I. Project Title: Improved Mensuration of Automated Hand-Held Photography GDIP

Submitting Agency: HQ FTD/SQHA Decision Unit No: 2210

II. Costs:

FY 1983	FY 1984
$200 K	$200 K

III. Description of Project:

a. "Hand-held" photography refers to those photographs taken by tourists, attaches, and professional photographers using any of an assortment of small, commercially available portable cameras - usually either a pocket instamatic type or, more commonly, one of a number of popular 35mm Single Lens Reflex (SLR) cameras. The photographs are generally taken of objects having potential intelligence value (i.e., displayed at public air shows, technical exhibits, and parades). The intelligence information (particularly mensuration and configuration data) is extremely difficult to extract due to numerous factors affecting the object photographed. In short, the object is not usually as it appears but rather some distorted facsimile thereof.

b. Mensuration accuracy and configuration data of objects for weapon system analysis can be significantly improved by integrating the best features of two methodologies currently used for exploiting hand-held photography - graphical and analytical.

- Graphical technique: Produces a man-made drawing of the object photographed. The graphical method is very accurate and not as dependent upon imagery information (focal length, film format, enlargement factor, etc.), but it is a very slow, personnel-intensive process.

- Analytical technique: Produces parameter description of an object through the use of computer programs. This technique required less time than the graphical technique but is limited by the amount of information obtainable about the photography.

c. The integration of these methodologies through an external assistance contract should improve the timeliness and accuracy of object mensurations derived from hand-held photography. The effective application of such an integrated methodology requires the use of a graphics terminal linked with a digitizer board. Some modification (approximately $50K) to a currently existing terminal and digitizer board may be necessary, but such modification costs would be a small percentage of this proposal's total costs.

USAF review completed.

d. A system engineering approach to the problem will be done.

Phase I - Establish functional design requirements and technical requirements.
Phase II - Establish hardware and software specifications.
Phase III - Procure test hardware and code software.

This hardware will be commerically "off the shelf" and generic in class. The software will use modern coding techniques and be written in a modular fashion using a higher level language. In all cases, the system will be as hardware independent as possible. The intent is that the system be just another node on a general purpose computer and, thus, easily transportable. It could be adapted by any organization which has general computation support with minimal cost.

e. Both the graphical and analytical solutions have their good and bad points. This integrated approach, with the ability to identify the most productive path/technique as the job is progressing, will produce a large time savings. It will also allow more time to be spent on the correct technique, thus yielding a better product.

IV. Intelligence Community Applicability:

a. All intelligence organizations employing hand-held techniques to exploit imagery can use this methodology.

b. The effect, as in our case, is that more imagery can be exploited faster with a gain in information. At the minimum, the mensuration accuracy will be maintained at present levels.

V. Intelligence Consumer Benefits:

a. All intelligence organizations that use hand-held photography to derive intelligence products should benefit. It is hoped that a 25 percent reduction in man hours will be obtained, along with a better product.

b. A reduction in man hours will result in a more cost effective, timely product that would contain necessary, additional information.

VI. Probability of Success:

At the estimated funding level, the probability of success is estimated to be realistically greater than 50 percent. Increased funding would have a slight increase in success probability, while decreased funding would severely decrease the probability of success.