

## QUARTERLY REPORT

1. **Contract Number:** DAMD17-91-C-1081
2. **Report Date:** 23 March 1994
3. **Reporting Period:** 16 November 1993 to 15 February 1994
4. **Principal Investigator:** Dr. Robert W. Verona on permanent long-term disability.  
Dr. Victor Klymenko is acting Project Director.
5. **Telephone:** (205) 598-6389, FAX (205) 598-9256
6. **Institution:** UES, Inc.  
4401 Dayton-Xenia Road  
Dayton, Ohio 45432
7. **Project Title:** Development of Data Packages on the Human Visual Response with Electro-optical Displays
8. **Current staff, with percent effort of each on project:**

NAME	TITLE	HOURS*	% OF EFFORT
Dr. Robert W. Verona*	Engineering Psychologist	0	0%**
Dr. Victor Klymenko	Research Psychologist	381.5	77%
Mr. Howard H. Beasley	Electronics Technician	456	92%
Mr. John S. Martin	Electro-optics Technician	438	88%

496 hours were available this reporting period not including holidays. The above hours are the actual hours worked (sick leave and annual leave have been subtracted).

\* As of 21 June 1993 Dr. Verona was temporarily on sick leave and placed on permanent long-term disability as of 4 November 1993.

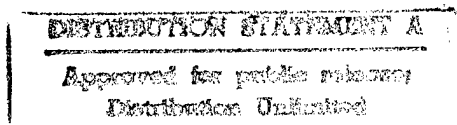
9. **Contract expenditures to date:**

Personnel	\$599,552.15	Equipment & Supplies	\$ 5,603.50
Travel	10,617.55	Other	<u>5,740.39</u>
		<b>TOTAL*</b>	<b>\$621,513.59</b>

\* Does not include facilities capital and G&A expense.

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**10. Comments on administrative and logistics matters:**

The building construction that had been disruptive to our office work area has been completed. Discussions are in process between the Army and UES regarding a potential replacement for Dr. Robert Verona as project Principal Investigator.

**11. Scientific Progress:**

**Physical Measurements:**

Data collection, analysis and interpretation has been completed for the paper describing the image intensifier measuring system (IIMS) measuring field-of-view, magnification and distortion. The final draft is in process and will be delivered early next quarter. Measurement procedures, the equipment and the software created for evaluating the performance of night vision devices has been documented for the paper.

Concentration this quarter has been focused on developing and refining the mechanical and electronic procedures and the HP software for dynamic sine wave (DSW) techniques. Also included was the testing of the validity of different methodologies. DSW techniques were developed to characterize the dynamic aspects of imaging systems, such as generating dynamic modulation transfer functions (MTF). These are new and untried techniques that parallel the more traditional static MTF, the traditional "figures-of-merit" used to characterize display devices. Data on various monitors using a counterphase sinusoidal modulation technique was collected. Results will be presented at SPIE Night Vision Psychophysics and Training Conference to be held in April 1994. Collection of data for comparison using the drifting sine wave technique will begin next quarter.

**Psychophysical Measurements:**

Three report deliverables have been completed and will be forwarded to Dr. Wiley, COR, and Dr. Kimball (AMLO) March 2, 1994. The deliverables describe visual performance experiments testing the effect of different factors used in helmet mounted displays. These reports will also be converted to USAARL reports. The report deliverables are: (1) "Factors affecting the perception of luning in monocular regions of partial binocular overlap displays," by Victor Klymenko, Robert W. Verona, John S. Martin, and Howard H. Beasley; (2) "Factors affecting the visual fragmentation of the field-of-view in partial binocular overlap displays," by Victor Klymenko, Robert W. Verona, Howard H. Beasley and John S. Martin; and (3) "The effect of binocular overlap mode on contrast thresholds across the field-of-view as a function of spatial and temporal frequency," by Victor Klymenko, Robert W. Verona, John S. Martin, and Howard H. Beasley. The second deliverable, "Factors affecting the visual fragmentation of the field-of-

view in partial binocular overlap displays," will be presented at the ARVO convention to be held May, 1994. A fourth paper will be written for the SPIE Night Vision Psychophysics and Training Conference scheduled in April, 1994.

**Milestones:**

Efforts for the next quarter will be focused on the collection, analysis and documentation of physical measurements.

In order to more precisely define the stimulus for report (3) described in the Psychophysical Measurements section above, extensive physical measurements--physical contrasts of 16 spatio-temporal stimulus variations of a complex stimulus probe pattern (4 spatial x 4 temporal frequencies) for each of 256 (computer defined) values for each probe were taken. Measuring the MTF of the HP monitor using the techniques described in the dynamic sine wave paper to determine whether or not the technique can predict performance of a monitor with more complex stimuli is being considered. This would require the use of mathematical (Fourier analysis) techniques to determine the non-linearity (differences from prediction) observed with the complex stimuli.

Flat panel demonstrations were repeated at the Army's request for Army officials who were not able to attend the first medical imagery demonstration.

It is planned for next quarter to present research papers at both the SPIE Night Vision Psychophysics and Training Conference to be held in April, and at the Association for Research in Vision and Ophthalmology Convention held in May.