TOP HORIZONTAL

NUMBER

NOTES:

MEDICAL EXPERIMENT PROGRAM

SUPPORTIVE REQUIREMENTS

NON-INVASIVE CARDIAC OUTPUT DETERMINATION TECHNIQUE
NON-INVASIVE VENOUS PRESSURE TECHNIQUES (PERIPHERAL AND CENTRAL)
NON-INVASIVE REGIONAL BLOOD VOLUME MEASUREMENT TECHNIQUES
* MICROWAVE PROPOSAL
IMPROVED LIMB PLETHYSMOGRAPHY
IMPROVED ARTERIAL PRESSURE MONITORING METHODS
IMPROVED DYNAMIC TESTS OF CIRCULATORY RESPONSE
IMPROVED TECHNIQUE FOR INFLIGHT MEASUREMENT OF PULMONARY DIFFUSION CAPACITY
VIGILANCE INDICATOR TECHNIQUES
TECHNIQUES TO IDENTIFY CEREBRAL DEFICIT
GROUP SELECTION CRITERIA
METABOLIC ANALYZER, RAPID RESPONSE, ADAPTABLE TO SUITED ACTIVITY
SWEAT MEASUREMENT AND SAMPLING TECHNIQUES
INFLIGHT BODY VOLUME MEASUREMENT TECHNIQUE (LEAN BODY MASS)
* TIRR PROPOSAL FOR PHOTOMETRIC MEASUREMENT
IMPROVED TECHNIQUES FOR INFLIGHT BIOCHEMISTRY
* ORION PROPOSAL FOR EXPANSION OF SPECIFIC ION ELECTRODE TECHNIQUE
AUTOMATED BLOOD CELL COUNTING TECHNIQUES FOR INFLIGHT USE
IMPROVED URINE VOLUME MEASUREMENT METHODS
INFLIGHT SAMPLE HANDLING TECHNIQUES
SAMPLE PRESERVATION TECHNIQUES FOR INFLIGHT USE
TECHNIQUES FOR INFLIGHT ISOTOPE HANDLING
MICROBIAL CULTURE AND IDENTIFICATION TECHNIQUES FOR INFLIGHT USE

(NOTE: * - PROMISING PROPOSALS)

TOP VERTICAL

TOP HORIZONTAL

NUMBER

NOTES:

SKYLAB FOLLOW-UP RESEARCH

Neurophysiology (-11)

Space Motion Sickness - susceptibility, predisposing factors, mechanisms, preventive training, improved Rx.
Post-Flight Tendon Relfex Changes - significance.
Sleep Data - ground based comparative data amplification.

Cardiovascular Physiology (-12)

Orthostatism - mechanisms; influence of non-wtl. factors; correlation of LBNP, tilt and centrifuge responses; susceptibility; prognostic indices.
Cardiac Responses - cardiac output, possible coronary effects, significance of arrhythmias, ground based correlative VCG data, tissue changes.
Vascular Responses - ground based correlative venous compliance data, vascular permeability studies, tissue changes.

Respiratory Physiology (-13)

Vital Capacity Decrease - ground based correlative data, mechanisms, other respiratory changes.

Metabolism & Nutrition (-14)

Exercise Tolerance Maintainance In-Flight, Decrease Post-Flight - mechanisms.
Muscle Atrophy Despite Exercise - mechanisms.
Anthropomorphic Changes - ground based correlative data.
Bone Mineral Changes - mechanisms
Predictive Indices - further ground based correlative data.
Body Composition Changes - ground based correlative data.
Fluid & Electrolyte Shifts - ground based correlative data.
In-Flight Flatulance - etiology, prevention.
Altered Food Taste - etiology, prevention.

Hematology (-15)

Red Cell Mass Losses - etiology, mechanisms, prevention.

TOP VERTICAL

TOP HORIZONTAL

NUMBER

NOTES:

SKYLAB FOLLOW-UP RESEARCH (CONT'D.)

Hematology (-15) (Cont'd.)

Immunological Changes - ground based correlative data, mechanisms, significance.

Endocrinology (-16)

Cardiovascular Changes -endocrine controlling mechanisms.
Fluid & Electrolyte Shifts - endocrine controlling mechanisms.
Bone and Muscle Changes - endocrine controlling mechanisms.
Changes in Urinary Endocrine Outputs - ground based correlative data.
Disparity Between Urinary & Blood Hormonal Shifts - ground based correlative data, improved measurement techniques, mechanisms.

Countermeasures (-17)

Cardiovascular Changes - preventive/corrective procedures.
Musculo-Skeletal Changes - preventive/corrective procedures.

Chemistry & Microbiology (-25)

Red Cell Mass Loss - possible toxic source.

Environmental Factors Effects (-35)

All Skylab Findings - increase bed rest studies for correlative ground based data.
Red Cell Mass Loss - evaluate gaseous atmosphere profile as possible etiology.

Medical Support (-45)

Skin Problems - etiology, prevention, correction.
Upper Respiratory Congestion - etiology, prevention, correction.
Plantar Sensitivity - etiology, prevention, correction.
Arrythmias - medications in kit for possible etiological roles.

TOP VERTICAL

TOP HORIZONTAL

NUMBER MM 4-1441

NOTES:

TOP VERTICAL

A-1

13

NASA FORM 682 (MAY 62)

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Apollo - 33

TOP HORIZONTAL

NUMBER

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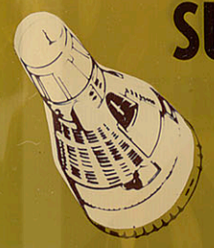

SUMMARY OF BIOMEDICAL OBSERVATIONS IN MERCURY

1. CARDIAC ARRHYTHMIAS
   - A) ECTOPIC BEATS
   - B) TACHYCARDIA(SINUS) AT CRITICAL POINTS IN FLIGHT
2. CIRCULATORY CHANGE
   - A) MOTTLING, VENOUS DISTENSION, & SYSTOLIC PRESSURE DROP (MA-8)
   - B) DIMINISHED TILT-TABLE TOLERANCE (MA-9)
3. DEHYDRATION - ALL ORBITAL FLIGHTS
4. MARKED DECREASE IN URINARY NOREPINEPHRINE (MA-8, MA-9)
5. REVERSAL LYMPHOCYTE-NEUTROPHILE RATIO FOR ONE MONTH BEGINNING 5 DAYS POST-FLIGHT (MA-9)

MM 4-1275

TOP VERTICAL

M-1

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TOP HORIZONTAL

NUMBER MM 4-1442

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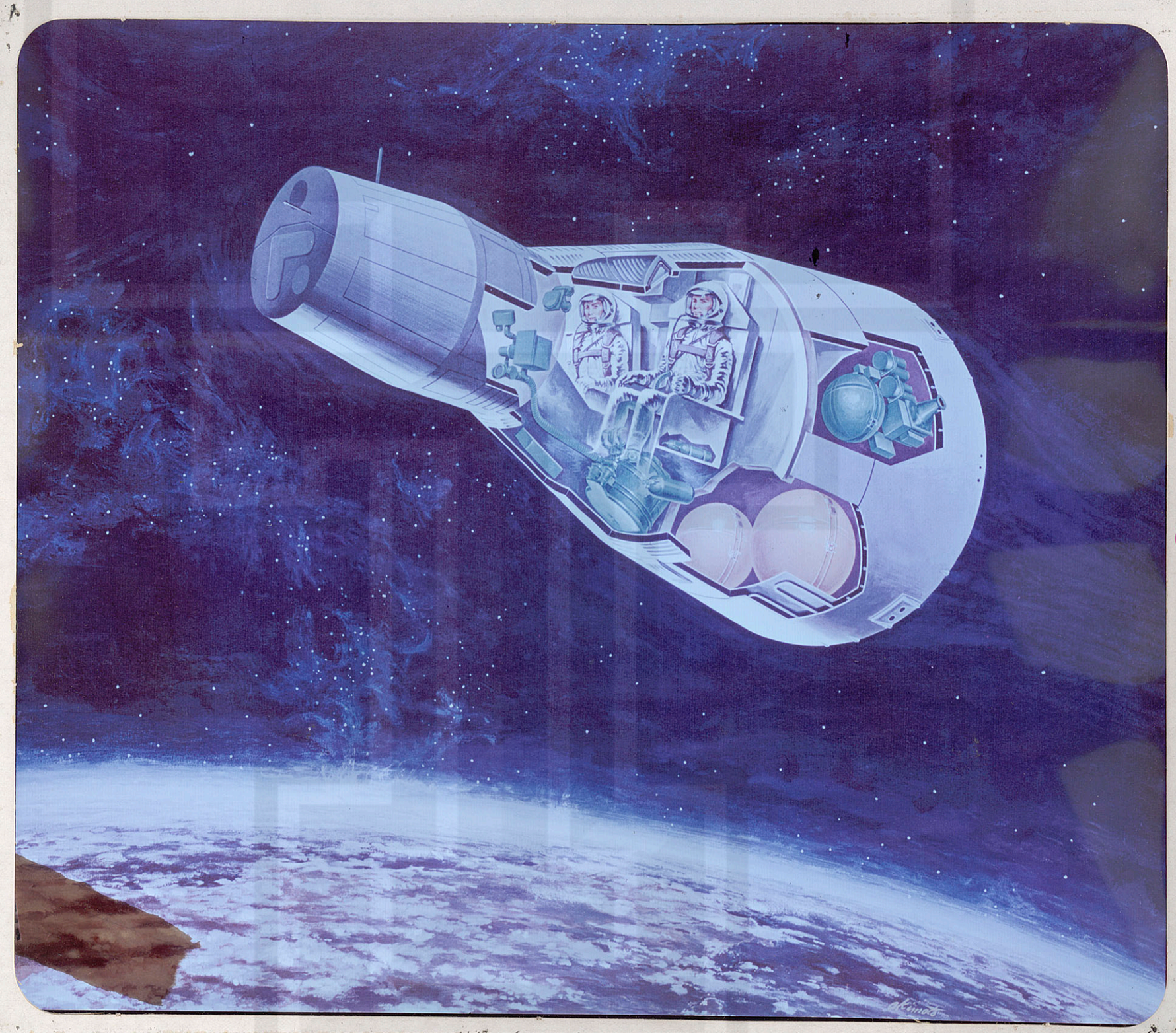

TOP VERTICAL

G-1

3

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GEMINI - 79

TOP HORIZONTAL

NUMBER MM 4-1392

DR. VINOGRAD

NOTES:

M - Exps.

GEMINI MEDICAL EXPERIMENTS

A. OBJECTIVES

1 VALIDATION OF MERCURY TRENDS EXTENSION OF DATA

2 ACQUISITION OF MORE SOPHISTICATED DATA

3 VERIFICATION OF REMEDIAL MEASURES

B. PROPOSED EXPERIMENTS

M-1 CARDIOVASCULAR REFLEX CONDITIONING EXPERIMENT: CUFFS: EXERCISE: TILT TABLE

M-2 CARDIOVASCULAR EFFECTS OF SPACE FLIGHT: TILT TABLE

M-3 INFLIGHT EXERCISE: WORK TOLERANCE

M-4 INFLIGHT PHONOCARDIOGRAM

M-5 BIOCHEMICAL ANALYSIS OF BODY FLUIDS: STEROIDS: CATECHOLS

M-6 BONE DENSITOMETRY DURING SPACE FLIGHT

M-7 GEMINI CALCIUM BALANCE STUDIES: CALCIUM: NITROGEN HYDROXYPROLINE

M-8 INFLIGHT ELECTROENCEPHALOGRAM (EEG)

M-9 VESTIBULAR EXPERIMENT

TOP VERTICAL

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

3

TOP HORIZONTAL

Humphreys

NUMBER 2B

NOTES:

SIGNIFICANT MEDICAL RESULTS

GEMINI

MODERATE LOSS OF RED CELL MASS

MODERATE CARDIOVASCULAR DECONDITIONING

MODERATE LOSS OF EXERCISE CAPACITY

MINIMAL LOSS OF BONE DENSITY

MINIMAL LOSS OF CALCIUM AND MUSCLE NITROGEN

MODERATE BODY WEIGHT LOSS

HIGH METABOLIC EXPENDITURE DURING EVA

TOP VERTICAL

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TOP HORIZONTAL

NUMBER _____

NOTES:

MEDICAL/BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

ENDOCRINOLOGY

1. IN VIEW OF THE KNOWN CHANGES IN BODY WATER DISTRIBUTION AND BALANCE WITH CHANGES IN BODY POSITION, TO WHAT EXTENT WILL WEIGHTLESSNESS PER SE BRING ABOUT LOSSES OF FLUID? TO WHAT EXTENT IS ANTI-DIURETIC HORMONE INVOLVED IN THE MECHANISM OF THIS CHANGE?

2. TO WHAT EXTENT WILL CHANGES IN THE METABOLIC COST OF ACTIVITY IN SPACE BE REFLECTED BY CHANGES IN THYROID HORMONE PRODUCTION? CAN A CAUSE AND EFFECT RELATIONSHIP BE ESTABLISHED?

3. TO WHAT EXTENT ARE THE PREDICTED LOSSES OF MINERAL IN LONG DURATION SPACE FLIGHT ASSOCIATED WITH INCREASED BONE RESORPTION MEDIATED BY ELEVATED PARATHYROID HORMONE SECRETION?

4. AS BOTH A REFLECTION AND MEDIATING FACTOR OF STRESS RESPONSE, WHAT IS THE TIME COURSE OF CHANGES IN ADRENAL CORTICAL ACTIVITY IN PROLONGED SPACE FLIGHT?

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9-11-69

TOP VERTICAL

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TOP HORIZONTAL

16

NUMBER MM69-6001

NOTES:

MEDICAL/BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

MICROBIOLOGY

1. WHAT CHANGES CAN BE EXPECTED TO TAKE PLACE IN THE MICROBIAL FLORA OF FLIGHT CREWS DURING SPACE FLIGHT ?
2. WHAT ARE THE INFLUENCES OF SPACE FLIGHT CONDITIONS ON THE RELATIVE DOMINANCE OF PATHOGENIC MICROORGANISMS ?
3. WILL THERE BE GENETIC ALTERATION IN MICROBIOLOGICAL ORGANISMS AS A RESULT OF THE SPACE FLIGHT ENVIRONMENT ? TO WHAT EXTENT? CAN A PATTERN OF SUCH CHANGES BE ANTICIPATED ?

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9-11-69

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TOP HORIZONTAL

NUMBER MM69-5995

NOTES:

MEDICAL/BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

NEUROPHYSIOLOGY

1. WHAT ARE THE EFFECTS OF THE SPACE FLIGHT ENVIRONMENT ON SLEEP?
2. WHAT IS THE CHANGE IN SUSCEPTIBILITY TO MOTION SICKNESS AS A FUNCTION OF:
   a. TIME ALOFT?
   b. FREEDOM OF MOVEMENT WITHIN THE THE SPACECRAFT?
   c. ROTATION OF THE SPACECRAFT
3. WHAT ARE THE EFFECTS OF SUSTAINNED LOSS OF GRAVITATIONAL CUES ON SENSORY PERCEPTION (THE SPECIAL SENSES, KINETHESIS, AND OTHER SOMATC SENSES) AND ON SPATIAL ORIENTATION?

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9-11-69

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TOP HORIZONTAL

NUMBER mm69-5996

NOTES:

MEDICAL/BEHAVIORAL EXPERIMENTS PRIORITY I QUESTIONS TO BE RESOLVED

PULMONARY FUNCTION AND ENERGY METABOLISM

1. WHAT ARE THE EFFECT OF SUSTAINED WEIGHTLESSNESS ON THE MECHANICS OF BREATHING IN WHICH, NORMALLY, THE GRAVITATIONAL FORCES INTERACT WITH THE RESPIRATORY MUSCLES AND ELASTIC FORCES OF THE CHEST AND LUNGS ?

2. WHAT IS THE ENERGY COST (METABOLIC GAS EXCHANGE) AT REST AND DURING ACTIVITY IN THE SPACECABIN WITH AND WITHOUT THE SUIT, IN NORMAL FLIGHT AND DURING EVA ?

3. WHAT IS THE DEGREE AND DURATION OF ARTERIAL HYPOXIA DUE TO VENTILATION/ PERFUSION INEQUALITY IN THE LUNGS DURING LAUNCH AND RE-ENTRY IN SPACE FLIGHT ?

4. ARE THERE ANY ALTERATIONS IN ALVEOLAR GAS TRANSFER OR THE CONTROL OF BREATHING UNDER PROLONGED COMBINED EFFECTS OF WEIGHTLESSNESS AND A LOW PRESSURE MIXED GAS OR PURE OXYGEN ENVIRONMENT ?

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9-11-69

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TOP HORIZONTAL

NUMBER MM69-5997

(14)

NOTES:

MEDICAL/BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

CARDIOVASCULAR FUNCTION

1. IS CARDIAC OUTPUT ADEQUATELY MAINTAINED IN PROLONGED SPACE FLIGHT ?
2. TO WHAT EXTENT DOES SPACE FLIGHT AFFECT NORMAL ARTERIAL PRESSURE CONTROLS ?
3. HOW ARE VENOUS COMPLIANCE AND CENTRAL VENOUS PRESSURE AND THEIR ADJUSTING MECHANISMS INFLUENCED BY PROLONGED SPACE FLIGHT ?
4. HOW IS CARDIAC FUNCTION AFFECTED BY LONG DURATION SPACE FLIGHT ?
5. WHAT ARE THE FACTORS OF SPACE FLIGHT WHICH CAUSE CHANGES IN CIRCULATING BLOOD VOLUME AND ITS DISTRIBUTION ? AT WHAT POINT AND UNDER WHAT CONDITIONS IS A NEW EQUILIBRIUM ESTABLISHED ?
6. WHAT IS THE TIME COURSE OF CHANGES IN OVERALL FUNCTION AS DETERMINED BY PROVOCATIVE TESTING (TILT TABLE, LBNP) ?

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9-11-69

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NUMBER MM69-5998

NOTES:

MEDICAL/BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

NUTRITION AND MUSCULOSKETAL FUNCTION

1. WHAT ARE THE ACTUAL CALORIC REQUIREMENTS AND THE VARIABLES IN CALORIC UTILIZATION UNDER VARYING WORKLOADS AND UNDER VARYING CONFIGURATIONS OF SPACE SUIT CONSTRAINTS IN LONG DURATION SPACE FLIGHT?
2. WHAT ARE THE SPACE FLIGHT FACTORS OR STRESS CONDITIONS WHICH MIGHT CHANGE CALORIC, WATER, ELECTROLYTE OR MINERAL REQUIREMENTS? TO WHAT EXTENT DO THEY CHANGE THESE REQUIREMENTS?
3. BY WHAT PREDICTIVE OR MATHEMATIC FACTORS ARE ENERGY COSTS OF ACTIVITY IN SPACE DIFFERENT FROM THOSE IN THE ONE-G ENVIRONMENT?
4. TO WHAT EXTENT IS GLUCOSE METABOLISM CHANGED BY SPACE FLIGHT CONDITIONS (AS NOTED IN PROLONGED BED REST)?
5. ARE VARIATIONS IN BODY MASS DURING SPACE FLIGHT WITHIN THE LIMITS TO BE EXPECTED WITH ADEQUATE FOOD AND WATER INTAKE AND WORK SCHEDULES COMPARABLE WITH THE EARTH ENVIRONMENT?
6. WHAT IS THE TIME COURSE AND DEGREE OF SKELETAL AND MUSCULAR CHANGES DUE TO WEIGHTLESS FLIGHT? WHAT ARE THE RELATIVE INFLUENCES OF WEIGHTLESSNESS, RELATIVE INACTIVITY, AND THE ATMOSPHERIC ENVIRONMENT?
7. WHAT ARE THE BEST PREVENTIVE OR RESTORATIVE TECHNIQUES AGAINST BONE AND MUSCLE DETERIORATION DUE TO SPACE FLIGHT?
8. WHAT ARE THE EFFECTS OF LONG DURATION WEIGHTLESS FLIGHT ON WATER AND ELECTROLYTE BALANCE?

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9-11-69

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NUMBER MM69-6000

NOTES:

MEDICAL/BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

HEMATOLOGY AND IMMUNOLOGY

1. WHAT ARE THE ENVIRONMENTAL FACTORS RESPONSIBLE FOR THE LOSS OF RED CELL MASS NOTED DURING GEMINI?

   WHAT ARE THE RELATIVE ROLES OF:

   a. THE 100% OXYGEN ENVIRONMENTS
   b. NITROGEN IN SMALL AMOUNTS?
   c. WEIGHTLESSNESS?
   d. DURATION OF EXPOSURE?
   e. DIMINISHED RED CELL PRODUCTION VS INCREASED DESTRUCTION?
   f. AMBIENT TOTAL PRESSURE ?
   g. VIBRATION?
   h. AMBIENT TEMPERATURE ?
   i. DIETARY FACTORS?

2. WHAT SPACE FLIGHT FACTORS ARE RESPONSIBLE FOR CHANGES IN PLASMA VOLUME
3. ARE COAGULATION PROTEINS, PLATELET FUNCTION, AND VASCULAR FRIABILITY INFLUENCED BY LONG DURATION SPACE FLIGHT? IF SO, WHAT ARE THE RESPONSIBLE ENVIRONMENTAL FACTORS?
4. CAN ONE ANTICIPATE ALTERATIONS OF INFLAMMATORY RESPONSE AS A RESULT OF LONG DURATION SPACE FLIGHT ?
5. TO WHAT EXTENT CAN SPACE FLIGHT BE ANTICIPATED TO PRODUCE ALTERATIONS OF CELL DIVISION OR CHROMOSOMAL COMPOSITIONS? IF SUCH CHANGES DO OCCURR, WHAT ENVIRONMENTAL FACTORS ARE RESPONSIBLE AND WHAT PREVENTIVE ACTION CAN BE TAKEN?

TOP VERTICAL

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TOP HORIZONTAL

15

NUMBER mm69-6002

NOTES:

MEDICAL /BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

BEHAVIORAL EFFECTS

1. WILL PERCEPTUAL EFFICIENCY BE AFFECTED BY SPACE FLIGHT CONDITIONS ?

2. WHAT CHANGES IN TIME AND / OR PATTERN OF ACTIVITY WILL MAKE PERFORMANCE OF TASKS IN SPACE MOST EFFICIENT ? MOST COMFORTABLE FOR THE ASTRONAUT ?

3. WHAT CHANGES IN THE TOLERANCE LIMITS TO STRESS OCCUR OVER TIME IN THE EXTENTED PERIODS OF WEIGHTLESSNESS ?

4. WHAT ARE OPTIMAL INFLIGHT AND EVA WORK-REST PERIODS BASED ON FACTORS OF (A) FATIGUE, (B) ENERGY LOSS, (C) DISCOMFORT, AND OTHER STRESS INDICANTS ?

NASA HQ MM69-6002
6-11-69

TOP VERTICAL

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★ GPO : 1966 OF—208-861

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TOP HORIZONTAL

NUMBER mm69-6002

NOTES:

MEDICAL / BEHAVIORAL EXPERIMENTS
PRIORITY I QUESTIONS TO BE RESOLVED

BEHAVIORAL EFFECTS

1. WILL PERCEPTUAL EFFICIENCY BE AFFECTED BY SPACE FLIGHT CONDITIONS ?

2. WHAT CHANGES IN TIME AND / OR PATTERN OF ACTIVITY WILL MAKE PERFORMANCE OF TASKS IN SPACE MOST EFFICIENT ? MOST COMFORTABLE FOR THE ASTRONAUT ?

3. WHAT CHANGES IN THE TOLERANCE LIMITS TO STRESS OCCUR OVER TIME IN THE EXTENTED PERIODS OF WEIGHTLESSNESS ?

4. WHAT ARE OPTIMAL INFLIGHT AND EVA WORK-REST PERIODS BASED ON FACTORS OF (A) FATIGUE, (B) ENERGY LOSS, (C) DISCOMFORT, AND OTHER STRESS INDICANTS ?

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TOP HORIZONTAL

NUMBER _____

NOTES:

SKYLAB MEDICAL EXPERIMENTS PROGRAM (CONT'D)

M150 - BEHAVIORAL EFFECTS

M151 - TIME AND MOTION STUDY

M170 - PULMONARY FUNCTION AND ENERGY METABOLISM AREA

M171 - METABOLIC ACTIVITY

M172 - BODY MASS MEASUREMENT

MM-9/70

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TOP HORIZONTAL

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NOTES:

SKYLAB MEDICAL EXPERIMENTS PROGRAM

M070 - NUTRITION AND MUSCULOSKELETAL AREA

- M071 - MINERAL BALANCE
- M072 - BONE DENSITOMETRY (PRE-AND POST-FLIGHT)
- M073 - BIOASSAY OF BODY FLUIDS
- M074 - SPECIMEN MASS MEASUREMENT

M090 - CARDIOVASCULAR FUNCTIONING

- M091 - LBNP (PRE AND POST FLIGHT)
- M092 - INFLIGHT LBNP
- M093 - VECTORCARDIOGRAM

MM-9/70

TOP VERTICAL

TOP HORIZONTAL

NUMBER _____

NOTES:

SKYLAB MEDICAL EXPERIMENTS PROGRAM (CONT'D)

M110 - HEMATOLOGY AND IMMUNOLOGY PROGRAM

- M111 - CYTOGENETIC STUDIES OF BLOOD (PRE-AND POST-FLIGHT)
- M112 - MAN'S IMMUNITY - IN VITRO ASPECTS (PRE-AND POST-FLIGHT)
- M113 - BLOOD VOL AND RED CELL LIFE SPAN (PRE-AND POST-FLIGHT)
- M114 - RED BLOOD CELL METABOLISM (PRE-AND POST-FLIGHT)

M130 - NEUROPHYSIOLOGY AREA

- M131 - HUMAN VESTIBULAR FUNCTION
- M133 - SLEEP MONITORING EXPERIMENT

MM-9/70

TOP VERTICAL

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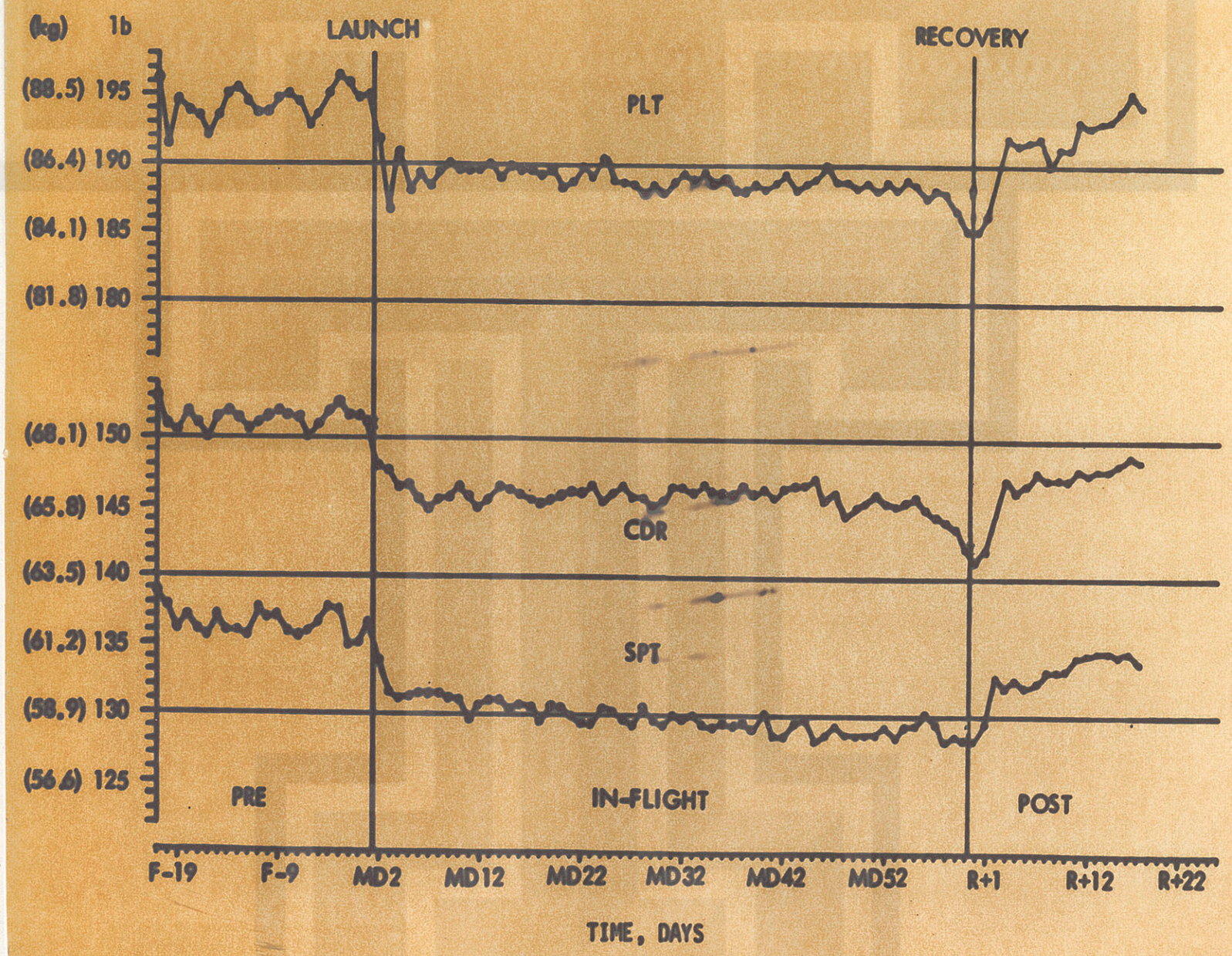

Figure 3.1-1. - SL-3 Crew Weight.

TOP VERTICAL

TOP HORIZONTAL

NUMBER 10

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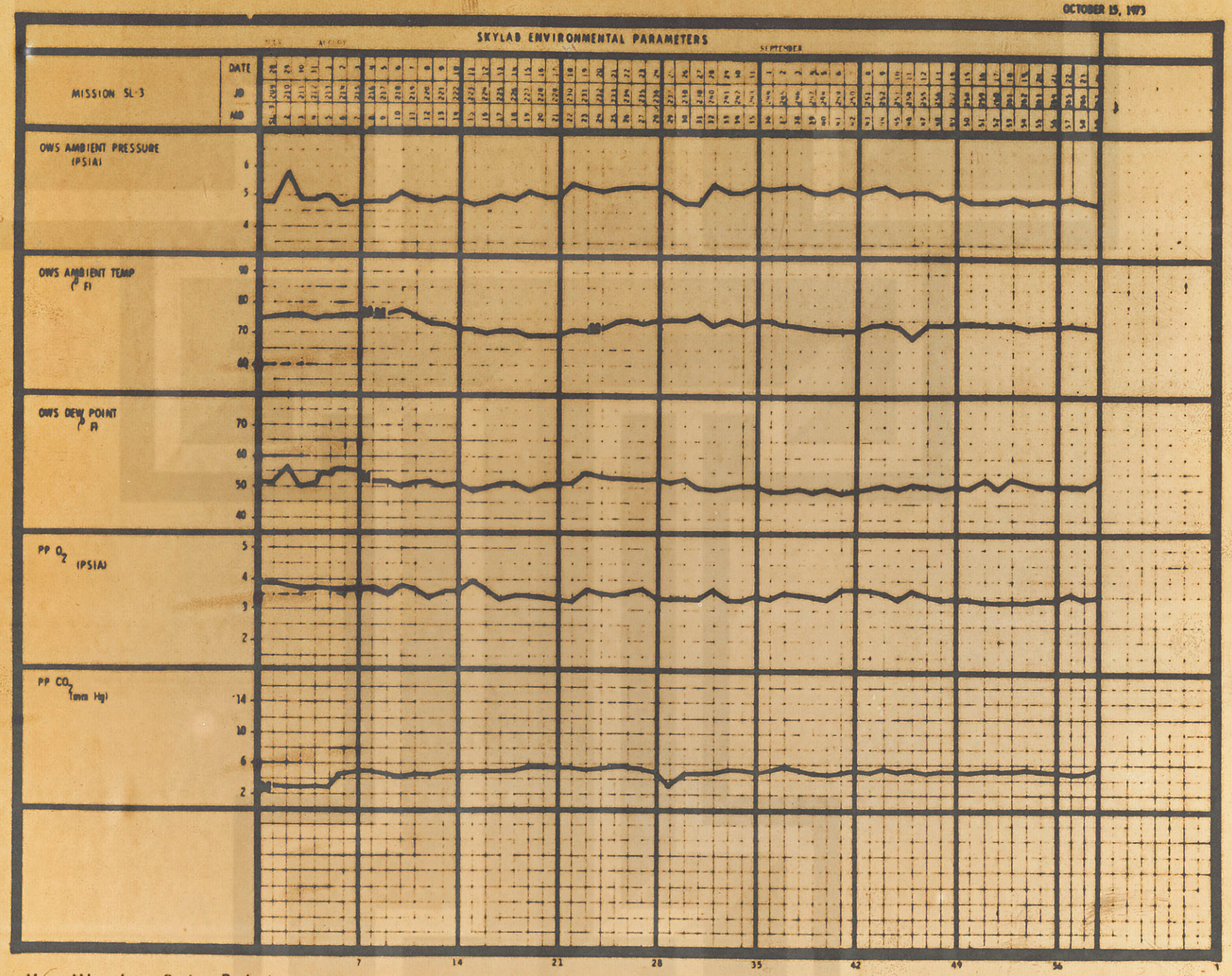

M = Missing Data Point

Figure 1.2-1

TOP VERTICAL

TOP VERTICAL

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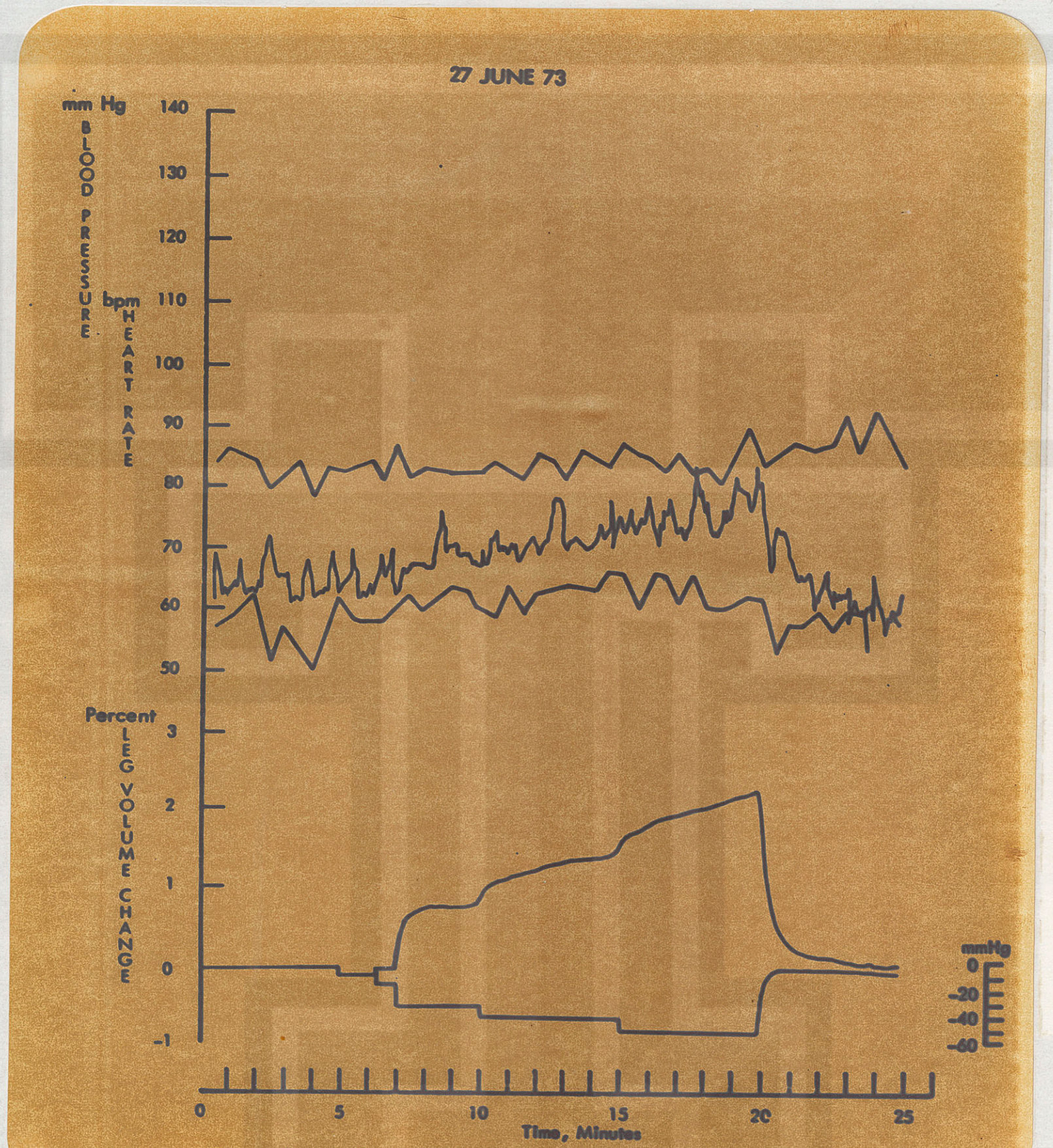

Figure 3.5-2.- Typical Response During Preflight LBNP Test of CDR (SL-3).

TOP HORIZONTAL

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NOTES:

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TOP VERTICAL

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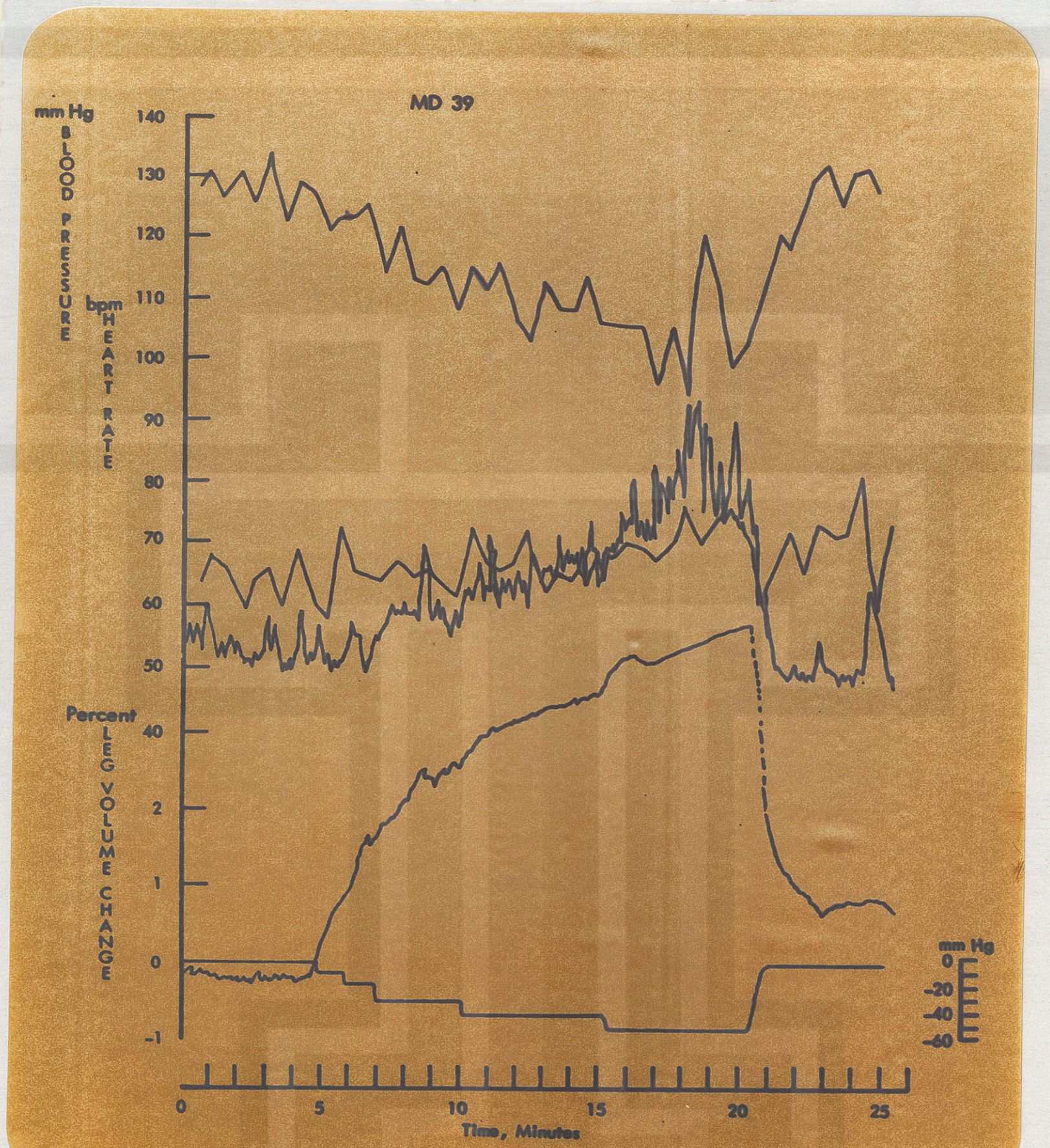

Figure 3.5-9. -Response to In-Flight LBNP of SL-3 Pilot Showing Stress (MD 39)

TOP HORIZONTAL

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NOTES:

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TOP HORIZONTAL

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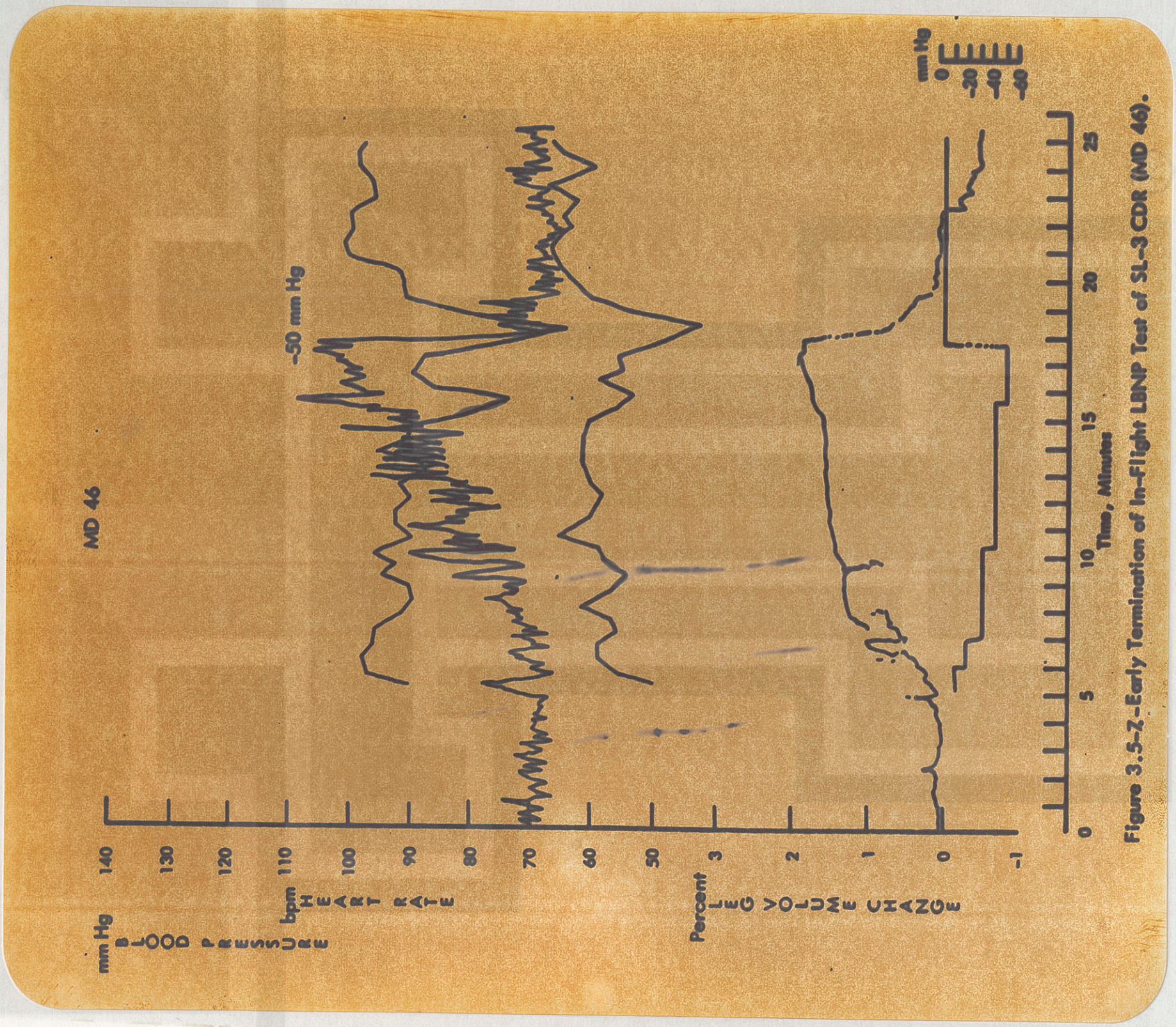

Figure 3.5-2.-Early Termination of In-Flight LBNP Test of SL-3 CDR (MD 46).

TOP VERTICAL

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NUMBER 9

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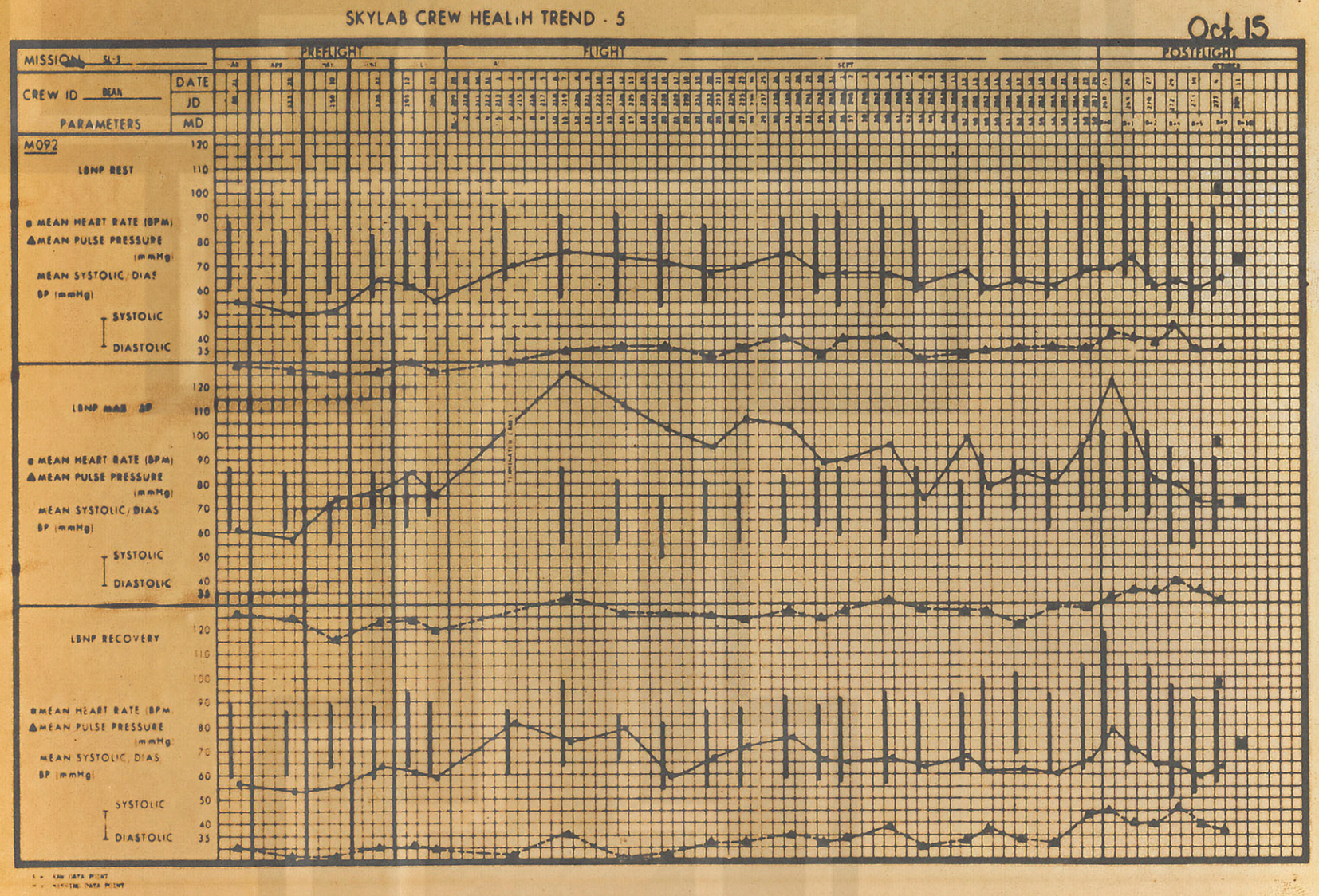

Figure 1.2-4

TOP VERTICAL

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TOP HORIZONTAL

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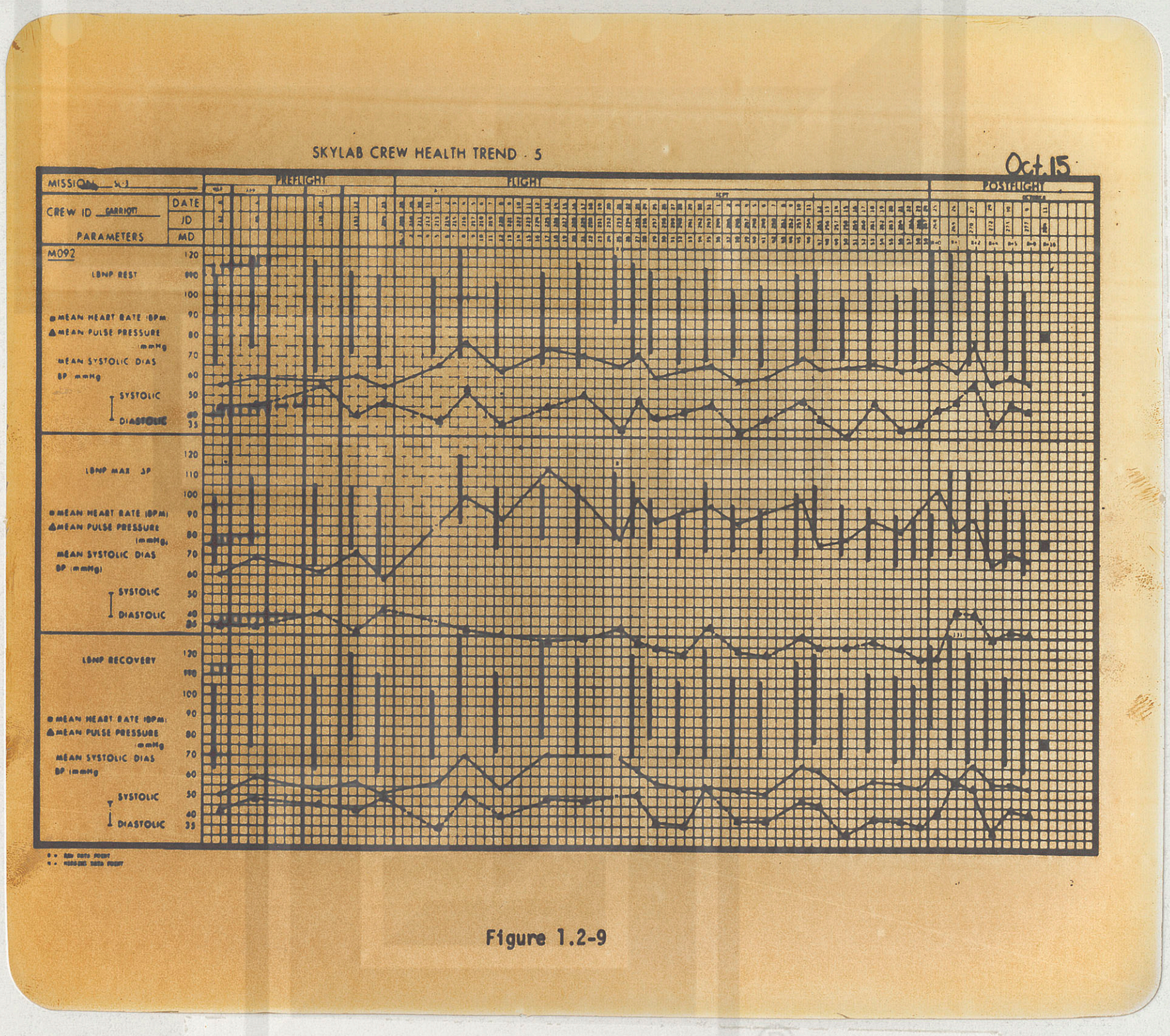

Figure 1.2-9

TOP VERTICAL

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TOP HORIZONTAL

NUMBER 3

NOTES:

SKYLAB CREW HEALTH TREND - 5

Oct. 15

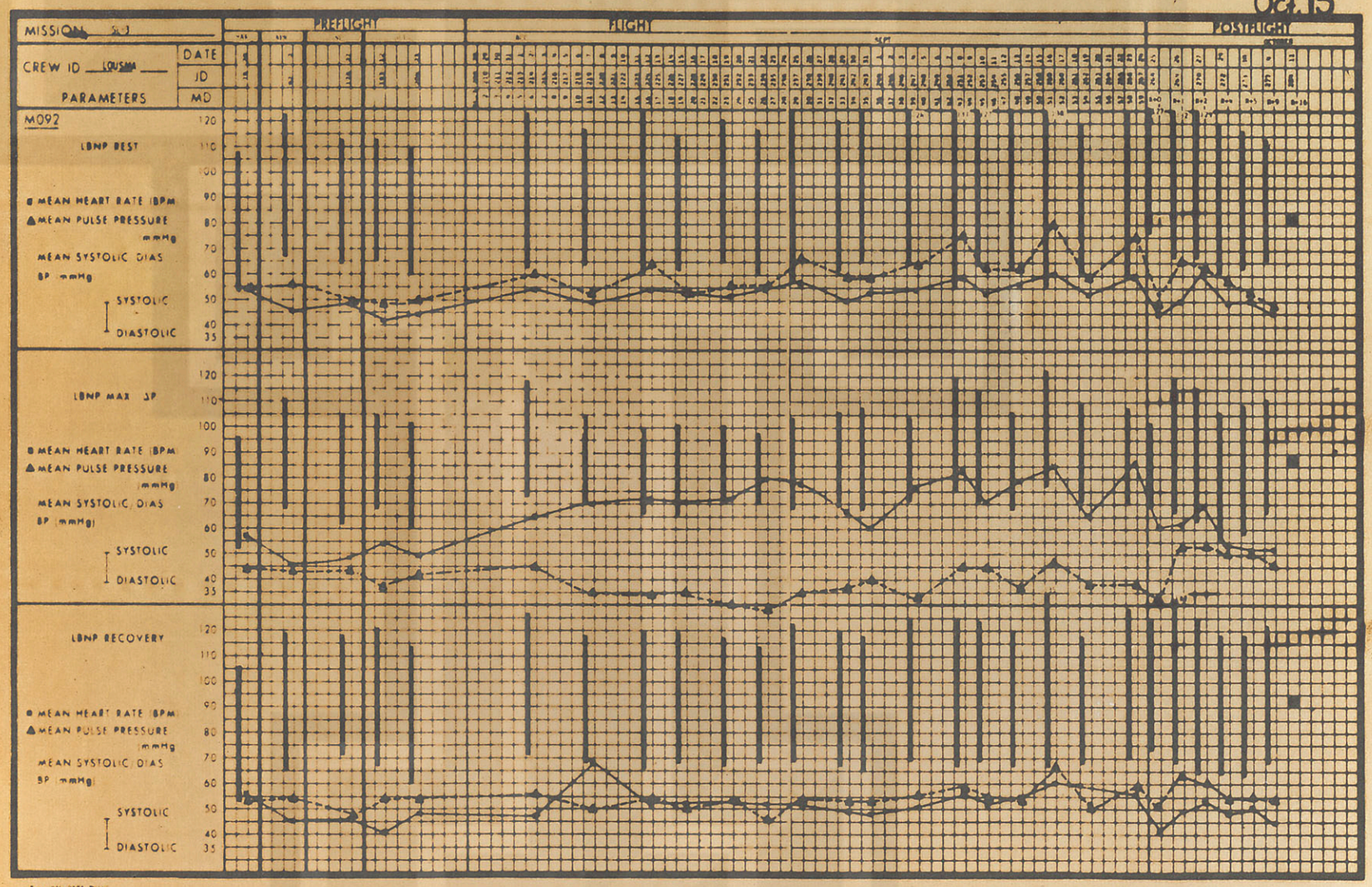

Figure 1.2-14

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TOP HORIZONTAL

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NOTES:

PERCENT CHANGE OF RED CELL MASS AND PLASMA VOLUME
FROM F-21 DAY VALUE (SL-3)

DAY	CDR	SPT	PLT	MEAN	CONTROLS BUCHANAN	BURCHARD	WHITTLE	MEAN
Red Cell Mass (ml)								
R+0	- 6.1	-19.8	-10.6	-12.2	- 3.7	+ 0.4	- 1.7	- 1.7
R+14	- 2.7	-13.8	- 5.9	- 7.5	- 5.1	-	- 2.5	
R+45	+ 3.0	+ 1.7	+ 3.1	+ 2.6	-	-	-	
Plasma Volume (ml)								
R+0	-18.4	- 9.1	-11.8	-13.1	- 2.0	+ 0.2	- 3.4	- 1.7
R+14	+ 0.1	+14.7	+ 2.0	+ 5.6	+ 7.3	-	+ 0.8	
R+45	+ 2.8	+11.7	+ 6.8	+ 7.1	-	-	-	

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NOTES:

PERCENT CHANGE OF RED CELL MASS AND PLASMA VOLUME
CONCENTRATION FROM F-21 DAY VALUE (SL-3)

DAY	CDR	SPT	PLT	MEAN	BUCHANAN	CONTROLS BURCHARD	WHITTLE	MEAN
			Red Cell Mass (ml/kg)					
R+0	- 0.7	-15.9	- 9.3	- 8.6	- 2.5	+ 0.7	- 4.4	- 2.1
R+14	+ 1.1	-13.1	- 8.0	- 6.7	- 5.0	-	- 4.1	
R+45	+ 1.1	+ 0.7	+ 1.3	+ 1.0	-	-	-	
			Plasma Volume (ml/kg)					
R+0	-13.8	- 4.8	-10.7	- 9.8	- 0.8	+ 0.4	- 6.0	- 2.1
R+14	+ 3.9	+15.4	- 0.4	+ 6.3	+ 7.2	-	- 0.6	
R+45	+ 0.4	+10.6	+ 4.7	+ 5.2	-	-	-	

TOP VERTICAL

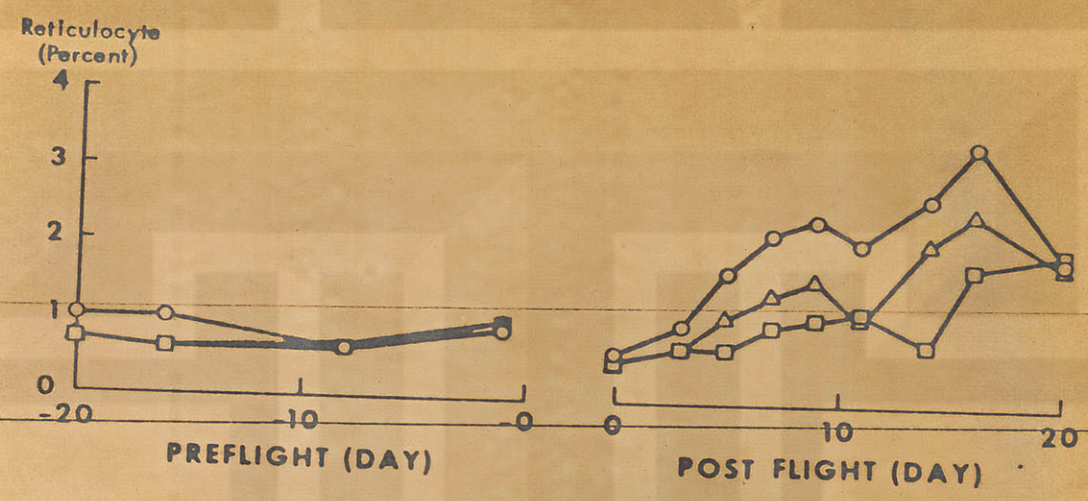

Figure 3.11-7. - Reticulocyte Count, (SL-3).

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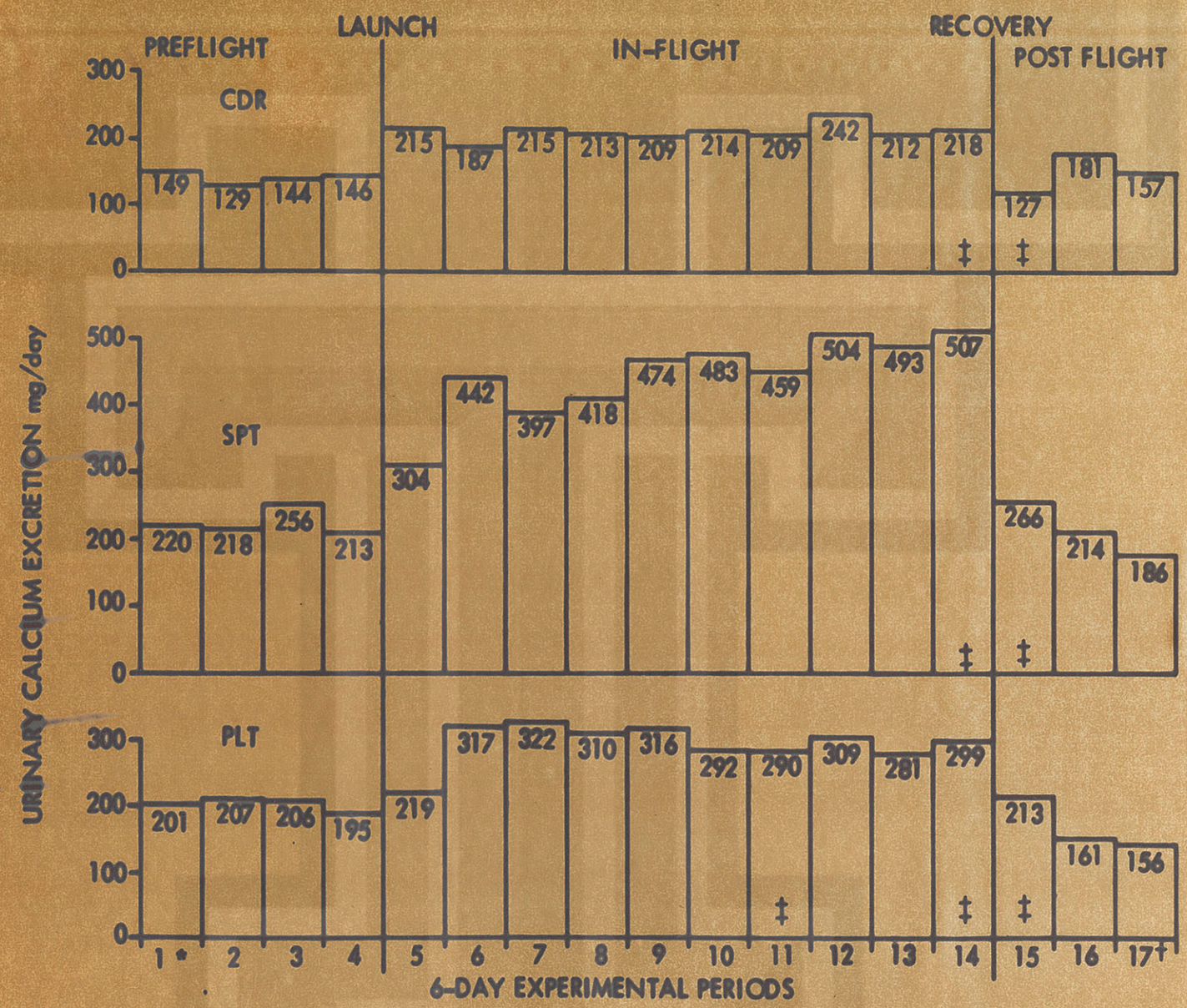

* 3 DAYS ‡ DATA INCOMPLETE FOR THIS PERIOD † 5 DAYS

Figure 3.1-2. - Urinary Calcium Excretion, SL-3.

TOP VERTICAL

TOP HORIZONTAL

NUMBER _____

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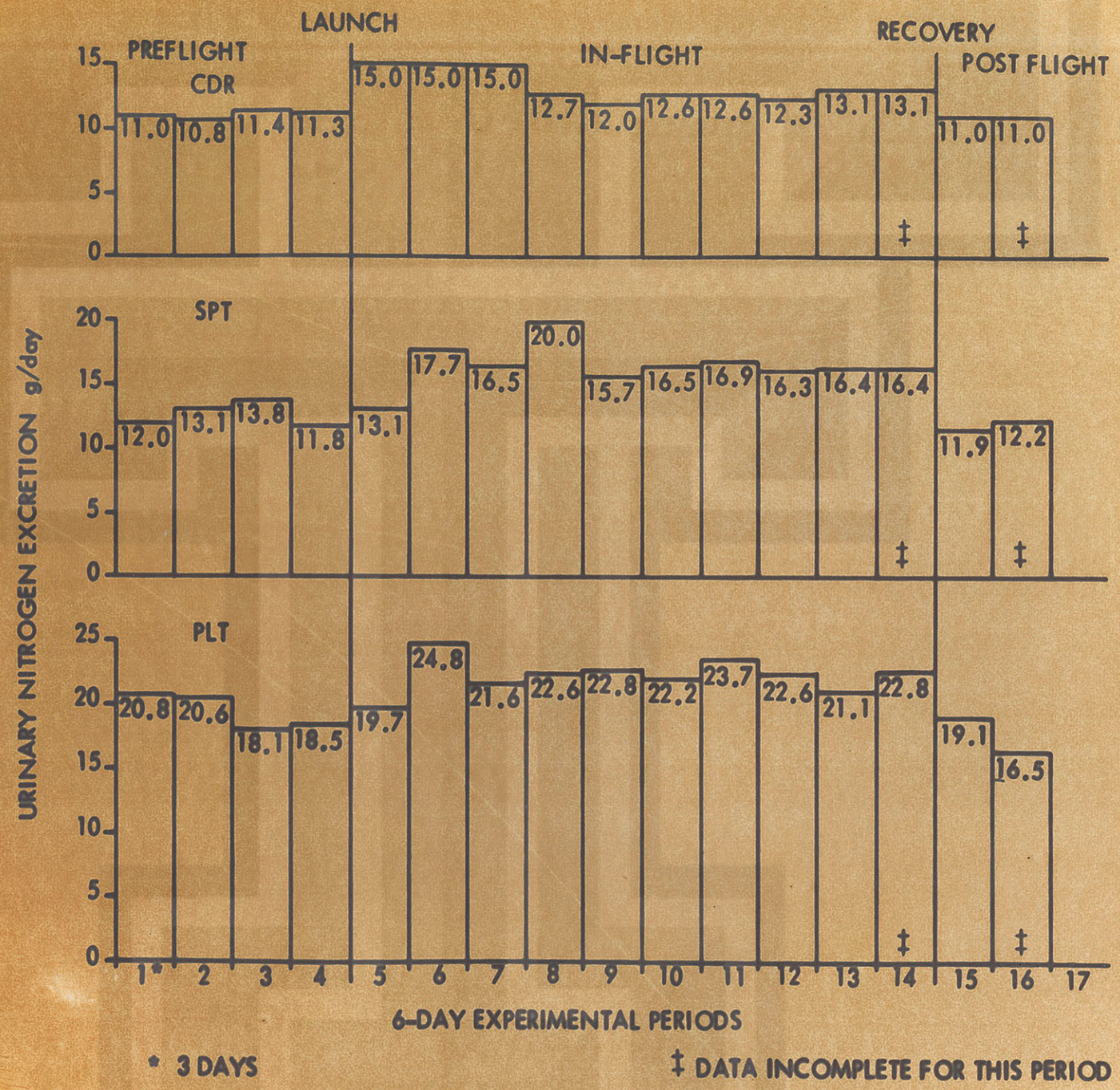

* 3 DAYS

‡ DATA INCOMPLETE FOR THIS PERIOD

Figure 3.1-3. - Urinary Nitrogen Excretion, SL-3.

TOP VERTICAL

TOP HORIZONTAL

NUMBER 23

NOTES:

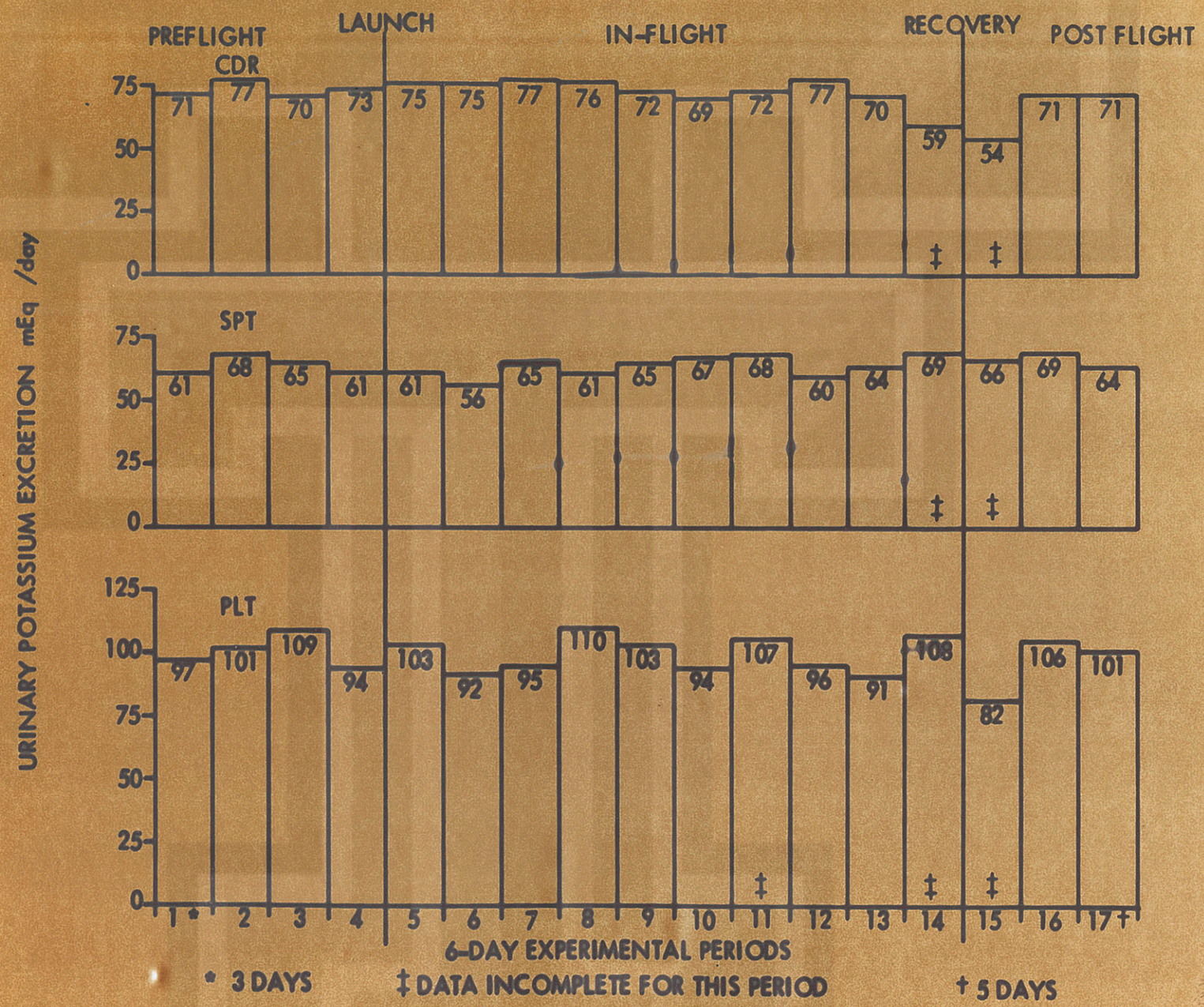

Figure 3.1-4. - Urinary Potassium Excretion, SL-3.

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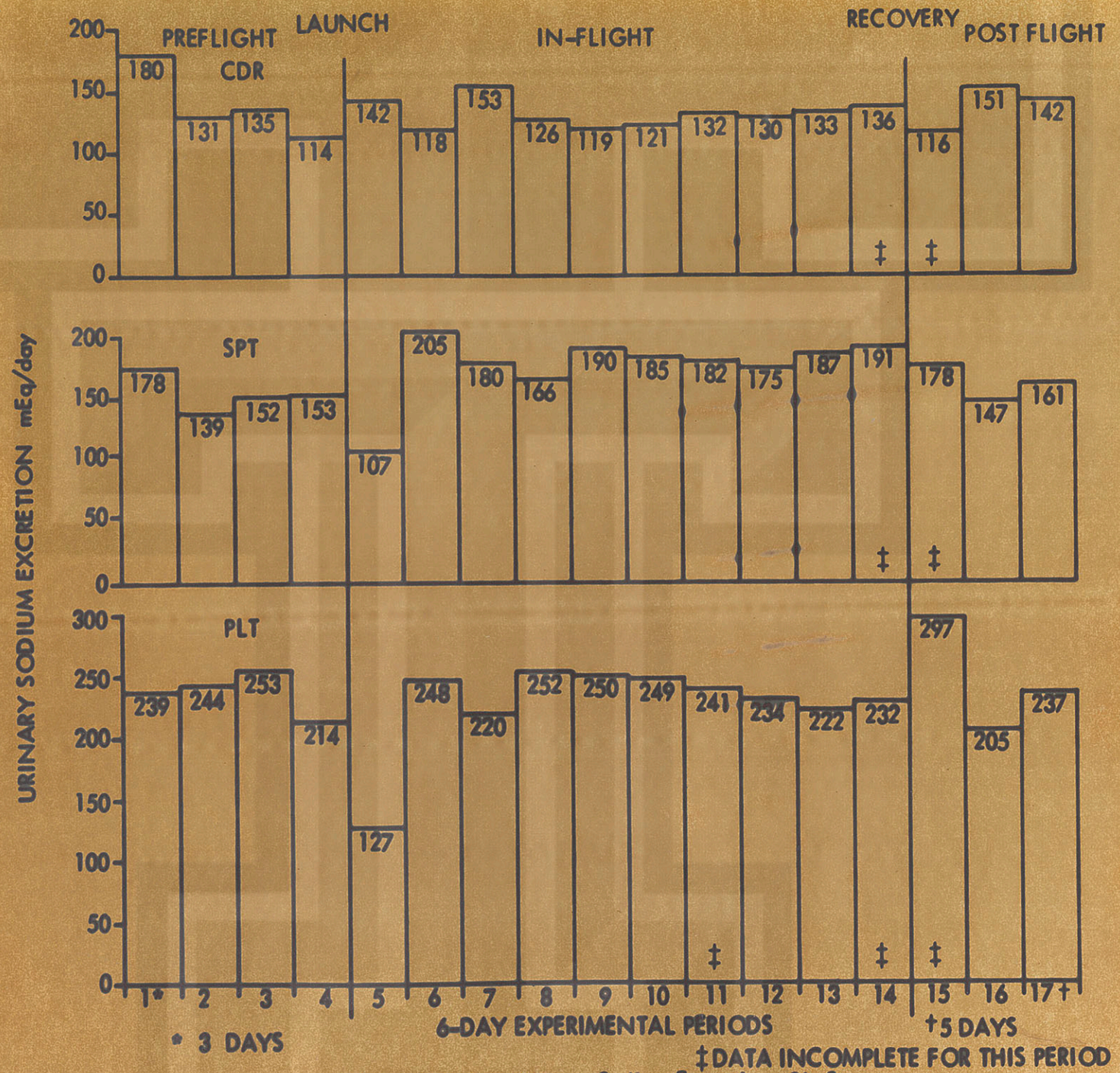

Figure 3.1-5. - Urinary Sodium Excretion, SL-3.

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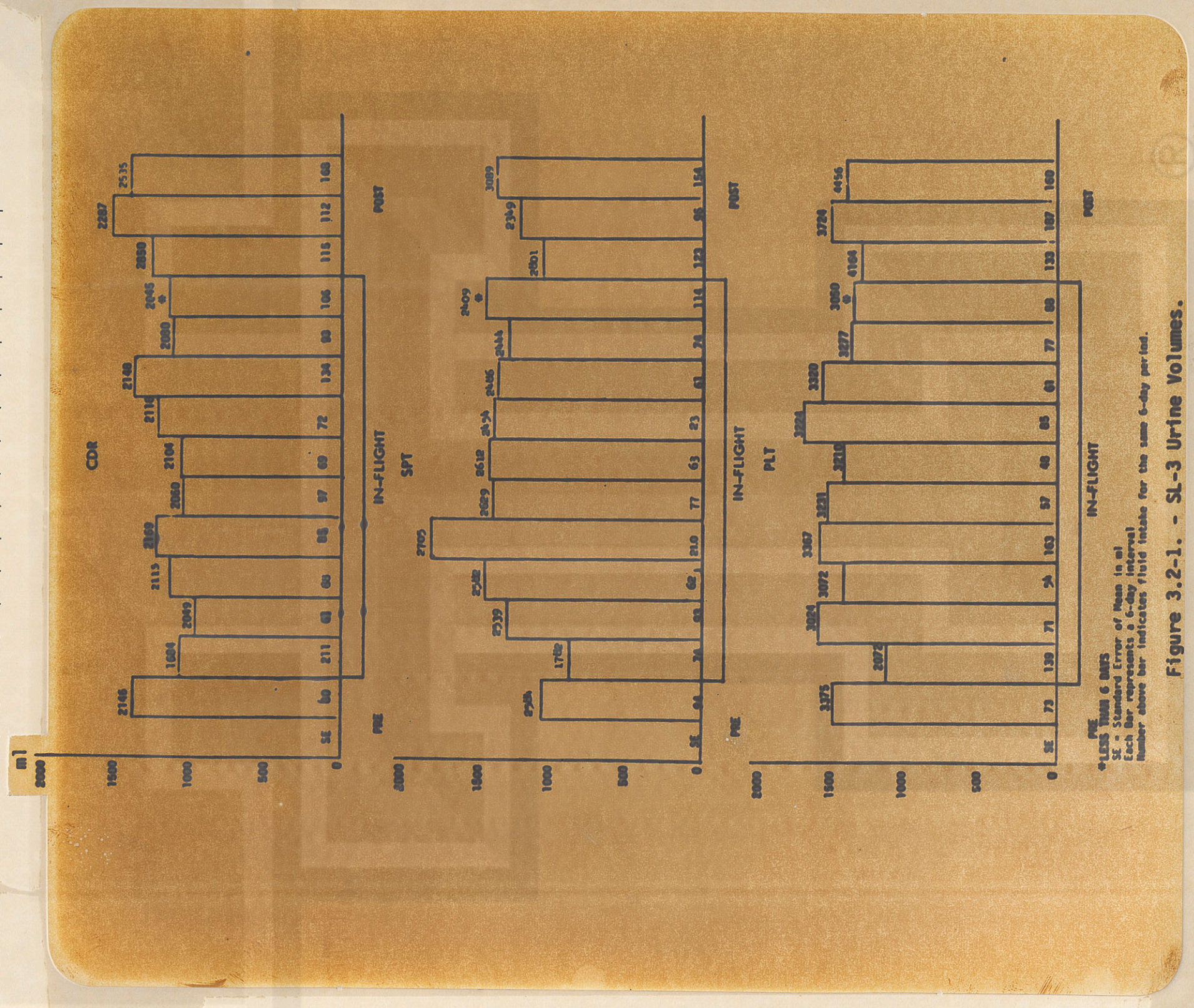

Figure 3.2-1. - SL-3 Urine Volumes.

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NUMBER MM8-2 72-7333

TOP HORIZONTAL

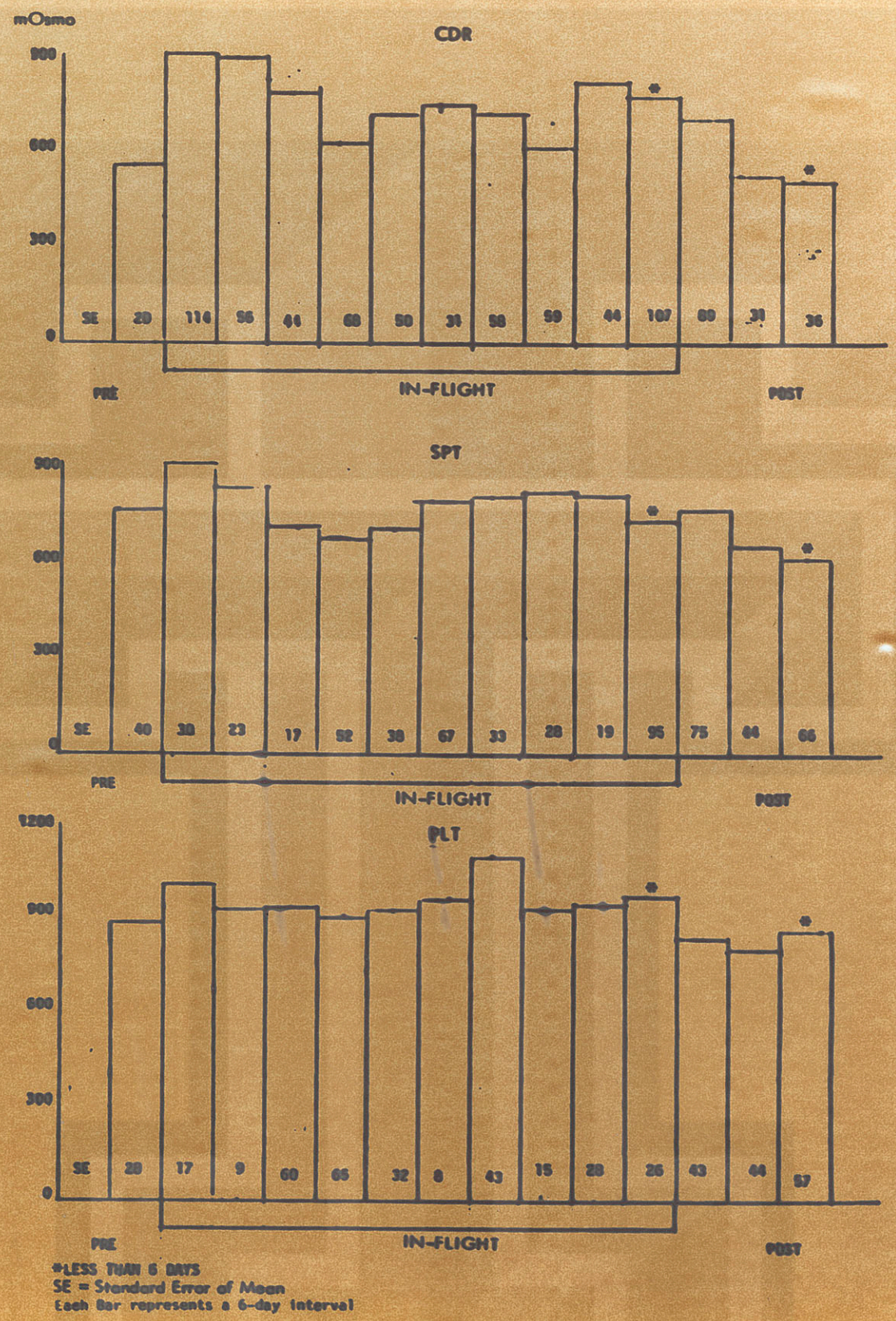

Figure 3.2-6. - SL-3 Urinary Osmolality.

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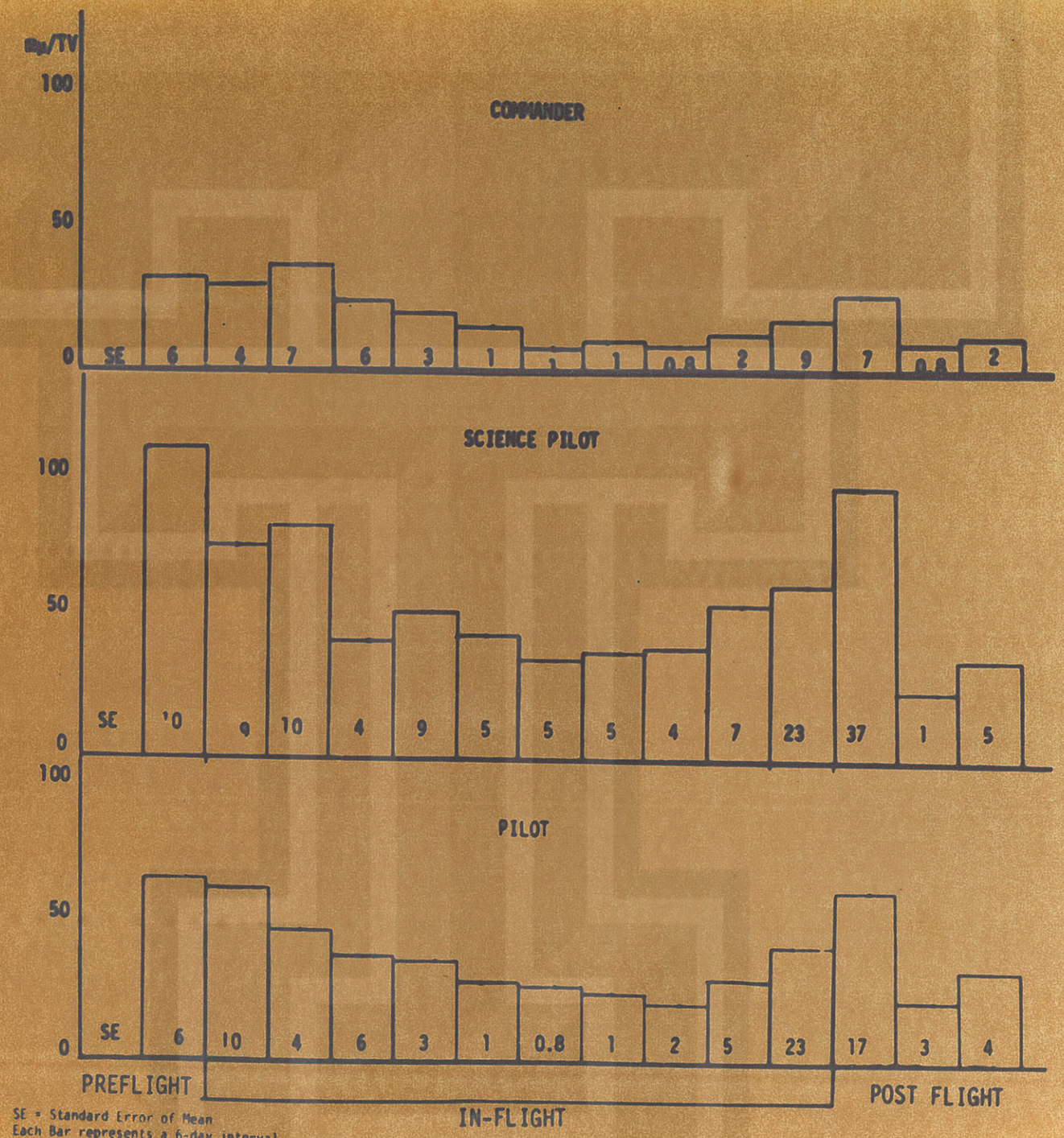


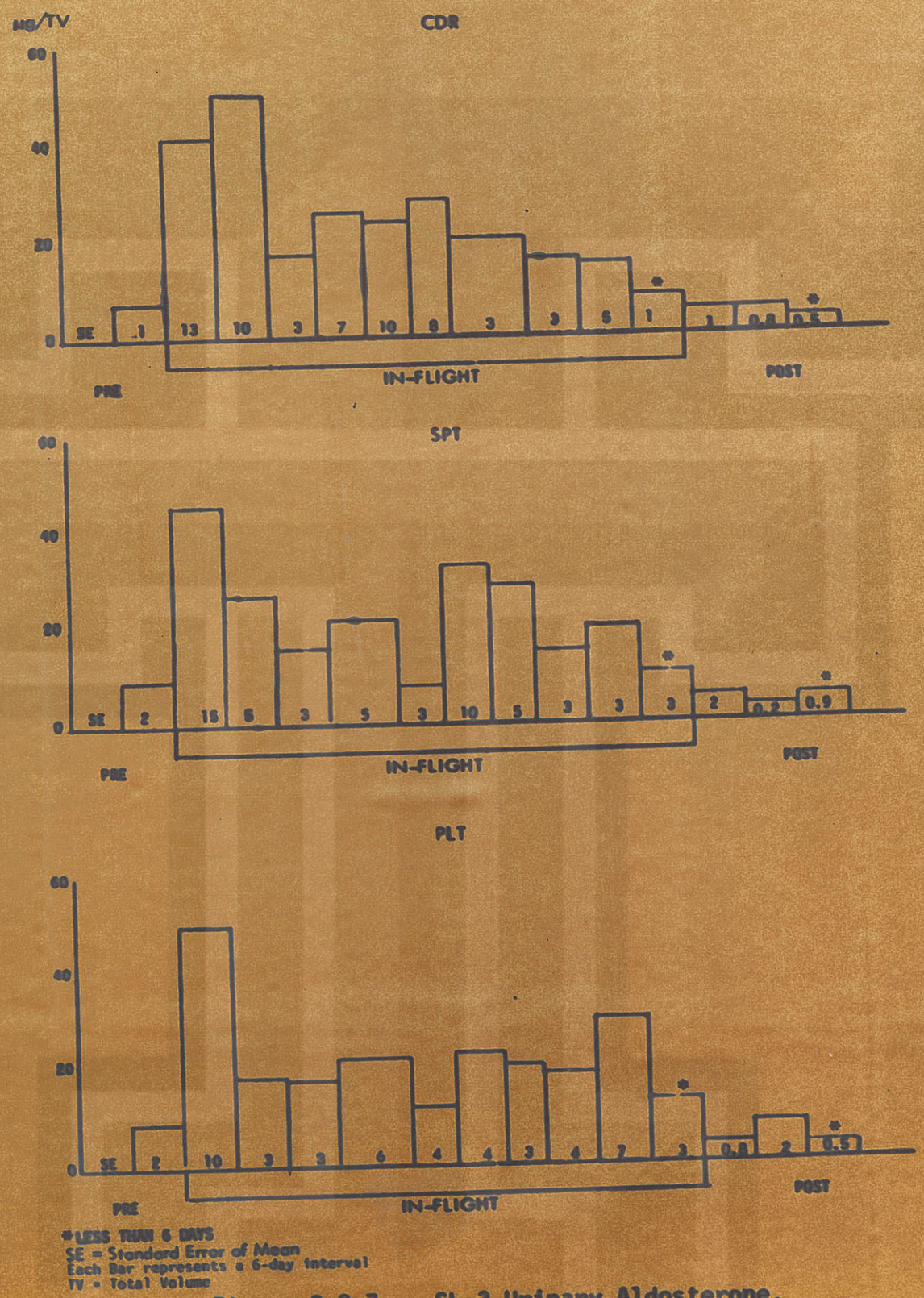
SE = Standard Error of Mean
Each Bar represents a 6-day interval

Figure 3.2-3. - Urinary ADH, SL-3.

TOP VERTICAL

TOP VERTICAL

NUMBER



*LESS THAN 6 DAYS
SE = Standard Error of Mean
Each Bar represents a 6-day interval
TV = Total Volume

Figure 3.2-7. - SL-3 Urinary Aldosterone.

TOP HORIZONTAL

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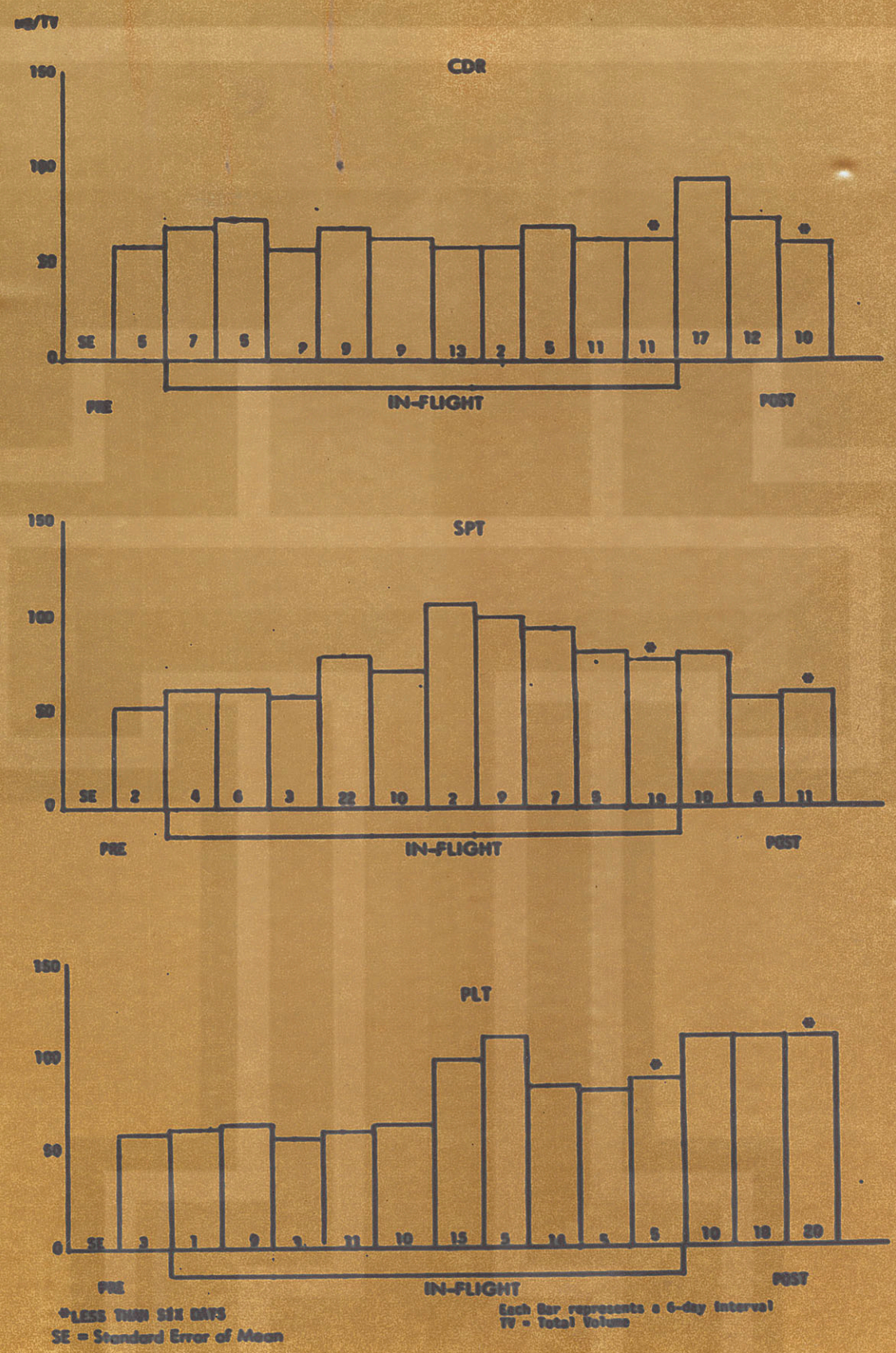

Figure 3.2-10. - SL-3 Urinary Norepinephrine.

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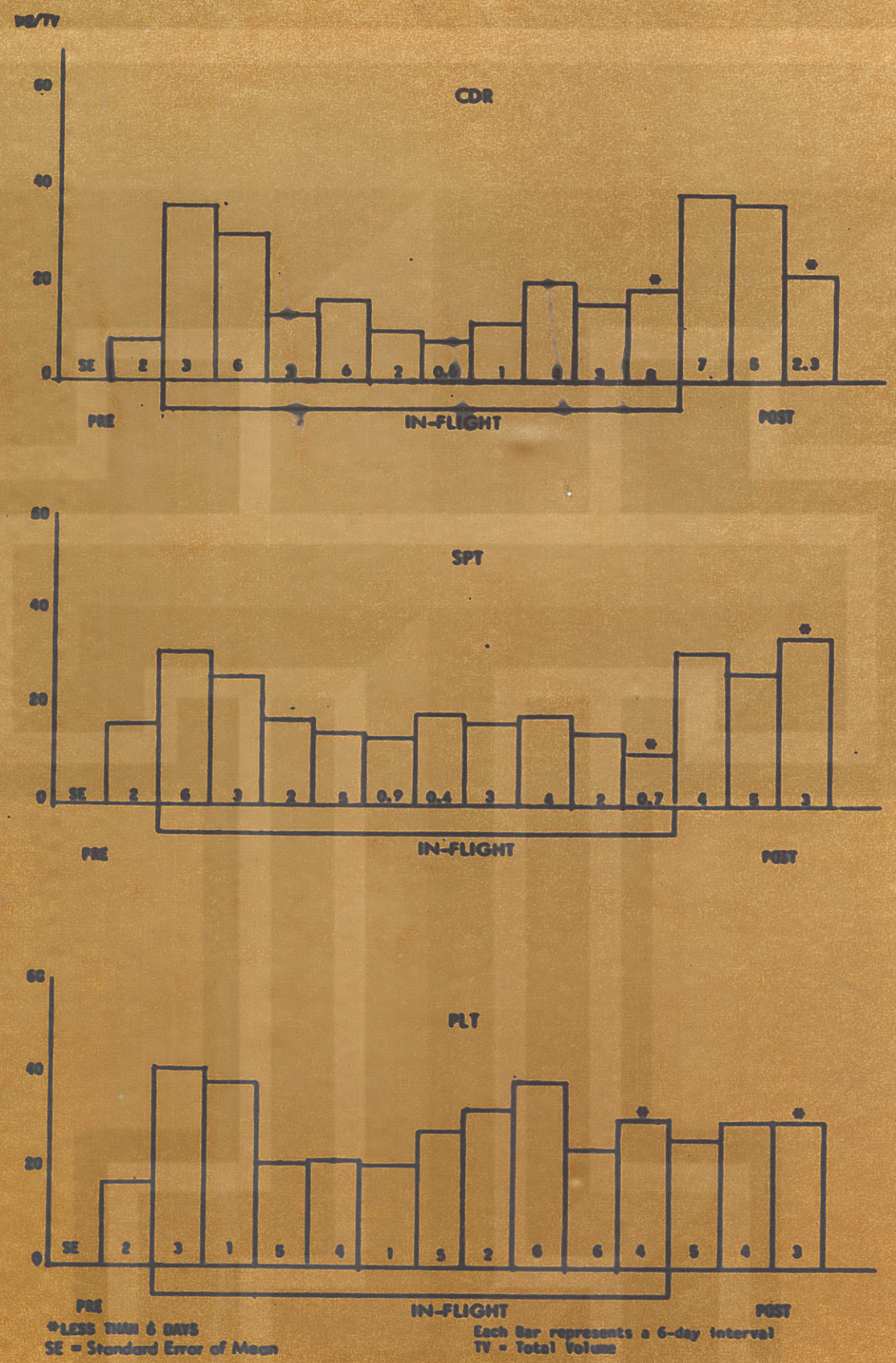

Figure 3.2-9. - SL-3 Urinary Epinephrine, Commander.

NOTES:

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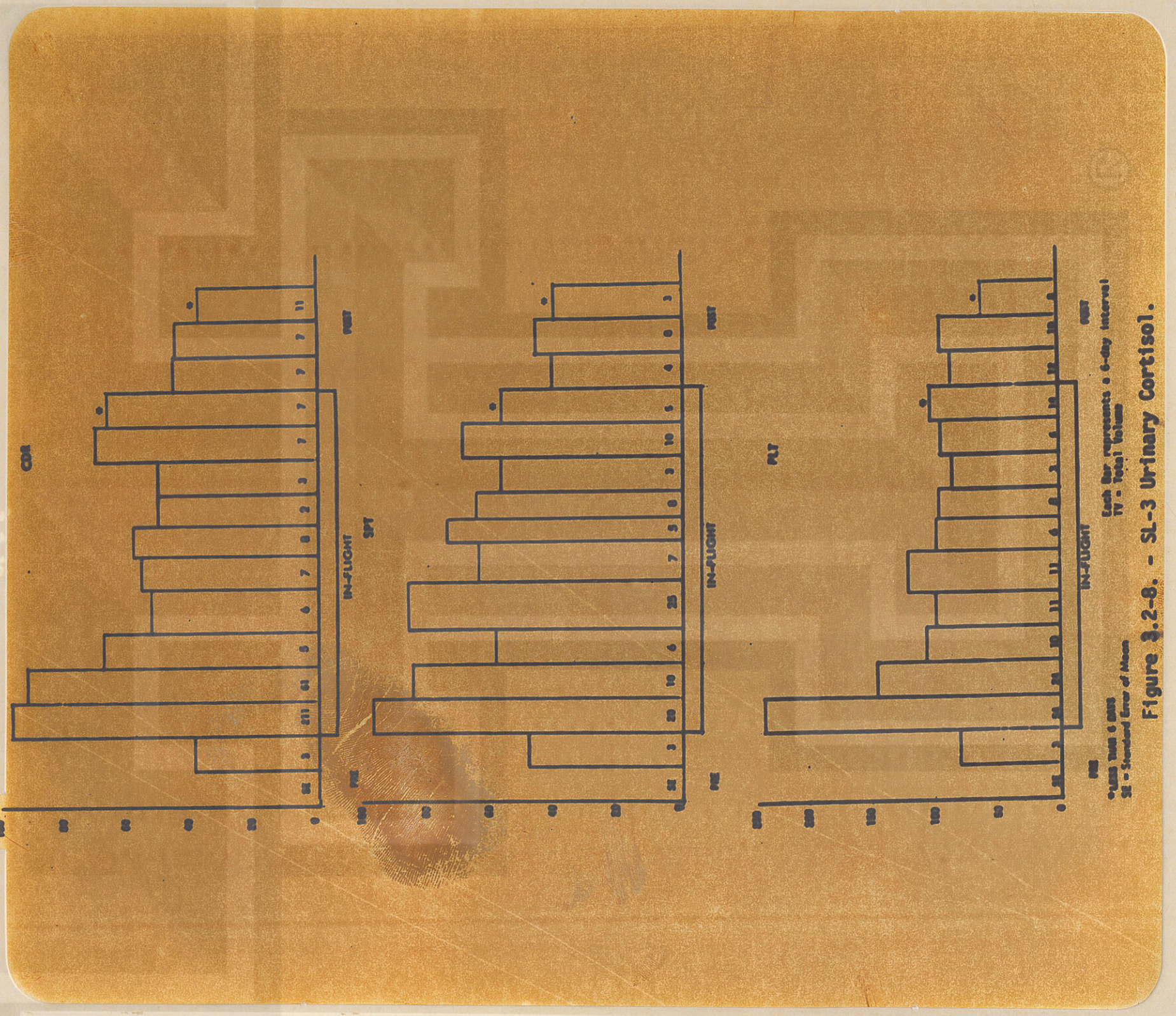

Figure 3.2-8. - SL-3 Urinary Cortisol.

TOP VERTICAL

TOP HORIZONTAL

NUMBER 8

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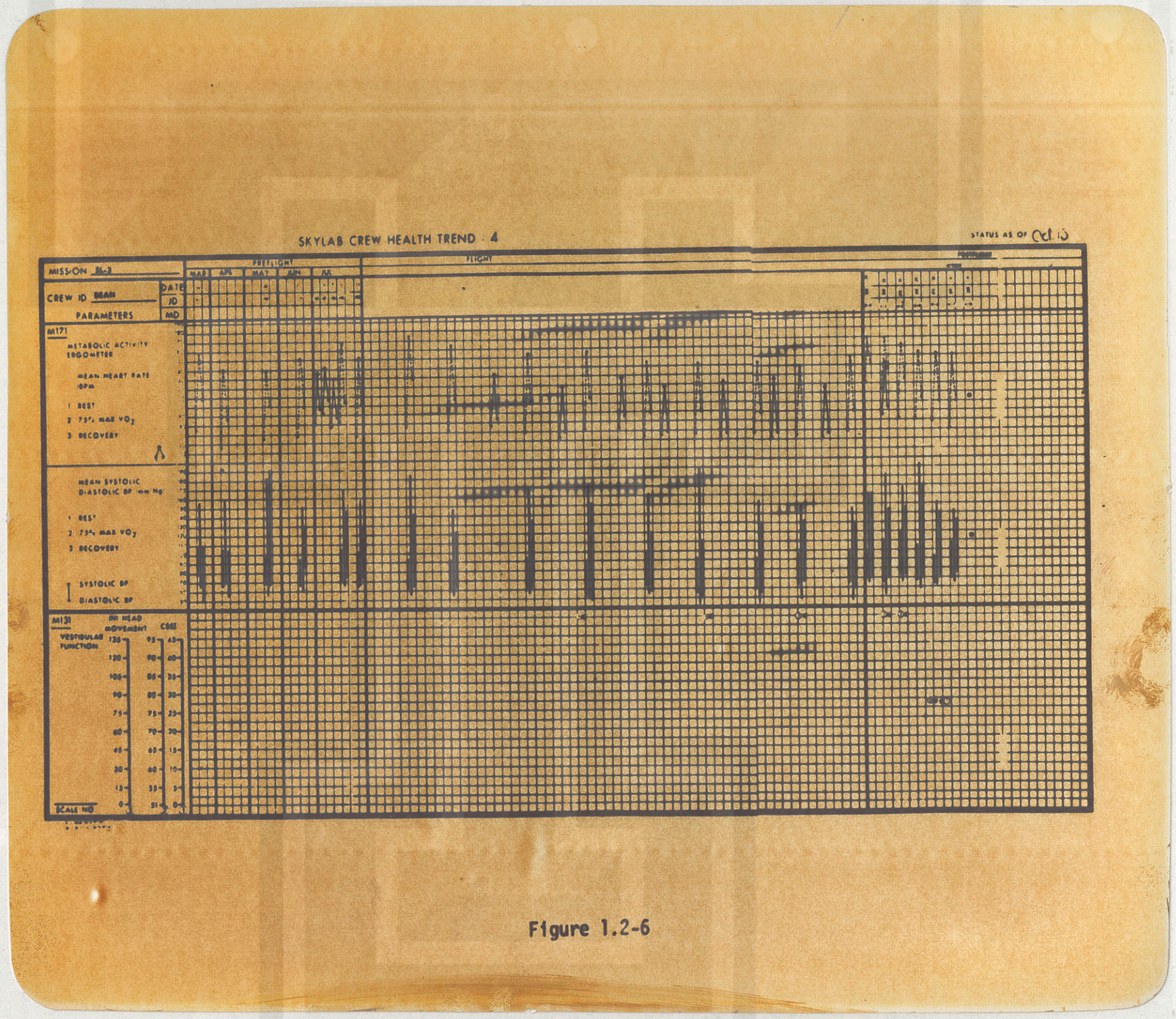

Figure 1.2-6

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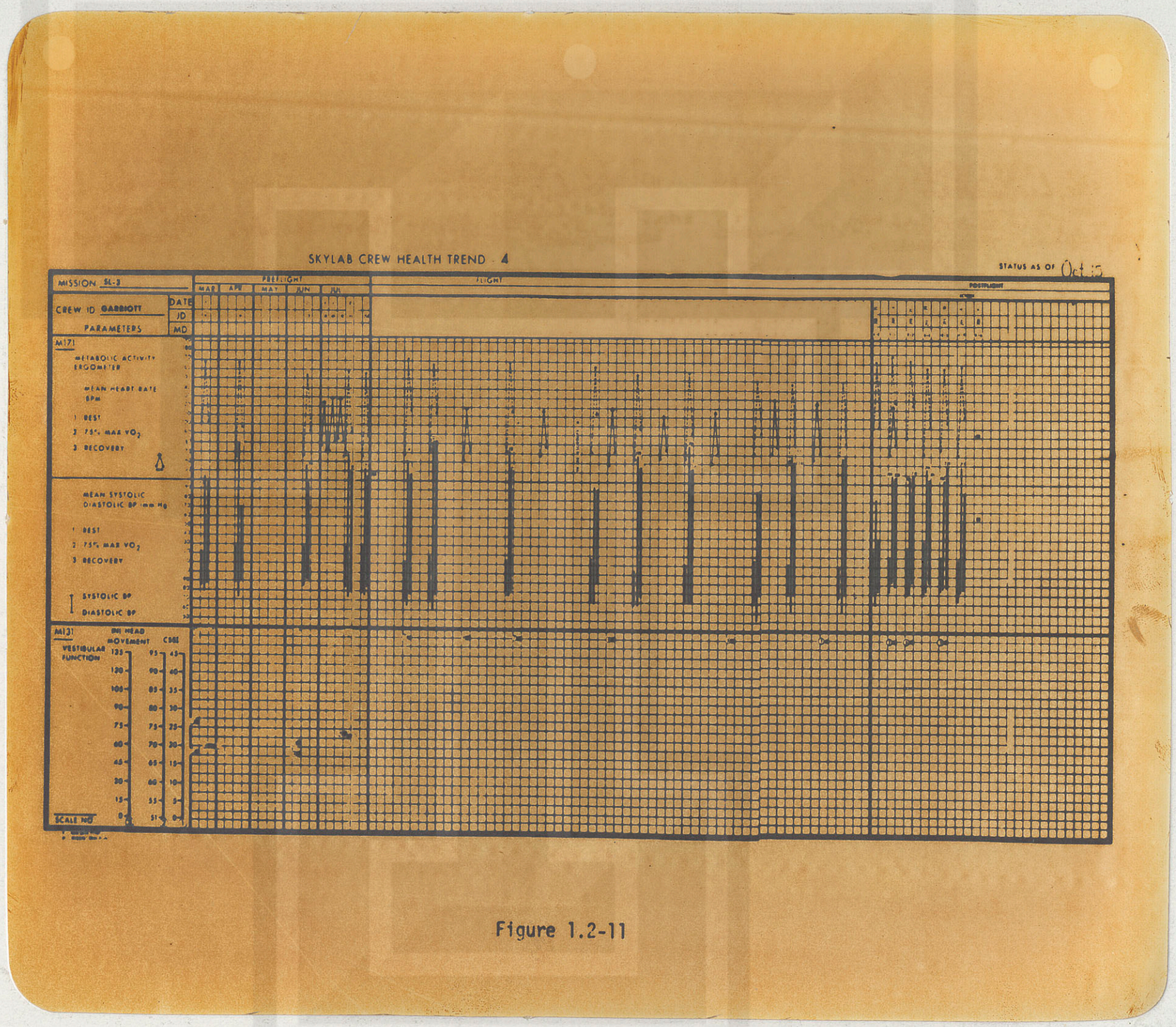

Figure 1.2-11

TOP VERTICAL

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NUMBER 4

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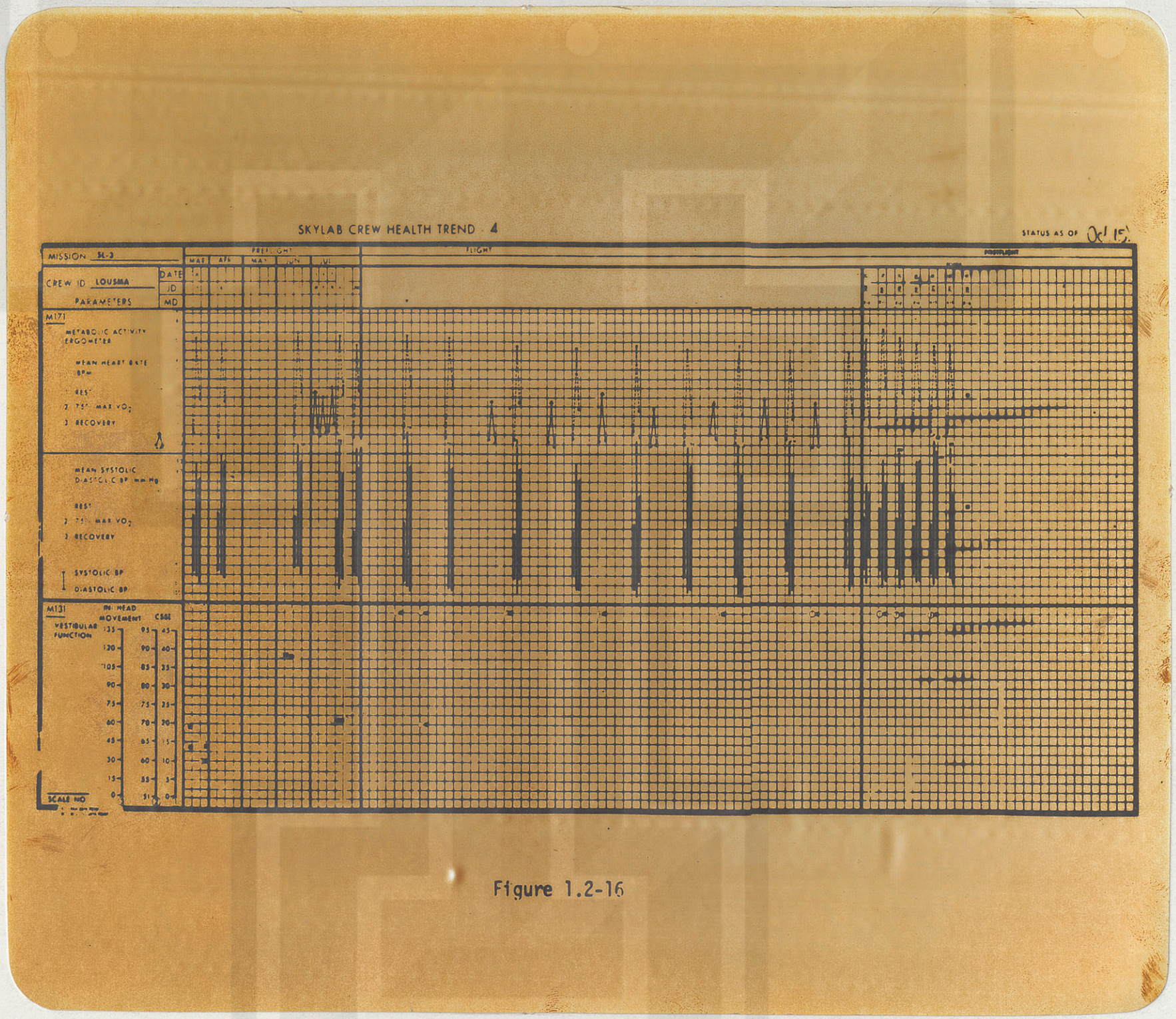

Figure 1.2-16

TOP VERTICAL

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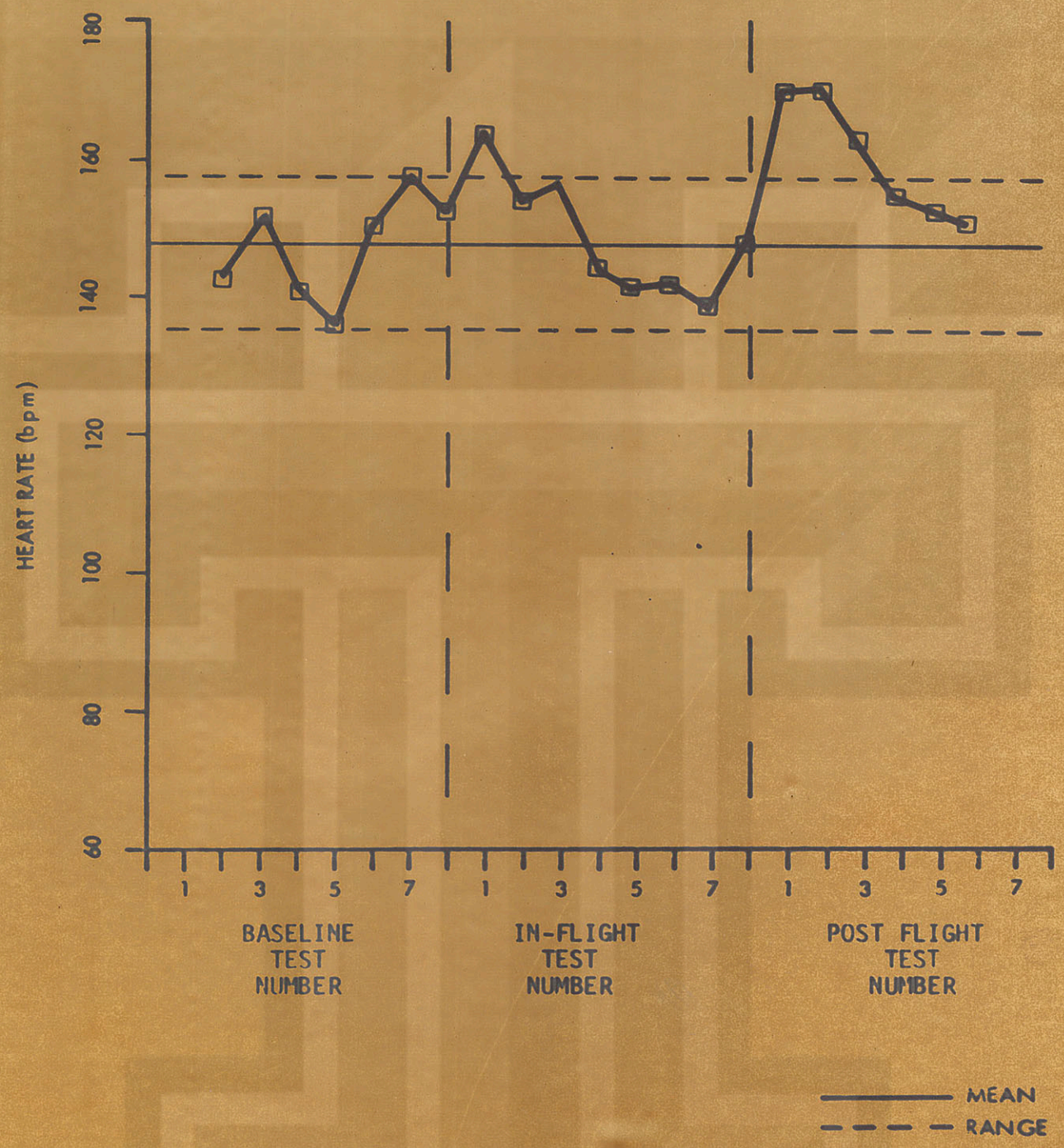

Figure 3.15-4. - CDR Heart Rate, Level 3 Exercise (SL-3).

NOTES:

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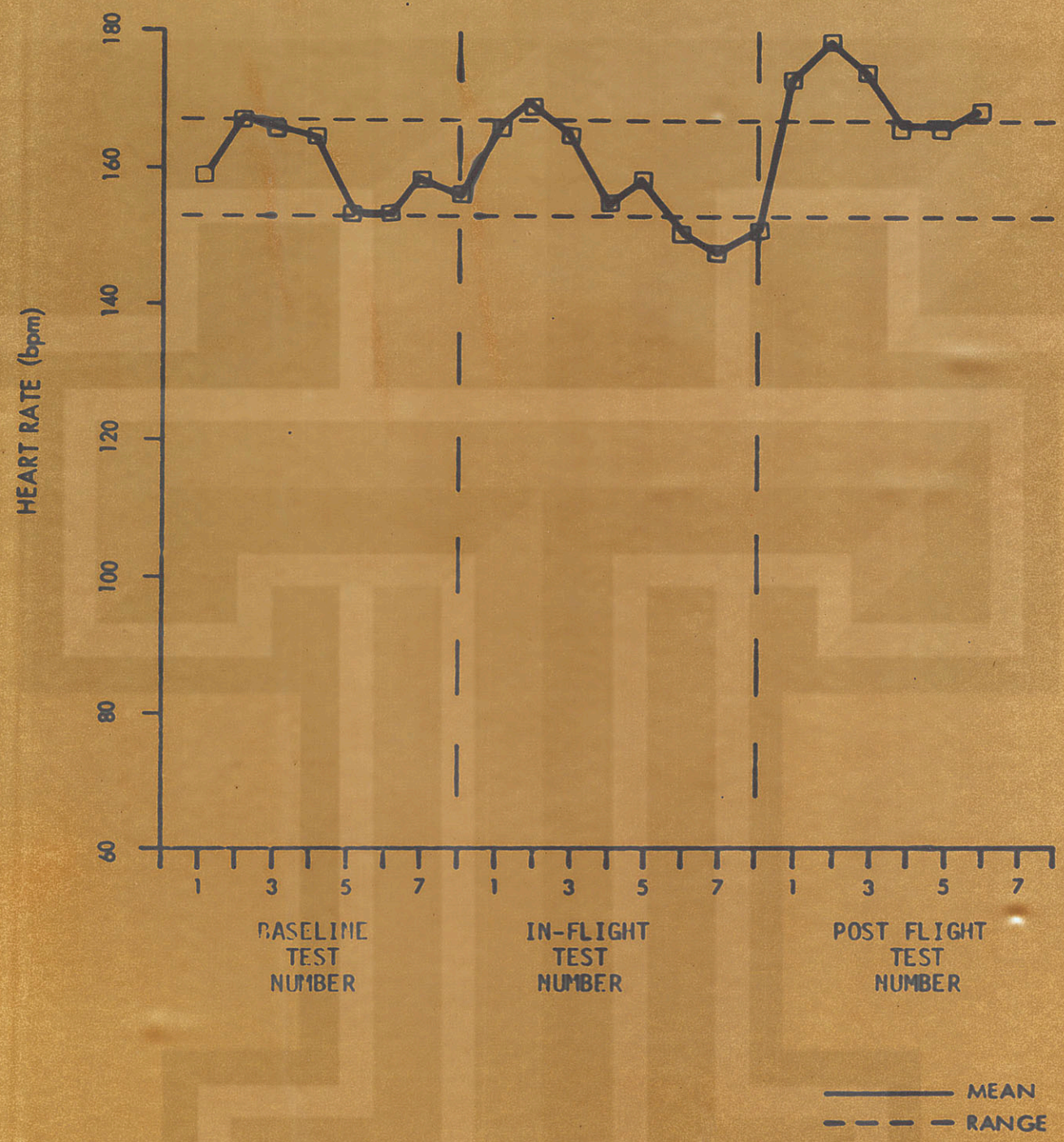

Figure 3.15-5. - SPT Heart Rate, Level 3 Exercise (SL-3).

NOTES:

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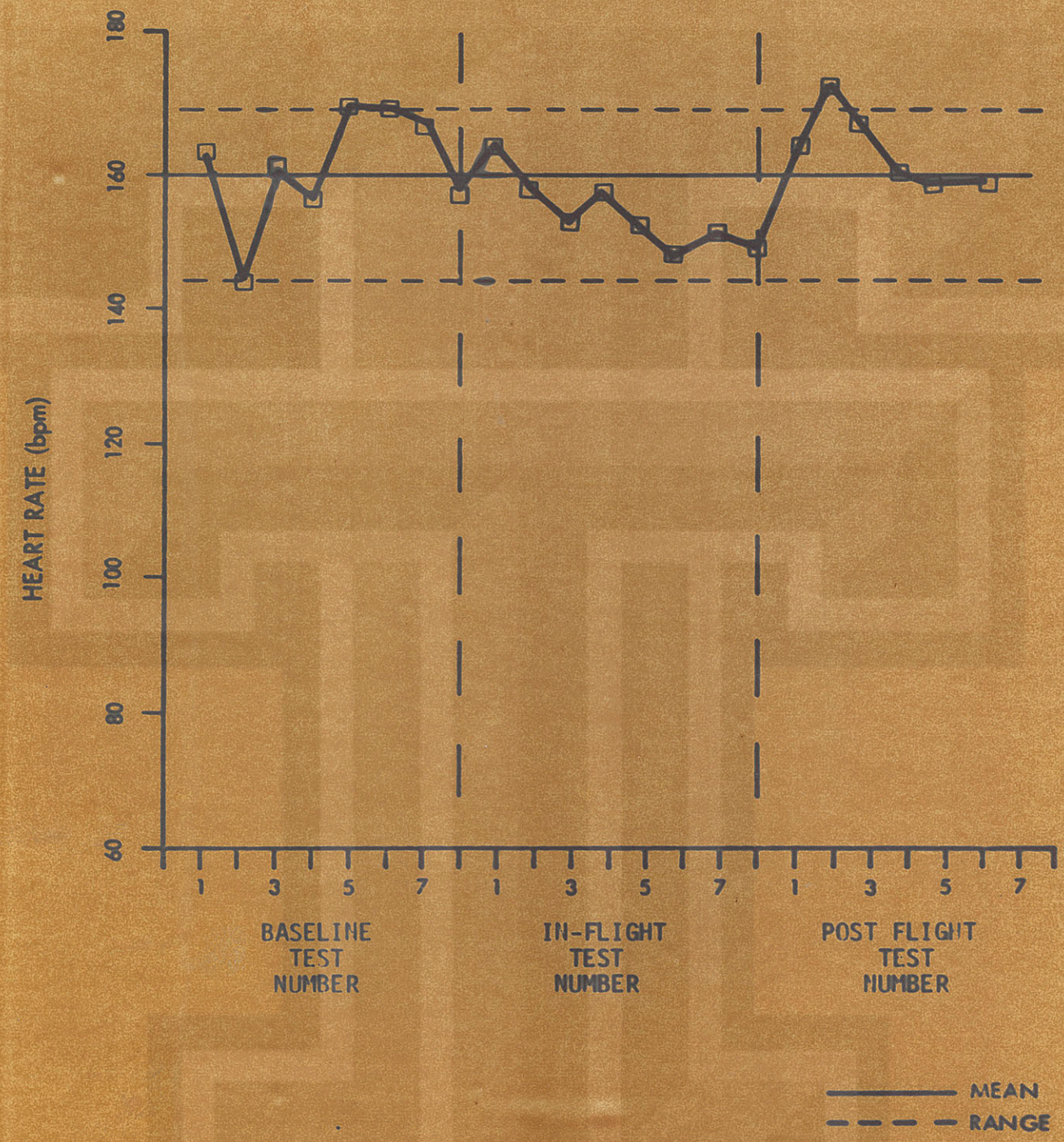

Figure 3.15-6. - PLT Heart Rate, Level 3 Exercise (SL-3).

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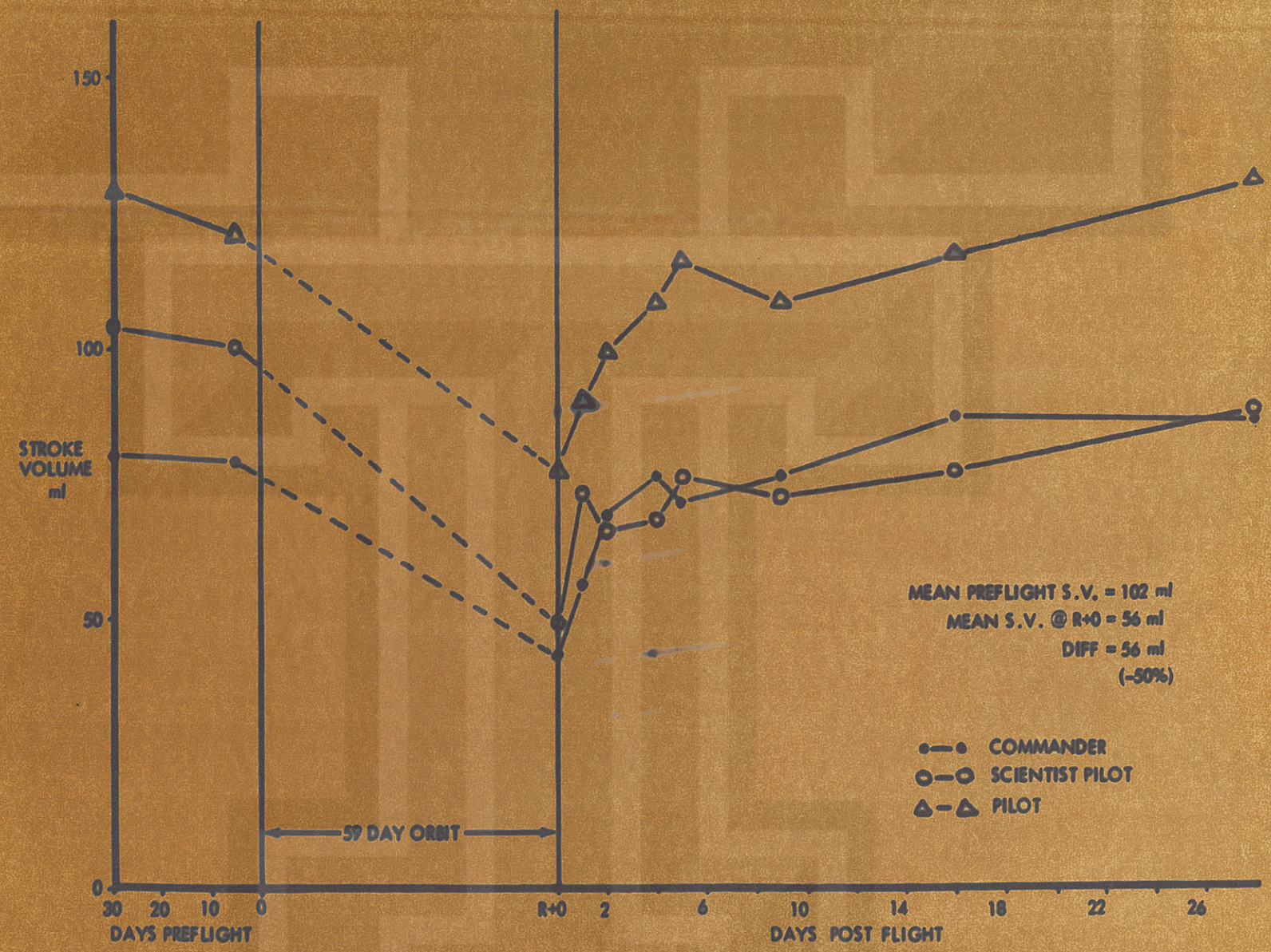

Figure 3.15-13. - Mean Stroke Volume During Submaximal Exercise (SL-3).

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TABLE 2.5.2-V. METABOLIC RATES DURING SL-3 EVA'S AND IVA'S

	SPT		PLT		CDR	
	Btu/h	(kJ/h)	Btu/h	(kJ/h)	Btu/h	(kJ/h)
EVA I (6 hours, 31 minutes)	954	(1007)	1054	(1112)	-	-
EVA II (4 hours, 31 minutes)	1004	(1060)	1223	(1291)	-	-
EVA III (2 hours, 41 minutes)	717	(757)	-	-	886	(936)
IVA [M509-3 (2 hours, 26 minutes)]	-	-	-	-	520	(544)

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TABLE 2.5.2-I. SL-3 EVA-1 (SUNSHADE DEPLOYMENT AND FILM RETRIEVAL, MD 10)

G.m.t.	Elapsed Time (minutes)	Activity Completed	Metabolic Rate PLT Btu/h	PLT (kJ/h)	SPT Btu/h	SPT (kJ/h)
218:17:29	0	Depressurization	-	-	-	-
218:17:32	3	Opened hatch	507	(530)	492	(519)
218:18:08	36	Initial unstowage of Sunshade equipment	1079	(1139)	1228	(1297)
218:18:11	3	EV2 egress and translate to double work station	1027	(1084)	1032	(1090)
218:19:25	74	1st 11-section pole out and being clamped to base plate	966	(1020)	1127	(1190)
218:19:39	14	More pole assembly	1167	(1232)	984	(1039)
218:19:43	4	Watching sunset	705	(744)	990	(1045)
218:20:16	33	Both poles out but twist in one rope	934	(986)	1157	(1221)
218:20:44	28	Straightened twisted pole line	1085	(1146)	1308	(1381)
218:21:03	19	Sunshade deployed but with some folds stuck together	1485	(1568)	532	(556)
218:21:09	6	Sunshade redeployed-folds unstuck	1717	(1813)	482	(509)
218:21:38	29	Sunshade tied down and temporarily aligned in position	1481	(1564)	628	(663)
218:21:42	4	Stowing sunshade gear	1482	(1565)	1167	(1232)
218:21:47	5	Unstowing gear for film replacement EVA	1242	(1311)	1392	(1470)
218:21:48	1	Translated to VC	900	(950)	852	(899)
218:21:53	5	Completed S056 film replacement	1152	(1216)	1140	(1204)

NOTES:

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TABLE 2.5.2-I (Concluded)

G.m.t.	Elapsed Time (minutes)	Activity Completed	Metabolic Rate PLT Btu/h	PLT (kJ/h)	SPT Btu/h	SPT (kJ/h)
218:21:58	5	Completed H alpha 1 film replacement	972	(1026)	804	(849)
218:22:04	6	Open S082 doors	840	(887)	572	(598)
218:22:14	10	Inspection of quads & visual inspection of vehicle	969	(1023)	526	(550)
218:22:19	5	Translate VT	1047	(1105)	816	(861)
218:22:23	4	Translate to VS	1107	(1169)	1092	(1153)
218:22:28	5	82A and 82B film replacement completed	1107	(1169)	660	(697)
218:22:48	20	Working checkout problem on 82A and 82B	771	(814)	477	(504)
218:23:02	14	Resting waiting for sunrise	988	(1043)	509	(532)
218:23:15	13	Working on 55 door	922	(973)	626	(661)
218:23:25	10	Translate to VT and work on S149	831	(877)	812	(857)
218:23:37	12	Readjusting Sunshade	917	(968)	632	(667)
218:23:49	12	Work on S230	1122	(1185)	557	(582)
218:24:00	11	Stowing gear in AM, ingressing and repressurization	1194	(1261)	1081	(1141)
		$\bar{x}$	1054	(1112)	954	(1007)

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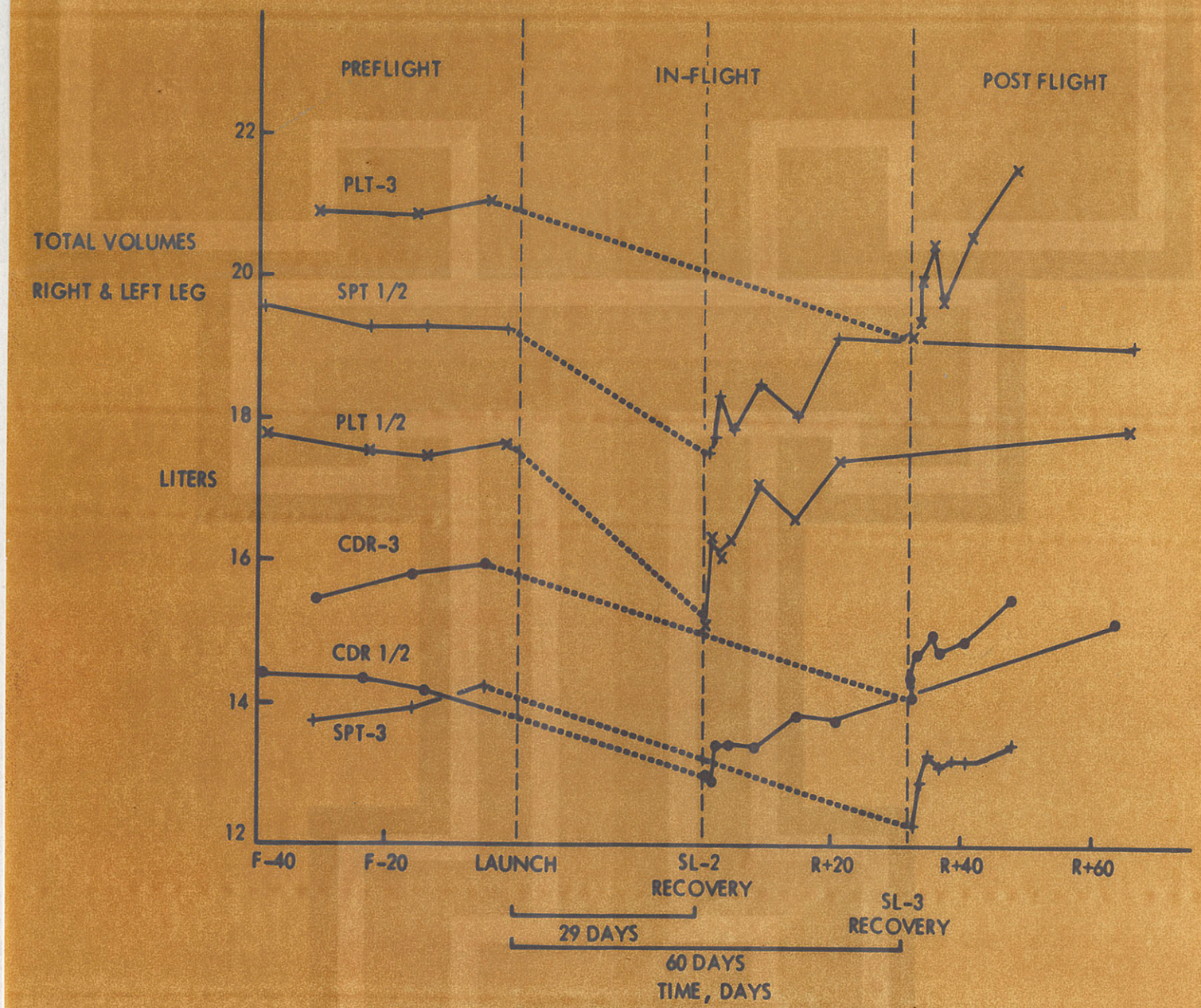

Figure 2.4.3-1. - Leg Volumes of SL 1/2 and SL-3 Crewmen.

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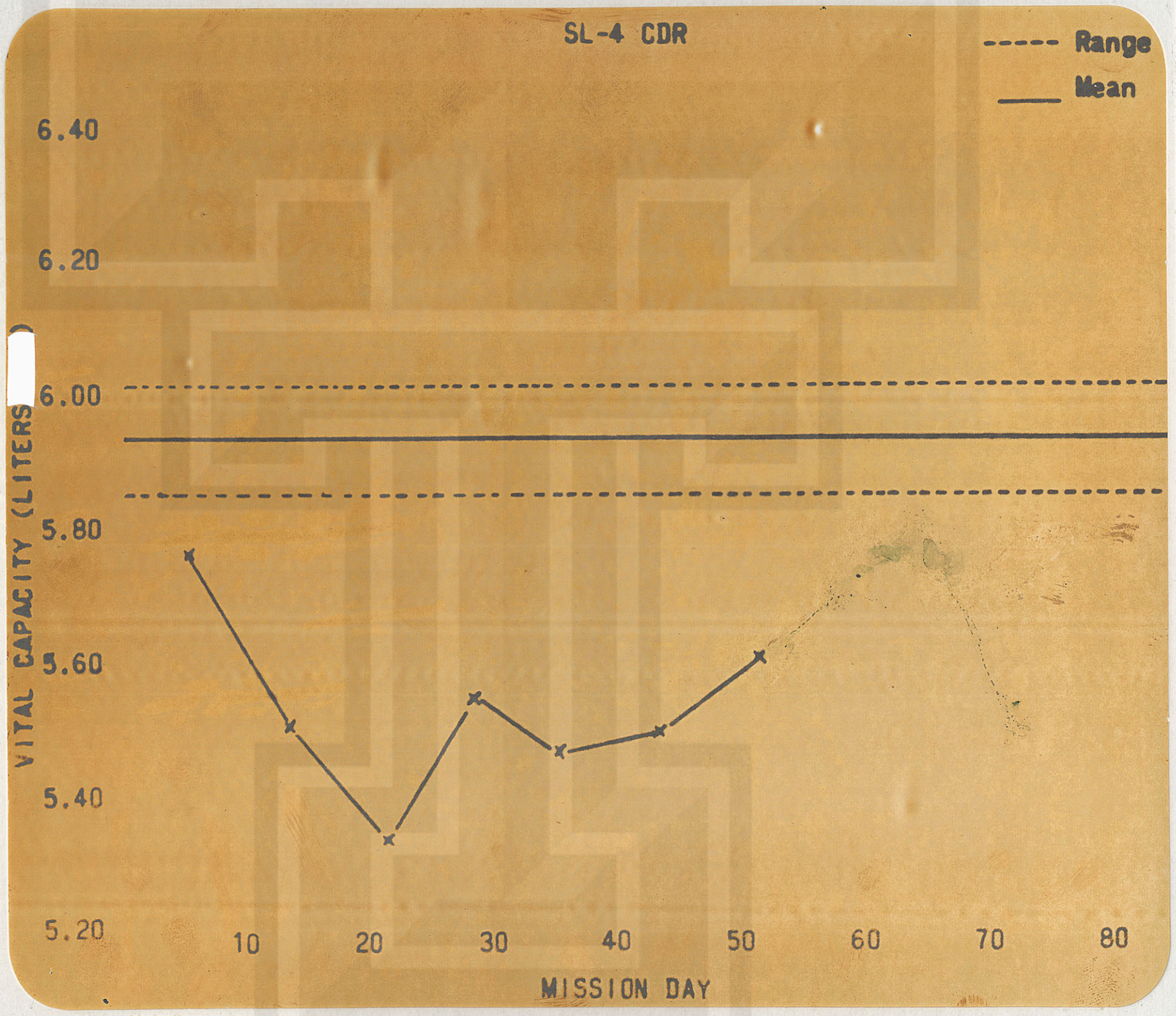

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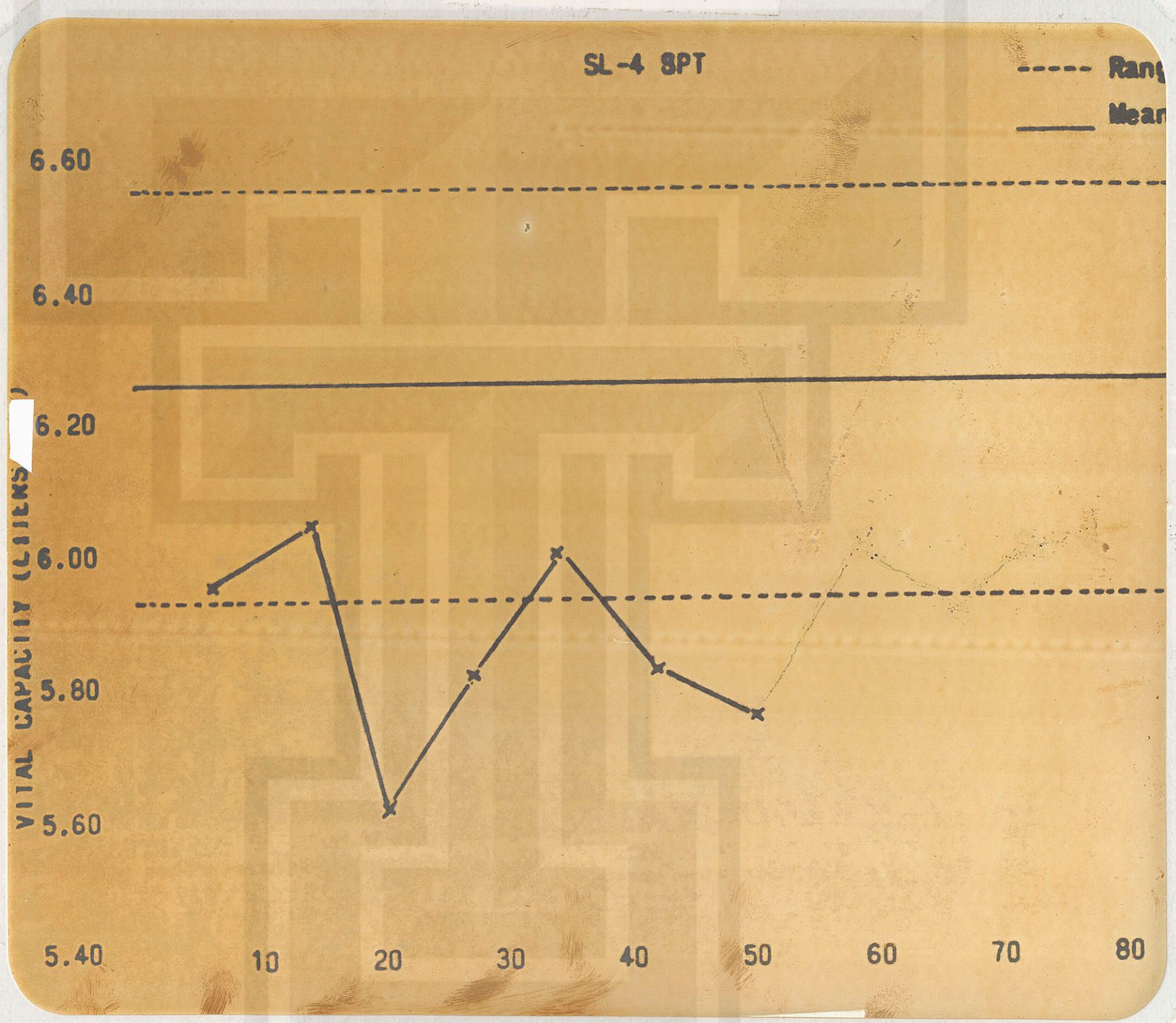

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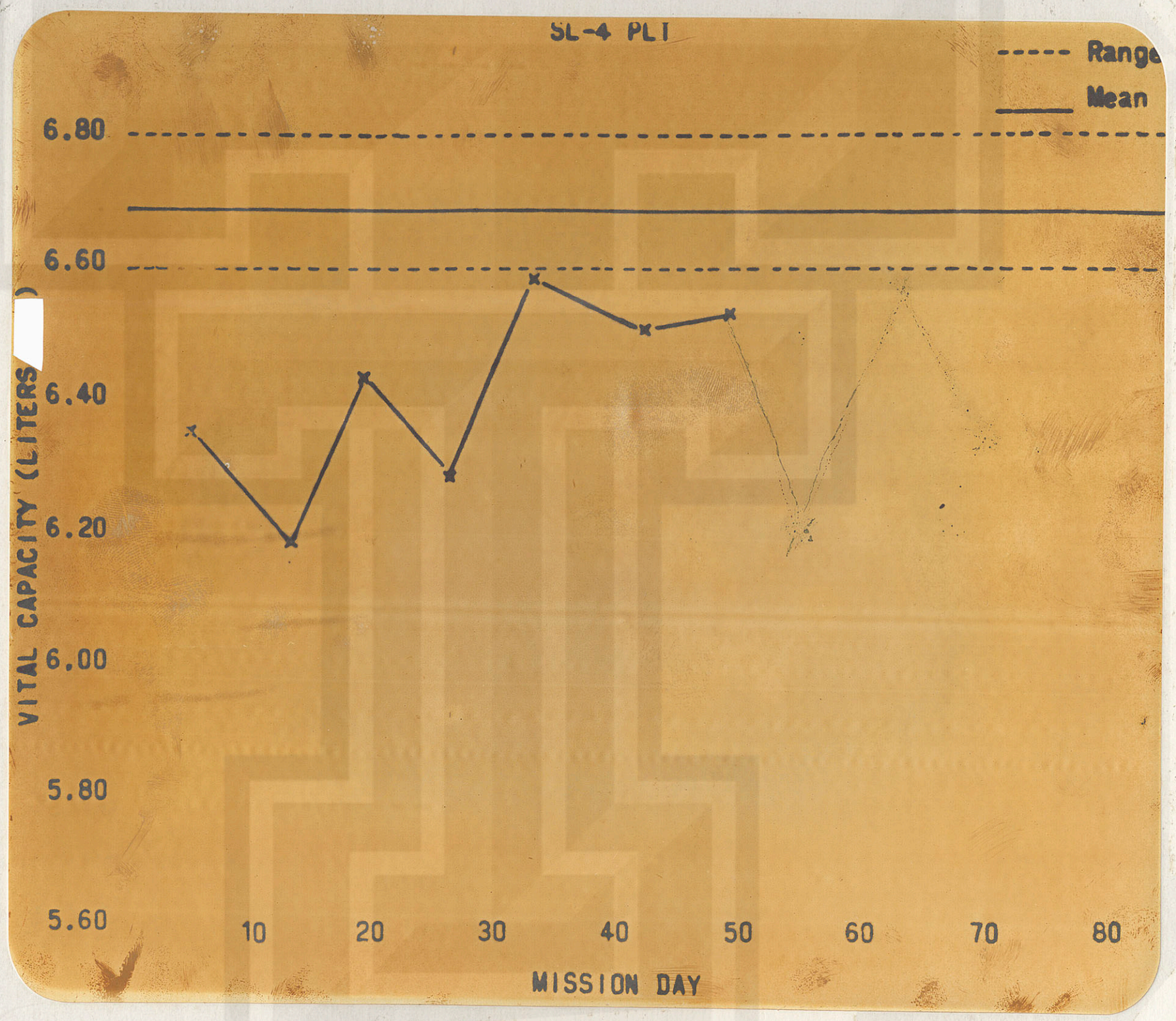

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