

2. Amendment/Modification No. P00003	3. Effective Date 2004SEP17	4. Requisition/Purchase Req No. SEE SCHEDULE	5. Project No. (If applicable)
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6. Issued By TACOM WARREN AMSTA-AQ-ABGA KATHY LAMBERT (586)574-7634 WARREN, MICHIGAN 48397-5000 HTTP://CONTRACTING.TACOM.ARMY.MIL EMAIL: LAMBERTK@TACOM.ARMY.MIL	Code	W56HZV	7. Administered By (If other than Item 6) DCMA DALLAS 600 N PEARL STREET SUITE 1630 DALLAS, TX 75201-2843	Code	S4402A
			SCD C PAS NONE ADP PT HQ0339		

8. Name And Address Of Contractor (No., Street, City, County, State and Zip Code) LOCKHEED MARTIN CORPORATION 1701 W. MARSHALL DRIVE GRAND PRAIRIE, TX. 75051-2704 TYPE BUSINESS: Large Business Performing in U.S.	<input type="checkbox"/>	9A. Amendment Of Solicitation No.
	<input type="checkbox"/>	9B. Dated (See Item 11)
	<input checked="" type="checkbox"/>	10A. Modification Of Contract/Order No. DAAE07-03-C-L152
Code 64059 Facility Code		10B. Dated (See Item 13) 2003SEP26

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers is extended, is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing items 8 and 15, and returning _____ copies of the amendments; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. **FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER.** If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. Accounting And Appropriation Data (If required)
NO CHANGE TO OBLIGATION DATA

13. THIS ITEM ONLY APPLIES TO MODIFICATIONS OF CONTRACTS/ORDERS

It Modifies The Contract/Order No. As Described In Item 14.

<input type="checkbox"/>	A. This Change Order is Issued Pursuant To: The Contract/Order No. In Item 10A.	The Changes Set Forth In Item 14 Are Made In
<input type="checkbox"/>	B. The Above Numbered Contract/Order Is Modified To Reflect The Administrative Changes (such as changes in paying office, appropriation data, etc.) Set Forth In Item 14, Pursuant To The Authority of FAR 43.103(b).	
<input checked="" type="checkbox"/>	C. This Supplemental Agreement Is Entered Into Pursuant To Authority Of: Mutual Agreement of the Parties	
<input type="checkbox"/>	D. Other (Specify type of modification and authority)	

E. IMPORTANT: Contractor is not, is required to sign this document and return _____ copies to the Issuing Office.

14. Description Of Amendment/Modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

SEE SECOND PAGE FOR DESCRIPTION

Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. Name And Title Of Signer (Type or print)	16A. Name And Title Of Contracting Officer (Type or print) DEREK MCALEER MCALEERD@TACOM.ARMY.MIL (586)574-7197
15B. Contractor/Offeror (Signature of person authorized to sign)	15C. Date Signed
	16B. United States Of America By _____ /SIGNED/ (Signature of Contracting Officer)
	16C. Date Signed 2004SEP17

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SECTION A - SUPPLEMENTAL INFORMATION

1. The purpose of this modification P00002 is to make minor changes to the scope of work (Section C). The contract is changed as follows:

a. SECTION C - Para. C.3.2, sentence 5 which states that "Tagged polygons shall be exported to CTDB (Compact Terrain Database)/Open Flight Databases and export to external software shall be estimated" is deleted and replaced with "Tagged polygons shall be exportable to CTDB (Compact Terrain Database)/Open Flight Databases and export to external software shall be estimated."

- Paragraph C.3.2.1, first sentence which states that "The contractor shall make external ancillary data available for eCognition and make eCognition results available for CTDB databases." is deleted and replaced with "The contractor shall make external ancillary data available for eCognition and make eCognition results available for CTDB data base conversions."

- Paragraph C.3.2.4, first sentence which states that "The contractor's software shall produce and export maps in digital format for CTDB and Open Flight as identified by the COTR." is deleted and replaced with "The contractor's software shall produce and export maps in digital format convertible to the CTDB and Open Flight as identified by the COTR".

2. There is no change in the total amount or the total funded amount of the contract.

3. All other terms and conditions of the contract remain unchanged and in full force and effect.

*** END OF NARRATIVE A 003 ***

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SECTION C - DESCRIPTION/SPECIFICATIONS/WORK STATEMENT
SECTION C STATEMENT OF WORK

C.1 General

C.1.1 The contractor, as an independent contractor and not as an agent of the Government, shall conduct the activities called out in this Statement of Work.

C.2 Overview

The contractor shall develop detailed polygon-based mobility and threat avoidance maps derived from overhead images for use in tactical UGV (Unmanned Ground Vehicle) operations. The contractor shall integrate commercial off the shelf (COTS) image processing software with existing government mobility, threat avoidance and route planning software assets to generate the required mapping information. The basic effort is broken into three basic tasks: Development of a Mobility Map Generator, UGV Route Planner/Operator Interface, and the embedding of the eCognition enterprise into the NGIA (National Geospatial-Intelligence Agency) environment.

C.3 Mobility Map Generator - Task One

The contractor shall provide an enhancement of previously demonstrated image reduction capabilities in the Definiens eCognition software suite and the tailoring of that product to UGV operations. The software shall ingest satellite and other overhead imagery and generate a matching DEM (Digital Elevation Map) and polygon feature map of the imaged area. To accomplish this effort, the contractor shall complete the following:

C.3.1 Overhead imagery/meta data procurement

The contractor shall acquire overhead imagery and metadata from a Government designated test facility (to be named later) for both winter and summer time conditions. The Government will provide assistance to the contractor in scheduling a test site as necessary.

C.3.2 Develop Mobility Map Generator.

The contractor shall develop a mobility map generator with the application rules base development to include the import and incorporation of external data sources for characterization of drivability features to the existing Wizard for Advanced Feature Extraction (WAFE) software. All polygons shall carry source data information as available within the selected database. All polygons shall include precise geophysical location. Any region of the data that is unclassifiable shall be marked/tagged and a message to the operator will be initiated or written to a log file. Tagged polygons shall be exportable to CTDB (Compact Terrain Database)/Open Flight Databases and export to external software shall be estimated. The following subtasks shall also be completed in this phase of the development.

C.3.2.1 - Integrate Meta Data

The contractor shall make external ancillary data available for eCognition and make eCognition results available for CTDB data base conversions. The data shall consist of, as a minimum, soil characterization, weather, vegetation, and raw laser altimeter and/or NASA STS (National Aeronautics and Space Administration Space Transportation System) earth Radar Return data, and handled in the following manner:

- Acquire data base description to include soil characterization, weather, vegetation, and raw laser altimeter and/or NASA STS earth Radar Return data
- Data import from files
- Convert soil, weather and vegetation data into eCognition readable form
- Get raw laser altimeter and/or NASA STS earth Radar Return data
- Specify reading procedures
- Data export in files
- Convert current export files readable for Open Flight Data Base
- Explore current export files readable for mobility software program
- Explore current export to files readable for other formats as necessary to address changed requirements

C.3.2.2 Core Application Development

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The contractor shall ensure that the software is able to:

- Identify valid data (no clouds)
- Identify basic landcover classes
- Water bodies, vegetation - non vegetation, building, sealed area, bare soil, roads
- Further characterize data using weather and roughness data
- Wet and dry bare soil
- Smooth, rough, very rough surface
- Specify roads by:
 - Road type, wetness, roughness, soil type, road width

Obstacles, visible in changed roughness or large enough will be analyzed for suitability for inclusion in the database.

C.3.2.3 Enhanced Application Development/Automated mobility map generator. The contractor's core application algorithms shall be enhanced to address changed requirements as they become defined (including change detection) and to enable minimum manual interaction and extended wizard development. Output will be tagged polygons.

C.3.2.4 Produce Drivability Maps for User Selected Test Site

The contractor's software shall produce and export maps in digital format convertible to CTDB and Open Flight as identified by the COTR. The maps will include digital maps with tagged polygons, reliability maps, and indication of manual postprocessing.

C.3.2.5 Develop and integrate Open-Flight map export options

The contractor shall develop a dedicated export interface enabling export of results suitable for CTDB/Open Flight databases, to an external software program and to a specific terrain representation file (both of the contractor's choosing).

C.3.2.6 Develop Operator GUI (Graphical User Interface)

The contractor will develop an enhanced GUI interface that provides a simplified front end to the eCognition processing tasks. The contractor shall ensure the GUI will be suitable for later upgrade to batch, embedded, and fully automatic operations.

C.4 UGV Route Planner/Operator Interface - Task Two

This effort is broken down into two components:

C.4.1 UGV Route Planner Subtask One - The contractor shall integrate two existing government tools (NRMM2 (NATO Reference Mobility Model 2) mobility model and Pathfinder threat aware route planning suite) into a callable library format suitable for embedding and capable of ingesting the data provided by the Mobility Map Generator. The resulting software library will render the UGV both detailed detection avoidance and high speed corridor navigation over the entire area imaged and processed in the Mobility Map Generator.

C.4.2 Operator Interface Subtask Two - The contractor shall Integrate the total software suite and their maps into a DIS (Distributed Interactive Simulation)/Open-Flight environment capable of further exercising and testing on any area for which overhead imagery exists. Included in this effort is a network aware UGV route-planning tool capable of using static and dynamic threat lay downs to generate and display tactical UGV routes within the imaged area.

C.4.2.1 UGV Route Planner

The contractor shall use the existing government NATO Reference Mobility Model 2(NRMM2) and Pathfinder mobility calculation and route planning assets to develop the route planner. The Route Planner shall iteratively compute the route that best fits the input criteria. The calculated route shall be sent to the operator interface for conformation or request for recalculation.

C.4.2.2 Operator Interface

The contractor shall develop the UGV operator interface to allow the operator to test and interact with the Route Planner and review the results/effects of this interaction and the effects of threats, obstacles, and terrain features on route generation. Initially the operator interface shall consist of a mission parameter interface (to enable the operator to input mission criteria, cost , and other

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factors and request that a route to be generated) and a UGV control interface (to allow the operator to hide or display the UGV projected route, instruct the UGV to accept or reject the projected route, and command the UGV to go or stop).

C.4.2.3 In the process of developing the Route Planner/Operator Interface the contractor shall accomplish the following tasks:

C.4.2.4 - Soil characterization

The contractor shall develop methodology in remote soil characterization suitable for ingestion by NRMM2 and Pathfinder toolsets.

C.4.2.5 - Encapsulate NRMM2 and Pathfinder software

The contractor shall encapsulate and deliver NRMM2 and Pathfinder into a standalone JAVA (machine independent) library capable of being called as required by the UGV Route Planner/Operator Interface.

C.4.2.6 UGV Portrayal

The contractor shall tailor NRMM2 inputs to accurately portray a UGV of the Government's choice in NRMM2.

C.4.2.7 GUI Requirements Definition

The contractor shall perform requirements definition and development of the GUI for the route planner and operator interface

C.4.2.8 Route Planner Interface

The contractor shall integrate and test route planner/interface with NRMM2 and Pathfinder callable modules

C.4.2.9 Mobility Map data ingestion

The contractor shall integrate and test for ground truth Open-Flight data export and mobility map ingestion options from eCognition.

C.4.2.10 Demonstrate hardware/software

The contractor shall Deliver and demonstrate the full hardware/software suite to the customer.

C.5 Embedding of the eCognition enterprise into the NGIA environment - Task Three

This effort is broken down into four components:

C.5.1 Increase interoperability and improve workflow Subtask One - The contractor shall embed eCognition in NGIA's environment and enable a smooth, error avoiding and reproducible workflow. The contractor shall ensure that the number of necessary data exchanges between different software packages will be reduced or simplified.

C.5.1.1 Continuous software development and review with NGIA

The contractor shall ensure that eCognition Enterprise within the NGIA work environment achieves maximum functionality/payoff given the available resources. The contractor shall

- Install eCognition in its current version at NGIA
- Identify bottlenecks in workflow
- Install an updated version (mid term review)
- Train analysts to use updated version
- Refine requirements (workflow review II)
- Install a final version.

C.5.1.2 Improve file exchange

The contractor shall simplify the data exchange with the integration of C++ libraries to import/export Vector Product Format(VPF).

C.5.1.3 Improve operational workflow of eCognition enterprise in NGIA environment.

The contractor shall develop an open architecture by API (Application Programmer's Interface) to allow simplified extensions, create a basis for user profiles, and create a basis for 3D analysis.

C.5.2 Extended editing functionality Subtask Two - The contractor shall extend the current manual interaction capabilities to allow basic digitization in eCognition and simplify manual post-processing.

C.5.2.1 Basic digitization & post-editing

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The contractor shall simplify manual editing in eCognition. Developments will be made to improve complex object cuts, straighten/smooth boundaries, insertion of comments.

C.5.2.2 Context based editing & processing

The contractor shall explore how context knowledge can be used for context sensitive editing, matching shapes to templates and context based processing.

C.5.3 Modular Solution Development Subtask Three - The contractor shall develop different wizards for eCognition software for classification workflows to simplify/accelerate solution development by image analysts and test developments made in C.5.1 and C.5.2 on real test cases. The contractor shall deliver input for advanced object attribution including but not limited to material, geographical parameters and time stamps. The solution development will be modularized into sensor, location and season dependent modules.

C.5.3.1 Sensor specific module

The contractor shall develop classification strategy for basic landcover classification using Ikonos, Quickbird and other available data sources chosen by the government. The developed strategy shall retrieve Geo- and biophysical parameters dependent on individual sensor measurements.

C.5.3.2 Location specific module

The contractor shall develop classification strategy for basic landcover classification to retrieve information dependent on geophysical location and include geographical attributes to polygon.

C.5.4 Enhanced Polygon Attribution Subtask Four - The contractor shall extend eCognition polygon attribution to include object material, height and geographical position, and source of object generation including sensor and time stamp of data acquisition.

C.6 Reports/Software Deliverables

C.6.1 Reports to TARDEC

The primary program deliverable will be a detailed Final Report documenting the applicability of mobility map generation and extraction from overhead imagery and results of effort on any options, if exercised. A monthly Contractor's Progress, Status and Management Report (DI-GMT-80227 - (CDRL A001) shall be delivered in accordance with the referenced CDRL. Computer Software Product End Items (DI-MCCR-80700 - CDRL A002) shall be delivered in accordance with the referenced CDRL. A quarterly Scientific and Technical Report (DI-MISC-80711 - CDRL A003) shall be delivered in accordance with the referenced CDRL. Video conferencing facilities at TACOM, Lockheed Martin, Definiens, Waterways, and TRAC-Monterey will be used for coordination meetings as required. A Start of Work (SOW) Meeting will be conducted by the contractor at his facility. Any other meetings can be conducted via video teleconferencing. The start of work meeting should take place within 30 days of contract award.

C.6.2 Reports to NGIA

A monthly Contractor's Progress, Status and Management Report (DI-MGT-80227 (CDRL A001) shall be delivered in accordance with the referenced CDRL. Program Reviews will be provided every two months to assess the technical performance of the contract. Videoconferencing is not included in the scope of work for the NGIA effort. Communications will be maintained with frequent phone calls and e-mail exchanges. A Mid-term Scientific and Technical Report (submitted in accordance with DI-MISC-80711 (CDRL A003) shall be delivered electronically after three months and the Final Scientific and Technical Report shall be submitted six months after the start of work. This report shall describe input, output and strategy for simplified and improved use of eCognition enterprise for NGIA 1.0 beta and eCognition enterprise for NGIA 1.0, respectively. The robustness, accuracy, and transferability will be assessed. The advantages and limitations for further development will be discussed.

C.7 Hardware Deliverables

C.7.1 Deliverables to TARDEC

A minimum of one PC/workstation loaded with all software (COTS eCognition, WAFE rule, set and multispectral imagery of a Government selected test area, will be delivered to the Government upon completion of the contract. Contractor shall also delivery the UGV Route Planner/Operator Interface and the Pre-Processed Mobility Map of the Government selected terrain. Contractor will also provide on-line technical support for the PC/workstation and software suites delivered. If any of the options are exercised, updated software shall be delivered.

C.7.2 Deliverables to NGIA

all software and application development work as indicated in the proposal to generate a customized version of eCognition
all management work to perform this project

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Manuals and documentation as described in this specification (one hardcopy and digital pdf format)
Updated eCognition enterprise version for whole project to exchange experience with image analysts at NGIA
1 months test installation at NGIA's site after project

C.8 Option 1 - UGV Motion Simulator

The contractor shall create a UGV DIS simulator modeled on a particular UGV of the Government's choice. The simulator shall fully integrate the software generated in Mobility Map Generator and UGV Routed Planner/Operator Interface with the DIS environment and the simulator allowing full scale virtual testing of all software elements.

C.9 Option 2 - Extended Automation And Advanced Applications Development of The WAFE And Automatic Network/Batch Processing Capabilities

The contractor shall extend the software suite by adding a fully automatic network aware mode of operations. Imagery shall be ingested and processed automatically with no effort on the behalf of the operator. Input directories shall be automatically scanned for the arrival of new images and/or metadata which trigger processing of the new information.

C.10 Option 3 - UGV Special Testing

The contractor shall image a test area selected by the Government, and then utilize a real world UGV to validate and verify the functionality of the mobility and threat avoidance predictions made by the software suite.

*** END OF NARRATIVE C 001 ***