interest in UASs is driven by the perception that UASs can provide increased warfighting capability at reduced cost relative to equivalent manned platforms. Removing the crew from the air vehicle saves weight and volume by eliminating not only the people, but the life support, safety, and interface systems that would otherwise have to be installed on the vehicle itself. From an engineering perspective, these savings can be used to increase the air vehicle's payload, maneuverability, stealthiness, efficiency, and economy. Operationally, because the crew is not aboard the vehicle, commanders can deploy the vehicle into environments that would otherwise be considered too dangerous. Moreover, if the crew does not have to be aboard the vehicle itself, it raises the possibility that a single crew, or even a single operator, could control more than one vehicle simultaneously. Together, these features promise to increase the effective size of the U.S. air arm while allowing a reduction in military manpower.

One requirement for achieving this vision is to develop control systems that would allow crews on the ground to fly and fight their air vehicles. The natural tendency of Aerospace Experimental Psychologists (AEPs) is to interpret this challenge as a classic human factors engineering problem. In the near term, there are a number of human factors engineering issues facing the current crop of UASs. For example, although a significant part of the argument for UASs is that they promise to allow a single operator to control multiple vehicles, all large UASs currently require multiple crew members to control each individual vehicle. Reducing the size of these crews and allowing them to simultaneously control multiple vehicles will require careful attention to how well any control station supports crew situation awareness (SA) without imposing excessive crew workload. Moreover, in a February 2009 Acquisition Decision Memorandum, the Undersecretary of Defense for Acquisition, Technology, and Logistics observed that a common control station across all UASs would save money in system development and support costs and enhance interoperability of systems across services. Consequently, control stations must not only allow a single operator to simultaneously control multiple vehicles, but to control multiple kinds of vehicles concurrently.

The requirement to simultaneously control multiple instances of multiple kinds of vehicles has interesting human factors implications. Legacy UASs, such as the RQ-1 Predator and its derivatives, are hand-flown, so their control stations are effectively cockpits on the ground. Consequently, much of the human factors work in updating their control stations is dedicated to building what is effectively a better cockpit. However, it is doubtful that anyone can simultaneously hand-fly multiple vehicles in dynamic operational situations, so the control paradigm for common control will need to be quite different. Operators of more recent UASs, such as the RQ-4 family, navigate their vehicles by providing the vehicle with waypoints via keyboard and mouse inputs. The vehicle's flight control system then determines how to best actuate the vehicle's controls to move the vehicle to the waypoint. This control paradigm is similar to the use of autopilot systems in legacy aircraft. With the vehicle performing most of the flying tasks itself, the crew has more spare cognitive capacity to perform other mission tasks. However, these systems still only involve one vehicle under the control of one control station, so the current autopilot paradigm still does not match the intent of the common control station.

Alternatively, a common control station for multiple dissimilar unmanned vehicles should model the current air traffic control paradigm for manned aircraft. In air traffic control, the controller has "big-picture" summary information about the state of the aircraft under his or her control and provides the crews of those aircraft with summary instructions. The crews then translate the summary instructions into specific actions that will allow them to fly their aircraft in accordance with the controller's plan. If the controller's instructions inadvertently lead to a dangerous situation, or an emergency dictates that the crews should deviate from otherwise valid instructions, the crews are expected to act on their own to safely resolve the situation. As the situation permits, they are also expected to inform the controller as to why they deviated from the instructions. Managing several unmanned vehicles with a similar approach could achieve the intent of the common control station.

Air traffic control works because the controller is only responsible for managing the big picture: controllers only deal with enough information from each aircraft to be able to route the aircraft appropriately and they only transmit enough information to provide appropriate routing to the aircraft. The details of executing the routing are then handled by the aircraft, or more accurately, the onboard crews. In translating this air traffic control system to UAS control, there are some standard human factors issues that will need to be addressed. For example, engineers will need to determine what minimum amount of information will allow UAS controllers to accomplish the mission. Engineers will also have to provide controllers with a sufficiently simple control scheme to transmit instructions to the vehicles. However, in both cases the human factors solutions to these challenges will depend on how autonomous the air vehicles are. That is, if UAS operators have to perform more micromanagement of the vehicle, then they will require more information and a more complex control capability. However, if the vehicle has some autonomy, then operators can manage the big picture and will need less complex control capability. Currently, UAS control is approached as a standard "controls and displays" issue and autonomy is planned to be treated as just another system feature; however, how autonomous the vehicles are will determine the control station human factors that will need to be addressed. Therefore, it will be important for AEPs to view and actively work on autonomy as an independent human factors issue as well as be involved in the classic human factors work for UASs.

It is in how we approach autonomy that this author believes AEPs (and others involved in UAS development) need to mind the lessons of Operation Bolo. It is tempting to interpret a requirement for enhanced UAS autonomy as a requirement to develop vehicles that can better follow the controller's orders. However, such a highly centralized system is effectively what the VPAF sent into battle in January of 1967. The VPAF pilots were likely as intelligent and potentially autonomous as any other human beings, but per their doctrine and training constraints, they were limited to fighting battles as dictated by their controllers. Such highly centralized systems tend to be very brittle in dynamic situations such as combat. This weakness was illustrated when the VPAF controllers were unable to provide coherent instructions and their pilots almost instantly ceased to be effective warfighters. It is a weakness that we should be mindful of in approaching UAS autonomy.

We expect American warfighters to be more adaptable than the VPAF controllers were, so presumably our UAS controllers would be less vulnerable to elaborate ruses. However, a ruse is not the only way to disrupt control instructions. An enemy that could jam the control signal or destroy the stations or satellites used to relay that signal could neutralize the fleet without having to overcome the stealth, maneuverability, and operational flexibility of the vehicles themselves. Although either of these actions would require a degree of technological sophistication, many of our potential future adversaries are increasingly technologically advanced. It is dangerous to assume that we will be able to maintain continuous communication with the vehicles, especially if we intend to operate over the enemy's territory and at a great distance. Therefore, to be reliably effective, vehicles will need at least some ability to act on their own, suggesting that UAS control means UAS autonomy.

This does not mean that UAS control design is leaving the realm of aerospace psychology. We tend to assume that we need a person in the UAS control loop because the human brain is the only information processor currently able to make complex tactical decisions reliably. In fulfilling our more standard human factors engineering role, AEPs analyze how people make operational decisions in order to design systems that will enable the people to make those decisions better. The new role for AEPs will be to analyze how people make operational decisions in order to better replicate that process within the unmanned vehicles themselves.

UAS Workshop Held at NAMRU-Dayton

BY LT STEPHEN M. EGGAN, NAMRU-D

The previous articles in this newsletter reveal the relative paucity of, and substantial need for, continuing and future unmanned vehicle research. This need was also highlighted at a recent workshop hosted by the Naval Medical Research Unit-Dayton (NAMRU-D) at Wright-Patterson AFB from 8-9 Nov 2011.

WORKSHOP IDENTIFIES UAS S&T RESEARCH GAPS

The goals and purpose of the workshop, outlined by former Aerospace Experimental Psychologist (AEP) Dr. Rick Arnold, in his opening remarks, were to identify and address science and technology (S&T) research gaps related to a range of unmanned aircraft system/remotely piloted aircraft (UAS/RPA) Human Factors/Human Systems Integration (HF/HSI) topics. To do this, and to align with Congress's base realignment and closure (BRAC) mandate to create a joint center of aeromedical research excellence aboard Wright-Patterson AFB, the workshop brought together UAS subject matter experts from across the Navy, Air Force, and Army. The presenters included :

- Dr. Henry Williams, Deputy Director of Aeromedical Research, Naval Medical Research Unit – Dayton
- Lt Col Anthony Tvaryanas, 711th Human Performance Integration Directorate, USAF
- CDR Joseph Cohn, Military Deputy, Human and Bioengineered Systems Division, Office of Naval Research (ONR)
- LCDR Brent Olde, Air Warfare Training Development IPT Lead, NAVAIR PMA-205
- Ms. Melissa Walwanis, ONR Program Officer, and Senior Research Psychologist, Naval Air Warfare Center-Training Systems Division (NAWC-TSD)
- Dr. Phil Mangos, Senior Quantitative Research Scientist, Workforce Selection Science, Kronos Inc.
- Dr. Thomas Carretta, Research Engineering Psychologist, 711th Human Performance Wing, USAF
- Dr. Rick Arnold, Director of Aeromedical Research, Naval Medical Research Unit – Dayton
- Mr. Jeremy Athy, Cognitive Research Psychologist, U.S. Army Aeromedical Research Lab, Ft. Rucker
- Dr. Wink Bennett, Technical Advisor, 711th Human Performance Wing, USAF

In the opening session, Dr. Williams provided an overview of general UAS human factors issues that would be discussed in detail by subsequent presenters. These topics included workload, situation awareness (SA), vigilance, fatigue, decision-making, teamwork, trust in automation, information technology, field interface, onboard control interface/optionally manned vehicles, crew/operator selection and training, and manpower/manning. This session continued with briefs from Lt Col Tvaryanas and CDR Cohn that compared and contrasted UAS/RPA issues in the Air Force and Navy and discussed future initiatives that each branch is pursuing. One common concern across the Air Force and Navy is that with UASs there is a shift in the battlespace from "munitions to cognition." It was stated that this will present problems for the current scheme of UAS/RPA selection and training, which tries to fit UAS training and selection into existing manned schemes rather than trying to develop new schemes for UASs. This was highlighted in later sessions by Drs. Mangos and Arnold, who illustrated that the knowledge, skills, abilities, and other personal characteristics (KSAOs) required for successful UAS performance are different from those required for manned aviation, with the former being more cognitive and perceptual in nature. The workshop also included tours of the NAMRU-D lab spaces and the USAF RPA and Integrated Combat Operations Team Training labs.

NAMRU-D staff (Ms. Ashley Turnmire, Drs. Rick Arnold, Beth Hartzler, and Henry Williams, LT Frank Varino, and AEPs LT Stephen Eggan and LCDR Wilfred Wells) will generate a proceedings report of the workshop. This report will capture the essence of the various presentations and discussions, generate a listing of the top UAS S&T gaps, and provide recommendations for necessary research efforts (this article will therefore refrain from detailing that information.) Specific topics to be covered will include: UAS selection, training, control station design, manpower and scheduling, and other miscellaneous topics such as teaming, motion sickness, and medical standards. It is hoped that this tri-service proceedings report will be used to show sponsors the UAS research areas requiring future research.

WHAT'S IN A NAME? AN ARGUMENT FOR NEW TERMINOLOGY

Another issue that emerged from the UAS workshop in Dayton (at least for this author), and is also evident in the contributions to this newsletter, concerns the lack of standardized/consistent terminology relating to unmanned vehicles. Most of those working in the field, experts and novices alike, understand the general meaning of "UAS," "UAV," "UA," and "RPA" (the Air Force's adopted term) when those terms are seen or heard. However, when and where it is appropriate to use these terms has been inconsistent within the discipline, and the terminology used to define these acronyms has varied among individuals.

For example, in this newsletter, UAS has been defined as both unmanned *aircraft* system and unmanned *aerial* system by different authors. So, what exactly does the "A" in these terms represent – aircraft, aerial, or air? In addressing this issue, we can look to the Department of Defense (DoD), which has published the following definitions for UA, UAS, and UAV (from The Joint Publication 1-02, Department of Defense Dictionary of Military and Associated Terms) for guidance :

- Unmanned aircraft - An aircraft or balloon that does not carry a human operator and is capable of flight under remote control or autonomous programming (also called UA).
- Unmanned aircraft system - That system whose components include the necessary equipment, network, and personnel to control an unmanned aircraft (also called UAS).
- UAV definition not listed. However, in appendix A (Abbreviations and Acronyms; p. A-155) UAV is defined as "unmanned aerial vehicle."

The absence of a definition for UAV could be because the DoD "adopts the terminology unmanned aircraft (UA), rather than unmanned aerial vehicle (UAV), when referring to the flying component of an unmanned aircraft system. This change in terminology more clearly emphasizes that the aircraft is only one component of the system, and is in line with the Federal Aviation Administration's decision to treat "UAVs" as aircraft for regulatory purposes" (DoD UAS Roadmap 2005-2030, p. i). While the examples above define the "A" in UAV as "aerial," unmanned "air" vehicle is used in individual platform names in these same DoD publications. Thus, according to DoD, the "A" in UAS clearly represents "aircraft," which was also the consensus at the NAMRU-D workshop, but for the term UAV the definition of "A" is still up in the air.

Why is there such disparity? Perhaps because the terms used to describe unmanned vehicles/systems, while once suitable, are no longer completely accurate or appropriate. For example, whereas RPA is an accurate name to describe some unmanned vehicles, such as the Predator or Raven that are hand-flown, newer and more advanced unmanned vehicles have greater autonomy and are "operated" rather than piloted – mouse and keyboard inputs are used to instruct the vehicle to fly to waypoints, take-off, and land. Other terms, such as manned and unmanned have been viewed as a politically incorrect and therefore, inappropriate. As such, some individuals use "uninhabited" to define the "U" in UAS. While more appropriate, inhabited and uninhabited are not accurate because they imply that aircrafts are "lived in" as places of dwelling (indeed, some crews might argue that that this is true!). Instead, more appropriate terms are occupied and unoccupied, although these terms have not been used to best of this author's knowledge.

While this topic may be thought to be a minor concern to some, we have to consider the ramifications of inconsistently and inappropriately using terminology – confusion and even misconceptions in the public eye. For example, the term "drone" (another term often used to name unmanned vehicles), while benign to many, evokes a negative reaction from some in the public because the media and movies have popularized the notion that when human control over a drone fails, its automation might allow it to go rogue and turn against its human operators. In addition, the term "unmanned" could be misconstrued to suggest that these aircraft are completely autonomous, when they are indeed "manned" in the traditional sense of being controlled by a human, albeit from outside the aircraft. Therefore, we need to be cognizant of the terminology that we use.

These arguments suggest that it is perhaps both essential and timely to develop new naming/terminology for referring to unmanned vehicles and their operating systems. In doing so, it is essential that the name accurately and appropriately described what the product represents, does, and is meant to do. Perhaps we should adopt the terms "Remotely Operated Aircraft System" (ROAS) and "Remotely Operated Aerial Vehicle" (ROAV). These terms best capture the essence of unmanned vehicles/systems and avoid the previously described issues. Furthermore, this terminology will remain accurate and appropriate into the future, even if the mission set of these vehicles evolves to include extracting wounded from the field or the capability to be optionally manned as they are expected to, which would make them "manned."

Broad Area Maritime Surveillance (BAMS) UAS Panel at the AIAA Centennial of Aviation

BY CDR JIM PATREY, NAWC-AD

There have been many ongoing tributes to the Centennial of Naval Aviation; among them was a dedicated forum at the annual American Institute of Aeronautics and Astronautics (AIAA) conference in Norfolk, VA from 20-22 Sept celebrating the history of Naval Aviation and focusing on the latest technical developments pertaining to naval aircraft, weapons, ships, defense acquisition, and operations. Reflecting on a century of aviation history and progress inevitably leads to speculation about what the next century of Naval Aviation will look like. In the near future, several innovative new aircraft will enter our inventory – the F-35 Joint Strike Fighter and P-8A Poseidon are at the forefront, as are a number of unmanned aircraft system (UAS) platforms currently under development. Given the qualitatively different nature of UASs, it is not surprising that a preponderance of the questions and discussion at the AIAA conference addressed the future role of UASs in Naval Aviation, or that the conference included a panel dedicated solely to the Broad Area Maritime Surveillance (BAMS) UAS.

The BAMS UAS panel members included CAPT Jim Hoke, Program Manager at NAVAIR PMA-262 (Persistent Maritime UASs), Mr. Robert Klein, Northrup -Grumman, Vice President of Engineering (Battle Management and Engagement Systems), Mr. George Hill, Vice President, L3 Communications Systems, and CAPT John Robey, Air Sea Integration lead at SPAWAR PMW-750 (C4I Installation Management). During the panel discussion, Mr. Klein and Mr. Hill provided a detailed overview of the BAMS air vehicle specifications and its Intelligence, Surveillance, and Reconnaissance (ISR) capabilities. In particular, Mr. Klein outlined those specifications that distinguish BAMS from its Global Hawk sibling, most notably persistent ISR of the sea as has never existed before. Mr. Hill continued by discussing the profound interoperability challenges associated with thoroughly and effectively connecting BAMS into military operations, with emphasis on the sheer volume of entities requiring communication interoperability.

CAPT Hoke continued the panel discussion by expanding on the evolving BAMS mission and its many challenges. He recounted the novel manner in which the BAMS has been integrated into the P-8A Poseidon mission such that BAMS will be used to *support*, rather than *supplant*, manned missions. As such, crew selection and training for BAMS is being built into the manning and career path of Poseidon crews. In essence, this will free up manned assets to focus on the highest-value, most "human-intensive," aspects of the mission, and will delegate those mission components that are able to be conducted remotely to BAMS.

This allocation schema seems ideal despite the intimidating change that it brings to Naval Aviation operations. Yet, this change is unavoidable. This point was most apparent when CAPT Robey presented one finding from a 2006 Maritime Intelligence, Surveillance, and Reconnaissance (ISR) Enterprise Acquisition (MIEA) report demonstrating the orders of magnitude increase in information available to the warfighter. He made clear that we have already exceeded the ability of Naval Aviation to process all available information, so major changes in the manner in which we conduct missions are absolutely essential as the ISR data are already exceeding transmission capacity by several orders of magnitude. By 2020, this gap is projected to exceed 10^{10} due to the copious ISR capabilities of unmanned assets.

In this vein, a question of interest to Aerospace Experimental Psychologists is: once you collect and transmit that much information, what do you do with it? This presents significant human systems challenges - to transform copious amounts of data into actionable information. Although the conference panel was focused on general challenges regarding BAMS, the information management challenges were at the forefront of discussions, as well as other issues surrounding the human's role in unmanned systems such as:

- How do we appropriately and effectively crew UASs?
- How do we perform target curing and automated target recognition in order to minimize the load on the human operator in sifting through thousands of potential entities of interest?
- How do we develop commonality among systems to reduce costs?
- How do we enable operators/crews to control multiple and/or different types of UASs?

The AEP community is uniquely positioned to support the development of effective solutions to these issues, as well as address the current and emerging operational challenges regarding UAS training, selection, manpower, and other human factors issues.

Conditional Aviation Career Incentive Pay (ACIP) Flight Time Requirements for Aeromedical Officers

BY LCDR HENRY L. PHILLIPS, NAVAIR 4.6

The release of OPNAVINST 7220.l8 on 6 August 2010 established a requirement for the annual verification of flight hours for recipients of conditional ACIP, a group which includes all student and designated aeromedical officers (AOs), including Flight Surgeons, Aerospace Physiologists, Aerospace Optometrists, and Aerospace Experimental Psychologists[1].

The requirements themselves did not change with the release of OPNAVINST 7220.l8, only the issue of how and by whom they are tracked. They are still governed by the DoD Financial Management Regulation (DoD 7000.14-R, Vol 7A, Chapter 22, hereafter referred to as the FMR), and OPNAVINST 3710.7U (hereafter referred to as the 3710, particularly Chapters 8 & 11). These two instructions delineate two entirely separate sets of requirements for AOs.

While line officers are eligible for Continuous ACIP, AOs are entitled to Conditional ACIP only, having Aviation Status Indicator (ASI) code "J". ASI "J" further dictates that officers must adhere to flight time requirements outlined in the DoD FMR.

This article is presented in three sections. The first section covers requirements that must be met before a Conditional ACIP recipient logs flight time. The second deals with flight time requirements and rules regarding flight pay entitlement. The third deals with procedures for verification of compliance with these instructions and flight pay recoupment.

ELIGIBILITY REQUIREMENTS

Eligibility requirements are outlined in the 3710 and in OPNAVINST 7220.18. Generally, to earn and retain Conditional ACIP, a Conditional ACIP recipient must:

1. be in a flight coded billet (2102 for MC officers and 2302 for MSCs),
2. possess orders for duty in a flying status involving operational or training flights (DIFOPS),
3. have a current flight physical and possess a current up-chit,
4. have current egress training for the specific aircraft in which he or she logs flight time,
5. have current survival (physiology and water) training for all aircraft categories in which he or she logs flight time, and
6. submit a summary of his or her flight time for the FY to PERS-435 by 31 December in order to retain flight pay award for the FY just concluded.

[1]Conditional ACIP recipients also include line aviators who have missed continuous ACIP flight gates and non-flag line aviators with over 25 years of aviation service, but their annual flight requirements per the 3710 differ from those of aeromedical officers, and are beyond the scope of this article.

DIFOPS Orders and Flight Coded Billet. This is normally handled by the officer's detailer. It must be noted that not all billets available to Conditional ACIP recipients will be flight coded. A Conditional ACIP recipient sent to a non-flight-coded billet will be ineligible to receive flight pay. Additionally, Conditional ACIP recipients sent to flight-coded billets should make sure they are on DIFOPS orders.

Current Flight Physical and Up-chit. All personnel in flight status must have a current flight physical, which expires on the last day of the officer's birth month each year and may be renewed either in the officer's birth month or in the month prior (e.g., birth month is September, then flight physical can be completed between 1 August and 30 September each year). An up-chit represents certification of physical qualifications by a flight surgeon and that the Conditional ACIP recipient is not currently medically incapacitated (e.g., common colds, broken bones, etc.).

Egress Training. Egress training is good for one year and must be completed prior to flight time accrual for all aircraft in which flight time is logged.

Survival (Physiology and Water) Training. Survival training is good for four years and expires on the last day of the month (e.g., Training received 13 September 2011 would expire 30 September 2015). Survival training is best described in terms of 1) initial and continuation, and 2) refresher training requirements. AOs going through initial flight training receive N-1 water survival and NP-1 physiology survival training. This N-1/NP-1 training must be accompanied by advanced continuation training for specific aircraft categories: N-6 for tactical jets, N-11 for fixed wing non-ejection seat aircraft, and N-12 for helicopters. Thus, to be eligible for aircrew flight time in all three of the above aircraft categories, an AO's initial training must include N-1/NP-1, N-6, N-11, and N-12. There are additional requirements for specific populations, which are beyond the scope of this article. See 3710 Chapter 8 for more information.

Upon expiration of initial and continuation qualifications (N-1/NP-1, N-6, N-11, and N-12), applicable refresher (R/RP) training is required: R-1/RP-1 for flight in ejection-seat equipped aircraft, R-2/RP-2 for flight in non-ejection seat parachute equipped aircraft, R-3/RP-3 for flight in helicopters, and R-4/RP-4 for flight in pressurized (oxygen available) non-parachute equipped aircraft. Thus, when a Conditional ACIP recipient's N-1/NP-1 and N-12 training has expired he or she will only need R-3/RP-3 training to satisfy physiology and water survival training requirements for flight in helicopters for another four years. A Conditional ACIP recipient whose initial and continuation training had expired would need R-1/RP-1, R-2/RP2, R-3/RP-3, and R-4/RP-4 refresher training to fly in all aircraft categories.

FLIGHT TIME REQUIREMENTS

There are two different categories of flight time requirements: Annual requirements outlined in the 3710, and monthly requirements outlined in the FMR.

Annual Requirements. The 3710 outlines annual and semi-annual flight time requirements for maintaining currency/proficiency. These requirements are specific to the fiscal year (FY). The FY minimum flight hours requirement for AOs is 48.0 hours in each FY (i.e., October – September) and 24.0 hours semi-annually (i.e., October – March and April – September). These minimum annual/semi-annual currency/proficiency flight time requirements are prorated based on each full month an individual is under DIFOPS orders. Note that 3710 annual requirements for line aviators receiving Conditional ACIP differ from these, and are discussed in Chapter 11 of the 3710.

Minimum 3710 flight time requirements do not apply while enroute on PCS orders or TAD in excess of three consecutive weeks where no flight time is available. Note, however, that FMR requirements still apply in such circumstances. Note also that flight time accrued in a simulator or during leave may be used to satisfy 3710 requirements, but that neither time acquired in a simulator or while in a leave status can be applied to FMR requirements, which are outlined below.

Finally, note that five offices: COMNAVAIRFOR, CMC, COMNAVAIRFORES, CG FOURTH MAW, and COMNAVEDTRACOM, have the authority to issue a waiver of these annual 3710 requirements to AOs. *These waivers, however, apply ONLY to the annual flight time requirements outlined in the 3710. These offices do not have the authority to waive the monthly flight time requirements delineated in the FMR.*

Monthly Requirements. The document ultimately governing entitlement to ACIP is the FMR. The basic FMR Conditional ACIP requirement is 4.0 hours of flight time per month. *Flight time logged in any given month must first be applied to meet requirements for that month.* Flight time in excess of the amount required for a given month (i.e., 'excess' flight time) may be counted toward monthly requirements up to five months ahead. Therefore, a Conditional ACIP recipient not in a grace or waiver period who flew 24.0 hours in January could satisfy requirements through June (Jan + 5 months) without flying again. Excess hours expire if not applied before or during the fifth month beyond the month in which they were flown. Any hours flown in a month in which flight pay is forfeited become excess hours, and may be applied toward requirements in any of the five months beyond the one in which they were flown.

Requirements for Partial Months. In cases where flight status entry occurs after the first day of a month, or termination occurs other than the last day of the month, FMR requirements for that fractional month are prorated (e.g., 7 days requires 1.0 hour, 15 days requires 2.0 hours, 22 days requires 3.0 hours, etc.; see FMR Table 22-2).

Grace Period. A Conditional ACIP recipient failing to meet FMR requirements for a given month is entitled to a grace period of three calendar months to make up the deficit. The month in which the deficit occurs is the first month of the grace period, so once a deficit has occurred, only two months remain in which to make up the missed flight time. If a deficit is made up in the second month of the grace period (i.e., 8.0 hours applied), the grace period ends after two months.

If a grace period does last three months, FMR requirements must be satisfied for all three months (i.e., 12.0 hours applied) in order for hours flown in months two and three to be applied to the requirements of earlier months within the grace period. If a Conditional ACIP recipient enters a grace period with no excess hours and waits until month three to log flight time, that officer would lose two months of flight pay if he or she logged as many as 11.9 hours in month three. In this example, the 7.9 hours not applied to requirements for month three would become excess hours, and could not be used to satisfy the requirements of grace period months one or two.

If a grace period ends with no loss of flight pay entitlement (i.e., if FMR requirements are met for all months of a grace period), the Conditional ACIP recipient is entitled to enter another grace period the following month if necessary. *If flight pay is forfeited for any month(s) of a grace period, however, the Conditional ACIP recipient is not entitled to enter a new grace period*, and must meet FMR requirements within the month following the grace period. If the officer fails to apply 4.0 hours to that month by flying and/or applying excess hours, he or she will lose flight pay for that month in addition to the pay recouped during the grace period. The officer will lose ACIP each month thereafter until requirements are met for one month. ACIP will be reinstated at that point, with no ACIP entitlement for preceding months in which requirements were not met.

Waiver Periods. If a Conditional ACIP recipient is unable to meet the normal flight time requirements due to "military operations (combat or otherwise) or nonavailability of aircraft" (FMR 220203.E., p. 22-12), and his or her commanding officer certifies in writing that only these conditions prevented the officer from complying with the normal flight time requirements, the officer may meet requirements by accumulating 24.0 hours of applied flight time over six consecutive calendar months. The accumulation of 24.0 hours of applied flight time may occur at any time during the 6-calendar-month period and in any combination of flights. These 24.0 hours may include any available excess hours earned prior to the waiver period.

The FMR is silent on the question of when a "six calendar month" waiver period should begin once approved. Policy at the author's previous command is that if a recipient is in a grace period when the waiver request is approved (as is true in the overwhelming majority of cases), the waiver period begins on the first day of that grace period. Thus, if the Conditional ACIP recipient is in the third month of a grace period when the waiver is granted, the waiver period covers only an additional three months. The FMR does not stipulate whether the six-calendar month waiver must be issued before, during, or even after a grace period concludes.

Injuries and Flight Pay. If a Conditional ACIP recipient is injured or medically incapacitated during operational flying (e.g., barotrauma, sinusitis, etc.), the officer is considered to have met requirements for that month and the following two months. If requirements were already met for the month in which the injury occurred, requirements are considered met for the following three months. The officer will not receive flight pay beyond this three-month period unless incapacitation ends and more flight time is logged. A Conditional ACIP recipient injured or incapacitated <u>not</u> as the result of flying is only entitled to flight pay for those months where flight time requirements were already met at the time of the incapacitation. It is wise to make a practice of maintaining banked excess hours for this reason in particular.

An incapacitated Conditional ACIP recipient may remain qualified for aviation service for up to 365 days during the incapacitation. To be qualified for aviation service, an officer must be listed as Aeronautically Adaptable (AA) and either Physically Qualified (PQ) or Non-Physically Qualified (NPQ) but waivered for NPQ status. Qualification for aviation service does not ensure ACIP entitlement. During incapacitation while qualified for aviation service, a Conditional ACIP recipient will receive ACIP only for those months for which requirements are met as outlined above. A Conditional ACIP recipient will be disqualified from aviation service on the 366th day of incapacitation.

Suspension. Expiration of physical exam or survival training results in the recipient being suspended from flight duties. Conditional ACIP recipients are *ineligible* to receive ACIP during periods of suspension. Once a suspension is lifted, if the officer remains qualified for aviation service, then he or she may receive ACIP for months during the suspension in which requirements were met using excess hours. Note also that expiration of annual egress training results in suspension from flight duties in that specific aircraft.

Student AEP LT David Combs receives Conditional ACIP flying the T-6 at NAS Pensacola.

Student AEP LT Kirsten Carlson receives Conditional ACIP flying the TH-57 at NAS Whiting Field.

Student Status. Flight time requirements apply to AOs in student status, and become effective the date of flight pay commencement. Flight pay typically begins upon the date of an officer's report to Primary Flight Training, with students receiving documentation of this simultaneously with PSD. AOs should be aware of their flight time requirements as soon as they enter flight status. Given constraints on AO flight curriculum duration, it is not uncommon for an AO to graduate from Primary Flight Training in the third month of a grace period.

Passenger Status. In order to log flight time applicable to the FMR and 3710 requirements, a Conditional ACIP recipient must be listed as a member of the crew on the manifest and Naval aircraft flight record (NAVFLIR), or DoD equivalent, for any flight in a DoD aircraft. Conditional ACIP recipients are advised to get signed copies of NAVFLIRs for all flights. Passenger flight time in DoD or civilian aircraft does not count toward 3710 or FMR requirements.

VERIFICATION AND RECOUPMENT PROCEDURES

As mentioned earlier, OPNAVINST 7220.18 paragraph 7.k.(2) stipulates that by 31 December of every year, all Conditional ACIP recipients must submit summaries of their flight time for the FY just concluded and last six months of the preceding FY to PERS-435 via their Commanding Officer. Thus, on 1 Oct 2011, this author submitted a summary of all flight time accrued from 1 May 2009 through 30 Sep 2011 to his CO for endorsement. This endorsed summary will then be forwarded to PERS-435 on or before 31 Dec 2011.

Rationale for Inclusion of Flight Hours from the Last Half of the Preceding FY[2]. The reason for the inclusion of flight records covering the last five months of the preceding FY is to ensure the conditional ACIP recipient receives the greatest possible benefit of the doubt for evaluation of adherence to FMR requirements. *Flight time from the last five months of the preceding FY is evaluated only for potential bankable hours that may carry forward into the FY just concluded*. Flight pay will not be recouped for the last six months of the preceding FY (e.g., Apr 2010 – Sep 2010), regardless of what is submitted to PERS-435. The only ACIP evaluated by PERS-435 will be for the FY just concluded (e.g., Oct 2010 – Sep 2011).

Endorsed flight time summaries submitted to PERS-435 should *not* include copies of NAVFLIRs or photocopies of logbook pages. The summary should include the dates the recipient entered or left a DIFOPS billet,

[2]While OPNAVINST 7220.18 stipulates that flight hour summaries should include hours from the last six months of the preceding FY (Apr-Sep), recognize that the last five months of the preceding FY (May-Sep) are the only months in which bankable hours usable in Oct or beyond could possibly be accrued.

and indicate whether a DIFOPS billet is still occupied. First-tour AOs are also advised to include their Aviation Service Entry Dates (ASED) in this summary. A useful template is provided as enclosure (5) to OPNAVINST 7220.18.

Recoupment is All or None for a Given Month. If FMR flight requirements are not met for some portion of the FY, flight pay will be recouped for any and all months in which requirements were not met. Flight pay recoupment is not pro-rated; if a Conditional ACIP recipient misses a month's requirements by 0.1 hours, he or she loses the entire month's flight pay.

Recoupment Procedures. In cases where PERS-435 determines that requirements have not been met, PERS-435 will attempt to contact the Conditional ACIP recipient first to verify the accuracy of its records, and will then contact the Defense Financial and Accounting Service (DFAS) to initiate recoupment of ACIP as appropriate. Conditional ACIP recipients who submit no endorsed summary to PERS-435 by 31 December will have all flight pay recouped for the FY just concluded, regardless of how many hours were flown, and regardless of what substantiating records may be produced after 31 December.

PERS-435 Enforces only FMR Flight Time Requirements. PERS-435 will not recoup Conditional ACIP through DFAS for failures to meet 3710 requirements. Recognize that failure to meet 3710 flight requirements will have its own consequences for an aviator's career, but they will not immediately involve DFAS or PERS-435.

SUMMARY

This article has attempted to summarize the detailed information from multiple sources governing ACIP eligibility and flight time requirements for AOs. The rules governing excess hours, grace periods, and waiver periods can seem overwhelming. Ultimately, however, there are only a few things you need to do as an AO to ensure you meet all flight time requirements:

1. Verify your billet coding and DIFOPS orders status.
2. Keep your physical exam current (annual) and stay in an up status.
3. Keep your survival (physiology and water) training current (every four years) for the aircraft categories in which you intend to log flight time.
4. Keep your required egress training current (annual) for the aircraft in which you intend to log flight time.
5. Fly 4.0 hours every month, or ensure you fly 12.0 hours every quarter of the FY (i.e., Oct-Dec, Jan-Mar, Apr-Jun, and Jul-Sep).
6. Submit your endorsed flight hour summary to PERS-435 in a timely manner at the start of every FY.

Conditional ACIP requirements only become complicated when recipients fail to follow the six steps listed above. If you follow these steps, you will never lose flight pay. The reason AOs receive flight pay in the first place is to help them maintain an intimate familiarity with the stressors of flight experienced by their fleet customers. AOs should seek exposure to as many types of flying (e.g., shipboard, over water, operational, night, air combat maneuvering, etc.) as possible, commensurate with their aeromedical and security clearances. With local commander's approval, AOs are even authorized to fly in control of dual-controlled naval aircraft (3710). The surest way to get that approval is by demonstrated interest and ability. Maintain both, meet requirements, and never forget what a privilege it is to fly.

Disclaimer. This article is a summary of issues commonly encountered and questions frequently raised by officers receiving conditional ACIP. It is not a complete explanation of all relevant rules covered in the governing publications. This article is not a substitute for the instructions that govern the flight pay program requirements, nor should it be referenced as a Navy instruction. Recognize also that the information presented here is applicable only to current instructions.

REFERENCES

1. OPNAVINST 7220.18 (6 August 2010). Aviation Career Incentive Pay (ACIP).
2. DOD 7000.14-R Financial Management Regulation, Vol 7A, Chapter 22 (June 2010). Conditional ACIP flight rules begin in 220203 on p. 22-13.
3. OPNAVINST 3710.7U (23 November 2009). General Naval Air Training and Operational Procedures Standardization (NATOPS) General Flight and Operating Instructions, Chapters 8 and 11. Aeromedical Officer Flying Policy, 11.2.1, p. 11-3

LCDR Henry Phillips currently serves as the Assistant Director of Operations, Human Systems Department, Naval Air Systems Command. An abbreviated version of this article appeared in Contact in 2002.

Perspectives: An Interview with CAPT Dave Gleisner, AEP #77

BY LCDR HENRY L. PHILLIPS, NAVAIR 4.6

CAPT Dave Gleisner was commissioned in September 1982, making him the most senior active duty Medical Service Corps Captain as of this writing. He was winged as AEP #77 in May 1983. He currently serves as Vice-Commander, Naval Air Warfare Center – Aircraft Division (NAWC-AD), a post he has held since June 2009. CAPT Gleisner expects to retire in June 2012. I recently had the opportunity to sit down with him and capture his insights and some brief reflections on his 30-year career in the MSC and the AEP community. He was a very gracious host, and the view from his window in Building 2185 aboard NAS Patuxent River was gorgeous. The time passed quickly and before I knew it, we were all done.

As Vice Commander, NAWC-AD, you have achieved an assignment few AEPs have matched. What are the keys to having a successful career?

The most important thing is to develop a broad base in your career, particularly as an O3 and O4. Get out of your comfort zone. I started in Human Factors (HF) at Warminster, and then went to Crystal City to support several NAVAIR Program Management Aviation (PMA) offices, followed by an assignment to the Chief of Naval Air Training (CNATRA), where I worked in selection and training and had an opportunity to work with the line community. My next assignment was to the Defense Manpower Data Center (DMDC), which was for all intents and purposes a joint command, and an extremely valuable experience. I then moved back into the HF world doing Human-Systems Integration (HSI) work and bounced back between NAVAIR Headquarters and NAWC-AD Competency work. Diverse experiences like these will strengthen you when you reach senior levels and allow you to speak with authority on multiple subjects to diverse communities. This is a critical ability, and one that can only be developed through experience.

What are the most important lessons you've learned over the course of your career?

Know your customer and their requirements. [AEPs] are seldom the ones to establish requirements; we're usually supporting someone else's. Particularly as a junior officer, it can be hard to know who the ultimate customer is but it's really worth it to understand how these requirements are derived, and by whom. It's important to understand your command's goals and the Navy's goals (see the CNO's annual guidance). It can be hard for a junior officer to develop this perspective, and in some instances to see exactly how the bench-level or administrative work he or she is doing fits into this broader picture, but as I said, it's very important. This broader perspective is also important for writing a good FITREP narrative. Junior AEPs need to learn how to reflect the alignment of what they're doing with the larger strategic goals of the Navy, Navy Medicine, the MSC and their commands. Block 41 entries should communicate this clearly.

What advice can you offer up and coming scientists for a productive and successful career?

Find a good mentor early on. Seek out people who are already successful who you see as role models and who can help you understand what you need to do and accomplish, when, and why. Also, as early as you can in your career, be a mentor yourself. Help where you can and share the benefit of your wisdom. Many AEPs work in relative isolation from the rest of the community, in "1 of 1" billets, with little regular face-to-face contact with other members of their community. Junior officers in such positions desperately need mentorship.

Get all the training you can: acquisition, medical courses, joint training, core competency training, and the list goes on. Most is online, much is free. Relevant training can be a valuable tie-breaker for FITREP rankings and Selection Boards and helps you broaden your base.

Take care of your record. No one else will do it for you. A mentor can be particularly helpful here. Rely on your Specialty Leader and your Detailer to keep your record accurate and as complete as possible. Many officers overlook accomplishments that merit an entry on their data cards, service schools in particular.

Learn to write an effective FITREP. I've written every one I've ever received over the course of my career. Include what you've done, the results, and what the larger benefits are for the Navy. Send your mentors a copy of the narrative for comment before you submit it.

Keep flying! Try to get meaningful flights in a variety of aircraft and mission profiles, including training and test flights. Operational flight time is hard to come by in today's environment, so don't pass up these opportunities when they arise. It's particularly important for AEPs, and Conditional Flight Pay recipients as a group, to meet flight requirements in today's financial environment when the future of flight pay is uncertain.

Get out of the lab. Many of us come in as researchers, comfortable in the research environment and eager to do the work we know how to do. But early in your career, you should start to move out of the lab. When I was NAVAIR 4.6 [Human Systems Military Director], I tried to get the first-tour AEPs some out-of-lab work early on and get them involved part-time on a program. If you stay in the lab, you'll only last a couple of tours. You must grow beyond this environment.

Be an expert at something of value to the command. It really helps to be the command's "go-to" person on something important. You can get face time with senior leadership this way too. It's a good way to break yourself out on FITREPs.

Take care of yourself and your family. You must have a life outside of work, which should include more than running 1.5 miles twice a year. Get involved in some physical activity, something you can enjoy with your family. Spend all the time you can with your spouse and kids. Let them know what's going on at work and in the Navy. Make sure they find out what's going on locally from you; don't make them hunt down the local goings-on on their own. Remember that you only have your kids for a short time. Don't squander this time. Don't let your job take priority over them; take care of them and be part of their lives.

What do you see as the aerospace psychology field's most important current and future challenges?

This has got to be the challenge of staying relevant in an unmanned world. Even in manned aircraft, it has historically been difficult to convince program managers that they needed HF support in the first place. This may prove to be even more difficult in an unmanned world, even though all our HSI, safety, selection, training, and design work should be even more important. We still have to produce for these customers.

In your opinion, what must the AEP community do to ensure its continued relevance?

We need to show value to the warfighter and to Navy medicine. In the tail-to-tooth equation, we are always in the tail, so we MUST show that we bring value to both. Get involved in projects where you can show that relevance and make sure the work is documented in your FITREP. If we aren't bringing value to the customer, someday someone will have an easy time deciding whether to cut this community. The budget cuts coming in the next two years may be pretty eye-watering. We need to be ready. We need to be able to show that someone in uniform provides added value beyond an equivalent scientist not in uniform.

How have the Navy, MSC, and the AEP community mission changed over the course of your career?

The missions have remained quite stable but the technology has changed. Back when I came in, we were dropping grenades out of open cockpit aircraft and now we're testing the Joint Strike Fighter (JSF) and Broad Area Maritime Surveillance (BAMS) Unmanned Aerial System (UAS). The needs related to HSI, safety, and selection are the same as they ever were; only the tools we use have changed.

Another change has been in the availability of research funding. Twenty-five to thirty years ago, money was far more readily available and it was much easier to do the kind of research you wanted to do. Today, in order to get any research dollars at all, you must be able to show relevance to a sponsor, be it the Office of Naval Research (ONR) or some other agency, with a fair degree of specificity and detail.

From your perspective, how has the AEP role in systems acquisition changed over your career?

Back in the old days, we used to be more involved in field activities, at Point Mugu, China Lake, Warminster, and Pax River. AEPs tended to be 'niche' people, with experts in control-display, ergonomics, and other related areas, but today we have to be less specialized. We need to be facile with the broader range of HSI-related areas.

As a group, we have moved out of the lab and gotten involved in Integrated Product Teams (IPTs). Years ago, we did not have a senior position in NAVAIR Human Systems. This is a big change. Both CAPT Schmidt and I have screened for program management (PM) positions, which is also a more recent opportunity for this community. Given our community's positioning, it's my hope that an AEP on active duty today will someday become a PM at PMA-202 or 205.

Thanks so much for your time. Are there any observations you'd like to provide in closing?

Never forget to have fun. It's been a great career. The reason I never got out was that I had more good days than bad days and there was always something around the corner to look forward to.

Shipmates

Baggin' Hours:
An Account of an Interesting Flight

BY LT LEE SCIARINI, NAWC-TSD

I imagine that many an AEP found that the combination of work schedules, flight availability, and other commitments resulted in a call to a VR squadron for a big hour flight in order to maintain flight time. Recently, I found myself in this situation and was able secure a seat on a three-day mission transporting members of a VAQ for their deployment. This was definitely a "good deal" flight from the standpoint of logging hours as well as being able to interact with squadron personnel on their way to sea. Just a few days before it was set to depart, the mission dates slid to the right by one day. No big deal. After all, its Naval aviation and a passenger lift, so a change of this nature is almost expected.

The night before departure, I completed my personal "Long Duration VR Flight Checklist":

- NATOPS - current
- Suitcase - packed
- Snacks - plenty
- Pile of work to get caught up on - stacked and stowed
- Laptop, Phone, I-Pod - three charged and ready

ORM was easy for the drive into the squadron, a 1000 brief for a 1200 departure allows for a good night's sleep and missing the morning rush. Arriving at the squadron early, I had plenty of time to drop off my NATOPS jacket and make my way to OPs to attend the mission brief. Like clockwork, the brief started about fifteen minutes late. Nothing was missed - introductions, mission details, IMSAFE, CRM, etc. was wrapped up quickly. The only passengers on the first leg of the mission were a handful of Space-A travelers and there was plenty of time to preflight and load the venerable C-40A Clipper to meet the scheduled departure. During the course of preflight, the terminal notified the crew chief that one of the passengers was going to be carrying portable oxygen. Immediately, the discussion turned to checking the regulations for the situation and after review, transporting the passenger with his FAA approved oxygen generator would not be an issue. In keeping with sound CRM practices, the crew had a brief discussion about the matter to ensure that everyone had a common understanding of the situation.

So there I was … in the jump seat having what I am sure the pilot and co-pilot would consider the most riveting discussion about automation, mode awareness L-NAV, V-NAV, and the FMS when we were interrupted by a crew member entering the cabin. Calmly and professionally, she informed us that there was a problem with the passenger on oxygen. His pulse oximeter readings indicated that his blood oxygenation level (BOL) was low and he had become concerned. Immediately, the discussion changed to how the passenger was feeling and responding, and how he looked. I had already turned the quick release on my four-point harness and was on my way aft when the pilot asked "Can you have a look, Doc?" As many of us have said in the past when shipmates have asked us for our "professional" opinions about sore ankles or troublesome rashes, I replied, "Yes, sir, I'm not that kind of doc but I'll take a look." The words used in jest on numerous occasions during API, Primary, at NAMI, and around my current command suddenly carried seriousness. Fully aware that my education and training did not permit me to makes a diagnosis or a patient care decision, I made my way to the passenger. Fortunately, I was armed with enough knowledge about aviation physiology from my Naval Aerospace Experimental Psychology training and a slight familiarity with pulmonary and cardiac conditions to confidently assess the situation.

My initial concern was that the passenger was experiencing complications due to his medical condition, a situation that could have dictated a much different chain of events than those that unfolded. Fortunately, the passenger was sure that he was not in medical distress. Accepting his assessment, I began asking the passenger a battery of questions, which could reveal signs of hypoxia:

- Are you nauseous or dizzy?
- Are you having more trouble than usual breathing?
- Are you having problems with your vision?
- Can you tell me what colors these are? (the aircraft safety card is exceptional for this test)
- Do you have any tingling in your hands or feet?

I even asked him to touch his nose with his index finger. Fortunately, the passenger did not exhibit signs of being hypoxic. Feeling that the passenger was not in immediate danger, my questions shifted to what his normal and physician's BOL targets were for the ground and in an airplane. Instead of answering, the passenger complained that being over 30,000 feet was the cause of his problems and requested that we change our flight level. Putting on my aviation systems hat, I explained some of the finer points of pressurization systems and that the actual cabin pressure was significantly lower than our actual altitude. The passenger, perhaps growing tired of the scintillating (I thought so at least) pressurization lecture, eventually revealed that his oxygen generator was not properly charged and that he did not have the correct electrical adaptor that would permit an onboard recharge. With this new bit of information, concern shifted back to the passenger's medical condition and potential effects if his BOL continued to fall. A quick decision had the passenger using a first-aid emergency oxygen bottle in place of his faltering oxygen generator. After about five minutes on first-aid oxygen, the passenger's BOL had returned to a normal level. Comfortable that the passenger would not be in danger, the crew chief and I went to the cockpit to brief the pilot and copilot on the situation.

Having almost reached our halfway point, the mission commander decided to continue with the mission as planned. However, this was not the end of the process. Following sound CRM, the crew-members gathered in the cockpit to discuss issues that the situation presented. An immediate concern was the availability of first-aid bottles onboard the aircraft. One of the crewmembers checked the minimum equipage list. Unfortunately, it referred him to a publication that was not included in the aircraft's library of manuals. This revelation sent several crewmembers to complete a physical count of the bottles. Having discovered numerous bottles, our passengers stabilized BOL, and no other immediate concerns, the situation was deemed to be under control.

Reduced Oxygen Breathing Device (ROBD) training at the Aviation Survival Training Center simulates an altitude related hypoxia event while students are engaged in a flight simulator task.

After a short time had passed, the crew chief and I checked on the passenger. He indicated that he was feeling well and his BOL remained stable. Good news indeed, however, we discovered he had used about one-third of the oxygen bottle. The results of a quick calculation showed that our passenger would use almost half of the first-aid oxygen onboard before we arrived at our destination. This revelation started a discussion on the potential to jeopardize the capability to execute the overall mission due to restrictions concerning the required first-aid oxygen bottle to passenger ratio. We immediately headed to the cockpit to pass along this new information. Considering the new information and the uncertainty of replacing or refilling used oxygen bottles, the crew quickly arrived at the decision that the passenger could not remain onboard and began the task of diverting and landing the airplane.

The co-pilot began searching for an adequate field and found several locations capable of accommodating our needs, including an international airport. Fortunately, there was also an Air National Guard Base, the perfect selection. The field was contacted and the request to land was made. Clearance was given and we touched down within 20 minutes of the decision to land. As a precautionary measure, emergency services were awaiting our arrival. Additionally, a fuel truck was standing by at the request of the forward-thinking crew. I escorted our passenger and his wife off of the aircraft and into the terminal where we met EMTs. After a short time on deck, we were back on mission minus two passengers.

As far as aviation incidents go, this was barely a blip on the radar. The passenger was never in danger, the airplane was never in a tenuous position, and the crew performed professionally and decisively as the situation unfolded. Considering the routine that exists in just about every flight, one could easily fall into the "self loading baggage" trap. However, it is important to remember that aviation is unpredictable and no two flights are the same. Of course, the crews that we fly with are exceptionally trained and capable of handling situations without the assistance of an AEP, but we must remember that we are also exceptionally trained. As members of the flight crew we are obligated to remain cognizant of our in-flight responsibilities, and draw from our training and experiences to be active participants whenever racking up those coveted flight hours.

Shipmates

The “Pensacola” AEPs: Looking Back 50 Years

BY LCDR (RET) JIM JOHNSON, AEP #9

As we move into a new century of Naval Aviation, it might be timely to take a look back at what was going on and what some of the Aerospace Experimental Psychologists were doing during the 50th celebration of Naval Aviation.

Noteworthy developments were occurring in Building 16 on the Pensacola Naval Air Station. Building 16 was a two-storied, spacious, many-windowed, round building that housed, on the upper deck, the offices of the NAEPs and civilian AEPs. For the purposes of this article, NAEP refers to Navy uniformed Aerospace Experimental Psychologists, while AEP refers to their civilian counterparts. All of the psychologists, uniformed and civilian, were engaged primarily in research involving the prediction of pilot performance during flight training.

The emerging space age had a great influence on the activities of the NAEPs. Their efforts were enhanced by the introduction of computers, one of the technologies ushered in by the space age. Another outcome from the space age was the change of name from Aviation Experimental Psychology to Aerospace Experimental Psychology.

There were usually about a dozen NAEPs in Building 16. LCDR McMichael had not yet arrived, so Bill O’Connor was the Senior Officer Present Ashore (SOPA) and the only (“full bull”) Lieutenant. In those days, a master’s level entry came in as an Ensign and an entry with a Ph.D. entered as a Lieutenant Junior Grade. NAEPs did not receive flight pay, but some did receive hazardous duty pay ($110 monthly) for flying.

In 1961, the NAEPs in Pensacola were Bob Wherry, Larry Waters, Tony Morton, Dick Shoenberger, Jim Johnson, Bob Kennedy, Rick Doll, Larry Hardacre, Al Longo, Lee Beach, Len Green, and Stan Harris. Jim Goodson had recently departed for the Naval Medical Research Institute, Bethesda to study for his Ph.D. at the George Washington University. Stan Harris and Bob Kennedy spent most of their time with CAPT Ash Graybiel and Dr. Fred Guedrey near the slow rotation room up in the School of Aviation Medicine studying motion sickness and other vestibular issues. CAPT Allen Grinsted, NAEP #1 on the historical roster, was also in Pensacola on his twilight tour as a member of the staff of the Naval Air Training Command.

The civilian AEPs in Building 16 were Roger Berkshire (Department Head), John Bair, Rosalie Ambler, and Bush Jones. Marshall Bush Jones was a former NAEP who returned to Pensacola as a civilian AEP. Later, he became Dean at the Penn State Milton S. Hershey Medical School.

This was a busy time for both uniformed and civilian AEPs, with numerous publications typed (yes, I mean typed) at the School of Aviation Medicine in 1961. A sampling of those publications is provided in a table at the end of the article.

Meanwhile, Pensacola was abuzz with exciting celebratory activities. In April 1911, “Spuds” Ellyson, a Virginia-born submarine officer became Naval Aviator No. 1, thus solidifying l961 as the 50th anniversary of the birth of naval aviation. It was a big deal in Pensacola. Although some folks in San Diego might not agree, Pensacola is recognized as the “Cradle of Naval Aviation” and it was the breeding ground of NAEPs.

The 50th anniversary celebration at Sherman Field on the Pensacola Naval Air Station was breathtaking. The Blue Angels flew the sleek, long-nosed version of the Grumman F-11F Tiger, which was a majestic machine for aerial demonstrations. All of the latest Navy airplanes were on display, including the F-4 that Major John Glenn (later astronaut and Senator) had flown to set a speed record from Los Alamitos, CA to Floyd Bennett Field, NY, in three hours, 22 minutes, and 50.05 seconds. There were also performances by the Golden Hawks, the new Canadian military aerobatic flying team (in the F-86) and the U.S. Army Golden Knights parachute team.

The USS Antietam, the Navy's training carrier, was operating out of Florida, primarily between Pensacola, for basic flight training carrier landings and Corpus Christi, for advanced flight training carrier landings. Furthermore, the Antietnam provided a landing spot for some NAEPs hitting the boat for the first time in the backseat of a T-28 out of Whiting Field, after practicing field carrier landings at “Bloody Barin” (Naval Auxiliary Air Station Barin Field).

The city of Pensacola itself was also ablaze with festivities. Admiral Dan Gallery, naval aviator and World War Two hero, brought in the Navy Steel Band. The band performed on a lower balcony of the old San Carlos Hotel in downtown Pensacola, while there was dancing in the street below. The San Carlos was still open for business and sometimes provided temporary lodging for incoming NAEPs. The best restaurants in town were the Driftwood and Carpenters. Carpenters was especially appealing to NAEPs because it was located in Warrington, near the base. It also had the lure of the "Side Bar," which, according to some of the spouses, was not such a good thing!

Additional distractions from scientific endeavors were the weekly duplicate bridge parties enjoyed by NAEPs and AEPs, and their spouses, and Bob Kennedy's famous BOQ 600 parties, which attracted BOQ residents, some AEPs, and occasionally, local celebrities and camp followers. One of the prominent features of his parties was a life raft containing rum punch made with equal parts of grape juice, grapefruit juice, grain alcohol, and dry ice served with a ladle from an ammunition container. It served 50.

Trader Jon's did a good business during the 50th anniversary. Traders was famous worldwide. It was a nightclub (and later a museum) featuring exotic dancers and was especially appealing to flight students who would save up their shekels to visit during their time off from training. Once, there was an unfortunate incident where a couple of the students tied a boa constrictor, used by a dancer as part of her act, into a knot. The poor snake succumbed of a broken back! The late Martin Weissman, known to adoring customers around the world as "Trader Jon," opened the bar in 1953 and presided over it until he suffered a debilitating stroke in 1997. His claim to fame, other than being a wing-walker at air shows, was that if you ever caught him wearing a pair of matched socks, he would buy you a drink.

Perhaps the NAEPs in 1961 weren't as well organized as they are today (e.g., no "Call Signs"), but the camaraderie and networking interactions that existed in 1961 seem to remain. Therefore, as shown by research, it seems reasonable to conclude that since past behavior is a pretty good predictor of future behavior, the present group of active duty NAEPs is in for a bright future.

List of AEP Publications from the School of Aviation Medicine in 1961

- Ambler, Berkshire, & O'Connor - *The identification of potential astronauts*
- Ambler, Bair , & Wherry - *Factorial structure and validity of naval aviation selection variables*
- Ambler & Longo - *Student suggestions concerning the flight and NAO training programs*
- Ambler & Longo - *Suggestions to improve the flight and NAMI training programs*
- Goodson & Jones - *In-flight suggestibility*
- Graybiel, Guedry, W. Johnson[1], & Kennedy - *Adaptation to bizarre stimulation of the semicircular canals as indicated by the oculogyral illusion*
- Johnson - *An evaluation of a device designed to teach the principles of trimming an aircraft*
- Johnson & Berkshire - *The use of newly designated aviators as instructors*
- Jones, Ambler, Waters, Doll, Longo, & Johnson - *The technology of behavior, request for comments*
- Kennedy and Graybiel - *Validity of tests of canal sickness in predicting susceptibility to airsickness and seasickness*
- Klein, Mendelson, & Gallagher[2] - *The effects of reduced oxygen intake on auditory threshold shifts in a quiet environment*
- Longo & Ambler - *Suggestions to improve the flight and NAO training programs*
- Shoenberger - *Flight surgeon officer indoctrination course*
- Shoenberger & Berkshire - *The relation of performance in aviation training to officer quality in the fleet*
- Voas - *Project Mercury astronaut training program*
- Voas - *Some implications of the Project Mercury experience for future astronaut training programs*
- Waters - *Stability of EPPS need scale scores and profiles over a seven-week interval*
- Waters & Wherry - *A note on the stability of the preference index in forced-choice blocks*
- Waters & Wherry - *Evaluation of two forced-choice formats*
- Waters & Wherry - *Predicting voluntary withdrawal from flight training by means of a forced-choice scale: Construction, preliminary validation*
- Wherry, Stander, Leight, & Lecznar - *General on-the-job criteria of airman effectiveness applied to three career fields*

[1]AEP Woody Johnson transferred to the Army and became a helicopter pilot
[2]Thom Gallagher, AEP #5, was in graduate school at Temple University at the time of this publication

Bravo Zulu

AWARDS

Congratulations to the following AEPs on their recent awards!

- CAPT Sean Biggerstaff, awarded the Meritorious Service Medal from NAVAIR 4.6 for his end of tour.
- CDR Deb White, awarded the Navy & Marine Corps Commendation Medal for her exceptional management of source selection work on a $490M omnibus contract for NHRC.
- CDR Sidney Fooshee, awarded the Navy & Marine Corps Commendation Medal from NAVAIR 4.6 for his end of tour.
- CDR Jeff Alton, awarded the Navy & Marine Corps Commendation Medal from Naval Safety Center for his end of tour.
- LCDR Hank Phillips, awarded the Navy & Marine Corps Commendation Medal from NAMI for his end of tour.
- LCDR Chris Foster, awarded the Navy & Marine Corps Commendation Medal from CNATRA for his end of tour.
- LCDR Tatana Olson, awarded the Meritorious Service Medal from OPNAV N1 for her end of tour.
- LCDR Pete Walker, awarded Navy & Marine Corps Commendation Medal from the U.S. Navy and Marine Corps School of Aviation Safety for his end of tour.
- LT Tony Anglero, awarded Navy & Marine Corps Commendation Medal from NAMI for his end of tour.

PUBLICATIONS & PRESENTATIONS

- Eggan, S.M., Lazarus, M.S., Stoyak, S.R., Volk, D.W., Glausier, J.R., Huang, Z.J., & Lewis, D.A. (2011). Cortical GAD67 deficiency results in lower cannabinoid 1 receptor mRNA expression: Implications for schizophrenia. *Biological Psychiatry*, Epub ahead of print.
- Eggan, S.M. NMRU-Dayton investigates neural localization of spatial processing. *Naval Medical Research and Development Newsletter, 3(8)*, p. 5.
- Wells, W.H., Karwowski, W., Sala-Diakanda, S., Williams, K., & Pharmer, J.A. (in press). Application of systems modeling language (SySML) for cognitive work analysis in systems engineering design process. *Journal of Universal Computer Science.*
- LCDR Pete Walker's manuscript, "Behavioral Event Data and Their Analysis," was accepted to *Data Mining and Knowledge Discovery*, the premier technical journal focused on the theory, techniques, and practice for extracting information from large databases. The manuscript explored the analysis of human adversarial behavior in Iraq and Afghanistan by encoding data as a trail of events over time and space. LCDR Walker and co-authors presented a novel approach to representing these data as graphs or tensors that allowed them to decompose event data to identify areas of intense activity and to predict what types of adversarial behavior are highly related.
- LCDR Pete Walker presented a paper at the 2011 Human Factors and Ergonomics Society Meeting on *"Evaluating the Utility of DoD HFACS Using Lifted Probabilities"* analyzing HFACS data from Naval and Marine Corps Mishaps.
- LCDR Tatana Olson co-authored a paper, entitled, "*Navy Results from the Don't Ask, Don't Tell (DADT) Survey: Importance of the Contact Hypothesis*," to be presented at the Defense Equal Opportunity Management Institute 8th Biennial Research Symposium.

LT FINDLAY WINS THE GOLDEN PEN AWARD FROM NNOA

LT Rolanda Findlay was awarded the Golden Pen Award at the 2011 National Naval Officers Association (NNOA) Annual Conference in August for her diligent efforts in revitalizing the Pensacola NNOA chapter. The Golden Pen Award is presented annually to a junior officer (O-3 and below) who excels in the accomplishments of the goals and objectives of NNOA. LT Findlay acted as the Pensacola Chapter Treasurer and Scholarship Chair (responsible for the solicitation, selection, and presentation of two NNOA Pensacola Chapter scholarships). In addition, her coordination and continued involvement in community outreach events with organizations such as Junior Achievement, Loaves & Fishes Soup Kitchen, and local area churches allowed the Pensacola chapter to accomplish NNOA's mission within its first year back in action.

Calendar: Mark These Dates Down!

March 12-14, 2012
2012 Symposium on Human Factors and Ergonomics in Healthcare in Baltimore, MD

April 26-28, 2012
27th Annual Conference of the Society for Industrial and Organizational Psychology in San Diego, CA

Spring 2012, Date TBD
Department of Defense Human Factors Engineering Technical Advisory Group Meeting, Wright-Patterson Air Force Base. Please check http://www.hfetag.com/meetings.html for dates

May 13-17, 2012
83rd Annual Scientific Meeting of the Aerospace Medical Association in Atlanta, GA

May 24-27, 2012
24th Annual Convention of the Association for Psychological Science in Chicago, IL

July 21-25, 2012
4th International Conference on Applied Human Factors and Ergonomics in San Francisco, CA
2nd International Conference on Cross-Cultural Decision-Making in San Francisco, CA

August 2-5, 2012
120th Annual Convention of the American Psychological Association in Orlando, FL

USN AEP SOCIETY

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