

**Webster University**

Space Program Systems Management

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## **Executive Summary**

This brief report will give a summary of lessons learned and overall experience gained in the Webster University Space Operations Management program. This is submitted in partial fulfillment of the course requirements of the Space Systems Operations Management (SPSM 6000) course – Practical Research in Space Operations. Each highlighted class will be covered in the order they were taken. A completely unbiased standpoint is taken and all comments are based on facts. This report is generated for the fulfillment of the capstone requirements and completion of the program in its entirety. All instructors mentioned herein are referred to as “the instructor” and no individual instructor or student names are used. The intention of this paper is to give a synopsis of the lessons and experience gained. The graduate student author’s intention is solely to provide feedback for the improvement and evolution of this outstanding program.

### **SPSM 5000 – Space Environment**

The SPSM 5000 requisite course is the first class in the Webster University space management program. Overall the class was very informative and the instructor was very knowledgeable, professional and personable. With a good sense of humor all around, the instructor was able to explain the concepts and get the points across. With a plethora of information on several subjects pertaining to the space industry, the instructor gave a very good foundation on which all classes would be built. One recommendation would be to give a refresher course for the required math for this class. The Webster guide for new students states: “Students are introduced to the mathematics of orbital mechanics and determination techniques, and learn how to calculate orbital parameters.” (Webster) This is somewhat misleading due to the fact that it is assumed students will be proficient and practiced at the mathematics involved. Although this math is not difficult, it may come as a surprise to some graduate students that may not have worked problems since early undergraduate, or even high school. Another recommendation would be to at least stress to the student that the required math skills will be included on exams and minimal proficiency to perform these functions will be offered by the instructors.

### **SPSM 5770 - Space Operations Management**

The 5770 class was the first class taken in the program following the requisite course. The textbook required for the course, Space Mission Analysis and Design (SMAD), was outstanding and very informative. This class was the foundation of what was to come and a recommendation would be to have students take this following the requisite course. Many students may not have this author’s advantage of being mentored into the program

by an instructor from undergraduate school, and therefore would not have this information early on. Fortunately, due to this fact, the transition into graduate school was comfortable and smooth. Additionally the instructor for this course was the same instructor and mentor mentioned here. This instructor is very knowledgeable and informative. This instructor knows aerospace science and the management structure of the aeronautical industry. The instructor is personable and friendly with a witty sense of humor. He is someone that without knowing it himself, just naturally draws you closer to his character, leaving you wanting to know him and be his friend. At this point it would be necessary to include that the instructor makes all the difference in the world when it comes to the success of the student and the reputation of the institution he or she represents. A good teacher can make a boring subject fun, an exciting industry a joy to be a part of, and a less than confident student feeling as if they could achieve anything they put their mind to.

### **SPSM 5900 - Space Commercialization**

The commercialization of space is the crux of what is happening with the industry at the present time. An exciting time for the space industry and all of those related to it's success. It has been said that anything worth pursuing for the betterment of the planet is worth collaboration. This commercialization of the space industry is definitely no exception to that as this will be one of the most amazing advancements to business and industry in history. It will be a major collaboration of many industries and technological innovations, ingenious people and intelligent leadership. The 5900 class, combined with the leadership of the instructor, offered a solid foundation on the understanding of the

basic elements and trends related to this subject. Collaboration with a lifelong friend and the guidance and teaching of the instructor, led to a very informative and educating experience. This was what would become the application and formal introduction of this lifelong friends twenty-five plus years working on an invention for use in space. The guidance and knowledge gained in this class on the NASA technology transfer program would lead to the advancement of the work and an eventual contact and proposal to NASA. Although the contact communication made is still in the early stages of development, following through will be a priority immediately following graduation.

### **SPSM 5650 – Space Systems Contracting**

This class was so good that the professor was asked if it was ok to record the lectures on audiotape. The cassettes are now like a book on tape that can be referred to when needed. If there were an example of a perfect instructor, this gentleman would get the vote from just about any student breathing oxygen in the SPSM program. A combination of professional teacher, stand up person, friendly, clever, intelligent and fun, this instructor should be commended to the highest possible degree. The learning experience and knowledge gained through this term was priceless.

As mentioned, the NASA technology transfer program that was introduced in the prior class was pursued in this one. The specific track was the NASA Small Business Innovative Research (SBIR) program est. by congress in 1982. The program allows small and disadvantaged businesses a platform on which to transfer their technological ingenuity to the space industry. The prior establishment of a partnership and shared vision with the lifelong friend while still an undergraduate now evolved into a business

relationship and the formation of Force equals Mass times Acceleration ( $F=MA$ ). This company, owned by the friend will continue, with the help of the former vice president (now the president of Stellarforce LLC and author of this report) to offer ideas and innovations to the space industry.

There was a multitude of knowledge gained on contracting with the government and their contractors and subcontractors. As a result of this experience, the program whole, and effective instructors, the option to offer consultation to individuals wishing to pursue ventures in space is realized. All consultation offered is validated through research on current law, policy and performance guidelines on a case-by-case basis. Any consultation that is outside of the knowledge base/research ability or area of operations is simply not conducted and direction to the authorized agency in control is given.

### **SPSM 5950 – Space Systems Project Management**

Looking over some of the documentation for this class, some questions arise that would need to be discussed for clarification. Homework was given in sets and after a review of the questions asked and answers given, more questions come to mind. The instructor was knowledgeable in his area of operations and overall friendly with a good sense of humor. A recommendation would be that this instructor clarifies further questions for homework that are given verbally. This problem could be resolved by typing up the questions in a more formal manner versus the verbal delivery. The questions were copied down word for word and so the variations in psychological processes of individual's methods of delivering and assimilating information are evident here. Valuable knowledge of management skills was added and one of the two textbooks required was very useful.



As a successful manager of human beings, the psychological, cognitive processing of each employee should be understood. This will allow for effective communication and an understanding of the level of ability to do so by the manager relating to several *different* employees. It does not make a difference if one is managing people at a circus or space mission control; the human element remains the key factor and the most valuable asset. A not so subtle test of these communication abilities was given back as part of the fulfillment of a presentation assignment. It is with regret that the results of the test reveal cognitive processing skills and communication abilities of the typical human being seem to be devolving. One student passed the test. This may be due to the fact that depth of thought has been replaced by the “textbook answer” and the societal adherent hebetations that stifle “thinking outside of the box.”

In consideration of this, the final recommendation for this class (in any tract) is to be sure not to remove the human element of management, the “art of thinking” before the entire corporate world becomes a giant computer. People may get sick, but when they are “down” they usually remember what happened...something that mankind cannot replace with a microprocessor.

### **SPSM 5600 – Space Systems Acquisition Law**

This class was very informative and the instructor was squared away in all areas. The class was run as tightly as a naval ship and there was never a doubt as to this person’s credibility. The textbook used was *The Administration of Government Contracts*, third edition. This book along with its predecessor in class order *The Formation of*

*Government Contracts* from 5650 is kept with the proof of facts and other law references in the Stellarforce library.

The instructor covered everything from the acquisition process, contract interpretation, space specific federal acquisitions, and the legal structure of government procurement and acquisitions management, to the critical thinking and analysis necessary to make intelligent decisions with minimal disputes and relation damaging terminations. The effectiveness of the instructor down to the self-tests used to open conversation participation was superb. A helpful tool of contract types was given to the instructor to assist with students understanding that may not have taken the contracting class prior to this one. It was noted that this tool aided the students and having this information at their fingertips was helpful. The only recommendation would be to advise students to take government contracting sequentially prior to this class.

### **SPSM 5930 – Space Law and Policy**

Informative and fun once again describes this class and instructor. An understanding of historical origins of space policy laid the foundation for the class objectives. These included an understanding of national law and policy and the implications and considerations of international collaboration that is a necessity in space operations. Questions and Answers were given and discussed each week to open discussion that was very helpful for the understanding of reasoning used for laws, conventions, treaties and other policy existing today. The following is a list of treaties, conventions and agreements that were covered and presented on a CD ROM created by the instructor:

NASA Act of 1958  
Nuclear Test Ban Treaty of 1963

Outer Space Treaty of 1967  
Rescue Agreement of 1968  
Liability Convention of 1972  
ABM Treaty of 1972  
ABM Treaty Agreed Statements of 1972  
ABM Protocol of 1976  
Registration Convention of 1974  
Bogotá Declaration of 1976  
Convention on Prohibition of Military Use of 1976  
Moon Treaty of 1979  
START  
Open Skies Treaty of 2002

This class was one of the most interesting and informative of all. So interesting in fact that it allowed a shift of gears from one concentration (space propulsion systems research, advocacy and exploitation) to another in the obvious (to a pilot) necessity for an airspace redesign. This concentration has now come to a head with graduation two weeks away. The emphasis is now on the development of a National Aerospace Control Center (NACC). The Capstone project is a strategic plan to advocate Colorado for the location of this much-needed system. The Space Law and Policy class laid the foundation and provided the tools necessary should the opportunity arise for a key role in making this vision for Colorado a reality.

### **SPSM 5990 – Issues in Space Operations**

This class was a perfect opportunity to continue placing an emphasis on the necessity of the National Airspace Redesign (NAR), the Space and Air Traffic Management System (SATMS), and the latest focus on the NACC. Many issues were discussed and our opinions and ideas for addressing them considered for discussion. The instructor was credible and about as even keeled as one teaching the subject could be. There was an emphasis placed on “drilling down” when it comes to research and the importance of

credible, scientific community certified resources. The main acceleration of importance would be the allowed continuation of the Air to Space issue. These term dedications and presentation slides can be found on the Stellarforce website under MS graduate studies.

### **BUSN 5000 - Business**

Try to imagine sorting and documenting, not to mention taking physical action on 400 emails each week without a Blueberry <sup>TM</sup> or a Palm Pilot <sup>TM</sup>. This was an opportunity, as with all classes taken, to actually make a difference for the betterment of the legal system. The main goal for Stellarforce is simply to help others and leave the planet in a little bit better shape than it was found.

Attorneys whom have utilized services by this author for nearly ten years agreed that this was a breakthrough concept for the industry and would improve all aspects of the system. The company that has the opportunity to take advantage of this and put themselves at the forefront, is in transition of management priorities and may or may not deliberate further. Again, information is available on the website.

This class was informative but taught as if the students already knew the subject matter. There was a, practically non-existent review for exams and one student was even failed. On behalf of the instructor, this student may have earned this as the person was either late or absent from just about every class. The instructor was knowledgeable but needed to explain subject matter as if it was being taught to students and not reviewed to colleagues.

**SPSM 5800 – GPS – Space Radio Navigation Systems**

The Global Positioning System (GPS) class was definitely the most fun. This was a technology with heavy emphasis at the undergraduate level of aerospace science and the commercial pilot AT1 emphasis. A practical use of the GPS system was standard and many new aircraft are equipped with receivers. The difference in this class is the student and subject matter is grounded. The challenge of negotiating obstacles unique to ground operations make finding “caches” slightly different than the aerial surgery required for pilots dropping out of the clouds and the runway is right where he or she has calculated and it better be. The ground use, although somewhat more physical, is by far the easier and less critical (from a civilian non-war zone perspective) utilization of the technology. As a soldier in the Militarized Zone (MZ) on the ground, your position is most definitely the more critical one.

The instructor was very adept to the technology and subject matter. A perfect example of an all around American resembled a gym teacher with a great attitude and personality. The technology as related to ground operations, terrestrial map data systems, and GPS and Radio navigation theory such as triangulation was discussed. The prior knowledge going into the class made it a simple and very enjoyable experience that was another opportunity to help the instructor explain concepts to other students. This class was, combined with other issues and documented (once again) timing, the origination of the S4ORCE11 call sign. This was required for the geocaching.com registration, which was a requirement for the class. The instructor thought it was “really cool.” It was just a pleasure to see a person so happy and find pleasure in something so seemingly simplistic.

**SPSM 5710 – Space Communications Systems**

This class was sought purposely and a transfer to the Colorado Springs campus was made to insure it was taken. The reason was the nearly twenty years to date that has been spent in dedication to the communications industry. As the knowledge has now been transferred to consultation for small business over the employee commitment, a greater desire to keep up with current trends is imperative.

The class was very informative and the instructor a joy to observe. There were many aspects of the technology that were old news but much more was either reinforcing of existing knowledge, or additional spacecraft specific knowledge gained. One lesson learned in this class was not to assume that because you know the material, you could fly through the exams. This position could definitely prove that hasty assumptions have no place not only in the cockpit, but the office and classroom as well. For example, just when someone abuses technology and the power to control it, they had better be careful not to assume they are completely safe from the repercussions of their actions by assuming what they are doing is just. There is a quote to this by John Milton but it “is not but by the spirit understood.”

**SPSM 5730 – Space Operations Research**

From the Garden of Eden Webster to the present state of polls that ask if “God should be taken out of the pledge of allegiance” (CNN, 2004), this report is coming to its end. The instructor for this class was able to teach the science of decision analysis utilizing the power of Microsoft Excel® and add in tools like Solver™, and still carry on an intelligent conversation about the unknown sciences. The valuable tools taught in 5730

were by no means easy to learn. It was actually quite challenging and time consuming for some, yet simpler for others already utilizing the tools at work. While educating the mind to the taught processes and their many functions and uses, it was most pleasant and comfortable to be able to communicate on all levels with the instructor. The problem solving techniques were fascinating and many ideas for applications to aid small businesses with logistics issues were gained. The class was valuable and what was learned will be utilized as long as necessary while completing the main and various other goals and missions to be completed and still to come.

### **Conclusion**

Overall the program was a valuable addition to the knowledge base and a useful tool for future reference. Whenever assisting the aerospace and astronautic industries, as well as the Government, as always, to make informed, intelligent and practical decisions on subjects that choices made can have major impacts and repercussions of epic proportion. This candidate for the Master of Science in Space Operations Management makes only one biased statement in closing. That which was stated to the CNN polls on further damage to the already confused, abused and desensitized children right here in 33 million homeless America: “Sure take it out...after you remove it from the money.”

Joseph, 2004