Satellite controllers receive a different kind of Space training

By CPT Stacy Godshall,
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CAMP ROBERTS, Calif. — The need for Space cadre, or more specifically a cadre of Space professionals specifically trained in, and knowledgeable about, Space capabilities to complement the actions of the signal, intelligence, information operations, and engineering staff personnel working within the Space arena, was identified several years ago and has continued to evolve to the point that the Space Operations Officer Qualification Course is an intensive academic program that allows officers to comply with the Space cadre goals. In addition, the emphasis for Space cadre continues as indicated by way of the Army's decision to use the Force Management and Analysis Review (FORMAL) process to establish and maintain a professional Space cadre.

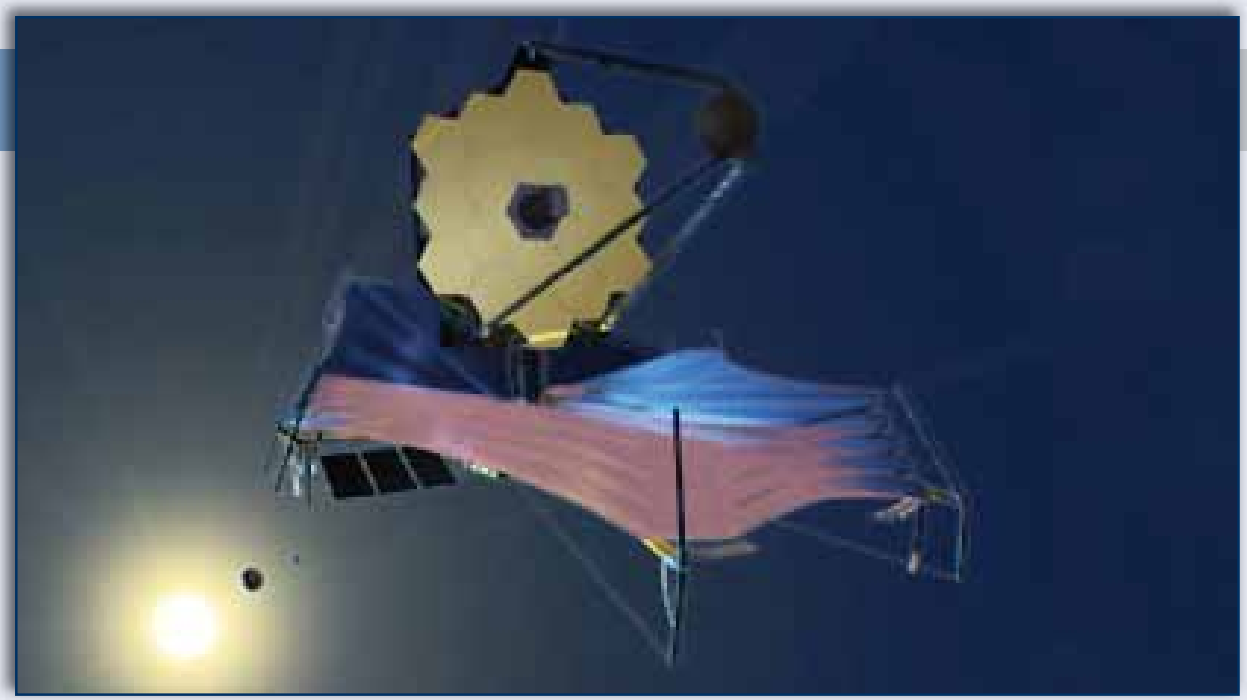
So the question that we need to ask is what does Space cadre training/education entail? The qualification course is the model for this type of training and there are many areas that it covers to educate Functional Area 40 (FA40) officers, but one aspect of the course recently also allowed some enlisted Satellite Controllers to gain some Space education that they had not been exposed to before.

A portion of the qualification course is dedicated to Space industry facility tours, which gives the officers valuable exposure to the leading edge technologies that are currently being designed, manufactured and tested by the civilian sector. Maj. Sam Russ, U.S. Army Space and Missile Defense Command/U.S. Army Forces Strategic Command liaison officer to 14th Air Force, upon completion of one of these tours stated, "One of the primary purposes of the industry tours is to gain a better appreciation for the critical role that industry plays as a force enabler and force multiplier.

This tour clearly highlighted the importance of sustaining our military industrial complex; they are truly a national resource and the systems they produce are literally saving lives on the battlefield every day." There is a history between industry and military use of satellites that reaches back to the days of a successful launch of SCORE (Signal Communicating by Orbital Relay Equipment) on Dec. 18, 1958.

Russ visited D Company, 1st Satellite Control Battalion, Camp Roberts, Calif., a few months ago and extended an invitation to the company to send some Soldiers along on the November tour to both Boeing and Northrop Grumman in Los Angeles, Calif. This was an invitation that the company could not and would never think of declining because of the uniqueness of such an experience.

The company began to make preparations to send just a small group of Soldiers to meet the officers taking the qualification course at the facilities for the tours. We wanted to keep the group we sent low in number since we were not the target audience for the tours from the respective industries. With the assistance of Russ, we were able to make all of the coordination with the facilities and proceeded to



An artist's rendition of the James Webb Space Telescope.

the LA area.

Because we arrived at Northrop Grumman early in the morning and well before the officers, we were given an added opportunity of viewing the Defense Support Program (DSP) satellite, which was in the high-bay testing area. Our tour guide proceeded to give us an opportunity type unclassified lesson about this satellite. We then proceeded back to the conference room, which was where the tour was to begin with several briefings, to include one about Advanced Extremely High Frequency satellites and Force XXI Battle Command Battalion/Blue Force Tracking.

Once the briefings were concluded we proceeded to tour more of the facility to include several of the high-bay areas where they conduct assembly and testing of the satellite subsystems. One of the most informative areas of the tour was the area where the Next Generation Space Telescope was being designed/tested. This Space telescope will be a significant improvement to the current Hubble Space Telescope and is named the James Webb Space Telescope (JWST).

When launched in 2011, this telescope will peer into the past at greater distances than ever before. For the first time, scientists will be able to observe the formation of the first stars and galaxies in the universe billions of years ago. The powerful observatory's design features a 6.5-meter aperture primary mirror, comprised of 18 hexagonal-shaped segments. The large-sized mirror, which could fit seven Hubble Space Telescope mirrors within its surface area, gives it the light-collecting sensitivity to see objects 400 times fainter than those currently observed by ground- and Space-based telescopes. This will yield a wealth of new lessons about Space and the overall Space environment.

To facilitate the overall effectiveness of Space telescopes, engineers and scientists conduct analysis to determine the best location so as to mitigate factors that would interfere with the observations made by the observatory. This was the case when the Solar and Heliospheric Observatory Satellite was placed in what is called the L1 orbit. This location is one of the Lagrange Points that are very unique in its orbital physics properties. The Italian-French mathematician Joseph-Louis Lagrange discovered five special points in the vicinity of two orbiting masses where a third, smaller mass can orbit at a fixed distance from the larger masses.

More precisely, the Lagrange Points mark positions where the gravitational pull of the two large masses precisely equals the centripetal force required to rotate with them. According to the Space Telescope Science Institute, a feasibility study was conducted in 1995-1996, which allowed NASA and the institute to consider a wide variety of orbits for JWST. The most promising was the second Lagrange Point (L2), approximately 1.5 million kilometers from Earth, outside the orbit of the Moon.

The region about L2 is a gravitational saddle point, where spacecraft may remain at a nearly constant distance from the Earth throughout the year by small station-keeping maneuvers. JWST will be placed in a large halo orbit in a plane slightly out of the ecliptic plane. This orbit avoids Earth and moon eclipses of the Sun. The halo orbit pe-

riod is about six months. Nominal station keeping maneuvers will be performed every half orbit (three months). JWST, near the L2 point, will be in a benign and essentially unchanging environment. There is no significant gravitational torque and thermal influence from the Earth and Moon are greatly reduced. The main operational influence to consider is the torque created by the Solar wind on the sun shield. The JWST in L2 orbit, if successful, may be an initial discovery for even more key Space endeavors to possibly include a way-point of sorts for future NASA missions.

A personal point of interest about this information relative to the type of orbit that the JWST would occupy, was a great lesson learned by all those in attendance in the tour group. The engineer conducting that portion of the tour asked the entire group if they knew the reason for the stability of the L2 orbit and SPC Robert Fletcher didn't hesitate in giving the answer which was direct and to the point; "Centripetal force." This clearly demonstrates the intuitive minds of our young Soldiers in today's Army, and more specifically, in tomorrow's Army Space cadre.

Once the engineers and tour guides were satisfied that we had learned enough, they concluded the tour and we proceeded to travel to the Boeing facility a short distance away from Northrop Grumman.

The tour in this facility was conducted in much the same manner and began with a thorough in-brief before the extensive walking tour began. This facility tour included information about many current Boeing Satellite System projects to include Geostationary Operational Environmental Satellite; Thuraya, which provides mobile communications and serves a region of 2.3 billion people; SPACEWAY, Hughes' next generation broadband satellite network that will provide high-speed, two-way communications for Internet, data, voice, video and multimedia applications; XM Satellite Radio which delivers up to 100 channels of digital-quality music, news and information; and most importantly for the Soldiers from D Company, 1st SATCON, the Wideband Gapfiller Satellites (WGS) which will replace the current Defense Satellite Communications System (DSCS).

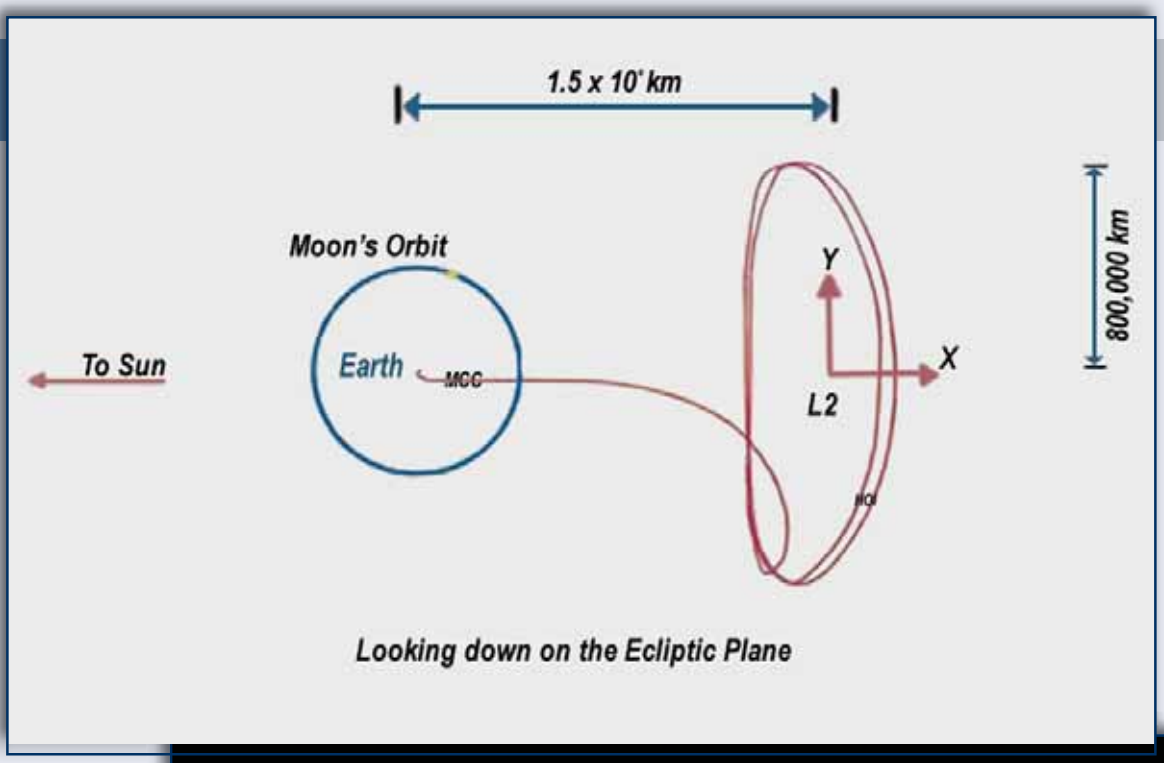
The portion of the tour that allowed us to see the different stages of production and testing of the WGS was the most intriguing to our Soldiers since it is the system they will be controlling after it is launched. To see the payload and testing of a system that hasn't launched yet makes it that much more tangible and thus allows the Soldiers to make more of a connection with the equipment used in the mission than just the intangible uplinks, downlinks, telemetry, etc that the Soldiers monitor on a 24-hour basis. To also see the types of testing that are conducted on that system also allows the Soldiers to learn much more about the efforts put into the system development.

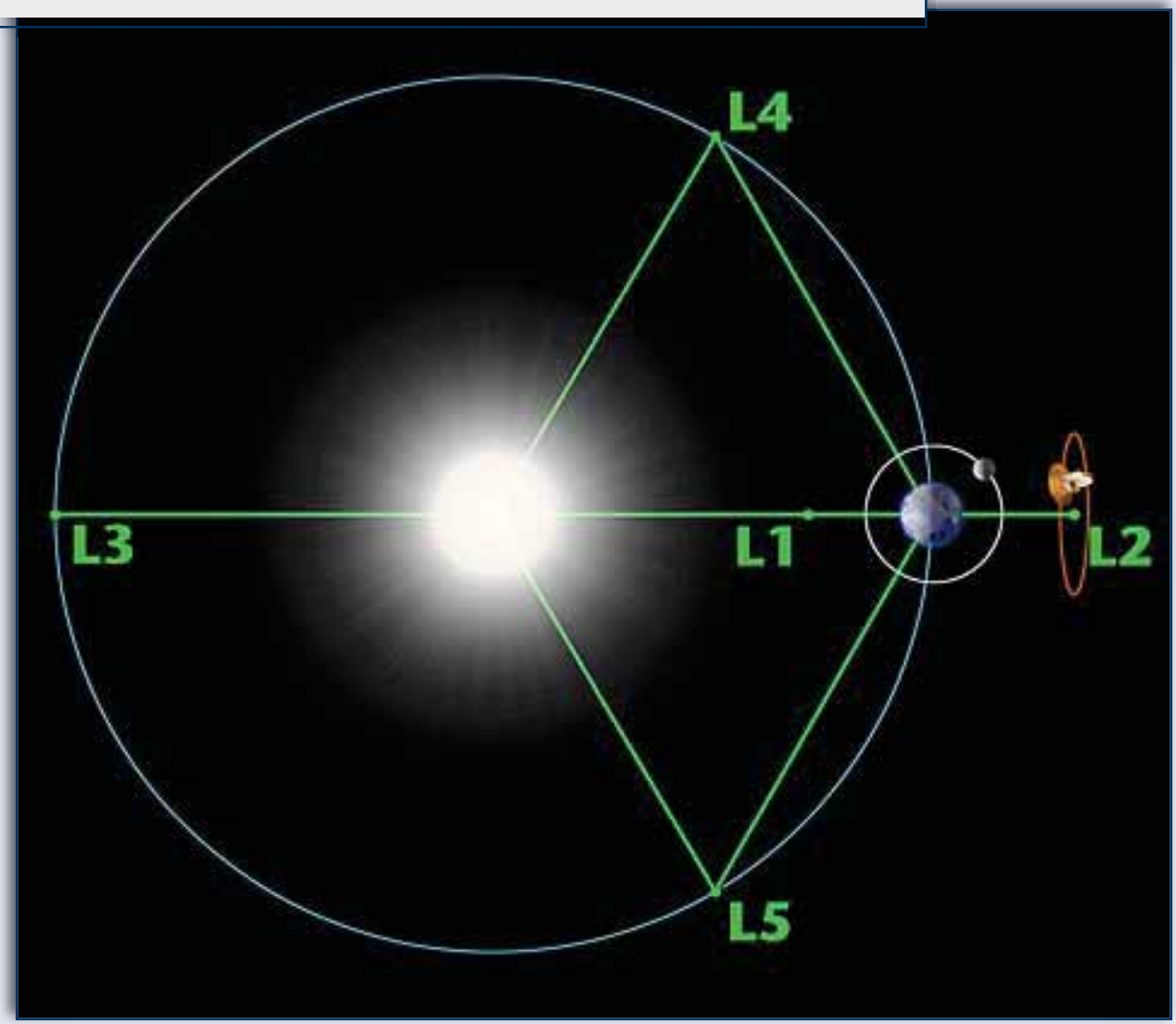
Each of these satellite systems were in different areas of the facility to include the testing areas such as the anechoic chamber and the environmental testing areas which included the vibration, acoustic and radiation areas. Each of the environmental testing areas is designed to simulate each of their respective conditions and thus allow the engineers to identify any issues during the different stages of product development. From these tests they are able to make needed adjustments well before launch and thus prevent any issues once the satellite is in orbit.

The anechoic chamber was of great interest for the "signalers" in the group, as it is the chamber used for antenna data collection to include antenna pattern measurements as well as gain performance. The antenna pattern and gain performance measurements allow the engineers to determine if the antennae are working according to specifications and will provide the earth coverage, beam patterns and Effective Isotropic Radiated Power that will be needed by the warfighters.

Once we had seen nearly everything in the facility and learned more than we could have possibly hoped to, the tour came to an end. An After Action Report (AAR) comment by Fletcher stated, "It was really interesting to see satellites in the different stages of development." An additional AAR comment was for the company, pending approval, to make quarterly trips to the facilities in order to provide the same education to all other company Space cadre.

CPT Stacy Godshall is the Signal Officer who commands D Company, 1st Satellite Control Battalion, Camp Roberts, Calif.



Right: A diagram of the L2 orbit.

Below: A diagram of the Lagrange orbits.