Orbiter

The Official Newsletter of the Aerospace Medicine Student and Resident Organization

HAPPY HOLIDAYS!

Dear AMSRO members,

Welcome back to another issue of *The Orbiter*. I had fabulous responses from the AMSRO community this past year, and I want to encourage all of you to continue writing about your aerospace medical experiences from conferences, internships, research projects, or any news of members. Please send your articles my way. All of this may be sent to: laura.drudi@mail.mcgill.ca. Enjoy the issue and I look forward to your feedback and your articles in the New Year! Have a great, safe and relaxing holidays.

Laura Marie Drudi

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In this issue:

2012 NASA Academy Recruitment Efforts

By Laura Drudi
McGill University, M.D., C.M. Candidate 2013

It's certainly that time of year again. The 2012 NASA Academy applications were launched December 1st, 2011. Recruitment efforts are already under way within the NASA Academy Alumni Association (NAAA). The Executive Council has been busy emailing individual Space Grants with recruitment campaign information for distribution.

If AMSRO members know of any undergraduates, graduates, and medical students interested in participating in the 2012 NASA Academy program, please pass on the following information:

The information and online application form can be found at this link: https://www.academyapp.com/ with the deadline for applications being January 23rd, 2012. There are many academies with different research areas in the aerospace industry. A broad interdisciplinary focus with science, health, engineering, technology and commercial ventures can be found at the NASA Academy at Ames Research Center (Mountain View, CA), Glenn Research Center (Cleveland, OH), Marshall Space Flight Center (Huntsville, AL). The full list is extensive and can be found on the website above.

If anyone has any further questions, please do not hesitate to contact me at: laura.drudi@mail.mcgill.ca

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Out of Air on the Great Barrier Reef

By Greg Stewart, M.D.

The Great Barrier Reef (GBR) is the world's largest reef system composed of thousands of individual reefs and stretching for over 1600 miles off the Queensland coast of Australia. It is the world's largest living structure and it is clearly visible from the International Space Station. In August 2011, I had the privilege to deep sea dive this truly amazing reef. I was very fortunate to be paired with a fellow Divemaster experienced in deep sea diving. It was our seventh dive on our second day of our weeklong trip on the outer GBR. We were over 90 feet deep at the base of what Australians call a "bommie" or an underwater pillar of coral. I looked over my shoulder to signal a slow ascent to end the dive and I was surprised to see him calmly signal "out of air". I instinctually handed him my alternate air source and we safely ascended to the surface.

As this was our seventh dive together, we had already developed mutual trust where we could discuss matters openly and honestly. He told me that he is typically very good on air consumption and for most of the dive his submersible pressure gauge (SPG) was reading more than half a tank of air. Suddenly, he noticed that his SPG was reading ZERO and his tank was empty. He was truly grateful that I was nearby to lend my air.

As a recently certified Divemaster, I was aware of the inner workings of an SPG. We discussed how the pressure sensing device in the SPG is called a *bourdon tube*, usually made from curled copper, and it straightens if the pressure inside the tube increases, for example when your tank is full. Thus, as you breathe the air in your tank, the pressure inside the bourdon tube decreases and the SPG reading decreases as well. However, like any device there can be functional problems. For example, high readings may indicate that the copper in the tube has fatigued and will soon fail. In our case, we did indeed suspect that the SPG bourdon tube was faulty. When the SPG was replaced with a nominally functioning gauge for subsequent dives, we found his air consumption to be accurately predictable and had no further issues for the remainder of the week.

This out of air emergency reinforced three important lessons. First, physical fitness is extremely important in deep sea diving. Ideally, every diver should exercise regularly to ensure his or her air consumption rate is not excessive. As a guideline, Health Canada recommends 150 minutes a week of cardiovascular exercise for every adult. The target heart rate for a 40-year-old individual is 135 beats per minute. It is given by the formula (220 – age) x 0.75. What is your target heart rate?

Second, your diving gear should undergo regular maintenance on an annual basis. This includes your regulator, alternate air source, buoyancy compensator device in addition to your SPG. Last and certainly not least, you should always determine the air pressure on your SPG where you will "turn the dive" or prepare to ascend to the surface. For example, if your tank has 3000 psi, standard practice dictates you would "turn the dive" at two-thirds your tank pressure, or in this case 2000 psi. Ideally, you will end your dive with one third or 1000psi as an emergency reserve when you surface.

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"To Explore New Worlds": A 3-pronged approach to the revitalization of American space operations in the coming century

By James Pattarini, M.D.
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The National Aeronautics and Space Administration (NASA) faces a unique challenge to its continued survival despite its innumerable accomplishments since its inception in 1958. Though not conceived with a singular vision, within 6 years of its creation President Kennedy had charged the agency with a single task, one that would shape its public perception until this day. The history of NASA since the era of Lunar exploration ended; however, it has been one of expansion and re-expansion of purpose beyond its perceived intent. As radio telescopes, communication satellites, robotic probes, and orbiting space stations were proposed, each was placed under the purview and responsibility of NASA, with the result of expanding and ultimately diluting the core purpose of the agency in the eyes of the public on which it depends for continued support and funding. Ironically, it was the explosion of competing research projects and hardware in need of funding, which followed the conclusion of the Apollo program that served to both broaden the agency's reach, and simultaneously limit its grasp.

Unity of purpose, clarity of vision, and effective communication of these principles are essential for an entity that relies on public funding. In 1970 an average US citizen, if asked what the purpose of NASA was, would undoubtedly have replied "to take humans (Americans) to the Moon." This was evident in every action NASA took, every penny it spent, and in every press release it made. The Apollo program comprised the overwhelming majority of the NASA budget, and the American public was keenly aware of both the cost and results of the program.

Today it is not so clear. Ask an average American what the *raison d'être* of NASA is and you will receive varying answers, from 'constructing and maintaining the ISS,' to 'servicing satellites,' to 'robotic missions, orbital primary research experiments, deep space probes, human spaceflight, deep sky surveys for near earth asteroids, solar activity monitoring…' and the list goes on. All of which are true, and all of which are valuable endeavors which have given us breathtaking discoveries over the past 50 years, and all of which have been found under the umbrella of NASA as time has passed. The clear consequence of this expansion of NASA's role is that it happened at the expense of a clear mission statement, a single reason to exist that the public can latch onto.

I am not proposing a single-minded return to manned space flight as the sole purpose of NASA at the expense of robotics, orbiting telescopes and deep space probes. Though, I am proposing a unifying mission statement that places all of these endeavors into a single plan with a unifying *raison d'être* for NASA in the next century and beyond. I also believe that this is not an option, but rather a necessity if the agency is to survive with private industry and other nations become space faring entities.

NASA was created to explore the unknowns of human life outside the confines of our atmosphere. Within 6 years of its inception it had but one purpose, to land an American on the surface of the Moon, and return him safely to the Earth. Today, that goal is too small given the explosion of unmanned science missions that largely define NASA today, and yet it characterizes the singularity of focus a NASA mission statement must possess in order to capture the attention of the populace. Thus, I propose a 3-pronged organizational structure to all future NASA projects that will contribute to a vital component to the overarching mission statement above.

1. Deep Space Telescopes: To travel to new worlds, we must first find them. Already, ground-based sky surveys and the orbital Kepler mission have identified over 500 extrasolar planets, several of which may have rocky surfaces and a few even giving tantalizing hints suggestive of oxygen and water. As detection techniques continue to improve, the extrasolar planets that show signs promising for life will be given priority for the second arm of NASA (see below). Thus, the primary mission of the next generation of telescopes should ostensibly be the discovery of new worlds.

2. Robotic and Deep Space Unmanned Missions: From Viking and Pathfinder to Pioneers and Voyagers, unmanned missions of exploration have arguably produced the most data about the universe in which we live. No human has ever set foot on Europa or our nearest neighbor, although we know the soil and atmosphere composition of Mars and how thick the ice is likely to be at a Europan pole in summer. To the worlds that our telescopes identify as promising for further study, the next generation of deep space probes will be dispatched. Looking at the planets and moons within around our Sun, there over 120 moons to explore between Jupiter and Saturn alone. We have an entire universe of discovery waiting in our own galactic backyard.

3. Human Exploration: Finally, where our telescopes have identified new worlds and our probes and robots have blazed a trail, we ourselves will follow. With a firm purpose to expand the human presence in our solar system, and by working closely in concert with the other branches to tailor target selection and hazard mapping, human exploration will again be a core principle of NASA. Without a unifying mission to unite these seemingly disparate endeavors, human spaceflight can all too easily appear to be in competition for purpose and funding with other, non-human exploration efforts. Seen in the context of this proposal, each branch is seen as integral and necessary to the whole.

Lest this reorganization seem trivial, let me reiterate that while it still allows for the vast majority of NASA operations to continue with only semantic changes, it critically provides a working context for these operations that places them in a codependent, symbiotic relationship that is easy for the layperson to understand, and makes logical sense from a mission planning and fiscal appropriations point of view. Now, the imaging obtained from telescopic observation and orbital probes is shown to feed directly into the mission planning and target selection for our robotic missions, which in turn will be tailored to provide the critical information needed for human exploration. Each branch relies on the preceding allowing a unity of purpose that NASA has not been able to project to the public for nearly half a century.

UPCOMING OPPORTUNITIES

INTERNATIONAL SPACE UNIVERSITY (ISU) SOUTHERN HEMISPHERE SPACE STUDIES PROGRAM
ISU will be hosting its 2012 Southern Hemisphere Space Studies Program in Adelaide, Australia from January 6th to February 11th, 2012. A variety of scholarships are available through the International Space University. The program is comprised of core lectures from a multi-disciplinary faculty who are leaders in the international space industry, and the team project is based on tele-presence. Please visit the website for more information: http://www.isunet.edu/index.php?option=com_content&view=category&layout=blog&id=287&Itemid=88889209.

2012 AEROSPACE MEDICAL ANNUAL MEETING
The 2012 annual scientific meeting of the Aerospace Medical Association will be taking place in Atlanta, Georgia from May 13-17th, 2012. A variety of scholarships are offered through AsMA and AMSRO to attend the conference. The AsMA and AMSRO committee looks forward to welcoming many students, medical students, and young professionals to the conference.

2012 INTERNATIONAL ASTRONAUTICAL CONGRESS
Naples, Italy will be the home for the annual meeting of the International Astronautical Congress (IAC). Students and young professionals can be sponsored through their national space agency through the International Space Education Board (ISEB). NASA, CSA, ESA, and JAXA offer a variety of scholarships, and there are youth grants that are given on a competitive basis through the International Astronautical Federation committee.

INTERNATIONAL SPACE UNIVERSITY (ISU) SPACE STUDIES PROGRAM
ISU will be hosting its 2012 Space Studies Program on the Florida coast at the Kennedy Space Center from June to August 2012. A variety of scholarships are available through the International Space University, the Canadian Federation of the ISU, and the National Space Society. The program is comprised of core lectures, departmental activities, and a group project. Please visit the website for more information: http://www.isunet.edu/