II STATEMENT OF WORK (U)
ESU 83-147

1. (U) GENERAL

1.1 (S/CL-3/NOFORN) The objective of this effort is to investigate the possible effects of ambient geophysical/low-frequency electromagntic (ELF) factors on RV performance.

1.2 (U) MAJOR GOALS

a. (S/CL-3/NOFORN) Phase I: Search and summarize the literature on geophysical/ELF effects on biological organisms, especially as they relate to the degradation of Human performance skills at a behavioral level.

b. (S/CL-3/NOFORN) Phase II: Examine the statistical correlation between RV performance in the historical SRI RV data base and the ambient geophysical/ELF factors.

c. (S/CL-3/NOFORN) Phase III: Explore the statistical correlation between RV performance and ambient ELF fluctuations--specifically on the basis of real-time ELF monitoring.

d. (S/CL-3/NOFORN) Phase IV: Provide an evaluation report as to whether measurement of ambient geophysical/ELF factors can be used as an indicator of expected RV performance, and whether optimum performance windows can be identified.

2. (U) SPECIFIC TASKS

2.1 (S/CL-3/NOFORN) SRI International will conduct a literature search to collect and summarize up-to-date knowledge in the field of bioelectronics. The literature search will be carried out in the following categories:

- Bioactive frequencies for ELF/VLF at the gross anatomical and behavioral levels.
- Effects of ELF/VLF frequencies at the biochemical (hormonal, ionic, molecular) level.
- Effects of ELF/VLF at the neuronal membrane level.
- Natural sources of ELF/VLF.
- Man-made sources of ELF/VLF.
- Artificial generation of ELF/VLF.

(S/CL-3/NOFORN)

- Propagation characteristics of ELF/VLF.
- Detection and measurement of ELF/VLF.

This will be accomplished by means of both references to literature on hand, and by computerized keyword searches. Additionally, the SRI-International consultant will contact Dr. William D. Schul, Olive W. Garvey Center for the Improvement of Human Functioning, Wichita, Kansas.

2.2 (S/CL-3/NOFORN) SRI International will perform an analysis to determine whether correlations exist between RV performance in historical data (data from previous experiments) and factors in the ambient geophysical environment. Data from previous studies conducted under controlled conditions will be analyzed by means of epoch, bivariate, and multivariate analysis (when possible) against the following geophysical variables:

- Weather (temperature, relative humidity, barometric pressure, and so forth).
- Geomagnetic indices (A_p, A_{fr}, A_a).
- Solar electromagnetic emissions.
- Sunspot number .
- Ionospheric conditions.
- Solar magnetic field.
- Lunar cycles.

Further, because it is hypothesized that the mechanism by which geophysical factors could play a role in RV performance is that of changing the ambient ELF environment, SRI-International will examine this hypothesis as well. An ELF data base spanning a year and a half (from May 1982 to present) was monitored by a field station in Los Altos, California. Data were taken twice daily. The same analysis techniques used for the geophysical analysis will be applied to the ELF data. Positive results from these tasks could yield a rough index of expected RV performance, given prevailing geophysical factors.

2.3 (S/CL-3/NOFORN) SRI-International will implement a program of real-time ELF monitoring. Little information is available on the variation of the ELF environment from location to location, although it is known that ELF frequencies generated by geophysical means tend to very simultaneously over the globe. Therefore, local variations

may exist that are caused by both man-made sources, and by the geological structure of the area. For this a reason, two ELF stations will be set up: one at the SRI premises in the RV laboratory, the other at a field station 17-km distant. Data from the SRI station will be compared with the field station data to determine the variability attributable to location and distance. This comparison may also help determine whether RV performance is influenced by global, local, or both sources of ELF disturbances. Particular attention will be paid to bioactive frequencies found as a result of the literature search in Task I. Statistical correlations will be sought between the RV performance (on an appropriate series of trials carried out in the RV chamber) and the ambient ELF fluctuations, in order to determine whether measurement of ambient ELF can be used as an indicator of expected performance, and whether optimum performance windows can be identified.

3. (U) SECURITY

(U) Military security requirements in the performance of this contract will be maintained in accordance with the "CENTER LANE SECURITY PROCEDURES GUIDE," dated 1 March 1983 (S/CL-1/NOFORN/ORCON). The highest classification involved in the performance of this contract is SECRET/CL-4/NO FOREIGN DISSEMINATION/ORIGINATOR CONTROLLED.

4. (U) DELIVERALBES

(U) SRI-International will provide the following.

4.1 (U) A progress report (2 copies)--a written evaluation of findings (within 10 days of completion) of Phase I, literature survey.

4.2 (S/CL-3/NOFORN) A progress report (2 copies)-- a written evaluation of findings (within 10 days of completion) of Phase II, investigation of the statistical correlation between geophysical/ELF factors and the historical RV data base.

4.3 S/CL-3/NOFORN) Following Phase III, an investigation of the statistical correlation between ambient ELF fluctuations and RV performance, a final report (3 copies) will be furnished within 30 days, which will include an overall evaluation of the Geophysical Factors/ELF/RV Correlation Study Task.

5. (U) ACCESS TO MATERIAL

(S/CL-3/NOFORN) Reasonable access to raw data material will be made to CENTER LANE personnel to ensure a full understanding of statistical methodology used during evaluations.

6. (U) SPECIAL REQUIREMENTS

(U) Requirements concerning the use of human subjects as outlined in the INSCOM Statement of Work on Identification of Selected Personnel, dated 2 August 1983, will be adhered to.