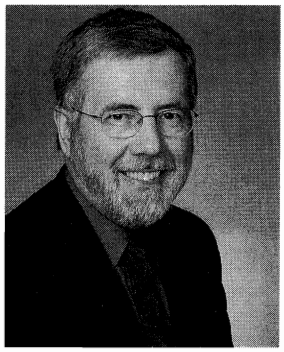
President's Page



David J. Schroeder, Ph.D.

In his July 1999 President's Page, Jeff Davis wrote about the many changes in the AsMA constitution and by-laws that were brought about as the result of 3 years of strategic planning. As part of this effort the association adopted a new vision statement: "The international leader in aviation, space and environmental medicine" as well as a new mission statement: "Apply and advance scientific knowledge to promote and enhance the health, safety, and performance of those involved in aerospace and related activities."

Another element of the change brought about by strategic planning was the decision to establish four vice presidents who would be in charge of four of the five functional areas in which the association conducts its business: education and research, members services, representation and advocacy, and international activities. The fifth area, governance, is managed by the president-elect. To further promote coordination of the various activities of the Association, each committee was placed under the direct guidance of one of the vice presidents or the president-elect. When this change was implemented, I had the distinct honor of being the first vice president in charge of education and research. Ultimately, this reorganization was designed to provide a more effective means of planning and carrying out the business of the Association. While I may be too close to the process to identify its deficiencies, I think that we have been able to accomplish more than we did before with this new organization. If nothing else, our Council meetings appear to be more effective and better organized.

Given that we are now nearly 5 years beyond implementation of these changes, it would appear to be a good time to see if we still maintain the same vision and mission and whether there are new initiatives that we should pursue. Allison and Kaye, in their book *Strategic planning for nonprofit organizations: A practical guide and workbook*, refer to strategic planning as "making conscious choices as to how you are going to use your limited resources to achieve your purpose in response to a dynamic environment."* As with many organizations, AsMA is also dealing with limited resources but still has a large and vital mission to fulfill. Indeed, many changes have taken place over the past 2 to 3 years – particularly within commercial and military aviation. Add to that the continued development of new technologies in aerospace systems, changes in medical practice - new procedures and medications, advances in genomics, and the development of nanomedicine - and it becomes clear that there is a need within the association for a good strategic plan. Toward these ends, the Executive Committee will hold a 2-day meeting early in September, of which the first day will focus on strategic planning. We need to take another look at the strengths, core capabilities and the unique attributes of our association. What are our weaknesses and where do our strengths lie so that we can effectively meet the challenges of the future? Given the rapid changes in technology, we need to ensure that we are planning ahead and positioning ourselves so that we can continue to fulfill and expand our mission.

For the Executive Committee and Council to fully address issues associated with planning for the future, we need your input. Please provide your thoughts to one of the members of the Executive Committee. The members for this next year include the president-elect (Melchor Antunano), the vice president of education and training (Richard Jennings), vice president for international services (Michael Bagshaw), vice president for membership services (Peach Taylor) and vice president for representation and advocacy (Jack Hastings). Members at large from the council include Ronald Reed, Susan Richardson, and Robert Weien. Each of you has some thoughts about what the organization can do strategically in the next 3-5 years to remain vibrant and involved. Dr. Weien, along with members of the Finance Committee and the Executive Director, Russell Rayman, are already working on a strategy to improve our financial planning. Dr. Rayman will also be working with the new co-chairs of the Membership Committee, Andy Bellenkes and Warren Silberman, to increase our membership during this next year. I will talk more about membership in a future column.

Our website plays a pivotal role in communicating with our membership as well as providing information to scientists, aerospace medical personnel, and the general public regarding our association and our positions on aerospace-related issues. If we are going to continue to be a force in aerospace medicine we will need to utilize this medium more and more to communicate our ideas and positions on important topics at hand. Scott Shappell, who assumed the role as chair of the Communications Committee in May, will be addressing some of the issues during the coming year. A problem he is facing is that he needs additional committee members to carry out the planning effort. If you are interested in supporting the work of this committee, please contact him at Scott.Shappell@faa.gov. Also, if you have ideas about how to make the website more effective and efficient, be sure to contact Scott. We will also continue to call on Ron Hoffman, who has worked with the contractors to improve the look and feel of the website.

In addition to these activities, we need to more clearly identify any areas of weakness within the association, as well as new opportunities on the horizon. I am asking each of the committee chairs and presidents of the constituent organizations to confer with their colleagues and provide input regarding their perceptions of the status of the association as well as identify initiatives that should be undertaken as a part of our strategic planning. To fully support the efforts of the Executive Committee and Council, we need your input by the end of August. I realize that this is short notice, but this is very important to the health of our organization and therefore time-critical. Once again, you can provide your input to any member of the Executive Committee. But let's not kid ourselves; to fully complete the strategic planning process will require continued effort over the next year or two. However, if we want to truly be the international leader in aviation, space and environmental medicine in the next decade and beyond, we must get started now.

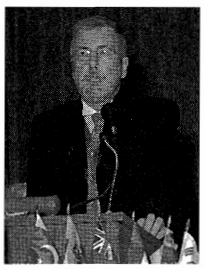
I would like to thank the chairs of the AsMA committees who completed their terms this past year. Eileen Hadbavny who, as chair of the Bylaws Committee over the past few years, guided revisions to the bylaws and generated a number of revisions and additions to the policies and procedures manual.

See PRESIDENT'S PAGE, p. 913.

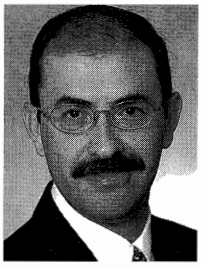
*Allison M, Kayer J. Strategic planning for nonprofit organizations: A practical guide and workbook. New York: John Wiley & Sons, Inc.; 1977:76.

New AsMA Officers:

Schroeder Installed as New President; Antuñano is President-Elect



Schroeder



Antuñano

David J. Schroeder, Ph.D., was installed as President of the Aerospace Medical Association during Honors Night, May 8, 2003, in San Antonio, TX. Melchor J. Antuñano was elected President-Elect at the AsMA Annual Business Meeting on May 6.

Two Vice Presidents were also elected: George Peach Taylor, M.D. and John D. Hastings, M.D. Continuing as Vice Presidents are Michael Bagshaw, M.B., B.Ch. and Richard T. Jennings, M.D., M.P.H.

In addition, four Members-at-Large for Council with terms to end in 2006 were elected: Fanancy Anzalone, M.D., Ronald D. Reed, Ph.D., John S. Crowley, M.D., and James T. Webb, Ph.D. Two Members-at-Large were elected to replace those elected as Vice Presidents: Henry L. Taylor, Ph.D., term to expire in 2004; and Jeffrey Sventek, Ph.D., term to expire in 2005.

David J. Schroeder, Ph.D., is Manager of Civil Aerospace Medical Institute's (CAMI) Human Resources Research Division in Oklahoma City. His biography ran in the July 2002 issue, p. 718.

Melchor Antuñano, M.D., is currently the director of the U.S. Federal Aviation Administration Civil Aerospace Medical Institute in Oklahoma City. He provides executive direction and is responsible for the administration of FAA Office of Aerospace Medicine's programs in Medical Certification, Medical Education, Medical Research, Human Factors Research, and Occupational Health Services. He was the recipient of this year's Liljencrantz Award. His biography appeared in the July 2003 issue, p. 797.

Highlights of the Council Meetings:

AsMA Journal Goes Online in August!

The Council of AsMA met at 9:00 a.m. on May 4 and at 7:00 a.m.on May 7. Council meeting minutes of November 20, 2002 were approved as read. One of the most exciting announcements was that the Journal is going online with this, the August 2003 issue. The rest of 2003 will also be placed online.

Editor's Report -- All manuscripts are now being submitted electronically. It is now taking on average 45 days from submssion to acceptance using the electronic submission system There was an l8% rejection rate in recent months. Manuscripts continue to flow smoothly without a large backlog. The Editor very much supports placing the journal online. Dougal Watson has volunteered to archive the journal on CD, but cost estimates are still needed.

Managing Editor's Report -- The Managing Editor stated there were four supplements in the works with Medical Guidelines for Airline Travel published in May and the PFO supplement in June. There is a new history feature in the journal written by Dr. Dalitsch. The Managing Editor described basic costs for placing the journal online.

Scientific Meeting Report -- The Executive Director announced that advance registration was 1,146, approximately 300 less than last year. This is attributed to the war in Iraq as well as the SARS epidemic.

Dr. Bellenkes reviewed the Scientific Program and thanked his Committee members. Abstract submission for this year's meeting was very smooth. There were 531 total abstracts submitted; 512 were accepted. There were 41 Panel Sessions. This year's meeting was accredited by the AMA for 24 hours, by the AAFP for 22 hours and by AOA for Category A with no hours indicated in their letter of acceptance.

Dr. Jennings has arranged for ABPM in modulars for this meeting consisting of the FAA sessions and two of the Workshops. We will plan for 20 hours of modulars at the 2004 Alaskan meeting.

It was announced that Ms. Julienne Wong received the Annual Student Resident Stipend for 2003. She is currently a student at Queens University in Ontario, Canada.

Outreach -- The Executive Director announced that Medical Guidelines for Airline Travel will be published this month after which it will be put on the Web. It was also announced that a $500.00 donation for this project was contributed by Mr. Gorman. We have received many kudos from commercial companies for our Space Passenger position paper that was recently published in the journal. Furthermore, AsMA sent a letter of support to the USAF Chief of Staff, the Surgeon General, and the Secretary of Defense in support of the USAF policy on Go-No-Go Pills.

AMA Activities -- Major activities of the AMA include Torte Reform and Medicare. Furthermore, at the June House of Delegates, the AMA will discuss and vote on whether to continue as an organization of individuals or an organization of organizations. The inflight medical database is ongoing; there need to be international standards for categories used in the description of symptoms inflight.

Committee Report Highlights:

Aerospace Human Factors -- Slides on the web are being updated.

Air Transport Medicine -- Paper on SSRI will be sent to Council for final review and vote at the November Meeting. The Committee is also working on periodicity of physical examination requirements.

Aviation Safety Committee --The "age-60" paper is still under review by the Aviation Safety Committee. It is anticipated that it will be ready for Executive Committee review at their September meeting and then for a vote at the November Council Meeting.

Awards -- The 7-year rule for receiving awards was rescinded. The 3-year rule for retentions of nominees was retained. The nomination form is online and can be e-mailed to the chair. The new Chair is Verba Moore.

Bylaws -- Col. Hadbavny presented four proposed Bylaws changes at the Business Meeting; three of them were passed. Kirk Nailing is the new chair of this committee.

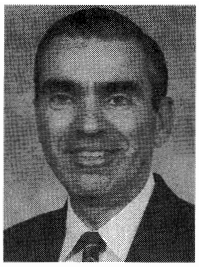
Communications -- Dr. Ron Hoffman presented two proposals for Website redesigns, ranging from $16,000.00 to $29,000.00. A third proposal is pending. Dr. Hoffman will continue to work as the website coordinator. The new committee chair will be Scott Shappell.

Corporate & Sustaining -- A symposium on cardiovascular research for long duration spaceflight is still being planned. The committee is sponsoring a panel on dentistry. Corporate membership is down at the moment, but efforts continue to attract new members.

See COUNCIL, p. 917.

CONSTITUENT	ORGANIZATION REPRESENTATIVES: COUNCIL	NOMINATING COMMITTEE
AMDA -	Thomas B. Faulkner, M.D.	Thomas B. Faulkner, M.D.
ASAMS -	Warren S. Silberman, D.O.	Jerry B. Owen, M.D.
ANS -	Maj. Joyce M. Rosenstrom	Diane L. Fletcher, R.N.
AsHF -	Carol A. Manning, Ph.D.	Carol A. Manning, Ph.D.
AsPS -	Susan E. Richardson	Vincent W. Musashe
IAMFSP -	Dwight A. Holland, Ph.D.	Dwight A. Holland, Ph.D.
USAF/FS -	Bruce Green, M.D.	TBD
SMB -	Philip J. Scarpa, Jr., M.D.	Denise L. Baisden, M.D.
LSBEB -	Estrella M. Foster, Ph.D.	Donald A. Diesel, Ph.D.
USArmy -	James S. McGhee, M.D.	James S. McGhee, M.D
USN/FS -	Dean A. Bailey, M.D.	Dean A. Bailey, M.D.

Executive Director's Column



Rayman

Preventive Medicine and the Aviator

At the AsMA meeting in San Antonio, a number of papers were presented on medical certification of civil aviation pilots. Several speakers emphasized that the purpose of the medical exam was to ensure that the pilot was disease-free and in no danger of significant illness or subtle/sudden incapacitation only during the validity of the medical certificate. This may vary from 6 to 12 months, depending upon national regulatory authorities. Consequently, long-term health, screening, and risk assessment are not given consideration.

Although this might seem cavalier, there are several cogent reasons for this policy. For example, in some countries, the pilot might have to pay out of pocket for screening tests and risk assessment. Some pilots might object to testing beyond what is required for many reasons including costs. There could also be pressure from pilot unions. In addition, pilots have an understandable fear that any test or study might reveal a medical problem that threatens qualification for flying. Consequently, costs and fear in the minds of any examinee is understandable.

However, physicians who practice aerospace medicine (and in my opinion, all physicians) should have prevention upper-most in their minds, regardless of the purpose of an encounter with a patient. One might argue that a pilot undergoing a medical examination is not really a patient and that the encounter is very different from that of a physician caring for a patient with illness or injury. This may be true, but nevertheless, it is a professional encounter and should be considered so.

Is there a way to resolve the dichotomy of costs and fear on one hand and good preventive medicine on the other? I believe there is. First, during the medical examination, the examining physician can easily discuss healthy lifestyles with the pilot -- this causes no increase in costs nor does it induce fear. Second, the physician might also suggest recommended screening tests depending upon age, sex, family history, or other such factors. This could come in the form of a recommendation to the pilot rather than as a mandated part of the medical examination. The pilot could be given the option of undergoing those screening tests that are recommended. In this way, bearing the costs would be at the discretion of the pilot, the results would be confidential, and the pilot would receive appropriate preventive advice. Everybody would win.

The United States Preventive Services Task Force periodically publishes recommendations for screening tests giving the advantages as well as disadvantages. It is an excellent reference regarding screening tests, and is extremely useful for any physician who believes in the merits of preventive medicine.

This Month in Aerospace Medicine History-- August 2003

By Walter Dalitsch III, M.D., M.P.H.

Introduction

Strangely enough, I frequently find myself writing these columns while at altitude. Air travel has become such a routine concept in the world today that we do not give it a second thought to be at a meeting on one coast in the morning, and having dinner on another coast in the evening.

So I find myself airborne, en route from finalizing a new home in Virginia back to Florida, from where I'll fly (privately this time) to Kansas City to get married, followed by a flight to Canada for our honeymoon. That's all in the matter of a week's time. There are certainly human factors involved here, and that's where we will begin in this month's feature…but 50 years ago.

Fifty Years Ago

Even in 1953, the man-machine interaction was recognized as being significant in aviation safety: "The airplane is one part of a man-machine combination. Therefore, the question is not whether the machine is complex in itself but whether the man-machine combination can function efficiently… It is often necessary to complicate the machine to simplify the pilot's task… Automatic systems are complex, but are aimed at simplification… An emergency system is of questionable value if it introduces a new hazard through possible malfunction. Such cases have happened. This does not necessarily mean it must be removed; it should be studied to see if, possibly by a slight increase in complexity, the secondary hazard can be eliminated. Much complexity in the modern airplane is essential to its ability to serve its purpose, and cannot be eliminated without destroying the ability. We must, in fact, be ready to accept an increasing amount of complexity of this type, if aviation is to continue to develop" (9).

Here is interesting commentary from Williams Air Force Base Hospital, Chandler, AZ: "Neurocirculatory collapse is the most appropriate terminology to describe the syndrome of collapse which results from exposure to low barometric pressure. The outstanding symptoms are either neurological, circulatory or a mixture of these two; hence, 'neurocirculatory.' Such a condition is most frequently observed following ascent to simulated altitudes of 30,000 feet or more in an altitude chamber, but may also be seen to occur as a result of actual flight to similar altitudes in the present day aircraft… Although the exact patho-physiological changes which occur in the human body with this condition are not fully understood, it is believed that maladjustment of the autonomic nervous system may be responsible for the severity of some of the cases. The causative factor in the development of this clinical syndrome is thought probably to be an ischemic hypoxia resulting from gaseous emboli and/or vasospasm" (6).

From Wright Air Development Center, OH: "Ballistocardiographic studies of cardiac output …indicate that the Emergency Partial Pressure Suit maintains subjects in approximately the same condition as that which is obtained while breathing against 30 to 35 mm Hg without any protective counterpressure… [This demonstrates] that the suit is capable of maintaining a properly indoctrinated subject in relatively good condition for at least thirty minutes. This period is sufficiently long to permit descent from all altitudes above 40,000 feet to safe pressure breathing altitudes in the event of sudden loss of cabin pressurization" (2).

Early hearing conservation measures were being employed: "The physical insult of aircraft engine noise is reaching or is soon likely to reach extensive proportions. The use of ear protective devices must be encouraged. This is primarily the responsibility of medical officers, particularly of flight surgeons, because aviation ground and deck personnel require protection to avoid unnecessary discomfort, pain, deafness, and consequently, rapid turnover. Ear muffs and ear plugs should be evaluated in operations… The flight surgeon must learn from his own experience the precautions required for particular noise environments. Otoscopy and auditory tests will probably become his main evaluational procedures" (8).

Fifty years ago, an editorial comment encouraged that "Every Member Get a Member": "Recently it was stated that more than 4,000 physicians in the United States devote all or part of their time to the practice of aviation medicine. This group includes airline medical directors and their consultants, Civil Aeronautics Administration examiners, Naval and Air Force flight surgeons and aeromedical teachers and researchers. It represents a highly-specialized segment of American physicians who are making major contributions to the health and safety of flyers and their passengers, and to the steady progress of aeronautics… On the other side of the ledger, it is disconcerting to find that less than half of the 4,000 physicians…are members of this Association. Paradoxical as it is, the majority of these physicians, whose income is derived wholly or partially from aviation medicine, are failing to support the one professional society which has organized and fostered their specialty" (5). [Ed note: some things haven't changed!]

Twenty-five Years Ago

From August 16 to 17, 1978, the first successful transatlantic balloon flight was completed by three men from Albuquerque, NM. Ben Abruzzo, Larry Newman, and Maxie Anderson accomplished this in their helium-filled balloon, Double Eagle II (10).

The Civil Aeromedical Institute in Oklahoma City found that training in disorientation was lacking: "A 10-item, voluntary questionnaire answered by 674 flight and ground schools provided information [on training in disorientation]. More than one-third of the respondents evaluated their disorientation training program as inadequate and defined the inadequacy most often as a lack of appropriate materials, aids, and information. Tabulations of responses to the separate items suggested areas for improvement in disorientation training" (3).

The Naval Submarine Medical Research Laboratory in Groton, CT, had this interesting commentary on nitrogen narcosis: "Simple and complex psychomotor performance were tested among 21 Navy divers under normal conditions and during nitrogen narcosis in simulated dives to 170 ft of sea water. Complex psychomotor performance was im-

See HISTORY, p. 902.

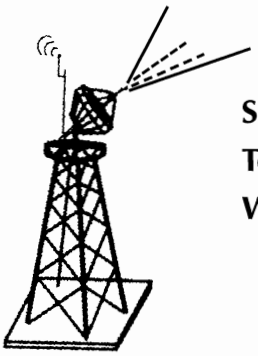
HISTORY, from p. 901.
paired significantly during narcosis, while simple psychomotor performance remained essentially normal. Differences between baseline scores for complex psychomotor performance (pre- and post-dive combined) and scores obtained form the two combined testing sessions administered during narcosis were correlated with official Navy records of diving experience and self-reported moods. None of the diving experience measures was associated significantly with these difference scores. The moods of Fatigue and Happiness were, however, correlated significantly with impairment. These results indicate that, although previous experience with nitrogen narcosis and diving tasks do not mediate the performance effect of nitrogen narcosis, the complex psychomotor effects of nitrogen narcosis are related to emotional traits." (1)

The Uniformed Services University of the Health Sciences in Bethesda, MD, had this regarding mental health needs following aviation mishaps: "A major commercial aircraft accident mobilizes a sophisticated disaster response by the federal government and local disaster teams. However, there is no effort to deal with the significant mental health needs of survivors, airline crew, ground personnel, and rescuers. The time has come to deal with the human tragedy and its emotional consequences. The development of an emergency protocol for response to mental health crises at the time of an accident must be confronted. An appropriate response on the part of the mental health community must address all persons involved in the accident. Management would involve a relatively brief length of time. Team members can include psychiatrists, physicians, nurses, psychiatric aides, airlines representatives, clergy, and other trained personnel. The establishment of such a mental health preparedness program in crisis intervention must be the responsibility of the airlines, federal agencies, and others if the program is to be a success" (4).

August of 1978 witnessed a significant moment in Army Aviation: "COL Robert W. Bailey, USA (Ret)…former commander of the U.S. Army Aeromedical Research Laboratory at Ft. Rucker, AL, and COL Stanley C. Knapp, MC, the present commander, [joined] in turning the symbolic shovelful of earth for a new USAARL facility. Construction of the $7 million laboratory began in June. Completion is expected in 2 years. It was under COL Bailey's leadership that the conception and planning for the new laboratory began" (7).

REFERENCES

1. Biersner RJ, et al. Diving experience and emotional factors related to the psychomotor effects of nitrogen narcosis. Aviat Space Environ Med, 1978; 49:959-62.
2. Cain CC, Mahony DI. The effect of high breathing pressure on cardiac output with and without counter pressure. Aviat Med 1953; 24:308-21.
3. Collins WE, et al. Disorientation training in FAA-certificated flight and ground schools: A survey. Aviat Space Environ Med, 1978; 49:947-51.
4. Duffy JC. Emergency mental health services during and after a major aircraft accident. Aviat Space Environ Med, 1978; 49(8):1004-8.
5. Editorial comment: Every member get a member. Aviat Med 1953; 24:257-8.
6. Halbouty MR, Long DR. Neurocirculatory collapse in aircraft flight: Report of a case. Aviat Med 1953; 24:301-7.
7. Medical news: New USAARL at Ft. Rucker. Aviat Space Environ Med 1978; 49:1037.
8. Mendelson ES. Reduction of aircraft engine noise hazards. Aviat Med 1953; 24:340-6.
9. Stieglitz WI. Complicated safety. USAF Flying Safety, 1953 (Aug); 9(8):9-11.
10. www.infoplease.com/ipa/A0004537.html



Science & Technology Watch

Keeping You Informed Of The Latest Advances In Science And Technology

Fatigue and the effects of sleep restriction are well known issues for aviators. In this month's column, we report on a relatively new methodology, functional magnetic resonance imaging, and its use with EEG to study individual differences in fatigue research.

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Neuroimaging Sleep Debt with FMRI in Short- and Long-Sleepers

by Walter Carr[1], Sean P. A. Drummond[2], and Thomas Nesthus[3]
[1]Naval Health Research Center (NHRC);
[2]University of California San Diego/Veterans Affairs San Diego Healthcare System (VASDHS);
[3]FAA Civil Aerospace Medical Institute

Understanding the impact of sleep deprivation on cognitive performance is increasingly important in our society where many people acutely or chronically fail to obtain adequate sleep. This is especially true in aviation, where cognitive demand is high and tolerance for performance error is low. Despite a history of sleep and fatigue research, specific underlying physiological mechanisms remain elusive. Functional Magnetic Resonance Imaging (FMRI), a neuroimaging technique in use for about 10 years, has found new application in this research area. University of California San Diego (UCSD), Veterans Affairs San Diego Healthcare System (VASDHS), and Naval Health Research Center (NHRC) have research protocols utilizing FMRI technology to assess the impact of sleep deprivation on cognitive performance and brain function of "short sleepers" and "long sleepers," a naturally occurring individual difference in need for sleep. Results of this research augment recent data showing an unexpected increase in neural activity after sleep deprivation (2) and recent data suggesting neurophysiological differences between short- and long-sleepers (1).

Since the 1920s, measurements of brain activity in sleep and fatigue research have focused on electrophysiological data [e.g., electroencephalogram (EEG)]. A newer treatment of metabolic data and recent advances in functional brain imaging techniques have allowed researchers, more directly than ever, to relate brain function to behavioral performance following sleep deprivation. In FMRI Blood Oxygen Level Dependent (BOLD) contrast imaging, the natural differences in magnetic susceptibility between deoxyhemoglobin and oxyhemoglobin is exploited. Hemoglobin is the primary oxygen carrier in the blood and when oxygen is used by cells in the body, deoxyhemoglobin is generated. Deoxyhemoglobin is paramagnetic and degrades the signal measured by FMRI from surrounding tissue more quickly than does oxyhemoglobin. When the brain increases activity, the firing rate of neurons increases, and regional blood flow increases. Cerebral blood flow increases to a greater extent than the increase in oxygen consumption rate, yielding a lower deoxyhemoglobin to oxyhemoglobin ratio in the region of increased activity. This differential ratio increases the local FMRI signal. The recorded signal reflects the localized neuronal activation in response to the subject's behavior during the scan. Each FMRI record is a 2-dimensional slice acquired in about 40 ms with up to 23 mm resolution. Multiple slices are assembled into a 3-dimensional volume. Unlike some neuroimaging methods, no ionizing radiation is required for FMRI. With current technology, FMRI represents an optimal combination of spatial and temporal resolution for noninvasive measurement of whole brain or localized neural activity.

Few neuroimaging studies have simultaneously examined the effects of sleep deprivation and cognitive performance on cerebral activation, and those studies that have used attention demanding tasks. Our emphasis is on tasks with greater cognitive demand. Positron emission tomography (PET) (see 5) studies reported that decreased thalamic activation after sleep deprivation is associated with decreased behavioral performance across a 30-minute epoch of measurement, while the FMRI study (4) reported that increased thalamic activation is associated with intact performance across a 6-min epoch. These findings support the hypothesis that arousal levels following sleep deprivation influence task performance.

The serial addition-subtraction performance task used in the PET study by Thomas et al. (5) required arithmetic working memory as well as attentional demands. Their results showed decreased activation in the prefrontal cortex, inferior parietal lobe, and the anterior cingulate gyrus. This suggests that brain regions involved in working memory and arithmetic might be vulnerable to sleep deprivation and supports the notion that the prefrontal cortex is particularly susceptible to adverse effects of sleep deprivation. However, given the length of the task (i.e., 30 min), it is difficult to separate sustained attentional demands from working memory demands when interpreting the cerebral activation data.

Drummond et al. (2) used experimental tasks with greater cognitive demands than sustained attention tasks alone and found evidence of an increase in neural activation for a verbal learning task under conditions of sleep deprivation. This was an unexpected finding that may reflect an adaptive recruitment of additional and new cognitive resources to sus-

See SCI TECH WATCH, p. 903.

SCI TECH WATCH, from p. 902.
tain performance. Specifically, when comparing neural activation after deprived sleep with activation after normal sleep, increased sleepiness correlated positively with increased activation in the left inferior frontal gyrus, and there were increased and new cerebral responses in regions of the bilateral prefrontal cortex and parietal lobes with greater activity in parietal lobes correlating with more intact memory performance. Differing from the verbal task, an arithmetic task showed the more expected decline in neural activity after sleep deprivation (3). Thus, it appears the brain does not react uniformly to cognitive task performance following sleep deprivation. In fact, available findings suggest that after sleep deprivation the brain may adaptively recruit additional resources not used in the normally rested state to perform some cognitive tasks. This adaptation can manifest either as involving spatially larger brain regions activated in the normally rested state, or as recruitment of new brain regions not normally responsive to task performance. This cognitive demand-specific hypothesis is the first to incorporate an adaptive cerebral response after sleep deprivation and suggests that specific cognitive demands associated with a given task mediate cerebral adaptation during sleep deprivation. One task demand that may mediate differential results in the attention studies reviewed is time-on-task: the tasks that required long periods of attention showed decreased thalamic activation and behavioral performance, while the shorter task showed increased thalamic activation and intact performance.

Research at UCSD/VASDHS and NHRC examines this adaptive cerebral mechanism hypothesis further and includes individual differences in need for sleep-differences that EEG data suggest are related to arousal level (and thus thalamic activation). In the current research, individuals identified as short- or long-sleepers (naturally sleeping less than 6¼ hours or more than 8¾ hours per 24-hour period, respectively) are examined with FMRI while completing cognitive tasks at multiple time points under conditions of normal sleep, deprived sleep, and recovery sleep. Except for duration, sleep for short- and long-sleepers is normal in architecture and physiology as traditionally measured. The neurobiological basis for these individual differences in sleep duration is not known. David Dinges indicated that understanding such individual differences was of paramount importance for sleep research in his 2002 Keynote Address to the Associated Professional Sleep Societies. Neuroimaging techniques, such as FMRI, have the potential to reveal mechanisms underlying individual differences that behavioral data cannot.

EEG research of short- and long-sleepers suggests between group differences in alteration of brain dynamics under conditions of sleep deprivation (1). Specifically, short-sleepers show greater theta activity than long-sleepers. Such theta activity is associated with internal pressure to sleep and suggests that short-sleepers have a greater internal pressure to sleep during sustained wakefulness and specific differences in neurophysiological processes. Additionally, increased theta activity is related to decrements in cognitive function and performance. FMRI data should augment EEG data and better characterize the brain's plastic compensatory activation mechanisms in response to internal pressure to sleep. Such data may also be useful in predicting an individual's natural sleep requirement by examining brain activation during sustained wakefulness and may eventually yield improved fatigue countermeasures, especially on an individually tailored basis, that would have implications for occupational safety and efficiency.

REFERENCES:

1. Aeschbach D, Postolache TT, Sher L, et al. Evidence from the waking electroencephalogram that short sleepers live under higher homeostatic sleep pressure than long sleepers. Neuroscience 2001; 102:493-502.
2. Drummond SPA, Brown GG, Gillin JC, et al. Altered brain response to verbal learning following sleep deprivation. Nature 2000; 403:655-7.
3. Drummond SPA, Brown GG, Stricker JL, et al. Sleep deprivation induced reduction in cortical functional response to serial subtraction. NeuroReport 1999; 10:3745-8.
4. Portas CM, Rees G, Howseman AM, et al. A specific role for the thalamus in mediating the interaction of attention and arousal in humans. J Neurosci 1998; 18:8979-89.
5. Thomas M, Sing H, Belenky G, et al. Neural basis of alertness and cognitive performance impairments during sleepiness: I. Effects of 24 hours of sleep deprivation on waking human regional brain activity. J Sleep Res 2000; 9:335-52.

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The AsMA Science and Technology Committee provides this Science and Technology Watch Column as a forum to introduce and discuss a variety of topics involving all aspects of civil and military aerospace medicine. The Watch can accommodate up to three columns of text, which may include a figure or picture to illustrate your concept.

Please send your submissions via e-mail to: ShenderBS@navair.navy.mil

Bailey Assumes Presidency of SUSNFS

CAPT Dean A. Bailey, MC, USN, assumed the presidency of the Society of U.S. Naval Flight Surgeons during the annual meeting in May in San Antonio, TX. The son of a Marine Corps aviator, CAPT Bailey was born in Pensacola, FL, in 1956. He received a bachelor's degree in Chemistry from the University of California, Los Angeles in 1978, and earned his medical degree from the Uniformed Services University of the Health Sciences in Bethesda, MD, in 1982. After completing a surgical internship at Naval Hospital San Diego, he was assigned to NAS Pensacola where he attended Flight Surgeon training at the Naval Aerospace Medical Institute. Following designation as a Naval Flight Surgeon in May 1984, he was assigned to Fighter Squadron 124 at NAS Miramar, CA, flying the F-14 Tomcat. He later served as the flight surgeon to the Navy Fighter Weapons School and then was reassigned to Carrier Air Wing Eleven, and deployed onboard USS ENTERPRISE (CVN 65) for an around-the-world deployment in 1989. He was subsequently assigned as the flight surgeon to Carrier Airborne Early Warning Squadron 110 at NAS Miramar in 1990. In August 1992, he began his training as a resident in aerospace medicine, completing his Masters Degree in Public Health and Tropical Medicine at Tulane University. He returned to the Naval Aerospace and Operational Medical Institute and completed the Aerospace Medicine residency in June 1995, after serving as Chief Resident for his final year.

Upon completion of his residency, CAPT Bailey was assigned as the Senior Medical Officer aboard USS GEORGE WASHINGTON (CVN 73) from July 1995 to July 1997. During his tour, GEORGE WASHINGTON made a record setting deployment to the Mediterranean, Adriatic Sea, and Persian and earned the COMNAVAIRLANT "Blue M" twice in succession, and back-to-back Battle "E" awards in 1996 and 1997. During his tenure, GEORGE WASHINGTON achieved widespread recognition for its development and successful use of advanced medical technology at sea, including telemedicine.

In August 1997 Captain Bailey assumed duties as the Assistant Force Medical Officer, Commander Naval Air Force, U.S. Atlantic Fleet at Norfolk,
Virginia. In January 1999 he returned to sea as the Senior Medical Officer aboard USS THEODORE ROOSEVELT (CVN 71), where he led his department in support of combat air operations over Yugoslavia and Operation NOBLE ANVIL.

Captain Bailey returned to Norfolk and was promoted to his present rank in June 1999. He assumed the duty of Force Medical Officer, Commander Naval Air Force, U.S. Pacific Fleet in August 1999, and was responsible for the medical readiness, training, and healthcare support for all Pacific Fleet aviation units. After 9/11, he was instrumental in the fielding of advanced DNA-based biological warfare agent detection equipment to shipboard platforms, significantly upgrading existing CBR defense capabilities. In 2002 he assumed additional duties as the Force Surgeon for the Commander, Naval Air Forces. In this role, he was responsible for medically related policy and requirements for all of Naval Aviation worldwide, including 12 aircraft carriers, 120 aircraft squadrons, and over 75,000 active duty personnel.

AsMA Future Meetings

May 2-7, 2004
Egan Convention Center
Anchorage, AK

May 9-12, 2005
Kansas City, MO
Hyatt Regency Crown Center

May 14-18, 2006
Caribe Royale Hotel
Orlando, FL