President’s Column

Col Richard Bachmann, USAF, MC, CFS

The theme for this edition of your Society Newsletter is the aero-medical support of space operations. The active duty Air Force does not have a large role in these missions today, but that hasn’t always been the case. In fact, the “space race” of the 1950s and 1960s was directly responsible for the build up of personnel, facilities and cutting-edge expertise at Brooks AFB that became the Aeromedical Systems Center. In order for the nation to put humans in orbit and go to the moon, a tremendous amount of resources had to be dedicated to research and training the astronauts and the professionals who supported them. Today’s flight surgeons are the beneficiaries of that legacy and carry on the tradition of excellence. Some of you may be inspired to pursue opportunities with NASA – they are always looking for professionals with your credentials.

Other articles cover a range of issues, from an update on actions we are taking to alleviate the chronic flight surgeon shortage, practical tips on using AHLTA, SGP HSI toolkit, and many others. A summary of the 2006 State of the Flight Surgeon Survey demonstrates that the squadron-level operational flight surgeon is still highly regarded by the aviators we support. If it piques your interest, the full report is available at the Society website.
On a personal note, I have had the opportunity to engage with five Aerospace Medicine Primary course classes since taking command of the school. Talking to our newest flight surgeons is tremendously energizing – I get fired up by the excitement in their eyes as we talk about the wide variety of missions they support and the opportunities that they made be afforded in their new career in aerospace medicine. Col Karl Lee has done a great job of being the AMP Daddy for the last couple years, and now we are nearing the construction of the completely revised AMP. Thanks to funding support from Air Staff and a tremendous amount of work by Karl, we have completely transformed the AMP. In the very near future, students will experience “Death by PowerPoint” in the comfort of their own homes or offices – the didactic lectures have been converted to distance learning format - no more dozing in the lecture halls! After completing all 12 modules and passing their respective exams, they will come to USAFSAM for four weeks of workshops and problem-based learning exercises where they will use the information they learned on-line. The current Fall AMP class is the last one we will teach using the traditional model. The Spring 2007 course will be the first offering of the distance learning/workshop combination. If you are interested, you are welcome to go to the developmental website at http://63.166.150.212/amp/menu.htm and have a look. The username is ampuser and the password is user!amp. We welcome your feedback!

Sadly, we have lost a valued member of the flight surgeon community in Lt Col Steve Goff. I had the chance to work with Steve in Europe a few years back, and was always impressed by his quiet expertise. Please take a few moments to ponder his passing, and what a life of service means. Make sure you are taking care of each other while you are taking care of the mission and defending our freedoms. We can’t afford to lose a single one of you! Thanks for all you do, stay safe and check six. ♠
These workshops provide hands-on training for any issue DoD communicators have with external or internal stakeholders. They include both communicator skills training and communication issues planning:

- How to deal with negative emotions such as anger, fear, distrust, irritation and frustration.
- How to deal with agendas such as personal, political, economic, social, historical and cultural.
- How to deal with perceptions of risks that are different than the science/data/facts.
- Workshops cover how communicating with the media is different than communicating with the public.
- How to improve your nonverbal skills through both observation and self awareness.
- How to develop a flexible, practical communication plan.

Fulton Communications, represented by Keith Fulton and Sandy Martinez, has over 43 years of experience in the chemical industry, including plant manager and public affairs manager of a major petrochemical plant, dealing with safety, health and environmental issues, economic and political agendas with internal and external stakeholders including the media.

**FLIGHT SURGEONS**

Preventive Medicine and Community Health (PMCH) at the University of Texas Medical Branch in Galveston, Texas is seeking several flight surgeons for our work with the aerospace industry. These positions will support the UTMB subcontract with Wyle Laboratories, Life Sciences Systems and Services, the prime contractor for the Bioastronautics contract at the NASA Johnson Space Center in Houston, Texas. This position will also include an appointment to the faculty of the UTMB School of Medicine. You will:

- Work in Star City, Russia (up to 3 months per year), and Johnson Space Center–Houston
- Support JSC Medical Operations
- Provide medical support to Expedition and/or Shuttle mission development and implementation
- Provide primary acute care in Russia to astronauts and dependents; NASA personnel
- Support training and procedures development in U.S.

(Operational flight surgeon experience or accredited AM board eligibility/certification required.)

All candidates must have a degree in medicine (D.O. or M.D.) with ABMS-recognized board certification or eligibility in a clinical specialty. Current (or ability to obtain) unrestricted Texas medical license, DEA and Texas DPS controlled substances certifications. Must be a U.S. citizen or permanent resident.

Send inquiries and/or a detailed resume to:

email: CPM.Jobs@utmb.edu

*UTMB is an equal opportunity, affirmative action institution which proudly values diversity. Candidates of all backgrounds are encouraged to apply.

Over 200 Risk Communication Workshops conducted for the Department of Defense over the past 10 years.

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Because every Squadron flight doc knows “Keep ‘em Flying!” doesn’t stop when your pilot hits the base gate.
My column this quarter is dedicated to passing on information from the Society Board of Governors, which met in September.

Several Society officer positions will open up in May ’07. We will need a Vice President (one-year term followed by one year as President Elect), Secretary (two-year term), and three elected Board Members (2-year term). If you are interested in filling one of these positions or making a nomination, please contact Col James Stewart, the Nominations committee chair, at James.Stewart@ustranscom.mil. The list of current officers can be found on the SoUSAFFS website, http://www.sousaffs.org.

What’s new on the SoUSAFFS website? Your Society Webmaster, LtCol Dave Sarnow, will be changing the layout to a more user-friendly version. The site contains links to resources including the Aeromedical Theater Guide, Deployed Medical Commanders’ Handbook, and SGP Tool Kit, as well as links to the Brooks Heritage Foundation and past issues of Flightlines. Contact LtCol Sarnow, David.Sarnow@Brooks.af.mil, if you have suggestions for improving the website.

Whether you are Active Duty, Guard, or Reserve, keeping up with training requirements is a constant challenge. Check out the new Flight Surgeon Sustainment Training section posted on the Knowledge Exchange. From the Kx homepage, go to “Functional View” - “Aerospace Medicine” - “Flight Medicine” - “Flight Surgeon Sustainment Training”. Lectures are posted to this webpage to serve as a resource for training flight surgeons in Mission Essential Tasks and Activities for Line Support (METALS). This project is still in its infancy, with 11 topics posted so far. The goal is to have a complete series of METALS-related lectures on the site, avoiding duplication of efforts and preparation of training materials at each local base. If you have requests for future topics or have material to contribute, please e-mail Col Ronald Poole at ronald.poole@brooks.af.mil.

Each time we mail an issue of Flightlines, the Society pays about $25 in fees for returned mail. You can help us cut down on this unnecessary expense. If you have moved or have a PCS pending, please update your address and contact information on the SoUSAFFS website. If you’ve misplaced your user name or password, email me at Cheryl.Lowry@Brooks.af.mil. Keeping your contact information current helps us find you when your Flightlines doesn’t!

There are two easy ways to become a SoUSAFFS member or renew membership. Use the form on the back cover of Flightlines, or download the membership form from the SoUSAFFS website (located in the “Membership & Dues” link on the left side of the page). The Society mailing address is on both forms. Dues are $20/year ($200 for lifetime membership), and you must also be a member of AsMA. For membership questions, email LtCol Jeanine Czech, the Membership committee chair, at Jeanine.czech@incirlik.af.mil.

As the calendar year comes to an end, it’s time to recognize the outstanding work done by our flight surgeons and aerospace medicine technicians. The “SoUSAFFS Awards” link on the website has a brief description of each of the Society’s awards. We will post nomination criteria, instructions and deadlines by December.

That’s about all the news. Keep ‘em flying!

Wingman LtC Sarady Tan attempts biceps flexion following the fini flight of outgoing Surgeon General, LtG Peach Taylor.
AFMOA Physical Standards: Vision Policies and the Rapidly Aging NEW 48-123

Col Charles W. Cotta, USAF, MC, CFS
AFMOA/SGPA
Chief, Medical Standards Application Policy

Well, a lot of water has gone under the bridge since our last update in June 2006. Col Lane Wall has now been firmly ensconced as the 6 AMDS/CC at MacDill AFB and I’m told on good authority that he claims not to miss Air Staff at all, hard to believe! Having been out of true aerospace medicine work since 1994 someone decided that I needed to be “re-blued” so here I am trying to fill the rather large shoes that Lane left behind. Col Joe Anderson was pulled to be the MDG/CC at Vandenberg AFAB and from notice to departure he was gone in less than a month, sound familiar to anyone out there? Joe’s replacement will be Maj. (Dr.) Jaime Broughton, coming to us fresh from the 10 MDG where she was working cadet type standards issues. Jaime should arrive in DC by mid October and will be welcomed with open arms by yours truly. In the meantime I continue to wear two hats, neither of them fits well due to lack of recent aerospace medicine experience, but the job has been held together by great staff teamwork and a reliance on a high quality (ret) aeromedical technician, Ms. Brenda Kearney. Again, sound familiar to any of you SGP types?

From the last issue, Joe had talked a little bit about changes in color vision policy within the aviation environment. As part of this process a Color Vision Summit will convene from 25-26 September 2006 at Brooks City Base, hosted by the Ophthalmology Branch at the Aeromedical Consult Service. Representatives from all three sister services will attend, experts in color vision, pilot physicians, an FAA rep and cockpit design types from the Air Force Research Lab at Wright-Patterson AFB. Topics will include: what standards need to be used for testing, what do we do with the color vision deficient individuals who are applying for aviation service now, how do we bridge the gap between our very early understanding of the use of color in the cockpit to how cockpit design will be accomplished in the future. At Air Staff we are grappling with what specific career fields need normal color vision, which ones don’t need it as part of their job description, and the 24 thousand dollar question; “What jobs can be performed well with known limited color vision policy?” Hopefully we can report out some significant progress in this area after the meeting this month.

The Corneal Refractive Surgery (CRS) Policy letter hit the streets on 5 September 2006. There is a rather large set of guidelines that are attached to it and I strongly recommend that everyone reads these closely and more than once. I find I’m still learning something new every time I pick it up. Some points that I feel need to be stressed. CRS is not considered a medical benefit. Though CRS may be operationally beneficial in some personnel, it is considered an elective procedure. In the new CRS policy the procedures are broken up into two categories; Advanced Surface Ablation (ASA) and Intra-Stromal Ablation (ISA). ASA procedures include; Photorefractive Keratectomy (PRK), Laser In-Situ Epithelal Keratomileusis (LASEK), Epi-LASEK and Wave-Front Guided Photorefractive Keratectomy (WFG-PRK). ISA procedures include; standard Laser In-Situ Keratomileusis (LASIK) and its variants, Wave-Front Guided Laser In-Situ Keratomileusis (WFG-LASIK), technological advances of the basic laser procedure, such as femtosecond technology, “all laser lasik.” All flying applicants with history of ISA procedures are DQ’d for FCI, rated pilots in aircraft with operational ceilings >14,000 feet or high performance aircraft are not authorized ISA but are ASA eligible. Remember that all applicants are profiled 4-T (not WWQ) post CRS until off post-op steroid treatment (steroid treatment can last four months or longer with some procedures). USAFSAM ACS Ophthalmology Branch will accomplish both the pre- and post-op ISA procedure evaluations on AD and ARC pilots and in-flight refuelers. Note that this in person follow-up at USAFSAM is no longer required for individuals undergone an approved ASA procedure but is still required after ISA. For all CRS applicants that use contact lens they must remove these lenses for at least 30 days for soft and at least 90 days for hard lens prior to evaluation and the CRS procedure itself. As I stated in the beginning of this paragraph, it is very important that all health care providers who will work with CRS candidates know this guideline well. Remember for your base/squadron you are the expert!

Now the news you have all been waiting for – the New AFI 48-123 has finally been published! Hard to believe, I know, but oh so true. Brenda and I have been fielding a lot of questions from the field generated by those folks who love to read new AFIs and compare the changes to the old one. It’s true they really are out there and are alive and well, trust me. As in any new AFI there are going to be discrepancies and this one is no different. One of the things Brenda has been dealing with in these last few weeks is documenting where the discrepancies are and then channeling them up stream so that we can get a coherent message out as part of any fix. One of the first things you will notice is that there are four separate volumes. The decision to break the AFI down into volumes was to allow future IMC changes in a timelier manner. Changes were made in several areas and are easily identifiable by the bold bar that is
to the left of the affected paragraphs. One area in particular will require
your attention. V2, Chapter 4 – Profiles and Duty Limitations is already
out of date even though it might appear to you that it was a significant
process improvement – it was but that’s life in today’s rapid response AF.
In this chapter we gave a block by block instruction for how to complete
the profile. A new AF Form 422, Physical Profile had been coordinated
in conjunction with the AFI. While the AFI and AF Form 422 were in
the process of final coordination and publishing, the new DoD Health
Affairs policy guidance for medical deferral pending deployment to
theaters of operation was signed out. An IMC change in Mar was
made to AFI 41-210 Patient Administration Functions to accommodate
the ALC-C stratifications. The CSAF wrote a memo to ALMAJCOM/
CCs to ensure that Commanders have oversight of 4-T profiles. The
combination of all these changes meant that our new AF Form 422 and
Chapter 4 arrived DOA. Col Tidaback has been tasked to work this issue
and in June he organized a Profile LEAN event with all parties involved
with these processes. The results of the LEAN Event will be a new
profile form, changed in our MEB process, PIMR changes, and a new
policy letter to replace V2, Chapter 4. The new AF Form 422 that was
coordinated in conjunction with this AFI will not be used. Other major
changes can be found in the psychiatric, and physical profile serial chart.
As mentioned above, there are some identified discrepancies in cross-
referencing throughout the four volumes. We have made a list of them
and posted them in the Aerospace Medicine Knowledge Exchange.

Not to try to make this a doom and gloom report, but I must also mention
problems with AIMWTS and PEPP. If you have not experienced any
problems recently I’m sure your technicians can give you an ear full.
In August the server that AIMWTS and PEPP are on was relocated to
Oklahoma City and converted to a different code. The move and conver-
sion created many problems for our users that were not anticipated by
the folks at the Medical Web Help Desk located at Maxwell AFB, Gunter
Annex. We are working closely with the help desk folks on problem
resolution and responsiveness to data related issues. Hopefully you and
your support folks are noticing an improvement of performance in both
AIMWTS and PEPP recently. If they haven’t already done so, please
ask all of your users to e-mail them at medweb@gunter.af.mil for resolu-
tion and correction of data integrity issues (e.g. incorrect name or social
security number) and system issues.

One thought from a grey beard RAM, class of ’87, and that is how useful
I feel the Waiver Guidelines put out by ACS truly are. When I was a
practicing FS and SGP we didn’t have them to assist us through the mine
field that a waiver application can be. Now that I’m sitting at the SGPA
desk and reviewing AF/SG level waiver requests I’m amazed at how
much help they offer for many of our most difficult cases. Having said
that, I’m also amazed that more flight surgeons don’t seem to know that
they have these guidelines to assist them with the workup of these cases.
Please ensure that all your folks are well-versed in the waiver guidelines
and know how to access them. They can be accessed through the hyper
links in AIMWTS.

That’s all for now from AFMOA/SGPA – Keep em Flying! ♠

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**Light at the End of the Tunnel**

*Col Dale Tidaback, USAF, MC, CFS*

One year ago I wrote about the flight surgeon shortage and what we
planned to do to fix it. Today I am writing to tell you there is light at
the end of the tunnel.

Over the past year I developed and cultivated a relationship with Family
Practice and Medical Force Management. Family Practice because they
are short manpower and are competing for many of the same providers.
Medical Force Management because they are responsible for ensuring
we don’t have too many of one specialty and not enough of another.
They also have a close relationship with the recruiting service.

So, why is the future looking brighter?

1. **$15M has been allocated to contracting Family Practice docs.** To
date, 35 FPs have been identified with contracts in the works. We expect 45
more over the coming year. With the improved FP manning situation, we expect about 20 FPs to
migrate to Flight Medicine over the coming year.

2. **Recruiting service has been energized to emphasize successful
physician recruiting.** Further, there may be a signing bonus to
physicians willing to sign up to be flight surgeons. We expect 12-15 more flight surgeons due to this policy.

3. **In 2008, we will see all transitional interns coming onto active
duty status following their 1 year internship.** Though we typi-
cally get 20-30 of these folks annually, we should see 20 more
due to this policy.

Add it all up and you will see 50+ more flight surgeons in the AFMS!
We have also worked with AFPC to better utilize the ones we, with an
Choosing a career path is one of the hardest decisions to make while attending medical school. It is a decision that is made early in one’s medical career and is often made with limited knowledge of the various fields and uncertainty on how to gain access to career possibilities, as well as lack of knowledge concerning the degree of commitment required and a general unfamiliarity with specific responsibilities of the chosen roles. This results in choices made primarily through perceptions of specialty roles rather than being able to rely on an informed decision making process. I was interested in what influenced the career path decisions of Uniformed Services University Health Sciences (USUHS) students and so took an informal survey of my classmates. This article summarizes my findings.

By the third year of medical school, USUHS students are taking steps to choose rotations which will align their education with their intended future. This requires them to have a basic understanding of not only what is important to them on a personal and intellectual level, but also what options they perceive as military physicians. The USUHS student body is unique in that it is composed both of individuals with prior military experience as well as students new to the military. Both groups are sheltered from military operations during their medical education. My informal observations of my classmates suggest it is prior exposure to military operations, and the desire to be a career medical officer, which influences USUHS students to pursue flight medicine.

USUHS students interested in flight medicine are those with prior service, Academy or ROTC graduates, or those with active duty spouses. These students understand the workings of the military, have at least some exposure to the role of a flight surgeon, and plan on retiring from the military. Those most interested in flight medicine want to be part of the operational community. Flight doc aspirants related to flight as the mission of the Air Force and felt that the work of a flight surgeon tied them to this mission and the flying community. On the opposite side, USUHS students who do not have an interest in flight medicine are the ones who have no prior military experience and came to medical school with the intention of going into a particular field of medicine. For many of these students, being in the military is inconsequential in terms of their career goals - they intend to spend their careers in the military inside a hospital in their own niche of medicine.

The students who were most interested in the Residency Aerospace Medicine (RAM) tended to be the ones with the prior Air Force experience who perceived aerospace medicine as a career field, highly centered on leadership roles, as well as strong preventative and occupational medicine.

For students who do not intend to spend long careers in the military, the main detraction of the RAM is its perceived lack of applicability to medicine in the civilian community. Others not interested in the program perceive it to be focused primarily on hospital management and preventive medicine rather than clinical work.

Some students were interested in flight medicine as a stepping-stone along other career paths. Students who were interested in competitive residencies such as ENT, cardio-thoracic surgery and dermatology, see flight medicine as a way to improve their chances of acceptance, since completing a flight surgery tour would allow them to reinforce their skills as a primary care physician and create a stronger application. Other miscellaneous reasons why USUHS students were interested in becoming flight surgeons included, it was a “fun break from academics,” a good time to have children outside of residency, and a chance to meet up with friends in the service.

USUHS is a joint services program, but its proximity to Walter Reed and Bethesda Naval Hospital can sometimes skew the experience of students toward a focus on the Army and Naval medical corps. To counteract this, in 2004 Lt. Gen. Taylor initiated a summer experience for USUHS Air Force students, at the School of Aerospace Medicine at Brooks AFB. During the summer after their first year of medical school, the students get to complete a 6-week course centered on aerospace medicine. The course is designed to showcase the medical specialty of aerospace medicine and to give the students an understanding of the operational side of Air Force medicine. The program is a great way to reach out to students who came to USUHS without any operational experience. The program is valuable because it gives USUHS Air Force students a glimpse of the operational side of the Air Force. It allows many students to envision a niche where they can be fully operational while not giving up their chosen specialty.

The SAM summer course has potential to act as a powerful recruiting tool for flight medicine among (forgive me for saying it) impressionable future military physicians. By exposing students to operational medicine, this course helps students make steps toward that transition from military neophyte toward experienced military officer. With knowledge comes power and better career decisions. The increased awareness created through the summer experience at SAM brings these individual closer to the ultimate goal of providing the best operational medicine.

“Practicing good medicine in bad places.” - USUHS
AHLTA will be operational at every MTF in the MHS within the next several months. Presently, the majority of our Air Force MTFs are using AHLTA. Whether you are a seasoned vet or just learning how to use AHLTA, here are a number of strategies that have helped others document more effectively. The following list includes simple as well as more advanced strategies gathered from physician users.

1. Folder List: Your view should always contain the folder list. The folder list displays the modules available to you from your present location within the application. Any other view without folders will make navigating difficult. To display the folder list: left click on “View” at the top left of your screen then select “folders”. (Slide 1)

2. Autocite: Autocited data automatically displays at the top of your note. Settings are customizable, but I would recommend only Active Problems, Allergies, Active Medications and Family History. This is useful data and typically is manageable from a volume perspective. Other information such as Vitals, Labs and Rads add little value and contribute to unwieldy note lengths. I would avoid autociting these. They also will slow the system down because data is being pulled from multiple sources. When setting up Autocite do not forget to set the “Auto-save S/O” feature at the bottom of the window. This will ensure your note is saved if the system goes down. I recommend setting this for 1 minute. (Slide 2)

3. Always use a complete Template or AIM Form: The most efficient way to document with AHLTA is with a Template or Form. There are thousands of templates out there. I would recommend starting at the Enterprise level to find functional ones. Find templates that meet the majority of your needs and save them as your own. If you still can’t find one try Diagnosis Prompt and save the displayed findings as a template. Once saved, edit your templates so that they mirror the way you practice. Templates that accurately reflect how you practice make documentation much easier. If your templates are filled with exams you do not perform or questions you do not ask then they will not support efficient workflow. Streamline your templates and get rid of ineffective ones.

4. Use Copy Forward. For certain encounters copy forward is the easiest way to document. When returning someone to duty simply copy forward and verify that the findings that grounded them have resolved. The previous history and physical will be there for you to amend as you see fit. Patients you see routinely for follow up or for re-evaluations of injuries are also good choices for copying forward previous encounter data. In some instances having the data in front of you will remind you to follow up on something you might otherwise overlook.

5. Build a Default Template Strategies for building and using default templates will be presented in the next issue.

6. More Advanced Documentation Techniques. Even the best made template or form will not always cover everything you need to document in an encounter. But there are easy ways to fill the gaps. Using the following tools from the S/O section in combination with your default template will make your documentation complete.

i. Expand terms on your template if there is a “+” sign next to them. This will show all sub-categories of the term for greater documentation choices. Although not too advanced it is noted here for completeness sake.

ii. Select a system or finding on your template that requires greater documentation and click on “Browse from Here”. This will expand all levels of the MEDCIN tree associated with your chosen term. This can provide greater choices than simply expanding with the “+” sign.

iii. Use “Prompt” and “List size” to find associated terms that are related to your selected term but not linked via the MEDCIN tree. For example, if you select “Headache” and then click “prompt” the system will populate other terms that are commonly documented in association with headache (such as cough, nasal discharge, blurry vision, etc.). (Slide 10)
iv. “DX Prompt” is like an automatic template builder for the majority of diagnoses we see. For instance, if you see a patient for hypothyroidism and need something to help you document the encounter then from the S/O section click on diagnosis prompt and type in hypothyroidism. HPI, PMH, ROS and PE terms associated with this condition will load on your screen for your selection (just like loading in a template for that condition). To increase the number of terms available to choose from expand the “List Size”.

v. Find Term- If you cannot seem to locate a term click Find term and type it in. Caution; you must be on the correct S/O tab (HPI, PMH, PE, …) to find the term you want. For instance, if you type in “rales” and are on the HPI tab no result will show unless you go to the PE tab.

vi. Free Text- Only use free text if other methods to find a term fail. When using free text always link it to the most appropriate finding or term. This will make it easier for you and others to find the information. It will also better capture more of the work you did and thus better support your coding.

Additional articles detailing strategies for building and using a default template as well as maximizing workload credit with AHLTA are planned for future issues.

One of the more awkward situations we face as physicians is when we can’t “fix something.” As docs, we are trained to identify a problem, create a correct solution, and get-r-fixed. As flight docs, we often feel this pressure even more--because our actions are influencing operational capabilities, and sometimes an aviator’s career. So, what happens when you are working in the aftermath of a mishap? Deaths have occurred. Families are grieving. Your organization may even have a ‘black eye’ because of errors leading to the deaths. You would like to be helpful, but how? I hope to offer you some steps and information to help guide your actions during a time when you can still be a very powerful ‘healer’.

1. **Assure basic needs are met, including the need for accurate information.** The frustration that you feel about the death and the family’s loss, fears and sadness is something that you must manage inside yourself. Otherwise, when you arrive on the family’s doorstep you will try to start “fixing” the grief. What the family wants at this moment is to have a solid connection that is trustworthy, honest, and thoughtful. If the family trusts you enough to allow you into their grieving -- sit down, stop talking, and actively listen. Be sure the basic needs are being met: food, shelter, safety, and medical care for any of their concerns. In addition, be sure legal documents are being completed for the family (the casualty officer should help get these done.) Be sure you are “in the know” on the latest and most accurate information (beware, not always the same) about the mishap event. There are always a lot of negative rumors and misinformation that the family will want relief from. Finally, one of the greatest fears of a family is that the loved one suffered horribly in their last moments. Be prepared with the best information you can obtain about the events of the death. Don’t be surprised if these questions are asked repeatedly over the next weeks.

2. **Offer a helping relationship right away.** You have heard the Kubler-Ross stages of grieving: denial, anger, bargaining, depression, acceptance. These are particularly helpful when you think of them as different mechanisms that an individual will use to resolve the loss of a loved one. Do not consider these stages a step-wise progression (although accep-
tance is the end-point). Instead, expect an individual to pass “in and out” of stages over the typical course of up to 6 months of symptoms. For instance, significant sadness is the fourth “stage” but can be seen throughout the bereavement process. This sadness can keep a grieving individual ‘stuck’ in their home, so it is important (especially in the first weeks) for you to be proactive in meeting with the family. A relationship is the best way to restore trust and to reduce fear after a death. Despite how awkward you may feel—if you have been invited into the family grieving process—make it a point to visit each week at a minimum. In the second to sixth month, families may be better at reaching out to even more people for needed help.

3. Don’t be fooled by public appearances. A family member upon hearing of the death may have an acute response of cool clarity of thought (~15%), appear “numb” (~75%) or may have a hyper-reactive “outcry” phase (~10%). Cultural aspects influence which type of reaction you will see, as well as the personality style of the individual. Unless your family member is mute and catatonic (numbing gone too far) or speeding in the car and burning the home furniture in the front yard (outcry gone too far), please do not allow yourself to be dragged into the concept of “judging” a grieving response. You may have overheard this type of idle talk that happens after a tragedy, “I saw the widow yesterday and she didn’t seem very sad to me. She was talking and joking just like nothing had happened.” Of course, one hour before that she may have been sobbing uncontrollably and wondering how she was going to make it through the upcoming night. Stay engaged with visits to the family so you can hear what is truly happening. Don’t judge whether they are doing OK by what you see in public.

4. Help to re-establish a routine. Symptoms of grief include: sadness, preoccupation with thoughts of the lost loved one, tearfulness, irritability, insomnia, difficulty concentrating and difficulty completing daily activities. For most grieving adult patients, I offer an antianxiety agent, like Lorazepam 1.0mg q 4 to 6 hours pm, to use the first two to three weeks after the death. I want to assure sleep (sleep is interminable for the grieving, sleepless patient) during the night and to assure sufficient cognitive awareness to accomplish tasks during the day. The use of an antidepressant should be reserved for later in the course of an unresolved grief (unless you are expecting a recurrence of previous depression). Children may continue to have noticeable symptoms for up to 11 months, but they respond best to establishing a new “normal routine.” Young children will tend to avoid thinking or talking about the event, so watching pictures helps to see trends of resolution. Middle age girls tend to talk more about the lost parent, while boys in this age group tend to act-out in an aggressive way. For children, fear is the emotion experienced right after the death, then later comes sadness. Verbal communication (information about the event) or physical communication (hugging) are most helpful soothers, but only when delivered by parents and trusted adults. If parents are too overwhelmed to engage with their children, it is important to have trusted adults daily in the home to help provide structure and routine for the kids.

5. Get supportive people to the family. Since you can’t fix the grief, actively listen for what you can do to be helpful. Many times your first work will be to get the family reconnected to as many supportive relationships, as possible. While individual variations are possible, grieving families felt they could most rely on: other family members (70% thought they provided a high level of support), friends and coworkers (42% thought they provided a high level of support), and clergy (52% thought they provided a high level of support). These individuals are often able to provide practical support (grocery shopping, getting kids to school, house cleaning, balancing the checkbook, etc.) to help the grieving family cope with day-to-day requirements that feel overwhelming. Start by suggesting to the family that distant relatives be allowed to come to stay for a time. Then help create a schedule so that local helpers don’t all arrive in the first week and then not return, thinking “well they had plenty of help.”

6. Maintain your helping relationship. Grief is a process that takes time to finish, and you are not able to hurry it along to resolution. This timeline is a very personal one, where the grieving individual must work to assign meaning from this tragic loss to his/her life. It is a necessary but difficult job that is even more challenging because it has to be accomplished during a very dark period in the grieving person’s life. After losing someone so important to them, your relationship can be a reliable, steady comfort to the family. You can also observe for grief that is not resolving in a child or adult and get your mental health consultant involved. While most docs will find this an awkward time, if you are allowed into their world during this time—realize that your caring and thoughtful relationship can be a powerful force in helping the family heal.

References
Greetings fellow Aerospace Medicine Professionals. Since this issue of Flightlines focuses on how line commanders view flight medicine we would like to describe three programs at Luke AFB that have been recognized by the line as “great programs” and even named in ORIs as “Best Practices”. Apply these ideas to your aerospace medicine programs as you see fit. We’ll list a POC for each program at the end of the description.

GRIM- The G Risk Indicator Management Program. This local program is simply ORM applied to the risk of GLOC. The program was started by Lt Col Tom “Quack” Morrison, Capt Thomas “Vito” Massa, and Capt Sammy “The Bull” Galvagno to identify students in the F-16 B-course who were at an increased risk for G-related physiologic incidents. While Quack, Vito, and Sammy have all long since left Luke their legacy lives on in a program recognized by AETC as a “Best Practice”. Each incoming B-course student is evaluated on a variety of factors including their prior high G performance in UPT/IFF, physical conditioning at the beginning of their B-course, centrifuge scores, and performance during high G missions in the syllabus. This program represents the close relationship that Aerospace Physiology and Flight Medicine share at Luke. Physiologists and flight surgeons are in daily contact, constantly discussing the performance of individual students and identifying trends in G-performance and physiologic incidents at Luke. HUD tape reviews are done at regular intervals on syllabus flights that are deemed to have the highest risk of G related issues. This proactive approach to flying safety has identified multiple students in need of further AGSM coaching or even a repeat trip to the centrifuge. It has also identified a few unfortunate souls that simply could not perform an AGSM that would allow for their continued training in the F-16. While it was sad to not be able to train a student to the required standard, it is gratifying to know that we have prevented future GLOCs and probably even saved a life or two. If you train aviators at your base the same principles of this program could easily be applied to any significant aeromedical threat. To read more about this program check out the O.I. on the e-publishing website under LAFBI 11-401, G-Risk Indicator Management or contact Capt Farley or Maj McKee of the 56 TRS at Luke AFB.

ACCES- The Attenuating Custom Communications Earpiece System. If you are in ACC chances are that you have heard of this system or have even been using it for the past several months. For those who are not familiar it has potential applications for every airframe in which hazardous noise is an issue. These are custom molded silicone earplugs with an equalization vent to prevent barotrauma and tiny speakers built into the ear piece. In other words, it is a hi-tech communication earplug. The ACCES system not only provides more reliable and superior noise attenuation that standard foam plugs; it provides clear communications without the volume knobs cranked to the max due to the built-in sound bore. Have you ever been yelling into your mask at the pilot in the front seat just to answer a simple question? Have the radio/ intercom systems in every F-15 or F-16 sortie that you have flown leave much to be desired during tactical phases of flight? Hopefully these earplugs will be the solution. On the downside I have heard of a few comfort issues with these plugs since they are molded to the second bend in the ear canal, but overall the reports that I have seen indicate high user acceptability. The jury may still be out on this system for some, but at Luke we have just ordered our first batch of the ACCES plugs for a select group of senior pilots. If this test group goes well then we will test the plugs on one entire squadron, and then outfit all eight of our F-16 squadrons if the system works as advertised. The biggest drawback: ACCES is not yet certified for JHMCS or AERPS, but testing is currently underway to approve integration into these systems as well. I cannot stress the importance of flight surgeon oversight and guidance for this program as it gains popularity across the MAJCOMs. The ear plugs are made from impressions taken deep within the ear canal. As with every procedure therapeutic misadventure is a possibility. Flight surgeons need to know when their flyers are having the impression made- or better yet, be present when the impression is made if a non-provider is doing the procedure. Also, feedback from the field to alert fellow flight surgeons of comfort/fit issues, compatibility issues, and implementation lessons learned would be greatly appreciated. To learn more contact Capt Jeff Graley at the AFRL or visit the following link on the AF Knowledge Now website: https://afkm.wpafb.af.mil/ASPs/CoP/OpenCoP.asp?Filter=OO-ST-AC-05

FSAT- The Flight Surgeon Activity Tracker. We’ve all heard it from the MDG business managers before: “What the heck do flight surgeons do all day? Why are they so far behind the rest of the MDG in RVUs?” While AFI 48-101 and policy letters from HQ USAF/SGO have clearly indicated that RVUs do not accurately track flight surgeon requirements, the questions of measurable data to track flight surgeon productivity continues to be raised. But wait, can’t we just use MEPRS to prove that we are working our tails off? HAARUMMPH! More paperwork that really doesn’t track what I do since it proves to be impractical to look up the codes for each activity! For the past nine months at Luke we have used a simple computer program that translates easy to understand descriptions of daily flight surgeon activities into MEPRS codes. The program is intuitive, simple, and effective. Using drop down menus and easy to follow NAVAIDS I can tell you in an instant what I was doing on any given duty day since December 2005. Flying hours, clinic time, responding to in-flight emergencies- virtually anything that I might do on any given day is easily and conveniently tracked. Reports can be generated on each flight surgeon or as a group to show flight surgeon productivity in any number of fields. My workload per day to enter data is mere seconds. At the end of the month a MEPRS report prints with the click of a button. This program was written by MSgt Dave Lewis and TSgt Nakisha Matau of the 56 AMDS with guidance from Lt Col Sarady Tan, now the 325 ADS CC. While my CC on the line has not specifically endorsed this program he has noticed that he receives far fewer phone calls asking “just what the heck does Snapper do all day?”

We have outlined just three programs that improve flying safety and help keep things running more smoothly here at Luke. We would love to see what “best practices” you use in your daily practice in a future issue of Flightlines.

That’s it for now from Fighter Country. Keep ‘em flying, and Check Six!

-Snapper and Grover

Programs That Work

Maj Yuri “Snapper” McKeed MD, USAF, MC, FS
Capt Richard “Grover” Farley, USAF, BSC
56 Training Squadron, Luke AFB, AZ
SGP HSI Toolkit

Maj Rick Mooney, USAF, MC, FS
RAM Class of 2008

The SGP HSI Tool Kit is now available on the AFMS Knowledge Exchange (https://kx.afms.mil). It is located under the following tabs: **Functional View / Aerospace Medicine.** It provides tools for the base level SGP to use in the management of Team Aerospace. The Tool Kit is organized by HSI Inspection element and contains tools which aid in managing the programs and requirements associated with each element. These tools were identified by HSI Inspectors over the years as useful innovations which aid in base level SGP organization and management. Prior to the development of the SGP Toolkit, these pearls were shared by inspectors as questions arose and during SAVs. The Tool Kit will be regularly updated as new tools are identified through the inspection process. The addition of new tools will generally follow this process:

1. Tool identification by or to AFIA flight surgeon inspectors/consultants
2. Tool passed to RAM on HSI jumpseat rotation for any indicated modification
3. Tool passed to SGP Tool Kit program managers at USAFSAM/GE for coordination/review
4. Tool passed to AFIA flight surgeons for final review
5. Tools forwarded to webmasters for placement into SGP toolkit

The following figures have been adapted from the SGP Toolkit to provide an overview of the sites organization. Please check it out -- you will likely find something that could benefit your program. A special thanks to Maj Leigh Swanson and Maj Lynn Vix who helped get this program off the ground and for the web design assistance from Ms Kearney and Ms Stone at AFMOA. Please direct any questions to the current program managers: Maj Rick Mooney (richard.mooney@brooks.af.mil) and Maj Leigh Swanson (leigh.swanson@brooks.af.mil)

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**Figure 3. SGP Tools organized by HSI Inspection Element**

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**Figure 4. Pressing Management of Aeromedical Services on Figure 3 yields inspection tools useful in meeting the requirements of the HSI Element.**
As a USAF Captain, Dr. Thornton developed the first successful air to air missile scoring system and was awarded the Legion of Merit in the 1950’s. Selected as a Scientist-Astronaut by NASA in the late 1960’s, Dr. Thornton graduated USAF flight school and then left the Air Force as a Captain. His accomplishments at NASA included the development of the first automated EKG analysis and patient monitoring system. He also developed the first mass measurement device for space flight. As a Principal Investigator during Skylab Dr. Thornton demonstrated mechanisms of fluid shift, weight loss, and muscular deconditioning. Dr. Thornton flew in space twice. He first flew on STS-8 where he launched his own lab/protocol studying Space Motion Sickness. On his second space flight, Dr. Thornton flew the first animal payload on a manned shuttle and brought all the animals back alive (STS-51B). He retired in 1994 as a NASA Scientist-Astronaut and is currently a professor of Medicine/Cardiology at UTMB.

Dale stuck his head down from Challenger’s flight deck, his eyes got big and he yelled “Don’t go to the middeck, Thornton’s really lost it!” I had waited until they were busy Earth watching before slipping the long Milar catheter into my nose. Getting such a thin NG tube down had been nothing on earth, but weightlessness made a difference and there was a good bit of coughing and gagging getting it started. Dale had been an unstinting helper and subject of many of my studies, but the sight of another astronaut floating around stuffing a hose in his nose and gagging was too much. Maybe Deke had been right about medical scientists: “Some day we’ll have to fly a couple of the crazy bastards, lock ’em up and let ’em torture one another for a week.” After waiting 12 years, a week to torture myself in flight was a dream come true.

Post Skylab we had an elemental knowledge of the major effects of weightlessness, except for Space Motion Sickness (SMS). But now there were operational concerns about shuttle reentry and the media were playing up ‘the dreaded SMS’. Studies were planned for this on SLS-1 but that was a year or two away.

Ken Mattingley, commander of STS-3, and I put together an operational demo of EOG on his flight. Administration then allowed me to add a small kit and procedures to STS-4, 5 and 6 to do standard EOG studies, and expanding kits on STS-7 and 8 with Norm Thagard and me aboard to use them. We had gotten good data but nothing abnormal, except transiently sick crews, until Norm listened to his stomach, “It’s as quiet as a tomb in there when you’re sick”.

After an hour in orbit Dale and I were ahead of schedule doing stowage and set-up, when, without symptoms or warning, Dale emptied his gastric contents with two heaves of projectile vomiting. I did a quick focused neuro on him with everything normal except a quiet belly, until I pitched him forward. He shoved my hands away and growled “Don’t do that. AHAAH!” This was functional not patho-physiological, totally consistent with otolith signals outside anything programmed for the nervous system, which then triggers another more primitive or basic program to put everything on hold. Another half hour and I experienced the same thing and we were both miserable with malaise, lethargy and anorexia without nausea, brief bouts of projectile vomiting when digestive juices accumulated and hyper-sensitivity to pitching motion. But we did the things we had trained for, including Dale’s flawless execution of the Shuttle remote manipulator arm’s first extraction and replacement of a simulated big satellite in the payload bay. After thirty six hours in flight our nervous systems had a program patch in place and we were suddenly hungry, ready to make up for lost time and tumbling around with the rest of the crew. We didn’t get all the answers or an antidote, but except for suited operations, with a well-trained and motivated crew the ‘dreaded SMS’ was put in a transient nuisance category.

To my surprise, on return I was immediately assigned to STS-51B, a Space Lab scientific mission and the first significant animal payload, four monkeys and twenty four rats for which I was crew lead and Ames Research Center (ARC) was responsible. Except for some elaborate ARC/JSC joint 1g sims, the ARC animal group had no experience with human flight and never seemed able to comprehend why their veterinary practices couldn’t just be put aboard Shuttle, preferably with one of their vets who thought nothing of working with animals carrying Monkey-B virus, something I refused to do.

Flight training for this mission was unlike anything previously seen. Hardware and procedures were always late and usually unrealistic, there was internecine warfare between institutions over whose mission specialist would fly, and animal rights activists were picketing NASA HQ and sending some of us death threats. Worst of all, the animal cages were designed for isolation of their contents from the rest of Challenger, with negative pressure to insure all cage air went through HEPA filters before exhaust into our atmosphere. It didn’t take a rocket scientist to see that the cage pressure was positive, only a strip of Kleenex held near before exhaust into our atmosphere. It didn’t take a rocket scientist to see that the cage pressure was positive, only a strip of Kleenex held near any of the innumerable cage leaks. Bob backed my complaints first to ARC and then to our office, until we were told by JSC to shut up and fly it.

Launch day was the longest in my life. One crewman was vomiting vigorously on the flight deck before we un-strapped and I was pressed into duty on unfamiliar activation duties, hitches stuck and many details of the payload were not as advertised. As expected SMS recurred, in a milder but still irritating way. My day ended with an unscheduled two-hour search for last minute items stowed by JSC’s medical group, without a known location. When finally found and opened, the 24...
sample tubes flew out in 24 directions and all corners of the lab. They had not even been secured.

Next day, normally unheard of mishaps continued with many of the payloads and experiments. It culminated with my scheduled opening of the monkey cage inspection door with a blast of detritus and feces into the lab that reminded me of a shot gun muzzle blast. I grabbed duct tape and vacuum cleaner but it was too late. Late that afternoon there was an angry shout over the intercom “There’s monkey shit all over my seat! We told and told those XXX that these XXX cages were no XXXX good!” Bob Overmyer was a good Marine, well versed in both command prerogative and barracks room idioms. Nor had he forgotten Yaeger’s taunt when turning down an invitation to the Mercury program: “You’d have to wipe the monkey shit off the seat before you could sit down”. Ground became quieter than usual and then Bob was told to get on an encrypted loop for a private conversation. Unknown and unwarned, a program glitch had connected our intercom to air-ground and a surprisingly large number of media had listened to and recorded Bob’s comments, which were now being further transmitted with enthusiasm. Worse, Marvin Zindler, doyen of Houston TV reporters, famous for closing the best little whorehouse in Texas, was adding Challenger to his weekly list of unsafe places to eat because of “freely floating feces.” All other operations went on hold and we worked several hours installing and testing a software patch to prevent future cross talk. The following day elaborate, useless instructions were sent up for containment of detritus during scheduled servicing of rat cages, with make shift bunny suits and other impedimenta. On re-entry, after strapping in the two payload specialists, I decided, regulations or not I’d better see this one from the flight deck. Turns out that Musgrave had done it all along. Memories of Challenger’s pink halo and flaming trail, of the thunderheads over Hawaii and the knowledge that with skills learned as a child in our barnyard, I had brought ‘em all back alive, were my only consolations.

Bo Bobko had once presciently advised me during a SMEAT contretemps “Bill they might forgive you for telling them they were wrong, but they will never forgive you for proving it.”

Neither Bob nor I flew again. He deserved better.

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**Life in the Fishbowl**

**NASA Behavioral Sciences Services for Long Duration Lunar and Mars Missions**

Maj Walter Sipes, USAF (Ret.), BSC
Chief of Operational Psychology, NASA Johnson Space Center

Lt Col Gary Beven, OH ANG, MC, FS
Chief of Behavioral Medicine, NASA Johnson Space Center

The Behavioral Sciences group at Johnson Space Center will focus on four factors for lunar and Mars missions: Behavioral Medicine, Operational Psychology, Sleep and Circadian, and Human to System Interface. Drs Sipes and Beven are involved in the process of writing the psychological and psychiatric requirements for the Crew Exploration Vehicle (CEV) for the future missions to the Moon and Mars and guiding research efforts in this endeavor. Dr. Sipes is a retired USAF aviation psychologist and former US Army Viet Nam era helicopter pilot. Dr. Beven is the SME flight surgeon for the OH ANG’s 145th Air Refueling Wing.

Providing adequate behavioral health services to astronauts on a long duration lunar or Mars mission will require NASA psychiatrists and psychologists with extensive experience working with astronauts and their families during long duration space flight missions. Such personnel will require an in-depth knowledge and familiarity with the expedition crew and their family members, as well as a true working knowledge of all aspects of the mission pertaining to the spaceflight environment, habitability, sleep/wake schedules, workload, medical support capabilities, and risks.
Regular private communication with crewmembers will be required throughout the mission. During the initial and very late stages of a Mars mission, private psychological conferences (PPC) can be held using audio and visual communication in real time. However, most of the mission will occur at such a distance that the communication delay would make this impractical. PPC’s will then need to occur via e-mail or perhaps through recorded video response to written query or a standard interview questionnaire. Such a barrier will render the interpersonal human interaction and give-and-take of any needed counseling or psychotherapy useless and will make psychological assessment and potential treatment far more difficult. A long duration lunar expedition would then be an excellent test-bed for the monitoring and communication challenges of a Mars mission.

Such communication challenges will also mandate the existence of an autonomous method of psychological/psychiatric self assessment and diagnosis for disorders of mood, anxiety, thought, cognition and level of fatigue. A comprehensive battery of self, or crew medical officer (CMO), administered psychological diagnostic tests will be required. The results may then be sent to the NASA crew surgeon and NASA psychiatrist/psychologist for review and recommended therapeutic response. In this regard, the CMO will require a much greater level of training in behavioral medicine issues than is currently required for low Earth orbit missions. A computer delivered, interactive, self-guided psychotherapy tool to aid in the treatment of depression, anxiety and interpersonal conflict would also be highly beneficial. Antarctica, the ISS, and long duration lunar missions would provide venues for the testing of such a psychological treatment tool.

A 2.5 year Mars expedition would lead to a far greater level of isolation and psychological stress than any space mission attempted previously. Because of this, a risk of psychiatric decompensation would remain despite the most careful genetic and personality screening. If a serious psychiatric disorder were to develop during the mission, there would be no realistic opportunity for evacuation. As a consequence, there would need to be an ample range of medications to treat psychiatric disorders. Such medications would need to be effective in emergency and chronic psychiatric conditions including severe mood, anxiety, and psychotic disorders. The choice of psychiatric medications for such a mission will require a great deal of forethought and the mission CMO would require significant education in their use.

Operational psychology issues on a long duration lunar or Mars mission will begin with the requirement of NASA psychiatrists and psychologists to be consultants on the selection and training of the best crewmembers for such missions. In the past, the focus that had been on the selection of individuals to become astronauts will change to picking the best crew or team of astronauts. After the selection process, psychological training will be critical. Courses covering topics like conflict management, isolation, separation, confinement, close group living, teamwork, boredom, monotony and group dynamics will become important aspects of the training flow. In long duration missions, problems will occur. The key is how well the group handles and resolves the problems and works to prevent future similar occurrences or at least makes progress on the change process. Future long duration lunar and Mars mission crews must be directly observed working and living together in training before the real mission occurs.

Psychological countermeasures for crewmembers on long duration missions on the Lunar surface and Mars will include as much variety of food as possible, entertainment (music, movies, e-books, hobbies, exercise, etc), participating in scientific studies, holiday celebrations, and rituals (birthdays, anniversaries, religious activities, weekends, funerals, etc.).

Regular private communication between crewmembers and their families, friends, and crew discretionary events (including Public Affairs Office events) will be required throughout the mission. During the initial and very late stages of a Mars mission, private family conferences (PFC) can be held using audio and visual communication in real time. However, most of the mission will occur at such a distance that the communication delay would make this impractical. PFC’s will then need to occur via e-mail or burst type of communications. A long duration Earth (winter over in Antartica) and Lunar expedition would be excellent test-bed for the communication and other challenges of a Mars mission.

Psychological support and services for the astronaut families will also include training on the issues mentioned above (isolation, separation, social support systems, reintegration, etc.) that occur to the families during the training flow, during the mission, and the reintegration after the mission. Psychological countermeasures will include setting up communications with the crewmember, support systems, celebrating the holidays and normal rituals (anniversaries, birthdays, funerals, etc.) with the crewmember, etc. It is critical for the crewmember to know that their family is being supported by others and the Space Agency during their mission.

In the area of sleep and circadian factors, one important issue for a mission to Mars will be the 24.7 hour Martian day. It will be a necessity for the crewmembers to maintain a consistent 24 hour day. If individual crewmembers or the space flight crew are allowed to free run from their circadian cycle, attempt to live on the Martian day cycle, or if shift work is adopted, then multiple programmatic risks will occur, including sleep deprivation, concentration impairment and severe fatigue.

Human to system interface factors are not only the human factor issues of having effective interaction between the humans and the hardware in the crew exploration vehicles, but also responsible work/rest schedules. These schedules will need to include meaningful work, training and recreation for optimal productivity and psychological health of the crewmembers. Educating planners, crewmembers, administrators, and ground controllers on these topics are critical.

A 2.5 year Mars expedition would lead to a far greater level of isolation and psychological stress than any space mission attempted previously. In many ways it will be similar to exploration trips made on Earth by earlier explorers like Nansen, Amundsen, Shackleton, Magellan, and Cook. We need not only to learn from their lessons, but meet the physical, psychological, and psychiatric challenges of long duration space missions. ♦
Exploration Medical Support System-
The Future of Human Spaceflight Health

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Note this article was truncated to allow for publication in the allowable number of pages.

1- Lead Exploration Medical Operations, Captain USN Reserve, Executive Officer MAG 41 Medical, Flight Surgeon VMFA-112, F/A-18 squadron, NAS Fort Worth, TX
2- Medical Operations Branch Chief, Major USAF Reserve
3- University of Texas Medical Branch/Wyle Laboratories, Major, Flight Surgeon, USAARL, Fort Rucker, AL

CLV (Crew Launch Vehicle) Concept- with CEV

This is an exciting time for NASA as we embark on the development of a new fleet of space vehicles to allow human exploration of our solar system. The Constellation Program Office has been tasked with developing the exploration vehicular architecture. The first vehicle, the Crew Exploration Vehicle (CEV), recently christened Orion, will be built and tested over the next 5 years by NASA with the prime contractor Lockheed-Martin. Teams have been developing requirements for design, construction and operation of the new vehicles, and a number of studies of design for both CEV and the Lunar Lander are under review.

The architecture includes initial flights of CEV to ISS and allows 3-6 crewmembers to be rotated, beginning in 2012, after the Shuttle is retired, and ISS construction is complete. In the 2016 timeframe, lunar missions will resume, and will lead to a fairly rapid build-up of a lunar base. The lunar base will allow validation of power, life support and resource utilization systems in long-term operations, to help enable Mars missions.

Table-1: Levels of Care is matched to mission duration and destination.

<table>
<thead>
<tr>
<th>Level of Care</th>
<th>Mission</th>
<th>Example Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>LEO &lt; 8 days</td>
<td>SMS, BLS, First Aid</td>
</tr>
<tr>
<td>II</td>
<td>LEO &lt;30 day; e.g. STS EDOMP</td>
<td>Level I + Clinical Diagnostics, Ambulatory Care, Private Audio, (+/- Video) Telemedicine</td>
</tr>
<tr>
<td>III</td>
<td>LEO &gt; 30 day (ISS or Lunar Sortie)</td>
<td>Level II+ Limited Advanced Life Support, Trauma Care, Telemedicine, Minor Surgical and Dental Care</td>
</tr>
<tr>
<td>IV</td>
<td>Lunar &gt; 30 day (Outpost)</td>
<td>Level III+ Imaging, Sustainable ALS</td>
</tr>
<tr>
<td>V</td>
<td>Mars Expedition</td>
<td>Level IV+ Autonomous ALS, Basic Surgical Care</td>
</tr>
</tbody>
</table>

The exploration medical support system will be tiered to match the mission profile and duration according to NASA's Standards, as shown in Table-1. In this tiered system, missions of < 8 days duration to LEO (Low Earth Orbit) will have a level I support requirement, while longer missions will have level II or III care depending on duration. Missions to the Moon will have a level III or IV support requirement again depending on duration of stay, and resource availability. The Lunar Outpost will eventually have a dedicated medical support area, which will include a telemedical workstation, imaging, and treatment zone, as well as exercise countermeasures hardware. Missions to Mars will have level V care requirements.
The medical kits needed to provide these levels of care are summarized in Table-2. For CEV to ISS missions only the small, mini-medical kit will be flown to handle the usual expected physiological adaptation to 0-g, and any minor contingencies.

Table -2: Example hardware and mass/volume allocation for support of lunar missions

<table>
<thead>
<tr>
<th>Item for Lunar Sortie</th>
<th>Mass</th>
<th>Size</th>
<th>Development Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Kit</td>
<td>10 lbs</td>
<td>10x7x6 in</td>
<td>COTS</td>
</tr>
<tr>
<td>Medical Contingency Kit</td>
<td>30 lbs</td>
<td>32x12x16 in</td>
<td>Modified COTS</td>
</tr>
<tr>
<td>EVA Contingency Response Kit</td>
<td>16 lbs</td>
<td>16x16x8.5 in</td>
<td>Modified COTS</td>
</tr>
<tr>
<td>Environmental Health Kit</td>
<td>7.5 lbs</td>
<td>7x7x9 in</td>
<td>Modified COTS</td>
</tr>
<tr>
<td>Exercise Equipment</td>
<td>5-20 lbs</td>
<td>TBD</td>
<td>Technology Development Required</td>
</tr>
</tbody>
</table>

The CEV and lunar lander (Lunar Surface Access Module-LSAM) will also have radiation monitoring hardware and shielding to protect crewmembers against possible solar particle events, during mission phases outside of the Earth’s protective geomagnetosphere.

For Lunar Sortie missions, routine ambulatory medical needs will be met with a standard spaceflight medical kit. Two-way private audio/video is required for performing Private Medical Conferences with the flight surgeon is required to ensure optimization of medical care via the Crew Medical Officer.

Trauma management and advanced life support kits will be used to stabilize crewmembers experiencing lunar surface contingencies. Data from medical monitoring devices may be communicated to the ground for further diagnostic purposes. Some medical equipment will need interfaces for power, data, pressurized breathing gas, with or without oxygen concentration for certain medical conditions or for environmental contingencies—e.g. depressurization, fire, toxic release. Crew will don PPE during toxic spill clean-up, or dust-ridden activities. A crewmember with a significant illness or injury will be stabilized using lunar lander-based medical equipment in preparation for ascent and transfer to CEV.

EVA will be a main component of lunar surface activity and the suit team is considering new concepts for the suit mass reduction, distribution of load/center of gravity, glove fit and dexterity, life support system, biomedical telemetry, crew information management and display, - all geared to reduce crew overhead, minimize injury within the suit, and enhance task performance. Providing feedback to the EVA crew for navigation, consumable supply and physiological/thermal parameters is also a design objective.

Another contingency includes up to 120 hours in the spacesuit, in case of loss of vehicular pressure on the moon, requiring an urgent return to Earth. This will involve provision of a survival atmosphere (oxygen, CO2 scrubbing) crew hydration, nutrition and waste management. A very small exercise device will be flown for sortie mission crew use during outbound and return mission phases as well as between EVA days. For Lunar Outpost missions, the plan is to build up the habitat infrastructure to include a dedicated medical and fitness area. This area will allow for periodic health status acquisition via a medical diagnostic station with telemedical audio/video/data transmission capability.

The medical station will have improved autonomy for medical contingency response, to include sustainable advanced life support. This will allow the exploration mission support system to advance towards completely autonomous capability on the Mars surface. Possible technology developments include 1) an oxygen concentrator to supply oxygen-enriched respiratory gas, 2) regeneration of intravenous fluids, 3) non-invasive or minimal invasive diagnostic and therapeutic modalities, 4) differential diagnostic and preventive medicine maintenance software.

The precise level of activity and type of countermeasures required for maintaining physiological systems in 1/6-gravity for long duration, has yet to be defined, however an exercise countermeasure program that incorporates neurovestibular system maintenance, will be built into the medical support system. The equipment for this countermeasure function will be more robust for the lunar outpost missions, than found on sortie missions. Exercise will also assist in the behavioral health and performance (BHP) program. Key components of BHP, will be regular private family conference (PFC) capability, e-mail to family and colleagues, and recreational equipment and time allocation, as well as episodic psychological support interaction.

Cold food storage in the habitat may expand the types of food available to the crew, and development of systems to effectively grow plants, possibly even edible strains, or those cultivated to augment air revitalization, will make considerable progress towards crew autonomy during Mars missions.

With frequent EVAs the possibility of decompression sickness must be anticipated. Operating the habitat at a lower pressure, about 8.0 psi, with slight oxygen concentration enrichment, may help reduce the DCS risk. Having a suit with variable pressure of operation, up to habitat pressure, is one means of reducing risk, as well as a means of early onset treatment of DCS symptoms. An airlock that can raise atmospheric pressure above that of the habitat pressure will allow for additional surface treatment capability, although it is unrealistic to expect a true Table 6 level of treatment to be delivered.

The potential biological toxicity of lunar dust is not completely characterized at present, but lunar dust is clearly an irritant to the mucous membranes and respiratory system of humans, and management of lunar dust will be a design driver for the surface habitat.

In summary, the medical support system for exploration will be the most efficient and advanced of any flown in space to date. This system will have as small an overall medical footprint as is possible for the type of mission flown. It will be designed to provide health maintenance, EVA monitoring, contingency response, diagnosis and treatment as defined in the levels of care section of the Spaceflight Health Standards document, which increase in capability as destination and duration moves farther away from terra firma. The design should allow for an increasingly autonomous crew health care and maintenance, as the mission architecture demands.
The NASA RAM Experience

Sean “Pyro” Roden, MD, MPH, FACEP
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I was asked to contribute to FlightLines as a civilian flight surgeon who completed the NASA/UTMB RAM program. While I have never served in the military, I was able to “experience” approximately 40 weeks of military life through the NASA/UTMB RAM program. My background is in emergency medicine. I trained at UTMB for medical school. During my last six months in medical school I worked with the Royal Flying Doctor Service of Australia. I lived in an aboriginal community and took care of Aborigines and stock man in rural Australia. I completed a residency in emergency medicine and returned to my home in West Texas. I was an FAA examiner and issued medical certificates for my neighbors who used super cubs and bell 47 helicopters to round up livestock.

I heard about a medical conference called “Pushing the Envelope” and while attending was introduced to a former NASA flight surgeon who said he had a program where you can learn to take care of astronauts. I had never thought a civilian could ever do such a thing! After a further visit with him I applied and was accepted to the program.

Our first year was the MPH part and sprinkled in that first year was “Roll a Resident”. Which involved getting aerobatic training in the backseat of a Pitt’s biplane. There was “Dunk a Resident” where we received HEEDS bottle and dunker training with the Coast Guard. We supported the local air shows and were able to do some other aviation specific activities. The second year was when we began our “military” experience.

Prior to this my only experience with the military was at Darnell Army hospital in Killeen. I had OB/GYN and anesthesia rotations there. We wore civilian clothes; we were recognized as civilians and treated as such. My first day and first call concluded 36 hours later around 5 pm. While driving off base I noticed everyone was stopping, pulling over, and standing at attention and saluting. I did not know why, where, or what for but after 36 hours of being awake I figured when in Rome. I did not know why, where, or what for but after 36 hours of being awake I figured when in Rome. I was an FAA examiner and issued medical certificates for my neighbors who used super cubs and bell 47 helicopters to round up livestock.

I was instructed (in torrid detail) how to dress like a soldier, including how to remove my hat, salute, etc. They had me polished to the point that I looked just like everyone else. Except for the fact I had no name tag, rank, or branch insignia. This caused a problem. It turns out that I was not informed that without these I was considered special, as in special ops, CIA, FBI, etc. This finally made sense after I was called hombre secreto several times. When I told them I was not a special operator or in the agency and that I am just a civilian, they said “Oh Yea, civilian, right got ya, just a civilian. Wink wink. Don’t worry we won’t tell.” After awhile I just started feeding their imaginations and it became a running commentary.

Brooks was my first military experience. The AMP course was the first experience for a lot of us. Most had just graduated medical school and OCS. At AMP we were all learning the culture of how to support flight crews and understand the operational military environment. It just so happened that the class I attended was in the Fall, specifically September. On September 11th, during our classes, the commander came into the class room and said that all personnel were to return to there rooms pack and be ready to deploy in 2 hours. He briefly explained what had happened and that we should be ready to deploy immediately. As we were dismissed I approached and he gave me the look (as in where is your rank name, etc.) that I had become accustomed to and I stated I was a NASA RAM and that while not military I was a board certified ER doc. I had extensive experience in trauma and field medicine and had worked on helicopters as a flight medic. I also added that growing up on a ranch that I was quite familiar with both the AR 15 and AK 47 and was a pretty good shot, though I now have to wear glasses to hit anything. I told him that I wanted to volunteer to go help. In a look and a smile I will not forget he said, “Well son, thanks for the offer but one, you can’t quite ‘volunteer’ the way you are proposing, and two you can’t shoot a rifle because you’re a doctor--it is against the rules. Where are you from?”

I said, “TEXAS.”

“Well now that would explain a lot. We are in San Antonio, home of the Alamo! I can’t argue with that but I am afraid I can’t let you go.” I went back to my room and called family. Still thinking of a way I could help and that not letting a doctor shoot a rifle just did not seem very fair. Everyone one else has one! No one went anywhere that day, though, later a lot of my classmates from AMP did.

I completed AMP, went to Panama City for Navy Hyperbaric Medical Officer training and then on to Pensacola for further flight training with the Navy. I returned for CCACT and I came close to going to Groton Connecticut for Navy Radiation Medical Officer training but due to security issues post 911 was not allowed. I completed my RAM program and I was hired by UTMB and sent to Star City Russia where I was deployed as an expeditionary flight surgeon to support NASA crews training on Russian systems. Everything I learned at primary was used in my support of crews in Russia. My first commander was an Army colonel now astronaut. Many of the crews were military. While still a civilian I was able to have a common experience in which to start a conversation and develop a rapport.

The military training was invaluable for a civilian flight surgeon at NASA. We have our call signs, we have our coins, and we fly in military aircraft and support military crews. We deploy with Air Force teams to Kazakhstan for Soyuz landing operations. All of this I am comfortable with because of my training. I look back with the fondest of memories. Had I started my career sooner I may have gone on and “volunteered” for an extended experience? I did look into joining the Hawaiian Air National Guard to continue my experiences, but that is another story----------
The Neutral Buoyancy Laboratory (NBL) at Johnson Space Center in Houston, Texas opened for training in January, 1997. The mission of the NBL is to prepare astronauts for space missions involving space walks (EV A, extravehicular activity). This facility provides controlled neutral buoyancy operations to simulate the zero-g or weightless condition that is experienced by flight crew during space flight. EV A is an essential tool for the design, testing, and development of the International Space Station (ISS) and future space initiatives.

The NBL facility consists of a pool containing 6.2 million gallons of water and is 202 feet long, 102 feet wide, and 40 feet deep. Water temperature is automatically monitored and controlled to a temperature of 82-88 degrees Fahrenheit to minimize the potential effects of hypothermia on divers. The pool is chemically treated to control contaminant growth and the entire pool volume is filtered every 19.6 hours.

The facility contains full-size mockups of space flight equipment including the Space Shuttle cargo bay, the ISS, two functioning remote manipulator arms, and associated flight hardware.

The NBL is designed to conduct two training activities simultaneously. Two to three suited subjects may undergo training in each half of the pool. A cadre of four to five divers supports each suited subject during training. This includes two safety divers who continuously monitor the suited subject; a float camera diver to obtain close-up camera views of training; and one or two utility divers to help move small pieces of equipment and tools in the pool. On a busy day there could be four to five astronauts and 20-25 divers in the pool at one time. Divers receive communications through bone conduction head sets and respond with hand signals using the float camera. Dive crew is rotated out of the pool every 90 minutes for comfort (potential hypothermia) and vigilance reasons.

Astronauts conduct training in the extravehicular mobility unit (EMU) spacesuit. The suit is pressurized above ambient to 4.3 psi, or approximately 10 feet seawater (fsw) pressure. Unlike the EMUs used in space which have a self-contained life support system, these Class III suits are tethered to an umbilical which delivers breathing gas, cooling water, and communications. The breathing gas used for both suited subjects and divers is a special Nitrox mix of 54% nitrogen and 46% oxygen. This mix greatly reduces the risk of decompression sickness by providing a
physiological maximum depth of 17 fsw for divers and 24 fsw for suited subjects. The oxygen concentration does not pose a risk for oxygen toxicity during the standard six hour training runs. There is full two-way communications among the suited astronauts, topside trainers, facility test coordinators, the flight control team within JSCs Mission Control Center, and the on-site Shuttle Mission Simulator. EVA mission training is provided for assigned missions scheduled on orbit from the Space Shuttle and ISS. The training-to-flight ratio is approximately 10-12 hours of NBL training for each hour of EVA planned on orbit.

Medical support at the NBL is provided by two physicians trained in diving/hyperbaric medicine. I am the NBL Medical Director. I completed USAF Hyperbaric Medicine fellowship training at Brooks and ran the US Army’s Clinical Hyperbaric Medicine Program prior to the NBL. Dr. Sam Strauss, D.O., M.P.H. (RAM class 90) has both USAF and Navy experience where he was a Diving Medical Officer. We are supported by a cadre of two paramedics and a mix of 11 USAF and Navy aerospace physiology specialists who operate the hypo- and hyperbaric chambers at the NBL. The group maintains a 12-patient, dual lock, multiple hyperbaric chamber which is required to be on stand-by for all suited runs. With the risk of decompression sickness so low due to the use of Nitrox, the primary concern is the occurrence of a gas embolism. Training is regularly conducted with the divers and suit technicians to treat this emergency condition. Fortunately there have been no actual cases of gas embolism or decompression sickness since the facility opened.

Suited subjects and guest divers undergo a limited physical exam (ENT, heart, lungs) before each run, while NBL working divers complete the physical their first working day each week. The most common medical problem treated in divers is sinus and ear blocks due to congestion from allergies and viral infections. A common problem in suited subjects is fingernail delamination (onycholysis) attributed to axial loading and moisture in gloves. Other issues include shoulder pain due to hard contact with the suit, especially while heads down; and compression complaints on the tops of the feet and distal toes associated with problems with the boot fit. Effective countermeasures have been employed to reduce these problems.

Working at the NBL is the best “operational” job a RAM could have outside the military. Supporting astronaut training at this one of a kind facility is extremely similar to supporting air crew as a unit flight surgeon. With each successful mission you feel a strong sense of teamwork, pride and accomplishment. It’s truly amazing to be part of the team that is building the ISS to further human exploration in space!
The Air Force took a hit not long ago for not adequately developing its space cadre. As a result, schools such as the National Security Space Institute were stood up, formal classes were initiated, new space wings came into being, and an effort to develop space cadre was born.

But the Air Force left out the medical folks. Or maybe, we left ourselves out. Most people, even some of our own medical folks, do not think that the Air Force medical service supports anything in space. They are very wrong. Keep in mind that although the Air Force does not have a human-rated vehicle, they do support a human-rated space program. Most of the pilots for the space shuttle come from the military, and more than half are active duty Air Force. The commander of the last space mission is an active duty Air Force pilot, and one of the spacewalkers for that mission is an Air Force reservist.

But the Air Force only has two active duty flight surgeons assigned to NASA so it shouldn’t really matter right? Actually, in addition to the active duty cadre, there are 11 reserve flight surgeons. There have been arguments that we shouldn’t have anything to single these folks out as space cadre, as “any RAM can do the job”. That is akin to saying we shouldn’t have any designation as a flight surgeon, as any physician could do the job. There is a massive amount of training that takes place in order to earn the NASA flight surgeon designation and wings. We do not just take care of the crews and their families, but we are also intimately involved with the health of the vehicle from a life support perspective. There are many areas that are unique to space medicine and space hardware that are not even remotely covered in a traditional aerospace curriculum. There are two separate training plans for both the space shuttle and the international space station, each over 500 hours. You just can’t sit down at the console in Mission Control and take a wag at it. The simulations are intense, the failures can be catastrophic, and each decision is under the microscope from the crew and the flight director.

Let’s take one of the active duty cadre as an example. By the end of this year, this flight surgeon will have taken more than 572 hours of training in space specific systems, and will have engaged in mission analysis and design and human systems integration that is uncharacteristic of the traditional flight surgeon role. He will have deployed twice to Russia and Kazakhstan, will have manned mission control for six months, flown numerous T-38 sorties, and will have worked one if not two space missions. After three years of training, a Master’s in Aerospace, and working strictly on space medicine and space environmental and health issues, what does he get to show his expertise? A ribbon? A space badge? How about nothing? Unfortunately the latter is what he gets. Meanwhile, an airman with a few space courses and some time on console somewhere is space command gets his space wing designation.

Does it really matter? Should we try to invite ourselves to the table? Unfortunately, historically we as flight surgeons come knocking on the door for recognition a little late in the game. Sure this only affects us as flight surgeons, but more importantly it leaves the rest of the Air Force with the impression that the medical service does not know anything about space or have any specialized training in space, which is far from being correct. But with this impression, if the Air Force developed an offensive human-rated capable vehicle, the bioastronautics aspects would probably be subcontracted out to Boeing or Lockheed Martin, as there would be no way of knowing there was in-house expertise. Second, we will lose a great deal of corporate knowledge. If folks that are heavily trained in space medicine leave the Air Force, we will not have this expertise. This is already happening, as many of the flight surgeons in the reserves have difficulty maintaining their reserve career on top of the ops tempo for space missions and are contemplating leaving or moving over to the IRR. For STS-121, four flight surgeons were covering the Mission Control console around the clock over their UTA weekend, as they monitored the ECG, metabolic rate, oxygen consumption, CO2 production, and radiation data during the spacewalk. So they had to reschedule their UTA. Why not have them cover the spacewalk as blue-suiters? Why not have Air Force uniformed folks sitting at the SURGEON console in Mission Control?

Nasa flight surgeons are in-grained in every facet of vehicle operations and design. Right now we are writing requirements every day for the new exploration vehicle. What oxygen pressure do we want? What G level do we want? What suit pressure? What radiation monitoring? What medical support? What exercise? This is probably one of the biggest advantages NASA flight surgeons have, is that they are fully engaged in the human system integration aspect of vehicle design. I am fearful if we do not get on the space cadre band wagon in the Air Force, we will be chasing the wagon down the hill, and trying to invite ourselves to the party very late in the game.

Great Polk, but there are only a few Air Force slots at NASA, so how do I get space knowledge? There are several courses in the Air Force that flight surgeons can take, and there are several ways to gain rudimentary space knowledge. The Space Operations Medical Support Team Course is put on by the Department of Defense Manned Spaceflight Support Office (soon to become the Human Spaceflight Support Office at Patrick AFB) several times a year and at different locations, including Europe. This course teaches basic spaceflight physiology, toxicology, and hazards involved in spaceflight, as well as rescue techniques. It is a pre-requisite to being an AirDoc on one of the MH-60’s that support each shuttle launch and landing. There is also the Aerospace Medicine in Space Operations course, which has been held semi-annually at Brooks City-Base. But with the flux and transition, it has not been held this year. There are the Space 100 courses available on CD-ROM from the National Security Space Institute.

In short, there is a small contingent of space medical cadre within the field of human spaceflight, whether they are recognized formally or not. But opportunities exist for us to expand that role, and make sure we play apart in it. Space is not going to go away, and if we are not willing to take ownership of it as space medicine professionals, someone else will surely step into that void. I for one do not like sitting on the sidelines. The Air Force is developing a space cadre, and we still need to play a major role in that mission. I won’t be happy until I see a flight surgeon wearing space wings at the Aerospace Medicine conference, and flight surgeons counted as part of the Air Force space cadre.
So you want to launch your crew, take care of them on orbit via console in mission control and recover them by crawling into the vehicle upon landing? Well, bring us your medical or surgical board certification, aviation medicine expertise, deployment into austere environment experience, your interest in Space and, most importantly, your passion for exploration and we’ll train you to do just that.

The President and the Department of Defense have called for the training and development of a cadre of space professionals. The expected specialty codes of systems procurement, space weapons operators, and satellite drivers are already included. What has been forgotten is the identification of a cadre of medical professionals that will take care of these professionals, the military Astronauts who will fly the next generation of military aerospace vehicles and those who can best utilize the orbital technologies and capabilities that only space medicine can provide. We believe we already have both an experienced cadre of military space medicine professionals and the training programs to continue to produce more.

You’ll need the time to train to become a space surgeon. For example, to qualify to sit console as a surgeon supporting the international space station you will need at least 204 hours of class and practical training on radiation, space physiology, vehicle systems, toxicology, environmental systems and crew procedures. Add to this extensive review of mission flight rules, rationale, medical support systems, contingency plans, communications and medical procedures. We’ll add individual flight surgeon training with an experienced crew surgeon using clinical scenarios and actual medical events that have occurred on orbit.

Then you will be ready for over 100 hours of simulation with the rest of the mission control flight team. You’ll be listening as a flight controller to 5 conversations in your ear as you work the surgeon console with your biomedical engineer team. You will be reporting to the flight director as medical professional in charge of the health and safety of the crew and as the representative for Space Life Sciences. Let it roll off your back when the flight director notes to the rest of the flight sim team, “Uh-oh, the flight surgeon is here for the sim…get ready for some kind of medical emergency.” They’ll throw problems of decompression sickness, toxicology emergencies, and fire and inhalation exposures at you and you’ll handle the problems with the human physiology that few of the other engineers in the room can understand. You’ll also be required to sit “left seat” for at least 100 hours of OJT during actual missions. Every word you say on the loops is being recorded. Your logs will be scrutinized. An experienced flight surgeon will work you through the pre-launch tasks, extravehicular activities including exercise prebreathe protocols, medical procedures and pre-landing fluid loading. You’ll coordinate with DDMS and the NASA Centers. Best of all, you’ll talk directly with the crew on orbit during private medical conferences. After serving as a basic console surgeon you’ll get even more training as you go for training and certification as a deputy crew surgeon and take on a crew for an actual mission.

If you are assigned shuttle training you’ll again do those classroom hours and 200 hours of console, as you learn the specific systems of the orbiter. Plan for at least 18 months of training before you can start actual solo console. Again, go for further training and become a crew surgeon. Stick around past 2010 and we’ll be adding the crew exploration vehicle to your plate as we return to the Moon.

Bring your language skills and your experience in foreign cultures. Besides learning a new vocabulary and syntax of “NASAese,” you’ll also have the opportunity to pursue language training in Russian, Japanese and the European languages. You’ll have the chance to practice your bureaucratic and negotiation skills working with contractors, civil servants and engineers who might not share your same concern for the human protoplasm for which you are responsible. You’ll continue your annual computer security training, blood borne pathogens, FAA senior aviation medical examiner requirements, and NASA annual requirements. You’ll be writing requirements and sitting on countless boards and engineering meetings as the representative for space medicine. There is more technology involved than you can swing a cat at, as it truly is rocket science.
We’ll expect you to keep your board certifications and medical practice current. You’ll have your training in BLS, ACLS, and ATLS and keep it current. You’ll easily meet your 50 + hours of continuing medical education each year. Each of your colleagues at the space center are trained in such specialties as Aerospace Medicine, Family Practice, Emergency Medicine, Urology, Infectious Disease, Dive Medicine and critical care. Some are double or triple board certified. All are FAA Senior Aviation Medical Examiners. You’ll need their help with problems that present in flight medicine and on orbit. We’ll add hyperbaric medicine, dive medicine, air evacuation and shuttle and soyuz specific medical training. You will care for the crew’s family members and do house calls, coordinate consultation and present waivers at the aerospace medicine boards.

You’ll have the chance to train with your other military colleagues in support of shuttle launches and with air evacuation support of launches at Kazakhstan. We’ll add in critical care experience utilizing the best of human medical simulators and a specialist in Anesthesiology and Critical Care who will put you through your paces. You’ll will intubate patients at a teaching hospital, work in their emergency room, read films and rotate on the internal medicine wards. You can moonlight on your own time, if available. We’ll add in zero-gravity training on the DC9 weightless wonder, where you will intubate, run ACLS scenarios and medical procedures while you try to keep your cookies down. You’ll need that crucial training to help your crews on orbit or if there is an emergency on landing in Russia, where you are the only American provider, all you have is what is in your backpack and in your head and the whole world is watching you. Same goes for landing at KSC, where you will be the first to crawl into the orbiter to get to your crew.

There is flying involved. You’ll have the opportunity to fly as crew on the T-38N, only after you complete the physiology training, water survival, basic ground school, egress training and emergency procedures training. You’ll fly the T-38 simulator and then put on your blue NASA flight suit for some of the best flying you’ll have in your life. Your front seat pilot will be either a NASA pilot who flies everything in the inventory, mission specialist pilots or a shuttle commander. You’ll fly locals to Beaumont, cross country to El Paso and you’ll pinch yourself as you fly down to the Cape for STA flights. You’ll fly in that shuttle training aircraft as it makes repeated shuttle approaches. You’ll support the WB-57, Super Guppy and Gulfstreams.

There is diving involved. Obtain your open water dive certification and we’ll arrange nitrox training. With those tickets you’ll be able to dive with the Astronauts in the Neutral Buoyancy Lab and support your crew as they prepare for EVAs. Stick around past 2010 and you might be jumping out of the helicopters in the ocean, Dr. Ross (Apollo) style, as you recover your crew from the CEV. It won’t cost you a dime.

There is international travel involved. You’ll travel to and possibly live in Russia, Europe and Japan supporting your crew in hazardous training, through international medical certification boards and during launches and landings in Kazakhstan. You’ll be the sole American provider and NASA medical representative and on-call for any emergency Soyuz landing. You’ll coordinate contingency landing operations in Africa, Europe and potentially at emergency landing sites.

You’ll be training others as well. You’ll train your fellow flight surgeons, your Astronaut crew medical officers, medical students, military RAMs, RAMs from UTMB, international flight surgeons and associated researchers and engineers.

Half of the NASA flight surgeons at JSC are military, either active duty or active reservists. We support the military Astronauts on missions that are going on right now. We’re also serving in traditional guard and reserve units as flight surgeons and as commanders. Come train with us. Come work with us. Come help us continue to build the Cadre of Space Medicine Professionals.
In 2003, AF/SG requested that SoUSAFFS provide an annual report capturing the “state of the flight surgeon.” This summary of the third “State of the Flight Surgeon” (SOTFS) report contains important corrections after statistical review since the raw data was first presented during the Annual Society Business Luncheon in Orlando in May 2006. This assessment provides an independent assessment of priority areas to guide senior leaders in continued improvements.

As a benchmark assessment of fundamental changes within Air Force aerospace medicine, this report provides basic comparative data that reflects significant changes over the past half decade. Over the previous five years, the core enlisted aeromedical support has transitioned to generic medical support. Anecdotes of widespread issues with that transition have been common. Air Staff has made a concerted effort to strengthen the Chief of Aeromedical Services (SGP) role through defined responsibilities in overarching guidance (AFPD 48-1 and AFI 48-101) and renewed inspection vigor. Finally, this survey encompasses over five years of continuous sustained combat operations overlaid on fifteen years of continuous worldwide deployment and peacekeeping and combat.

Flight Surgeon training has evolved greatly over the past five years. The Aerospace Medicine Primary Course is re-structuring with a major course re-write migrating to a partially distance learning course (set for deployment in 2007). The Residency in Aerospace Medicine (RAM) added a Preventive Medicine (PM) emphasis area in 1999 and moved the Occupational Medicine (OM) training to Tinker AFB in 2002. Additionally, RAMs have been allowed to complete their training after a Master of Public Health and an Aerospace Medicine year only. All residency programs and the AMP changed directorships at least once during the previous five-year period. Finally, preparations are on-going to migrate to Ohio forming the Institute of Aerospace Medicine.

The third SOTFS consists of the results of two web-based surveys. The first queried line commanders (CCs) from operational (flying or missile/launch operations) wings. These included operations group commanders (OGCCs) and squadron commanders (SqCCs) regarding their perceptions of the abilities and capabilities of, and mission support by, their SGP's, SMEs, squadron-attached FSs and their installation FSs as a group (IFSs). This was the first such survey of line commanders. The second survey queried SoUSAFFS flight surgeon members regarding their impressions of AMP and RAM training, and builds on a shorter survey done in 2004. This article briefly summarizes the results of these two surveys. Both involved large enough samples to provide good statistical power, and should be useful in future comparative surveys.

Discussion:

For the line CC survey, 30 OGCCs and 123 SqCCs responded for a return rate of 52 and 65%, respectively. In the first question set (QS1), all CCs were surveyed regarding their IFSs’ clinical credibility, credibility as aircrew, grounding management, medical care of flyers' families, IFS flying, readiness for mishap and other casualty response, communication skills and efforts, briefings (frequency, quality and impact on mission), and overall IFS impact on flight safety and mission completion. Other question sets: OGCCs rated SGP advisory support (aeromedical issues and mission support areas), leadership qualities and meeting attendance. SqCCs rated their SMEs’ and attached FSs’ advisory support, meeting attendance and flying frequency, as well as (for SMEs) leadership qualities and deployment support. CCs rated all four groups of FSs in overall knowledge of operational issues, flight safety, operational health and medical knowledge/practice.

Figure 1 is an example of the overall finding that the vast majority of commanders view their installation flight surgeons in high regard. Overall perceptions of competence and performance by operations group and squadron commanders were high among all populations.

One of the most striking findings from this survey was that SqCCs having SME or attached flight surgeons have more favorable opinions of their IFSs than do squadron commanders with no “unique” flight surgeon to consider “theirs.” The latter perceived the IFSs as briefing less, flying less, having a less favorable impact on the mission, having less credibility as flight crew and as clinicians, communicating less, meeting family health needs less well, and having less mission-critical knowledge. Figures 1 and 2 illustrate this trend. Many of the CCs’ comments specifically mentioned the value of the FS assigned/attached relationship in terms of operational readiness and mission completion. This is a valuable, and possibly under-rated, flight surgeon/line relationship.
Approximately 90% of commanders found the IFS knowledge of medical, operational, occupational and safety issues to be good or better (Figure 2). Overall, CCs rated IFS medical knowledge higher (approximately 75% excellent or better) than operational knowledge (approximately 60% excellent or better). The majority of no-opinion or negative responses in all categories were attributable to commanders without attached or assigned flight surgeons. 87 and 88% felt the IFSs contributed significantly to flying safety and mission completion, respectively.

This was the first survey evaluating the SGP’s effectiveness in a specific leadership role. Overall responses from commanders were favorable toward the installation’s SGP. 58% of operations group commanders identified the SGP as a frequent attendee at wing leadership forums, and 96% rated the SGP as excellent or superior in their role as advisors to line leadership. Operations Group commanders also tended to rate the SGP very highly in their fund of knowledge in all areas including occupational health and flight safety. That most (81%) of responding OGCCs considered their SGP to be their primary aeromedical advisors was impressive, given the lack of a formal or AFI-required relationship. Fully 80% of OGCCs felt their SGPs showed leadership qualities at an “excellent” or better level.

Assigned squadron medical element flight surgeons (SMEs) were rated by their squadron commanders. SMEs were universally (97%) perceived as a personal medical advisor and 100% were rated as good or better in their performance in that capacity. It was somewhat surprising that these ratings were nearly identical for the SMEs and for single unit-attached FSs, as rated by their assigned and attached SqCCs, respectively. The advice given to the SqCCs and squadron leadership by the SMEs, regarding factors that influence flyer readiness and mission completion, was rated similarly, and fairly highly, by both SqCC groups. Approximately 3/4 considered this excellent or better.

Three quarters of SME CCs reported excellent or better supervision and training of the SME unit by the SMEs. Leadership qualities of the SMEs were ranked highly, both in-garrison and while deployed. Their support of their units while deployed, in the various areas covered by the questions, was overwhelmingly perceived to be excellent or better.

On a negative note, 19% of commanders reported that their SME did not fly regularly. However, this may be partly explained by operational flying units where there is no opportunity for the SMEFS to do so, such as A-10 units. 32% of the SMEFSs were reported as participating in squadron social activities only occasionally or never. 29% of commanders reported that their SME presented briefings at meetings only occasionally and 6% never.

75 (49%) of the CCs left comments. These were mostly favorable, some very highly so – 20% of the comments included some kind of “best ever” wording – best flight medicine shop experienced in CC’s career, best group of FSs ever encountered, etc. There were a few less favorable comments, and a very few said there were FSs on their installations that their flyers avoided at all costs. There were many (25% of those leaving comments) CCs who expressed serious concern about FS manning at their installations, many ascribing the problem to deployment demands, and some suggesting the level of manning was so low at their installations that Flight Medicine services were rendered nearly dysfunctional.

SoUSAFFS membership was also surveyed to review the adequacy of AMP and RAM training. 230 active flight surgeons responded to the elec-
Knowledge Summary Graph
Flying Safety

IFS Knowledge Flight Safety

SGP Knowledge Flight Safety

AtFS Knowledge Flight Safety

SME Knowledge Flight Safety

Flying Safety Knowledge Summary

Knowledge Summary Graph
Medicine and Medical Practice

IFS Knowledge Medicine and Medical Practice

SGP Knowledge Medicine and Medical Practice

AtFS Knowledge Medicine and Medical Practice

SME Knowledge Medicine and Medical Practice

Medicine and Medical Practice

Summary of Medical Practice
tronic survey for a response rate of approximately nearly 50% of all active flight surgeons. The comparative survey of 2002 had only 60 respondents, so comparative data with that survey, due to its very low statistical significance may be considered somewhat suspect. However, the current survey should be considered to be highly representative of the active flight surgeon population. AFPC reported that at the time of this survey there were 93 RAM authorizations with 62 filled, 377 48R or G authorizations with 356 assigned, and 10 pilot/physician authorizations with 6 filled for a total denominator of 424. Members of the ARC were not independently identified in this survey.

AMP course effectiveness was compared to the 2002 survey. The statement “the AMP course prepared me well for my duties as a flight surgeon” was graded on a five-point scale. Fewer respondents in 2006 noted strongly agreeing, the difference was statistically insignificant (p=0.20). Comparing those who graduated the AMP before and those who graduate the AMP after the major overhaul of the course, showed no difference (p=0.8).

Responding to “I am well prepared to do my job” and stratified by years since the AMP course, there appeared to be a correlation with time since training and perception of adequacy of training. This could reflect experiential learning as well as that from primary training. When compared to the 2002 survey, fewer respondents agreed or strongly agreed in this survey, but this was not significant (p=0.08).

The period prior to this survey included major changes in post-AMP training (dissolving the Operational Aeromedical Problems, creating the Team Aerospace Operational Solutions, then skipping TAOS), an aborted effort at sustainment training, canceling the Aerospace Readiness and Management course altogether, and more. Thus, a correlation was attempted between the 2002 survey in flight surgeon sustainment training and the current survey. In the current survey over 20% fewer respondents rated post AMP sustainment training highly.

Retention and FS satisfaction was addressed. 80% of recent AMP grads intend to remain on active duty for less than retirement. 40% of them plan to separate when their commitment ends. Conversely, among flight surgeons with 6-10 years since their AMP training, 80% intend to remain on active duty to retirement or beyond.

Additionally, we evaluated the difference in intended retention plans of the 2002 survey versus the 2006 survey. Again, we did not find statistical significance using an unpaired t-test (p=.0966) suggesting that the population of flight surgeons and RAMs and expected attrition is relatively stable and predictable.

We attempted to assess the impact of various factors on flight surgeon retention. One major goal for this study was to determine whether current high operations tempo could have a direct correlation to retention.

Deployment tempo was addressed in terms of months deployed per 36 month period. In this population, 75% of 48G/R flight surgeons had deployed greater than 4 months during the past 3 years, and 20% had deployed greater than 8 months (2 cycles) during that 3 year period. RAMs deployed at a similar rate, though slightly fewer (15%) deployed twice during the 36 month time period.

We correlated respondent’s expectations for career longevity with the number of months deployed with the hypothesis that there would be a correlation with greater months deployed and an expectation to leave the service sooner. In fact our data reflects no correlation to number of months deployed and expected duration of career service (p=0).

Summary:
This survey combination provided a valuable insight into the training, motivation, utilization and retention of flight surgeons. The perspective of the end-user suggested that line leadership with attached or assigned flight surgeons are, on the whole, quite satisfied with the performance of their flight surgeons. Commanders without assigned or attached flight surgeons (SpaceCom and similar operational units) were generally less positive toward installation flight surgeons. Across the board, occupational medicine, flight safety and mishap response remained areas of concern having somewhat less positive and even a few negative comments. These may be appropriate areas for USAFSAM medicine staff to research further using this data as a starting point. SMEs and SGP s were generally very strongly valued. All flight surgeons were felt to be knowledgeable in all key areas. Participation in unit safety activities, regular flying, and participation in squadron social events was generally good but among some groups less frequently than expected.

These surveys tended to contradict a widely held preconception that a high ops tempo led to poor retention. This survey found that sense of duty was the top factor in retention, and that ops tempo had no correlation to perceived career longevity. Also, from the flight surgeon’s standpoint, AMP training seems to be as adequate now as it was in the past, though sustainment training seems less adequate.

From a career field management standpoint this survey provided a clear and reproducible model of expected attrition and utilization in terms of years after AMP and years after RAM. Further, this survey demonstrates statistically significant stability within aerospace medicine over a period of significant tumult, which should further assist in modeling future requirements for training and for establishing selection criteria based on anticipated demand.

The full version of the surveys may soon be available by qualified request. Please contact FlightLines staff if interested.

Finally, this survey does confirm that the vast majority of respondents “love being a USAF Flight Surgeon”.

### Post AMP Training Satisfactory?

![Post AMP Training Satisfactory Graph]

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>72</td>
<td>50</td>
</tr>
<tr>
<td>2006</td>
<td>219</td>
<td>55</td>
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</tbody>
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Unpaired t test
T=1.755
p = .08
Serving the Line

LtCol (ret) Adonto D’Amore. USAF, MSC

A short while ago, while holding forth to the current RAM class on a myriad of specious topics, I mentioned that I thought the medic-line relationship was still shaky and that the first ambassador for the AFMS to the real air force was the squadron flight surgeon. I went on to opine that the main reason we had public relations problems with the line is that all the line squadron commanders know about us is that we seem to go out of our way to keep them from accomplishing their mission. We DNIF any flier brave enough to present with a problem, we wave the black flag as soon as the heat and humidity get high, we won’t give “go pills” almost without a direct order, we complain about the noise and fumes of the generator farm, we won’t let anyone drink the water and, the coup de grace, we make it nearly impossible for their and their fliers’ wives to get into gyn and their kids to see a pediatrician. So, how do we overcome that bad press?

Well, first, we learn who our customer is and then we learn how to serve him. Since our customer is the war fighter, we need to learn the line mission, both from the macro level of the Air Force and the micro level of our Wing and Squadron. The more we know about the fliers’ mission, the more we will understand their world and their perspective. Holy PME, Retiree Bob, do you mean doing Squadron Officer’s School and Air Command and Staff College? Ay-yup, and if ya wanna make colonel, do it in seminar at the very minimum. Another great way to learn the mission is at the bar and the crud table, whether in the O Club or the ready room. Best thing about the club is you also see the non-flying line guys and learn their mission. It never hurts to have friends in the cop shop or civil engineering.

When you remember that first and foremost a pilot’s entire raison d’etre (at least a young one’s) is centered around flying, you’ll understand his reticence to speak to a physician unless it is an emergency or he is asking about some symptoms his “friend” has. Talking to doctors can lead to grounding and that ain’t happening! OK, so if they won’t talk to me, how do I serve them? Simple -- become one of them. Spend as much time as you can down in your squadron and be accessible. Tell dirty jokes, or at least giggle at them. Attend their parties and official functions and have a drink. Play on the softball team. FLY, Fly, fly (good luck on getting a combat sortie). Do what they do, see what they see, and feel what they feel, and observe, observe, observe. Deploy with your squadron and share their pain. Be involved. Familiarity breeds familiarity and earns confidence, and one day, you’ll find yourself practicing a lot of medicine in the ready room (“Hey, it’s probably just a little virus, but come by the office and we’ll check it out.”). Now you’re serving the line!

Your relationship with the flying squadron commander is also very important, as you have to share your concerns about his people without betraying confidences or violating HIPAA (did I really use that word?). Speak honestly and frankly of any real health issues you have noticed and know that once he knows you have earned the confidence of the crews and support folks, he’ll initiate conversations with you, making your job even easier. Also know that the commander has his own set of unique problems, sortie generation and the burden of command being what they are, and you need to be observing him, too.

Remembering that you are a physician and not a pilot, and that you also serve another master, the local medical commander, do your clinic time. Make it as easy as you can for all squadron (that means the enlisted, too) family members to see you. Treat, refer, and follow up, and remember that 90% of medicine is listening and hand-holding. You may run into some problems with your medical commander by spending what he thinks is too much time in the squadron, but remember that he too “serves the line” and his Wing Commander’s wife is hearing from the Squadron Commander’s wives all the time. Regardless, this presents you with a real tight rope, so never fail to remember that although the line squadron commander may write your OPR, the medical community makes your next assignment and they will look to your medical commander for input.

All of this leads to a few final admonitions. First, know that a commitment to serving the line is just that -- a commitment. When the day comes that you can no longer do that with the élan required, go back to direct patient care and make a difference there. Always remember that healthy people don’t really like medics until they need them, so learn how to accomplish your mission in a non-threatening manner. When you are in the ready room, look and listen and never pass up the opportunity to keep your mouth shut unless the subject is mission-critical or life-threatening. Get to know and take great care of your squadron medical element and they’ll take care of you. Make friends with the other Wing squadron’s docs and look out for each other. Be approachable and professional with your fliers. Act like an officer. Look like one, too -- if your flight suit makes you look like the Pillsbury dough boy, get a bigger one and lose the weight. Remember as you climb the ladder to support and advocate for the (or your, should you be the medical commander) junior flight surgeons and always keep in touch with your line buds. Walk the talk for life, and always remember that that LT or Captain you had in your squadron, took care of, and made the right impression on just might turn out one day to be your wing king, or even higher, and his whole opinion of the AFMS just might be a direct result of YOU.

By the way, if you are wondering where an MSC gets off talking to you like this, you should know that I served as the CENTAF/SG to General Chuck Horner for 2 years, was the SGP at Tinker (552 AWACS), was the first Commander of the Buckley AFB Clinic, newest medical squadron and MTF in the AF, where I had 2 flight surgeons, both of whom became RAMS and, most importantly, I have had this chat too many times to remember with several of our senior AFMS leaders, to include lots of senior RAMS, where I have decried that too many medics think they are medics in blue suits rather than Air Force officer who happen to be doctors. So, as far as I am concerned, if you can’t be the flight surgeon or RAM the line needs, its time for you to return to the MTF and be a clinician. Can I get a HOOAH!!
On Exchange with the RAF

Maj Kathy “Fog” Hughes, USAF, MC, FS
Pilot Physician

The saying goes, “Two nations separated by a common language” but one year into my three year exchange as the Senior Medical Officer/Pilot at Royal Air Force Centre of Aviation Medicine (RAFCAM) I would have to disagree. Certainly there has been some adjustment involved in living on an RAF base: the children attending British schools, driving on the other side of the road. The exchange rate continues to cause hypertension each time you open the wallet (the mantra is “just don’t convert it into dollars”) but this assignment is a unique opportunity I never envisioned.

RAFCAM is located at RAF Henlow in Bedfordshire, just an hour north of London. It was formed in December 1998 when the RAF School of Aviation Medicine, based at Farnborough, and the RAF Aviation Medicine Training Centre, based at RAF North Lufenham, combined. Although it is a new entity, RAFCAM continues to carry on the tradition of supporting aviation medicine in the British military, one which dates back prior to 1920. RAFCAM’s mission is “to provide specialist medical and scientific support and training to the Royal Air Force in the fields of Aviation, Occupational and Environmental Medicine, and to make available the most effective medical support to all aspects of Air Operations in peace and war.” The Centre is commanded by a one-star general, Air Commodore W J Coker, and is comprised of four wings and the RAF Medical Board. The Administration Wing oversees the budget and the library, which holds an impressive collection of books and journals and is an outstanding resource for research in any of the fields of aviation medicine. The Engineering Wing is responsible for the maintenance of medical and dental equipment all medical and dental centers throughout the RAF. The Occupational and Environmental Medicine Wing is responsible for research, training and inspection in the fields of environmental and occupational health, communicable diseases, dangerous substances, and noise and vibration. The Aviation Medicine Wing is the largest of the four wings and includes the Aircrew Equipment Integration Group, Human Factors and Biodynamics Section, Aviation Physiology Section, Aviation Pathology, Clinic Instruction and the Aviation Medicine Flight. Facilities at RAFCAM include: four hypobaric pressure chambers, one hyperbaric pressure chamber, two AMST DISO spatial disorientation trainers, a climatic chamber (-20°C to +50°C) and an NVG lab with terrain board.

A small part of the Aviation Medicine Wing is my department, the Aviation Medicine Flight. We conduct our flying operations at MoD Boscombe Down, which also is home to the Empire Test Pilot School. The flight is comprised of only six people, but also two airplanes, both of which are the British Aerospace Hawk Mk1. The Hawk is a two seat, single engine jet trainer used much like the T-38. The two assigned to RAFCAM have an extended flight envelope and are cleared from -3.5G to +9.5G. Instrumented with sophisticated video and data recorders and specialized regulators, the Hawks are ideally suited for the Av Med Flight mission of aircrew equipment development and testing, and clinical rehabilitation of airsickness and injuries. The RAF is the only air force in the world which has aircraft completely dedicated to aerospace medicine use. With just two pilots assigned and two planes, the flying is ripe. Along with the USAF exchange pilot-physician the Av Med Flight is commanded by an RAF Pilot, currently Squadron Leader Chris Taylor.

The history of the USAF pilot-physician exchange with the RAF dates back over 20 years, many who have served in this billet continued on to leadership in the USAF medical community. The names are familiar to all of us: Gen Andy Anderson, Col Geoff McCarthy, Col Bob Munson, BGen Tom Travis, Col Lex Brown, Col Pete Mapes and LtCol Will Hallier. I have been here since Oct 05 and will finish my exchange in June 08, when I anticipate beginning my MPH year of the RAM.

The role of the exchange pilot-physician is challenging and represents a balance of duties based at RAFCAM, clinical duties at RAF Lakenheath, and flying operations at Boscombe Down. Three days a week are spent at Boscombe, generally flying four to six sorties. The projects I have worked on thus far are quite varied. There have been three airsickness desensitization candidates in the past year, which are aircrew members referred from station medical officers for refractory airsickness. They generally are navigators or pilots in training anywhere along the pipeline but occasionally a Nimrod back-ender is referred. The first month is spent at Farnborough undergoing twice daily ground desensitization in a spin trainer or vertical or horizontal accelerometer. Once he has persevered death-by-barany-chair, he is continues on with 20 sorties in the Hawk with increasing levels of maneuvering and progresses to low-level attack sorties and BFM. The success rates candidates returning to fly and finish their careers in aviation is close to 90%.

The newest fighter in the European community is the Typhoon, a multi-role aircraft designed in cooperation by the UK, Germany, Spain and Italy. Much of the aircrew equipment to include the flight suits, undergarments, chest-counter pressure jacket, and full coverage anti-G suits were developed and tested for in-flight performance, safety, and longevity in the Hawk. We currently are testing the final version of the Typhoon helmet, which will provide a helmet-mounted display system with off-axis boresight capability for missile employment and direct voice input for many in-cockpit functions.

Prior to training in the Typhoon, all pilots selected for the enviable assignment undergo Typhoon pre-employment training (PET) to include classroom refresher training on aviation physiology, ground and chamber training for pressure breathing, and a centrifuge run at Farnborough with their newly fitted Typhoon “kit”. There the pilots begin to learn the new techniques for sustaining G with full-coverage trousers, chest counter-pressure jacket and pressure-breathing for G (much like the USAF’s Combat Edge). The culmination of PET is two flights in the Hawk, the first flight with a multitude of structured turns from 5 – 9G at varying onset rates, the second flight is a 1 v 1 high-energy air-combat profile. During this training I provide unique instruction on the ground and during flight to help the Typhoon
pilot adjust to the high G environment and how to most effectively adapt his anti-G straining maneuver to maximize the benefit of the full coverage G-suit and pressure breathing. Most of the RAF aircrew have never used this technology before, and many haven’t flown in a high G aircraft in years. The Typhoon pilots say the training is invaluable and they find the aircrew ensemble extremely effective, stating once used to it, the kit almost eliminates the need to strain while sustaining G which highly reduces fatigue. Talking at 8-9G is a concept they never thought possible before!

Future flight trials will include work on the Joint Strike Fighter program to include G-protection and helmet trials.

The flying has been challenging – the weather is generally worse than anything I have routinely flown in before, the low-level environment is just that – very low and very fast. The thrill of cruising around the hills of Wales and the mountains of Scotland at 250 feet and 420 knots is addictive! Extra excitement added for free, as all the navigation is map reading, compass and stopwatch. A good visual look-out is a must, not only for birds, helicopters and towers, but you never know when a two-ship of Harriers or Tornados might see us as a “target of opportunity” and bounce us for a bit of impromptu low-altitude dog-fighting!

Although there are two years left in this exchange tour, I can already say the most rewarding part of this assignment will be working closely with our greatest ally, meeting the many talented people who have contributed significantly to aviation medicine, and forging what will hope to prove life-long personal and professional relationships.

Cheers and fly safe! 🚀

What is Missing From USAF Human System Integration Proposals

Col Pete Mapes, USAF, MC, CFS

Flightlines recently ran a very complete edition on the Air Force’s initiative to bring HSI into acquisition. I was struck by the similarity of the proposed program to the “guidance for program managers” found in DoDI 5000.2, enclosure E7. This creates a bit of a quandary because program managers deal with programs after requirements are pretty well determined. As a result, it seems that the HSI model we have adopted as a corporate Air Force does not have a robust method for requirements generation.

Most of us understand that inexpensive changes are made on paper. When changes need to be made to systems after they have been produced, the price tag quickly becomes unaffordable. As system costs increase, the incentive to ‘get it right’ the first time becomes immense. The question then is: ‘how to ensure the requirements are done properly before the system comes out of the design phase?’

Currently, MAJCOMs control most of the dollars for system development and acquisition. They generate teams who draft requirements for new systems. Since the amount of expertise in any one area at a MAJCOM is usually shallow, the Systems Centers are frequently represented on the teams during requirements generation. Unfortunately, there is a recent history of not including experts from the human biosciences on these teams, so requirements relating to human needs are frequently overlooked or poorly written. One need only review the $56M cost of modifying the air conditioning units of the T-6s we took delivery of prior to discovering the predictable problem of increased radiant heat buildup in the cockpit to get a hint of the cost of leaving the experts out during the paper phase.

If we proceed by staffing our HSI offices with people who represent the disciplines in the nine petals of the current HSI model (Manpower, Personnel, Training, Survivability, Safety, Environmental, Occupational Health, Habitability & Human Factors) true human bioscience expertise will continue to be limited. The generation of HSI requirements should be the purview of the human bioscientist. A biological scientist employed in HSI requirements generation needs at least a Master’s degree in a biological science and must have experience in either operations, acquisition or engineering of the type of system they are evaluating (aircraft, missile, armor, etc.) These backgrounds provide the ability to approach proposals from more than one angle which I suggest is required for a complete, relevant HSI evaluation. Expertise in the biological sciences can be categorized into three subject areas - Anatomy, Cognition and Physiology.

There is some limited human bioscience capability represented in the current nine petal model, but not enough to do an adequate job of requirements generation. Individuals with human factors expertise have some cognitive training, but they are not strong in anatomy and physiology and they are more focused on the engineering sciences. Occupational health experts come the closest to bona fide experts in the biological sciences but they are trained to view systems from the standpoints of injury and disease prevention not operational employment or system design. Trained experts in survivability and habitability also have potential cognizance of biological issues, but they are usually drawn from the ranks of the engineers so their knowledge is usually of an engineering, rather than a biologic nature. For the remainder of the disciplines, knowledge of the biological sciences would be accidental rather than by design.

These experts populating the areas of expertise defined by the nine petals should use requirements generated by human bioscientists to build and operate a safe system. For instance, manpower experts decide how many people are hired to use service and maintain the system. Personnel specialists assign people with the right skills and training, and then monitor the experience of people who have worked with the system. Environmental staffs ensure that requirements are included to comply with guidance concerning environmental impact. The guidance from the representatives of the disciplines in the nine petals ends up being largely outside of human requirements but the human requirements have a large effect on the requirements from the nine disciplines.

What is needed is a core body of trained human bioscientists who have experience working with systems. When the USAF returns human bioscientists to the requirements generation process, it will have solved a majority of the HSI problem – provided their advice is heeded. 🌟
Accept No Substitutes

Col Hadley Reed, USAF, MC, CFS

I would like to offer my response to those who have posed this question over the years: Why not put physiologists on mishap boards in the place of Flight Surgeons?

The answer is simple and can be derived from a consideration of their relative backgrounds, training, and historic roles and responsibilities.

Ultimately physiologists are trained in the biological engineering of the “human machine” connected with a mishap, much the same as the other engineering-oriented members sitting around that table (I myself simply haven’t met any Board Presidents or Pilot Members who were Fine Arts/Music majors in college, but must further confess that I continue to be surprised by aircrew all the time).

But the Flight Surgeon’s very existence is predicated upon this great and terrible truth: a pilot is more than a physiologic mechanism, a pilot is a human being. And in trying to untangle and define the causes, the failures, and the behaviors of all of the people involved within the sequence of mishap events, it absolutely positively requires someone who understands much more than just the mechanics of human physiology. It requires someone who also understands the dynamics and even the spirit, if you will, that comprise the entirety of human energies reacting to, involved in, and producing causes of their own within a sequence of mishap events.

Physiology is simply not enough. It reflects only a piece of the vast human puzzle. It would be absolute folly to believe that by simply evaluating a biological machine along with the other machineries of steel, silicon and composites an SIB will adequately capture the totality of the human involvement within a mishap. It would be utter foolishness that flies in the face of more than 100 years of human flight to presume that such a reductionist view of the pilot will suffice.

Another reason is found in the fundamental truth that pilots are not going to respond to anyone else the same way they’re going to respond to a Flight Surgeon during the course of the investigation, especially the interviewees. Those being questioned will know that the person facing them is interested in more than just matters of physiology, that their interviewer understands more about “what’s going on” than just questions of biology.

The historic role of the FS as a sympathetic supportive “trusted agent” who traditionally is free from outside “political” influences, all recalled from the previous experience of the pilot, will be a powerful dynamic influencing the interview process. This can and has had a significant positive effect on what is recalled by the pilot as well as what is revealed by the pilot during the course of that interview.

The converse is equally important. Given that a person tends to hear only what they are expecting to hear, and see only what they are taught to look for, it is much less likely that a physiologist is going to be as inclined to pick-up those often very subtle clues and cues regarding emotional, psychological and sociological aspects of an aircrew’s answers.

This reflects a significant cultural aspect to the entire investigation process that by its very nature should make a Flight Surgeon the more complete, the more thorough, the more proficient investigator in a mishap. This is, if you will, the unique aeromedical application of the profound insight made by the famous French physician Paul Tourney when he coined the phrase, “medicine of the whole man” in the late 1930’s. The entire person of the pilot is involved in the mishap, therefore it requires someone who understands that pilot in his or her totality to be the one leading the investigation of the human element in the mishap.

This is the same reason why we don’t select an ophthalmologist or an ENT doctor or an internist or even a family practitioner to be the medical investigator of aircraft accidents. It requires someone who has the fullest broadest and most comprehensive grasp of the complete and full nature of the human being involved in the mishap sequence, in the mishap event.

It is for this reason also that a psychologist, no matter how thoroughly trained in the unique aspects of aerospace psychology, is equally insufficiently suited to be the only or leading medical member of a mishap board - again, they only know their particular piece of the entire human puzzle.

However, well beyond having insight into personal issues and aspects comprising the individual aircrew, there also is required someone who is equally and intimately acquainted with the greater sociological dynamics of the aviation community as a whole. It requires someone who has been an active member, a full participant if you will, but also trained to develop an internal perspective, who can speak to the group dynamics that are part of the complete milieu in which an air crew member exists, and interacts. This is what Flight Surgeons are trained to become; this is part of the Flight Surgeons job description.

Aircraft mishaps are NOT just isolated “physiologic” or “psychological” events, even if the immediate proximate cause to a pilot flying into a mountain was due to the lesser - SIBs therefore must always speak to much more than simple proximate causes if they are to effectively intervene and prevent other such events - and FS’s are, by the very nature of their training and historical roles and responsibilities in the squadron, the best qualified to identify and effectively speak to, to address in their totality, these equally crucial larger issues, the often more subtle causal factors that all lead to an aircrew hitting the earth unawares.

Issues of culture, of leadership, of group dynamics, all impact every member of a squadron - mechanics & clerks as well as pilots, enlisted members as well as non-pilot officers, all of whom can & have made their own tragic contributions to mishaps. FS’s are simply better qualified to delve into these complex multi-layered issues to determine their unique & often unexpected contributions to a mishap.

This even speaks to the greater and perhaps also more subtle wisdom that the Air Force applies when, if at all possible, it tries to bring a Flight Surgeon member onto a board who is from the same or similar background of the weapon system and its unique culture as that of the mishap pilot. The expectation (or hope) is that such a Flight Surgeon will have the most sound and accurate possible insight into every aspect ranging from individual issues of the mishap pilot flying that particular weapon system to the larger group social dynamics of the squadron of whom the pilot is a part.

Finally, FSs are not only trained in complex multi-factorial problem solving, they spend their entire careers using and honing that ability – it’s called making a diagnosis. Nearly every moment of every day of their lives is spent conducting “mishap investigations” – only those “mishaps” involve one person (usually) and are called “diseases”. Without question, the FS is the best trained and most experienced “investigator” on any SIB – this is something to which a few weeks (or even months) of training at USAFSAM cannot compare.

Throughout the entire history of aviation there has been one and only one professional who’s remarkable historically validated combination of unique training and singular experiences gives them a full global grasp of the “whole man” involved in aviation, much less aviation accidents. That one irreplaceable professional is the Flight Surgeon.

Accept no substitutes.
Bridging the Gap

LtCol Andrew Woodrow, USAF, BSC, MRaeS, CHT, CEM
Branch Chief, Aerospace Physiology Formal Programs
USAF School of Aerospace Medicine

The author has 24 years experience in aerospace physiology including 8 Class-A mishap boards, several Class-B consultations, and has taught graduate and undergraduate mishap investigation programs for over 10 years. His greatest thrill (in the context of this topic) is discovering that flight surgeons and physiologists can work together and learn together on every investigation.

In response to an esteemed colleague’s question Why not put physiologists on mishap boards in place of flight surgeons? I will attempt to build a bridge within the aerospace medical community.

The answer is, indeed simple, and is derived through careful consideration of the backgrounds, training, and experiences in each field.

Physiologists are recruited from any variety of life sciences, and much like their physician colleagues, undergo a series of training programs to help translate university-based understanding of the physiological systems and human factors to an aerospace-centric reference. Unlike the engineering-orientated members of the mishap board, the physiologist looks at the mishap puzzle with the perspective of the complete man-machine interface; much like the physician. Few physiologists would ever argue that the human found in the middle of a mishap sequence is measured merely in physiological terms. Physiology is a complex science but incomplete without practical experience in the application of human function to aviation. The foundation of a mishap investigation team is predicated on the understanding that it is too much to ask even the best informed flight surgeon to have committed to memory or have at his fingertips all the understanding of all of the information that might be of use in every conceivable mishap scenario. A prudent flight surgeon faced with an unfamiliar analysis of human performance will acquire all relevant information in the time available before making a decision or putting pen to paper. It would, indeed, be absolute folly to believe the flight surgeon could cobble together a comprehensive review of the complexities of the human piece of the mishap puzzle without seeking advice from specialists in areas of human performance, acceleration, high altitude physiology, sustained operations and others. Specialists in such areas have access to sources not familiar to the squadron flight surgeon tapped for a one-off experience of mishap board member. As my learned colleague prescribed, ‘it would be utter foolishness’ to presume a reductionist view of the pilot would suffice for life sciences analysis. Likewise, foolish is the flight surgeon who believes that a single-ship cerebral strike could possibly result in anything less than unwarranted conclusions.

As for the interviews, it is true that many (not all) flight surgeons have a well-articulated sense of maneuvering through the often difficult interview process. However, this experienced mishap investigator would suggest that on many accounts, the physiologist enters the interview not simply by thinking ‘outside the box’ but actually eliminating the box completely...in fact the physiologist actually does understand more about “what’s going on” than just questions of respiration and neural function, and can suggest a line of inquiry that supplements that of the flight surgeon.

The flight surgeon’s judgment to request the consultation of an aerospace physiologist is informed by the desire to obtain the best advice available. But only the flight surgeon can know when it is time to call for this support. Enter the aerospace physiologist (AP). AP’s are, by the very nature of their training and historical roles and responsibilities in the squadron, are excellent advisors to identify and support the crucial larger issues associated with the unfortunate circumstances related to aircrew unwittingly shortening an otherwise uneventful flight. The fully qualified aerospace physiologist has experienced the breadth of aviation-centric tutelage...from survival schools to flight training, plus formal courses in accident investigation, night vision goggles, sleep physiology, and crew resource management, to name but a few. It is for this reason that an aerospace physiologist (or aviation psychologist), thoroughly trained in the unique aspects of the aerospace environment, is equally suited to be the leading consultant to the medical member of a mishap board. Any suggestion that a life sciences expert (physiologist or psychologist) could run the medical investigation is reckless.

The role of the life sciences team requires a partnership of experts who have been active members of the aerospace community and also trained to develop an internal perspective; consultants who can speak to the group dynamics that are part of the complete environment in which an air crew member exists.

Aerospace physiologists are now seen in the midst of all squadrons that include humans at the center of activity and mission accomplishment. Nearly every wing in the Air Force, both CONUS and OCONUS, maintain a billet for a physiologist and physiology specialist to interface between flight medicine, safety and the broader community. In the role as Human Performance Effectiveness guru, the physiologist provides just-in-time consult, analysis, and training to every member of a squadron – a partnership within Team Aerospace that targets errors and seeks to correct them before tragic mishaps occur. AP’s are simply a natural match, along with aviation psychologists, to be the unique & often unanticipated master consultants to help determine the contributions to a mishap.

Couple the life sciences experts together from the same or similar aircraft experience and the unique culture as that of the organization and the benefits are exponential. APs are, like their flight medicine siblings, not only trained in complex multi-factorial problem solving, they spend their entire careers using and honing that ability – it’s called accident analysis. No disagreement, the FS is the best trained and most experienced “investigator” on the investigation team. But make no mistake, the years of experience in patient care cannot compare to the robust nature of accident investigation...where the few weeks of USAFSAM training provided to BOTH the flight surgeon and aerospace physiologist pale against the fortitude of a science-based team that will dredge through the mire to retrieve a sensible explanation of the reasons behind the mishap.

The solutions to human-based errors resulting in a mishap are not found in a PDR or textbook, but only through street-savvy partnerships. The authority of the flight surgeon is not in question here. Investigation teams need flight surgeons who are not just competent to make decisions and assemble analyses, but ready to exercise the option to consult with other life sciences experts. The volley on ‘Accept no Substitutes’ is simple...recognize where shortcomings exist and Bridge the Gap!
Comment

A Non-Satirical Tale of Sartorial Credibility

Royce Moser, Jr., M.D., MPH

I was visiting with some recent RAMS at the Society of USAF Flight Surgeons’ Luncheon, when the discussion turned to providing higher ranks to new Air Force physicians who had advanced civilian training/experience. I noted that we had experienced a similar situation during the Vietnam conflict, and I commented then that I could envision a “new” Lt Col asking a Wing Commander during a briefing, “Sir, What’s an ORI?”. Not knowing about the make or break Operational Readiness Inspection would not enhance the credibility of the Medical Corps. However, an experience I had while teaching the AMP course was more telling, and the RAMS I was with suggested passing it along to you. I was giving the welcome address to a new AMP class as some late arrivals were coming into the room. My wife was sitting at the back so that she could later advise the group about opportunities for spouses, including free golf lessons with the Brooks pro, etc. I happen to see her suddenly look shocked as a late arrival took his seat.

After the session, I met with the officer and asked him where he had come from. He stated he was from New York City and was proud to be in the Air Force, particularly since they had given him advanced rank. I asked where he got his uniform (“Class A” at that time), and he replied that the tailor he had used for years had made it for him. I noted that for years he had worn a silver oak leaf to designate the Lt. Col. rank, not an eagle with a silver First. Lt. However, an experience I had while teaching the AMP course was more telling, and the RAMS I was with suggested passing it along to you. I was giving the welcome address to a new AMP class as some late arrivals were coming into the room. My wife was sitting at the back so that she could later advise the group about opportunities for spouses, including free golf lessons with the Brooks pro, etc. I happen to see her suddenly look shocked as a late arrival took his seat.

As difficult as it is to believe, it is time again to get folks thinking about nominations for the SOUSAFFS Awards. One of the greatest effects we can have as leaders is to recognize the accomplishments of those with whom we serve. In this spirit, the Society of USAF Flight Surgeons sponsors several distinguished awards. As the Awards Chair, I ask that each of you take a minute to read the following award citations. As you people work with come to mind, and I am certain they will, I hope you will consider nominating them. By press time, more complete information about the awards will be posted on the Society webpage, to include submission deadlines. Please feel free to contact me at work via e-mail at Margaret.matarese@pentagon.af.mil or call me DSN 297-4864 with any questions or suggestions for improvement to the program.

Malcolm C. Grow Award Established by the Society of USAF Flight Surgeons to recognize an individual thought to exemplify the ideal flight surgeon at the operational level. Selection is based on exception-ally effective support of a flying organization and superior rapport with flying personnel.

Olson-Wegner Award Established by the Society of USAF Flight Surgeons to recognize aeromedical enlisted personnel for their contributions to the Air Force Aerospace Medicine Program. It is awarded to the most outstanding aeromedical technicians in the Air Force. This award is in memory of Master Sergeant Gary J. Olson and Airman Shane D. Wegner who lost their lives in a helicopter accident 25 Oct 1991. Beginning in 1999, the award was divided into three categories: Airman, NCO, and Senior NCO.

George E. Schafer Award Established and awarded by the Society of USAF Flight Surgeons’ Board of Governors, this award honors Lieutenant General George E. Schafer, Chief Flight Surgeon, and former President of the Society. General Schafer’s distinguished career ranged from squadron flight surgeon to Air Force Surgeon General and epitomizes the purposes and principles of the Society of USAF Flight Surgeons. It is fitting that the award, in his name, be given to a United States Air Force Medical Corps officer who has made long-term significant contributions to the mission effectiveness of the United States Air Force and to the vitality of the specialty of Aerospace Medicine.

Howard R. Unger Award Established by the Society of USAF Flight Surgeon’s Board of Governors, this award seeks to encourage and reward publication of original work by USAF flight surgeons. The award goes to the best paper written by a USAF flight surgeon, published in Aviation, Space and Environmental Medicine during the previous year.
Lt Col Steven P. Goff passed away on Monday, September 4, 2006. At the time of his death, Dr Goff served as the Chief of Aeromedical Services at Malmstrom Air Force Base in Montana. Prior to his service at Malmstrom, he also served at Grand Forks Air Force Base in North Dakota; Andersen Air Force Base in Guam; and Spangdahlem Air Base in Germany. As a Senior Flight Surgeon, Dr Goff risked his life regularly performing search-and-rescue missions in helicopters in harsh blizzard conditions throughout Montana, Idaho, and Wyoming, saving hikers, hunters, skiers, and others who got lost or stranded in the wilderness. Dr Goff was assigned to the Khobar Towers in Saudi Arabia when terrorists bombed the barracks in 1996, and despite suffering serious wounds, Dr Goff immediately jumped into action and began providing life-saving medical care to his fellow Airmen. For his actions, Dr Goff was presented the Airman’s Medal by then-Chief of Staff General Fogleman (pictured above). Prior to his service in the US Air Force, Dr Goff also served in the US Marines. Dr Goff was born and raised in Wisconsin, loved the outdoors and reading, and is survived by his parents and two sisters.

I guess every office needs the old crusty sage to grow young and inexperienced Flight Surgeons, and at Spangdahlem Air Base in 1999, Steve Goff was that guy for us. Steve was a good doc, sharp with his medicine (and his wit) and he cared for his patients and his squadron, the office and his techs, in little ways and big, like they were all his own family.

As important as who he was, however, was who he wasn’t. He wasn’t a fighter pilot, and he didn’t pretend to be. (in fact, he wasn’t flying in fighters at all... “something about my eyes”... but that didn’t matter to us, his squadron, or to the base). He wasn’t loud or boisterous about things he had accomplished, either. In fact, although he had obviously done quite a bit of living, he never talked much about himself. He always seemed a bit happier with the spotlight on those around him, and in taking care of others in the little ways that I would often forget but that he always remembered. He always seemed to remember, too, that in some way, we are all support for the guy on the pointy end of the stick. Maybe sometimes I forgot that, but I don’t think Steve ever did, and through his own brand of quiet leadership showed that to the rest of us.

For the first year that I knew him, I didn’t know that he had been one of the heroes at Khobar Towers in the finest Flight Surgeon tradition. I later once asked him about that experience, because one of the guys he had taken care of was a friend of mine. I’ve always wondered if I would have the “right stuff” and do what he had done. Steve’s short answer about the bombing was standard act: “When some of the guys got shooky, we would take the big stacks of crap in binders we had spent so much time working on and put it under their feet.... That was the one time I’d seen paperwork actually save lives in my career....”

All of us who had the honor to serve with Steve have many more such truisms like that that we will reminisce about in the bar some Friday night with our junior Flight Surgeons. We’ll probably talk, too, about the fake barf, the rubber chicken, or punchlines to jokes that are getting tougher to tell around the office, but that even my wife admitted were really, really funny.

For those of you who didn’t know Steve Goff, I wish you would have been able to hear the stories first hand. They’ll get passed down, but they won’t be the same. Those of us who had the honor of serving with him, even if for only a short time, were blessed. Steve Goff was a superb Flight Surgeon, and a special friend and mentor for many of us. I’d like to pass that on to his family, and say “thank you”. I wish I’d have had the chance to tell him that too.

V/R, Paul Nelson 🌟

Let us know what you think!

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Please complete the applicable items on this form, detach and mail with a check for $20/yr to the Society at Box 35387, Brooks City-Base, TX 78235-5387. Checks should be made payable to: The Society of USAF Flight Surgeons. **Credit card payments, as well as address changes, can be made on-line at** [www.sousaffs.org](http://www.sousaffs.org). Life membership is available for $200 — you must also be a life member of AsMA.

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**Aerospace Medical Association membership paid through (month/year or life):** ______________________

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**Medical school and year graduated**

**Internship/Residency and year completed:** ________________________________________________

**Aerospace Medicine Primary Course place and year graduated:** ____________________________

In order to become a member of the Society, we may need to verify your information. Do we have your permission to verify the above information?  **YES**  **NO** (circle one and sign/date below)

**Signature:** ___________________________________________  **Date:** ______________________

Membership is open to all Flight Surgeons in good standing who are members of our parent organization, the Aerospace Medical Association (AsMA.) Society by-laws define the classes of membership. For more information, see the Society Website at [www.sousaffs.org](http://www.sousaffs.org).