

Follow-Up to FCC Request for Additional Information

Email Response from: Leann Nguyen, Leann.Nguyen@fcc.gov

Applicant: Fugro Earthdata, Inc.
 File Number: 0503-EX-PL-2014
 Correspondence Reference Number: 24408
 Date of Original Email: 07/02/2014

Mr. Sanford,

Based on US Military Association Group coordinator requested, your company needs a contract number to provide "contractual" work for the DOD and the DOD needs to provide a Stage 4 certification to develop this DOD system in non-government bands, and once the contract related work is done, the DOD needs to obtain an assignment from NTIA to continue using it. Without providing the requested information above, we are unable to process your application.

RESPONSE:

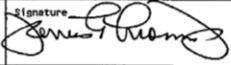
1 Stage-4 Certificate

The GeoSAR radar mapping instrument received its Stage-4 Operational Certificate dated: 06 October 2003. Figure 1 is a copy of the cover page; see the attachments for the full text of the Stage-4 License.

The GeoSAR system is NOT a new development. It was developed by DoD from 1998 to 2003, and subsequently upgraded by DoD three times between 2004 and 2008.

DoD and other USG agencies, (e.g., NGA (now NIMA), NRL, NOAA, and USGS) have periodically used the GeoSAR system since 2002 for mapping missions of National importance.

Figure 1: GeoSAR Stage-4 License Cover Page

UNCLASSIFIED				
MILITARY COMMUNICATIONS ELECTRONICS BOARD (MCEB)				
EQUIPMENT FREQUENCY ALLOCATION GUIDANCE				
Military Department	Equipment	Stage		
Army Air Force	Geographic Synthetic Aperture Radar (GeoSAR)	4 - Operational		
Section 1: OPERATING CHARACTERISTICS FOR MCEB SUPPORT				
Enclosure Number	Description	Dated		
1	J/F 12/7417/2	06 Oct 03		
Section 2: OPERATING CHARACTERISTICS FOR MCEB SUPPORT				
Frequency	Emission	Power	Stage 4 Type of Service	Operating Location
9625.5 - 9794.5 MHz	169MQ3N	Peak 2 kWatts	Radiolocation	US & P
265.5 - 434.5 MHz		1 kWatts		
Section 3: MCEB GUIDANCE				
1. The enclosed application as described above is approved for operational use in the US&P, subject to the guidance below. 2. For the intended use in the radiolocation service, the subject system is in accordance with the US and ITU Tables of Frequency Allocations for the 9625.5 - 9794.5 MHz band and over portions of its operating range for the 265.5 - 434.5 MHz band. 3. Based on the information provided, a. the equipment complies with the requirements of the NTIA Manual Section 5.2. b. the equipment complies with the requirements of the NTIA Manual Section 5.5 (RSEC) Criteria C for the 265.5 - 434.5 MHz band. c. the equipment complies with the requirements of MIL-STD-469A Criteria C, Category 1 for the 265.5 - 434.5 MHz band. d. the equipment complies with the requirements of the NTIA Manual Section 5.5 (RSEC) Criteria B for the 9625.5 - 9794.5 MHz band.				
Steering Member ESG Working Group MCEB Frequency Panel	Signature 	Date NOV 5 2003	IRAC/SPS Number Doc. 33267/1 SPS-13976	Page 1 of 2
Downgrading Instructions Classified by: Declassify on:		NA	Distribution J-12 Holders	MCEB J-12 Number J/F 12/7417/3

UNCLASSIFIED

2 Important Historical Background Information

This section provides important contextual background information relevant to DoD interest in the GeoSAR System, justifying an ongoing commitment by both DoD and Fugro Geospatial to operational readiness.

2.1 GeoSAR Phase-II

GeoSAR Phase-I was a DARPA proof of concept R&D program which demonstrated the feasibility of generating terrain maps beneath obscuring foliage. A Consortium of NASA's Jet Propulsion Laboratory (JPL), the California Department of Conservation, and Calgis (later EarthData) was formed to develop the GeoSAR System as a "Dual-Use" (military and commercial) sensor. The Phase-II program was congressionally authorized in 1998. The DoD development contract type utilized the newly established "Other Transactions"¹ contracting paradigm and DARPA was assigned the originating DoD contractor. The system called for beneath the foliage terrain mapping utilizing the emerging interferometric synthetic aperture radar (IFSAR) technology JPL demonstrated in the Phase-I feasibility Program. Figure 2 is a copy of the cover sheet from DARPA Contract (MDA272-96-3-0017) along with the ~\$30.5M in payable milestones associated with the activity.

MDA972-96-3-0017

**GEOSAR PHASE II.
A RADAR-BASED
TERRAIN MAPPING PROJECT**

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
Information Systems Office
3701 North Fairfax Drive
Arlington, VA 22203-1714

Attention: Dr. Mark Davis
Program Manager

**AGREEMENT BETWEEN THE GEOSAR CONSORTIUM AND THE DEFENSE
ADVANCED RESEARCH PROJECTS AGENCY
CONCERNING
RESEARCH AND DEVELOPMENT OF THE APPLICATION OF A
DUAL-FREQUENCY, FOLIAGE PENETRATING, INTERFEROMETRIC GEOGRAPHIC
SYNTHETIC APERTURE RADAR SYSTEM**

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

By: _____
Ron H. Register
Deputy Director for Management

Date: _____

Consortium Members' Concurrences:

The State of California,
Department of Conservation
Sacramento, California

By: _____
John H. Burton
Assistant Director

The California Institute of Technology,
Jet Propulsion Laboratory
Pasadena, California

By: _____
Edward C. Stone
Director

The GeoSAR Consortium

By: _____
John H. Burton
Lead Party Representative
Consortium Management
Committee

Date: 6/20/96

Calgis, Inc.
Fresno, California

By: _____
Gerald S. Dildine
President

MDA972-96-3-0017

ATTACHMENT NO. 3
SCHEDULE OF PAYMENTS AND PAYABLE MILESTONES

DATE (Start +)	MILESTONE NAME	DARPA MILESTONE PAYMENTS	CUMULATIVE MILESTONE PAYMENTS (\$ x 1,000)
Start	Contract Initiation	\$6,710	\$6,710
6 months	GIS/Radar Documents	\$2,610	\$9,320
12 months	P-Band Transmitter & Receiver	\$8,395	\$17,675
18 months	AC Modifications Procurement	\$3,745	\$21,420
24 months	Radars Installed on Aircraft	\$5,010	\$26,430
30 months	Validation Experiment Plan	\$4,030	\$30,460

* "Start" based on execution of contractual documents in July '96

AGREEMENT BETWEEN THE GEOSAR
CONSORTIUM AND DARPA
JUNE 18, 1996 PAGE 32 OF 38

Figure 2: Cover Page for GeoSAR Phase-I, DoD Contract MDA272-96-3-0017

¹ OT prototype authority may be used only to carry out prototype projects that are directly relevant to weapons or weapon systems proposed to be acquired or developed by the Department. As such, any resulting OT awards are acquisition instruments since the government is acquiring something for its direct benefit. "Other Transaction" Authority (OTA) for Prototype Projects, P. 12 http://www.google.com/url?url=http://www.acq.osd.mil/dpap/docs/otguide.doc&rct=j&frm=1&q=&esrc=s&sa=U&ei=4P3DU6WcOeHIsAT0m4KgBg&ved=0CBQQFjAA&usq=AFQjCNGCH_ehh1iRFs4XsCnUzq4-DPCgow

2.2 GeoSAR Phase-III

Technical issues and nuances associated with this new mapping technology were formidable, necessitating an extension to the development program. DARPA passed contracting responsibility to NIMA (National Imagery and Mapping Agency), now NGA (National Geospatial-Intelligence Agency). A copy of the new Other Transactions (OT) agreement as reported in “Department of Defense Annual Report on Cooperative Agreements and Other Transactions Entered into During FY2000 Under 10 USC 23712”, is shown in Figure 3. Justification for the new OT agreements emphasizes: *“the Government obtaining preferential access for use of the commercialized GeoSAR system”*; *“the collaborative relationship between EarthData/Calgis and NIMA”*; *“EarthData/Calgis’ in-kind contribution of a Gulfstream II aircraft on which the GeoSAR system is mounted is a significant benefit”*; and *“...NIMA will receive royalties from the sale price that EarthData/Calgis receives from any non-Governmental customer for GeoSAR services.”*

Agreement Number: NMA201-00-9-1001

Type of Agreement: Other Transaction for Prototype

Title: Geographic Synthetic Aperture Radar (GeoSAR) Phase III

Awarding Office: National Imagery and Mapping Agency, Procurement and Contracts Office in Support of Acquisition and Technology Directorate (NIMA/PCA)

Awardee: EarthData Holdings, Inc.

Effective Date: 09 Mar 2000

Estimated Completion or Expiration Date: 30 May 2002

U. S. Government Dollars: \$ 27,673,715

Non-Government Dollars: \$ 0

Dollars Returned to Government Account: \$ 0

Technical objectives of this effort including the technology areas in which the project was conducted:

The objective of this Phase III effort is to test and commercialize an operational prototype application of a dual-frequency, foliage-penetrating, interferometric synthetic aperture radar system.

Extent to which the cooperative agreement or other transaction has contributed to a broadening of the technology and industrial base available for meeting Department of Defense needs:

The use of an other transaction agreement has contributed to a broadening of the technology and industrial base by providing the Government access to a new commercial technology, an airborne, radar-based system for the mapping of the ground under foliage-covered terrain.

Extent to which the cooperative agreement or other transaction has fostered within the technology and industrial base new relationships and practices that support the national security of the USA:

The use of an other transaction has resulted in the Government obtaining preferential access for use of the commercialized GeoSAR system. Other benefits expected to be achieved because of the collaborative relationship between EarthData/Calgis and NIMA, include the flexibility to redirect the technical direction of the contractor, the incentive EarthData/Calgis has to succeed, and the use of commercial practices.

Other benefits to the DOD through use of this agreement:

The use of an other transaction has resulted in an additional benefit, not addressed above. EarthData/Calgis’ in-kind contribution of a Gulfstream II aircraft on which the GeoSAR system is mounted is a significant benefit resulting from this 845 agreement. In addition, NIMA will receive royalties from the sale price that EarthData/Calgis receives from any non-Governmental customer for GeoSAR services.

(Emphasis added)

Figure 3 GeoSAR Phase-III Other Transaction Contract Summary

The GeoSAR system became commercially operational in Oct 2003. NEMA (NGA) immediately began tasking it for critical below the jungle mapping in Columbia.

² Department of Defense. Annual Report on Cooperative Agreements and Other Transactions Entered into During FY2000. Under 10 USC 2371, p. 237, (accessed 14Jul2014), www.acq.osd.mil/dpap/Docs/FY00RPT.doc

2.3 DoD Directed Improvements for GeoSAR

From 2004 through 2008, NGA funded three separate GeoSAR System Improvement Program(s) (GSIP) specifically targeting modernization and performance enhancement needed to support evolving NGS needs. These improvements are summarized in Figure 4.

Phase & Dates	Improvement Activity	Funding Level
GSIP Phase-1 2004–2005	Replace tape-based recording system with a disc-based recording system; increase acquisition rate from 128MBS to 380MBS; add 2 additional radar data recording channels	\$8.6M
GSIP Phase-2 2006–2007	Upgrade to fully polarimetric capability in support of NGA's needs for detecting cultural features beneath dense jungle foliage. ³	\$4.0M
GSIP Phase-3 2007–2008	In-field deployable processor generating for quick-look, rapid response IFSAR data products.	\$5.0M

Figure 4: GeoSAR System Improvement Programs

2.4 GeoSAR Contributions to National Mapping Needs

Under NGA commercial data buys, GeoSAR has delivered over 635,000 sqkm of fully compliant 3m X band reflective MAG and DSM and 5m P-band penetrative MAG and DSM over Columbia, South America. For the USGS, over 182,000 sqkm of 5m penetrative, first surface DEM data has been delivered for some of the most difficult terrain in North America, including the rugged glacier encrusted Mt. McKinley. For the Australian government, over 333,000 sqkm of GeoSAR 5m reflective and penetrative DSMs and MAGs, plus 1.25m X-band and P band MAG imagery were delivered to support TLM generation of Papua New Guinea. In summary, GeoSAR is a proven airborne commercial IFSAR mapping system that generates high quality penetrative and reflective surface data over all terrain and canopy types.

GeoSAR's sensor and platform capabilities are summarized in Figure 5, and an X-band vs. P-band penetrative example from an NGA commercial acquisition in Columbia is shown in Figure CA-XXX.

Characteristic	Capability	Characteristic	Capability
Ground Sample Distance DEM/DSM	X-band DSM, 3m	Frequency: X-band (3cm)	9630–9790 MHz
	P-band Penetrative DSM, 5m	Frequency: P-band (85cm)	270–430 MHz
Ground Sample Distance Reflective Surface Imagery	Coregistered to DSM or DEM, 1m posting available	Geopositional Accuracy	< 5m RMSE
		Swath Width (either band)	12 km
Flying Height	11.5 km Barometric	Acquisition Speed	450 kts
Duration	4.5 Hrs	PRF (Radar Pulse Rep Frequency)	500 Hz (IFSAR)
Dual Sided, Single Pass X & P, Profiling Lidar, 380MBS Raw data recording bandwidth, JPL IFSAR processing algorithms			

Figure 5: **GeoSAR Sensor/Platform Capabilities.** The GeoSAR's platform is optimized for maximal dual band IFSAR mapping performance over difficult terrain and multicanopy foliage.

[1] ³ Reis, James J, Hensley, Scott, Williams, Mark A., Woods, Don, "Updating GeoSAR for Full-pol Interferometric Capability," Radar Conference, 2009 IEEE, 4-8 May 2009.

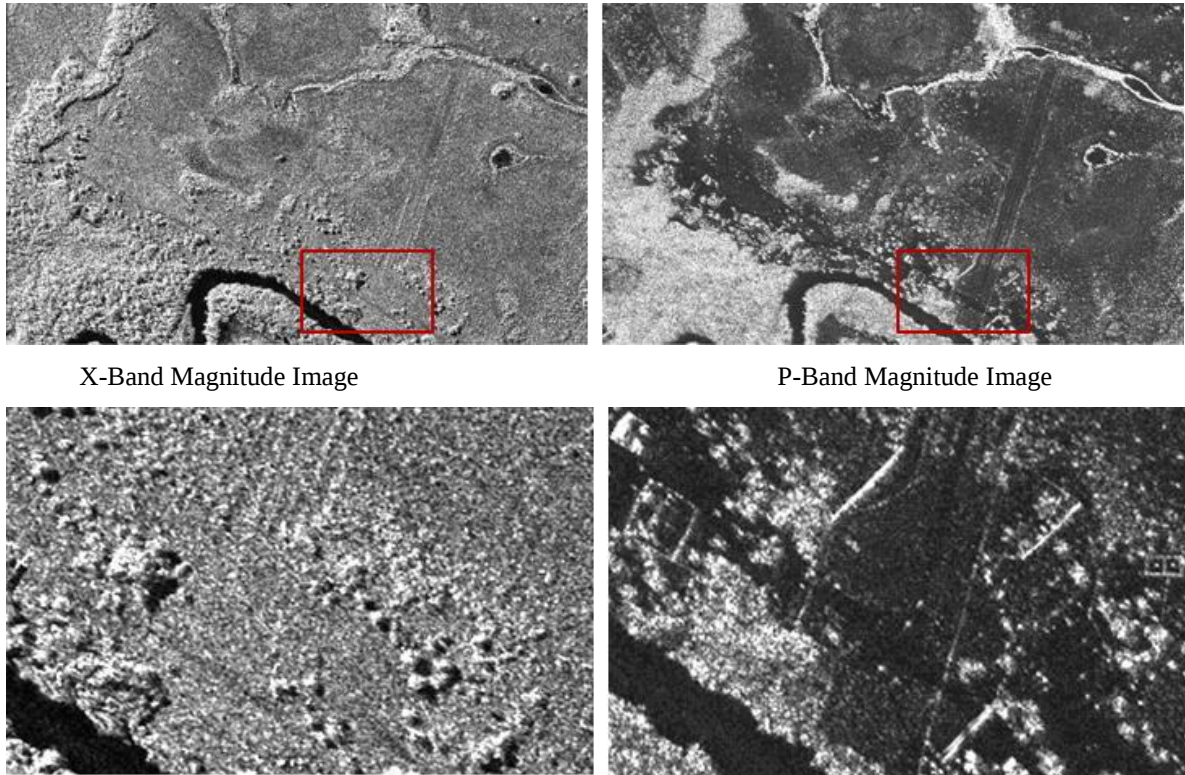


Figure 6: NGA analysts used this commercial GeoSAR P- band foliage penetration image to discover illegal terrorist activity, otherwise completely masked by tree canopy. Reference: NGA Commercial Remote Sensing (CRS) Guide, September 2007, page 22, Figure 10

2.5 Summary of DoD Involvement in GeoSAR Development

The four previous sections details the close nature between DoD interests in the GeoSAR System and Fugro Geospatial's commitment to DoD to keep GeoSAR operationally ready *at our expense*, so when a DoD or USG requirement emerges, we are ready to respond. GeoSAR is a not merely a commercial sensor, but rather from the beginning GeoSAR has been developed as a *dual use sensor*, where the US Government has priority access to the *world's only single pass foliage penetration mapping sensor* for immediate tasking at commercial rates; furthermore, Fugro Geospatial maintains the care and feeding the GeoSAR system and its technical infrastructure at no direct charge to the Government by using the excess capacity of the sensor for commercial activities. DoD has invested some \$76M over the last dozen years in developing this on-call capability, while *yearly* Fugro Geospatial spends nearly \$8M on staffing and fixed-cost logistics support of this unique system.

We are committed to keeping the system operationally ready and to improving the reliability and capability of the system and the quality of the mapping products it alone can generate. However, since GeoSAR is an active system *we rewire about a dozen hours per year to verify system functionality and to perform routine periodic calibration operations*. These overhead activities are not associated with a particular contract, per se, but are a necessary part of the upkeep associated with a system as sophisticated as GeoSAR.

Given all of the direct benefits to DOD and other USG agencies, and given the fact that DoD contracted over \$76M for GeoSAR's dual-use development, specifically designed to provide the US government with an affordable, long term access to a highly specialized commercial mapping sensor, we believe that DoD should continue to sustain the viability of this unique system by minimal routine testing and system calibration. This routine activity has been in place since 2003, with the issuance of our Stage-4 license, without a single complaint or violation. We believe that it remains in DoD's interest to continue the GeoSAR frequency access protocol. While the support costs for GeoSAR are paid for by Fugro Geospatial, a commercial entity, GeoSAR does not represent a purely commercial sensor attempting to gain

preferential access to frequencies reserved for Government operations. GeoSAR is a DoD sensor whose *dual-use legal status under DoD directives*, marks it for special consideration.

We ask that the FCC take under advisement the foregoing facts while considering our application for continuing to provide the frequency license for the GeoSAR system for maintenance and calibration to keep it operationally ready for DoD tasking, which is our perpetual duty under the dual-use agreement. We close by noting, that frequency approvals for actual USG sponsored mapping missions within CONUS and its possessions will continue to be obtained separately on a case-by-case basis, according to the principles established in our Stage-4 license.

Thank you for your kind consideration.