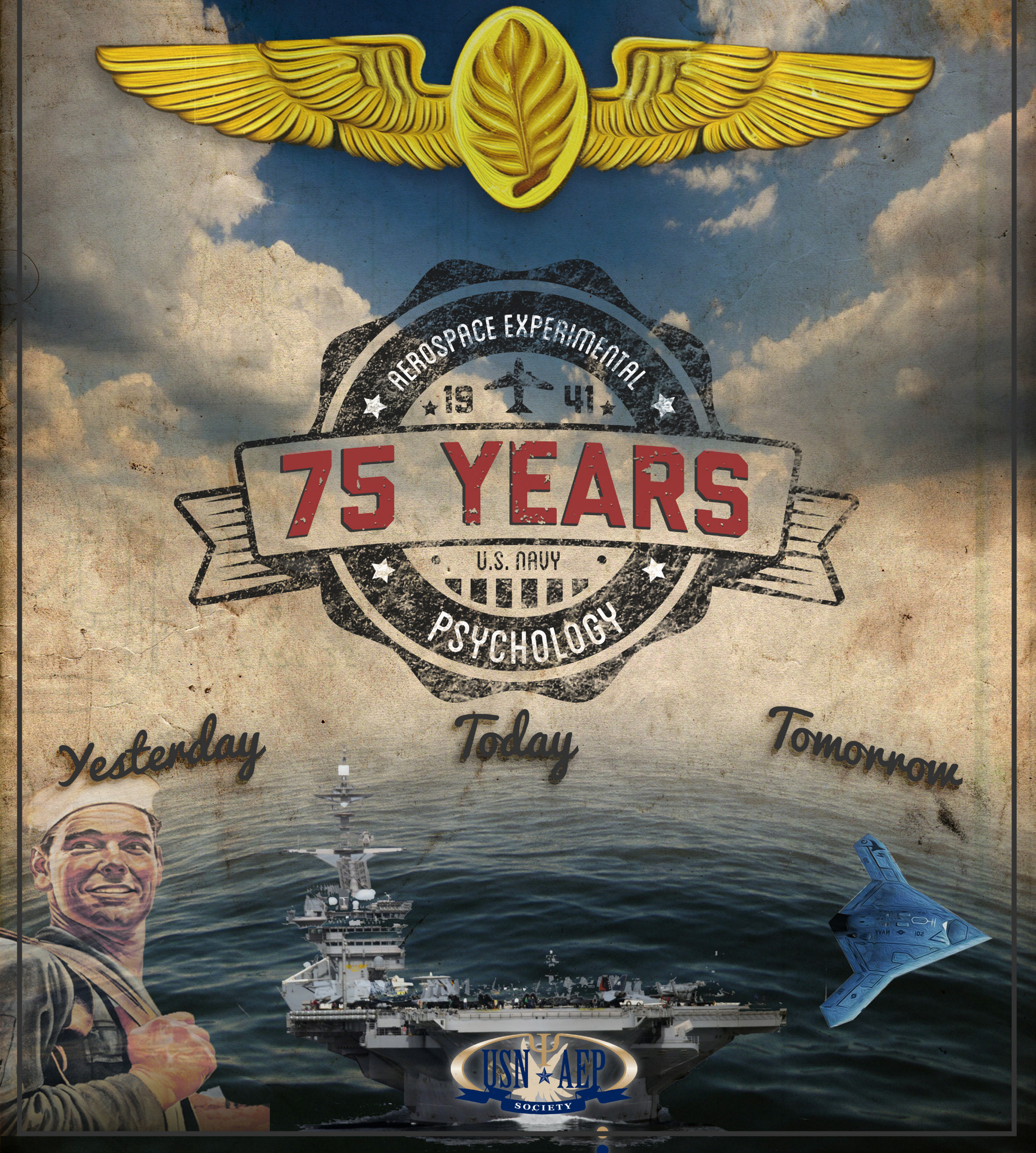
CALL SIGNS


AEROSPACE EXPERIMENTAL
19 41
75 YEARS
U.S. NAVY
PSYCHOLOGY
Yesterday
Today
Tomorrow
USN AEP
SOCIETY

CONTENTS

ABOUT THE USN ★ AEP SOCIETY

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

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

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

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

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MESSAGE FROM THE PRESIDENT

LCDR BRENNAN COX, AEP#142

HAPPY 75TH ANNIVERSARY U.S. NAVAL AEROSPACE EXPERIMENTAL PSYCHOLOGISTS!

In our spring issue of Call Signs, we reported the first H-V(S) class of Naval Aviation Psychologists was established in 1941 – thus marking 2016 as the year of our Diamond Celebration. In this issue, we take time to reflect on our AEP past, in addition to present and future activities, in appreciation of our community's heritage.

Heritage. It's one of the core values of the Medical Service Corps Director, RDML Anne Swap. A word that calls to mind the history, traditions, and cultural elements of a particular group or society. Features of the past that remain important today. That which is worth saving and should be preserved for future generations.

"The Navy has both a tradition and a future – and we look with pride and confidence in both directions." - Admiral George Anderson

CAPT(r) Frank Petho, AEP #64, is a revered AEP historian. In this issue of Call Signs, he brings us back to our beginnings with a series of articles on the initial years of our community, including biographical sketches of our earliest leaders – John G. Jenkins, Jack W. Dunlap, and E. Lowell Kelly – and a remembrance of the "Lost 100," those naval aviation psychologists who were procured during World War II, yet have not appeared on our historical roster.

Next, we feature updates from the Naval Health Research Center and Naval Medical Research Unit Dayton on existing areas of AEP research and development. First, Jay Heaney and I provide an overview of an Osprey medical evacuation training tool being assembled in San Diego, CA, to help trainees become familiar with the human factor challenges confronting medical providers within this unique aircraft. LT Todd Seech, AEP #153, follows with highlights on NAMRU-D's neurocognition laboratory, with emphasis on its electroencephalography and magnetic resonance imaging capabilities, concluding with an introduction to the lab's new disorientation research device, "the Kraken."

In our final article, CAPT(r) Mike Lilienthal, AEP #71, discusses autonomous systems, what they mean for the Department of Defense, including important human factor considerations, and the role AEPs will play in addressing the "Third Offset."
As we start a new chapter in 2017, let us take time to reflect on where we have been, where we are now, and where we are heading in the future.

"Know from whence you came. If you know whence you came, there are absolutely no limitations to where you can go." - James Baldwin

On behalf of the USNAEPS EXCOM, Happy Holidays and Happy Anniversary! We hope you enjoy this issue of Call Signs. Thank you for your continued support of the Society!

AEP ORIGINS: THE AUTHORITY TO PROCURE OFFICERS

BY: CAPT (RET) FRANK PETHO, AEP #64

In 1794, the United States requisitioned six new frigates and the men to operate them. There were six officer grades and 14 enlisted ratings.[1] By 1944, there were 10 commissioned officer grades and 124 enlisted ratings.[2] Today, there are still 10 commissioned officer grades, but with 74 subspecialty designators, and 91 enlisted ratings, but with 1,399 subspecialty codes.[3]

The point here is that probably all of the ranks, rates, ratings, designators, and enlisted classification codes in the Navy have their own creation tales, but one thing rings true: no Navy occupation officially exists until it is administratively codified and formally documented in the rules, regulations, and directives of the Navy's personnel system, and only then is it authorized to procure manpower.

On 07 February 1941, RADM Chester Nimitz, the Navy personnel chief, formally established a class of officers designated as H-V(S) for Naval Aviation Psychologists. H-V(S) officers were "those applicants who could not qualify in the Medical Corps but who were desired for duty." He wrote, "It is considered that this class is more appropriate for the designation of psychologists and directed that psychologists will be appointed in class H-V(S)."[4]

Carrier aviation grew from its start in 1910, through WW1 and into WW2, when "flat tops" assumed at least equal operational importance with battleships. Naval aviation's growth was explosive. In 1929, it had one carrier. In 1937, it had five.[5] In 1941, it had eight, and in WW2, it had 33.[6,7] In 1938, it had 1,000 planes. In 1942, it had 27,500, but actually procured 67,000 during the war to account for losses. In 1939, it had 11 air stations and 8 reserve bases. During the war, it had almost 80 air stations and scores of outlying fields.[8]

1 Source: https://www.navycs.com/navy-jobs
2 The Bluejacket's Manual 12th ed. (Annapolis, MD.: U.S. Naval Institute, 1944).
3 Navy Enlisted Occupational Standards, Volumes I and II, NAVPERS 18068F, January 2016
4 The Bluejacket's Manual 12th ed. (Annapolis, MD.: U.S. Naval Institute, 1944).
5 The Bluejacket's Manual 12th ed. (Annapolis, MD.: U.S. Naval Institute, 1944).
6 Source: http://www.hazegray.org/navhist/carriers/us_fleet.htm
7 Source: https://en.wikipedia.org/wiki/United_States_Navy_in_World_War_II
8 Source: https://www.ibiblio.org/hyperwar/USN/Building_Bases/bases-10.html

Meanwhile, beset by debilitating attrition rates, the pilot training pipeline swelled. In the five-years from 1935 to 1939, the Navy produced 2,030 aviators. In the five-years from 1940 to 1945, it produced 29,302. The sheer number of students needed to attain annual outputs of 6,000 aviators forced planners to reduce attrition in training dramatically.

In early 1941, H-V(S) psychologists entered the picture, using their so-called "numerical methods" to develop and validate paper-and-pencil tests to select aviators. The operational requirement was stark. The Navy needed new selection tools, because, since WW1, the flight physical, which remained unchanged save for an ineffective psychiatric interview for assessing aeronautical adaptability, failed to reduce attrition rates that soared beyond 50%. In fact, in some cities, the interview alone rejected upwards of 40% of applicants.

The numerical method used statistical methods

Navy officer grades and enlisted rates, circa WWII

from the study of individual differences, an area of psychological research that sought to statistically map the range and variability of human behavior in various settings, in this case a warplane's cockpit.[9] In fact, Navy flight surgeons, dissatisfied with the predictive utility of the flight physical, had already begun collecting paper-and-pencil data in the mid-1930s to augment the physical examination.

In January 1942, the National Research Council assigned John G. Jenkins, a civilian industrial psychologist at Cornell and later University of Maryland, to head BuAer's fledgling, but administratively overburdened testing office. With Jenkins onboard, the Surgeon General established the Aviation Psychology Branch in BuMed's Aviation Medicine Division on 29 October 1942. Jenkins procured almost 100 psychologists during the war, fathered a dynamic and sprawling research program, and provided his men and women with unparalleled covenant leadership, close-bound mentorship, and a broad sustaining vision.

The H-V(S) designator ended when Congress created the Navy Medical Service Corps in 1947. Most of the original band of H-V(S) psychologists left the Navy by 1946 and returned to academe (40%) or industry (12%). The 6% who stayed in the Navy extended the empirical arc and cultural contours that insinuated in this young community during the war years and, in 1965, established today's Naval Aerospace Experimental Psychology community, the successor organization to the original H-V(S) cohort.

9 Compare Japan's approach to aviator selection offered by a Japanese psychologist after the war. "The strictly numerical approach is inimical to the Japanese temperament. Whether it be in the making of swords, the design of prints, or the construction of psychological tests, the Japanese must always do something artistic. In assessing candidates for the Air Force, we try to arrive at an artistic judgment." Navy Department, BuMed Newsletter, Aviation Supplement, Vol. 6, No. 12, 21 June 1946, p. 3.

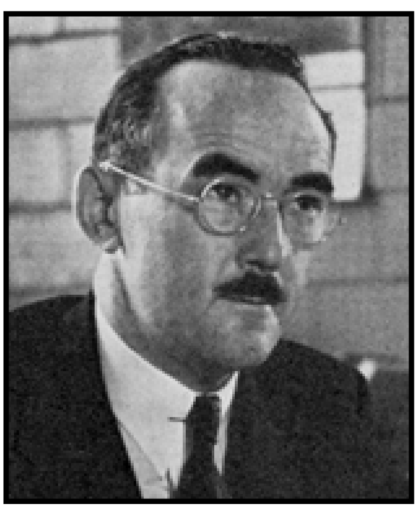
BIOGRAPHICAL SKETCHES OF EARLY AEP LEADERSHIP

BY: CAPT (RET) FRANK PETHO, AEP #64

From 1941 through 1944, the Navy procured only three direct commissioned H-V(S) officers in the rank of Lieutenant Commander, under the auspices of paragraph H-2317 in the Navy's personnel manual.[1] All three appointments were commensurate with the age, academic seniority, practical experience, and demonstrated ability of these men to fulfill the specific duties of a particular mobilization assignment. The appointments included John Jenkins from the University of Maryland, who entered in January 1942; Jack Dunlap from the University of Rochester, who entered in November 1942; and E. Lowell Kelly from Purdue University, who entered in December 1942.

The average age of the original 96 H-V(S) psychologists was 30 years (median age, 26). Jenkins was 41 when he entered. Dunlap was 40. Kelly was 37. Thus all three men met the age consideration for direct commission to LCDR, which, as the following sketches attest, was unequivocally corroborated by their extensive professional record, academic seniority, and practical experience.

The three leaders insinuated the then growing community of H-V(S) officers with their espousal and professional practice of the so-called "numerical methods;" measurement and scaling, performance assessment and quantification, experimental design and statistical treatment of data, and a straightforward, unrestrained empirical approach to problem solving and description.



John G. Jenkins

Jenkins received his bachelor's degree from Cornell University in 1924; his master's degree from Iowa State College in 1927; and his Ph.D. from Cornell in 1929. He moved briefly to Iowa State College as an Assistant Professor after receiving his doctorate, but soon returned to Cornell in 1930 where he remained until recruited to the University of Maryland in 1937. During those early years, he gained a reputation for being a brilliant teacher and demonstrated an excellent administrative ability. He pursued a variety of applied research problems, and formalized his views on applied psychology which he called "Psychotechnology."

As an assistant professor at Cornell in 1935, Jenkins published Psychology in Business and Industry: An Introduction to Psychotechnology, a text that explored the use of controlled observation and statistical analyses to address questions raised by industry, ranging from market research and advertising effectiveness, worker motivation, industrial production, to corporate personnel issues. He stressed the importance of careful data collection compared to anecdotal and conventional wisdom, and argued that applied research was methodologically no different from traditional experimental research except in its subject matter. He also argued that applied psychology was ascendant because it dealt with practical affairs, while traditional research had become sterile and steeped in arcane theory.

As the country prepared for war in the late 1930s, Harry Clifton "Curley" Byrd, who became President of the University of Maryland on 1 July 1935, sought someone to lead and develop an applied psychology department. He recruited and appointed Jenkins as department chairman in 1937. Jenkins arrived in College Park, MD in 1938, and immediately started recruiting on his own. By the spring of 1938, the prewar faculty consisted of five members who assiduously began developing new courses for a program in applied psychology. A faculty member who taught one of the first courses later wrote:

In the spring of 1938, the program was launched. Jack and I began instruction in applied psychology. I can't convey the feeling of excitement we felt. The students ... all undergraduates felt it too and our classes were much larger than

1 Paragraph 2317. Officers, Volunteer Reserve, (Special Service), Class H-V(S)

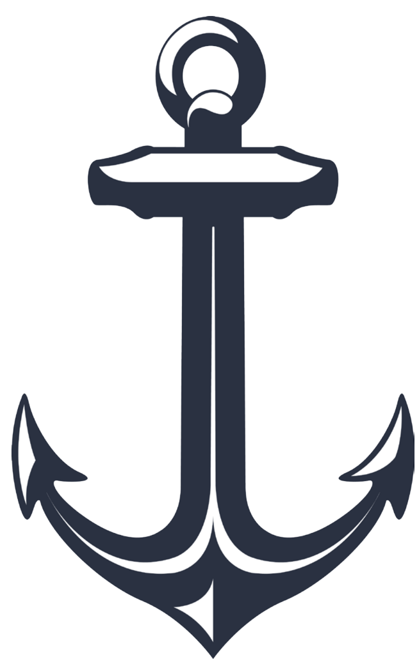
anticipated.... We liked everyone and everyone liked us.[2]

The 1938-1939 academic catalog listed 15 undergraduate courses: Introduction to Psychology, Applied Psychology, Psychology for Students of Commerce, Psychology of Individual Differences, Educational Psychology, Experimental Social Psychology, Child Psychology, Mental Hygiene, Abnormal Psychology, Psychological Problems in Market Research, Psychology in Advertising and Selling, Psychological Tests and Measurements, Psychological Aspects of Industrial Production, Psychology of Personnel, and Techniques of Interrogation. Graduate level courses included: Research in Psychotechnology, Seminar in Educational Psychology, Seminar in Current Psychotechnological Problems, and Participation in the Testing Clinic.[3]

Along with his duties as chairman of the department, Jenkins also chaired the National Research Council (NRC) Committee on Selection and Training of Aircraft Pilots from 1939 to1940 and directed the committee's research from 1940 to 1941. In July 1940, the Civil Aeronautics Administration (CAA) and the NRC launched the Pensacola Project on the Selection of Naval Aviators. Psychologists from NRC and flight surgeons from the Medical Research Section of the Bureau of Aeronautics (BuAer) and the Aviation Medical Division of the Bureau of Medicine and Surgery (BuMed) focused on producing a battery to select aviators.[4] The battery's validation began 15 February 1941, when Chief, BuAer directed the use of three paper-and-pencil tests following the flight physical. On 26 November 1941, he followed up with a letter to Naval Reserve Aviation Bases and all Naval Aviation Cadet Selection Boards directing the use of test scores in decisions concerning a student's fitness to continue training in Naval Aviation.

In January 1942, NRC assigned Jenkins to head BuAer's fledgling, but administratively overburdened testing office. At the same time, the Navy appointed Jenkins a LCDR and ordered him to report for duty. With Jenkins onboard, the Surgeon General established the Aviation Psychology Branch in BuMed's Aviation Medicine Division on 29 October 1942. Jenkins procured almost 100 psychologists during the war, fathered a dynamic and sprawling research program, and provided his men and women with unparalleled covenant leadership, close-bound mentorship, and a broad sustaining vision. He attained the rank of Captain before his discharge in 1945, at which time he returned to the University of Maryland.

During his Navy service, Jenkins often discussed plans for revitalizing the department at Maryland upon his return. By the time the war was over, his plans were fairly well developed. His thinking was affected by his wartime experiences, the kinds of problems with which he dealt, and the kind of professionals with whom he associated during his four year Navy tenure. Upon his return to academe, he recruited a team of ten psychologists from 1945 to 1948 from four broad areas: social psychology, counseling and clinical psychology, statistical design and industrial psychology, and human engineering. Jenkins felt that he had a masterful team. He wanted well-trained, diversified graduate students, but with a focus on industrial psychology.
There was a palpable excitement at Maryland, an excitement based primarily on Jenkins' indefatigable energy and his fresh view of the future of psychology. The Maryland Conference on Military Contributions to Methodology in Applied Psychology, chaired by G. A. Kelly, one of Jenkins' wartime H-V(S) shipmates, had just been completed, and there was a general ferment about psychology, particularly applied



2 Ghiselli, Edwin E., "Some Recollections of Early Days in Department of Psychology at the University of Maryland," (1958), File held in the Department of Psychology, University of Maryland, College Park. Cited in Anderson, N. S., The First Thirty Years. A Short History of the Department of Psychology at the University of Maryland, College Park, unpublished manuscript, October 1996.
3 Jenkins, J. G., "A Departmental Program in Psychotechnology," J. Consult. Psychol., Vol. III, No. 2, p 54-56, March-April 1939.
4 Petho, F. C., A History of Naval Aviation Psychology During World War Two, presented at the 35th Annual Conference of the Military Testing Association, 15 – 18 November 1993, Williamsburg, VA

and industrial psychology. Nine H-V(S) officers presented at the conference, but Jenkins made the opening remarks:

We were brought in, in an era of gloom and defeat, under the conviction that things were so bad that any available magic should be tried, even psychology. We have worked four years, more or less. Now we are going out the … front door, labeled as military specialists … . Victory has replaced defeat; concrete realization of what psychologists can do has replaced a vague hope that they might possibly do something; and a warm and cordial acceptance has replaced a suspicious and grudging admission to the military work-place.[5]

But, there were unmistakable signs that the burdens Jenkins carried during the war and during the revitalization of the department afterward took their inexorable toll. By Thanksgiving of 1947, he had gradually fallen into a deep depression and stopped teaching at the Christmas break. On Friday, 30 January 1948, he took his own life in the basement of his home in College Park.

An H-V(S) shipmate from his war years, Jack Dunlap, eulogized him.

He was the most energetic worker among those he led and it was this very quality which proved his undoing, for he drove himself as few men can. He was never too busy to refuse help, either to a person or a group, the constant demand which was made on him for service with many committees was a gratifying recognition of the contributions he had made and could make again to various professional problems. The unending flow of requests for advice and guidance by students and associates, by friends and friends of friends, was a tribute not only to his accessibility and understanding but also to his competence as a professional psychologist.[6]

The University appointed Denzel Smith, another H-V(S) shipmate with whom Jack served, as Interim Chairman of the Department in February 1948.[7]

5 Jenkins, J. G., New Opportunities and New Responsibilities for the Psychologist, in Maryland Conference on Military Contributions to Methodology in Applied Psychology, 27-28 November 1945, p. 1.
6 Dunlap, J., "In Appreciation," Personal Psychology, Vol. 1, 1948, pp. 109-110.
7 Bennett, G. K., "John Gamewell Jenkins: 1901-1948," Am. J. Psychol., 1948, 61, 433-435.

Jack W. Dunlap

Dunlap entered Kansas State University in 1919, majoring in economics and statistics, got his bachelor's degree in 1924, his master's degree in 1926, and then started a doctoral program at Stanford University, studying under Lewis Terman.

He left Stanford in 1927 to take a Dean's job elsewhere, but returned to his doctoral work at Columbia University, studying under Edward L. Thorndike. He was appointed Associate Professor of Educational Psychology at Fordham University in 1932, and in 1937, left Fordham for a five year tour at the University of Rochester, where he served as Associate Professor of Educational Psychology, before joining the Navy. In his career, Jack taught elementary, secondary, college undergraduate, and graduate school courses.[8]

Reflecting his interests in psychometric methods, he authored or coauthored 42 scholarly products from 1930 to 1942. He was one of the founders of the Psychometric Society, served as its president in 1942, and was editor of the Journal of Educational Psychology, Journal of Experimental Education, Personnel Journal, and Psychometrika.

In 1940, while an Associate Professor at Rochester, the NRC choose him as Director of Research for the Committee on Selection and Training of Aircraft Pilots from 1941 to 1942, the same job John Jenkins held before he too joined the Navy in 1942.

While Dunlap was still at the University of Rochester, he supervised a new CAA program called the National Testing Service. The service, which started in June 1942, standardized administration and scoring of aviation selection tests on a nationwide

8 Kurtz, A. K., "Obituary. Jack W. Dunlap," Am. Psychol., Vol. 34, No. 6, p. 538.

basis and reported the results, usually within 24 hours, to selection boards and candidates via telegrams and air mail. In its inaugural run, the service tested 16,379 applicants in 44 days between June and August 1942 and by January 1943, it tested 62,323 applicants.[9] In 1942 and 1943, Navy Pilot Training Rates topped 6,000 a year.

Dunlap's first Navy tour was in the Aviation Psychology Branch at BuMed in Washington, DC. He joined seven officers who staffed the section; among them were John Jenkins, Donald W. Fiske, and E. Lowell Kelly.[10]

Dunlap and Kelly quickly got involved in selection issues that confronted BuAer, such as establishing cut-off scores on selection tests for V-5 candidates.

After his tour at BuMed, he was appointed Officer-in-Charge of the Aviation Free Gunnery Training and Research Unit at Naval Air Station Boca Chica, FL, near Key West.[11] After Boca Chica, he served at the Purcell Naval Air Gunners School at Naval Air Technical Training Center in Purcell, OK, and later at the Naval Air Gunners School at Naval Air Station Jacksonville, FL.

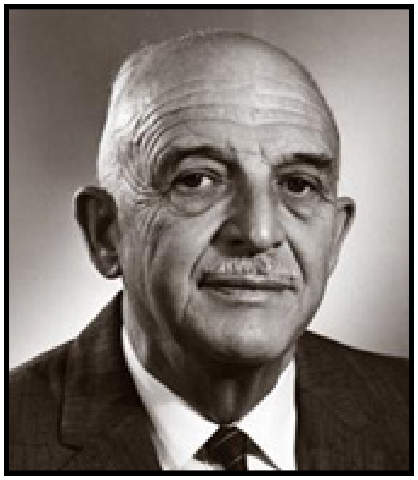
His last assignment was with the Office of Naval Intelligence in Operation Paperclip. Operation Paperclip was a classified Office of Strategic Programs project that started in 1945. Its objective was to look for equipment, documents, and facilities, but above all, to identify and move Nazi scientists, engineers, and technicians out of Germany after the war to prevent Russia and Britain from exploiting Nazi technical talent. The operation brought almost 1,500 Germans to the United States.[12]

Jack's mission was to find and transport the engineering staff and the drawings for the Messerschmitt ME 262, the world's first operational jet fighter. In a few weeks, he found what he was looking for and arranged to have Douglas DC-3's land in Leipzig to pick-up key staff members and their families and fly them to Paris.[13]

Armed with about 100 cartons of cigarettes to trade, Jack then spent another several months in Germany near Hamburg and Kiel. He wrote three reports while in the Navy; two related to aerial gunnery, and one describing devices Germany used to train operators of several types of guided missiles.

Captain Dunlap separated from the Navy in 1946 and joined The Psychological Corporation in New York City. He left The Psychological Corporation in 1947 to form Dunlap and Associates in 1950, which became one of the premier human factors consultancies in the nation.[14]

E. Lowell Kelly



Kelly earned his Bachelor of Science degree at Purdue University in 1926, his Master of Arts degree from Colorado College of Education in 1928, and his Ph.D. in Psychology from Stanford University in 1930. He worked as a high school principal in Taiban, New Mexico after he graduated from Stanford, and later, joined the psychology faculty at the University of Hawaii, and then the University of Connecticut. From 1939 to 1942, Kelly served as a faculty member at Purdue University and Director of the Psychological Clinic at Purdue University.

One of Kelly's first NRC-CAA projects at Purdue concerned the selection of naval aviators. He was instrumental in devising a way to statistically predict future cadet flight training proficiency using biographical information from the past and his assessment was incorporated into the first Naval Aviation Questionnaire, which was fielded in November 1941, a week before Japan attacked Pearl Harbor. The paper-and-pencil test, the Biographi-

9 Report on C.A.A - National Testing Service, (Second Phase: 03 August 1942 to 15 September 1942, Third Phase: 16 September 1942 to 15 November 1942, Fourth Phase: 16 November 1942 to 31 January 1943), prepared by National Research Council Committee on Selection and Training of Aircraft Pilots, Report Number 9, Washington, DC., January 1943, p. 1.
10 Chapter II, The First War Year, 1942.
11 See "The Aviation Gunnery Group" in Fiske, D. W., "Naval Aviation Psychology. IV. The Central Research Groups," American Psychologist, Vol. 11, 1947, p. 68.
12 Source: "Operation Paperclip", https://en.wikipedia.org/wiki/Operation_Paperclip

13 Orlansky, J., ob. cit., p. 50.
14 Orlansky, J., ob. cit., p. 51.

cal Inventory (BI), sought to predict with statistical accuracy what experienced interviewers predicted by professional skill, practice, and intuition.[15,16]

The items, which were elements of personal history and expressions of attitudes and interests, were originally part of a large pool of items written by experts in aviation training and personal interviewing. That pool was successively reduced by eliminating items which failed to show statistically significant differences between two criterion groups, students who passed and students who failed. This analysis ultimately produced a subset of items which consistently and dependably predicted "passers" and "failers." The BI, developed over 75 years ago, is still used today in the Navy's Aviation Selection Test Battery.

Kelly was also Project Director from 1940 to 1942 on pioneering research into pilot training. An obstacle for flight training research at the time was that since training aircraft only had two seats, there was no way to accurately record the all-important verbal exchanges between an instructor and a student. So, Kelly's team coupled a short-wave transmitter to the plane's intercommunication system, which enabled researchers to continuously capture the instructor/student dialog, transmit it to ground stations, where it was recorded, transcribed, and analyzed.

Kelly's team studied the transcripts of four pairs of instructors and their students each recorded for ten hours. It found 500 different words, terms, and phrases that were unique to individual instructors, that a lot of instruction could have been given on the ground rather than in the air, and that many instructors lacked good teaching procedures.[17]

Based on the data, Kelly developed training aids that obviated the spontaneous instruction given by instructors in the air. The aids provided instructors and students with a simple, complete, and standardized description of each flight maneuver in a sequence of language that was precisely coordinated with the cockpit control inputs that effected the maneuver. These lucid textual descriptions, accompanied by drawings, were and still are called "patter," which is the special language instructors use while they demonstrate maneuvers in the air. [18]

Kelly reported for duty in the Navy in December 1942. He was assigned to the Aviation Psychology Section in BuMed, where he served with his CAA colleagues, Jack Jenkins and Jack Dunlap, among others. While at the Bureau, he investigated a spate of inflight accidents at night and discovered that they were caused by students who were unable to judge their distance from a plane if that leading plane had only one tail light. So, he argued for putting two equidistant lights on the tail to help judge closure distances. Midair accident rates dropped precipitously.

He was awarded a Secretary of Navy's Letter of Commendation before he separated in 1945, and took a position at the University of Michigan. At Michigan, Kelly's research interests were basically an extension of the work he did in the Navy, which was centered on the ubiquitous numerical methods: devising assessment instruments and rating scales, measuring job performance, evaluating psychological factors in marital compatibility, assessing qualifications for professional training, and benchmarking personality markers using longitudinal studies. With Donald W. Fiske, an H-V(S) officer with whom he served at BuMed, he published a classic study on the prediction of performance of clinical psychologists.

Kelly served 25 years as director of the university's Institute for Human Adjustment. He was on the Board of Directors for the American Psychological Association (APA) for years, was president of the Division of Consulting Psychology and the Division of Clinical Psychology, and was elected president of the APA in 1954. He chaired the Executive Committee for the Boulder Conference on Graduate Training in Clinical Psychology (1948–49), espousing the scientist-practitioner model. He served as a consultant to the National Selective Service, the Veterans Administration the National Institutes of Health, the Educational Testing Service, the National Science Foundation, the Agency for International Development, and the Peace Corps.

15 Kelly, E. L., The relationship of background and personality factors to pilot competency, Progress Report, September 1940.
16 Kelly, E. L., and Ewart, E. S., A preliminary study of certain predictors of success in Civilian Pilot Training. Washington, D. C., CAA Division of Research, Report #7, December 1942.
17 Kelly, E. L., The flight instructor's vocabulary, Washington, D.C., CAA Division of Research, Report #32, October 1943.
18 Kelly, E. L., and Ewart, E. S., The effectiveness of "Patter" and of "Fundamentals of basic flight maneuvers" as training aids, Washington, D.C., CAA Division of Research, Report #6, December 1942.

MOBILIZATION AND DEMOBILIZATION: THE LOST 100 AEPS

BY: CAPT (RET) FRANK PETHO, AEP #67

When it comes to documenting contributions that individual H-V(S) Naval Aviation Psychologists made during WW2 or procurement trends, a nagging, but fundamental challenge is to find an exhaustive list of the names of officers who actually served. Indeed, there are references to the total number of H-V(S) psychologists that were procured during the war[1, 2, 3] (roughly 100), but no names, ranks, commission dates, service entry dates, pay entry base dates, separation dates, or civilian destinations after release. Without those markers, identifying longitudinal contributions from specific individuals, establishing trends in mobilization and demobilization, validating the findings of the present article, and establishing a basis for further research is impossible.

These officers, undocumented and obscured for the last 75 years, collectively comprise the so-called "Lost 100."

This article attempts to preliminarily document those H-V(S) psychologists by taking four lists[4, 5, 6, 7] that were originally compiled for different purposes, by different organizations, over the course of a decade or two (or three), then iteratively applying filters to sidestep irrelevant and redundant data, to identify names that accord with the period of interest, and finally to validate the status of H-V(S) officers on the resultant list by finding their name and attendant information in the 1943 and 1944 Register of Commissioned Officers, Cadets, Midshipmen, and Warrant Officers of the United States Naval Reserve.[8, 9]

The four aforementioned lists contained the names of 260 aviation psychologists that served the Navy at various times, places, and capacities, but after winnowing the undifferentiated list to only H-V(S) officers who entered the Navy from 1940 to 1945 and after finding their names in the "Register," a list of 96 officers — the so-called "Lost 100"— slowly emerged, one by one. Their names, ranks, and estimated entry dates are listed in the Appendix following this article.

Table 1, below, shows that 1942 was the watershed year in terms of mobilization. 60% of the H-V(S) who served during the war entered in 1942.

Table 1: Number of H-V(S) Entrants by Year		
Year	Number	Percent of Total
1940	1	1.4
1941	6	6.2
1942	58	60.4
1943	19	19.8
1944	12	12.5
TOTAL	96	100.3

That 60% of the total H-V(S) wartime compliment was procured in 1942 and that fully 80% was procured in two years, 1942 and 1943, reflected RADM Chester Nimitz's 07 February 1941 decision to procure H-V(S) professionals, which was followed by BuMed's and BuAer's drumbeat requests for more H-V(S) psychologists, and BuPers' willing authorizations for their procurement. In fact, H-V(S) psychologists were originally commissioned to administer, score, and interpret psychological tests, but BuMed, in a series of letters to aviation field stations, expanded their support role into biomedical and educational statistics and data reduction, descriptive and experimental research,

1 Jenkins. J. G., Naval Aviation Psychology: I; The Field Service Organization, *Psych. Bull.*, 42: November 1945, p. 631.

2 Jenkins. J. G., Naval Aviation Psychology: I; The Field Service Organization, *Psych. Bull.*, 42: November 1945, p. 632.

3 Memorandum from Goodson, J. E. to Gadolin, R., SUBJ: *Development and Management of the U.S. Navy and Marine Corps Aviation Selection Test Battery*, June 2004, page 12.

4 Trumbull, R. and MacCorquodale, K., "A History of Aviation Psychology at NAS, Pensacola, Part I (1939-1946)," US Naval School of Aviation Medicine, Pensacola, Florida, 1 October 1951, *Appendix B. Roster of Personnel of the Aviation Psychology Section.* This roster listed 43 officers: 19 H-V(S), four A-V(S), one A-V(N), four W-V(S)H, and ten Medical Service Corps officers.

5 *BuMed Newsletter-Aviation Psychology Branch (1948). Section 1. Register of Officers Who Served in APB – November 1948.* The list contains 84 names and is introduced as follows: *In Section I of the appended material is a register of former H-V(S)ers as up to date as we have been able to make it.*

6 *Inactive Psychologists.* This undated, five-page list is labelled "INACTIVE PSYCHOLOGISTS" and shows three variables: "Name," "Active Duty Date," and "Release Date." It lists 99 officers, seven civilians, and one physician.

7 *Questionnaire-Qualifications. Aviation Experimental Psychology. Medical Service Corps, U. S. Naval Reserve.* This 36-page document, probably from the 1960s, contains personal data on 34 psychologists. One field was "military experience," which for some members reached back to the early to mid-1940s, the period of interest for the current paper.

8 *Register of Commissioned Officers, Cadets, Midshipmen, and Warrant Officers of the United States Naval Reserve,* United States Government Printing Office, Washington, D.C., January 01, 1943

9 *Register of Commissioned Officers, Cadets, Midshipmen, and Warrant Officers of the United States Naval Reserve*, United States Government Printing Office, Washington, D.C., July 31, 1944

equipment design, developmental and operational test and evaluation, and training.

When RADM Nimitz established the H-V(S) community, he caused paragraph H-2317 in the personnel manual to stipulate that H-V(S) psychologists were appointed in ranks commensurate with their age, academic seniority, practical experience, and their ability to fit the duties of a specific mobilization assignment. So, besides at least four years of college, proper licenses, and evidence of competence in a particular specialty, the applicant needed recent practical experience: two, six, or eight years for an appointment to the rank of ENS, LTJG, or LT, respectively. Hence, the spread of entry ranks and ages amongst the 96 original psychologists, which are shown in Table 2, below.

Table 2: Age and Rank at Entry

Rank	Number in cohort	Percentage of Total	Mean (SD) age at entry
ENS	35	36.5	27.1 (2.4)
LTJG	41	42.7	30.5 (3.6)
LT	16	16.7	33.9 (4.9)
LCDR	4	4.2	38.0 (3.2)
TOTAL	96	100.1	30.0 (4.5)

The Aviation Psychology Branch, which was established on 29 October 1942, in BuMed's Aviation Medicine Division, managed the 96 psychologists. The Bureau's attendant administrative and personnel policies were decidedly loose by design, but effective. Simply stated, the Head of the Branch, LCDR John Jenkins and his staff, retained control over all H-V(S) officers. Informal correspondence between Branch staff and field officers was encouraged, and routine trips to the various field stations made for effective contact between the central Branch and psychologists stationed in the field.

Accordingly, with the significant surge in entrants in 1942 and 1943, and the rapidly expanding mission during mobilization, Branch staffing grew. New psychologists spent two weeks or more as transient members of the Branch, sharing the work, the ambiance, and the collegiality. Seven staff members ran the office in 1942, including LCDRs John Jenkins, Jack Dunlap, and E. Lowell Kelly. These three senior officers were supported by LTJG Martin D. Kaplon (one of Jenkins' pre-war students at the University of Maryland), ENS Donald W. Fiske (who joined Kelly after the war at the University of Michigan), ENS Willis C. Schaeffer (who joined Jenkins' after the war at the University of Maryland), and R. C. Rogers.[10, 11]

Table 3: Destinations of the original H-V(S) Psychologists after 1945

Destination	Number	Percentage
Academe	40	41.7
Business	14	14.6
Government	10	10.4
Clinical/Counseling	11	11.4
Private Address	7	7.3
Unavailable	14	14.6
TOTAL	96	100

Demobilization abruptly began when the war ended. Germany surrendered in May 1945. Japan surrendered in August 1945. The war was over. The United States had more than 12,000,000 personnel under arms in 1945, and with significant public and political support (reflecting, in part, the country's suspicions of a standing force) the United States reduced that number by almost 90%, to 1,566,000, by 30 June 1947.

And so it was in the H-V(S) community. By the fall of 1945 and through 1946, H-V(S) product lines thinned and narrowed both in depth and scope. Requests for new studies, analyses, and research projects decreased precipitously, as did selection board proceedings. For example, Pensacola only processed 12 applicants in January 1945.[12]

Flight school training courses in night vision,

10 Undated, anonymous copy of *Chapter II, The First War Year, 1942*, page 28.

11 R. C. Rogers may not have been an H-V(S) officer. His name without rank or designator appears under "Editorial Staff" in an organizational chart of the NRC Committee on Selection and Training of Aircraft Pilots in Viteles, M. S. "The Aircraft Pilot: Five Years of Research, A Summary of Outcomes," *Psych Bull*, Vol 42, No. 8, p.4 92. But, a handwritten note attached to a copy of the 29 Oct 1942 BuMed letter that established the Aviation Psychology Branch in BuMED states that, *Ensign R. C. Rogers reported for duty in BuAer's Medical Research Section and assisted Ensign Kaplon in his duties. During the Fall of 1941 all newly commissioned H(S) psychologists reported to BuAer for two week indoctrination. These newly commissioned psychologists in BuAer's Medical Research Section assisted Ensigns Kaplon and Rogers managing the test validation program.*

12 Trumbull, R. and MacCorquodale, K., *ob. cit.*, p. 33.

speech intelligibility, and spatial disorientation had convening enrollments drop from scores of students to class sizes in the low single digits. H-V(S) activities during the final months of 1945 were described as "the gradual almost imperceptible folding of tents and quietly stealing away."[13]

As workload decreased, H-V(S) separations increased. Table 3 shows the general destinations to which the original 96 psychologists separated between 1945 and 1946.

Three letters between Jenkins at BuMed and a junior officer in the field capture the H-V(S) exodus that began in the fall of 1945. Jenkins first wrote from the Bureau,

> *Your letter of 8 August (1945) was held for my return… I managed to get back just in time for the victory celebration. Since then, things have been spinning at high speed here. … Luck to you in keeping things going during the period of transition that lies ahead.*[14]

The junior officer replied,

> *The few remaining projects are being finished up, the air is full of scuttlebutt … and every recent TAD from Washington is drained like a … sponge. … It sounds as if you are … running the placement bureau for decrepit officers. Twelve (job) recommendations is a full day's work.*[15]

To close, Jenkins replied,

> *The section here continues to be a cross between an employment agency and a madhouse. … Typical of the pace of events is the fact that 14 H(S)ers made Lt. Commander yesterday. The others here join me in regards to you and to the local survivors.*[16]

RADM Nimitz authorized the procurement of H-V(S) psychologists in February 1941. Starting in 1942, the community quickly mobilized and grew to 96 by 1944. But starting in 1945, as quickly, the community demobilized and lost over 95% of the original cadre in less than a year. By 1947-1948, only three LTs staffed the BuMed Branch and records show that there was only a handful (literally) of H-V(S) psychologists left in the Navy.[17] But, they were enough to lead the community into the fledgling Medical Service Corps, which was established in August 1947, and then to reconstitute, reorganize, and expand naval aviation psychology's community of practice to mobilize for the Korean War (1950-1953).

So, before they dispersed in 1945, the "Lost One-Hundred" left behind a few officers from the original cadre to ultimately extend the group's professional trajectory of influence, service, and scholarship into the 1950s and beyond.

U.S. NAVY MEDICAL SERVICE CORPS AEROSPACE EXPERIMENTAL PSYCHOLOGY 1941-2016

13 *Ibid.*
14 Letter from J. Jenkins to R. Trumbull of 20 August 1945.
15 Letter from R. Trumbull to J. Jenkins of 17 Sept 1945.
16 Letter from J. Jenkins to R. Trumbull of 10 October 1945.

17 Undated, mimeographed, BuMed newsletter from the Aviation Psychology Branch, circa 1947-1948. The newsletter reported that LT Harry Older headed the Branch, was assisted by LTs William Madden and Joseph Synder, and that CDR Verne Lyon and CDR Alan Grinsted were on the Chief of Naval Air Training staff and at the School of Aviation Medicine and Research in Pensacola, FL respectively. Two statements in the newsletter support the 1947 release date: (1) it notes that the H(S) designator would soon be discontinued and replaced by MSC, and (2) it contains a roster of psychologists that served in the APB, which is dated November 1948.

H-V(S) ROSTER

H-V(S) NAVAL AVIATION PSYCHOLOGISTS (N=96) WHO SERVED IN WWII

ANDERSON, JOHN. P.	LTJG	16-FEB-42
KRAMER, GEORGE A.	ENS	7-MAY-42
BENNETT, CHESTER C.	LT	17-FEB-43
LAWRENCE, PHILIP S.	LTJG	1-OCT-42
BLOOMER, H. HARLAN	LT	11-JAN-43
LEVERETT, HOLLIS M.	ENS	25-DEC-41
BRIGDEN, ROBERT L.	LTJG	16-NOV-42
LUNDBERG, DONALD	ENS	21-OCT-42
BROMER, JOHN A.	LTJG	24-SEP-42
LYON, VERNE W.	LT	21-AUG-41
BUCKMAN, JR., MAURICE	LTJG	15-JUN-42
MACK, LEONARD J.	ENS	13-DEC-42
BUGELSKI, R. RICHARD	LTJG	25-JAN-43
MACMILLAN, JOHN W.	LTJG	16-DEC-42
CAMPBELL, JOHN M.	LTJG	15-FEB-43
MADDEN, WILLIAM F.	ENS	19-NOV-42
CARROLL, JOHN B.	ENS	1-FEB-44
MAHAN, HARRY C.	LT	15-JUN-42
CHANNELL, RALPH C.	LCDR	1-SEP-40
MCCOARD, WILLIAM B.	LTJG	1-SEP-43
CLARK, WALTER BRANT	LT	1-OCT-42
MCCROAN, JR., JOHN E.	ENS	5-APR-43
COFFEY, HUBERT S.	LTJG	16-NOV-42
MCGEHEE, WILLIAM	LTJG	10-JUL-42
COURTNEY, PAUL D.	LTJG	7-APR-42
MCNEAL, BENJAMIN F.	ENS	24-NOV-42
CRAIG, DAVID R.	ENS	16-APR-42
MIDDENTS, WALTER F.	ENS	19-AUG-42
CRAWFORD, ISABEL	ENS	28-NOV-43
MILLARD, KENNETH A.	ENS	2-SEP-42
CURRY, EVERETT T.	LTJG	5-OCT-42
MORRIS, CHARLES M.	ENS	11-MAY-42
DANZIG, ELLIOTT	LTJG	1-OCT-42
MORROW, ROBERT S.	LTJG	1-MAY-44
DARLEY, JOHN G.	LTJG	8-MAR-44
MUHLENBERG, C. A.	ENS	16-NOV-42
DARLING, RALPH P.	LT	15-JUN-42
NADEL, AARON B.	LTJG	16-APR-42
DOTY, ROY A.	LTJG	30-MAR-44
OLDER, HARRY J.	ENS	3-JUL-42
DREHER, ROBERT E.	ENS	1-JUN-44
ORLANSKY, JESSE	ENS	11-MAY-43
DUNLAP, JACK W.	LCDR	1-NOV-42
PAGE, ROGER B.	ENS	25-MAR-42
EPSTEIN, LEON J.	ENS	1-OCT-42
PARTRIDGE, ERNEST D.	LT	24-FEB-44
FISKE, DONALD W.	ENS	17-MAY-42
PECKHAM, ROBERT H.	LT	1-OCT-42
FONTAINE, JESSE T.	LTJG	15-JUN-42
PERKINS, KEITH J.	LTJG	29-MAY-43
FOSBERG, IRVING A.	LTJG	1-OCT-42
PFAFFMAN, CARL	LT	15-JUN-42
GABERMAN, JOSEPH	LTJG	8-JAN-43
PRICE, FRAMPTON B.	LTJG	15-JUN-42
GILBERT, HARRY B.	LT	15-JUN-42
PROTHRO, EDWIN TERRY	LTJG	20-JAN-43
GITTINGER, JOHN W.	LTJG	1-OCT-42
ROSS, SHERMAN	ENS	20-MAY-42
GRINSTEAD, ALAN D.	LT	30-NOV-41
SCHAEFFER, WILLIS C.	ENS	5-MAY-42
HADLEY, JOHN M.	ENS	29-MAR-41
SCHULTZ, D. A.	LTJG	3-JUN-43
HENRY, C. E.	ENS	19-JUL-43
SEITZ, CLIFFORD P.	LTJG	12-APR-43
HORN, DANIEL	ENS	13-MAY-44
SELOVER, ROBERT D.	LTJG	20-JUL-42
JENKINS, JOHN G.	LCDR	10-JAN-42
SHAW, WILLIAM G.	ENS	25-SEP-42
JOHNSON, MAYNARD	LT	22-FEB-44
SMITH, DENZEL D.	ENS	16-APR-42
KAPLON, MARTIN D.	LTJG	15-JUN-42
SNYDER, JOSEPH F.	LTJG	22-MAY-42
KELLY, E. LOWELL	LCDR	5-DEC-42
STEER, MACK D.	LTJG	8-APR-42
KELLY, GEORGE A.	LT	24-NOV-43
STONE, IRVING R.	LT	15-JUN-42
KELLY, JAMES C.	LTJG	5-JUN-44
STROMBERG, ELEROY L.	LT	1-OCT-42
KERR, WILLARD A.	ENS	5-MAY-44
TOLHURST, GILBERT C.	ENS	19-OCT-42
KORCHIN, BARNEY	LTJG	1-OCT-42
TRAWICK, MACELDIN	LT	15-JUN-42
TRUMBULL, RICHARD	LTJG	26-JAN-43
UNDERWOOD, BENTON J.	ENS	18-DEC-42
VAN DUSEN, ALBERT C.	ENS	4-DEC-42
VAUGHN, CHARLES L.	LTJG	29-MAY-43
VINACKE, WILLIAM E.	ENS	15-MAR-44
WALKER, EDWARD L.	LTJG	2-FEB-43
WEST, HOWARD	ENS	2-SEP-41
WHITE, HOWARD R.	LTJG	13-MAR-44
WILKE, WALTER H.	LTJG	24-FEB-43
WILLIAMS, ALEXANDER	LTJG	1-SEP-41
WISELY, HAROLD M.	ENS	8-OCT-42
WOODARD, DONALD P.	LTJG	24-JUN-42
YUDIN, HARRY C.	ENS	18-MAR-42
YUILL, JOSEPH S.	LTJG	5-JUN-42

TOWARD A V-22 MEDEVAC TRAINING TOOL

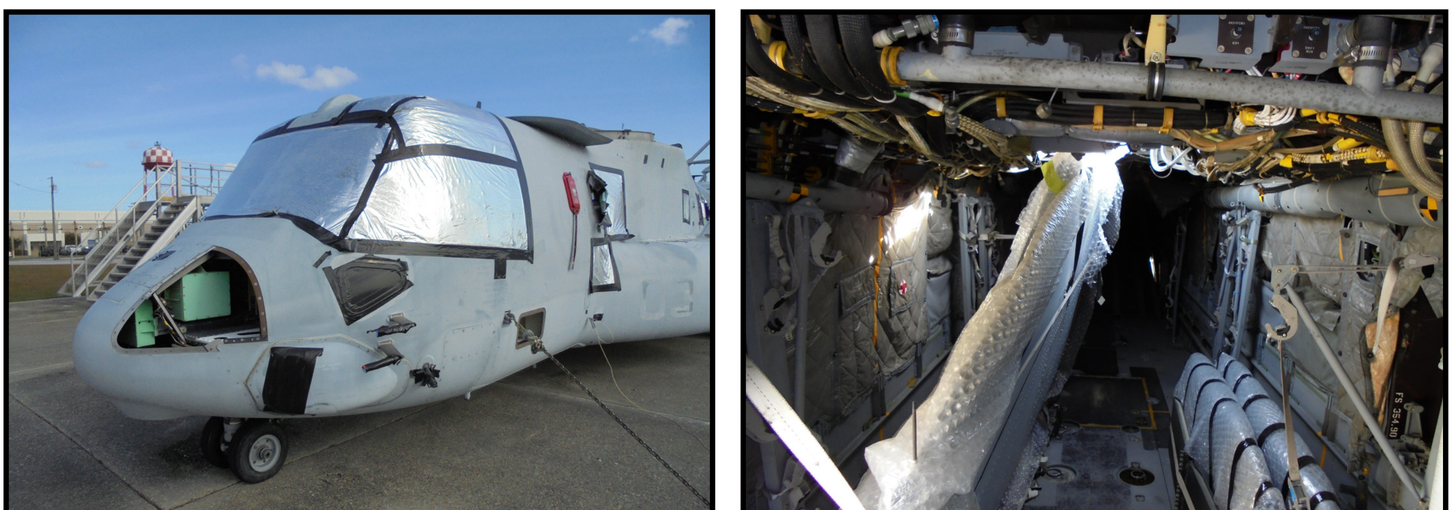
BY: JAY HEANEY AND LCDR BRENNAN COX, AEP #142

With the versatility of a helicopter and the speed/range of a turboprop, the V-22 Osprey provides tremendous potential for the provision of en route care (ERC). This is largely based on the V-22's tiltrotor design, which allows the Osprey to access and transport injured warfighters from diverse battlefield environments to Navy ships and shore-based medical treatment facilities far outside the reach and range of other aircraft.

With this emerging capability comes an increased need to transition best practices in ERC to the V-22 platform. To address this need, the Naval Health Research Center (NHRC), in partnership with Naval Medical Center San Diego (NMCSD), is outfitting a non-operational Osprey fuselage to become a training tool for medical providers. This MEDEVAC simulator will provide a one-of-a-kind asset for aeromedical professionals, including Aerospace Experimental Psychologists, to influence the future of ERC procedures within naval aviation.

To date, efforts have mostly focused on restoring this shell of an aircraft, which arrived to San Diego in December 2015. Although there was no structural damage to the fuselage, all serviceable parts and components had been stripped, and signs of wear and tear were rampant. Once repairs are finalized, this training device will simulate the environmental conditions of a V-22 in flight, including noise, lighting, temperature, and space considerations.

NHRC currently has Joint Program Committee Panel 6 tasking and funding to evaluate the challenges of performing ERC procedures within the Osprey, with initial efforts focused on measuring and characterizing this work environment. Once the environment has been adequately characterized, the research plan will evaluate four standard 20 min ERC mission scenarios: airway trauma management, respiration management, circulation management, and disability (neurological) assessment. Ultimately, training scenarios will range from short to mid-length (20–60 min) to long duration ERC mission sets (120+ min) and will include time to transport patients on and off the aircraft from simulated battlefields to simulated clinics or medical facilities.



Exterior and Interior of the V-22 Osprey fuselage upon arrival at NHRC, December 2015

Exterior and Interior of the V-22 Osprey fuselage after retrofit and repair, prepared for simulation training at NHRC, Fall 2016

These features will help trainees become familiar with the human factor challenges confronting medical providers performing within this unique workspace.

As the Department of Defense's "Pivot to the Pacific" strategy continues to develop, Navy Medicine and all members of the Joint Operations medical community need to ensure the ability to provide lifesaving care in the "golden hour" (and now longer) of transport and understand the potential physiologic impact of the transport environment. The results from this project will contribute to shaping current and future clinical practice guidelines on the safety and efficacy of medical procedures in the V-22. Along with direct benefit to operational forces of all services, the knowledge and equipment procured as part of this NHRC study will support multiple clinical care-oriented research projects and training programs offered by NMCSD.

NAVAL HEALTH RESEARCH CENTER
READINESS THROUGH RESEARCH

The V-22 prepared for MEDEVAC training at NHRC, December 2016. The next phase of work will focus on installation of environmental (heat, ambient noise, lighting) simluation features in order to increase the fidelity of training for enroute care in an operational environment.

THE AEP AS A BASIC SCIENTIST AT NAMRU-D

BY: LT TODD SEECH, AEP #153

The future of Naval Aerospace Experimental Psychology is alive and well at Naval Medical Research Unit Dayton (NAMRU-D). Co-located with the U.S. Air Force's key aviation research assets on Wright-Patterson Air Force Base, NAMRU-D is a virtual "sandbox" for basic, advanced and applied research on a range of leading aeromedical and aviation-based human performance topics. From issues related to hypoxia, hypocapnia, hypobaria, spatial disorientation, and fatigue, among others, NAMRU-D is on the cutting edge of aviation research. And yet, new research emphases are emerging at this Midwest Mecca of Aeromedical Research, as the command is currently rolling out new capabilities in the areas of neurocognition and spatial disorientation.

Neurocognition Laboratory: Recent technological advances in the measurement of central nervous system functioning have allowed for new approaches to (a) monitoring human performance and readiness in real-time as well as (b) training the warfighter to control his/her own neurocognition and behavior. These technologies will have a direct impact on a variety of aeromedical and aviation psychology issues, including performance impairments related to hypoxia, fatigue, decompression sickness, and spatial disorientation. In this vein, and largely influenced by initiatives begun by NAMRU-D AEPs like LT Stephen Eggan (AEP #143), CDR Michael Lowe (AEP #132), and CDR (ret.) Michael Reddix (AEP #100), the value of an increased emphasis on neuroimaging and cognitive science at NAMRU-D is apparent. To properly harness this new research thrust area, NAMRU-D has devoted lab space, personnel, and state-of-the-art equipment for a new Neurocognition Laboratory. The mission of the lab will be to position NAMRU-D as a neuroscience-capable research entity by establishing competencies in emerging technological methods like electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) and advancing these methods across the spectrum of basic neuroscience toward operational military application.

Disorientation Research Device from Observation Platform

EEG Research Emphasis: Measurement of human event related potentials using EEG has undergone a revolution in recent years. The combination of high-reliability and high-durability electrodes with new experimental paradigms promise to make EEG technologies relevant to warfighter performance and safety once again. One paradigm of particular interest in operational settings is the Mismatch Negativity/P3a (MMN/P3a) response complex, which is a fundamental cross-species brain process that automatically monitors environmental stimuli and subsequently generates and utilizes a simple predictive model to detect novel or salient stimuli. This unique complex is evoked automatically, pre-consciously, and without willfully devoting attention to an experimental task, which makes it an ideal candidate for directly measuring cognitive states during operational tasks. Promising data from clinical investigations support the robustness of this paradigm, as it has been linked to a variety of outcomes of interest, like cognitive functioning/intelligence, recovery prognosis after traumatic brain injury, performance in vigilance tasks, and drug intoxication. The NAMRU-D Neurocognition Lab is already applying EEG paradigms like MMN/P3a to issues like hypoxia through research funded by the Office of Naval Research with the objective of producing results that may have breakthrough implications for real-time hypoxia detection.

MRI Research Emphasis: Magnetic Resonance Imaging methods have also undergone a transformation from a focus on static tissue imaging to functional brain activity mapping. This increase in technological capabilities has opened the door for human performance enhancement strategies that make fMRI a viable option for operational training in the military, despite the expensive and immobile nature of the associated machinery. University-based collaborating researchers, including a core group of experts at the local Wright State University, have demonstrated that presenting research participants with real-time images of their brain functioning allows them to willfully control regional brain activation. Remarkably, this brain activation training generalizes to activities outside of the MRI scanner, which has important implications for training human operators to overcome a variety of aeromedical concerns (e.g., enhanced control of frontal brain regions to improve depleted working memory capacity). Additionally, NAMRU-D scientists are exploring the unknown mechanisms of acute hypoxia and recovery on neural activity and blood perfusion, which will have concrete implications for aviation emergency procedures. These efforts have established requisite relationships with local and national universities, hospitals, and MRI facilities for the new Neurocognition Lab to pursue important future research questions.

Disorientation Research Device: NAMRU-D's newest research apparatus, affectionately known as "the Kraken," is giving new meaning to "ground-shaking research." The Kraken, or Disorientation Research Device (DRD). is a one-of-kind 4500 horsepower motion simulator capable of six degrees of freedom of motion (i.e., pitch, yaw, roll, x-axis, y-axis, z-axis movement) and up to 3Gs+ and 1.5Gs-. The DRD, which is housed in a two-story 2500 ft2 room, is capable of simulating a variety of motion profiles that are common in military environments, including those related to aircraft, surface ships, and underwater vehicles. Add to these accolades a configurable "cockpit" equipped with viewers and a sound system, and the research applications are plentiful and far-reaching. Although a formal "release the Kraken" unveiling ceremony was held in June

Disorientation Research Device Capsule Entrance

2016, the DRD was formally accepted in October 2016 from Environmental Tectonics Corporation, the commercial company contracted to construct the device. This exciting development means that NAMRU-D staff are currently being trained to operate the behemoth machine and man-rating will commence shortly, which will allow the DRD to become fully operational. Research projects slated for DRD use are already stacking-up, with topics related to spatial disorientation mitigation, motion sickness countermeasures, and wearable augmented reality technology validation, and many other aeromedical and human performance issues.

NAMRU-D is an ideal command to showcase the value of and need for Aerospace Experimental Psychologists in today's and tomorrow's Navy. The AEP clearly fills a capability gap by combining Aviation Science with Psychological Research and, in collaboration with a diverse group of other specialties (e.g., Aerospace Physiologists, Aerospace Optometrists, Flight Surgeons), brings tangible improvements to fleet procedures, equipment, and policy.

A THIRD OFFSET VECTOR: AUTONOMY AND THE HUMAN FACTOR

BY: CAPT (RET) MIKE LILIENTHAL, AEP #71

Autonomous systems have gotten increased attention by lawmakers, the Pentagon, and the general public over the past few years. However, the Navy has shown interested in autonomous systems for decades. The Naval Research Laboratory (NRL) has been involved in developing autonomous systems since the lab's inception in 1923. NRL developed the control system for the first U.S. flight of a radio-controlled pilotless aircraft in 1924 and devised a radio remote control system to maneuver the warships USS Stoddert and USS Utah as target ships in the 1930s[1]. In 2012 NRL completed construction of the new Laboratory for Autonomous Systems Research, which is conducting research including addressing human-machine interactions.

Science advisory committees have also taken note of the opportunity and the challenges of both commercial and military autonomous systems. There have been three Defense Science Board (DSB) studies on autonomous systems[2,3,4].

The DSB was established in 1956 in response to recommendations of the Hoover Commission: "The Assistant Secretary of Defense (Research and Development) will appoint a standing committee, reporting directly to him, of outstanding basic and applied scientists. This committee will canvass periodically the needs and opportunities presented by new scientific knowledge for radically new weapons systems."[5]

The latest DSB recognized autonomous capabilities, due mostly to the advances in artificial intelligence, are readily available to the commercial sector, allies and to adversaries. This presents two sides of the same technological coin – new capabilities and new threats. The study did not recommend any new major programs because of the current budget environment. The DSB recommended experiments/prototypes that would demonstrate clear operational value and help refine and institutionalize their enterprise-wide recommendations. It recommends partnering with non-traditional R&D communities in novel ways to both speed DoD's access to emerging research results and to identify areas in which additional DoD investment in autonomy is needed to fully address DoD missions.

Autonomous systems are included as part of the enabling technologies for what DoD has termed the Third Offset Strategy.[6] An offset strategy is the implementation of a plan that compensates for a disadvantage. The First Offset Strategy (1950s) was the development of nuclear capabilities to offset Russia's geographic and numerical advantage over the United States in Western Europe. The Second Offset Strategy (1975 – 1989) was a response to the Soviet's gaining nuclear parity and the unsuccessful Asian land warfare experience. The military leveraged information technologies including microprocessors that improved sensors transforming iron bombs into precision munitions through GPS, and the fielding of stealth systems. That technology was thought to offset the Russian numerical advantages. Luckily, that has not been tested against numerically superior forces.

Once again potential adversaries have caught up with the U.S. military. The Third Offset Strategy (2014- ?) is once again trying to leverage U.S. advantages in new and emerging critical technol-

1924 Remote Controlled Pontoon Plane

1 Naval Research Laboratory autonomous system timeline https://www.nrl.navy.mil/media/publications/autonomous-systems-research-timeline/
2 Defense Science Board Summer Study on Autonomy, June 2016 http://www.acq.osd.mil/dsb/reports2010s.htm

3 Defense Science Board Task Force Report: The Role of Autonomy in DoD Systems, July 2012
4 Defense Science Board Task Force: Next Generation Unmanned Undersea Systems, October 2014
5 Defense Science Board website http://www.acq.osd.mil/dsb/history.htm

6 3rd Offset Strategy 101: What it is, What the Tech Focuses are March 30, 2016 http://www.dodlive.mil/index.php/2016/03/3rd-offset-strategy-101-what-it-is-what-the-tech-focuses-are/

ogies. The U.S. military is losing its advantages in some areas of conventional warfighting capabilities. Potential adversaries are fielding their own sensors, precision weapons, and reconnaissance-strike networks. This means the Navy is increasingly vulnerable to long range strikes, sophisticated integrated air defense systems, more capable underwater systems, as well as attacks from space and cyber domains. There is a growing concern within the Navy about how to deal with the growing problem of anti-access/area denial (A2AD) posed by China, especially in the East and South China Seas. Autonomy is most likely a key enabler for the Air Sea Battle (ASB) now known as the Joint Concept for Access and Maneuver in the Global Commons (JAM-GC).[7]

The Third Offset is still short on details, but there is the mention of five common technology drivers:

- Deep Learning Systems
- Human Machine Collaboration
- Human-Machine Combat Teaming
- Assisted Human Operations
- Network Enabled Cyber Hardened Weapons.

Autonomy is a major technological enabler, but the human and the AEP is not out of the loop by a long shot. Although it is a "target rich" environment for AEPs, there is a strong movement to accelerate the acquisition of new systems. Congress and others have criticized the DoD acquisition process taking too long to field new systems which do not meet cost, schedule, and performance requirements. Partly as a response to this impression and in support of the Third Offset, DoD created the Strategic Capabilities Office (SCO) in 2012. It has developed capabilities partnerships with the Services, four Combatant Commands and the Intelligence Community. The focus is on rapid prototyping, good enough solutions, and the maintenance of a near-term creative urgency. This has the potential to lower cost and rapidly field prototypes into the hands of experienced operators who are developing unconventional tactics, which will hopefully buy time for the Third Offset technologies to be fielded.

Unidentified officer operating steering and throttle controls of the USS Stodert and USS Utah converted target ships through selector switches based on the teletype mechanisms using the Baudot code.

That rhythm of quickly moving from concept to a fielded system is two sides of the same organizational coin – it saves on cost and time but it can give priority to the "hard" engineering sciences and give the "soft" human factors sciences passing consideration with few fiscal resources to succeed in a rush to field systems. If you follow the money (or at least the current plans), the next five fiscal years give some indicators about the Third Offset strategy investments.

With the caveat that much of what is in the investment plans is in the classified domain, the next five years project $3 billion in advance human–machine teaming to improve human-machine collaborative decision-making and enabling swarming of systems. There is $1.7 billion for cyber and electronic warfare, which includes systems that can sense, learn, and react autonomously, and more than $500 million to expand war gaming, test new operational concepts, tactics, techniques and procedures, and demonstrate advanced capabilities, but with a particular focus on ground combat.[8] The Navy has embraced unmanned and autono-

7 Bitzinger, Richard, A. Third Offset Strategy and Chinese A2/AD Capabilities, June 13, 2016 https://www.cnas.org/publications/reports/third-offset-strategy-and-chinese-a2-ad-capabilities

8 Blakeley, Katherine Analysis of the FY 2017 Defense Budget and Trends in Defense Spending. Center for Strategic and Budgetary Assessments (CSBA), 2016 http://csbaonline.org/research/publications/analysis-of-the-fy-2017-defense-budget-and-and-trends-in-defense-spending

mous vehicles, as have the other Services. Autonomy is mentioned in the Naval Aviation Vision 2016-2025[9] and is incorporated into the Undersea Warfare (USW) Science & Technology (S&T) Strategy (2016) as one of the focuses of Naval Research & Development Establishment (NR&DE) S&T investments.[10,11] The DoD FY 2017 budget asked for $71.8B in RDT&E funding – the Navy and Marine Corps' portion of that budget request is $17.3B. The total budget request is a 5.3 percent increase over FY 2016.[12] However, the RDT&E snapshot of FY2018-FY2021 has Navy funding decreasing to an annual budget of $11.8B by FY2021. The oncoming Republican President and Congress will most likely look favorably on the DoD budget by further amending the Budget

eXperimental Fuel Cell (XFC) unmanned fully autonomous aerial system 2009

Control Act of 2011 (i.e. Sequestration) lifting the spending caps. However, the past few months have reinforced Yogi Berra's comment "It's tough making predictions especially about the future".

Even with this uncertain future, DoD has issued a directive on autonomy, DoDD 3000.09, Autonomy in Weapon Systems[13] laying out the top level policy for "the development and use of autonomous and semi-autonomous functions in weapon systems, including manned and unmanned platforms." A quick extract from the directive address several elements of human factors that have been baked into policy:

- Consistent with the potential consequences of an unintended engagement or loss of control of the system to unauthorized parties, physical hardware and software will be designed with appropriate Human-machine interfaces and controls.
- Design human-machine interfaces for autonomous and semi-autonomous weapon systems to be readily understandable to trained operators, provide traceable feedback on system status, and provide clear procedures for trained operators to activate and deactivate system functions.
- Certify that operators of autonomous and semi-autonomous weapon systems have been trained in system capabilities, doctrine, and tactics, training, and procedures (TTPs) in order to exercise appropriate levels of human judgment in the use of force and employ systems with appropriate care and in accordance with the law of war, applicable treaties, weapon system safety rules, and applicable ROE.
- Establish and periodically review training, TTPs, and doctrine for autonomous and semi-autonomous weapon systems to ensure operators and commanders understand the functioning, capabilities, and limitations of a system's autonomy in realistic operational conditions, including as a result of possible adversary actions.

If you take the view that no matter how autonomous a system becomes there is a human somewhere in the chain of events that develops, produces, tests, maintains, supplies, directs, and teams with an autonomous system, human factors is a key enabler for the Third Offset Strategy. Even without this view, there are many questions that need to be answered from a human system integration perspective.

The most recent DSB addresses the issue of trust with regards to autonomous systems. Trust is mul-

9 Naval Aviation Vision 2016-2025 http://www.navy.mil/strategic/Naval_Aviation_Vision.pdf
10 Undersea Warfare Science and Technology Strategy 2016 http://www.defenseinnovationmarketplace.mil/resources/2016_USW_Strategy_Distro%20A.PDF
11 Undersea Warfare in Northern Europe" A report of the Center for Strategic & International Studies, July 2016 https://www.csis.org/analysis/undersea-warfare-northern-europe
12 Blakeley, Katherine Analysis of the FY 2017 Defense Budget and Trends in Defense Spending. Center for Strategic and Budgetary Assessments (CSBA), 2016 http://csbaonline.org/research/publications/analysis-of-the-fy-2017-defense-budget-and-and-trends-in-defense-spending
13 Department of Defense Directive DODD 3000.09 Autonomy in Weapon Systems November 21, 2012 https://dap.dau.mil/policy/Lists/Policy%20Documents/DispForm.aspx?ID=3350

Unmanned Semisubmerrible (USS) 2010

tidimensional and it is a psychological construct rather than a physically measureable one. That makes things difficult for engineers and testers who are used to dealing with repeatable, highly observable physical measures. The person making a decision to use a system on a given mission must trust the system to accomplish its mission. This makes the acquisition process more complex (including test and evaluation) than manned systems. The "trustworthiness" of a system will have to be established as they design it, manufacture it, and test it. The Navy and contractor team will have to provide new metrics that can be used to assess that trustworthiness in different unforeseen and untested operational contexts. This new level of complexity in acquisition and testing is evolving just as complexity of the human-machine team is evolving. Some autonomous systems are adaptive and will have the capacity to learn from the environment and the mission. Test and evaluation will become even more challenging when the learning system under test changes every time it is used.

As with any field of interest, standard definitions and metrics help researchers, prototype developers, line personnel, and leadership communicate, develop, analyze, evaluate and field autonomous systems more effectively and efficiently. There are multiple definitions, interpretations, and metrics for different levels of autonomy. This does pose problems as people communicate with the same terms but not the same definitions. The automobile industry, the Department of Defense, state policy makers, the Federal Aviation Administration, and others are approaching autonomy from their community's environment, mission, and interests. One way that has been used to categorize autonomy is to bin vehicles: scripted, supervised, and intelligent. Scripted autonomous systems use a preplanned route or guidance rules with embedded physical models to accomplish the intended mission objective. Smart bombs and guided weapons (e.g. AIM-9X) require no human intervention once released; they are point, fire and forget. Supervised autonomous systems have some or all of the functions of planning, sensing, monitoring, and networking to carry out the activities automated. The human makes decisions associated with an autonomous vehicle, makes sense of sensor data, diagnoses problems and coordinates with others. Finally, there are intelligent autonomous systems that make their own decisions given a set of automated planning options, they perceive and interpret sensory information, are self-diagnosing, and collaborate with other autonomous or human systems. Another way to quantify the degree of autonomy is more complex and it takes into effect other factors.

The National Institute of Standards and Technology (NIST) produced several special publications in collaboration with 20 government organizations including the Services, the Federal Highway Administration, and the Society of Automotive Engineers and others.[14] The effort produced an autonomy levels for unmanned systems framework (ALFUS). This model characterizes autonomy along three axes: Human Independence, Mission Complexity, and Environmental Complexity. Human Independence can be measured by the percentage of time the human and the machine interact, the percentage of time the human versus the machine does mission planning, and even the workload and skill levels required of the human. Mission Complexity can range from static, controlled environments (e.g. laboratory or production lines where the tasks can be all preplanned) to highly dynamic environments (e.g. urban warfare situations requiring real time planning) requiring the development of metrics on the level of interactions, collaboration, and dependencies. The Environmental complexity includes metrics that take into account weather, locale (e.g. Deep Ocean, urban, riverine), threats, and decoys. Other Laboratories have come up with their own axes for metrics and mappings: Los Alamos National Laboratory – Mobility, Acquisition, and Protection; Draper Laboratory's Three Dimensional Intelligence Space – Mobility Control, Task Planning, and Situational Awareness; and the Air Force Research Laboratory's Ten-level, three Axes with same three labels as Draper Laboratory.

The one constant in all of this is the Navy's continuous evolvement because of changing threats, environment, technology, tactics, leadership, and the will of those that elect our political leaders. The strategy of rapid fielding championed by the SCO will gain momentum and cross over into traditional acquisition systems. This means not only rapid fielding but also rapid test & evaluation, rapid manufacturing, rapid engineering, and rapid designing. AEPs and other "soft" science personnel have a major role in the Third Offset. That will require mental and physical agility. Although the pace of change and the demands of the Fleet are already at breakneck speed, the pace will have to pick up – adversaries will not wait until the Navy is equipped, manned, and trained for new warfare. That means personnel need a deep understanding of the operational environment, must be able to digest reams of technical data quickly to develop actionable near term human- system recommendations and have the leadership skills to form and lead teams with diverse education and experience.

I think the AEP A-team is ready.

14 Autonomous Levels for Unmanned Systems (ALFUS) Framework Volume II: Framework Models Version 1.0 National Institute of Standards and Technology (NIST) Special Publication 1011-II-1.0, December 2007 and other publications. https://www.nist.gov/el/intelligent-systems-division-73500/cognition-and-collaboration-systems/autonomy-levels-unmanned-0

Call Signs is an electronic newsletter published on behalf of the United States Naval Aerospace Experimental Psychology Society (USNAEPS). Issues are published bi-annually in the Spring and Fall and are available electronically at our website: www.navyaep.com.

Bravo Zulu!

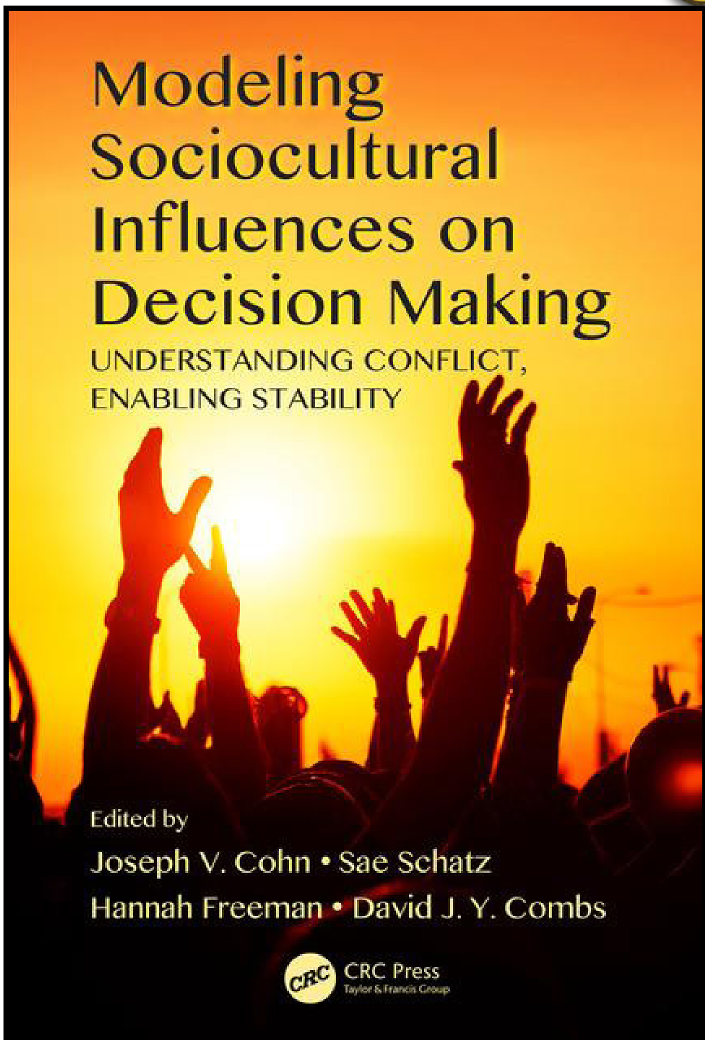
CDR Hank Phillips travelled to Camp Buehring Kuwait for deployment of the Squad Overmatch integrated training approach to Army Central Command (ARCENT)

LT Mike Natali (AEP #150) was awarded the Navy and Marine Corps Achievement Medal for his work as Vice Chair of the Scientific and Ethical Review Comittee at NAMI.

From left to right, LT Andrew Miranda, LT Mika Natali, and LCDR Tatana Olson, Aerospace Experimental Psychologists, celebrate LT Miranda's winging ceremony as he became AEP #155 on Wed 21 Sep, NAS Pensacola, FL.

Joseph Cohn (AEP #113) was promoted to the rank of Captain at a ceremony on 01 Sept 2016 at DHHQ, Falls Church VA. The ceremony was presided over by RADM Chinn, Director, J9 Research and Development, Defense Health Agency

Bravo Zulu!



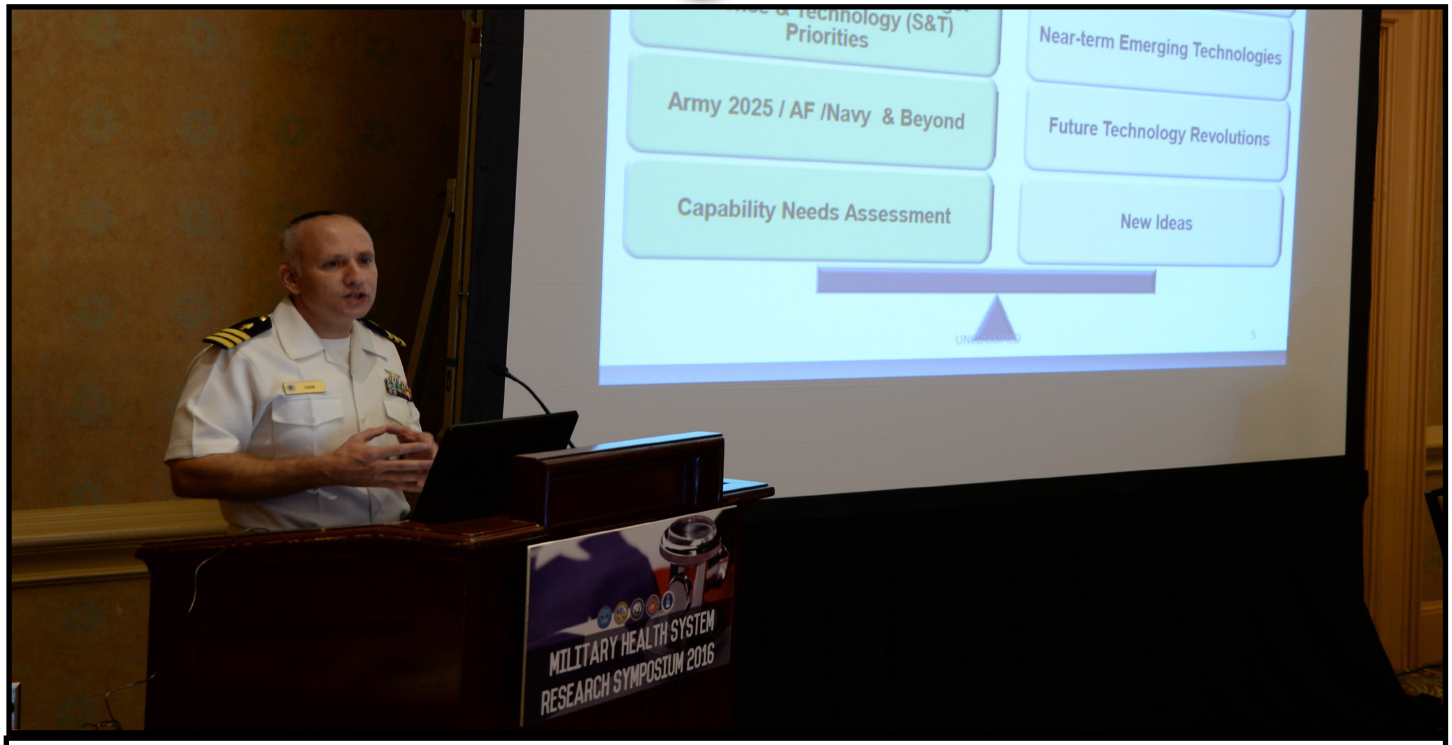
A textbook entitled "Modeling Sociocultural Influences on Decision Making: Understanding Conflict, Enabling Stability" published by CRC Press was recently released. Captain Joseph Cohn (AEP #113) and Dr. David Combs (AEP #146) both edited to the book. LT Eric Vorm (AEP #149) also contributed a chapter. This book illustrates how new technologies combined with the social sciences can be leveraged to better understand how sociocultural context influences decision making.

LCDR Tatana Olson was elected as Member-at-Large for the American Psychological Association's Division 19, the Society for Military Psychology.

LCDR Brian R. Johnson received the Air Force Academy's Outstanding Academy Educator Award, presented annually to recognize one instructor in each academic department who by personal example and performance best characterizes the principles of excellence in education.

CDR Deborah White explained and demonstrated the Naval Undersea Warfare Center's (NUWC) Augmented Reality technical capabilities during the NUWC Keyport Division's Technology Demonstration at the Washington Navy Yard. This effort supports the CNO's High Velocity Learning initiative by providing technology for fleet maintenance and training objectives.

Bravo Zulu!



CAPT Joseph Cohn,Director for Advanced Medical Technology Development, in the Defense Health Agency's Research, Development, & Acquisition Directorate, co-chaired a special session on transitioning medical science and technology to the Warfighter at the 2016 Military Health System Research Symposium. Over 200 Symposium attendees from across the DoD, other Federal Agencies, Industry and Academia attended this session.

Monterey, CA - LCDR Lee Sciarini, Aerospace Experimental Psychologist, with daughter Olive (8), above the Sunken Garden at the Naval Postgraduate School after she pinned on his new rank.

USN★AEP SOCIETY

The US Navy Aerospace Experimental Psychology Society (USNAEPS) exists to promote the role of Aerospace Experimental Psychology and the field of Aviation Psychology throughout the Department of Defense, and recognize their contributions to supporting the Warfighter. USNAEPS has been granted tax-exempt status by the IRS, and is organized with its own Constitution and By-Laws and elects its own officers.

Mark Your Calendars!

JANUARY	FEBRUARY	MARCH
USNAC: http://www.usnac.info/		
APRIL	**MAY**	**JUNE**
SIOP: http://www.siop.org/conferences/17con/	**ISAP**: https://isap.wright.edu/ **ASMA**: http://www.asma.org/ **DOD HFE TAG**: http://www.acq.osd.mil/rd/hptb/hfetag/	
JULY	**AUGUST**	**SEPTEMBER**
AHFE: http://ahfe.net/ **HCII**: http://2017.hci.international/	**MHSRS**: https://mhsrs.amedd.army.mil/SitePages/Home.aspx **APA**: http://www.apa.org/convention/index.aspx	
OCTOBER	**NOVEMBER**	**DECEMBER**
HFES: http://www.hfes.org/web/HFESMeetings/meetings.html	**I/ITSEC**: http://www.iitsec.org/Pages/default.aspx **Society for Neuroscience**: https://www.sfn.org/annual-meeting/neuroscience-2017 **AMSUS**: http://www.amsus-meetings.org/	