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**PROPOSAL FOR EXTENSION IN SCOPE ON  
THE EFFECTS OF  
PHOTOGRAPHIC GROUND RESOLUTION  
ON PHOTOINTERPRETATION**

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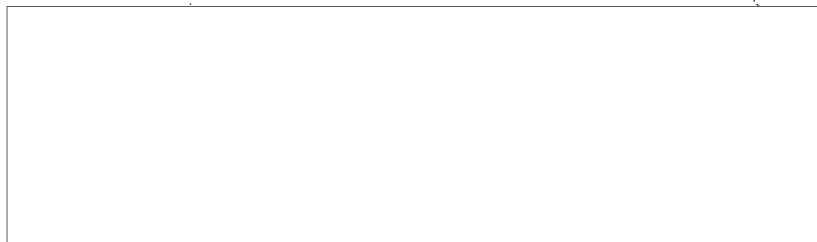
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PROPOSAL FOR EXTENSION IN SCOPE ON  
*THE EFFECTS OF PHOTOGRAPHIC GROUND RESOLUTION  
ON PHOTOINTERPRETATION*



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20 January 1970

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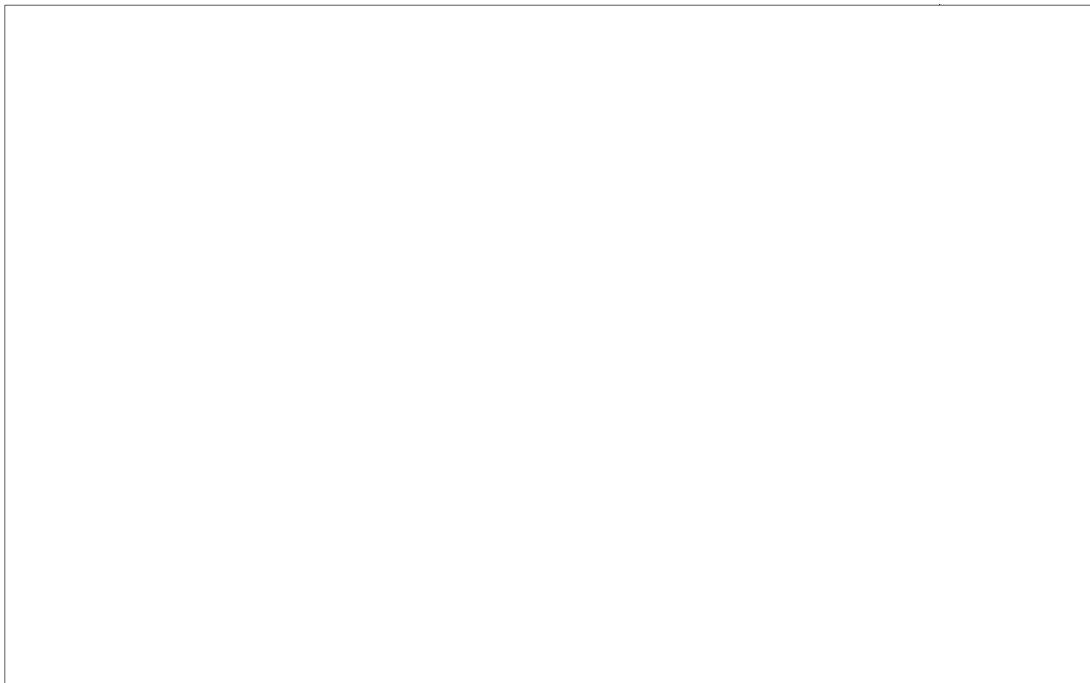
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ABSTRACT

This is a proposal for an extension in scope of Contract [redacted] *The Effects of Photographic Ground Resolution on Photointerpretation*. The purpose of the extension will be to design and conduct an experimental study of the effects of photographic ground resolution on the identification of ground order-of-battle targets. The high resolution photography of Aberdeen Proving Ground already obtained under the contract will be used to prepare photographs representing five appropriate ground resolutions. Professional photointerpreters will view them for the purpose of identifying vehicles and artillery pieces. A report and briefing describing the results will be prepared.

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The estimated costs are as follows:



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ON PHOTOINTERPRETATION



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INTRODUCTION

Contract  *The Effects of Photographic Ground Resolution on Photointerpretation*, was written primarily for the purpose of obtaining high-resolution, aerial photographs of ground order-of-battle targets to be used subsequently in an experimental study of the effects of ground resolution on photointerpretation. The specific tasks to be performed were as follows:

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- Task 1. Selection and procurement of the required aircraft and camera.
- Task 2. Selection, procurement, and placement of appropriate targets.
- Task 3. Construction or procurement and placement of test targets.
- Task 4. Collection of "ground truth" information.
- Task 5. Collection of photography.

The contract <sup>exp. design ?</sup> thus called only for the collection and preparation of photographic and other materials required for an experimental study in which professional photointerpreters (PIs) would serve as subjects. Most of that preparatory work has been done: an aircraft/camera system was obtained from the sponsor's parent organization; arrangements were made to photograph the tank/artillery museum at Aberdeen Proving Ground; test targets were prepared and placed adjacent to the museum; test flights were

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flown to determine the altitude and camera settings required to achieve the desired ground resolution; and the photographic acquisition flights were flown while luminance measures of the targets and their background were being made on the ground. In addition, part of the required ground-truth information was obtained.

✓ *This proposal for extension in scope is to conduct and report the experimental study.* In it, the effects of photographic ground resolution on PI identification of ground order-of-battle targets will be investigated.

The relevance of the work was described in the original proposal as follows:

Modern photographic reconnaissance systems are enormously expensive, and the attainment of better ground resolutions implies greater expense. The relation between resolution and expense probably is not a linear one; improving ground resolution by a factor of two, for example, probably means an increase in system expense by much more than a factor of two. Furthermore, improvements in ground resolution may imply a decrease in area coverage.

For these reasons, the intelligence community should continue the effort to determine what additional significant intelligence information is obtained with improvements in ground resolution. Such knowledge is vital to the evaluation of proposed systems.

No one has yet been able to develop an objective relation between intelligence information and dollars. For one reason, the value of intelligence information varies over time and it is difficult, if not impossible, to foresee entirely what information will be valuable in the future. Nevertheless, the effort to determine *what* information better ground resolutions permit the photointerpreter to obtain should continue, so as to provide the people responsible for designing and evaluating systems with an additional source of relevant data.

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Thus far, three studies of the effects of ground resolution on the interpretation of targets have been completed. The targets in the first were domestic, offensive ICBM sites; the targets in the second were scale models of mobile radars; and the targets in the third were models of tanks and other military vehicles. Technical reports describing these studies have been submitted to the sponsor. In addition, briefings on these studies have been given to both the sponsor and other organizations in the intelligence community.

Domestic, offensive ICBM sites were selected as targets for the first study because of the significance of that type of target to the intelligence community. The results showed that because of their relatively simple external configurations "very good" ground resolutions were not required to exploit fully the intelligence in overhead photographs of them.<sup>1</sup>

The fact was recognized then, and still is, that the effects of ground resolution on interpretation is "target specific." One class of targets requires better ground resolution than another for the complete exploitation of overhead photography.

For that reason, a similar study was done with models of mobile radars serving as targets. They were selected because of the greater detail in their external configurations--the antennas, horns, feeder lines, and so on. The results showed that significantly better ground resolutions are required for radars than for missile sites to exploit fully the intelligence information available in overhead photography.

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<sup>1</sup>The specific results are not presented here because of security.

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It was suggested by representatives of the sponsor and other intelligence organizations that ground order-of-battle targets might require even better ground resolutions than radars for the complete exploitation of photography. Consequently, a third study of the effects of photographic ground resolution was conducted using scale models of tanks and other military vehicles as targets.<sup>2</sup> The dependent measure was percent correct target identification.

## TECHNICAL DISCUSSION

In general, the experimental study proposed here will be an extension of the previous photographic ground resolution studies. However, real military vehicles available in the Aberdeen photography will be used as targets.

The method will be essentially the same as that used in the previous studies. Experienced PIs will view the targets at each ground resolution, starting with the poorest and ending with the best. At each resolution they will attempt to identify each target by comparing its image in the photographs with "ground-truth" information. The data will be analyzed to determine the mean and standard deviation of percent correct identifications at each ground resolution. Tests of the statistical significance of differences in identification performances between and among ground resolutions will be made. A description of the method and the results plus their implications will be presented in a technical report.

*Perseveration?*

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<sup>2</sup>In this study, the effects of line-scan images that varied in signal-to-noise ratio and number of scans per target were investigated simultaneously.



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It is expected that the expenditure rate will be

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However, the rate during the execution of Task 1 could be somewhat less due to delays in preparing the photographic materials. It could be somewhat greater during the execution of Task 2 due to possible conflicts with operations.

DELIVERABLE ITEMS

1. The photographic stimulus materials.
2. A book containing the "ground-truth" data.
3. Bimonthly progress reports.
4. A technical report and briefings requested by the sponsor.
5. A final, summary report.

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NOTES

1. The overhead rate shown in this proposal is a bidding rate. Overhead is allocated to contracts on the basis of a rate derived from actual overhead expenses allowable under cost-type contracts in accordance with ASPR XV, and is audited each calendar year by the Defense Contract Audit Agency, 11099 La Cienega Boulevard, Los Angeles, California 90045.
2. Bidder is not dominant in its field of operation and with affiliates employs fewer than 500 employees.
3. The prices of the items covered do not exceed those paid by any other purchaser from the contractor and the Government is placed in the most favored price category.
4. Prices are based on straight time.
5. Bidder represents that he has not employed or retained a company or person (other than a full-time employee) to solicit or secure this contract and agrees to furnish information thereto as requested by the Contracting Officer.
6. Bidder is incorporated in the State of Nevada.
7. Bidder is a profit institution as determined by the Bureau of Internal Revenue.
8. Government contract administration is handled by the

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WORK STATEMENT

The work in this proposed extension in scope would include the following tasks:

- Task 1. Preparation of the experimental and statistical design, books containing the "ground-truth" information, subject requirements and instructions, and data collection forms.
- Task 2. Collection of the experimental data using the customer's facilities and PI personnel as subjects.
- Task 3. Analysis of the experimental data.
- Task 4. Preparation of a technical report and briefing describing the methods, the results, and their implications.
- Task 5. Briefings.
- Task 6. Preparation of the final report.

*not done  
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