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MAY 1977

November 1976
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76-N-069

Technical Proposal

PHOTOGRAPHIC INTERPRETER
SUPPORT SERVICES
FOR ~~IAS~~ OIA

Declass Review By NIMA/DOD

Submitted to

Office of Imagery Analysis ~~Service~~
OE

[Redacted]

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CLASSIFIED BY [Redacted]
EXEMPT FROM GENERAL DECLASSIFICATION
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WARNING NOTICE
SENSITIVE INTELLIGENCE SOURCES
AND METHODS INVOLVED

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FOREWORD

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[Redacted]

is pleased to submit this

unsolicited proposal for providing Photographic Interpreter services to the Imagery Analysis Service at the National Photographic

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Office of E

Interpretation Center. For over eighteen years

[Redacted]

personnel have been performing detailed photographic interpretation

in support of our own, as well as customer requirements. This

interpretation has been performed on all of the conventional photo-

graphic system images as well as on the more esoteric SLAR, IR,

other radar and other unconventional sensor images. Special atten-

tion has been paid to analysis of

[Redacted]

imagery by a number

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of our interpreters. As can be seen from a review of their resumes,

included at the end of this proposal, many of our interpreters

received their training in the formal military P.I. schools and thus

their background and capabilities should be similar to those of your

own interpreters.

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1. INTRODUCTION

1.1 Background

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[redacted] has been involved in the design, evaluation and reduction of conventional and unconventional photogrammetric systems for almost twenty years. [redacted] has been involved in the reduction, analysis, and interpretation of satellite imagery from the beginning of the space program. Much effort has been expended determining the exploitation potential of such unconventional image

[redacted]

Currently

located in

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[redacted] has a professional staff of ~~over thirty~~ individuals with expertise in various aspects of reconnaissance system data reduction and exploitation. Of this group nearly ten are experienced Photo Interpreters. Other personnel include senior and junior level Photogrammetrists, Mathematicians, Computer Programmers and Instrumentation Engineers as well as the necessary support staff. Almost all of the staff have at least a TOP SECRET clearance with access to SI/TK material. Where required, special level clearances are possessed for work on the latest programs.

The facility itself has a work and storage area dedicated to SI/TK material exploitation. The photographic interpretation work which has been performed by this group of individuals is summarized by the varying job descriptions included in this proposal. They run from an analysis of chemical, biological and conventional warfare

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storage areas¹ prepared for the U.S. Arms Control and Disarmament Agency to detailed preparation of Object Recognition Guides.²

A number of our contracts dealt with training of customer personnel in the use of new sensor imagery. In the latest photo interpreter contract [redacted] personnel, augmenting an interagency image interpretation group, completed a two year study investigating the feasibility of orbital unconventional imaging systems. We were responsible for the training of government personnel in equipment recognition and thermal characteristics of a variety of high current intelligence interest targets.

¹ Aerial Imagery Analysis in Support of FS-32 Inspection of the Storage [redacted]

[redacted] 10 pages with photos, [redacted] This is one example of a series of contracts and tasks for the U.S. Arms Control and Disarmament Agency.

² A multi-year contract to provide Object Recognition Guides for the Special Activities Branch, Operations Division, IEG, NPIC. The guides have included artists renderings, drawn to uniform scales, of Soviet and Chinese AOB, GOB and NOB with detail shown as it would be seen on [redacted] photography. Other guides have been prepared as well for use throughout the intelligence community.

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proposes a time and materials (T&M) type contract to ~~IAS~~ as being the most suitable for their needs. A given funding level may be designated by ^{OIA} ~~IAS~~, and a contract written not to exceed this amount. Then, as tasks are defined, personnel can be supplied to carry out the work.

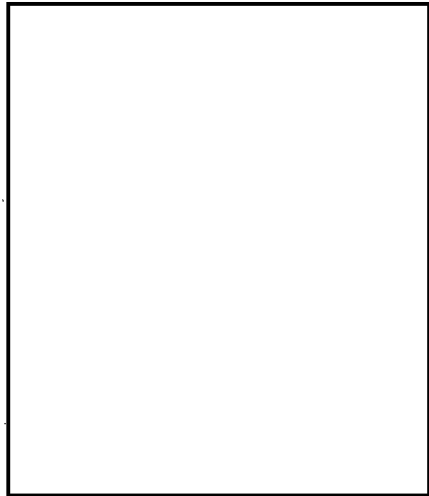
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personnel are available to provide detailed photographic interpretation of any type desired by the customer. As is common in this field, some interpreters have more experience with certain sensor images, geographic regions, and target specialties than others. The specific experience of each interpreter can be found in the individual's resume presented at the end of this proposal.

Photographic Interpreters, as detailed at the end of this proposal, could be made available as their commitment to other jobs permits. Specific, long term commitments for specific individuals can be agreed to during contract negotiations. In order for you to be able to estimate the cost of a particular level of effort, the following forward pricing rates are given below. These should only be used for budgetary purposes; final rates will be agreed to during contract negotiations. However, barring any unforeseen delay in the start of a contract, the negotiated rates should be close to those given below:

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- Category
- Principal Scientist
- Senior Scientist
- Scientist
- Senior Technical Specialist
- Associate Scientist
- Technical Specialist
- Senior Technical Clerk



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The cost of a particular individual may be determined by comparing his labor category, as determined from his resume, with the above rates.

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3. STATEMENTS OF QUALIFICATIONS

Of particular interest for this proposal are the summaries of classified Photographic Interpreter related jobs beginning on page 28 and the detailed personnel resumes' beginning on page 51.

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A. COMPANY BACKGROUND

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25X1 [redacted] was founded independently in 1957 as the
25X1 [redacted] offering research and development services in the then new and exotic
field of remote sensing. In 1962, the firm became part of [redacted] 25X1
25X1 [redacted] it is fully integrated with [redacted] with headquarters and main
laboratories in [redacted] 25X1
25X1 [redacted] now offers a full range of services in four related technical areas: photogrammetric
mapping, remote sensor image analysis, map-based information systems and engineering of photo-
25X1 grammetric instruments. 25X1

25X1 [redacted] a diversified, multi-national company of 17 divisions with major sub-
sidiaries in 14 nations, annually supplies \$2 billion worth of high-technology products and
services to industry, government and consumer markets. The range of [redacted] products runs
from electronic components and systems to educational materials, and includes heavy construc-
tion equipment; major appliances; air defense missiles and missile guidance systems; specialized
computers and software; and services for engineering, construction, and geophysical exploration.
In a half century of growth from a small electrical manufacturing firm to the diversified 25X1
25X1 company it is today, [redacted] has developed an international reputation for quality, 25X1
integrity, and service.

25X1 [redacted] shares fully in this reputation in its sphere of activity, providing a
25X1 single source of superior mapping and remote sensing products and services.

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B. ORGANIZATION

The [] staff of approximately seventy-five is made up of scientists, engineers, administrators and highly-skilled technicians drawn from the primary disciplines necessary to the successful pursuit of all areas of our business. As shown in Figure 1, this staff is organized on functional lines. The Mapping Operations Department is staffed and equipped to undertake all facets of photogrammetric mapping, and also to support other [] groups with mensuration and cartographic services as required. The Resource Information Systems Department is responsible for development of map-based information management systems, manual as well as digital, and for programs involving analysis of natural and cultural resources through interpretation of remote sensor imagery. The focus of the [] is the development of advanced exploitation techniques and applications for airborne and satellite remote sensing. In addition, [] draws upon the engineering, computational, manufacturing, and managerial resources of the Equipment Division and other elements of [] to meet unusual technical requirements as they arise. The relationship of the [] Operation to Equipment Division is shown in Figure 2, the entire Company in Figure 3, and the [] in Figure 4.

Through years of national and international experience, [] has also developed a network of professional and academic associations in the disciplines which immediately support or utilize our technology, such as ground survey, aerial photography, remote sensor data collection, geology and geomorphology, and digital equipment manufacture, to name a few. When programs require it, we also provide goods and services drawn from such disciplines on the basis of rigorously specified subcontracts with firms and individuals of proven capability.

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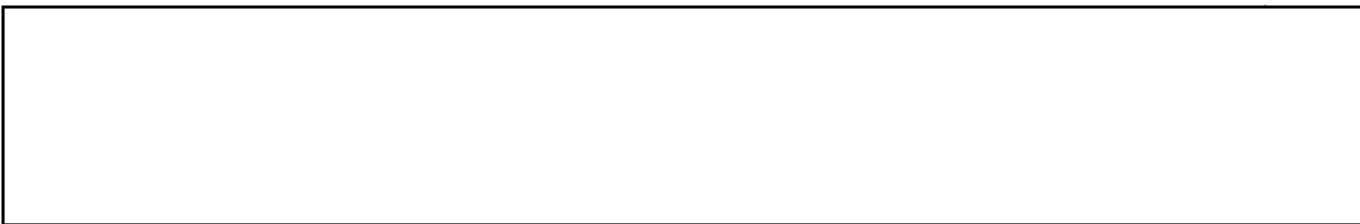
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C. FACILITIES, CAPABILITIES & EQUIPMENT



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[redacted] work is carried out in several laboratories equipped to meet the requirements of one or more of its business areas. Central among these is the 3600 square foot photogrammetric mapping laboratory, where photo mensuration, analytical triangulation and map compilation tasks are performed. This laboratory is the most completely equipped and versatile in New England. The major items of its equipment, and the functions in which they are used, are summarized in Tables 1 and 2. Note that while [redacted] boasts state-of-the-art capability for automated editing and plotting of digital maps, cartography, in most projects, remains a demanding manual process, dependent upon the precision scribing and inking skills of individual craftsmen. This work is also carried out in the mapping laboratory.

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[redacted] also maintains in its Mapping Operations Department an extensive and fully equipped photographic laboratory which supports our photogrammetric mapping programs and provides reproduction services as required by projects in other business areas. This 20-room laboratory, covering 4800 square feet of floor space, is environmentally-controlled for temperature, humidity and dust. Its equipment, and the functions it serves, are outlined in Table 3.

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TABLE 1 - PHOTOGRAMMETRIC MAPPING LABORATORY

<u>FUNCTION</u>	<u>EQUIPMENT</u>
<u>ANALYTICAL TRIANGULATION</u>	
• Camera Calibration	[] COMPARATOR - A precision point measurement device capable of measurement to a least reading of one micrometer. IBM KEYPUNCH - Peripheral recording device for measurement data.
• Camera Station Parameter Generation	CAMERA STATION GENERATOR/PROGRAM/IBM-370* - Program to generate camera station and attitude data.
• Point and Transfer Measurement	[] PUG - A stereoscopic instrument for the location, transfer, and drilling of pass points on diapositives. [] COMPARATOR [] SEMI-AUTOMATED COMPARATOR - A semi-automatic point measurement device which uses an air-bearing sub-system and is capable of measurement to a least reading of one micrometer. IBM KEYPUNCH
• Triangulation Analysis	PREPROCESSOR PROGRAM/IBM-370* - Program for initial corrections of lens aberrations, film deformations and atmospheric refraction. [] PROGRAM/CDC-6700* - Rigorous least squares adjustment program for the analytical triangulation of blocks of frame photography.
• Stereocompiler and Plotter 'Set-up' Programming	A-10 and K-320 PLOTTER PROGRAMS/IBM-360 and CDC-6700* - Programs for deriving instrument settings from triangulation data.
• Control Manuscript Plotting	[] 632 PLOTTER - A 48" x 60" flat-bed plotter, equipped with a model M-12 tape drive and a photo plotting head. [] COORDINATOGRAPH - A 42" x 48" manual plotter with a precision of 0.001 inch.

* Equipment Division Central Processing Units

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TABLE 2 - PHOTOGRAMMETRIC MAPPING LABORATORY

FUNCTION	EQUIPMENT
<u>STEREOCOMPILATION</u>	
• Line-and-Symbol Mapping (Planimetry & Topography)	[] A-10 (2) - "First order" stereo-plotters which accept normal, wide, and super-wide angle photography and are capable of 12X magnification from the diapositive.
	[] PP3 - "Second order" 3-projector stereo-plotter capable of 4.5 - 5.3X magnification from the diapositive.
• Ortnophoto Mapping (Planimetry only)	[] K-320 - A three-projector orthophoto compilation instrument (2nd order) capable of printing a full double model at 3.8-5.8X magnification from the diapositive; either directly on film or through a digital record on paper tape which can be incrementally edited prior to printing.
	S.F.O.M. MODEL 9300 - A two-projector orthophoto compilation instrument (2nd order) capable of printing a single stereo-model at 3.7-4.3X magnification from the diapositive directly on film.
• Digital Mapping (Planimetry & Topography)	[] A-10 STEREO-PLOTTER
	[] RSS 400 MARK II and MAG TAPE UNIT - Digital data recorder interfaced with Wild A-10.
	[] PROCESSING PROGRAMS/IBM-370* - Program for initial tape format edit, 'cartographic' correction and final grid adjustment and transformation.
	[] CV II-III (10) - Interactive graphic terminals capable of displaying, editing and check-plotting digital map records on magnetic tape.
	[] PLOTTER - High speed flat-bed plotter with magnetic tape drive unit.

* Equipment Division Central Processing Units

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TABLE 3 - PHOTOGRAPHIC LABORATORY

<u>FUNCTION</u>	<u>EQUIPMENT</u>
25X1 25X1 • Aerial Roll Film Processing Duplicating, Contact Printing.	[] PROCESSOR - Semi-automatic aerial film processor. [] STRIP PRINTER - Aerial film continuous strip printer.
25X1 25X1 • Film Inspection	[] DENSITOMETER - Automatic film density recorder. [] SENSITOMETER - Instrument for exposing precise sensitometric step wedges on film.
25X1 25X1 • Frame Film Enlargement and Reduction	[] ENLARGER - Aerial film photographic enlarger. [] HE12 ENLARGER - Aerial film photographic enlarger with 12X magnification range and tilting 60' easel.
25X1 25X1 • Diapositive Printing	[] MARK IV PRINTER - Variable exposure automatic dodging contact printer with automatic step-repeat capability. [] DENSITOMETER
25X1 25X1 • Map, Index, and Photomosaic Copying, Enlargement and Reduction	[] COPY CAMERA - Precision engineering copy camera with 6 foot front easel and 5 foot back easel. VACUUM FRAMES - 60" x 72" contact printer.
25X1 25X1 • Large Sheet Processing	[] 42" PROCESSOR - A semi-automatic processor which accepts inputs up to 42" in width and processes individual items "dry-to-dry" in 75 seconds, and replenishes processing chemicals automatically. [] 42" PROCESSOR - A semi-automatic film and paper processor which accepts inputs up to 42" in width.
25X1 25X1 • Diazo Printing	SIMPLEX DRYER - 60" variable temperature print dryer. [] PRINT MASTER - 60" diazo reproduction printer.

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In support of its programs in remote sensing research, imagery exploitation, and map-based information system design and development, the [redacted] facilities in both [redacted] and [redacted] contain appropriately equipped imagery and data exploitation laboratories. Their equipment includes stereo- and monoscopic imagery viewers, layout tables, and secure storage vaults and files. These laboratories are arranged to accommodate multiple projects and provide appropriate spaces for interpretation and evaluation tasks; experimentation; and production tasks such as plotting, indexing, mosaicking and screening.

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Finally, the [redacted] as a fully integrated element of the [redacted] makes extensive use of facilities provided by the Equipment Division, two of which are worthy of note. First, the [redacted] is equipped with ten [redacted] CVII and III interactive computer-graphic terminals, a [redacted] computer and peripherals, and a high-speed, tape-driven [redacted] plotter. It is one of the largest facilities of its type in the country. Created to automate large portions of the Equipment Division's internal drafting and product documentation operations, this facility also provides [redacted] with both capability and large capacity for map digitizing, map-based digital data editing, graphic data management and plotting. Secondly, and in addition to the dedicated computers of the [redacted] the computational capacity of Equipment Divisions' central data processing units, an IBM-370/60 and a CDC-6700, is fully available to the [redacted]. To exploit these facilities, [redacted] has developed an extensive library of special-purpose software to support its mapping and information systems programs. This library includes the [redacted] Program which provides capacity for simultaneous adjustment of large blocks of aerotriangulation data; and the REDMAP software system, a collection of approximately 80 sub-routine modules which can be combined variously in some 35 software routines to provide comprehensive capability to compile, validate, store-and-retrieve, synthesize and analyze map-based digital data bases.

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25X1 All Equipment Division facilities engaged in government work have either SECRET or TOP SECRET clearances. Specifically, [redacted] facility has a TOP SECRET clearance granted by DCASR, Boston, on 3 August 1966; and the [redacted] facility, a TOP SECRET clearance granted by DCASR, Philadelphia. Our cognizant security office is presently the Defense Contracts Administration Services Region, 666 Summer Street, Boston, Massachusetts. 25X1

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25X1 [redacted] has been organized, staffed and equipped to offer the widest possible range of remote sensing services -- in mapping, information systems, image analysis and instrumentation engineering -- with the highest levels of efficiency and economy consistent with technical excellence.

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D. EXPERIENCE

The following pages contain selected contracts awarded to [redacted] Section D-1 includes general functional areas, contract names, customers, and work synopses. Section D-2 presents more detailed summaries of contracts having particular relevance to this submittal.

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SECTION D-1

Summaries of Work of General Interest

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SECTION D-2

GENERAL

This Appendix is presented to IAS in order to indicate the range of special security work and other contract efforts which are directly applicable to the proposed IAS support contract.

These programs/studies primarily have been performed in connection with the National Reconnaissance Program (NRP) and, as such, relate to strategic high altitude (satellite and aircraft) operational and R&D reconnaissance programs.

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PROGRAMS

[redacted] over the past 15 years, has performed supporting RDT&E in the exploitation area with the various [redacted] image-forming systems. This research has included both photogrammetric and photointerpretation areas and has been performed primarily for the National Photographic Interpretation Center and the U.S. Army. Some indication of the work conducted through 1973 is shown in Table 4.

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More recently [redacted] has been working under contracts for the Navy Space Projects Office (PM-16, now PME-106) and Naval Intelligence Support Center (NISC) in the exploitation of current and future KH systems from both an interpretation and photogrammetric standpoint. Additional contracts have been performed for other aerospace companies. Feedbacks have resulted, related to Naval collection system needs for ocean surveillance as well as the actual design and implementation of data handling systems. Current involvement includes a Photogrammetric/Mensuration

[redacted] Other similar special access evaluations and systems work is being, or expected to be, conducted in the radar, E-O, and infrared imagery exploitation areas.

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In addition to DOD and Intelligence Community, separate studies have been performed for the Arms Control and Disarmament Agency where [redacted] acted as expert consultants in the reconnaissance area for both SALT and MBFR potential applications.

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25X1 Most of [redacted] highly classified work has been under the direction of [redacted] with current contracts being performed by its Special Projects Office in [redacted]

25X1 In addition to image-forming reconnaissance, SI and special access work has been performed by [redacted] in the Satellite Ocean Surveillance System (SOSS) area with [redacted] (Project 749 - related systems definition study) and in the SIGINT, ELINT, and EW/ECM areas. The latter has primarily been accomplished by [redacted] and Equipment Division.

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25X1 Some of the particular programs of specific interest in the photographic interpretation area are described again in further detail on the following pages.

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This work entailed the study of the technical parameters and simulated outputs of an advanced reconnaissance system for meeting ocean surveillance requirements. The work involved a treatment of both mensuration/photogrammetric and interpretation factors as they theoretically and empirically relate to system performance.

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Title: Imagery Analysis Group (IAG) Support.

Job No.: 53-0195-0001-8; 53-AA35-2500; 53-AA25-2400; 53-AA24-8700; 53-0196-0001.

Objectives: To provide professional RDT&E image interpretation, sensor-grammetric, system analysis, programming, automatic data processing analysis, and collateral/ground truth services in connection with advanced national unconventional reconnaissance systems.

Approach: A unique government-industry team was established to ensure integration of image exploitation expertise (interpreters, photogrammetrists, intelligence analysts) with front end vehicle/sensor system engineer and scientist personnel. A Requirements Group and the IAG directed the RDT&E which was conducted to establish the utility (statistically through empirical testing) of advanced sensor systems to meet national needs. Digital image processing and other softcopy techniques were also evaluated vs. conventional hardcopy (film) interpretation procedures.

Results: Reports published by the NRO and briefings presented to the USIB. The approach taken, work conducted, and published data has been regarded as precedent-breaking.

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Title: Information Content of Certain Reconnaissance Satellite Imagery.

Job No.: 126-16

Objectives: The purpose of the program was to determine the environmental data content of the imagery of the KH-5 and KH-4 satellite systems. The program's interpretation and mensuration efforts involved a sampling of the spectrum of natural and man-made phenomena and detail. The general areas of interest included:

- Geology
- Land Use
- Snow and Ice Cover 25X1
- Clouds
- Urban Features 25X1

Approach: In order to determine the value of satellite photography and its possible application to the disciplines of geology, and resources exploration, an initial review of all pertinent geologic and geomorphologic criteria was conducted. Those essential elements that were considered to be interpretable from satellite photography were isolated. The terrain elements were then compiled into target lists to serve as interpretation guides.

Imagery was selected and interpreted. These interpretations were then compared with collateral data for accuracy and data content.

Results: The study indicated the satellite imagery contained much useful data although an exact measurement of the accuracy and completeness of the study results could not be ascertained without further research.

It was recommended that additional research be carried out in order to determine the system's utility to produce an accurate and complete product.

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Title: An Optimum Cartographic Collection System

Job No.: 126-18

Objectives: To determine the parameters of an optimum cartographic collection system operating in a satellite orbiting the earth and capable of acquiring photography suitable for topographic mapping and point location.

Approach: The requirements, both in content and in accuracy, for topographic maps at large and medium scales (1:50,000 and 1:250,000) meeting military needs, and the requirements for point location, were first established. The parameters of cartographic collection systems were then developed. The functional relationships between these parameters and the accuracy, content, and ground coverage of a cartographic collection was developed and presented both in the form of equations and in graphical form (using the graphs, trade-offs between the various parameters can be determined). The parameters of a number of existing and proposed systems were evaluated with respect to their ability to meet the requirements of content and accuracy for large and medium scale mapping and for point location. The costs--including development, equipment, booster, launch and recovery, data reduction, and map production--of each of the existing and proposed systems were considered.

Results: An optimum cartographic collection system was selected.

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Title: The Evaluation of the Hipernas IIB Inertial Navigation System, The evaluation of a Mapping Satellite for Controlling a Rapid Combat Mapping System USQ-28, and Rectification of Side-Looking Radar by means of High Altitude Photography.

Job No.: 126-24

Objectives: To determine the quality of a map compilation for a specified block of terrain in which little or no previous ground control is available.

Approach: In the first study errors were generated in a sample ground control network with the aid of a simulation model made for the Hipernas IIB inertial navigation system. These errors were then used to perturb a real set of control points associated with real photography. An orthophoto produced in this manner with the use of the B8-Stereomat was then compared with the unperturbed orthophoto to determine and quantitatively analyze the magnitude of the errors introduced by the inertial navigation system. In the second study, pertaining to the geodetic mapping satellite, a similar approach was used insofar as an orthophotograph was the final product of this phase. However, in this situation, the errors were propagated indirectly from a physical model consisting of a pair of overlapping satellite photographs to the ground control through the intermediate media of conventional altitude photography. In the final study the high altitude photograph, or a small sector thereof, was enlarged to the scale of the photographic presentation of the side-looking radar. The SLR was oriented in the plane of the horizon and rectified by comparison with the high altitude enlargement by a manual process which seeks to match detail, one small area at a time. Finally, a best visual match was made between the two film transparencies, the SLR copy superimposed on the enlarged KH-5 photography.

Results: The studies indicated that the qualify of map compilation could be improved by the use of inertial navigation equipment and/or satellite altitude photography.

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Title: Evaluation of Experimental Strategic Military Geographic Intelligence from Short Focal Length Satellite Imagery

Job No.: 126-25

- Objectives:**
- 1) The construction of a mosaic covering the Continent of Africa;
 - 2) The derivation and compilation, through photo-interpretation, of basic geoscience data covering the continent;
 - 3) The synthesis and compilation of military geographic intelligence overlays from the basic geoscience data.

Approach: This program was conducted without the aid of collateral materials. The area studied was divided into 12 sections, each covered by a mosaic sheet and 8 overlays. The mosaic sheets were produced from six missions and the imagery was selected in such a manner as to minimize cloud cover. The mosaic was constructed at a scale of 1:4,000,000 and then reduced, for presentation purposes, to 1:2,000,000.

The geoscience overlays were compiled through stereoscopic interpretation of the enlarged satellite frames. The military geographic intelligence overlays were then synthesized from the data compiled above.

Results: It was concluded in this study that geoscience and military geographic intelligence could be derived from satellite imagery and it was recommended that other systems be used to obtain preliminary data for military and civil engineering.

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Title: Studies of Photo Interpreter Performance as a Function of Resolution, Stereo, and Color

Job No.: 165, 2241

Objectives: To determine the relationships between interpreter performance and photographic ground resolution.

Approach: Human factors studies were performed to determine the resolution performance relationships. [redacted] assisted in the ground truth data collection phases of the studies. [redacted] administered the tests to NPIC photointerpreters, assisted on the test design and analysis and served as overall coordinator between the other contributing contractors and NPIC personnel.

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Results: Two studies were published: The Analysis of Missile Sites as a Function of Photographic Ground Resolution (S) and The Measurement of Photographic Images by Human Operators (U).

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In the missile study a specific range of ground resolution was determined as providing the answers to the Essential Elements of Information that were asked of the subjects. A missile key was also published on the sites used in the study.

In the measurement study, errors were demonstrated by subject and total subjects for different geometric shapes as a function of edge spread and contrast.

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Title: Use of Satellite Photography for Military and Civil Engineering

Job No.: 1215

Objectives: The objective of this program was to ascertain the amounts and type of civil and military engineering data, required for major works, that can be extracted from satellite imagery.

Approach: The first phase of the program required the systematic interpretation of satellite imagery covering a broad distribution of geographic, climatic and physiographic regions.

The second phase required the construction of a semi-controlled mosaic of a 10,000 square mile area in Indiana. From the mosaic and imagery interpretation an effort was made to acquire reliable engineering design information. These data were used to select alternate military highway routes between two points and five "hasty" airfields.

The third phase required the interpretation and mensuration of engineering data along a major proposed highway route. This data was then evaluated and compared with engineering data prepared for development of the route.

Results: The data acquired during the course of the program was then applied to the formation of an organization that will make pragmatic everyday use of satellite photography for preliminary engineering design purposes in support of field army requirements.

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Title: Human Factors Support Services

Job No.: 3261

Objectives: To provide services to [redacted] to accomplish three specific tasks; Photo Interpreter Performance Mission, Stereo Evaluation and Factors Study, and The Relative Accuracy of Mensuration. 25X1

Approach: [redacted] personnel were responsible for gathering the test stimulus material (satellite photography, KH-4, [redacted] annotating and locating the targets, training and administering the tests. There were over a thousand targets analyzed for use on the tests. All the work was accomplished. 25X1

Results: [redacted] provided inputs to all the final reports. [redacted] published two Task Analysis reports on the flow of satellite file and data handling of the imagery by the photointerpreters to produce the OAK, OAK supplement and detailed reports and mensuration film handling procedures of the Photogrammetric Branch within NPIC. 25X1

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Title: Feasibility Study of Engineering Planning Support
for STRICOM

Job No.: 1265

Objectives: The purpose of this program was to establish standard procedures for determining routes of communication and movement with satellite imagery for the STRIKE Command.

Approach: The study required the construction of a mosaic at a scale of 1:1,000,000 and a series of 1:250,000 scale mosaics to cover the terrain between Khartoum and Port Sudan. A series of geoscience overlays was prepared and the best routes were chosen. These routes were then studied in detail and a series of military geographic overlays was prepared. In addition, a study of rail, port and airfield facilities was made. Plans were constructed showing what improvements would be required in the event the area became an area of operation.

Results: The program resulted in a series of mosaics and overlays depicting the geology, vegetation, cultural features and landforms of Sudan. These overlays were accompanied by overlays showing the suitability for cross-country movement and the construction of roads and railroads. A text detailed the work effort required to operate in the theatre and the design changes needed at all airfields.

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Title: Imagery Experimentation Support

Job No.: 2272, 2319

Objectives: To determine the intelligence value of satellite imagery (both line-scan and photographic) for military targets, from the relationship of interpreter performance, target ground resolution, and intelligence analyst estimates.

Approach: The techniques used were the same as in 165 and 2241.

Results: Published Study, The Analysis of Radar Sites as a Function of Photographic Ground Resolution (S).

This study was similar to the missile study in that ground resolutions for the requirements were demonstrated. The latter job 2319, is currently in process with the analysis of Ground Order of Battle Targets as a function of photographic ground resolution and various line-scan parameters.

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Title: Terrain Study Prototype

Job No.: 1278

Objectives: The principle objective of this program was to develop a prototype terrain study. The program was designed to illustrate, through an operational test, the effectiveness of using a combination of satellite imagery and collateral materials for the solution of regional military problems concerning terrain studies. The study was addressed specifically to problems concerning military geographic intelligence and irregular force operations.

Approach: The program was conducted in three tasks:

(1) The first task required the construction of a mosaic using KH-4 panoramic imagery. A series of geoscience overlays was then compiled covering the mosaic, through the stereoscopic interpretation of the satellite panoramic imagery. Upon completion of the basic overlays the data was synthesized into five military geographic overlays.

(2) The second task required the production of basic geoscience overlays at an enlarged scale of 1:50,000.

(3) The third task encompassed the checking of data developed in Tasks I and II using collateral materials in the form of National Intelligence Survey reports.

Results: The conclusions of the study were:

(1) The KH-4 panoramic photography affords wide areal coverage and contains adequate ground resolution characteristics so as to allow an interpreter to extract a sufficient level of continuous terrain detail to meet the requirements of the DIA Guide to the Production of Terrain Studies.

(2) KH-4 panoramic imagery can be enlarged to a scale of 1:50,000. At this scale sufficient ground resolution is maintained to allow stereoscopic interpretation of a geoscience "data base", from which military geographic intelligence overlays for guerrilla operations can be produced.

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(3) It was shown that KH-4 panoramic photography can be enlarged approximately 8X to a scale of 1:20,000. At this scale considerable ground resolution is lost, however, the imagery can be used to formulate preliminary or contingency defense plans in conjunction with previously compiled, smaller scale, military geographic intelligence.

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Title: FT-15 - A Comparative Analysis of Photographic Quality

Job No.: 2319-1

Objectives: To provide a valid and precise expression of the amount of information available in satellite and aircraft imagery.

To compare the information available in each type of imagery and provide an indication of the amount of Arms Control information which can be expected from large and small scale presentations.

Approach: To satisfy these objectives, [redacted] performed a qualitative and quantitative analysis of KH-4 [redacted] and aircraft imagery. This analysis consisted of:

1. Image interpretation
2. Modulation Transfer Functions
3. Granularity Measurements
4. Density Measurements

Results:

[redacted]

The small scale KH-4 and aircraft imagery were not comparable.

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Title: Data Analysis and Interpretation
Job No.: 3229-1/1301-1
Objectives: This project was a service program for the ARPA Terrain Atlas for Nuclear Test Detection Program.

Approach: The program required two photo-geologists to interpret satellite imagery over potential nuclear test sites in the Soviet Union. The two geologists interpreted the imagery and corrected the collateral data where discrepancies were detected.

The program disciplines were geology, soils, vegetation and landforms. A total of 13 atlases were revised over the two-year term of the contract.

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Title: Data Analysis and Interpretation

Job No.: 3329-2/1301-2

Objectives: The objectives of the study were to determine the quantitative aspects and the physical configuration of geologic formations through the use of satellite imagery with a projection stereoplotter. In addition, the task was designed to determine the ability of a stereoplotter to fulfill the requirements of a geologic study and to determine the ability of a geologist, untrained in the operation of a stereoplotter, to operate a stereoplotter and produce an accurate geologic interpretation.

Approach: The initial phases of the study were directed to the feasibility of using the imagery with projection-type stereoplotters to record dip and strike, measure stratigraphic sections and delineate formation contacts of geologic structures. This was followed by a series of tests to determine time requirements and the problems involved in recording the structural attitude of key geologic formations in four test areas.

The final phase of the program was designed to evaluate the information gained from the tests for scientific value and accuracy and to ascertain if the data could be utilized in the ARPA Terrain Atlas Program.

E. PERSONNEL

25X1 [redacted] has over ten long term employees whose background and major duties have been photographic interpretation. Their detailed resumes as those of key management and support personnel follow. Eight of these photo interpreters currently hold TOP SECRET, SI/TK security clearances. Most of these eight hold additional clearances for work on special sensor imagery. Additional clearances currently held may be verified through your security office.

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