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# Eagle Vision - Exploiting Commercial Satellite Imagery

By

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## General

Eagle Vision is a family of systems that includes Eagle Vision I, an operational system that collects and processes commercial (SPOT, Landsat, Radarsat, and IRS) and national imagery located at Ramstein AFB, Germany; National Eagle, an operational system that processes (no collection capability) national and commercial imagery at 152 IS, Reno (ANG), Nevada; and Eagle Vision II, a system developed by the National Reconnaissance Organization for the U.S. Army that collects and processes commercial (SPOT, Landsat, Radarsat, and Orbview) imagery. Eagle Vision I and II are composed of two elements, a data acquisition segment (DAS) which includes an antenna and a shelter that collects and processes imagery into a standard format, and a transit-cased data integration segment (DIS) that processes the standard format products into useful products for a combat commander's mission planning, rehearsal, and intelligence gathering. The



**A recently painted radar.**

acquisition segment for Eagle Vision I and II were developed by EADS Matra Systems and Information, Velizy, France and the Eagle Vision I DAS is sustained by Matra as well. The integration segments for both Eagle Vision I and II were developed and are sustained by Veridian International, Ann Arbor, Michigan, as is National Eagle, a shelter version of the delta integration segment.

## Operational

The Eagle Vision family emerged from the Desert Storm combat commander's operational demand for digital imagery to support air and carrier based mission planning/rehearsal and intelligence gathering systems, as well as Army and Marine Corps topographic units. The requirements are documented in the Combat Air Forces Short Method to Acquire Ready or Replacement Technologies Operational Requirements Document CAF 304-96-III A for Commercial Imagery Exploitation Systems, 23 July 1998; the Joint Services Imagery Processing Systems Program Management Directive 2379(1)PE#0305154D, dated 10 April 1995; mission need statements AFSPACECOM MNS (003-92) for Multi-spectral Imagery (MSI) (S/NF), 12 February 1992; and JROCM MNS 070-91, Remote Earth Sensing (S), 22 November 1991.

During Desert Storm, U.S. forces did not have the organic capability to receive and process broad area/multi-spectral imagery, but they relied on the purchase of commercial SPOT imagery.

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This imagery required extensive processing at four different CONUS sites prior to shipment to the theater, a process that took four to six weeks. This delay did not meet the high tempo operational needs of Desert Storm. The operational requirement for “real time” mission critical imagery spawned the concept of Eagle Vision. Modifications have been made to the requirements based on emerging technologies (higher resolution/all weather satellites) and operational needs. Eagle Vision has been used extensively in the Balkans (Operation Allied Force) and deployed to Japan, Alaska, the United Kingdom, Italy and various CONUS sites to satisfy real world contingencies.

### **Acquisition History**

In the past, Eagle Vision acquisitions and modifications have been procured under the foreign comparative test (FCT) program (DoD 5000.3-M-2). By using the FCT program, U.S. government commitments under a memorandum of understanding (MOU) with the Republic of France were also fulfilled. An FCT candidate nomination proposal for the fabrication and demonstration of Eagle Vision I was submitted to OSD/DDR&E (T&E) on 15 May 1992. The proposal was based on a market survey conducted by ESC and USAFE that determined that the most cost effective candidate for the development of the Eagle Vision program was Matra. On 28 October 1992, the Office of Secretary of Defense selected and funded the Eagle Vision program under the FCT provisions. Subsequently, a sole source request for proposal was released to Matra for the demonstration and validation effort.

In 1995, the operational community identified a requirement for multi-spectral broad area imagery. To satisfy the requirement, a Landsat 5 capability was added to the system. Requirements for higher resolution imagery and an all-weather capability were identified in 1996. On 21 March 1996, a second foreign comparative test proposal was submitted to OSD/DDR&E, and was approved and funded. The purpose of this second candidate was to study higher resolution electro-optical and all weather synthetic aperture radar imagery collected by multiple foreign satellites (Canadian Radarsat, Indian Remote Sensing (IRS), and European Radar System (ERS)). This study was combined with the Landsat 5 upgrade and was designated as the Renaissance View foreign comparative test. Again, Matra was the designated source. Under this effort, a Radarsat satellite capability was added to the system, but IRS and (ERS) were not due to funding constraints. Data from IRS and (ERS) were evaluated to fulfill a need for higher resolution imagery, and for day and night and all-weather large area synoptic and optical coverage. These platforms provided a low-cost gap-filler to existing surveillance satellites, and improved the timeliness of data delivery due to faster revisit rates and all-weather capabilities.

In the Renaissance View FCT test report, USAFE made various recommendations. The USAFE recommended upgrades of the system and continued sustainment (maintenance, emerging technology hardware and software upgrades, and purchase of a DAS for National Eagle) of the Eagle Vision DAS system. This requirement was to be performed in the Renaissance View FCT implementation phase, to be funded collectively by the individual military services (i.e., non-foreign comparative test funding). Step one of the Renaissance View FCT implementation phase was intended to include USAFE’s recommended upgrades of the system and continued sustainment of the Eagle Vision DAS system. This effort was estimated at \$27.1M and, as before, Matra Systems and Information was the designated source. An international agreement competitive restrictions (IACR) for this first step of the Renaissance View FCT implementation phase (DAS sustainment) was approved on 16 September 1999. Additional Eagle Vision systems (both segments - DAS and DIS) were planned to be procured later under step two of the Renaissance View FCT.

Preliminary fiscal year 2000 defense budget actions included a \$21 million augmentation for the Eagle Vision program. To purchase a National Eagle collection capability (DAS) for the 152

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IS, Reno ANG, NV (under step one - IACR, above), and an Eagle Vision system (both segments - DAS and DIS) for the 240 CBCS, McEntire ANG, South Carolina (under step two). During committee review, however, the \$21 million addition was reduced to \$12 million.

Fiscal year 2001 defense budget actions included a \$5 million increase for the Eagle Vision Air National Guard program. To provide a dissemination capability to the Eagle Vision III and IV data acquisition segments were procured with fiscal year 2000 augmentation. The fiscal year 2001 defense budget actions also included another \$4.5 million augmentation for the Eagle Vision Air National Guard program, to provide one-meter upgrade to Eagle Vision III and IV. Part of this funding was used to pay for the shortfall when ESC/SRG awarded the DAS contract last summer (that paid for the IRS and Radarsat software and software licenses). There is approximately \$2.775 million remaining for this effort. The defense budget also included \$3.8 million for upgrades to the Eagle Vision I program. Headquarters USAFE/INXY and ESC plan to use these funds to upgrade and replace the existing Eagle Vision I dissemination capability (DIS) to take advantage of emerging technology and ensure system compatibility with Eagle Vision III and IV.

## **The Future**

The program office recently submitted a new foreign comparative test proposal for SPOT 5. The SPOT 5 satellite provides two advances not available in current commercial imaging satellites. First, it provides a readily pointable 5-meter panchromatic and 10-meter multispectral imaging capability. Second, the satellite and processing system are designed to acquire and process two 5-meter images into a single 2.5-meter image. The derivation of a higher-resolution image from two lower-resolution images is a new capability for commercial imagery satellite systems and this derived imagery product should be evaluated for its utility for the war-fighter. This 2.5-meter capability doubles the current Eagle Vision panchromatic resolution of 5 meters.

Because the SPOT 5 satellite provides unclassified, commercial imagery, it is ideally suited for use in coalition military operations. The imagery can be easily shared among coalition forces to support mission planning/rehearsal, time-critical targeting, conflicts other than war, disaster relief, treaty verification, etc. Incorporating the SPOT 5 capability into Eagle Vision will permit a thorough evaluation of the satellite and also provide a quick-turn-around for getting the imagery to the war-fighter.

This foreign comparative test will add the SPOT 5 satellite interface and processing to an existing Eagle Vision for field tests and operational evaluation. Specifically, this foreign comparative test will:

- Evaluate the quality of 2.5-meter resolution optical imagery that is produced via an interleaving/interpolation/restoration process from two 5-meter resolution scenes.
- Evaluate the utility of 2.5-meter resolution optical imagery for mission planning and rehearsal applications.
- Compare the relative merits of a wide 60km swath width for 2.5-meter optical imagery with at best a 17km swath width for commercial 1-meter optical imagery.

## **Today**

Eagle Vision I recently completed the on-site acceptance testing on its IRS upgraded (5 meter resolution). This higher resolution although not one meter will benefit EV I proposed deployment to South Africa scheduled for this calendar year. A second upgrade underway is the synthetic

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aperture radar (SAR) upgrade. This will reduce the current processing time from 40 minutes to 7 minutes. The DAS procurement for Eagle Vision III and IV is on going and will be delivered to the user the first quarter fiscal year 2002. The program office is investigating the one-meter upgrade system wide with the upcoming acquisition of the DIS.



**Inside the shelter at the rack equipment.**



**Looking inside the shelter from outside.**



**Equipment in transit cases.**

### **About the Author**

Captain James A. Hartmetx is the Eagle Vision Program Manager at the Intelligence, Surveillance and Reconnaissance Integration System Program Office, Electronic Systems Center, Hanscom Air Force Base, Massachusetts. He is responsible for the planning and execution of critical, multi-million dollar, congressional interested commercial satellite imagery programs.

Captain Hartmetz reentered the Air Force in 1997 as a graduate of the Air Force Reserve Officer Training Corps Program, California State University Sacramento, California. He was assigned to SMC/TEB as their small launch vehicle mission manager and air launch

target acquisition manager at Kirtland AFB, New Mexico. In 1990, he became an air reserve technician with the 940th ARW at McClellan AFB, California. Prior to that Hartmetx was an emergency action controller at the 509th BMW Pease AFB, Marshall Islands and the 11th SG Royal Air Force, Fairford, United Kingdom.