A GLOBUS II / HAVE STARE SOURCEBOOK

Version of 2013-09-20

Additional material for this sourcebook would be welcome. Please send it to thomsona@flash.net

http://upload.wikimedia.org/wikipedia/commons/1/18/Vardo_Radar-1.jpg

http://www.panoramio.com/photo/7091823

Unsourced

http://www.wpafb.af.mil/photos/media_search.asp?q=globus&btnG.x=5&btnG.y=11

GLOBUS II is pictured above. GLOBUS II a radar system located at Vardo, Norway, that is operated solely by Norwegian personnel, but which was developed by the United States and serves as part of the 29-sensor, global space surveillance network that provides data to the US Strategic Command. Engineers from AFRL/RX recently made a trip to Norway to perform thermography inspections on the radar.

http://www.barentsphoto.com/getfile.php/239336.921.adudswqcua/Globus%202%20radar%20Vard%C3%B8.jpg?force=1&return=www.barentsphoto.com

http://barentsobserver.com/en/security/2013/02/us-spends-50-million-vardo-radar-upgrade-27-02

U.S. spends $50 million on Vardø radar upgrade
By Thomas Nilsen
February 27, 2013

The $50 million (€38 million) investment will come in 2015 and 2016 reports NRK with reference to unclassified budget details from the U.S. Air Force. The description of the investments to be made in Vardø reads “Extends the operational life of the Globus II Radar, located in Vardø, Norway. Replaces again and unsustainable hardware groups including the transmitter, mission critical computing resources and receiver-exciter subsystems.”

The short budget item justification description following the document says Globus II is part of the Space Situational Awareness that encompasses intelligence and adversary space operations; surveillance of all space objects and activities; detailed reconnaissance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; and conducting integrated command, control, communications, processing, analysis, dissemination, and archiving activities.

Barents journalist Bård Wormdal from the nearby town of Vadsø published a book in 2011 claiming the Globus II radar in Norway’s north easternmost corner is essential for a U.S. missile defense system in Europe.

The book quotes MIT Professor Theodor Postol saying “It is very difficult to understand how the Vardø radar not will be used as part of the U.S. missile defence. The reason for this is because it is the only radar that has the capability to tell the difference between a real warhead and a dummy. It is the only radar with a resolution and a range that can provide information about the difference between a warhead and a dummy in an attempt to track an intercontinental nuclear missile from Iran to central parts or the east coast of the United States.”

The Norwegian Ministry of Defense confirms the U.S. investments in an e-mail to NRK and writes that the radar system is a Norwegian, American cooperation that was initiated in the late 90ties. “Prologing the fatigue life does not cause any changes in the radar system’s tasks,” the e-mail reads.

In 2007, Norway’s then-Ambassador to Russia, Øyvind Nordsletten, confirmed that one of the tasks of the Globus II radar is to monitor developments in Norway’s neighboring area.

Speaking at Oslo Militære Samfund, Nordsletten told the audience about certain Russian critics regarding some Norwegian dispositions. “This applies especially to the Globus II radar in Vardø and military excersises in Finnmark. We respond to this that the radar is under Norwegian control, and, yes - it also has the task to monitor the development in our neighboring area, which is important to avoid uncertainty.”

[deletia]

Engineers Demonstrate Pulsed Thermography Inspection for GLOBUS II

by Mindy Cooper
AFRL Materials and Manufacturing Directorate

6/5/2008 - Wright-Patterson Air Force Base, Ohio -- Engineers with the Air Force Research Laboratory's Materials and Manufacturing Directorate (AFRL/RX) performed an onsite pulsed thermography inspection of the GLOBUS II radar cover, demonstrating the capability of this new inspection technique.

GLOBUS II is a radar system located at Vardo, Norway, that is operated solely by Norwegian personnel, but which was developed by the United States and serves as part of the 29-sensor, global space surveillance network that provides data to the US Strategic Command. The radar system can identify more than 10,000 man-made objects orbiting the earth. The radar is sheltered by a composite fabric cover, manufactured by St. Gobain, of Merrimack, NH. The cover is fabricated in sections, which are joined together using a hot bonding process. The cover is suspended over the radar using pressurized air (similar to a balloon) and secured to the structure which houses the GLOBUS II radar.

"In 2005, the GLOBUS II suffered a cover failure due to a tear in the fabric, resulting in extensive damage to the cover and rendering it unserviceable," explained Mr. Kenneth LaCivita the senior nondestructive evaluation engineer that traveled to Norway and trained the team to perform the inspection. "The Structural Materials Evaluation Team (AFRL/RXSA) was contacted to conduct a failure analysis to determine the cause and develop a nondestructive method of inspecting the cover to prevent future failures."

Specimens of the failed cover were evaluated both nondestructively as well as destructively by the team. Nondestructive inspection (NDI) engineers used pulsed thermography inspection to characterize the extent of damage on the specimens and provide valuable information to support the failure analysis activity. The analysis determined that the bonding procedure used on previous repairs may have been the primary contributor to the cover failure.

According to Mr. LaCivita, as a result of the evaluations performed by RXSA engineers, a new radar cover was developed using a heavier and more durable Kevlar-based material. The engineers continued to provide support by developing and conducting a test program which resulted in a robust NDI procedure for evaluating bonded areas of the radar cover. The procedure utilized a Themoscope II Pulsed Thermography inspection system manufactured by Thermal Wave Imaging Incorporated, of Ferndale, MI.

"The system is comprised of an inspection hood containing an infrared camera and high intensity flash lamps, connected directly to a ruggedized laptop computer," explained Mr. LaCivita, "The inspection hood is placed directly onto the surface of the area of interest, heat is applied using the flash lamps, and real-time infrared thermal data (up to 300 frames per second) of the surface is collected, post-processed and displayed on the laptop."

The data can identify subsurface areas that are not bonded, which must then be dispositioned by the responsible engineering authority for either repair and/or recurring inspections. The flash thermography method is the state-of-the-art in thermography inspections. Conventional thermography also uses an infrared camera, but the heat source is typically a hand-held heat gun or heat lamp. In general, flash thermography inspection, as compared to conventional thermography, can detect deeper subsurface defects and provide higher resolution data, while being a more repeatable and less operator dependent inspection technique.

Mr. LaCivita traveled to Vardo, Norway, to perform onsite inspections on the new radar cover.He performed inspections on much of the radar cover, and also trained certified NDI technicians (who were also certified rope climbers) to use the thermography inspection system. The technicians assisted in many of the inspections and then went on top of the radar cover (which is over 100 feet high) and performed inspections of additional areas of interest. Indications of unbonded areas were identified in the new cover, but ITT of Colorado Springs, CO, which is the prime contractor for the radar, was able to determine that the size and location of the defects would not affect the cover's integrity. The defects will continue to be monitored and the cover will be inspected annually.

Peterson Air Force Base, in Colorado Springs, CO, the home of the HAVE STARE Integrated Product Team (850th ELSG/NSH) which manages the GLOBUS II program, has decided to purchase a pulsed thermoscope inspection system in order to perform reoccurring inspections. RXSA engineers are working with Peterson personnel and Thermal Wave to develop a customized system that will meet their specific needs.

http://community.emeraldcoast.com/news/space_16187___article.html/20th_operations.html

20th Space Control Squadron strengthens international partnership with Norway

By 1st Lt. Autumn Lorenz, 20th SPCS
June 12, 2007 – 10:29AM

EGLIN AIR FORCE BASE - The vastness of space got a little smaller when the 20th Space Control Squadron hosted representatives from the Norwegian Intelligence Service May 9 to 11 to build trust, interoperability and cooperative space capabilities.

The 20th SPCS is a geographically separated unit of the 21st Space Wing.

The NIS employs the Globus II radar at Vardo, Norway, to satisfy Norwegian intelligence requirements. Although operated exclusively by Norwegian personnel, the U.S.-developed radar is also part of the 29-sensor global space surveillance network, providing data to U.S. Strategic Command on the location and identity of more than 10,000 man-made objects orbiting the Earth.

Traveling from above the Arctic Circle halfway across the world, Norwegian officials visited Eglin to observe training, maintenance and operating procedures used at the 20th.

During the three day visit, NIS representatives were welcomed with a tour of the AN/FPS-85 phased array radar site, including the Space Operations Center, radar maintenance and computer operations rooms, and the squadron's training and evaluation simulator. 20th SPCS and NIS officials also exchanged information to help strengthen interoperability and cooperative space operations.

trond Anetsen, NIS liaison to Air Force Space Command, said the visit was very beneficial.

"We observed operating, training, and maintenance processes that can be integrated into our operations," he said. "We look forward to future exchange visits, both here and in Norway."

Of the 29 sensors in the Space Surveillance Network, Globus II and the AN/FPS-85 are the only dedicated space surveillance radars capable of tracking satellites in deep space orbits. Both can track objects smaller than a basketball orbiting 23,000 nautical miles away. Due to Globus II's strategic location in northeast Norway, the radar is able to survey portions of space unobserved by surveillance sensors 10 years ago.

"Maintaining an accurate common operating picture of the space environment is critical to the space control mission," said Lt. Col. Shane Connary, 20th SPCS commander. "The data collected by Globus II in Norway and the AN/FPS-85 here at Eglin is vital to the protection of (United States) and friendly space systems, as well as prevention of an adversary's ability to use space systems and services for purposes hostile to U.S. national security interests."

The NIS visit to Eglin marked another small success in AFSPC's long history of international partnerships as ideas were exchanged and relationships were strengthened.

"Continued global partnerships such as those between Norway and the United States are critical to future military success," said Maj. Paul Tombarge, 20th SPCS operations officer. "By promoting mutual understanding and trust, we can enhance interoperability and cooperative space operations. Together, we can maintain space superiority to dominate the fight."

http://www.eos-utvalget.no/

"Inspection of the Defense station in Vardø (Globus I and Globus II)

[Edited translation excerpted from the 2006 annual report of the Norwegian parliamentary oversight comittee on security services, EOS-utvalget , published April, 2007]

Before the inspection in 2006, the station in Vardø was inspected once in 2002. Over the years [since the installation in 2000] there has been great public interest in the station, especially the Globus II radar. Some have suggested that it is, or easy could be transformed into, a sensor for the American missile defence system.

In the two inspections the committee has now finished, the committee has not found evidence that installations at the station or the use of them violates the Intelligence instruction § 4 [law for the Norwegian Intelligence Service, NIS], which states that all activities conducted by the NIS are to be conducted under full national control and supervision.

A technical expert with no connection to the services [NIS, Police Security Service or the National Security Agency] was used in the inspections.

The service [NIS] gave the committee a broad introduction to the station's tasks and technical capabilities. The use of the radar and the procedures used when collecting information from the radar were given particular attention by the committee. In the inspection in 2006, the service gave an updated brief on the use of the radar, the technical equipment and the data networks the station is connected to. The Globus II radar has the same tasks as in 2002 -- intelligence, research and space surveillance. The intelligence and research parts are national tasks, but the space surveillance task is done in cooperation with the US Air Force Space Command. In this task, the Globus II radar joins other radars in a world-wide chain of stations known as the Space Surveillance Network, SSN. The task of the SSN is to identify all human-made objects in space. An important task is to monitor and ensure that satellites are kept within their designated orbits. In this task, the NIS contributes to the catalogue known as the "space catalog", which contains records of all man-made objects in space.

American tasks in the SSN program are always issued to a Norwegian operator in Vardø, who must start a manual operation to carry out the task. Remote control is not possible with today's configuration. Because of its technical design, the Globus II radar is unsuited for use in a missile defence system.

Responding to a question from the committee, the NIS said that the station does not engage in collection or processing of personal records, and that the tasks carried out at the station are not aimed at Norwegian citizens. The inspection gave no indication that there are applications or technical capabilities besides those the committee has been briefed on earlier and reported in earlier reports to the parliament.

http://www.blackplanet.com/jobs/job/view.html?job_id=929828
[Accessed 2007-02-19; apparently current as of that date.]

Radar Expert (MDSET/DEEZ)
Raytheon
Type: Employee
Location: VA - McLean/Arlington
Salary: Per Year
Job Status: Full Time
Job Category: Computers, Hardware
Relevant Work Experience: NOT PROVIDED
Career Level: NOT PROVIDED
Contact Information: Raytheon ARLINGTON, VA, 22201

Job Description:

Members of the Missile Defense National Systems Engineering Team (MDSET) develop the Ballistic Missile Defense System (BMDS) Integration Strategy for the Missile Defense Agency (MDA). This position supports the agency's (DEEZ) Systems Analysis directorate which is chartered with providing MDA-wide systems analyses to ensure commonality and consistency with performing assessments and comparative trade studies for the BMDS. Functions include maintaining a multi-layer BMDS focus and conducts cross system block/element/product analyses to support development and balancing of an integrated, layered defense. Conducts effectiveness analysis to establish expected BMDS capability and trade studies to support BMDS evolution. Conducts assessments to support System block and element reviews and defines requirements for BMDS engineering level models and simulations.

Job Description : Provides technical leadership and supervision for the Program sensor analysis team of 10 analysts. Coordinates with functional working group leads, senior management, and government offices responsible for executing analysis tasks associated with defining current and future capability and performing integration of the Ballistic Missile Defense System (BMDS). Conducts technical analyses of current and projected system level sensor capabilities.

Basic Qualifications: Subject Matter Expert on the National Team for RADAR/Sensor architectures used by the BMDS. Knowledge of the current BMDS radars (UEWRS, CD, THAAD/FBX-T, SBX. GBR-P, SPY-1), knowledge or alternatives on the table (PCLS, Have Stare, ARSR-4 or similar 3-D radars, OTH), knowledge of radar measurements, achievable accuracy, limitations, etc., as applied to offensive missile complexes, knowledge of EO/IR measurements - as applied to viewing offensive ballistic missile complexes, knowlwdge of discrimination (Radar and EO/IR) - familiarity with Project Hercules, Understanding of radar design sufficient to "size" radars for BMDS missions (power aperture, power aperture gain, waveforms, frequency, etc), Understanding of radar operations, Understanding of basic cost trades, Understanding of Missile Defense Operations (sufficient to place radar operations in that context). Understanding of EO/IR systems and phenomenology is also highly desirable, since these capabilities are both competing and complimentary in the context of the BMDS; cannot consider radars without concurrent consideration of EO/IR. The point is, we need someone who understands radars within the context of the BMDS, not just someone who knows radars.

Experience with the development of analytical tools, and numerical modeling of complex systems. Strong communication skills, with proven ability to provide senior management with technical briefings. Must have study lead / supervisory experience.

Desired Skills : Experience designing, evaluating, and managing analysis tasks. Strong coordination, organization, teaming and communication abilities.

Required Education(including Major) : MS preferred (PhD optional) in an applicable Engineering Science.

Raytheon is an equal opportunity employer and considers qualified applicants for employment without regard to race, gender, age, color, religion, disability, veterans status, sexual orientation, or any other protected factor.

http://www.coloradojobnetwork.com/jobs.asp?pagemode=15&jid=681039
[Accessed 2007-02-19; apparently current as of that date.]

Position title: Principal Hardware Engineer CSE-14
Location: Colorado Springs, CO
Term of employment: Regular
Type of employment: Full Time
Start date of this position: Immediate
Starting salary range: Not Provided
Education (minimum): Open
Experience level (minimum): Open

Position Description

Job Description:

Now more than ever the future is happening at L-3 Communications, Communication Systems-West (CS-W) in Colorado Springs, CO. We take pride in leading the defense industry with our state of the art communication systems products. We are a leader in communication systems for high-performance intelligence collection, imagery processing and satellite communications for the Department of Defense (DoD) and other government agencies, providing high-data rate wideband, secure, real-time communication systems for surveillance, reconnaissance and other airborne intelligence collection systems.

Take the next step and make a difference in your career join the L-3 Communications team where you can put your special skills to work helping to create some of the most advanced communication systems on the planet! Our employees enjoy a comprehensive benefits package that includes medical, dental, 401K, flexible schedules, tuition reimbursement and more.

PLEASE NOTE: This position is contingent upon assignment to L-3 Communications, SENSOR Ref. 8911, there is no relocation assistance available with this position.

POSITION RESPONSIBILITIES:

Primary duties are mechanical systems engineering level design, sustainment, and modernization tasks for the Ground Based Electro-Optical Deep Space Surveillance Systems (GEODSS), Have STARE, Mobile Optical Space Surveillance sensor (MOSS) optical and radar systems. Provide mechanical engineering support for sustainment and modernization projects on these sensors. Accomplish complete range of mechanical engineering activities starting with research, analysis, trade studies, design, development, installation, test, check out, and documentation.

Determine the technical objectives and requirements necessary to satisfy Customer requirements, deliverables, and expectations for sustainment and modernization projects.

Be able to Establish, and maintain a common understanding and commitment of system requirements between the Customer, Government, users, and stakeholders.

Perform the functional allocation activity that bridges the gap between the high level set of system requirements and constraints (from the Requirements Analysis) and the detailed set of requirements required (in Synthesis) to develop hardware systems.

Develop a design based on the requirements and associated architectures allocated to the subsystem level. Design activities may include design analyses, modeling, simulations, drawing development, and prototyping activities.

Support successful system integration which relies on the timely identification, management and verification of system interface requirements and design as well as commitment of appropriate resources to plan, prepare for, and perform integration and timely verification.

Provide technical guidance and assistance to project leads, hardware and software engineers for integration with mechanical solutions.

Meet with customer to ensure technical solution is satisfactory and documentation is approved.

Procure and assist in the construction of necessary hardware for mechanical solutions.

Design, develop, test, analyze, evaluate, various mechanical and fluid systems used in ground based radar and optics devices.

Support depot level troubleshooting and sustainment of legacy equipment for ground based radar or optical systems.

Coordinate with other hardware and software engineers to make system level decisions on the functionality of specific hardware and mechanical designs. Also coordinate with other people as necessary for adherence to product requirements, safety, OSS&E, etc., and for the fielding of the production hardware to the customer.

Work with various vendors to obtain hardware components and services such as the fabrication of mechanical devices or components.

Present and participate in technical design reviews.

Must be able to travel domestically and internationally

REQUIRED SKILLS, KNOWLEDGE, AND EXPERIENCE:

Must be computer proficient in MS Office products

Posses strong basic and advanced mechanical engineering theory, principles, operational and design knowledge, and application skills.

Possess familiarity with new equipment design, fabrication, assembly, integration and test process.

Proficient in the use of mechanical engineering measurement and validation tools.

Experience with ground based radar or optical systems.

Proficient in the use of CAD/CAE tools such as Protel, Autocad, MATLAB, and mechanical simulation software packages.

Proficient in the use of Visio, Adobe Acrobat

Ability to use Laboratory tools for fabrication, installation, testing, and analysis of technical solutions.

Minimum: Must be a US Citizen; must be able to obtain and maintain a security clearance, may be required to obtain an interim clearance within 6 months of document submittal.

REQUIRED EDUCATION:

Bachelor's degree in Engineering with 7-8 years of experience, or a Master's degree in Engineering with 4 years of experience; equivalent combination of education and experience will be considered.

We are proud to be an EEO/AA employer M/F/D/V. We maintain a drug-free workplace and perform pre-employment substance abuse testing.

http://www.mil.no/languages/english/start/article.jhtml?articleID=110161

Globus II under national control

Gro Anita Furrevik, FMS
2005-11-17

By Gro Anita Furrevik, Norwegian Defence Media Centre

There are three tasks for the radar Globus II in Vardø:

Surveillance of satellites, surveillance of Norway's national interests, and being accessible for national science and development.

GLOBUS II: The radar shall observe accurate positions of objects in space.

According to the NRK program Brennpunkt, this radar is part of the US National Missile Defense and not under Norway's national control.

- These allegations are old fashioned, incorrect and have been repudiated before, said Tom Rykken of the Norwegian Intelligence Service on October 12th.

There are only Norwegian personnel working on the radar in Vadsø, as is the situation at all other intelligence installations in Norway. But since Globus II represents a unique and complicated system, support from American expertise for complicated maintenance and repair is needed.

The three tasks of Globus II:

Intelligence: Continuing the activity that the Norwegian Intelligence Service has performed in the northern areas for 50 years.

Space Mission: The radar shall observe accurate positions of objects in space. It shall also produce radar images of objects that orbit the earth. These data are processed at the station in order to make the final products, which are radar images.

Science: The Intelligence Service has collaborated closely with The Norwegian Defence Research Establishment since the Globus II project started. This collaboration has contributed to establishing the highly competent radar environment at The Norwegian Defence Research Establishment, which has in turn made important contributions to several other projects in the Norwegian Defence and valuable support for The Intelligence Service.

http://www.csmng.com/images/spaceobserver/spaceobserver_2005-10-06.pdf

Peterson Air Force Base, Colorado
SPACE OBSERVER
Thursday, October 6, 2005 Vol. 49 No. 40

Courtesy photo

Located in Vardo, Norway, Globus II is a dedicated sensor in the Space Surveillance Network. Radar operations and maintenance support for Globus II transitioned from Air Force Space Command Headquarters to the 21st Space Wing Saturday.

21st Space Wing, Norway form partnership
By 1st Lt. Tracy Giles
21st Space Wing Public Affairs

More than 50 Airmen attended the Globus II realignment ceremony at the 21st Space Wing headquarters Monday. Radar operations and maintenance support for Globus II transitioned from Air Force Space Command headquarters to the 21st SW Saturday.

“We’re here today to celebrate the new partnership between Norway and the 21st Space Wing,” said Brig. Gen. Richard Webber, 21st SW commander.

The excitement was shared by the speaker following Gen. Webber at the ceremony.

"This is another milestone in the Globus system history," said Mr. Trond Anetsen, Norwegian liaison to the Air Force for the HAVE STARE program. "We feel good about this transfer and we are very proud to be a part of the 21st Space Wing."

Mr. Anetsen added that Airmen are always welcome to visit the site where Norwegians can share the system and its capabilities with them. Globus II is a joint program between AFSPC, Air Force Materiel

Command and the Norwegian government to relocate the HS radar that came on line at Vandenberg Air Force Base, Calif. in 1996 to Vardo, Norway.

The HS radar system is owned by the United States, but is operated and controlled by Norway. Globus II is a dedicated sensor in the Space Surveillance Network, meaning the system's mission is to detect, track, catalog and identify more than 9,500 deep-space and near-earth man-made objects orbiting earth daily.

"The system can detect small debris in the 1 to 10 centimeter range, depending on altitude, out to a range of 45,000 kilometers," said Maj. Jason Gross, 21st Operations Systems Support squadron assistant operations officer. "Globus II will now use this excellent surveillance capability to aid the 21st Space Wing in its space control mission."

The SSN consists of U.S. Army, Navy and Air Force-operated, ground-based radars and optical sensors at roughly 20 sites worldwide. The 21st SW operates or has a presence at 13 of these sites, including the Globus II site.

Photo by Dennis Plummer

The Peterson Air Force Base High Frontier Honor Guard unfolds the flag of Norway in front of 21st Space Wing headquarters. The Norwegian flag now flies in Memorial Flag Plaza here to represent the new partnership between the 21st SW and Norway.

http://www.peterson.af.mil/library/factsheets/factsheet.asp?id=4745

21ST SPACE WING

WELCOME TO THE 21st SPACE WING

The 21st Space Wing, commanded by Col Jay G. Santee and headquartered at Peterson Air Force Base, Colo., is the Air Force's only organization providing missile warning and space control to unified commanders and combat forces worldwide.

Our Mission: Conduct world class space superiority operations and provide unsurpassed installation support and protection while deploying Warrior Airmen.

Our Vision: Strength and Preparedness to Save the Nation.

We are located in 5 countries, crossing 9 time zones, consisting of 6 groups, a director of staff, 42 units at 27 locations. We literally cover the world with our operations.

The 21 SW provides missile warning and space control to North American Aerospace Defense Command and U.S. Strategic Command through a network of command and control units and ground and space-based sensors operated by geographically separated units around the world.

THE WING ...

Provides early warning of strategic and theater ballistic missile attacks and foreign space launches
Detects, tracks and catalogs more than 9,500 manmade objects in space, from those in near-Earth orbit to objects up to 22,300 miles above the earth's surface

Explores counterspace warfighting technologies in the field

Hosts HQ NORAD, HQ NORTHCOM, HQ Air Force Space Command and the 302nd Airlift Wing

Operates and supports Cheyenne Mountain Air Force Station; Thule Air Base, Greenland; and Clear AFS, Alaska

Provides community support to the 50th Space Wing, Schriever AFB, Colo
Provides community support to the Colorado Springs and the Denver areas.

MISSILE WARNING

Defense Support Program (DSP) satellites and their associated ground systems and personnel support the space-based early warning system. As the first system to detect missile launches, DSP satellites are critical sensors in the United States' and Canada's early warning system. DSP squadrons send crucial missile and space launch detection and nuclear detonation reports to NORAD and U.S. Strategic Command command centers at Cheyenne Mountain AFS.

Members of the 21 SW operate and maintain a complex system of U.S. and foreign-based radars that detect and track ballistic missile launches, launches of new space systems, and provide data on foreign ballistic missile events.

Today, ballistic missile warning is critically important to U.S. military forces. At least 20 nations currently have nuclear, biological or chemical weapons, and the technology to deliver them over long distances. According to intelligence estimates, during the next 10 years, several Third World countries will develop the technology and capability to launch intercontinental ballistic missiles at the United States.

The 21st Operations Group manages all operation units in the 21st Space Wing.

MISSILE WARNING (space based, ground based)

The 21 OG provides space-based missile warning data, serving as a focal point for transition to the Space-Based Infrared Satellite system, and providing space communication data and relay.

The wing's ground-based radars are comprised of a sea-launched ballistic missile, or SLBM, warning system--PAVE PAWS; a Ballistic Missile Early Warning System, or BMEWS; and a Perimeter Attack Radar Characterization System, or PARCS.

SLBM warning units are the 6th SWS, Cape Cod AFS, Mass., and the 7th SWS, Beale AFB, Calif. Their mission is mainly to watch America's coasts for incoming sea-launched or intercontinental ballistic missiles, and warn the appropriate authorities.

The wing's two BMEWS radar units are the 12th SWS, Thule AB, and the 13th SWS at Clear AFS. The 21st SW also has a detachment at RAF Fylingdales, U.K., to coordinate cooperative missile warning and space surveillance with RAF counterparts.

The wing's PARCS unit is the 10th SWS, Cavalier AFS, N.D.

SPACE CONTROL

Space surveillance is a critical element of the space control mission and will be vitally important to support future theater missile operations and assured availability of U.S. space forces. Desert Storm proved once again that whoever controls the high ground has definite military advantage.

In addition to its wartime missions, space surveillance is important during peacetime. As part of the space surveillance mission, the wing operates command and control as well as active and passive surveillance units. More than 9,500 manmade objects in orbit around the earth, ranging in size from a baseball to the Mir Space Station, are regularly tracked. Knowing the orbits of those objects is essential to prevent collisions when a new satellite is launched.

The 20th Space Control Squadron, Eglin AFB, Fla., provides dedicated active radar space surveillance. In addition, other collateral and contributing missile warning and research radars are used to support the surveillance mission.

The 4th SPCS, at Holloman AFB, N.M., performs mobile space surveillance communications and space data relay.

The wing also controls and operates optical space tracking systems under the 21st Operations Group.

The Ground-Based Electro-Optical Deep Space Surveillance system, or GEODSS, is operated by Detachment 1, Socorro, N.M.; Detachment 2, Diego Garcia, British Indian Ocean Territories; Detachment 3, Maui, Hawaii; and Detachment 4, Moron, Spain.

WING OPERATIONS CENTER

The 21st Space Wing's operations center is the Air Force's only Missile Warning Sensor Management/Command and Control organizations responsible for 16 space weapons systems in 42 units at 27 locations in 5 countries. The center provides immediate global and theater missile warning sensor management to NORAD, the Joints Chiefs of Staff, unified commanders and combat forces worldwide. The center also provides the wing commander command and control of assigned missile warning units and space assets, as well as real-time configurations and contingencies to maintain operational and system capabilities and required peacetime and wartime taskings. Additionally, the center responds to higher headquarter taskings and assumes tactical control of forces when directed.

FLYING UNIT

Peterson's 311th Airlift Squadron, a tenant Air Mobility Command unit, flies the C-21A aircraft in support of the worldwide operational support airlift missions.

MISSION SUPPORT

As host wing for the Peterson Complex, the 21 SW's 21st Maintenance Group and the 21st Mission Support Group provide complete logistical and base support services for Peterson AFB and Cheyenne Mountain AFS, and certain logistics and support functions for Schriever AFB, Colo.

Through these units and the 21st Medical Group, the wing also helps meet the medical, housing, educational, recreational and family support needs of assigned people, local retirees and their families. It also provides such services as personnel, security, civil engineering, communications and computer support, finance, contracting, transportation, flightline services, supply and maintenance.

In addition, the wing provides mission and personnel support to all geographically separated units and host base support at Thule Air Base, Greenland and Clear Air Force Station, Alaska.

The wing's 721st Mission Support Group is responsible for the upkeep and maintenance of facilities and equipment in Cheyenne Mountain AS. This responsibility requires civil engineering, computer and communications and security support. It makes sure the space operators are able to continue with their mission.

The wing's 821st Air Base Group operates and maintains Thule Air Base, Greenland in support of missile warning, space surveillance and satellite command and control operations missions. The group provides security, communications, civil engineering, personnel, service, logistic and medical support to remote active duty units in a combined U.S. , Canadian, Danish and Greenlandic environment of approximately 800 military, civilian and contractor personnel.

The more than 6,000 military members, 1,000 Air Force civilians and 2,600 contractor employees of the 21 SW around the world are proud of their role in performing these vitally important missile warning and space control missions, and in supporting the military people and families assigned to its units and bases.

For a listing of the units and their missions, click here.

21st Space Wing
Office of the Commander
775 Loring Ave., Suite 205
Peterson AFB, CO, 80914

ad.usno.navy.mil/forum/mccall.ppt

This Briefing Is Unclassified

Space Surveillance

Gene H. McCall
Chief Scientist,
United States Air Force
Space Command

Peterson AFB, CO

GLOBUS II Mission

- Primary: Space Surveillance
- GLOBUS II is expected to track 100 Deep Space (DS) objects per day
  - Expected to provide wideband Space Object Identification (SOI) imagery data on 3 DS objects per day
  - Numbers are based on studies, not actual data

GLOBUS II Description

- Globus II is a 27 meter mechanical tracker radar
  - Covers 0-360° in azimuth, 0-90° in elevation, and out to geostationary orbit in range

Space Surveillance Network

Lt Col Glen Shepherd

Air Force Space Command (AFSPC)

This briefing is for information only. No US Government Commitment to sell, loan, lease, co-develop or co-produce defense articles or provide defense services is implied or intended.

Space Surveillance Network (SSN) Map

LSSC = Lincoln Space Surveillance Complex
Millstone, Haystack, HAX
MSSS = Maui Space Surveillance System
(former AMOS/MOTIF site)
AFSSS = Air Force Space Surveillance System
RTS = Reagan Test Site

Tracking Radar
Detection Radar
Imaging Radar
Optical Telescope
SSN C2

● Dedicated
■ Collateral
▲ Contributing
★ SSN C2

Dedicated SSN Sensors

- Dedicated SSN sensors have a primary mission of Space Surveillance
- Dedicated sensors include:
  - Phased Array Radar (Eglin)
  - Mechanical tracker (Globus II – Vardo, Norway)
  - Detection only sensors (AFSSS)
  - Space based (MSX/SBV)
  - Ground based electro optical sensors (GEODSS and MOSS)

http://www.fbodaily.com/cbd/archive/2001/08(August)/02-Aug-2001/jsol007.htm

COMMERCE BUSINESS DAILY ISSUE OF AUGUST 2, 2001 PSA #2906
SOLICITATIONS

J -- SYSTEM ENGINEERING AND SUSTAINMENT INTEGRATOR (SENSOR) RFP RELEASE NOTIFICATION
Notice Date
July 31, 2001
Contracting Office
ESC/ND, Strategic & Nuclear Deterrence C2 , 11 Eglin Street, Hanscom AFB, MA 01731-2100
ZIP Code
01731-2100
Solicitation Number
F19628-01-R-0022
Point of Contact
POC: Mr. Joseph Williams,781-377-8916; PCO: Mr. Steve Meehan, 781-377-7746
E-Mail Address
Click Here to E-mail the POC (Joseph.Williams@hanscom.af.mil)

Description

This announcement serves as notice to all potential offerors that on or about 15 August 2001 the Strategic and Nuclear Deterrence Command and Control System Program Office (SND C2 SPO), Electronic Systems Center, Peterson AFB, CO, intends to release Request for Proposal (RFP) F19628-01-R-0022 for the System Engineering and Sustainment Integrator (SENSOR) contract. SENSOR provides for the sustainment and modernization of ground-based sensors whose sustainment is managed by the SND C2 SPO. The primary focus of the SENSOR contract is to provide single system integration support for the SND C2 missile warning (PAVE PAWS, BMEWS and PARCS) and space surveillance (GEODSS (SOTS), Eglin Radar and HAVE STARE) systems. The range radars located at Keana Point, Hawaii, and Ascension Island are identified for future inclusion under the realm of responsibility. Other existing missile warning, missile defense, and space surveillance sensor systems may be added to the scope of the SENSOR contract if they are later added to the sustainment responsibility of the SND C2 SPO -appropriate acquisition approvals will be sought at that time. In addition to engineering and sustainment efforts, the SENSOR scope will also include large upgrades that are identified, approved and funded over the course of the contract. Also, the SENSOR contract will include software version releases, periodic special studies, and supply support. The SENSOR objectives include: 1) ensure long-term Integrated Tactical Warning/Attack Assessment (ITW/AA) mission availability; 2) support integrated ITW/AA system-of-systems development in concert with Integrated System Command and Control (ISC2) contractors; 3) support program manager/element program manager integration of Early Warning Radar/Upgraded Early Warning Radar (EWR/UEWR) system development; and 4) execute with flexibility and scalability to implement and deliver all requirements. The contract will have a basic period of one year of System Support with 4 annual priced options. The contract will include an Award Term provision that will allow the contractor to earn up to 13 additional years, for a total potential contract length of 18 years. Also, the contract will include priced options for the PARCS Maintenance and Diagnostic Subsystem (M&DSS) upgrade. The solicitation will be available on the internet at the Hanscom Air Force Base Electronic Request for Proposal Bulletin Board (HERBB) Website at http://www.herbb.hanscom.af.mil/rfp.asp. Select the link

"System Engineering and Sustainment Integrator (SENSOR)." Offerors will be given 30 days to respond to the solicitation. Telephone requests for the solicitation will not be accepted. Firms responding to this request shall indicate whether they are a large business, small business, very small business, small-disadvantaged business, 8(a) concern, women-owned business, HUBZone Small Business, or Veteran-owned small business. Respondents must specify whether they are a U.S. or foreign-owned firm. This acquisition may involve data that are subject to export control laws and regulations. A foreign disclosure review of the technical data has not yet been accomplished. If the review determines that data are subject to export controls, only contractors who are registered and certified with the Defense Logistics Services Center (DLSC) shall be provided copies of the solicitation or other data subject to foreign disclosure restrictions. Contact the Defense Logistics Services Center, 74 Washington Avenue N., Battle Creek, MI 40917-3084 (1-800-353-3572) for further certification information. You must submit a copy of your approved DD Form 2345, Military Critical Technical Data Agreement, with your request for the solicitation. See Numbered Notes 12 and 26. An Acquisition Ombudsman, Colonel Joseph P. Maryeski, Director, Commander's Staff, has been appointed to hear concerns from offerors or potential offerors during proposal development. You should only contact the Ombudsman with issues or problems you cannot satisfactorily resolve with the program manager and/or contracting officer. The Ombudsman role is to hear concerns, issues, and recommendations and communicate these to the appropriate government personnel. The Ombudsman will maintain strict confidentiality if desired. The Ombudsman does not evaluate proposals or participate in source selection. You can contact the Ombudsman at (781) 377-5106.

http://www.regjeringen.no/nn/Dokumentarkiv/Regjeringen-Bondevik-I/Forsvarsdepartementet/232941/232995/the_globus_ii_radar_and_norwegian.html?id=242561

Pressemelding

Nr.: 09/2000
Dato: 25.02.00

The Globus II radar and Norwegian surveillance activities in the North

Due to the recent media interest in the Globus II radar, the Norwegian Minister of Defence, Mrs. Eldbjørg Løwer, wishes to issue the following statement for clarification:

Issues concerning the Globus II radar have been dicussed on several occasions between Norway and Russia, both at the political and working level. Norway has stressed that the radar is not to be part of any eventual future US missile defence. The radar is technically unsuited for such a role, and the agreement between Norway and the United States specifies totally different tasks for the radar. The radar at Vardø fully complies with the ABM Treaty.

We obviously have installations that monitor the Norwegian area of military interest. We cooperate with our allies, but all activities are under full Norwegian control. This does not constitute a threat towards Russia or other neighbouring countries. On the contrary, this surveillance activity provides a solid base for the national decicion-making process on defence issues, and prevents overreaction and unnecessary apprehension to Russian military activities in the North. The fact that Russia still has substantial concentrations of strategic nuclear weapons close to Norwegian territory, underlines the need for Norwegian authorities to follow the military activities in this area closely.

BY ORDER OF THE COMMANDER
AIR FORCE SPACE COMMAND

AIR FORCE SPACE COMMAND
PAMPHLET 38-9
1 MAY 2001

Manpower and Organization
ORGANIZATIONS AND FUNCTIONS

OPR: XPML (Richard A. Cathey) Certified by: XPM (Pamela K. Howell)
Supersedes AFSPCPAM 38-9, 1 Feb 99. Pages: 89
Distribution: F

This pamphlet prescribes the organizational structure of Headquarters, Air Force Space Command (HQ AFSPC) and defines the functions and responsibilities for each staff agency. It applies to HQ AFSPC.

[EXCERPTS]

6.2. Space Control Division (DRC). Directorate of Requirements' lead to determine, document, and represent requirements to assure our (friendly) use of space environment and deny that medium to the enemy. Responsible for requirements definition and integration of new and modified space control systems into AFSPC, USSPACECOM and NORAD operations. Coordinates requirements with Air Staff, MAJCOMs and Unified Agencies to ensure the National Command Authority (NCA) and combatant CINC's demands will be met in an accurate and timely manner. Determine, document and represent Space Control mission area operational requirements. Develops, coordinates and submits Operational Requirements Documents (ORD) and Analysis of Alternatives (AoA). Command's OPR for the following Space Control mission area and Space Situational Awareness programs: National Missile Defense (NMD) Battle Management Command, Control and Communications (BMC3); NMD Upgraded Early Warning Radar's (UEWR); NMD Deployment Planning; Space-Based Laser (SBL); SBL Integrated Flight Experiment (IFX); Theater Missile Defense (TMD) Airborne Laser (ABL) BMC3 Interface; Space Test Range; Computer Network Attack; Computer Network Defense; Computer Network Exploitation; Deep-Space Surveillance Technology Enhancement & Replacement for Ebsicons (Deep STARE); HAVE STARE/Globus II Space surveillance Radar; Early Warning Radar Life Extension Program (EWR SLEP), Clear Radar Upgrade (CRU), Eglin Radar Upgrade, Space-Based Space Surveillance, and approximately 10 other classified programs.

6.2.1. Offensive and Defensive Counterspace Branch (DRCC)

6.2.2. Defense Branch (DRCD).

6.2.3. Surveillance Branch (DRCS). Conducts requirement analysis, program funding advocacy and acquisition oversight for the nation's current and future space surveillance capabilities primarily through upgrades, modifications and additions to the Air Force Space Surveillance Network (SSN) and command's focal point for Space Situational Awareness (SSA). Current command lead acquisition programs include HAVE STARE/Globus II and Deep STARE. HAVE STARE/Globus II is a space surveillance radar operating in the X-band frequency, utilizing a single 27-meter dish antenna. HAVE STARE/Globus II is primarily a deep space radar and will collect both spacetrack (metric data) and space object identification (imaging data) of deep space and near earth satellites. Deep STARE is a GEODSS sustainment program to replace the depleting ebsicon tube cameras with a charge-coupled device camera, replace the unsupportable telescope mount control system and upgrade the image processing sub-system. In addition, DRCS is the focal point for: initiating the Space-Based Space Surveillance (SBSS) system which will be a major step in performing dedicated space surveillance from space; the Eglin Radar Upgrade which will replace unsupportable equipment and implement network performance improvements reducing outyear O&M costs; and Computer Network Exploitation. DRCS supports the Space Control Mission Area Team (SCMAT) as space surveillance experts during the Integrated Planning Process and provides the SCMAT technical support on space surveillance issues. DRCS is also responsible for space surveillance system requirements during the acquisition of all future systems that will perform space surveillance as a secondary or tertiary mission (Space Based Infrared System, NMD, SBL, etc.).

http://www.norway.mid.ru/radar.html

Radar station in Vardø

19.09.2000

In the course of the meeting in the Kremlin between Sergei Ivanov, Russian Federation Security Council Secretary and Jonas Store, state secretary at the office of the Prime Minister of Norway, a wide range of questions relating to the two countries' cooperation in the most diverse fields was discussed. Noting the substantial invigoration of Russian-Norwegian contacts in the political and economic fields, Sergei Ivanov expressed a hope for their further constructive development, and for the intensification of joint efforts in the field of the maintenance and strengthening of strategic stability and international security.

In this connection he expressed a wish to the Norwegian side that it would take into account Russia's serious concern over the continuing construction of a U.S. radar station ("Have Stare") in Vardø, which runs counter to the ABM Treaty.

The Russian Security Council Secretary highlighted three large mutually beneficial areas of cooperation that over the long run must become determining in the onward development of bilateral relations with Norway. They are joint management and rational exploitation of the biological resources of the Barents Sea, joint development of oil and gas deposits in Russia's North and on the adjacent continental shelf, and continued work on normalizing the environmental situation, including radiation safety, on the Kola Peninsula.

Navy Admiral Vladimir Kuroyedov, commander-in-chief of the Russian Navy, took part in the meeting.

Statement by Official Spokesman for the Ministry of Foreign Affairs of Russia Regarding Norway's Participation in the US Plans to Develop a National ABM System

21.07.2000

According to press reports, Norwegian Chief of Defense Sigurd Frisvold has spoken in favor of studying the question of Norway's participation in the US plans to develop a national ABM system.

Such views by this high-placed Norwegian military official cannot but cause surprise in the light of Norway's repeated statements of support for the ABM Treaty, which is the cornerstone of strategic stability.

Such ideas are all the more alarming because an unresolved issue remains in Russian-Norwegian relations, that of the big radar station currently under construction in the Norwegian town of Vardø near the Russian border that could be used in the interests of the US national ABM system.

Russia has repeatedly expressed its concern to the Norwegian side in connection with the construction of this radar.

So far the Norwegian side has offered official assurances at different levels to the effect that this radar has nothing to do with the American plans for a national ABM system. But the frank statements by the Norwegian Chief of Defense make one think that the situation is very different.

We proceed from the premise that actions connected with the implementation of plans for a national ABM system lead to an undermining of the ABM Treaty, pose a potential threat to regional and global stability and are not in the interests of honest and goodneighborly cooperation in the north of Europe.

We hope that Norway, which claims that relations with Russia are a priority for it, will not take to a path that is fraught with negative consequences.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)									DATE February 2000
BUDGET ACTIVITY 07 - Operational System Development			PE NUMBER AND TITLE 0305910F SPACETRACK						PROJECT 674279
COST ($ in Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
674279 Have Stare Radar	18,946	27,253	1,387	0	0	0	0	0	TBD

NOTE: Have Stare total cost not available since it was transferred from intel budget in FY93

(U) **A. Mission Description**

The HAVE STARE radar (FPS-129) was transferred from the intelligence budget in FY93 at the direction of Congress. The Air Force has identified a requirement for the HAVE STARE system and has programmed funding in this program element to complete development and to deploy the system. The radar is a high resolution X-band tracking and imaging radar with a 27 meter mechanical dish antenna. The system is being deployed to Vardø, Norway, as a dedicated space surveillance sensor to support the mission of space object catalog maintenance and mission payload assessment. Progress in FY 99 was completion of the radar tower, installation of antenna, radome, and most radar electronics. The radar will not be a fully integrated element of the Missile Warning Network. The radar will only be integrated with the Space Control Center (Cheyenne Mtn AS, CO) and the Alternate Space Control Center (Dalgren Naval Surface Warfare Center, VA)

(U) FY 1999 ($ in Thousands)
(U) $1,200 Continued radar development incremental funding
(U) $5,600 Continued site preparations
(U) $11,224 Deployed and installed program equipment
(U) $922 Continued Logistics and training
(U) $18,946 Total

(U) FY 2000 ($ in Thousands)
(U) $11,900 Complete facility preparation
(U) $7,879 Complete system installation, integration, and checkout
(U) $5,084 Conduct formal system tests
(U) $2,150 Continue Logistics and training
(U) $240 Demolish test facility and cleanup test site
(U) $27,253 Total

http://www.dtic.mil/descriptivesum/Y2001/AirForce/0305910F.pdf

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE February 2000
BUDGET ACTIVITY 07 - Operational System Development	PE NUMBER AND TITLE 0305910F SPACETRACK	PROJECT 674279

(U) **A. Mission Description Continued**

(U) FY 2001 ($ in Thousands)

(U)	$500	Complete system development
(U)	$587	Complete testing
(U)	$300	Accomplish residual logistics and training
(U)	$1,387	Total

(U) **B. Project Change Summary**

FY01: Funds added to finish installation and checkout of radar in Vardo, Norway.

Projected schedule slip (Section E): Recent accident (Nov 99) occured in Vardo, Norway when high winds blew of the Radome. The projected schedule slip is 6-8 months. Initial Operational Capability (IOC) is now scheduled for 4th Qtr of FY01and Full Operational Capability (FOC) is scheduled for 3rd Qtr FY02.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
(U) AF RDT&E									
(U) Other APPN									
(U) Operations and Maintenance AF*	49,412	51,485	52,634	50,860	51,407	53,619	57,898	Continuing	

* Includes other projects in the Spacetrack program element

(U) **D. Acquisition Strategy**

The existing contract with Raytheon was modified in the third quarter of FY98 for the dismantling, shipment, and installation of the radar, and will be extended until FY01

(U) **E. Schedule Profile**

	FY 1999				FY 2000				FY 2001			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Radar dismantled at Test Site (Vandenberg AFB)				*								
(U) Begin Installation at Operational Site (Vardø, Norway)			*									
(U) Formal System Testing Completed											X	
(U) System Initial Operational Capability												X

http://www.dtic.mil/descriptivesum/Y2001/AirForce/0305910F.pdf

UNCLASSIFIED

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 2000
BUDGET ACTIVITY 07 - Operational System Development	PE NUMBER AND TITLE 0305910F SPACETRACK	PROJECT 674279

(U) A. Project Cost Breakdown ($ in Thousands)

		FY 1999	FY 2000	FY 2001
(U)	System development	1,000	0	0
(U)	Site preparation and support	5,000	10,900	0
(U)	Deployment, installation and checkout	9,894	7,229	0
(U)	Logistics and training	922	2,000	0
(U)	Formal system testing	0	4,634	0
(U)	Complete open development and testing items	0	0	587
(U)	SPO support	2,130	2,290	800
(U)	Take down test facility and cleanup test site	0	200	0
(U)	Total	18,946	27,253	1,387

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1999	Budget FY 1999	Budget FY 2000	Budget FY 2001	Budget to Complete	Total Program
Product Development Organizations										
Raytheon Elec Sys Sudbury, MA	C/CPIF/AF	Mar 91	26,520	26,520	3,022	10,494	12,032	500	0	26,048
Site Preparation	Various	Various	N/A	N/A	2,100	5,000	10,850	0	0	17,950
Misc	Various	Various	N/A	N/A	563	734	1,519	0	0	2,816
Total prior to FY 1999 data not available; program transferred from the intelligence budget in FY93 at the direction of Congress										
Support and Management Organizations										
MITRE	SS/PR	Oct 99	N/A	N/A	800	728	800	250	0	2,578
A&AS	C/PR	Various	N/A	N/A	1,123	954	800	587	0	3,464
Lincoln Lab	SS/PR	Oct 99	N/A	N/A	230	145	0	0	0	375
Program Office	Various	Various	N/A	N/A	354	451	690	50	0	1,545
Misc	Various	Various	N/A	N/A	24	440	562	0	0	1,026

http://www.dtic.mil/descriptivesum/Y2001/AirForce/0305910F.pdf

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 2000
BUDGET ACTIVITY 07 - Operational System Development	PE NUMBER AND TITLE 0305910F SPACETRACK	PROJECT 674279

(U) Performing Organizations Continued:

Test and Evaluation Organizations

None

(U) Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1999	Budget FY 1999	Budget FY 2000	Budget FY 2001	Budget to Complete	Total Program
Product Development Property									
None									
Support and Management Property									
None									
Test and Evaluation Property									
None									

Subtotals	Total Prior to FY 1999	Budget FY 1999	Budget FY 2000	Budget FY 2001	Budget to Complete	Total Program
Subtotal Product Development	5,685	16,228	24,401	500	0	46,814
Subtotal Support and Management	2,531	2,718	2,852	887	0	8,988
Subtotal Test and Evaluation						
Total Project	8,216	18,946	27,253	1,387	0	55,802

Have Stare total cost data not available; program transferred from the intelligence budget in FY93 at the direction of Congress. Prior years data reflects costs since FY93.

www.hanscom.af.mil/foia/Foiadownload.aspx?fileid=231&contract=3&FileName=Alpha_Listing.doc

HQ 38th ENGINEERING INSTALLATION WING

HAVE STARE (ND)

Point of contact: Lt. Col. Conlon, DSN 478-6351, Comm
(781) 377-6351 Hanscom

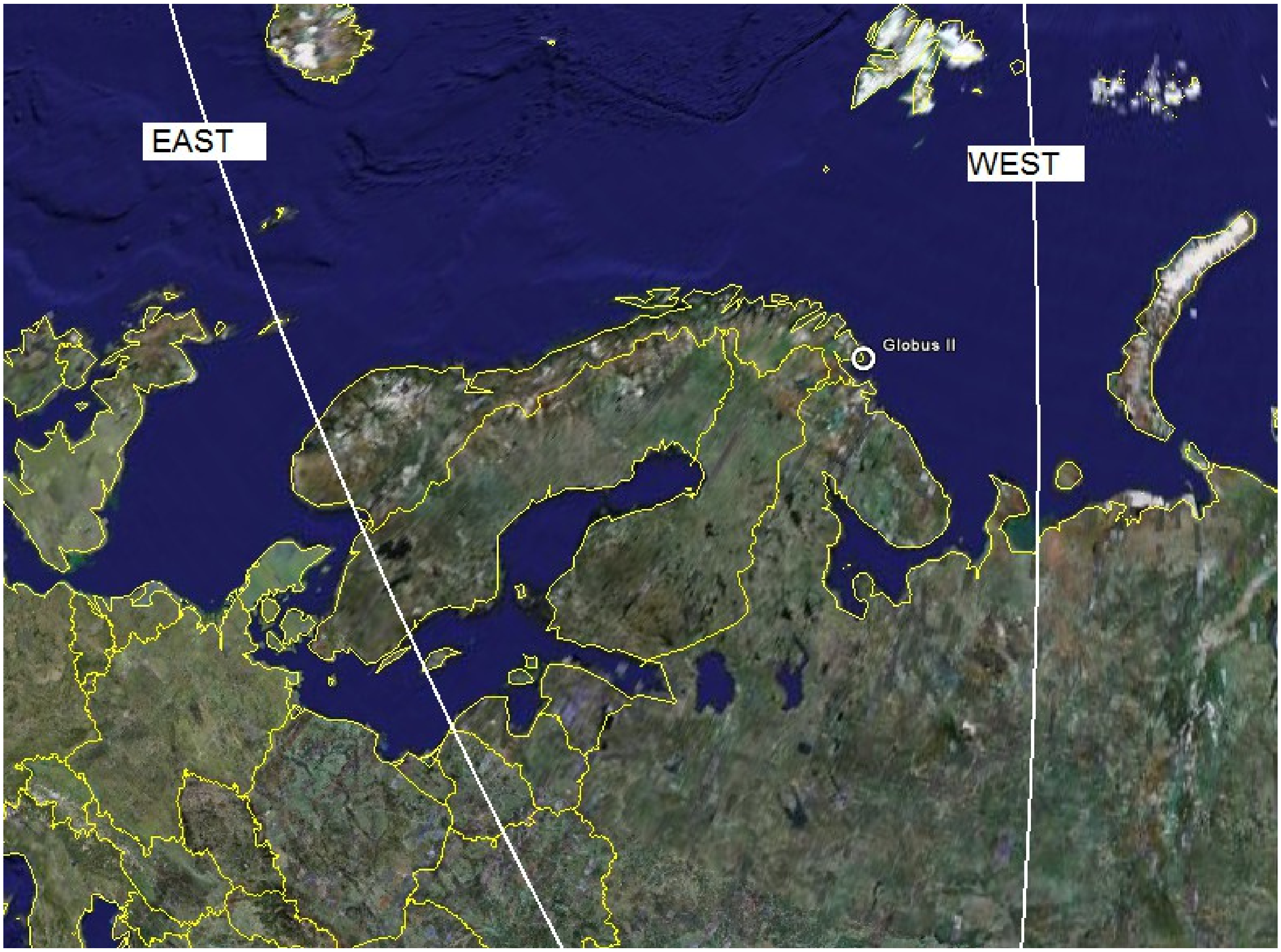
AFB

Prime Contractor: Raytheon

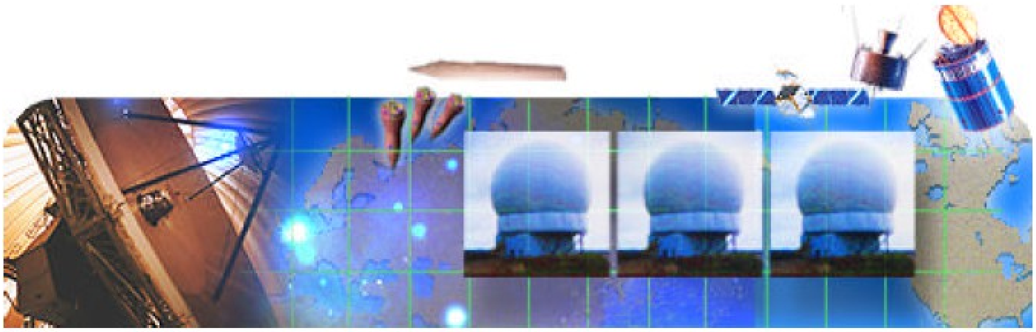
Acquisition Phase: Phase III-Production, Fielding/Deployment and Operational Support

HAVE STARE is an X-Band tracking/imaging radar, with a 27M dish/35M radome, and supports the AFSPC Space Surveillance mission area with spacetrack (Space Object Identification & Imaging) of geostationary satellities at 0-90E Longitude. It deployed from Vandenberg AFB to Vardo Norway Oct 98-May 99.

Segment of Geostationary Arc Visible from Vardo,
approximately 30 W to 90 E



Location of Globus II relative to ICBM trajectories from a hypothetical launch site in north-central Iran toward the east and west coasts of the continental US



AN/FPS-129 HAVE STARE

The AN/FPS-129 HAVE STARE radar system supports multiple missions and users with high-quality signature data.

The HAVE STARE radar system is a unique 27-meter X-band mechanical dish radar with stringent performance requirements — metric accuracy, sensitivity, sidelobes — that provides high resolution data collection using narrowband, high-PRF wideband, and other specialized waveforms. HAVE STARE's accuracy exceeds the capabilities of all existing U.S. Air Force radars.

The HAVE STARE system was originally designed to collect intelligence data against ballistic missiles, with aerodynamic and satellite tracking as secondary missions. Its current primary mission is to collect data on deep-space satellites, and its secondary missions are near-earth satellite tracking and data collection on missile and aerodynamic targets. HAVE STARE has successfully completed verification testing against the baseline requirements. Deep-space tracking and data collection as well as mission planning and communication functions provide HAVE STARE with space surveillance network sensor capability.

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Raytheon Systems Company

Sensors and Electronic Systems

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PO Box 902
El Segundo, California

http://www.defenselink.mil/contracts/1998/c06241998_ct321-98.html

FOR RELEASE AT
5 p.m. ET No. 321-98
June 24, 1998

AIR FORCE

Raytheon Co., Marlborough, Mass., is being awarded a $23,552,430 face value increase to a cost-plus-award-fee-contract to provide for relocation of the HAVE STARE radar system from the test site at Vandenberg Air Force Base, Calif., to its final operating location at Vardo, Norway. Estimated contract completion date is September 2000. Solicitation issue date was November 10, 1997. Negotiation completion date was May 29, 1998. Electronic Systems Center, Hanscom Air Force Base, Mass., is the contracting activity (F19628-91-C-0057).

http://www.new-bold.com/projects/itProjects/itAirForceProjects/itAirForceProjects.htm

Our work with the U.S. Air Force

HAVE STARE Near Real-Time Imaging (HSNRTI) Segment
subcontract with Electronic Warfare Associates, Inc.

HAVE STARE NEAR REAL-TIME IMAGING (HSNRTI) SEGMENT:

This project involved enhancing the HAVE STARE Radar System by adding a near-real time imaging capability. A major portion of this capability involved implementing data format conversion algorithms to produce radar images, and then generating this imaging data in various formats.

NBE's software engineering team generated the Software Requirements Specification (SRS) and the Software Test Plan (STP) documents following standard DoD-STD-2167A; assisted in writing system and unit level test procedures; developed data format conversion algorithms; designed, coded, tested and integrated various software units/components; and contributed in establishing standards and conventions, and quality assurance procedures to be followed throughout the project. NBE supported the HAVE STARE project throughout the integration, testing, and verification phases of the life-cycle.

http://www.fas.org/spp/starwars/budget/peds_98c/0603871c.txt

UPGRADED EARLY WARNING RADARS incorporate the software upgrades and modest hardware changes required by the existing Early Warning Radars to support the NMD mission. The UEWRs will detect, track and count the individual objects in a ballistic missile attack early in their trajectory. The UEWR data can be used for interceptor commit and GBR cueing in the event of an early deployment Depending on the anticipated threat (East Coast or West Coast) at the time of a defense deployment decision, the appropriate BMEWS and/or PAVE PAWS radars will be upgraded for inclusion in the NMD architecture. If needed, other existing forward based radars (such as Cobra Dane or HAVE STARE) could also be used to support NMD.

http://thomas.loc.gov/cgi-bin/cpquery/T?&report=hr265&dbname=105&

43-495

105TH CONGRESS
Report

HOUSE OF REPRESENTATIVES
1st Session

105-265
MAKING APPROPRIATIONS FOR THE DEPARTMENT OF DEFENSE FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1998, AND FOR OTHER PURPOSES

September 23, 1997- Ordered to be printed

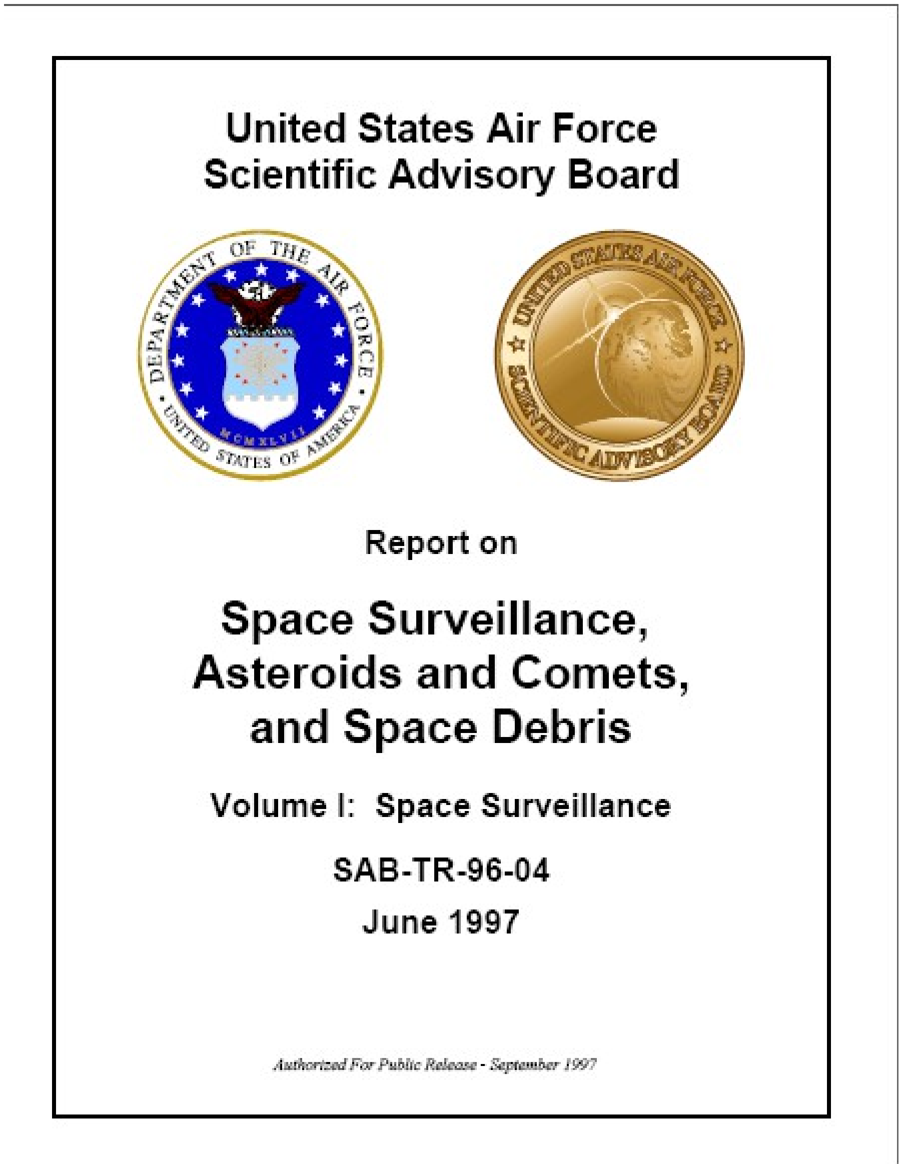
Mr. YOUNG of Florida, from the committee on conference, submitted the following
CONFERENCE REPORT
[To accompany H.R. 2266]

[EXCERPTS]

EXPLANATION OF PROJECT LEVEL ADJUSTMENTS [In thousands of dollars]

	Budget	House	Senate	Conference
SPACETRACK (SPACE)	28,573	28,573	36,073	43,073
Have Stare upgrade to support missile defense testing				7,000

http://www.fas.org/spp/military/docops/usaf/sab-tr-96-04-v1.pdf



United States Air Force
Scientific Advisory Board

Report on

Space Surveillance, Asteroids and Comets, and Space Debris

Volume I: Space Surveillance

SAB-TR-96-04

June 1997

Authorized For Public Release - September 1997

[EXCERPT]

For LEO, Space Control, and reentry processing, tracking by all of the existing radar installations is needed. However, even with them, there is negligible southern hemisphere coverage and a large longitudinal gap in coverage. As a consequence, great care must be exercised in closing installations, particularly overseas where coverage is sparse. If, for example, Pirinclik were to be closed* it should be replaced perhaps with HAVE STARE at Diego Garcia.

- Radar operations at Pirinclik were terminated in March 1997, after this study was completed and briefed at Hq USAF and Air Force Space Command http://ax.losangeles.af.mil/axf/eaapgs/docs/aitEA.pdf

Environmental Impact Analysis Process

Environmental Assessment
for
U.S. Air Force
atmospheric interceptor technology PROGRAM

November 1997

DEPARTMENT OF THE AIR FORCE
Material Command
Headquarters, Space and Missile Systems Center

[EXCERPTS]

2. Two existing USAF radar systems have high potential for NMD application. The upgraded Precision Acquisition Vehicle Energy - Phased Array Warning System (PAVE PAWS) radar located at Beale Air Force Base (AFB), California is a wide-looking potential target detection element of a future NMD system. The HAVE STARE tracking radar located at Vandenberg AFB, California represents a candidate design to perform the narrow-looking, target tracking radar role in a future NMD system. To fully understand the utility of these radar systems in an NMD role, the USAF plans to integrate and test these systems using realistic threat scenarios. California is the only location where these radars are close enough to be tested together. The PAVE PAWS radar initially detects an incoming target and hands over specific target tracking to the HAVE STARE.

[deletia]

1.2 ALTERNATIVE SELECTION CRITERIA

To support the USAF ait program, an alternative must meet the following criteria:

• Radar Coverage: Must allow simulation of inbound hostile threat trajectories, and confirm the ability of existing U.S. early warning PAVE PAWS and HAVE STARE radar sites in California to detect the test vehicle.

http://www.fbodaily.com/cbd/archive/1997/05(May)/27-May-1997/Bsol011.htm

COMMERCE BUSINESS DAILY ISSUE OF MAY 27,1997 PSA#1853
HQ Electronic Systems Center, Surveillance and Control Systems (TNK), 5 Eglin Street, Hanscom AFB, MA 01731-2802

B -- TECHNICAL SUPPORT FOR HIGH POWER X-BAND DISH RADARS POC Priscilla Busa, Contract Specialist, 617-377-9580; John Sorgini, Jr., Contracting Officer, 617-377-7241. Electronics Systems Center (ESC) intends to solicit on a non-competitive basis, Raytheon Company of Sudbury, MA. Solicitations are for short-fused NMD efforts being added to an existing contract to provide the Air Force (AF) and Ballistic Missile Defense Organization (BMDO) with timely answers on the ability of the X-Band Dish radar to perform the required NMD mission. The efforts anticipated include collecting and analyzing X-Band radar data from possible AF and BMDO sponsored VAFB launches [Jan 98 -- Sept 98], incorporating and testing additional object classification algorithms [Feb 98 -- Sept 98], and other support tasks associated with X-Band participation in NMD test activities through FY98. It is considered that Raytheon is currently the only qualified source with the technical understanding of the HAVE STARE radar being used as the X-Band surrogate for data collection and as the basis for developing a LESFOV design suitable for performing the NMD mission. Furthermore, Raytheon is the only source that has X-Band hardware at VAFB and the in-depth knowledge required for the integration of NMD algorithms into the existing system in a timely fashion to be able to support possible BMDO and AF test and analysis for FY 98 launches. Statutory authority for award of this contract is 10 USC 2304 (c) (1) as implemented by Federal Acquisition Regulation 6.302-1, "Only one Responsible Source". However, if your firm believes it could accomplish these efforts in the requested time frames indicated in the square brackets above, submit a qualification package not to exceed 20 pages explaining your capabilities to the above points of contact no later than fifteen (15) days of this notice. This synopsis is for information and planning purposes only, and does not constitute an IFB or RFP, nor does its issuance restrict the Government as to the ultimate acquisition approach. The Government will solicit firms meeting the screening criteria in the synopsis. Any offeror initially judged to be unqualified will be provided a copy of the solicitation on request, and any offer such a firm might submit will be evaluated without prejudice. An Ombudsman has been appointed to hear concerns from offerors or potential offerors during the proposal and proposal development phase of this acquisition. The purpose of the Ombudsman is not to diminish the authority of the program director or contracting officer, but to communicate contractor concerns, issues, disagreements, and recommendations to the appropriate Government personnel. When requested, the Ombudsman will maintain strict confidentiality as to the source of the concern. Ombudsman do not participate in the evaluation of responses, source selection, or formulation of acquisition strategy. Interested parties are invited to call the Electronic System Center's Ombudsman, Col Lee Hughes, (617) 377-5106. The Ombudsman should be contacted only with issues or problems that have previously been brought to the attention of the program manager and/or the contracting officer and could notbe satisfactorily resolved at that level. Again, this synopsis is for information and planning purposes only, and does not constitute an Invitation For Bid or RFP, nor does its issuance restrict the Government as to the ultimate acquisition approach. See Numbered Note(s): 22, 26. (0142)

Congressional Testimony

Statement of Rear Admiral Richard D. West, USN

Director (Acting), Ballistic Missile Defense Organization

before the Committee on National Security, House of Representatives

June 18, 1996.

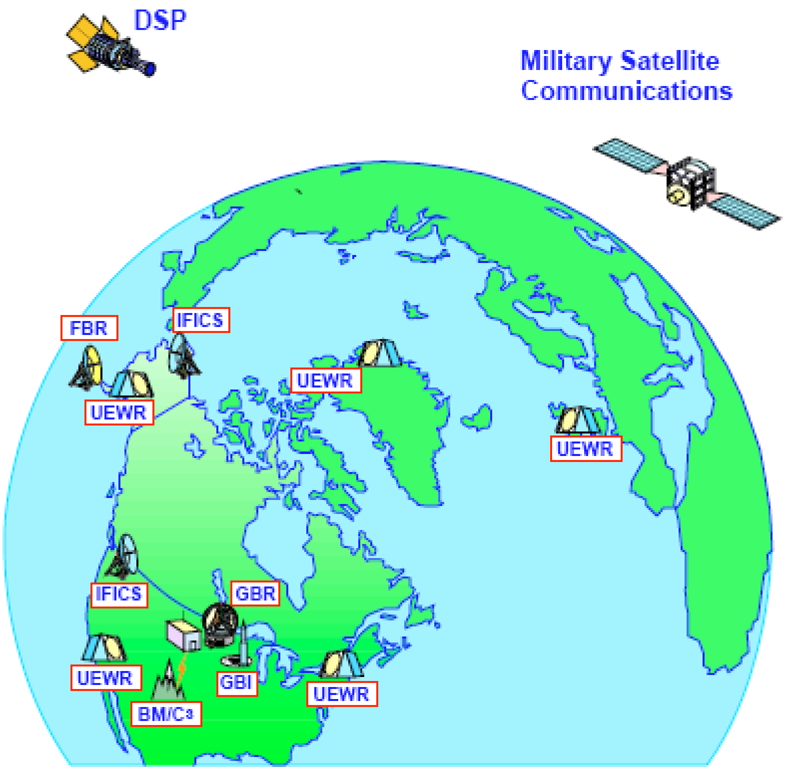
[EXCERPTS]

A program is about to begin which would prepare and demonstrate the needed upgrades to the existing early warning radars. Depending on the anticipated threat (east coast or west coast) at the time of a defense deployment decision, the appropriate BMEWS and/or PAVE PAWS radars will be upgraded for inclusion in the NMD architecture. If needed, other existing forward-based radars (such as Cobra Dane or HAVE STARE) could also be used to support the NMD system.

Forward Deployed Radars: Forward basing of a ground based radar places the radar in a position to obtain accurate data from early parts of an ICBM's trajectory. The advanced technology associated with X-band radars provides high angular resolution, thereby permitting effective performance against closely spaced threat objects. Together these radar attributes provide for early and accurate target-tracking and signature data, thus permitting earlier launch of defense interceptors and a greater battle space within which they can operate. The overall defense performance is therefore maximized.

Forward Deployed Radar(s)	
Initial Operational Capability	1
Full Operational Capability	1
Deployment Location	Shemya, AK or Bangor, ME
Type	X-band (dish or phased array TBD)

NMD 3+3 ARCHITECTURE



- Deployable In 3 Years After A Potential Deployment Decision In 2000. . . IOC 2003
- Components
  - Single Site In North Dakota
  - 100 Ground Based Interceptors (GBI)
  - 1 Ground Based Radar (GBR)
  - Upgrade Early Warning Radar (UEWR)
  - Adjunct Forward Based Radar (FBR) In Alaska
  - In Flight Interceptor Communications System (IFICS)
  - BM/C ^{3}

Figure 1

http://www.acm.org/sigada/wg/artewg/dist_workshop_summary.html

Summary of ARTEWG Workshop on Distributed Systems

21-23 April 1995

Submitted by Mike Kamrad (Computing Devices International) ARTEWG Chair

On 21-23 April 1995 in Santa Barbara CA, the Ada RunTime Environment Working Group (ARTEWG) of the Special Interest Group on Ada (SIGAda) of the Association for Computing Machinery (ACM) held a Workshop to discuss the needs for distributed systems software technology for high-tech applications in both DoD and non-DoD markets and how the distributed systems features of Ada95 can respond to these needs. A variety of experts in different application domains participated in the workshop.:

[EXCERPT]

Summary of Jeff Clark Presentation

Jeff Clark of Computing Devices International (CDI) made a presentation entitled "Distributed Systems In Radar and Tracking Applications", in which he described CDI's experience in using Ada in an early-warning, active RADAR application ("HAVE STARE"). Additionally, Jeff presented the current trends in such systems, as well as the issues involved with the application of distributed systems technology to that domain.

Jeff described a sample application as having a real-time, closed- loop architecture with a 50 millisecond track maintenance time frame, scheduling of future frame activities, and signal processing past frame returns. Additionally, at a lower relative priority, the system concurrently communicates events and processed data, drives operational displays and controls, and records bulk and processed data. System components thus include an active RADAR, a positioning and control system for the RADAR, signal processing components(e.g. to filter noise), a data recording facility (for later analysis), the track loop, communications processing (i.e., an early-warning system must transmit the warning), and integrated displays and controls. One salient characteristic of these high-powered RADAR systems is that failure to control the RADAR hardware can not only lead to loss of functionality (critical to ensure defensive capability), but can also physically destroy millions of dollars of hardware. (Other safety-critical systems can obviously do the same -- the difference here is the scale of damage.)

Jeff indicated that the commonly-appreciated advantages of distributed computing technology also applied to this domain, namely: spreading functionality of mainframes across several platforms to reduce cost and parallelize processing, improving availability, and facilitating the addition of functionality without redesigning the system. In today's implementation, he indicated that distribution across platforms is at the workstation level for displays and controls, with specialized RADAR control and signal processing hardware (on VME-bus based hardware). Data processing is still done by mainframe-class machines. At a finer level of granularity, the computational load is spread across processors, which may use Ada tasking as well as specialized, O.S.-specific memory and event interfaces.

Typical goals not met by today's systems include scarcity of adequate Ada implementations for parallel and vector processors or specialized single board computers, as well distributed processing in general because of large data stores and data latency issues. He indicated that a few processors can be used effectively, but not many.

Jeff then described their experience on one such successful system, the HAVE STARE (acronym not available) project, which uses Ada83. In this system, displays and controls functionality is distributed across several workstations, and track support loops are distributed across several general purpose processors with vector processors connected for signal processing. Other distributed processing includes specialized RADAR control and communications single-board computers, with signal processing performed by several processors within a single "data processor" machine. The HAVE STARE architecture thus consists of the single-board computer controlling the RADAR, another single-board computer for message processing, a multiprocessor "data processor" for the track loop, mission control, signal processing and data recording, and workstations for displays and controls. The "data processor" is a three-CPU VAX 9000 executing approximately 40 Ada tasks. The displays/controls workstations are VAX 4000 machines.

In the near term, Jeff indicates that there will be minimal new development of this class of system, as the DoD funding emphasis is to maintain existing systems. Furthermore, since existing systems were developed mostly before Ada was available, cost effective solutions for platform upgrades must reuse as much of the legacy design as possible. Ada is well positioned to aid in this requirement since it supports non object-oriented designs, where necessary.

He also indicated that Ada95's facilities in the Distributed Systems Annex would well meet the needs of distributed RADAR applications, via transparent remote subprogram calls and marshaling routines for platform independent data representation.

Finally, it was Jeff's opinion that requirements for very high availability are not yet such that distributed systems are typically proposed, because of the view that more hardware implies higher risk and higher test costs.

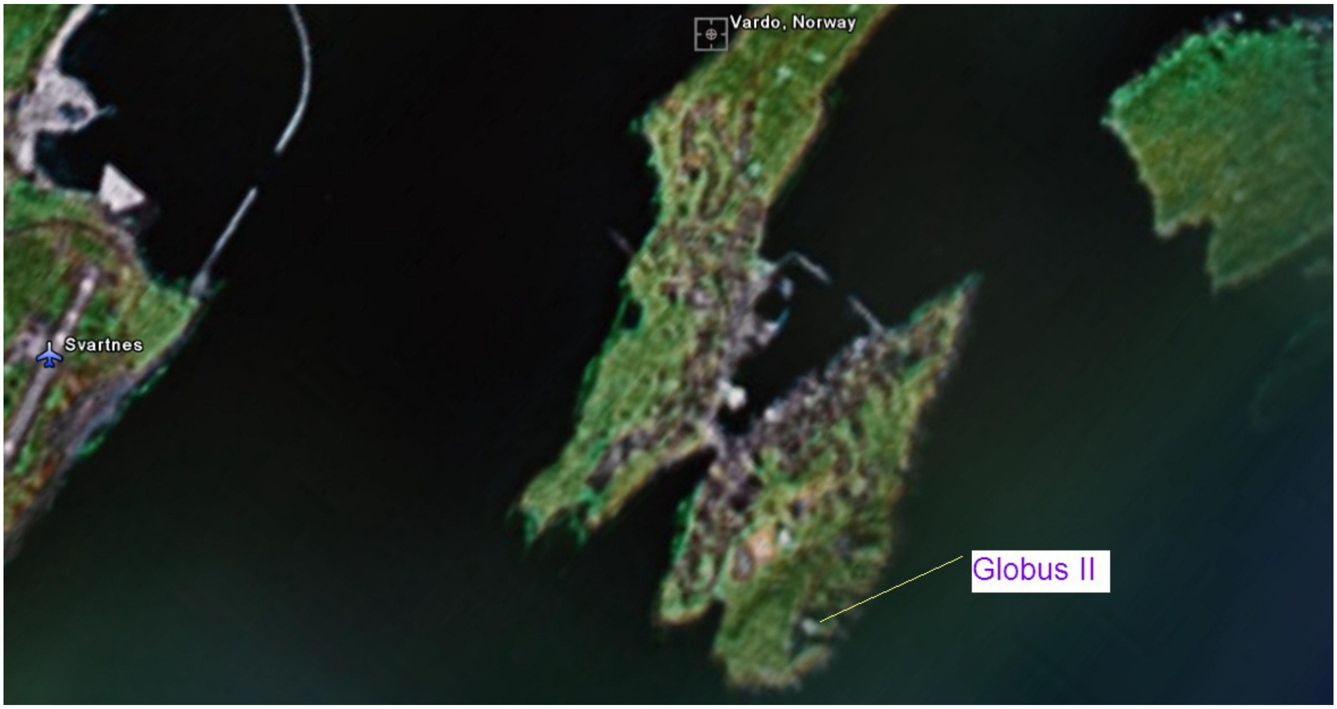
http://www.fbodaily.com/cbd/archive/1995/12(December)/04-Dec-1995/Jsol006.htm

COMMERCE BUSINESS DAILY ISSUE OF DECEMBER 4,1995 PSA#1482
Sacramento Alc/Pkxd, 3237 Peacekeeper Way/Suite 17, Mc Clellan Air Force Base Ca 95652-1060

J -- ENGINEERING SERVICES FOR MEDAL SOL F04606-96-R-17039 DUE 011996 POC For copy, contact the info office indicated., For additional information contact Watson.2ap/Pklxa/916-643-5690 Engineering Services for the Missile Warning and Space Surveillance Sensors (MWSSS) Engineering Development And Logistics (MEDAL) contract. The proposed acquisition includes logistics and engineering studies, software and hardware redesign, revision and development of supporting technical documentation packages, and qualification testing required for the support of Mission Critical Computer Resources (MCCR) and communication subsystems associated with the electro-optical, mechanical and phased array sensor systems which support the MWSSS portion of the Integrated Tactical Warning and Attack Assessment (ITW/AA) architecture. Specific sensor systems and their associated Software Programming Agencies (SPAs) to be supported are: a. Electro-Optical: AN/FSQ-114 Ground Based Electro- Optical Deep Space Surveillance (GEODSS) b. Mechanical: AN/FPS-129 (HAVE STARE), AN/FPS-79 (Pirinclik), AN/FPS-50/92 Ballistic Missile Early Warning System (BMEWS Site 2) c. Phased Array: AN/FPQ-16 Perimeter Acquisition Radar Attack Characterization System (PARCS), AN/PFS-85 (EGLIN), AN/FPS-120 (BMEWS Site 1), AN/FPS-126 (BMEWS Site 3), and AN/FPS-123 (PAVE PAWS). This announcement is for planning purposes only. This acquisition will be completed under streamlined source selection procedures IAW AF FAR Sup Appendix BB as supplemented. The Government intends to award a single indefinite quantity type contract with an ordering period of five years. MEDAL Industry Days will be held in February 1996 at Peterson AFB which will give an overall review of the requirement and a discussion on how the newly enacted Acquisition Reform initiatives will be implemented through the MEDAL contract. A draft Request for Proposal (RFP) is planned to be issued approximately April 1996, with the issuance of the formal RFP approximately July 1996. Firms interested in receiving a copy of the solicitation must submit a request in writing to: SM-ALC/AQ, Building 200, Room 36, 3237 Peacekeeper Way, Suite 7, McClellan AFB, CA 95652-1050, Attn: Pamela Watson (916) 643-5690. Responses should be received no later than 19 JAN 96. Verbal requests wil not be honored. Solicitations will be mailed to those firms providing documentation with their request which demonstrate the following screening criteria: 1) Ability to obtain security clearance of secret for facility and personnel, 2) knowledge or experience with the ITW/AA architecture. Potential offerors which fail to meet the screening criteria will nonetheless be provided a copy of the RFP upon request. The Government does not intend to award a contract on the basis of this notice or to otherwise pay for the information solicited except as provided in the subsection 31.205-18, Bid and Proposal (B&P) costs of the Federal Acquisition Regulation. FAX NUMBER: (916) 643-2021 No telephone requests. Only written or faxed requests received directly from the requestor are acceptable. (0334)

http://www.mda.mil/mdalink/pdf/chap7.pdf

[Reference] Hanscom Air Force Base, 1991. Final Environmental Assessment HAVE STARE Radar Development, Test, and Evaluation, Air Force Systems Command, Electronic System Division, February.



Location of Globus II at 70.3671 N, 31.1271 E http://www.maarithanssen.k-nettet.com/main/graphics/uploaded/357/globusII.jpg

http://home.online.no/~lhaughom/vardoe.htm

http://www.nrk.no/nyheter/distrikt/nrk_troms_og_finnmark/finnmark/1089418.html

Appendix A

"An Existing Large X-Band Dish Radar"

[Sourcebook note: The identity of the "existing Large X-Band Dish radar" is not known as of the date of this sourcebook. The corresponding 0603884C documents dated February 2006 and February 2007 make no mention of dish radars. It is possible that the function intended for the LXBDR will be performed by the GBR-P if it is moved to Europe.]

http://www.dtic.mil/descriptivesum/Y2006/MDA/0603884C.pdf

Missile Defense Agency (MDA) Exhibit R-2 RDT&E Budget Item Justification
Date February 2005

APPROPRIATION/BUDGET ACTIVITY
RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)
R-1 NOMENCLATURE

0603884C Ballistic Missile Defense Sensors

[EXCERPTS]

Note:

BMDS sensor improvements for delivery in Block 2008/Block 2010 timeframe will include the procurement of two X-Band Dish radars to augment the Forward Based X-Band Radar-Transportable (FBX-T) radar discrimination performance and the upgrade of an existing Large X-Band Dish radar to add sensor capabilities to the layered sensor concept.

Block 2008 efforts include:

- Upgrade an existing Large X-Band Dish radar to provide midcourse tracking and discrimination;

Upgrades to the existing Large X-Band Dish Radar will include software and signal processing enhancements to be completed for Block 2008. Upgrades will be based on SBX functionality and will include tracking and discrimination algorithms and connectivity capabilities. Procurement of the additional X-Band Dish radars will begin in FY07 with delivery in Block 2008 and Block 2010 respectively. Contractor Logistics Support will be provided to operate and sustain the radars. Support will include radar site survey, site preparations, personnel training, and radar system maintenance.

FY 2006 Planned Program:

- Initiate Studies for Large X-Band Dish upgrade

FY 2007 Planned Program:

- Award contract for upgrade of Large X-Band Dish radar
- Continue common software efforts for X-Band radars

An acquisition strategy will be developed in FY07 to upgrade existing Large X-Band Dish radar and to acquire two X-Band Dish radars for the FBX-T's, a Block 2008 and Block 2010 asset.

An acquisition strategy will be developed in FY07 to operate and sustain Large X-Band Dish radar and X-Band Dish radar for FBX-T radar.

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date February 2005
APPROPRIATION/BUDGET ACTIVITY RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE 0603884C Ballistic Missile Defense Sensors

I. Product Development Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2005 Cost	FY 2005 Award/ Oblg Date	FY 2006 Cost	FY 2006 Award/ Oblg Date	FY 2007 Cost	FY 2007 Award/ Oblg Date	Total Cost
Capability Development										
FBX-T Spiral Upgrade	SS/CPAF	Raytheon/ MA	0	0	N/A	5,100	1Q	106,255	1Q	111,355
FBX-T Radar #3	SS/CPAF	Raytheon/ MA	0	0	1Q	0	N/A	78,865	1Q	78,865
X-Band Dish Radar for FBX-T	C	TBD	0	0	N/A	1,000	1Q	10,000	1Q	11,000
Large X-Band Dish radar upgrade	SS/CPAF	Raytheon/ MA	0	0	N/A	2,000	1Q	19,000	1Q	21,000
Sensor for Asymmetric Threat Upgrade	CPAF	TBD	0	0	N/A	0	N/A	60,480	2Q	60,480
Subtotal Product Development			0	0		8,100		274,600		282,700

Remarks

UNCLASSIFIED

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date February 2005
APPROPRIATION/BUDGET ACTIVITY RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE 0603884C Ballistic Missile Defense Sensors

Fiscal Year	2004				2005				2006				2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition Milestones																																
Award Contract to Upgrade Large X-Band Dish Radar													Δ																			
Contract for Asymmetric Sensor Upgrade														Δ																		
Award Contract for 2 X-Band Dish Radar for FBX-Ts														Δ																		
Program Milestones																																
Complete Upgrade to Large X-Band Dish Radar																				Δ												
Deliver 1st X-Band Dish Radar for FBX-T Radar																					Δ											
Deliver FBX-T #3																						Δ										
Complete Upgrade to Asymmetric Sensor																						Δ										

UNCLASSIFIED

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date February 2005
APPROPRIATION/BUDGET ACTIVITY RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE 0603884C Ballistic Missile Defense Sensors

Schedule Profile	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Acquisition Milestones								
Award Contract to Upgrade Large X-Band Dish Radar				1Q				
Contract for Asymmetric Sensor Upgrade				2Q				
Award Contract for 2 X-Band Dish Radars for FBX-Ts				2Q				
Contract for Asymmetric Sensor Upgrade				2Q				
Program Milestones								
Complete Upgrade to Large X-Band Dish Radar					4Q			
Deliver 1st X-Band Dish Radar for FBX-T Radar						1Q		
Deliver FBX-T #3						2Q		
Complete Upgrade to Asymmetric Sensor						2Q		

Appendix B

Inverse Synthetic Aperture Radar (Range-Doppler) Images of Satellites Made with Globus II

~~REL NOR~~

GLOBUS II
Force Development Evaluation (FDE) & Fix Verification Test Final Report

Test Manager: Capt Dawn Githens
Lead Analyst: Mr Scott O'Connor

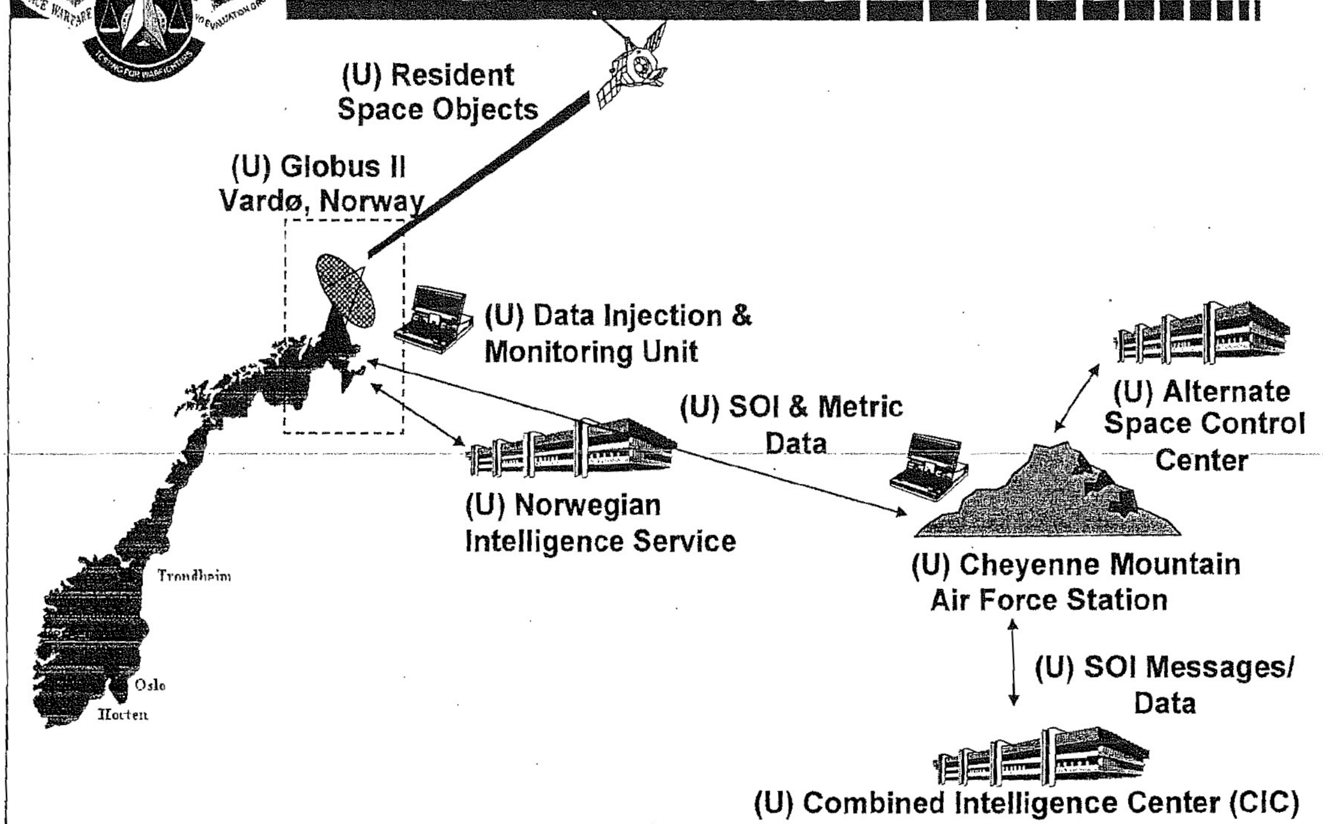
REL NOR

Current Status (U)

- (U) Force Development Evaluation (FDE)
  - (U) Conducted 13 Nov - 11 Dec 01
  - (U) 12 Category 1 deficiencies
    - (U) 2 identified prior to FDE / 10 identified during FDE
  - (U) Fix Verification Test required to correct mission critical deficiencies
- (U) Fix Verification Test (FVT)
  - (U) Conducted 26 Apr - 9 May 02
  - (U) 5 Category 1 deficiencies open
  - (U) Final Results -
    - 2 Satisfactory & 3 Unsatisfactory Critical Operational Issues (COIs)

UNCLASSIFIED

System Under Test (U)



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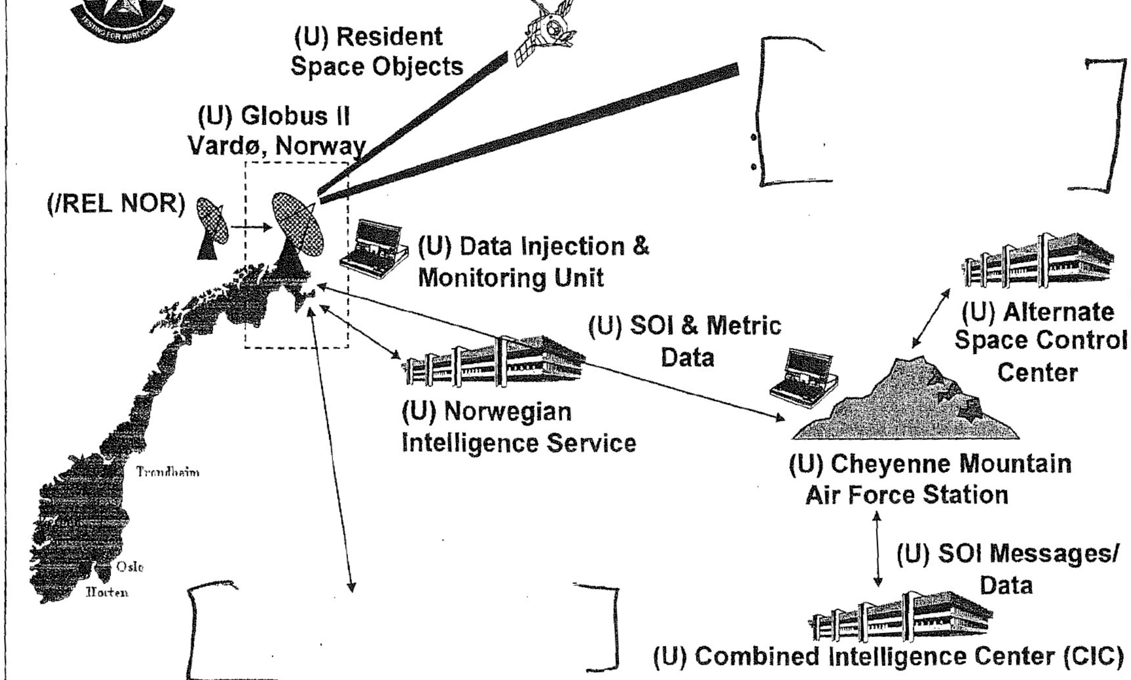
REL NOR

System Under Test (U)

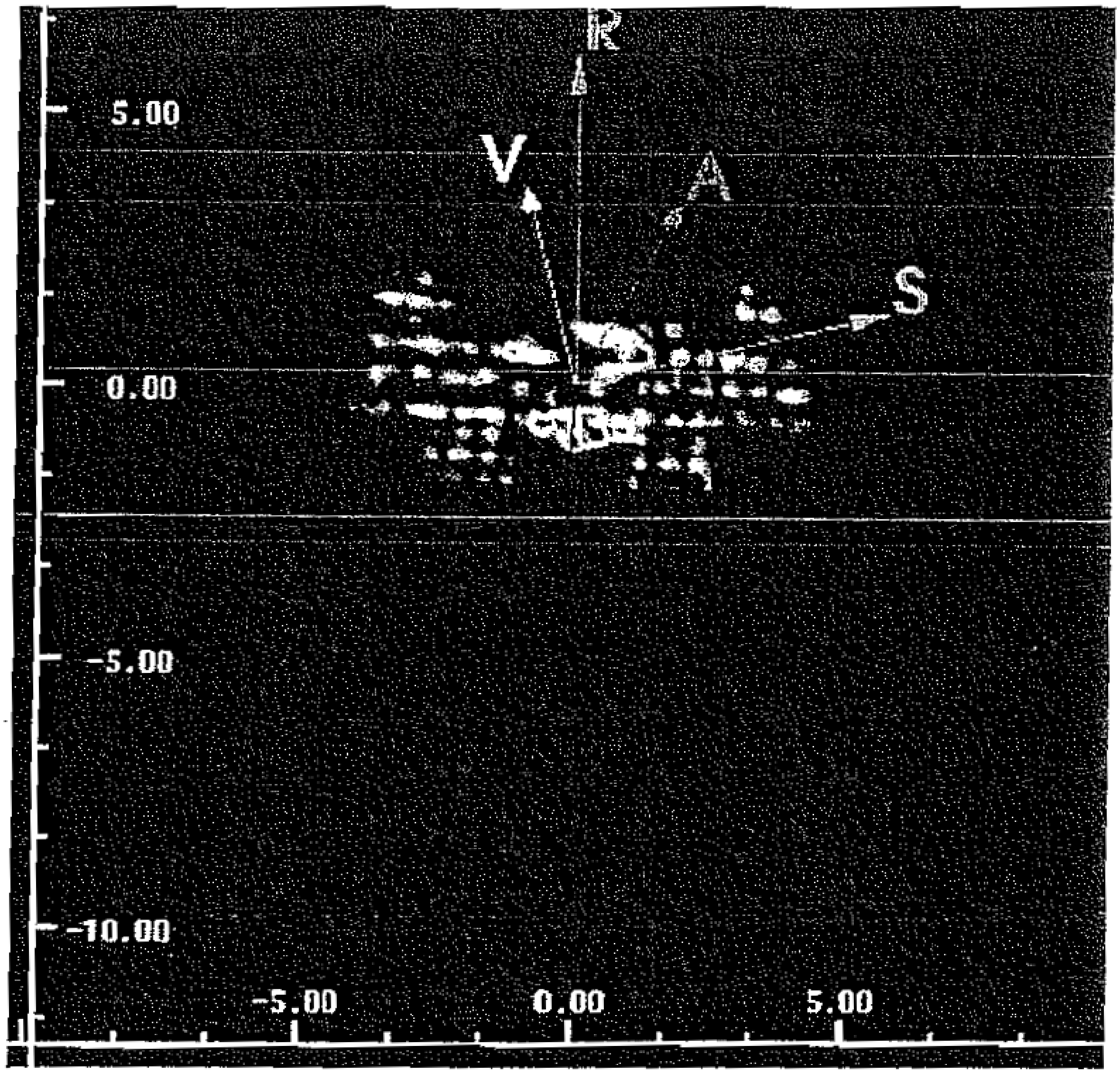


b(1)
1.5a
1.5b

REL NOR

Satellite 27409

At approximately 35,000km

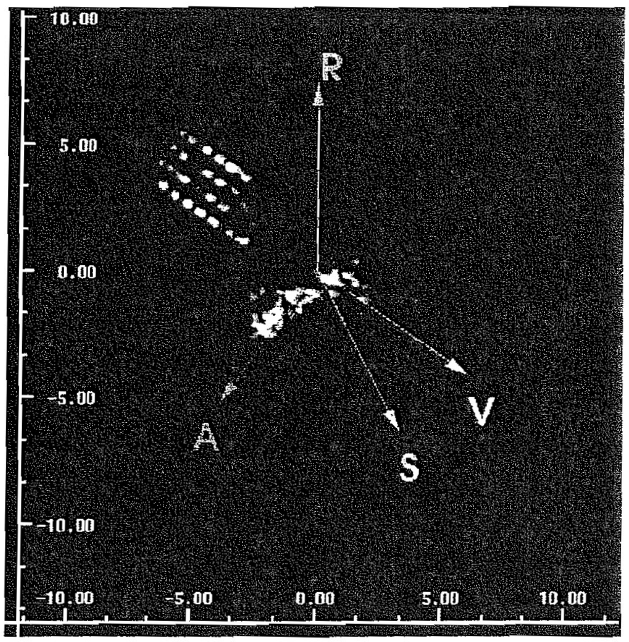


REL NOR

UNCLASSIFIED

[Cosmos 2388, an Oko-class Russian early warning satellite in a highly elliptical Molniya orbit. The range indicates the satellite was near apogee at 63 degrees north latitude at the time of imaging.]

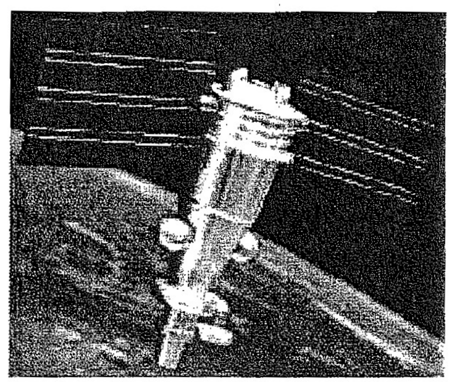
COI 2 Results (U)



Satellite 27382

Cosmos 2387

CIS Military Reconnaissance
Yantar 4K2 (Kobalt) Satellite



Appendix D

Research Opportunities using Globus II

www.cdi.org/pdfs/Korsbakken.pdf

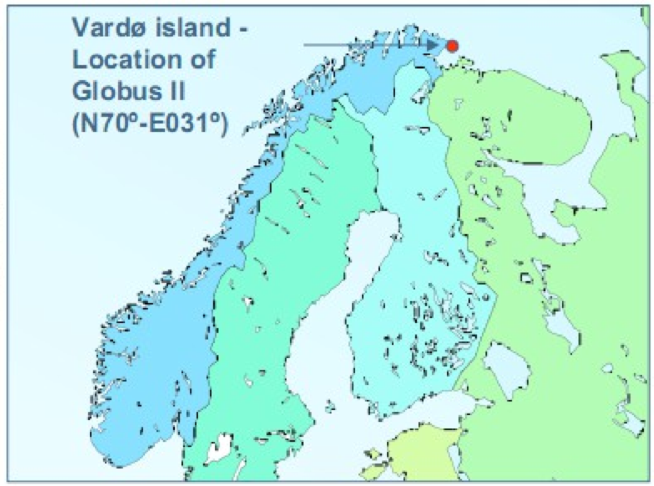
Globus II

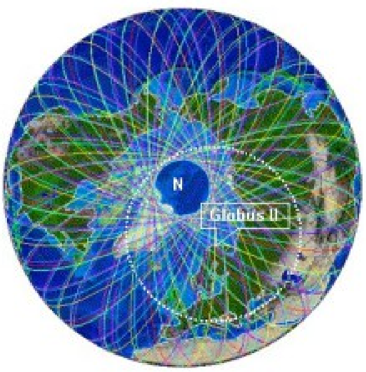
- Globus II is a cooperative project between Norway and US:
  - **US represented by Air Force Space Command**
  - **Norway represented by Norwegian Intelligence Service**
- Globus II was moved from Vandenberg, CA to Vardø in 1999
- It is a dedicated sensor in US Space Surveillance Network

Globus II

- FFI (Norwegian Defence Research Establishment) has been responsible for Globus II R&D activities since 1998
  - Test & evaluation
  - ISAR – imaging techniques
  - Space debris
  - Orbit determination

Location of Globus II





Provides excellent coverage of small objects in high inclination (polar) orbits

Covers GEO orbits from 0 to 90 degrees East

Globus II

- Frequency: X-band
  - **9.5 - 10.5 GHz**
- Mechanical target tracking
  - **Precision tracker**
  - **Single object**
- Range: more than 40 000 km
- Capability to provide data for ISAR* imaging

*Inverse Synthetic Aperture Radar

Globus II

- Peak power: 200 kW
- Cassegrain feed consept
  - 27 meter parabola
  - 3.15 m sub-reflector
  - 9.144 m focal length
  - Beam width < 0.1º

Data policy and procedures

- Limited amount of Globus II data can be made available, on a non-interference basis, for Norway, US and their partners for R&D activities
- The Globus II community has formalized procedures to handle external data sharing and product deliveries
  - Case by case or limited longer terms
  - Common approval NOR/US
- Application should specify what kind of data and intended use

Example of R&D cooperation with ESA

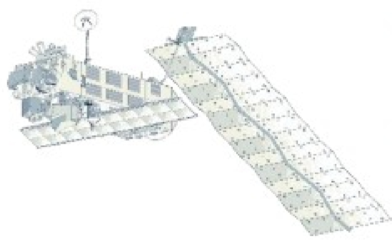
- Initial plans for a cooperation with European Space Agency (ESA) goes back to 1998
- ESA took the initiative by contacting the Norwegian Intelligence Service (NIS) after the Globus II establishment was known
- The Norwegian Space Centre was also involved and has supported the ESA contact
- Cooperation with ESA approved by NOR/US in March 2003

ESA study

- Small, one year study

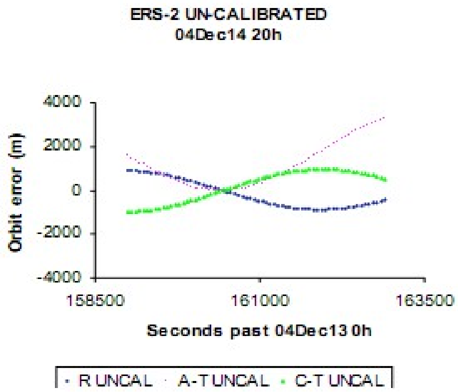
- Orbit determination
  - Carry out radar measurements of space objects (ESA satellites) with the Globus II radar, determine the orbit parameters and compare the results with known exact orbits from ESA.
  - Establish procedures for cooperative data exchange, for the benefit of current and future ESA missions.

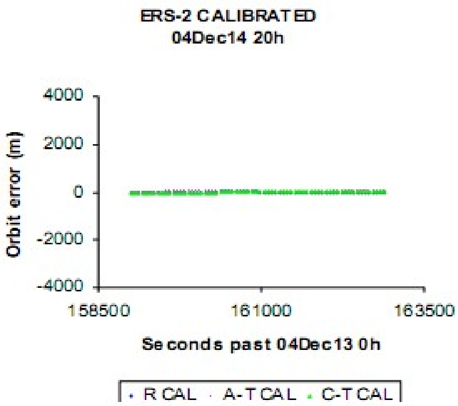
ESA study



- The study was supported by
  - the Norwegian Intelligence Service/US Space Command providing the Globus II data and
  - ESA providing the ERS and ENVISAT orbit files.

- The study was performed by FFI and the report was made available to ESA, US and Norway





ESA study: some conclusions

- For four or more passes:
  - Global max orbit errors:
    - 5-30 m radially
    - 40-120 m along-track
    - 20 m cross-track
  - Calibration improvement factors:
    - 2.8 radially
    - 2.2 along-track
    - 9.1 cross-track

- Uncalibrated single-pass solutions often diverges.
- Calibrated single-pass solutions usually converges

Summary

- The Globus II radar data can be available for R&D activities in US and Norway and shared with others after mutual approval.
  - FFI is the POC for this activities in Norway

- This has been supported e.g. for collaboration with ESA