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SPACELABS, INC.  
MONTHLY PROGRESS REPORT NO. 6  
CONTRACT NO. DA18-108-AMC-228(A)  
DYNAMIC MEASUREMENT OF PROTECTIVE MASKS

This report covers the period from 7 December 1963 to 6 January 1964.

Work Performed During the Period

The second discriminator was received from EMR during the past period. The reference oscillator has not been delivered but system tests can proceed without difficulty by shorting the point which is fed by the reference oscillator to ground. The lack of the reference oscillator will not hinder the development effort. The main program effort during this period has been in establishing the electronic circuit configuration and the complete layout for the mask electronics module. As previously reported, the art work for the VCO's, active filters, and coil driver amplifier was released and these three modules have been fabricated. The layout and package design for the balance of the circuitry has been proceeding in parallel with the electronic design of the mask electronics.

The electronic circuit design has presented some extremely difficult problems. The principal one encountered during the period was the design of a 40 kc oscillator with the necessary frequency and amplitude stability over the range of expected battery voltage and ambient temperature variation. A design has been established based upon a 40 kc multi-vibrator, buffer amplifier stage, an active filter, and a power amplifier with a gain of approximately 4. Test results indicate that this circuit will produce the necessary 40 kc power with a frequency variation not exceeding 100 cycles per second over the operating temperature range. Amplitude stability has been measured as approximately  $\pm 5\%$ . A second problem centered on the transducer bridge network and the harmonic content of the bridge output signal. The Hidyne pressure transducers

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have a relatively large third harmonic component which produces a scale factor change in the phase sensitive detector output, as a result both of temperature and frequency change. The present circuit appears to be adequate and final tests are underway to confirm its performance.

With the circuitry tentatively defined, the mask module layout has been started. Procurement of parts for the first mask system has been initiated. Parts for the additional nine systems have been withheld pending test results on the first system and the receipt of supplemental funding.

During the period, a coordination meeting was held at Spacelabs attended by Messrs Shoemaker and Redd from Edgewood Arsenal. Many aspects of the program were discussed during this visit and several significant points were reached.

- a. Agreement was reached on the envelope configuration of the electronics module. Based upon the best available information, a diameter of  $2.01 \pm 0.005$  inches was established together with a length of 1.5 inches.
- b. The mask coupling loop will be mounted under the nose flap of the protective mask.
- c. Preshipment tests for the nine additional systems will be started eleven weeks following the commitment of the additional funding.
- d. Spacelabs agreed to provide access to the d. c. output of the phase sensitive detector so that the mask instrumentation may be used in the laboratory without the back-pack or the telemetry data link.

e. Spacelabs agreed to investigate provisions for the necessary auxillary wiring within the mask which will permit the mask electronics module to be mounted on the back-pack if desired.

f. Edgewood representatives agreed to consider the advisability of substituting an environmental test at Spacelabs for the low temperature test previously planned at Pt. Mugu.

Work to be Performed During the Next Period

- a. Complete mask electronic packaging design.
- b. Complete breadboard tests.
- c. Assemble and test first mask electronics module.
- d. Finish prototype back-pack unit which includes reworking the battery switch to prevent inadvertent actuation.
- e. System tests with prototype back-pack and receiving station.