

SMEAT MEDICAL MISSION RULES

For simplicity, the SMEAT Medical Mission Rule Guideline <sup>was</sup> ~~is~~ presented in a chart form consisting of INPUT, DECISION MAKING SYSTEM, and OUTPUT.

Object:

The object of the attached Medical Mission Rule Guideline chart <sup>was</sup> ~~is~~ to provide SMEAT medical test personnel with easily interpreted information in event of a test contingency. The chart categorized <sup>sources of information</sup> ~~sources of information~~ (INPUT) concerning contingencies which might be presented to test personnel and provided <sup>the following information</sup> ~~the following information~~ to test personnel as a function of health hazard classifications:

1. The governing procedural documents <sup>were:</sup> ~~are:~~
  - a. MSC Disaster Plan
  - b. Chamber Test Mission Rules
  - c. Skylab Experiment Environmental Specification
  - d. SMEAT Medical Operation Rules
2. Minimum personnel to be contacted for decision making and the modification sequence.
3. The major decisions required (DISPOSITION/OUTPUT).

Examples of Use:

1. Suppose that test chamber CO<sub>2</sub> partial pressure begins to exceed a predetermined allowable level during a manned test and slowly increases over a two hour period. Total pressure remains constant.
  - a. Enter the chart row entitled "Chamber Environment."

- b. Under the first major category of "Medical Case Criteria," locate the three columns labeled under "Non-Immediate Threat to Life." At this point, test monitors do not know whether any illness resulting from increased CO<sub>2</sub> and reduced O<sub>2</sub> will be treatable in the chamber or not. Assuming a stabilizing of the out-of-tolerance condition with mild or no symptoms, the column "Illness/Injury Treatable in Chamber" is entered and the black ball (●) located.
- c. Moving to the right along the same row until the first circle (○) is reached, it is noted that the "Skylab Medical Experiment Environment Specification" or the "SMEAT Medical Operation Rule" is the governing rule document.
- d. Continuing further to the right, it is noted that the following personnel should be notified in order:
  - (1) -Test Crew
  - (2) -Test Director
    - Crew Surgeon
  - (3) -Medical Safety Officer
    - Experiment Officer
    - SMEAT Medical Conference
  - (4) -LSD Director
    - Test Operation Management Committee
    - PI/PCS Coordinator
    - PI/PCS
    - Medical Experiment Data Manager
- e. Continuing further to the right, it is noted that the following decisions must be made:



- (1) Abort all or any specific medical experiments, or  
modify medical experiments, and
- (2) Whether or not the crew should be treated with the  
IMSS.

Roman numerals (I to IV) correspond approximately the hazard category.

Two-edged arrow (  $\longleftrightarrow$  ) designates "or".

OMIT

The chart is preliminary, and any questions or comments concerning this should be directed to Dr. C. E. Ross, Health Services Division, Area Code 713, 483-4021.

SECTION II.

MEDICAL OPERATION RULES

1. While a crewman is under medical observation for any crew health anomaly, the Medical Officer will be required to approve flight plan activities for that crewman.
2. Those items in the IMSS labeled "For Physician Use Only" will not be used by non-physician crewmen without the concurrence of the Medical Officer.
3. The Medical Team Conference must concur on the changing of any of the following medical items; Mission Rules, Guidelines, Procedures, constraints, and priorities.
4. Occurrence of any anomaly that is determined by the Medical Officer to be detrimental to crew health if the test were allowed to continue may be grounds for a test abort or subject removed.
5. The physician crewman will be consulted in all actions of the Medical Officer with reference to crew health.



SMEAT Crew Health Support

The function of the Health Services Division in support of SMEAT was to provide medical surveillance and emergency support to the manned testing including health care of test subjects and their families, provision of hyperbaric chamber support, and provision of occupational clinical medical services for test personnel engaged in the test operation of the chamber. In addition, clinical laboratory capability to support all biochemical, microbiological and pathological analyses is provided.

To implement the requirements just mentioned the Health Services Division appointed a two man team consisting of the crew surgeon and a Safety Officer (medical). The crew surgeon was team chief and was responsible for all medical aspects of the program; the Safety Officer was responsible physiological training, implementation of the safety program and scheduling participation of all Health Services Division personnel.

During the prechamber operations the two man team had responsible for all prechamber operations including medical surveillance, physical exams, accomplishment of pretest and prediver check list, and participation in dry runs and shake down test. In addition, they were responsible for interfacing with the Life Sciences Directorate test project manager and the SMEAT Steering Committee and for coordination of intradivision activities associated with SMEAT.

Also during prechamber ~~ix~~ phase there was a health protection plan that was implemented. This plan provided general guidelines for SMEAT crewmen to minimize the probability of exposure to infectious disease during the last 3 weeks prior to test initiation. The following guidelines

were utilized:

1. Verify that improved immunizations for all family members are current.
2. Surveillance for any/<sup>signs of</sup>potential disease onset in self (crewmen) and family members.
3. Reporting to Flight Crew/Section for examination of self (crewmen) <sup>Health</sup> and/or family members if any change in health status was ~~noted~~ noticed.
4. All family members were instructed to avoid contact with ~~all~~ known ill individuals.
5. The crewmen limited personal contact to his own household and normal work related individuals.
6. Crewmen was to be alert and avoid contact with individuals that appeared to be expressing disease symptoms.
7. The crewmen ~~xxx~~ avoided outside activities involving individuals other than household members and normal work related individuals (parties, banquets, press conferences, etc.).
8. Crewmen avoided meetings, training sessions, cite visits, etc. that involved individuals other than normal work related~~individuals~~ population.
9. The ~~xx~~ crewmen took special precautions in planning family activities to avoid contact with children other than their own and with individuals who were ill or who were expressing indications of disease onset.
10. Crewmen made arrangements for acceptable alternate residency for himself in case of family members illness in order to avoid repeated contact.



11. Crewmen avoided activities during off duty hours that resulted in excessive fatigue and stress.

#### Medical Operations Team key Position Descriptions

The crew surgeon had overall responsibility for welfare of the crews and acquisition of the <sup>medical</sup> data and was the division medical representative on the Test Operations Management Committee (TOMC). He was also required to serve as a Health Safety Officer and will schedule the other Health Safety Officers duty periods.

The Safety Officer (Medical) had responsibility for: scheduling of all the Health Safety Officers, medical technicians, hyperbaric technicians supporting the test, and for implementation of the Medical Safety Plan

The Health Safety Officers were required to be physicians and were responsible for the following during test operations:

1. Daily crew status reports.
2. Monitoring crew during conduct~~ed~~ of M092/093 and M092/171 experiments.
3. Attending ~~the~~ daily SMEAT meetings.
4. He was medical point of contact with the Test Director. He also had the authority to remove any crewmen from the chamber or abort the test for medical emergency reasons in accordance with Medical Mission Rules.

The medical technicians assisted the Health Safety Officer and manned that position during the officer's absence. They were also contact the Medical Duty Officer and the Crew Surgeon in ~~xx~~ the event of a medical contingency situation. The medical technicians consisted of 12 technicians who were

from: NASA-MSC (3), Kelsey-Seybold (3), U. S. Army (2), U. S. Navy (2), and U. S. Air Force (2). The 6 Department of Defense physicians as listed had come from isolated duty stations and had superior training in ~~emergency~~ management of emergency situations and medical care.

The hyperbaric technicians were responsible for administration of hyperbaric chamber therapy in the event of contingency situation. During the first 72 hours of the SMEAT test the hyperbaric technicians rotated on a 24-hour bases. Thereafter the crews ~~work~~ worked their regular day shifts but were on a rotational bases for call at night time.

There were also operational consultants who were a form of on-call specialist in the areas of toxicology, microbiology, and clinical laboratory techniques and were responsible to the Health Safety Officer in matters relating to the test subject health. (A SMEAT Duty Roster to be included at this point) (If original is needed, may be obtained from Ken Hecht)

time obtain  
(At this ~~point~~ would like to ~~get~~ information Dr. Shumate about inclusion of Medical Mission Rule Guideline found as Fig. B-1, page B-5 of SMEAT Medical Operations Plan. I think that this outline has good material. I also believe that the Medical Operations Rules, Sec. II ~~is~~ in plan, located on B-11 should also be included, as well as some where in the document Section III, the Biomedical Experiment Rules which goes from B-12 thru B-19 in the same document.

medical  
~~In-order-to-asses-real-time/data-which--~~



In order to assess in real time medical data which impacted crew performance and function and provided for postflight interpretation of medical findings, medical observations on the crew health status were solicited from the in-chamber physician via the private communications line. In the event of medical problems or illness, the crewmembers had the option to communicate directly and privately with the Crew Surgeon or Health Safety Officer.

Medical surveillance via television was maintained by the Health Safety Officer and medical technicians located in Building 7. In order to assess the crewmen physiological status in real time, medical surveillance monitoring of all M092/M093 and M092/M171 experiment runs was accomplished via television. In addition, contact was maintained with the P.I./PCS team<sup>in Bldg. 36</sup> by means of dedicated communications line. Additional t.v. surveillance was maintained during 3 daily scan runs of 30 minutes duration with all cameras including the portable one. The <sup>LAT-100</sup> ladder camera was used to view inaccessible areas. One run was shortly after breakfast, 1 in mid-afternoon, and ~~the~~ the other shortly before the crew retired for the evening. Contingency T.V. ~~monitoring~~ monitoring was to be accomplished any time there was a threat ~~to~~ to the crew or test. A record of the event was to be kept in this case by the Health Safety Officer.

A number of SMEAT functional objectives were of particular interest to the medical officers. Therefore, particularly close surveillance was maintained over the following:

1. inflight medical support system (IMSS)
2. CO monitoring<sub>2</sub>

3. CO monitoring
4. Oral hygiene
5. Microbiology
6. Chamber Environmental Microbial Monitoring
7. Operational Bioinstrumentation System
8. Body weight
9. SMEAT shower
10. Aerosol analyses

In reference to the Clinical Laboratory certain data relative to the cellular elements of the ~~xxx~~ blood, chemical constituents of the blood and urine, the hemeral ~~xxxxx~~ and cellular factors involved with immunity and intercompartmental fluid volumes were monitored to evaluate crew & physical status. Reporting was accomplished on a daily bases and pertinent information was summarized either at the daily SMEAT Team meeting or the Test Operations Management Committee (TOMC).

SMEAT Medical Safety Plan (Gayland Pittman co-author)

See attached report.

Add to Emergency Procedures

Treatment facilities were located:

1. Building 7A emergency room - for immediate life/stabilization <sup>saving</sup> of the patient prior to hospital transfer.
2. Building 8 - MSC Dispensary Emergency Room - same as one if necessary, and also for ~~xxx~~ minor (non-hospitalizable) trauma care.
3. Bldg. 32 hyperbaric chamber - for case involving decompression sickness and ear imbolism.
4. Pasadena Bayshore Hospital - for case involving necessity to hospitalize a patient. The cases should not include severe chest and/or neurological problems.



# SMEAT MEDICAL SAFETY PLAN

## G.H. PITTMAN

### 1. Introduction

To help assure the safety and wellbeing of the SMEAT crewmembers it was necessary to develop a Medical Safety Plan with emergency procedures.

All medical and non-medical test and operations personnel, except those specifically exempted, were required to meet the MSC Medical Standards as established by the Health Services Division. Each test team member was required to be qualified for his duties and if necessary, to undergo training until the desired level of proficiency was achieved. When personnel met the medical standards and demonstrated proficiency in their assigned duties they were certified accordingly.

### 2. Medical Procedures

Procedures for test preparation required a comprehensive crew physical examination by the Crew Surgeon approximately 30<sup>15 AND 5</sup> days prior to the test, followed by a pre-test physical 4 hours before the actual scheduled start of the test with the results recorded in the health record of the individuals. A post-test physical examination was also conducted and recorded in a like manner. It was also the responsibility of the Crew Surgeon or his authorized representative to perform the Emergency Room Pretest Checklist to insure that all emergency equipment was present and operational. A second pretest checklist was conducted one hour before the scheduled start of the test and at daily intervals thereafter. Following the pretest physical examination, each of the crewmembers denitrogenated for a minimum of three hours on an open loop oxygen system prior to ~~the~~ beginning the test.

### 3. Medical Manning Plan

a. The manning levels for the SMEAT program varied with the test timeline based upon the probability of occurrence of a medical anomaly, the crewmembers health status, and the medical data-gathering activity. The maximum manning level ~~was expected to occur~~ <sup>WAS EXPECTED TO</sup> during the initial 48 hours of testing, during a medical anomaly, a possible emergency, and when critical experiments were conducted on the crewmembers, e.g., Experiments MO92, MO93, and M171. During other periods of this test program, the manning requirement level would be less. The medical manning plan was as follows:

b. Mission Crew Surgeon. Dr. Charles E. Ross was appointed to this position and his assistant was Dr. Charles K. LaPinta. Dr. Ross ~~will~~ schedule the Health Safety Officers who provide medical surveillance.

c. Health Safety Officer. Three physicians were assigned to serve in this capacity. The tour of duty was for a daily period of from two to five hours, except for first 48 hours, and scheduling was on a rotational basis. For the remainder of the 24 hours, the Medical Duty Officer performed the function of Health Safety Officer on an "on-call" basis.

d. The Chief, Test Support Section was responsible for scheduling of the Medical Technicians, and Hyperbaric Chamber Technicians to support the test. He coordinated the "on-call" medical coverage to be provided by the Medical Duty Officers.

(1) Initial 48 hours of testing. This phase of the test was monitored by the Mission Crew Surgeon and two other physicians. They worked 8-hour shifts on a rotational basis. They were at the test chamber for medical surveillance and had a dedicated line of communication with the Building 36 Medical Experiments Data Center where the biomedical data was received.



(2) Experiment/Test Monitoring. Following the initial 48 hours of testing and for the remainder of test program, medical coverage was provided by a Health Safety Officer. Physicians were scheduled on a rotational basis for this tour of duty as defined below.

- (a) During the performance of Experiments MO92, MO93, and M171.
- (b) For daily crew status reports and SMEAT Team meetings.
- (c) In the event of a medical anomaly.
- (d) In the event of an emergency.

(3) Medical Technicians. This position was manned full time to assist the Health Safety Officer and to furnish relief from medical surveillance when the physician was not present. Should a medical contingency condition develop when the Health Safety Officer was absent, the technician was to immediately notify the Medical Duty Officer by telephone. Each medical technician worked an 8-hour shift. There were two teams of six men each that rotated on a weekly basis.

(4) Hyperbaric Chamber Technicians. During the initial 48 hours of the test, the Building 32 hyperbaric chamber was manned by two chamber technicians. If a requirement existed for hyperbaric chamber therapy, they were to notify two other crewmembers who were "on-call" either at their office or residence. For the remainder of the SMEAT operation, a roster was maintained for an "on-call" chamber team, who could respond within 20 minutes after notification.

(5) Operational Consultants. A group of specialists (toxicology, microbiology, clinical laboratory) were on call to evaluate the aspects of the operation as they relate to test subject health. In the experiments area the consultants were the PCS/PI team. The latter were available during

conduct of their respective experiments and on call to lend expertise as required in matters affecting operational health.

(6) Contingency Phase. In the event of an off-nominal health situation, such as the occurrence of an illness or an accident among the test subjects or a physiological deterioration causing a temporary suspension of experimentation, a full-time mode of medical operation manning was planned. This mode was to exist until a decision was reached to resume normal operation or a test abort is declared. The medical manning requirements for such a contingency was identical to the initial 48 Hour Test Phase.

#### 4. Emergency Procedures

a. In the event of an emergency, the Health Safety Officer or his medical assistant were to enter the ante-room to render medical assistance and supervise the removal of the crewmember (or members) to a treatment facility. (Rest)

b. Two ambulances, each capable of carrying two patients in SMEAT Gurneys, were on stand-by at the Fire Department 24 hours each day throughout the entire test period.

c. In the event of illness experienced by a crewmember (or members) the Health Safety Officer was to determine what medical treatment or procedure is required. During his absence, the Medical Technician on duty would if necessary consult by telephone with the physician "on-call". The severity or nature of the illness will dictate whether the "on-call" physician was to report immediately to the test site area to administer assistance or if it was feasible to give appropriate treatment instructions to the Medical Technician on duty.



d. To assist the attending physician with his diagnosis of any crew-member illness that may occur, pertinent biomedical data was to be made available to him by the Principal Investigators and Medical Experiments Data Manager.

5. Methodist Hospital - For cases involving multiple severe injuries including chest and/or neurological problems, but not to include extensive burns.

6. Shriner's Burns Institute in Galveston, TX, for cases involving extensive burns, with or without other injuries.

NOTE: I have ~~xx~~ gone over the rough draft of Dr. Thorton's work some medical aspects of SMEAT as ~~xx~~ observed by crew physician. And on the first page Pretest Era, many of the areas that he was concerned with and initiated looks ~~xx~~ at what he thought were problem~~x~~ areas I was again involved in and worked a lot of these problems, I don't if the report in that area reflects this because this was half the battle~~x~~ the prechamber period and all the problems <sup>which</sup> Bill ~~xxxx~~ thought in and in some cases did definitely exist.

#### SMEAT

I have included a one page insert on/dental as prepared by Bill Fromme for my ~~xx~~ utilization. I also believe that you have a copy of vision as put in by Dr. Fitch, so I won't have an insert on vision. In reference with the SMEAT crew physicals.

#### SMEAT Crew Physicals

The Skylab Medical Experiment Altitude Test physical examinations consisted of a ~~xxxxxx~~ standard format. Included in these physical~~x~~ examinations were the height and weight characteristics, current cardiovascular status in relationship to a systolic over diastolic blood pressure in the sitting.....  
(continued in the attached report)



# SMEAT CREW PHYSICALS

DR. C. ROSS

The Skylab Medical Experiments Altitude Test Physical examinations consisted of a

~~STANDARD~~ similar format. The physical examination format consisted of the following:

## HEAD

Eyes

Ears

Nose

Sinuses (Frontal and Maxillaries)

## CARDIOVASCULAR

Arteries

Veins

Heart

## RESPIRATORY

Pharynx

Larynx (External)

Trachea (Position)

Chest (Shape and Symmetry)

## DERMATOLOGIC

Color

Texture

Moisture

Nails

Hair Distribution

Scars

Lesions

[Probably delete]

\* (all report  
all on tapes  
and slightly  
modified)

~~13~~

[Probably Deleted]

## LYMPHATIC

Nodes

Spleen

## GASTROINTESTINAL

Lips

Tongue

Gingivae

Teeth

Buccal Mucosa

Salivary Glands

Tonsils

Palate and Uvula

Stomach

Intestines

Liver

Pancreas

Rectal

Sphincter

Anus

Rectum

## GENITOURINARY

Penis

Scrotum

Testicles

Epididymus



7  
Testicular Cord

Inguinal Canal

Hernia

Prostate

Kidneys

Bladder

[Probably delete]

#### ENDOCRINE

Thyroid

#### MUSCULOSKELETAL

Deformities (Head, chest, abdomen, extremities)

Joints (Range of Motion and Abnormalities)

Muscle Strength

#### NEUROLOGIC

Cranial Nerves

Abnormal Movements (Tics and Tremors)

Nystagmus

Pain (Pinprick Sensation)

Light Touch (Cotton)

Vibratory Sense

Position Sense

Cerebellar (Romberg, Gait, Balance, Walk on Heels)

Reflexes

Mental Status

Included also in the physical examinations, were the height and weight

characteristics, current cardiovascular status in relationship to a systolic

over diastolic blood pressure in the sitting position, taken from the left arm,

and a sitting pulse rate.

The physical examinations were performed on 4 separate occasions pre-test period.

The reason for the examinations not falling exactly into the normal sequence of

a T-30, T-15, and a T-5 or T-3 examinations was the fact that the experimental

test in general had several slips in schedule. The first pre-smear test physical

examination was performed on June 13, 1972 at T-43 days. ~~XX~~<sup>7</sup> (In relationship to

the Commander, it was noted that the significant history, past history, revealed

he had had his tonsils removed surgically in 1940 and that he had had a left

inguinal hernia repaired in 1957. He also had a fracture of the 5th metacarpel

of the left hand on 6 March 1972, but no complications or sequelae had been noted

following the wearing of the cast for several weeks, and the subsequent removal.

The Commander also had a history of intermittent sinus blocks during flying

activities but had not had any recent problems. There were no gross physical

problems noted upon examination at this time. Height: 70 in. Weight: 158 1/4 lbs.

BP: 112/82, left arm, sitting, Pulse, sitting: 56.

The Pilot noted in his history that his only surgery was surgical excision of his tonsils as a child. No other significant history was elicited. On physical examination, it was noted that the pilot did have a slightly deviated nasal septum



but this apparently created no gross problem in breathing <sup>via</sup> by nose for him. He had ~~nasal x x x x x~~

a mild contact dermatitis of the right and left mid <sup>vector</sup> axilla from the electrocardiograph

electrodes. Height: 72 in., Weight: 186 lbs., BP 122/84, left arm sitting.

Pulse, sitting: 64.

The Science Pilot was noted to have had his tonsils surgically removed as a <sup>+ adenoids</sup> child. <sup>+ appendectomy during college -</sup> No other pertinent history was elicited at this time. The physical

examination revealed a slightly deviated nasal septum, but no obstruction to the

nasal airway passage. He was also noted to have a mild bilateral anterior <sup>cervical</sup> adenopathy.

Previous as well as current audiograms were ~~xxxxxxx~~ reviewed and

revealed a sensory neural hearing loss <sup>which</sup> was bilateral and consistent with the

effects of acoustic trauma. From visual exams <sup>in</sup>, he was noted to have hyperopia,

presbyopia, and anisometropia, and aniseikonia. Height: 72 1/4 in., Weight: 206 lbs,

BP 110/84, left arm, sitting, Pulse 64, sitting.

The second major physical examination date was July 6, 1972, or T-20

days. The Commander's interim history revealed that in June, after the physical

examination which he had received, he developed a recurrence of an acne type

condition which was located primarily on his forehead, principally between the

eyebrows. This problem <sup>had</sup> has been present for the past several years and has

remissions and exacerbations which do not have any known relationship. The Commander

<sup>was</sup> had been sent to a Dermatologist who diagnosed the problem as <sup>definitely</sup> Acne Rosacea, and  
<sup>Antibiotic</sup> had placed him on Tetracycline after appropriate culture and sensitivity had been  
 made of the lesion areas. He was placed on Tetracycline, 250 mg, 1 capsule 3 times  
 a day for 3 days, and then 1 capsule/<sup>daily</sup>for the next week. He was also instructed to  
 wash with Fostex soap twice a day and to apply Microsin lotion. He was also <sup>instructed</sup> to  
 use Van Seb ~~Tel~~ shampoo twice a week for a scaling red scalp of a mild nature, but  
 which was diagnosed as Seborrheic dermatitis. Therefore, during the July 6 physical  
 the patient was still noted to have a mild <sup>A R</sup> acne rosacea of the forehead - nasal bridge  
 area. He was also noted to have a mild folliculitis of the anterior chest skin and a  
 contact dermatitis of a left lower temporal head area from ~~his~~ sleep cap electrode  
 irritation. He ~~was~~ was also noted to have slight injection of the nasal mucosa,  
 especially of the right nasal passage, and a mild injection of the right posterior  
<sup>throat</sup> pharynx. The right submandibular node was felt to be moderately enlarged to ~~DO~~  
 palpation. Weight at this examination was 159 1/4 lbs, BP 110/72, left arm,  
 sitting position, and a pulse of 61, sitting position.

The Pilot was noted to have a mild contact dermatitis of the right mid-axilla  
 from the <sup>electro</sup>electrocardiograph electrodes. He was also noted to have a systolic murmur  
 of a functional nature which had been noted on some previous examinations during  
 annual physical examinations. Weight: 186 lbs, BP 126/84, left arm sitting position,



Pulse, sitting: 64.

The Science Pilot was noted on this date to have essentially the same physical findings as during his June examination. His weight was 206 1/4 lbs, BP 110/80, *left arm sitting*

Pulse: ~~56~~ sitting, 56.

The next sets of physical examinations were performed on July 17, 1972 at T-9 days. The Commander was noted to have slightly congested nasal mucosa. He also had slight ~~peripheral~~ *peripheral* injection of the conjunctiva of both eyes. The submandibular nodes were both palpable on each side under the mandible and measured approximately 1 cm X 1 cm and were freely movable. Weight: 157 1/4 lbs, BP 114/76, left arm sitting, Pulse, sitting, 56.

The pilot was noted to have a contact dermatitis of both mid-axillary lines, *coastal due to 2 pr* 5th interspace, from electrode placement. His conjunctiva also revealed slight peripheral vessel injection. Examination of his nose revealed congested nasal mucosa, mainly on the right side, but with inferior turbinate enlargement bilaterally. Secretion of a slightly yellowish nature *were* was noted with some crusting on the left. Weight 185 3/4 lbs, BP 128/82, left arm sitting, Pulse sitting 62.

*July 17*  
The Science Pilot's physical examination on this date was essentially unchanged from his previous history and physical exam<sup>*findings*</sup>. Weight on this date was 204 1/2 lbs, BP 108/78, left arm, sitting and the pulse was 60, sitting position.

The next series of physical examinations was on July 25, 1972, T-1 day.

The Commander on nasal examination revealed a slightly congested mucosa bilaterally. He also had similar submandibular nodes palpable as on the <sup>previous</sup> 17 July examination. They were still freely movable and not grossly tender. Weight 158 lbs BP 118/78, sitting position, left arm. Pulse: 60, <sup>in sitting position</sup>.

The Pilot again revealed a contact dermatitis ~~above~~ <sup>coastal</sup> of both midaxillary lines, 5th interspace from electrode placement. <sup>2 pr</sup> However, he had no other gross problems by history or physical examination. Weight 186 lbs, BP 128/86, left arm sitting, Pulse: 66.

The Science Pilot again had no remarkable changes from the initial examination. His weight was 203 1/2 lbs, Blood pressure 124/84, left arm, sitting position, Pulse 60. <sup>sitting.</sup>

In addition to the <sup>previously</sup> above mentioned physical examinations, the SMEAT Crew was given further clinical evaluations. These tests were essentially electrocardiogram and vectorcardiogram performed on July 17. The results of both tests on all

three crew members was normal. Rudmose audiograms were also performed on all 3

<sup>men</sup> crew members on June 16, July 17, and July 25. The results of the audiograms

in the Commander and Pilot revealed no significant changes, and they were interpreted

as having normal hearing ability. However, the Science Pilot in his audiograms revealed



a consistent high frequency sensory neural hearing loss in both ears, but especially the left ear. This diagnosis was confirmed by an Otorhinolaryngologist who also performed audiograms on the Scientist Pilot and also an Impedence audiogram which was normal.

A visual examination was performed on the SMEAT crewmen on July 17.

A post SMEAT vision examination was performed on the same men on September 21. The results of the vision examinations are discussed by Dr. R. C. Fitch in his section on vision.

(At this time I would just like to state that SMEAT dental examinations were performed on the crew both preflight and postflight and a page is included for discussion by Dr. Fromme for my utilization at this point.)

A complete physical evaluation was ~~made at this point~~ performed on the SMEAT crew on September 20, 1972, which was the final SMEAT test day (R+0). ~~Results of the Commander~~

Results of the Commander

a consistent high frequency sensory neural hearing loss in both ears, but especially the left ear. This diagnosis was confirmed by an Otorhinolaryngologist who also performed audiograms on the Science Pilot and also an Impedence audiogram which was normal.

Vision examinations were performed on the SMEAT crewmen on July 17. The examination consisted of testing of visual acuity both distant and near and the testing of accommodation in both eyes. The visual fields, using perimetry was also ascertained, as was the intraocular tension. The depth perception was also calculated, using the Howard-Dolman Test apparatus. Color vision, using an Anomaloscope was also determined as well as some other tests for phorias. The Commander, in his test was essentially emmetropic and all visual examinations were within normal limits. The intraocular tension on July 17 were: Right eye, 16 mm of mercury, left eye, 17 mm of mercury, which is within normal limits. The Pilot on the same date was noted to be slightly hyperopic, but the rest of his visual examinations were within normal limits. The intraocular tension on the same date revealed the right eye to be 15 mm of mercury, and the left eye 16 mm of mercury which was within normal limits.



## Science

The/Pilot's visual examination on July 17 revealed him to be hyperopic, presbyopic. He also was found to have anisometropia, and aniseiconia.

His intraocular tensions on this date were 16 mm of mercury in the right eye, and 17 mm of mercury in the left eye, which was within normal limits.

A complete physical evaluation was performed on the SMEAT Crew on ~~xxxx~~ September 20, 1972, which was the final SMEAT Test day. Results of the

Commander: The Commander revealed mild bilateral conjunctival injection, which was non-symptomatic. During the time of the SMEAT Chamber Test, the

Commander had grown a beard which in the hair area of the chin, he was noted to have some acne rosecea; the acne rosecea was also present at

the nasal bridge area, but was of a non-infected nature. Weight: 154 3/4 lb

BP: 102/74, left arm sitting, Pulse: Sitting, 66, Post Chamber Electrocardi

grams and Vectorcardiograms on the Commander were normal, as was a Rudmose

audiogram. A visual examination performed on September 21, showed the

Commander to be slightly hyperopic, but the rest of the visual examination

was within normal limits. Intraocular tensions on this date were: Right eye:

17 mm of mercury, and the left eye; 15 mm of mercury which was within normal

limits. The Results of the ~~Science~~ Pilot: The pilot had bilateral mild

injection of the conjunctiva which was non-symptomatic. There was also a

slight decrease in nasal patency on the right side, probably because of a mild deviated nasal septum. Again, a grade 1 on a 6 scale systolic murmur was noted over the 2nd left intercostal space. The murmur was heard best with the patient leaning forward and in expiration and there was no gross radiation of the murmur. This murmur is definitely a functional type murmur and no organic problem has been detected. Dermatological exam revealed bilateral electrode lesions of a contact dermatitis nature in the mid axillary areas, <sup>at the</sup> approximately 5th interspace. He also had some minimal <sup>shoulder and</sup> patchy acne of the back area, and one area on the right superior forehead. Weight: 185 1/2 lbs, BP: 122/78, sitting position, left arm, Pulse: 84. sitting. Postchamber electrocardiogram and vectorcardiogram were also within normal limits, as was a Rudmose audiogram. A visual audiogram on Sep. 21, revealed the Pilot to be hyperopic, but the rest of the visual examination was within normal limits. Intraocular tension on this date for the right eye was 12 mm of mercury, and for the left eye, 18 mm of mercury which is <sup>Result of S/P</sup> within normal limits. On September 20, the Science Pilot was noted to have a slight deviation of the nasal septum to the right with no gross airway obstruction. He was still noted to have a mild anterior cervical adenopathy in the entire chain of nodes, but with no gross change from the pre-chamber.



Weight: 193 1/4 lbs, BP: 112/78. sitting, left arm, Pulse, sitting: 60,

Electrocardiogram, and vectorcardiogram <sup>were</sup> was within normal limits,

during the post SMEAT physical examination. A Rudmose audiogram was performed which revealed the same high frequency sensory neural hearing loss which <sup>had been</sup> was noted pre-SMEAT Test. Especially noted in the left ear.

A vision examination revealed the following problems which were similar

visual to the pre-SMEAT Test/evaluation: Hyperopia, anisometropia, presbyopia, and aniseiconia. It was noted during this examination that fields and

prism induction tests were not conducted because of the patient's inability to remain awake. The intraocular tensions were 16 mm, right eye, 22 mm

mercury, left eye, which is within normal limits. The SMEAT Surgeon had

specific duties to perform ~~during the~~ prior to , during, and after

the SMEAT Chamber Test. The specific duties included: 1. Performance of

Crew physicals, both pre- and post-smeat, on specific designated periods.

2. Daily Surveillance of the crew in relationship to health and safety

problems, as well as daily surveillance ~~xxxxxx~~ of the chamber and its environmental safety.

3. Decisions for any medical contingencies which might occur during the pre-chamber, in chamber and post chamber periods

4. In charge of the inflight medical support system training, consultation and direction.
5. In charge of the detailed test objectives or IMSS DTO monitoring.
6. Safety monitoring of all major medical DTO procedures.
7. Care of the crews' dependents.
8. A member of the test operations management committee, which was the operating plans group during SMEAT.
9. To help give re-program advice in reference to mission rules, parameter selections for medical operations, and also ~~work~~ to help with data synthesis.

This final area is especially pertinent in timed SMEAT experiment to the actual Skylab program.

In reference to the in chamber operations there were certain crew status reporting procedures accomplished on a daily basis. The crew surgeon found that it was necessary to be present for the evening report in order to ascertain medical deltas which should be investigated within a proper medical operations time framework. Any problems of a medical nature which the crew would elicit, <sup>was</sup> ~~would~~ also ~~be~~ fed into the test operations management committee for review and action purposes which might not be



strictly medical. The Crew Surgeon as has been stated was in charge of any inchamber health problems in conjunction with the inchamber astronaut physician or (Science Pilot) and <sup>by</sup> / mutual agreement consulted one another if medication were to be used.. A list of the SMEAT IMSS medical supplies and drugs is given in the ~~XXXXX~~ Inflight Medical Support System detailed test objective. During the inchamber operations, it was also necessary to monitor certain environmental aspects in order to assure crew health status. In relationship to the chamber atmosphere, there were certain requirements for compounds to be analyzed for as trace gases in support of the Skylab ~~XXXXXXXX~~ Medical Experiments Altitude test. These can be found in the detailed test objective of SMEAT Atmosphere Analysis. ~~XX~~ In chamber CO<sub>2</sub> measurements were also given surveillance and the measurements themselves are found in the detailed test objective called "Inchamber CO<sub>2</sub> Measurement".

Aerosol analysis was also performed and kept under surveillance by the crew surgeon and ~~xxx~~ the requirements are noted in the detailed test objective entitled "Aerosol Analysis" Environmental noise was another aspect in relationship to health which was kept in close surveillance with the details being noted in the detailed test objective entitled

"SMEAT Environmental Noise". The SMEAT Potable Water System was carefully observed during the ~~xxxxxx~~ pre-test period as well as during the in chamber period and the results of tests performed to evaluate water quality were given careful surveillance. The specific tests of water purity included multiple tests <sup>for</sup> ~~xx~~/inorganic toxic substances as well as analysis for organic and bacteriological substances ~~or matter~~.



## SMEAT DENTAL

### PRE FLIGHT

A thorough pre-flight oral examination was performed on SMEAT crewmen, Crippen, Bobko, and Thornton at F-8 on 17 July, 1972. The examination included 4 bite wing radiographs, diagnostic casts, and a comprehensive, quantitative evaluation of gingival tissue tone, and plaque accumulation. The three crewmen were in an excellent state of oral health with no significant abnormalities.

### POST FLIGHT

A post-flight oral examination was performed on each crewman which duplicated the pre-flight examination except that radiographs were not made at R+2 on 21 September, 1972. No significant abnormalities were noted. Moderate increases however, were noted in calculus accumulation and gingival inflammation. Due to the relatively high level, and post flight persistence, of *Streptococcus mutans* (a cariogenic microorganism) follow up evaluation will be continued until a stable microbial balance is evidenced.

## IMSS DENTAL

### SUMMARY

A dental treatment kit, in-flight diagnostic and treatment manual, and a training program in dental treatment procedures was developed and exercised for the Skylab Medical Experiments Altitude Test (SMEAT).

The use of the kit and manual in simulations was satisfactory and this program is deemed adequate and appropriate for inclusion in the Skylab Inflight Medical Support System (IMSS).

### INTRODUCTION

The dental portion of the IMSS was developed to meet potential oral health problems that might arise in Skylab. Dental problems for which a treatment capability exists in IMSS - Dental, are those of a complexity up to and including tooth removal procedures.

Acknowledgement is made of the contribution of Colonel Bill R. Baker, USAF, DC, and Colonel Bill Roche, USAF, DC, of MacKown Dental Clinic, Wilford Hall Hospital, Lackland Air Force Base, Texas for their invaluable assistance in co-ordinating and instituting the clinical training program. We also wish to acknowledge Mr. Robert Hemby, and Darrell Fitzjerrel of General Electric Company for their efforts in developing the inflight treatment manual.

### DESCRIPTION OF APPARATUS

The IMSS - Dental included <sup>5</sup> instruments and drugs in prepackaged kit form which could be utilized to treat the most common inflight dental problems anticipated. The inflight manual serves as an aid in orienting one to the dental materials in the kit, an aid in diagnostic procedures, and an aid in treatment procedures.



### PROCEDURE

The Kit IMSS-Dental was developed and tested, and the inflight diagnosis and treatment manual was then written. Using the manual a twelve hour training course was developed. Four hours of the course were devoted to lectures, the subjects being Oral Anatomy and Physiology, Oral Medicine and Pathology, Anesthesia Techniques, and Tooth Removal. The final eight hours were devoted to clinical procedures on voluntary patients. The emphasis in the clinical phase was local anesthesia and tooth removal. Each participant in the training program participated in giving both local infiltration and nerve block anesthesia, and in removing at least one each of the several types of teeth present in the human oral region. Inflight the kit IMSS - Dental was deployed and simulated exercises were performed.

### RESULTS

The results indicated the SMEAT crewmen were capable of treating dental problems that might arise with the use of the aids provided.

### CONCLUDING REMARKS

The kit IMSS - Dental is satisfactory in its present state for inclusion in the Skylab vehicle. The inflight diagnostic and treatment manual for oral diseases and the training program are adequate.

## INFLIGHT MEDICAL SUPPORT SYSTEM

### INTRODUCTION

The purpose of the inflight medical support system in ~~SME~~ the Skylab Medical Experiment Altitude Test was to fully exercise the IMSS equipment under simulated space environment ~~in~~ and to obtain in chamber microbiological samples using the equipment and procedures identified. By use of the IMSS in SMEAT verification of prototype IMSS ~~type~~ hardware, training, timelines, procedures, and techniques were possible. The microbiological portion of the IMSS was a test system and was not expected to be used for diagnostic information even though on several occasions it was utilized by the Science Pilot for this purpose. Medical diagnostic coverage was provided however by the Lunar Receiving Laboratory, Microbiology Laboratories. The Dental hardware and some dental procedures was also evaluated on 1 day during the SMEAT Test and no gross problems were found.

Because of the lack of some areas such as clinical laboratory procedures and hardware as well as also some of the medical procedures, there were certain areas of evaluation which could not be adequately made.

### Development and Training Section

Over the past five years, the IMSS has been in a continuous or dynamic development phase. Multiple inputs from many medical personnel as well as research into the system with recommendations by Ohio State University has been obtained over these years. During the past year and half a decision for training with the IMSS has been a constant problem for work. After multiple inputs a decision was made to utilize the School of Health



Care Science at Sheppard Air Force Base, Texas and also the Base Hospital training area. The training program for the SMEAT crew at Sheppard Air Force Base consisted ~~and~~ of the following orientation lectures: head, eye, ear, nose, and throat, systemic, chest, cardiovascular, gastrointestinal and genital urinary, muscule skeltonal, dermatology, and emergency procedures. These orientations were presented over a 3-day period at which time the crew participated in some demonstrations and observed many of the lectures by audiovisual techniques. The major problem encountered ~~was~~ with the group specialist at Sheppard Air Force Base was the lack of orientation to the IMSS itself prior to the time of the lectures. Also it was noted that many of the techniques and procedures which were presented were not applicable to the zero-gravity environment and had to be modified over next several months to rendered them still. The training was also accomplished with the use of ~~some~~ some patient material from the hospital and clinical area at Sheppard Air Force Base Hospital and the Astronaut crew for SMEAT was required to observe and examine some ~~x~~ of the patients presented. It should also be stated that many of the consultant at Sheppard did present viable plans for IMSS. Some of the ideas which were utilizable; other for which were multiple reasons could not be used in our particular system.

#### Medical Procedures

The IMSS was to be used for verifying certain medical procedures but due to lack of some hardware items this was not possible. Dr. Thorton did have a period of time inside the chamber for medical experimentation



and at this time the results of his studies with the IMSS kit are not completely known.