# SKYLAB MEDICAL EXPERIMENTS ALTITUDE TEST

## DETAILED TEST OBJECTIVE

I. Experiment

a. Sleep Monitoring Experiment M133

b. Principal Coordinating Scientist

- Dr. Milton R. DeLucchi

c. Principal Investigator

- Dr. James D. Frost, Jr.

II. Purpose and Background

a. Purpose: To objectively evaluate sleep quantity and quality during the 56-day chamber test by utilizing automatic inchamber analysis of electroencephalogram (EEG) and electrooculogram (EOG) activity. It has been demonstrated that disrupted patterns of sleep are associated with modified performance capability. Accurate information regarding sleep in the space environment is therefore of practical significance and may find useful application in future mission planning.

b. Experimental Approach: It is recognized that the only reliable and objective method for determining the quantity and quality of sleep is to record the electrical activity of the brain (EEG) and motion of the eye (EOG) during the sleep period. As an individual goes from an awake to a drowsy state, the EEG dominant frequency decreases in association with a small decrease in amplitude. Similarly, there is a correspondence between the EEG and the various stages of sleep in that there are definite changes in certain wave forms as a person goes from a drowsy to a sleep state. In addition, the periodic appearance of bursts of rapid eye movements (REMs) has been associated with dreaming. Based upon the EEG and EOG characteristics, sleep may be divided by currently accepted criteria into five clinical stages. The equipment of this experiment will be able to analyze the data from the astronaut and categorize it into one of these sleep stages or one of two other conditions as follows:

1. Awake - A nonsleep state, characterized by Alpha activity (8 - 12 Hz) and/or low amplitude mixed frequency activity in the EEG signal.

2. Stage REM - Characterized by rapid eye movements as detected by the EOG and, concurrently, EEG signals which appear much like those of stage 1 but with less prominent vertex transient forms.

3. Stage 1 - The lightest stage of sleep, in terms of ease of arousal and characterized by low amplitude EEG signals of a predominately lower frequency (5 - 7 Hz) than the awake state. Occasional vertex sharp transient forms of up to 200 V may be present.

4. Stage 2 - This state is characterized by burst of 14 Hz EEG potentials (spindles) and/or K-complexes (relatively high voltage transients exceeding 0.5 seconds) superimposed on the somewhat random low amplitude background signal.

5. Stage 3 - Relatively high amplitude (greater than 75 V) activity of 2 Hz or slower is present between 20 and 50 percent of the time. Intervening activity is relatively low in amplitude. Fourteen Hz spindles may be present.

6. Stage 4 - Relatively high amplitude (greater than 75 V) activity of 2 Hz or slower is present more than 50 percent of the time. Fourteen Hz spindles may be present.

7. Stage 0 - A null state to indicate interruption of the data or other loss of the normal signal.

There is a definite and well established individual requirement for each sleep stage. A subject's sleep period is characterized by fluctuations in and out of the various stages of sleep. In assessing the quality of a particular sleep period; therefore, the time-duration plot with respect to the sleep stages provide essential information regarding sleep quantity and quality and is referred to as the sleep profile.

In order to accomplish the stated objectives of the experiment it will be necessary to obtain EEG, EOG and head-movement information from the subject continuously during the 8-hour sleep periods. The EEG activity will provide the most essential information to the analysis system and will permit detection of the awake state and stages 1 through 4 of sleep. Addition of the EOG data will allow definition of the REM stage of sleep. Detection of head movement will allow the analysis circuitry to ignore sections of data which may be contaminated with artifacts due to head movement in excess of tolerable limits.

c. <u>Justification:</u> The data obtained during the chamber test will provide baseline information regarding sleep during a simulated 56-day Skylab mission that can be used in interpreting the data collected during the actual space flight.

III. Participants

a. Number of Crewmen: Baseline data will be collected upon three members of the chamber crew prior to the 56-day inchamber period. The sleep of two crewmemberswill be monitored during the inchamber period according to the same schedule as will be used in the Skylab space flight.

b. Crew Function: The participating crewmembers will be responsible for all preparations, for carrying out the experiment and for maintenance tasks associated with the experiment.

IV. Functional Objectives

a. Prechamber: Baseline data for comparison with inchamber records will be collected during three consecutive nights of the prechamber period, and during one EEG recording session at the Principal Investigator's laboratory in the Methodist Hospital, Houston, Texas.

b. Inchamber: During the inchamber test period, recordings will be made on specified nights and the analyzed sleep data will be transmitted to the Experiments Control Center for real time display. The data obtained on a day-to-day basis will be compared with the prechamber baseline data for determination and assessment of any variations identified during the inchamber test period. Data will also be recorded inchamber throughout the 56-day test period. Upon termination of the test additional detailed analyses of the tapes will be made.

c. Postchamber: Recordings will be made on nights 1, 3, and 5 following the inchamber test period to assess the effects of the return to a normal environment and the persistence of any alteration in the sleep patterns observed during the test.

V. Test Conditions

a. Environmental Requirements: The chamber environment should be the same as that projected for the Skylab mission.

b. Crew Constraints: One crewman will act as both subject and experimenter. Approximately 10 minutes will be required for preparations. The crewman will don the cap and wear it throughout his normal night's sleep.

VI. Hardware Requirements - The experiment equipment consists of: Cap Assembly, Chin Strap, M133 Preamplifier and Accelerometer Assembly, M133 Panel Assembly, SIA Cable, and Tape Return Canister.

a. Cap Assembly: The Cap Assembly will consist of: Cap, EEG/EOG electrodes, and Preamplifier Connector.

Acquisition of EEG and EOG activity will be accomplished by utilizing a specially designed disposable cap which incorporates seven sponge-type recording electrodes. The recording cap is constructed so that the sponge electrodes are prefilled with an electrolyte paste which is prevented from escaping by a thin plastic coating over the electrode. A portion of this sealing tab is removed just prior to application of the cap. It is planned to provide a new cap for each recording session so that the only preparation procedure required of the subject is removal of the seals from each electrode. The one-time-only concept for the recording caps also greatly increases the reliability of the acquisition procedure since each electrode can be precisely loaded prior to the flight, and the effects of continued use on the components are eliminated.

Two EEG channels will be provided by the cap array and will be recorded by the M133 recorder. Only one channel will be utilized by the analyzer circuitry, and this can be selected from the control panel. (Either channel will provide an adequate signal for the analyzer). One EOG channel is provided by two cap electrodes, one located lateral to and one above the left eye. This configuration permits detection of both vertical and lateral eye movements.

b. Chin Strap: Reusable chin straps are provided to secure the Cap Assembly to the head.

c. Preamplifier and Accelerometer Assembly: This assembly will consist of: EEG, EOG, and Accelerometer Preamplifier, Accelerometer, Electroshock Protection, Electrostatic Protection, and the Umbilical. Amplification of the signals from the cap is accomplished in two stages. A small preamplifier assembly located on the cap accepts the electrode leads through a miniature connector which permits rapid connection and disconnection. Location of the preamplifier on the cap greatly reduces the effects of head movement and decreases the susceptibility of the system to extraneous electromagnetic interference. The preamplified signals are transmitted by the umbilical to the final amplification stages located in the M133 Panel Assembly. The Preamplifier and Accelerometer Assembly also contains a miniature accelerometer package which provides information concerning head movements of the subject, and this signal is also sent through the umbilical to the M133 Panel Assembly. Electroshock protection is provided for in this assembly.

d. <u>M133 Panel Assembly:</u> The M133 Panel Assembly will comprise the following functional units: EEG, EOG and Accelerometer Amplifiers; Electrode Test Circuit; Control Panel; Analyzer; and Magnetic Tape Recorders. During operation, it will be mounted in the sleeping compartment.

1. Control Panel and Electrode Test Circuit - The control panel assembly is designed to indicate to the astronaut proper application of the Cap Assembly, and to indicate proper functioning of the apparatus before the sleep period begins. It is easily visible to the subject during application of the cap and contains a series of indicator lamps, each representing one of the sponge-electrode sensors on the cap. When the cap is donned by the subject, he moves the panel selector switch from the "off" position to the "test" position, thereby activating the automatic test circuitry. A small test current is passed through the ground electrode to each of the six recording electrodes, and this current is sensed to provide an indication of inter-electrode resistance. If a given electrode is in proper contact with the scalp, the corresponding lamp in the simulated control panel display will be illuminated. Improper contact is resolved by slight repositioning and rocking of the sensor to obtain correct contact of the sponge against the scalp.

2. Analyzer and Amplifier Circuitry - These sub-systems of the M133 Panel Assembly will provide the final amplification for the EEG, EOG, and accelerometer signals and, based on specific characteristics of these signals, will classify the sleep status of the crewmember into one of the seven categories defined above.

3. Magnetic Tape Recorders/Magnetic Tape - Two tape recorders with tape will be utilized to preserve the unprocessed data for later, more detailed analysis. Existing flight hardware is suitable for this purpose (Gemini series, 7 channel magnetic tape recorders manufactured by the Cook Electric Company), and it will accept the various signals proposed for this experiment with minor modification. Each recorder will handle up to 100 hours of data , and thus the two recorders specified will adequately cover the 21 eight-hour sleep periods scheduled.

e. SIA - Cable: The SIA cable is used to connect the output of the analyzer to the Speaker Intercom Assembly.

f. Tape Return Canister: The Tape Return Canister holds two reels of magnetic tape.

g. Experiment Equipment List: A list of the experiment equipment and its function is shown in Table 1 .

h. Additional Supporting Equipment:

1. Mount
2. Scissors
3. Cable assembly, utility, high power

TABLE 1 - EXPERIMENT EQUIPMENT LIST

| Equipment | Function |
| --- | --- |
| Cap Assembly | A disposable assembly consisting of the cap, electrodes, and connector. |
| (1) Cap Assembly | Provides mounting and positioning for the electrodes including wiring interfaces between the electrodes and connector. |
| (2) EEG/EOG Electrodes | The electrodes (4 EEG, 2 EOG and 1 ground) are sensors located in the cap which detect electrical potentials at the scalp surface. |
| (3) Preamplifier Connector | Provides electrical connection between the cap and preamplifier assemblies. |
| Chin Strap | Secures cap to head. |
| Preamplifier and Accelerometer Assembly | |
| (1) EEG, EOG & Accelerometer Preamplifier | Provides initial gain for the detected signals. |
| (2) Accelerometer | Furnishes information regarding head movements of the subject. |
| (3) Electroshock Protection | Provides electroshock protection. |
| (4) Static Discharge Protection | Provides electrostatic discharge protection. |
| (5) Umbilical | A multiconductor individually shielded cable that provides connection between the preamplifiers and panel assemblies. |

TABLE 1 - EXPERIMENT EQUIPMENT LIST (continued)

| Equipment | Function |
|---|---|
| M133 Panel Assembly | |
| (1) EEG, EOG & Accelerometer Amplifier | Provides final amplification and conditioning of the signals. |
| (2) Electrode Test Circuit | Provides a means of checking the electrodes. |
| (3) Circuit Breaker | Circuit Breaker protection. |
| (4) Gain Control | Controls final amplifier gain. |
| (5) Control Panel | The panel contains all of the controls and display for the systems as follows: (1) Controls for the selection of the EEG channel to be analyzed, test circuit actuation and tape recorder control; (2) a display, arranged in similar geometric patterns as that of the cap electrodes which will provide indications pertaining to the proper electrode contact on the scalp. |
| (6) Analyzer | Contains the necessary circuitry to accomplish the data reduction and sleep-stage determination. |
| (7) Magnetic Tape Recorders/Tapes | Permit onboard recording of unprocessed data for later, more complete analysis. |
| M133 Tape Return Canister | Provides protection for the tapes outside of the recorders. |
| SIA Cable | Connects Speaker Intercom Assembly to the M133 Panel Assembly. |
| Utility Cable (High Power) | (Furnished by the chamber) to supply power. |
| Mount | (Furnished by the chamber) attaches Experiment to chamber. |

## VII. Chamber Interfaces

a. Stowage Requirements:

1. Weight and Volume - The weight and volume of the experiment equipment is shown in Table 2.

2. Dimensional Sketches

(a) Stowed - The dimensions of the stowed experiment equipment are shown in figures 1, 2, and 3.

(b) Operational - The operational configuration of the experiment equipment is shown in figure 4.

b. Structural and Mechanical Requirements:

1. Mounting and Orientation Requirements - The M133 Panel Assembly must be mounted in the sleeping quarters close to the head (when in the sleeping position) of the participating crewmember. The panel indicator lamps must be easily visible to the crewmen when donning the cap.

2. System and Equipment Modification - The tape recorders selected for this experiment must be modified to allow magnetic tape removal and return.

3. Plumbing Requirements - None

4. Fluid Requirement (Gaseous and Liquid) - None

5. Accessibility Requirements - The experiment equipment must be located such that it can be observed and operated by the crewmember while in his bunk.

Table 2 - Weight and Volume of Experiment Equipment

| Equipment Item | Weight | Volume ($Ft^3$) | |
|---|---|---|---|
| | | Stored | Operation |
| Flight | | | |
| Cap Assembly (43 ea.) | 8.6 | 1.38 | Conforms to Head |
| Chin Strap (18 ea.) | 0.9 | 0.0024 | Conforms to Head |
| Preamplifier and Accelerometer Assembly (3 ea) | 1.5 | 0.025 | 0.0008* |
| M133 Panel Assembly | 15.0 | 0.3 | 0.3 |
| SIA Cable (3 ea.) | 2.25 | 0.028 | 0.01* |
| M133 Tape Return Canister | 1.5 | 0.029 | N/A |
| M133 Tape Return Canister with Tape | 2.5 | 0.029 | N/A |
| TOTAL | 32.25 | 1.794 | 0.311 |

*Operation volume is for only one item at a time.

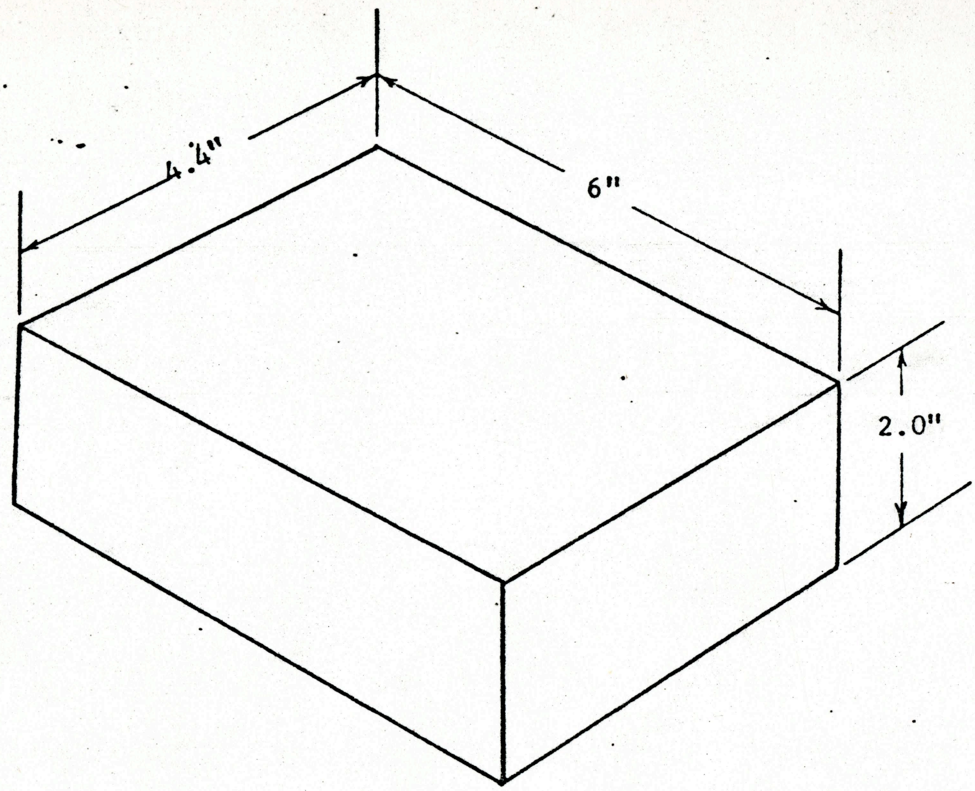



**Figure 1** Cap Assembly - Stowed Dimensions (43 items)

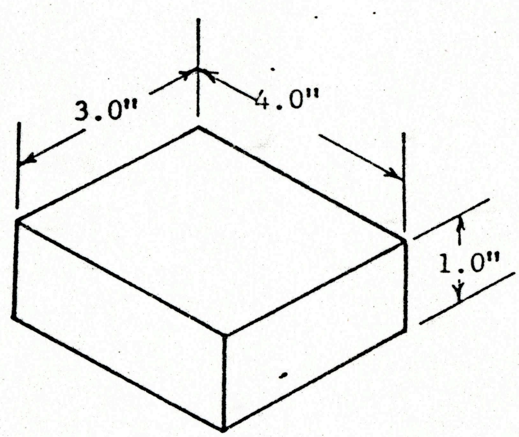



**Figure 2** Preamplifier and Accelerometer Assembly - Stowed Dimensions (3 items)

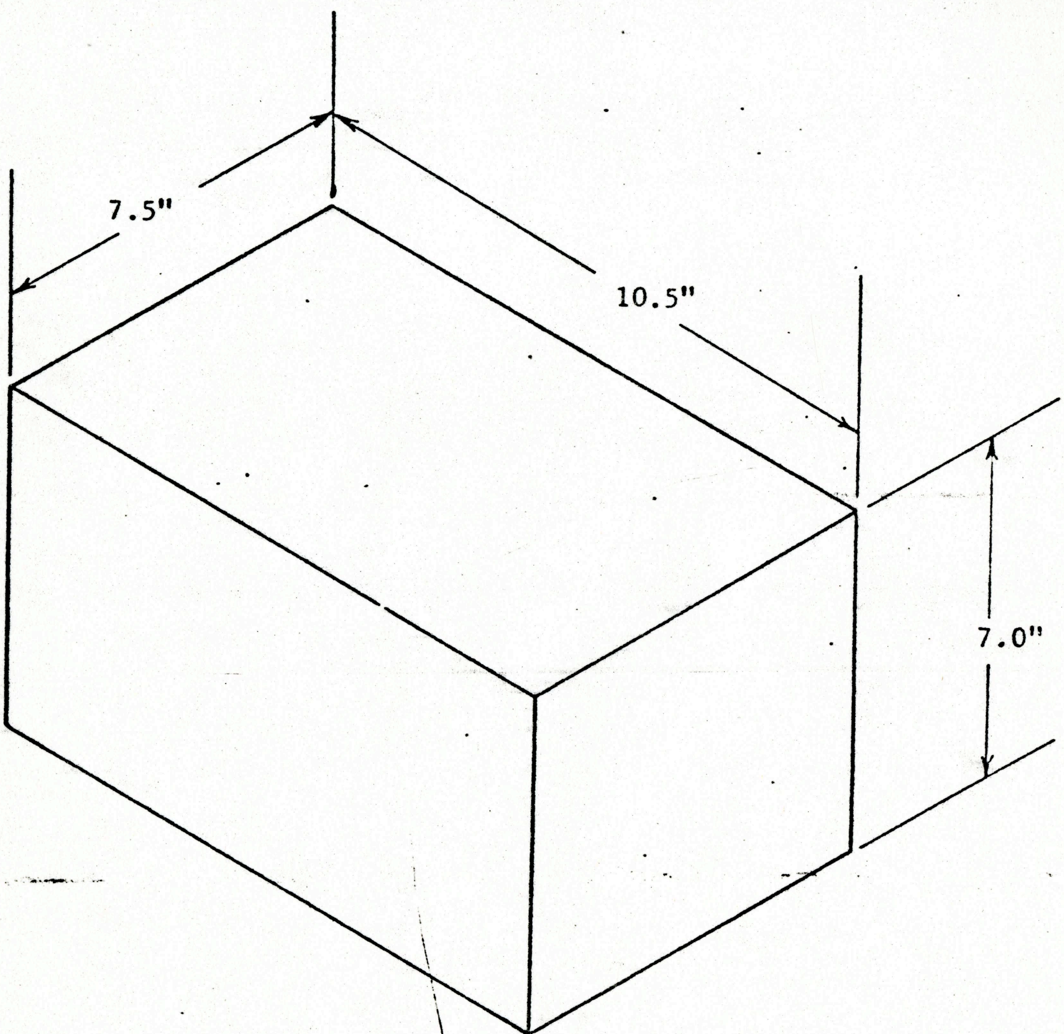



Figure 3 M133 Panel Assembly - Stowed Dimensions (1 item)

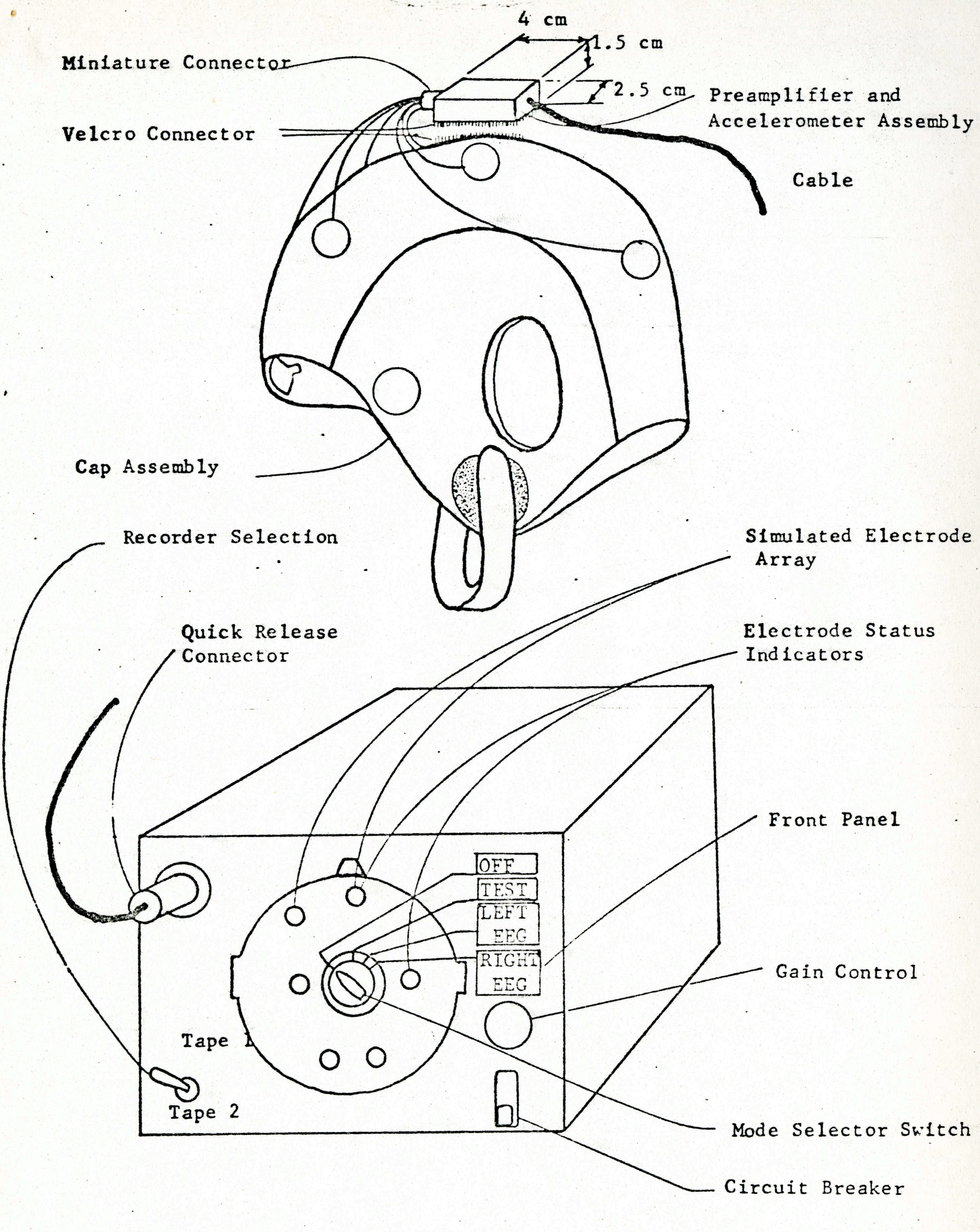



Figure 4. M133 Operational Sketch

6. Observation Access Requirements — The participating crewmember must be able to observe the control face of the Panel Assembly while in his bunk.

c. Electrical Requirements:

1. Power and Voltage Requirements — The power and voltage requirements for the experiment electronics are listed in Table 3 .

2. Power Profile - The total experiment power requirements are shown in the illustrated power profile chart in figure 5 .

3. Other Power Characteristics - None.

d. Instrumentation and Communication Requirements:

1. Timing System Requirements - A tape motion timing system will be provided as part of the experimental hardware.

2. Voice Communication Requirements - None.

3. Displays and Control Requirements - Displays and Control Requirements are shown in Table 4 .

4. Television Requirements - None.

e. Interface Requirements:

1. Interface Schematic - The Interface Schematic is shown in figure 6 .

2. Interface Identification - Interface Schematic is shown in Table 5 .

3. Existing Hardware Interfaces -

(a) Speaker Intercom Assembly

(b) Mount

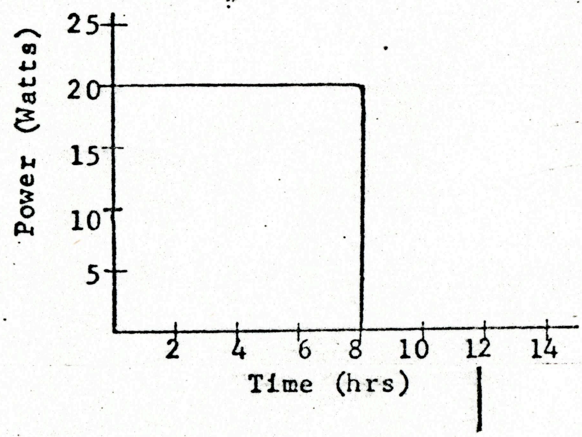
(c) Utility Outlet

Table 3 Power and Voltage Requirements

| Equipment Item | Voltage Required (Including Tolerance) | Peak (Watts) | Standby (Watts) | Average (Watts) | Total (W-Hr) |
|---|---|---|---|---|---|
| M133 Panel Assembly | $+28\,^{+2}_{-4}$ | 20 | 0 | 20 | 160 per run |

Table 4 Display and Control Requirements

| Description | Display/ Control | Location |
|---|---|---|
| Experiment Hardware | | |
| Mode Selector Switch | Control | M133 Panel Assembly |
| Electrode Status Indication Lamp | Display | M133 Panel Assembly |
| Gain Control | Control | M133 Panel Assembly |
| Recorder Selection Switch | Control | M133 Panel Assembly |
| Circuit Breaker | Control | M133 Panel Assembly |
| Other Hardware - None | | |




(Repeated times during 56 day mission)

Figure 5 Power Profile

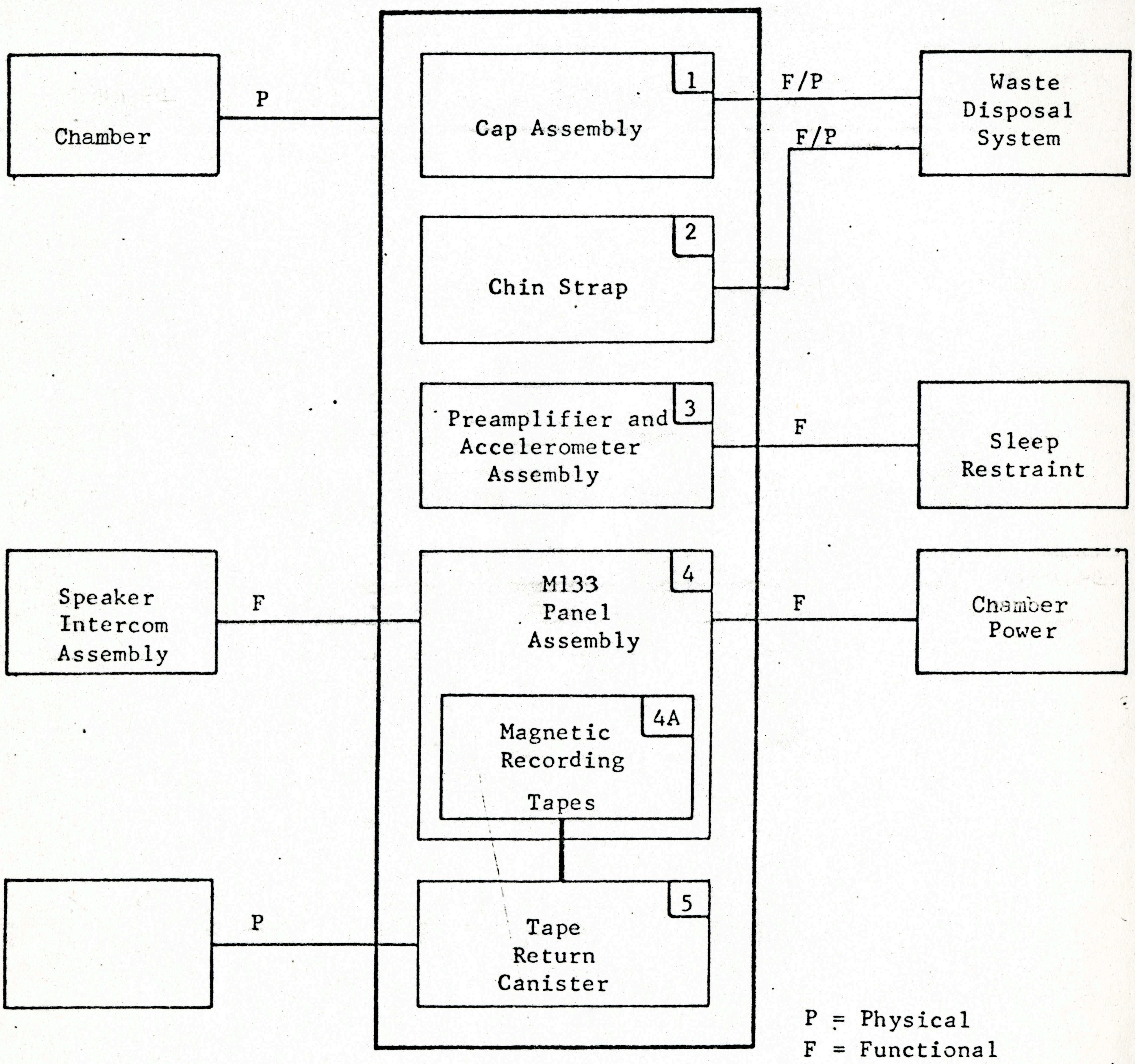



Figure 6 Interface Schematic

Table 5 - Interface Identification

| Experiment Equipment Item | Chamber Interfaces* | | | | | | | | Subsystem Interfaces* | | | | | | | Operational Equipment Interfaces* | | | | | | | | Other Exp. Interfaces* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chamber | | | | | | | | SIA | | | | Waste Disposal | | | Sleep Restraints | | | | | | | | | | | | |
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | AA | BB |
| | Mechanical | | Power | | | | | | | I and C | | | | | | Mechanical | | | Mechanical | | | | | | | | | |
| 1. Cap Assembly | | | | | | | | | | | | | F/P | | | F/P | | | | | | | | | | | | |
| 2. Chin Strap | | | | | | | | | | | | | F/P | | | | | | | | | | | | | | | |
| 3. Preamplifier & Accelerometer Assembly | | | | | | | | | | | | | | | | | | | F/P | | | | | | | | | |
| 4. M133 Panel Assembly | P | | F | | | | | | | F | | | | | | | | | | | | | | | | | | |
| 4A. Magnetic Recording Tapes | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Tape Return Canister | P | | | | | | | | | | | | | | | | | | | | | | | | | | | |

F = Functional
P = Physical
*ICD required

Type

VIII. Crew Training

Crew Training Requirements: The participating crewmembers(and backup crewmember) must be trained in the procedures associated with application of the electrode cap and operation of the M133 Panel Assembly. These procedures are straightforward and should be mastered with no more than a total of six hours of training time. Three consecutive nights of sleep (eight hours each) recording will be required of the prime and backup crewmembers. It is expected that most of the training could be accomplished in conjunction with these sessions by scheduling each period for approximately 10 - 12 hours.

IX. Scheduling Requirements

a. Number of Performances: Each participating crewmember will record his sleep on 21 of the 56 nights inchamber. The performance schedule is as presented in the Chamber Experiment Timeline in the Skylab Medical Experiments Altitude Test (SMEAT) Program Plan.

b. Time of Performance: The experiment will be performed during the crewmembers' regularly scheduled sleep period. The experiment preparation and post-operation tasks will require approximately 12 minutes.

X. Data Requirements

a. Chamber Data Requirements: Experimental baseline data will be required from each participating crewmember and one backup crewmember. This prechamber data will be obtained during three consecutive nights, wi~~thin~~ 6 within 60 days prior to the inchamber period, under normal sleep conditions, u using equipment that is functionally identical

## IX Scheduling Requirements

a. Number of Performances. ~~Of the Two~~ ~~Each crewmember~~ Each participating crewmember will record his sleep on 21 of the 56 nights in chamber. The performance schedule is as presented in the Chamber Experiment Timeline in the Skylab Medical Experiments Altitude Test (SMEAT) Program Plan.

b. Time of Performance. The experiment will be performed during the crewmembers regularly scheduled sleep period. The experiment preparation and post-operation tasks will require approximately 12 minutes.

## ~~X Data Requirements~~

# X Data Requirements

~~3. DATA REQUIREMENTS~~

a. ~~3.1~~ Chamber Preflight Data Requirements - Experimental baseline data will be required from test participating ~~[illegible]~~ crewmember and one backup crewmember. This is prechamber ~~preflight~~ data will be obtained during three consecutive nights, within 60 days prior to the inchamber period ~~launch~~, under normal sleep conditions, using equipment that is functionally identical to the Chamber ~~flight~~ hardware. These three prechamber ~~preflight~~ sessions will require approximately 12 hours per session to allow for much of the training and hardware familiarization to be accomplished at that time. During the attainment of the sleep baseline data, amplitude level determination will be made for the purpose of calibrating the ~~flight~~ analyzer. ~~The collection, analysis and distribution of this data will be the responsibility of the P.I.~~

In addition to the three consecutive nights, a one-hour session at the PI's laboratory will be required to obtain a standard EEG recording under controlled laboratory conditions.

~~There are no launch pad data requirements.~~

~~3.1.1 Preflight Hair Grooming.~~ chamber The crewmembers participating in this experiment will have a close cropped hair styling prior to ~~flight~~ the inchamber test period.

b. ~~3.2~~ Inflight Data Requirements

~~3.2~~ 1. Experiment Measurement List - Equipment listings with the appropriate criteria are tabulated in Table ~~3-1~~ 6.

~~3.2~~ 2. Chamber ~~Spacecraft~~ Systems Measurement List - See Table ~~3-2~~ 7 for listing and criteria.

~~3.2~~ 3. Photographic Data Requirements - None

~~3.2~~ 4. Other Inflight Data Requirements - A log entry is required after each monitored sleep period. This entry should contain information on the sleep duration, sleep quality and any medication used during the previous 24 hours before the beginning of the sleep period.

c ~~3.3~~ Postflight Data Requirements - Three nights of continuous sleep recording are desired on post Chamber ~~flight~~ days 1, 3, and 5 utilizing the same procedures and basic equipment as during the Chamber ~~inflight~~ tests. ~~Since the flight crewmen will probably be in transit immediately following recovery, arrangements to insure the availability of equipment for postflight recordings must be made.~~

Table 3-1. Experiment Measurement List

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Sampling Rate | | | |
| Name of Measurement | Meas. No. | Meas. Type | Meas. Format | Meas. Purp. | Meas. Range | ± Max. Error | % Redline Values | ST | RT | Mis. Disp. Meas. | Remarks |
| Crewman's Sleep Status | P7000 M133 | S | A | P/SD | Volts<br>0-5 VDC<br>NA | TBD | N/A | 1.25 SPS | 1.25 SPS | RT PP | None |
| | | | | | | | | | | | |

Explanation of Columns:

1. Scientific (S), or Housekeeping (H).
2. Analog (A), Digital (D), or Event (E).
3. Performance Evaluation (P), Malfunction Diagnosis (M), Environmental (E), Safety (S), Ground Checkout (GC), Flight Checkout (FC), or Scientific Data (SD).
4. Line 1 - Amplitude in Standard International Units.
   Line 2 - Amplitude in Volts.
   Line 3 - Frequency, if applicable.
5. Allowable error, end to end based on 3 sigma values.
6. Values which, when exceeded, result in termination of test, launch countdown, or flight operation.
7. Programmed sampling rate, in terms of samples per second, stored data (ST), and real time data (RT).
8. Real Time (RT), or Post Pass (PP).
9. Applicable characteristics, properties, or requirements peculiar to a given measurement.

7 chamber

Table ~~3-2~~. Spacecraft Systems Measurement List

| | | 1 | 2 | 3 | 4 | 5 | | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| Name of Measurement | Measurement Number | Meas. Format | Meas. Purp. | Meas. Range | ± Max. Error | Sampling Rate ST | Sampling Rate RT | Mis. Disp. Meas. | Remarks |
| Timing-Elapse Mission | N/A | D | P | Days of yr<br>NA<br>NA | ±1 sec/24 Hours | | | PP/RT | |
| Ambient Temperature | C7301 | A | P | 40°-100°F<br>0-5V<br>NA | TBD | 1.25 | 1.25 | PP/RT | |
| Ambient Pressure | TBD | A | P | 0-6 PSIA<br>0-5V<br>NA | TBD | 1.25 | 1.25 | PP/RT | |

MSC-02790

Explanation of Columns:

1. Analog (A), Digital (D), or Event (E).
2. Performance Evaluation (P), Malfunction Diagnosis (M), Environmental (E), Safety (S), Ground Checkout (GC), or Flight Checkout (FC).
3. Line 1 - Amplitude in Standard Engineering Units.
   Line 2 - Amplitude in Volts.
   Line 3 - Frequency, if applicable.
4. Allowable error, end-to-end based on 3 sigma values.
5. Programmed sampling rate, in terms of samples per second, stored data (ST) and real time (RT).
6. Real Time (RT), Post Pass (PP), or Post Mission (PM).
7. Applicable characteristics, properties, or requirements peculiar to a given measurement.

## XI FDF Requirements

a. Procedures. Procedures are detailed in Tables 8, 9 and 10 for crew tasks associated with experiment preparation, operation and post-operation.

~~Log~~

b. Logs. Logs entries shall be made ~~maintained~~ to record ~~the [illegible] data described in XI~~ information on sleep duration, sleep quality and any medication used within 24 hours of the beginning of the sleep period.

## XII Deviations from Approved Skylab Experiment

a. The sleep of two crewmembers will be monitored.

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Table ~~6-1.~~ Experiment Preparation Requirements

| Crew Task | Approximate Time (Minutes) | Crew Member A | Crew Member B | Crew Member C |
|---|---|---|---|---|
| A. Initial Preparation (one time only) | | | | |
| 1. Remove the Experiment Hardware from the stowed condition | 5 | X | | |
| 2. Mount the M133 Panel Assembly in the sleep compartment | 10 | X | | |
| 3. Connect OWS power | 1.5 | X | | |
| 4. Connect cable to SIA | 1.5 | X | | |
| 5. Set gain factor to correct setting | 1 | X | | |
| Total Initial Preparation Time | 19 | | | |
| B. Prior to Each Operation | | | | |
| 1. Remove Cap Assembly from storage container | 1 | X | | |
| 2. Attach Preamplifier and Accelerometer Assembly to Cap Assembly | 1 | X | | |
| 3. Remove sealing tab from each electrode don cap, attach chin strap | 2 | X | | |
| 4. Turn selector on M133 Panel Assembly to the "TEST" position; manipulate any nonfunctional electrodes until proper contact is made. Switch selector to Left EEG position and begin sleep period. Right EEG may be used if impossible to obtain proper contact on left electrodes | 1 | X | | |
| Total Preparation Time (Each Operation) | 5 | X | | |

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Table ~~6-2.~~ Experiment Operation Requirements

| Crew Task | Approximate Time (minutes) | Crew Member | | |
|---|---|---|---|---|
| | | A | B | C |
| 15 sleep monitoring sessions on 28 day mission | 480 (each) | X | | |
| 21 sleep monitoring sessions on 56 day mission | 480 (each) | X | | |
| during regularly scheduled sleep periods | | | | |

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Table 6-3. Experiment Post Operation Tasks

| Crew Task | Approximate Time (minutes) | Crew Member | | |
|---|---|---|---|---|
| | | A | B | C |
| 1. Remove and store chin strap | 1 | X | | |
| 2. Remove cap and disconnect the preamp and accel. assy.; store assembly and chin strap; discard used electrode-cap; turn selector switch to "OFF" | 3 | X | | |
| 3. Remove electrolyte from hair | 3 | X | | |
| Total Time | 7 | | | |