THE HISTORY OF AEROSPACE OPTOMETRY IN THE NAVY – HOW WE GOT THERE

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ABSTRACT

The author provides an overview of the history of aerospace optometry in the U.S. Navy and discusses his own activities in this endeavor. The importance of vision in aviation is emphasized. Various research efforts are discussed.

KEYWORDS

Aerospace optometry; Military optometry; Navy optometry; Aviation vision; Optometric research

*Michael H. Mittelman, OD, MPH, MBA.
Image courtesy of PCO Salus.*

There is a clear intersection between vision and aviation. You can't fly an aircraft if you can't see and you certainly can't land an aircraft on an aircraft carrier with suboptimal vision. My interest in aviation vision was peaked during my first tour of duty while stationed at Marine Corps Air Station, Cherry Point, North Carolina. It was there that I first had the opportunity to fly in naval high-performance aircraft. My first flight experience was in the backseat of a Marine Corps EA-6B Prowler. The EA-6B is a twin-engine, four-seat, electronic-warfare jet derived from the A-6 Intruder airframe. It looks like a stretch A-6 with a large bump on the tailfin. I remember taking off at dusk and then experiencing several night-time "touch and goes" at Bogue Field, an outlying practice airfield. What got my attention then was how difficult it was to perceive the horizon and the distances between the aircraft and the runway we were "bouncing" on. While this occurred in 1980, during the first tour of my military career, I was hooked after that.

EA6-B Prowler. By Cpl. Neysa Huertas Quinones - original file, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=73682976>

While at Cherry Point, I was lucky enough to have a good friend and mentor, Capt. Jerry Patee, who was an aerospace physiologist. Aerospace physiologists are aeromedical safety experts responsible for training Naval aviators in all the physiological aspects of flight, including vision-related subjects. They have broad knowledge of subjects such as hypobaric chamber operations, aeromedical aspects of flight, sensory physiology, aviation life support systems, acceleration physiology, emergency egress, water survival, aircraft mishap procedures hypoxia, visual illusions, water survival and ejection seat procedures.¹ Jerry allowed me to work with the physiology community, where I learned what they were teaching about the visual system. While not experts in the optometry field, they did an excellent job in explaining visual illusions associated with flight. They also recognized what I could bring to the discussion as an optometrist. I remember commenting to Jerry at the time, "Wouldn't it be neat if optometrists were able to get winged?" Thanks to his influence and guidance, we started percolating the idea.

In addition to the time I spent flying, I also had the opportunity to talk with the pilots and aircrew while conducting vision exams on them. I learned that even though they had documented 20/20 or better vision, they still believed their vision could have been better, especially at night and under poor weather conditions. Of note, the only medical professionals they could discuss these issues with were their flight surgeons, who had limited training in refractive analysis, the visual system and visual illusions associated with flight. Other than flight surgeons and aerospace physiologists, there were no aeromedical vision specialists that either aircrew or other providers could consult. Given these circumstances—what I considered shortfalls—I took it upon myself to learn as much as I could about the environment of flight while at Cherry Point.

In December 1980, I qualified to become special aircrew, which

meant I could ride as a passenger in a myriad of Naval aircraft by completing courses in basic water survival, ejection seat training and physiology of flight. I tried to get “hops” on as many aircraft types as I could which allowed me to gain some situational awareness of what it was like to fly under different conditions, such as day and night, as well as using instruments or flying under visual flight rules.

During my countless discussions with aircrew in the clinic, I learned many experienced night myopia and other visually related symptoms that could severely impact their performance and ultimately, aviation safety. Many exams revealed small amounts of astigmatism that, normally, I would not prescribe glasses for, but which made significant subjective differences in my patients’ performance in the cockpit. Some of my patients would ask me about visual illusions they experienced while flying, such as autokinesis, where they would stare at a single light source and it would appear to move. This illusion is related to a loss of surrounding visual references which normally serve to stabilize visual perceptions. I would explain to them that small eye movements which create the illusion are perfectly normal. The illusion can be eliminated or reduced by using visual scanning techniques.

The more of these encounters I had, the more we realized that Naval Aviation would be well-served if there was a cohort of aeromedically trained optometrists to augment our flight surgeons and aerospace physiologists. As with any idea, obtaining the buy-in of key leadership along the way is essential. Captain Patee was instrumental in ensuring I met and had the opportunity to share my idea with key personnel in Navy Medicine. Additionally, Captain Stanley Freed, the Navy’s Optometry Specialty Advisor, became a key advocate, mentor and dear friend along the way. And so, the campaign to establish Aerospace Optometry began.

Following my tour at Cherry Point, I was assigned as the only optometrist to U.S. Naval Hospital in Rota, Spain from 1984 through 1987. The commanding officer of the hospital, Captain Bill Buckendorf, was a flight surgeon and cardiologist. When I explained my idea of Aerospace Optometry to Captain Buckendorf, he immediately saw the merit of it and provided guidance, suggestions, and most importantly, additional contacts within the Navy medicine bureaucracy that would help to move the idea along. Captain Buckendorf told me that the only way I would be successful in accomplishing this would be to be stationed in Pensacola, Florida, the “Cradle of Naval Aviation.” Working with Captain Freed and others, I arranged to get orders to the Naval Aerospace Medical Institute (NAMI) in Pensacola for my next duty station.

NAMI is the Navy’s premier aeromedical training and screening command. It was there that all flight surgeons, aerospace physiologists and other aeromedically trained experts received their training. It was also there that every Navy and Marine Corps aviator was medically screened prior to entering the Naval aviation pipeline. I was assigned as the only optometrist to the command. When I arrived at NAMI, I learned that I would be working with two ophthalmologist flight surgeons, Captains Phil Briska and Andy Markovits. Both had been there for many years and had a high respect for optometry. When I discussed my idea for developing an Aerospace Optometry specialty, they were

extremely supportive. Frankly, without their support, I never could have moved the idea forward. Additionally, the commanding officer of NAMI, Captain Ronald Ohslund, also a flight surgeon, saw the benefits of the idea and helped to promote it along the chain of command.

As we discussed ways of developing a “proof of concept” for the idea, we decided the best way to accomplish this was for me to complete the Navy’s six-month Flight Surgeon/Aerospace Physiology training program. The program consists of the same water survival training all Naval aviators complete, followed by land-survival training and then a very concentrated didactic program in the aeromedical aspects of flight. The last portion of the program transitioned us to Whiting Field, where we received the same primary flight training as all Naval aviators. I was lucky enough to continue with my training and participate in “carrier qualifications” on the aircraft Carrier U.S.S. Lexington. Following my six-month training course, on May 19, 1989, I was awarded Medical Service Corps “Wings of Gold” at the graduation ceremony at the Naval Aviation Museum in Pensacola. When I crossed the stage, they announced that I was the Navy’s first-ever “Aerospace Optometrist.” Officially, though, I was designated as an Aerospace Physiologist,² as the Navy didn’t yet have an Aerospace Optometry designation. That was yet to come, following many months of bureaucratic wrangling. Captains Patee and Freed were instrumental in helping to move the process through the Bureau of Medicine and Surgery. When we eventually got it done, we were able to designate several billets where people would receive the same flight pay as flight surgeons and other aeromedical experts received.

Medical Service Corps Wings of Gold. Image courtesy the author.

I don’t believe any of this would have happened if it wasn’t for some unfortunate events that naval aviation experienced around the same time. There had been several flight mishaps, some involving loss of life at night, that likely were caused by visual illusions that were not easily recognizable by aircrew. As the Navy’s newly winged aerospace vision expert, many asked me for my opinion. After looking at several of the mishaps, I believed that some might have been preventable if aircrew could have experienced some of these visual illusions prior to seeing them in flight for the first time. The question was how could we do that?

The Naval Aerospace Medical Research Laboratory was across the street from NAMI. The lab was responsible for conducting human performance research associated with Naval aviation, to include vision research. We were lucky enough to have two world-class vision researchers at the lab during my NAMI tenure, Commander David Still and Dr. Leonard Temme. David was an active duty Navy optometrist with a PhD in physiological optics and Leonard was his civilian counterpart. I had been working with both of these experts during my tenure at NAMI and now asked for their assistance in helping to develop a night vision training aid

Dr. Mittelman preparing for T-34 Solo Flight at Whiting Field. Image courtesy the author.

Dr. Mittelman speaking as the Deputy Surgeon General at NAMI 2012. Image courtesy the author.

Winging Ceremony – Museum of Naval Aviation – Pensacola, FL. Image courtesy the author.

Dr. Mittelman with Dr. Robert E. Mitchell, Director of the Robert E. Mitchell Center for Repatriated Prisoner of War (RPOW) Studies, at NAMI. Image courtesy the author.

to allow aircrew to learn about and experience nighttime illusions in the safe environment of a classroom. Together, we developed the Navy's Unaided Night Vision Training Program which utilized a series of Kodachrome slides laminated with neutral density filters to explain the physiology of unaided night vision while at the same time allowing students to dark adapt and experience those illusions first-hand.³ We applied for and were granted a patent for the process of laminating the slides with the neutral density filters. David's and Leonard's contributions to this effort were central to its success.

I had the opportunity to travel around the country globally "marketing" the program, which was almost an instant success. I had the fortune to work with the Army Research Institute at Fort Benning, Georgia to develop the Army Unaided Night Vision Training Guide for Ground Forces,⁴ a corollary to the Navy's flight training program. Our program was eventually embraced by all of the services and is utilized even today in a much-improved, computerized version.

Following the almost universal acceptance of the unaided night vision program, the credibility and acceptance of Aerospace Optometry within the aeromedical community was assured. And that was just the beginning of the influence we've had on Naval Aviation.

Because 80% of sensory input comes through the eyes, 20/20, uncorrected vision was assumed essential to becoming a naval aviator. We ultimately had significant input into relaxing vision standards so that people who had 20/40 vision corrected to 20/20 would be eligible to become Navy pilots. That change also led to discussions about the use of contact lenses by pilots in Naval Aviation. Thanks to the great work done by Drs. Jim Socks, Joe Molinari and others at the Naval Submarine Research Laboratory in Groton, Connecticut, we learned that the use of contact lenses in submarines provided an advantage to people who had to use a periscope as opposed to wearing spectacles. There clearly were corollaries to Naval aviation, especially with the increased use of night vision goggles in high performance aircraft.

Articles written by both Drs. Socks and Molinari showed that contact lens wear was safe under the adverse conditions of submarine life.^{5,6} Using the work that our colleagues developed for submarines, Drs. Brian Seigel, Dave Still and I conducted similar work as it applied to naval aviation.⁷ We had similar results, showing that contact lens wear in aviation would not cause damage to the cornea and was advantageous to flying with night vision devices. This work, along with research conducted by others eventually led to changes that allowed both pilots and other aircrew to wear contact lenses while flying.

There was a plethora of other challenges that needed evaluation during the same time that included laser protection, early work on photorefractive keratectomy (PRK) and radial keratotomy. Work done by Dr. Steve Schallhorn and later Dr. Mitchell Brown (Aerospace Optometrist #2) with Captain Schallhorn, on PRK led to that procedure and later LASIK, being approved for naval aviation.

Since the program's inception in 1989, there have been more than 30 optometrists with the 6AN designation of aerospace optometrists¹, with nine specially coded billets in Navy Medicine that are co-located with Naval aviation centered commands. They include: Naval Hospital Jacksonville, Florida; Naval Hospital Lemoore, California; Naval Hospital Oak Harbor, Washington; Branch Hospital Clinic Oceana, Virginia; Naval Medical Clinic (Naval Training Center) San Diego, California; NAMI Pensacola, Florida; (2 billets), Naval Aeromedical Research Unit, Dayton, Ohio; Naval Health Clinic New England, Newport, Rhode Island; Naval Clinic, Atsugi, Japan.¹

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