Technology Development and Transition

Kwajalein complex makes unique contributions

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As the new SMDC Deputy to the Commander for Research, Development and Acquisition (RDA), I am excited that our organization is providing world-class Space support to the joint warfighter and national security Space team. Our job is to continue to develop innovative Space and technology solutions and assist technology transition to operational systems.

Space is increasingly critical to the Future Force by providing information and technologies necessary for the warfighters' day-to-day operations. In this article, I will highlight the unique contributions of the United States Army Kwajalein Atoll (USAKA) /Ronald Reagan Ballistic Missile Defense Test Site (RTS).

Space Control

The Army has a heavy and growing reliance on Space-based assets for communications, intelligence gathering, missile warning, navigation, timing, and weather. Unfortunately, this is well understood by our potential adversaries. One could expect the first act of hostilities may be an attempt to deny our forces access to these critical Space-based systems.

The Commission to Assess United States National Security Space Management and Organization[1] concluded, "We know from history that every medium – air, land and sea – has seen conflict. Reality indicates that Space will be no different. Given this virtual certainty, the United States must develop the means to both deter and to defend against hostile acts in and from Space."

Space control is the means by which Space superiority is gained and maintained to assure U.S. and friendly forces can use the Space environment while denying its use to the enemy. Space control relies heavily on its Space situational awareness foundation, which integrates Space surveillance, reconnaissance, intelligence, and environmental data to maintain reliable knowledge of the activities and environment in and through Space.

Within the U.S. Army Space and Missile Defense Command, USAKA/RTS is a unique contributor to the national Space control mission through its Space situational awareness capabilities.

This site is one of the most unusual and dynamic communities within the U.S. Army. It is comprised of nearly 2,500 contract employees, Soldiers and civil servants plus family members. It is located in the Kwajalein Atoll in the Republic of the Marshall Islands (RMI) in the central Pacific Ocean. Kwajalein Atoll lies approximately equidistant from Hawaii, Australia and Japan, just 700 nautical miles north of the equator.

The USAKA/RTS community, along with its international partners from the RMI, work together to maintain a world-class missile test range and a Space surveillance center.

The Kwajalein Space Surveillance Center (KSSC) is the command and control center for the USAKA/RTS Space surveillance mission and capitalizes on the synergy provided by the unique radar sensors that comprise the Kiernan Reentry Measurements Site (KREMS). KREMS is located on the island of Roi-Namur at the northern tip of the Kwajalein Atoll, approximately 54 miles from Kwajalein Island. KREMS is comprised of four instrument-quality radars, which were built over a 20-year period in support of missile defense programs.

The radars are TRADEX (L & S-Band), ALTAIR (VHF & UHF), ALCOR (C-band), and MMW (Ka-Band). These radars maintain their missile defense role but have been used increasingly for Space surveillance activities since the early 1980s.

Our Role in Space Surveillance

KSSC is a contributing site to the global Space Surveillance Network (SSN) and provides data to the

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U.S. Air Force Space Command (AFSPC) Space Control Center (SCC) and the U.S. Strategic Command (USSTRATCOM) Joint Intelligence Center (JIC) on resident Space objects in support of the USSTRATCOM Space control mission. USAKA/RTS provides an average of 138 hours per week of Space tracking and up to 300 Space object identification image sets annually as tasked by the AFSPC SCC and the USSTRATCOM JIC, respectively.

Catalog Maintenance

USAKA/RTS supports the Space surveillance mission by collecting metric observations (time, range, azimuth, elevation and range rate) on both near Earth and deep Space objects in response to tasking from the SCC. These tracks help maintain the Space surveillance catalog, which currently contains approximately 10,000 objects. Not all forces acting on satellites are well modeled, requiring regular updates to the orbital parameters.

In addition, regular tracking of maneuverable satellites is required for timely detection of orbital changes. Catalog maintenance consumes the majority of the KSSC Space surveillance time, and each year KSSC contributes over 45,000 tracks. In addition, KSSC contributes about 1,000 tracks per year on objects that are determined to pose a threat to the Space Shuttle or International Space Station.

KSSC is often asked to provide re-entry support by confirming an object has decayed into the Earth's atmosphere. Of historical note, USAKA/RTS was the last site in the network to track the Russian MIR Space Station before it re-entered in 2001.

New Foreign Launches

Due to its unique geographic location, KSSC is generally the first site in the SSN to have visibility on Space launches from Asia, including Russia, China and Japan.

KSSC visibility of these launches generally begins just 15 to 20 minutes after launch and, as a result, KSSC maintains a 24-hour, 7 day-per-week sensor recall status to respond to these events. The data from the KREMS radars are critical for launch assessment and providing orbital information for sites in the network with later visibilities.

If USAKA/RTS misses a launch, it is often days until the payload is found and then properly identified and cataloged. KSSC supports more than 40 new launches a year and has achieved the remarkable distinction of a 100 percent success rate in tracking all new foreign launches within its visibility in four out of the last five years.

One of the most notable examples of a recent new foreign launch was the historic Chinese Shenzhou-V manned-Space flight on Oct. 15, 2003. As the first site in the network with visibility, KSSC successfully collected critical metric observations on the principal objects within the complex approximately 20 minutes after its launch from Jiuquan, China, and provided these unique data to the network immediately following the coverage interval.

The timely collection of correctly identified metric data is critical to the Space control mission. Recent experiments that combined the wide beamwidth search and acquisition capabilities of ALTAIR and TRADEX with the wide bandwidth identification capabilities of ALCOR and MMW demonstrated USAKA/RTS has a critical ability to provide correctly identified new foreign launch metric data, especially in regard to complex launch scenarios involving numerous microsatellites.

Critical Coverage of Geosynchronous Orbits

The geosynchronous belt contains the majority of the world's communications satellites. These satellites stay fixed in the sky relative to a ground station. Of the 20 sensor sites that comprise the global Space surveillance network, only four radar sites have the ability to track objects in geosynchronous orbit. Kwajalein is one of the four sites and because of its unique geographical location USAKA/RTS provides the only radar coverage for satellites in one third of the entire geosynchronous belt.

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Space Object Identification

Wide bandwidth radar assets are critical to the SSN because they provide critical all weather, day or night imagery with resolution independent of range. The ALCOR and MMW sensors at USAKA/RTS are tasked routinely to collect data for Space Object Identification (SOI). This tasking comes from the USSTRATCOM Joint Intelligence Center and is used extensively for payload determination (size and shape), operation mode (i.e. mission), status monitoring, damage assessment, and motion determination.

Space Environment Studies

The reliable transmission of large amounts of information; the ability to provide wide area Space and ground based surveillance; and the availability of high integrity, high accuracy navigational information are increasingly important to the military as part of its desire for spectrum and information superiority. However, the ionosphere affects all trans-ionospheric radio frequency (RF) communications, surveillance and navigation systems operating at frequencies below 2 GHz.

USAKA/RTS routinely hosts programs that study the Space environment. Current projects include the NASA Equatorial Ionosphere Studies II and the Air Force Research Laboratory's (AFRL) Wideband Ionospheric Distortion Experiment. RTS hosts a ground station of the AFRL Scintillation Detection system which provides worldwide "nowcasting" of ionospheric disturbances that could disrupt communication systems. This site will also help validate the AFRL C/NOFS satellite which will provide forecasts of ionospheric disturbances. These programs are providing important contributions to our understanding of the ionosphere.

USAKA/RTS is clearly a unique and valuable entity. The outstanding government and contractor work force, the unique technologies and capabilities, and continued community support have combined to make USAKA/RTS a true leader in Space surveillance and a critical contributor to the national Space control mission.

[1] *This commission was established in 1999 by an amendment to the FY2000 Defense Authorization Bill and was chaired by Donald Rumsfeld.*

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ing the Army Space cadre within the eight life cycle functions (structure, acquisition, individual training and education, distribution, deployment, sustainment, professional development, and separation).

- Phase IV is a comprehensive analysis of the doctrine, organization, training, materiel, leadership & education, personnel, and facilities (DOTMLPF) domains to develop the final recommended Army Space Cadre Strategy for the Army.

The ASCF culminates with a briefing to the vice chief of staff, Army where recommended strategy and courses of action for implementation are presented and input is provided for resourcing requirements for Fiscal Year 2008-13 POM. The VCSA will decide which ASCF recommendations will be implemented and on what timelines.

An Army Space Cadre provides significant value. Foremost, it fulfills Congressional mandate, implements DoD directive, and meets guidance from the DoD Executive Agent for Space. The Army as a whole will profit from the efficiencies gained as a result of this FORMAL. A core of highly trained professionals will be identified and tracked to fully support the warfighters. This process will also increase the Army's capability to support combatant commanders and improve utilization of Army personnel. In the joint community, this FORMAL will enable the Army to participate in the joint arena on an equal footing and it also enables the Army to compete for joint resources.

The value that the Army gains from conducting a FORMAL cannot be overstated. FORMAL reviews are not intended to be stand-alone assessments. Rather, they are an integral part of the Army's Force Management process. FORMAL reviews provide valuable teaching mechanisms and a forum for horizontal and vertical exchange of information between HQDA and MACOM participants. Through this process the Army will improve management of its Space assets and develop systems to ensure proper education and career development for its Space professionals.

All Army MACOM POCs are encouraged to request access and visit the restricted FORMAL Web site portal at https://smdcspx.smdc.army.mil/sites/FDIC/default.aspx. All messages and correspondence pertaining to the FORMAL will be posted to this site for easy access information. (Requests for access may be addressed to mark.murray@smdc.army.mil.)

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