

SKYLAB MEDICAL EXPERIMENTS ALTITUDE TEST

DETAILED TEST OBJECTIVES

I. EXPERIMENT/OPERATIONAL SYSTEM

- A. Title: Inflight Medical Support System
- B. C. A. Jernigan, M.D. (NASA-MSC-DC-4) Requirements Developer
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II. PURPOSE AND BACKGROUND

A. Purpose of Experiment

The purpose of this experiment is to ~~fully exercise~~ the IMSS equipment under simulated space environment and to obtain in-chamber microbiological samples using the equipment and procedures identified.

This experiment will provide verification or identification of required modifications and further testing to the equipment, procedures, techniques, etc.

B. Justification for Experiment

Use of the IMSS in the SMEAT environment will add to the basic design and testing done during development of the system.

It will provide medical diagnostic, therapeutic and laboratory capabilities if illness or injury develops during the chamber test. However, if it is felt that if additional medical treatment capabilities are required during an in-chamber illness these capabilities will be provided.

III. PARTICIPANTS

A. Number of Crewmen Required

All three SMEAT crewmen will participate.

III. PARTICIPANTS (cont'd)

B. Function of Each Crewman

1. The physician crewman will utilize both the equipment identified for use by any crewman (A), and the equipment identified for use by a physician crewman (B).
2. The remaining two crewmen will serve as subjects, and as physician for the equipment identified for use by any crewman (A).

IV. FUNCTIONAL OBJECTIVES

F01 To unpack and use each noninvasive instrument in the IMSS.

F02 To unpack and simulate the use of each invasive instrument in the IMSS.

F03 To obtain in-chamber microbiological specimens of:

- a. Hardware
- b. Crew
- c. Air

F04 To obtain samples of four mock "illness events":

- a. Skin
- b. Urine
- c. Respiratory
- d. Blood (finger prick)

F05 To perform in-chamber crew physical examination

V. TEST CONDITIONS

A. Environmental Requirements

None

B. Crew Constraints

1. Microbiological hardware samples (F03 a) shall be obtained

V. TEST CONDITIONS (cont'd)

shortly after periods of high crew activity on the specified days. Fifteen in-chamber hardware samples and fifteen duplicate samples will be obtained and immediately passed out the chamber transfer locks. Each hardware sample shall be obtained by swab at the following sites:

3 samples in the sleep area (one per bunk)

3 samples in the wardroom (food management table)

3 samples in the waste management area

3 samples, one in each: a. LBNPD Interior

b. Ergometer seat

c. Off duty equipment locker interior

3 samples (walls of upper deck area) 1

2. Four body samples (Buccal, Otic, Subaxillar, Inguinal (F03 b) from each crewman will be obtained and held in the chamber at refrigerator temperature. 7 Four duplicate body samples will be obtained at the same specified time and immediately passed out of the chamber. The microbiological crew samples will be obtained by swab shortly after arising.
3. One in-chamber microbiological air sample (F03 c) (consisting of three separate volumes of air obtained in the wardroom sleep area and waste management system area) shall be obtained weekly and passed out of the chamber.
4. The mock "illness event" samples (F04) (skin, urine, respiratory and blood (finger-prick) will be obtained and processed in-chamber by the crewmen, using the appropriate microbiology, urinalysis or hematology kits. Duplicate plates will be

V. TEST CONDITIONS (cont'd)

inoculated with the mock or actual "illness event" samples and immediately passed out of the chamber. In the event of actual illnesses, sampling at the time of onset will be substituted for the above samples.

VI. HARDWARE REQUIREMENTS

A. Identification and Purpose of Hardware

Each item of equipment shall be identified (A) for use by any crewmember, (B) for use by or under the direction of a physician only and so labeled. A and B items shall be stowed separately except when such stowage would degrade utility.

1. Diagnostic Equipment

<u>Item</u>	<u>Qty</u>	<u>Function</u>	<u>Category</u>
Clinical Oral Thermometer	3	Measure a crewman's oral temperature	(A)
Stethoscope	1	Monitor characteristic body sounds (e.g., heart lungs)	(A)
Aneroid Sphygmomanometer	1	Take readings of the crewman's blood pressure	(A)
Ophthalmoscope-Otoscope	1	Provide illumination, examination, and diagnostic capabilities of the ears and eyes	(A)
Self-Powered, Head Mounted Light Source	1	Provide sufficient illumination for diagnostic examinations	(A)
Nasal Speculum	1	Provide examination of capability of nasal passages	(A)

VI. HARDWARE REQUIREMENTS (cont'd)

<u>Item</u>	<u>Qty</u>	<u>Function</u>	<u>Category</u>
Binocular Magnifying Glasses	1	Give magnification	(A)
Tongue Depressor	1 ^{kg}	Diagnostic purposes	(A)
Neurological Examination Instrument	1	Provide the capability of diagnosing deep tendon reflexes, skin innervation, and vibration response	(B)
Politzer Bag	1	Aid in the treatment of Eustachian tube blockage	(B)

2. Therapeutic Equipment

<u>Item</u>	<u>Qty</u>	<u>Function</u>	<u>Category</u>
Catheterization Kit	1	Provide the capability of urinary and nasogastric catheterization	(B)
1. 48" long nasogastric tube			
2. 16 Fr. Foley catheter urine bags			
Sterile lubricating jelly, etc.			
Dental Kit	1	Provide the capability of dealing with in-chamber dental emergencies	(A)
Hand held instruments			
Dental gauze			
Syringe & needles			
Local anesthetic			
Temporary restorative material, etc.			
Minor Surgery Kit	2	Provide the capability of extraction of foreign objects and creating and closing surgical and puncture openings.	(B)
Hand held instruments			
Towels			
Sutures			
Drapes			
Etc.			

VI. HARDWARE REQUIREMENTS (cont'd)

<u>Item</u>	<u>Qty</u>	<u>Function</u>	<u>Category</u>
Bandage Kit	1	Provide the capability of foreign objects and bandaging and splinting of wounds and fractures	(A)
Hand held instruments			
Examination gloves			
Bandages and dressings			
Splints			
Eye-patch			
Adhesive tape			
Etc.			
Drugs	1	Perform the particular functions listed:	
		a. Cardiac muscle stimulant	
		b. Cardiac muscle depressant	
		c. Skeletal muscle relaxant	
		d. Smooth muscle depressant	
		e. Decongestant - nasal decongestant & antihistaminic	
		f. Antidiarrheal agent	
		g. Analgesic - pain reliever	
		h. Sedative - short acting barbiturate	
		i. Psychomotor stimulant - sympathomimetic stimulant to central nervous system	
		j. Antiflatulent	
		k. Anticonvulsive agent	
		l. Anesthetic - rapid acting, wide spectrum local anesthetic	
		m. Anti-motion sickness agent	
		n. Cholinergic blocking agent	
		o. Antacid	
		p. Anti-emetic	
		q. Laxative	
		r. Antibiotic	
		s. Miscellaneous, e.g., skin cream, eye drops, etc.	

VI. HARDWARE REQUIREMENTS (cont'd)

<u>Item</u>	<u>Qty</u>	<u>Function</u>	<u>Category</u>
Emergency Kit	1	Provide the capability of treating emergency occurrences	(B)
Tracheostomy equipment			
Syringes & needles			
Laryngoscope			
Pharyngeal airways			
Endotracheal tube			
Wyamine			
Epinephrine			
Xylocaine			
Glucose			
Etc.			
3. Laboratory Equipment			
Urinalysis Kit	1	Provide the capability of performing the following analyses:	(A)
Bililabstixs		a. Microscopic examination	
Urobilistixs		b. Specific gravity determination	
Hand held refractometer		c. Determination of the following components:	
Etc.		1. pH	
		2. Protein	
		3. Glucose	
		4. Ketones	
		5. Occult blood	
		6. Bilirubin	
		7. Urobilinogen	
Hematology Kit	1	Provide the capability of performing the following analyses:	(B)
Hemoglobinometer		a. White blood cell count	
Counting chamber		b. White blood cell differential count	
Counter		c. Hemoglobin determination	
Slides			
Microscope (the microscope shall be a common usage item for all the IMSS laboratory requirements)			
Etc.			

VI. HARDWARE REQUIREMENTS (cont'd)

<u>Item</u>	<u>Qty</u>	<u>Function</u>	<u>Category</u>
Microbiology Kit	1	Provide the capability of collecting in-chamber microbiological samples and of presumptive identification of the causative organisms in the event of an illness event	(A)
Incubator			
Ancillary hardware			
Petri-dishes with media			
Transport media tubes			
Air sampler			
Etc.			

B. Identification and Purpose of GSE

None

VII. CHAMBER INTERFACES

A. Stowage Requirements

Stowage for the SMEAT IMSS shall be in lockers similar to Skylab locker/compartment W706, W707, W708, W709--a total of four lockers shall be provided in the wardroom area. In addition, a portion of the SMEAT in-chamber chiller shall be allocated for IMSS usage. It will store one-half of the samples taken in functional objective F03. Space shall be provided for the IMSS resupply modules.

B. Special or Unique Interfaces

1. Locker/compartment W708 which contains the incubator/work station will require 28 ± 4 VDC at 1.5 A maximum through 15 feet extension with Skylab "zero-g" connector.
2. The microbiological air sampler shall attach to the Skylab vacuum cleaner.

VIII. CREW TRAINING

Briefing and training sessions shall be in accordance with the requirements as specified in the SMEAT Crew Training Program.

IX. SCHEDULE

A. Number of Performances

1. Pre-Chamber

Week				
	1	2	3	4
F03(a)	T-1	T-10		
(b)	T-1	T-14	T-21	T-28
(c)	T-1	T-10		

2. In-Chamber

Week								
	1	2	3	4	5	6	7	8
F01		T+12			T+30			
F02		T+12						
F03 (a)						T+40		T+56
(b)						T+40		T+56
(c)	T+7	T+14	T+21	T+28	T+35	T+42	T+49	T+56
F04	T+7	T+14		T+28		T+42		
F05		T+14		T+28		T+42		

3. Post-Chamber

None

X. DATA REQUIREMENTS

A. Experiment Measurement List

The equipment classified as diagnostic and therapeutic equipment (Section VI, Hardware Requirements) will be evaluated for its adequacy of performance as related to its intended mode of use.

X. DATA REQUIREMENTS (cont'd)

The equipment classified as laboratory equipment (Section VI, Hardware Requirements) will be evaluated while performing functional objectives F03 and F04. The following measurements shall be performed:

Urinalysis Kit

- a. Microscopic examination
- b. Specific gravity determination
- c. Determination of the following urinary components:
 1. p^H
 2. Protein
 3. Glucose
 4. Ketones
 5. Occult blood
 6. Bilirubin
 7. Urobilinogen

Hematology Kit

- a. White blood cell count
- b. White blood cell differential count
- c. Hemoglobin determination

Microbiology Kit

- a. Colony isolation description and staining characteristics of 1 to 4 bacteria for each of three illness events.
- b. Antibiotic sensitivity testing results (as an aid in the selection of the appropriate treatment measures).

X. DATA REQUIREMENTS (cont'd)

- c. Microbial load (number and type) associated with the crew and the chamber air and hardware.

B. Unique Measurements to SMEAT

None

C. Data from Other Experiments

None

D. Other Requirements

1. Magnetic tape and transcript of verbal reports of comments on all functional objectives.
2. Inflight medical logs shall be kept of the results from all functional objectives with hard copies provided.

XI. FDF REQUIREMENTS

A timeline of daily activity will be required along with inflight operating procedures.

XII. DEVIATIONS FROM APPROVED SKYLAB EQUIPMENT

- A. All instruments will be opened intentionally to verify operability.
- B. Mock illness events are scheduled in order to verify operability of the microbiology, hematology and urinalysis kits.
- C. Microbiological samples will be passed out of chamber on a routine basis.
- D. Duplicate samples of in-chamber microbiological specimens from hardware, crew, air and mock illness events will be collected.