

NOTES FOR NEXT COURSE

MORE ON

Brown - INCLUDE HEARING AS WELL AS VISION - ADD TIME (20 min)

Funder - All are oriented - Need Basic Psychology & Group Psychology

ADD REG

ADD LUNAR SURFACE - RADIO INCL.

Barry Phillips - S/C Material. Construction - ADD

Post-battle lect. on radiation shielding - more tech. approach.

Electromagnetic Spectrum - More up to date lecture

For INBIMS
- INCORPORATE
A/B computer program
Frank Lloyd Wright " "

Lavery - Delete or incl. in Brecht.

Allen Van Brinks 2 hrs + Presentation Time

Need Long Duration Acceleration - as covered

Pass. also attenuation devices. Lecture
Need intro. on forces - i.e. terminology, etc., & class.

El. Harris - a little more time needed or
consolidate so can incl. more of
S/C finding & significance of.

Ted Hoyer - More Time Needed - 2 1/2 - 3 hrs

ADD VISION of FLORA

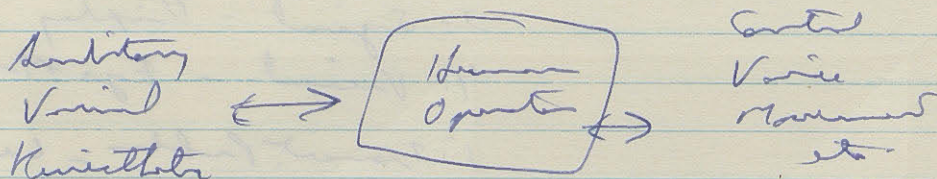
COUPLE BALDWIN WITH IRVING & FREEMAN - EXCELLENT!!

Load

Human Performance ~~Effect~~ Evaluation Ability Good!!

Mass of Work - Load

Mass. Optimal Limit on Performance During



Can have Primary & Side Tasks Simultaneously

Ref.

MURRAY on
ATTENTION

PERFORMANCE
PAPER

- NOV. 1941

3 MOS. OR SO.

(Bartlett)

Attention

- Problem is one of selective attention.
i.e. which one (2 or 3 simultaneously applied)

Murray has written much on 2 eared listening
(5 ear & 4 ear)

- also Broadbent

Both on vision as well

On studies of handling of competing
messages = frontoposterior etc

Vigilance (a form of attention)

- Test panels used

- observe for unanticipated change

- Research is in progress, i.e. why?

Probabilities fairly well known, i.e. what?

~~Exp~~ - if Frequency of ⑤ high - vigilance ⑦

- if Infrequent, 60

Motorist - ~~Exp~~

Get to control

∴ Can alter by Manipulating
operator

Much individual variation - i.e. can

mass. & predict individual's state &

changes. Much more difficult to

generalize.

Schwartz - NASA
CR 454

Signal characteristics
about panel observation
then

← F linear relationship

- CLEMENT, TBY, Graham - Systems Technology, Inc.

Started 1. 707 System Dynamics

2. Human Operator Factors

3. Signal - Display

4. Visual - Eye Movements

5. Transit Public - Link Values

6. Panel Layout -

Papers - been evolution of layout
panels - become more optimal in
50 yrs. Can then predict
req. in future airplanes

Summary

1. Selection (Crew) Variability & its
Effect on using F.W. Techniques -
∴ Use Prior Performance

2. Ordinary Psychological Tests Used in
Behavioral Observations - the priority
not in F.W.

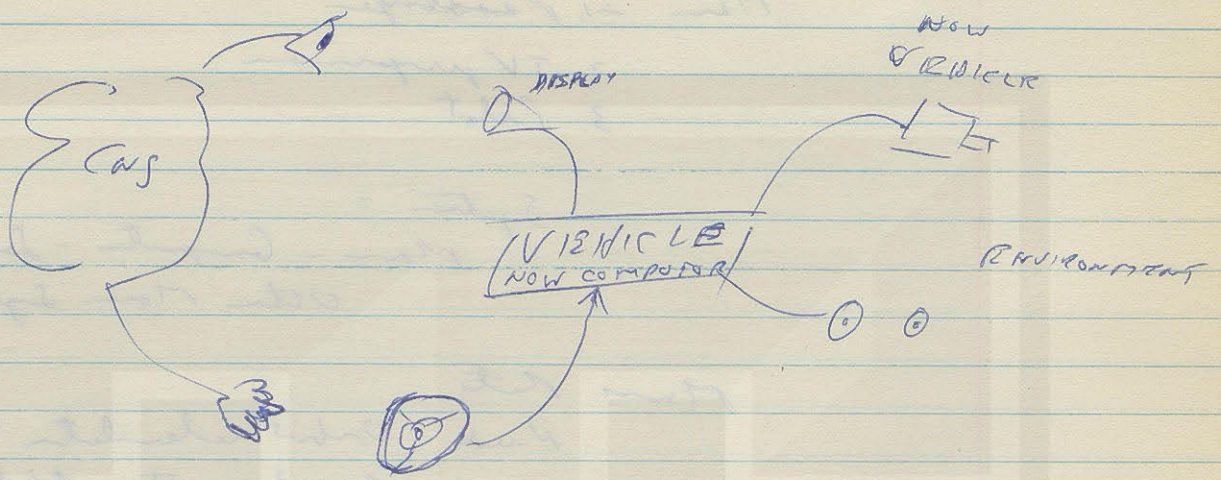
In Action - each test has use
as to determine if want to go to doctor

In Space, get most info by calling
Ailer. asking "How are you feeling?"
- Hawthorne of Minn. (with forrest)

3. Training must be step wise &
incremental.

4. Task analysis now more sophisticated

Simulation



i.e. Man Man Advisor Computer

~~Models~~

Models

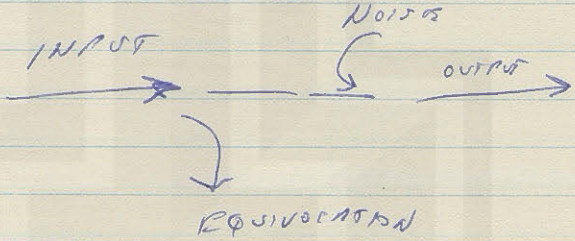
a. Continuous Filter

OUTPUT
RESPONSE
SET
Y

INPUT STIMULUS
SET

A	B	C	D

b. Probabilistic Matrix



c. Accumulate Evidence & Decide

A .3 Red
.7 Blue
B .3 Blue
.7 Red

	A	B
a	trans/trans	trans/trans
b	trans/trans	trans/trans

d - Will become more and more methods -
Have got it, no good one for
presently existing situation at
top of page.

B Apollo Guidance & Navigation System

Man - 1. Passenger

2. TV person

3. Pilot

System =

Man - Computer - Sensor - Display - ~~Man~~ - ~~Man~~

Other Man System

Man Rate

Need Orbit Calculator

Reckoner Watch

2 Star Fix to Point 170 (Fixed Manway Vant)

∴ Finding his position on a cone + finding his altitude in space

Recall

Earth $T = 290^\circ \text{K}$
 $p = 1 \text{ bar} = 10^5 \text{ mbar}$
 $\rho = 2 \times 10^{19} / \text{cm}^3$ (Density)
 $C = \text{N}_2, \text{O}_2, (\text{H}_2\text{O}, \text{CO}_2, \text{O}_3)$

Crust of Earth

$\text{H}_2\text{O}, \text{CO}_2$ - Would go into atmos. if
 Temp. T - like Venus
 Would be dominated by $\text{H}_2\text{O} \& \text{CO}_2$
 $\therefore$ ~~the~~ keep in mind when
 discussing atmos. of other
 planets.

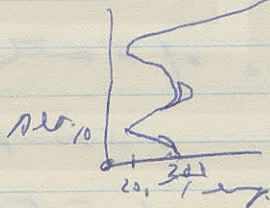
Jupiter & planet beyond may be $\Rightarrow$ gaseous
 $\Leftarrow$ Density 1.33 (same as air) and
 it has more but approx same.
 $\therefore$ negligible initial
 inner planets - density $\approx$ earth

Mercury - No atmosphere

Earth

UV is main heat of photos. $\rightarrow \uparrow T_{\text{surf}} \rightarrow$
 H_2 dissociation to species is quantified escape
 $\Rightarrow$ Volcanic, $\text{H}_2\text{O} \rightarrow$ Atmos. $(\text{at } 10^5 \text{ mbar})$
 $\text{CO}_2 \rightarrow$ Earth
 $\text{H}_2 \rightarrow$ To top of Atmos. &
 Out.

Earth Temp



Venus:

$T = 600^\circ \text{K}$

Tot Energy Same as Earth (Because of
 Diff. in Reflectivity)

2 yrs ago Mariner V $\rightarrow$ Venus, Signals sent by Atmos
 of Venus or Mariner went behind Venus (right before)

1 just after. Signals repeated by atoms. -
but as soon as they went into Venus.

Found Temp. $\uparrow$ as got closer to Venus - rose to
 800°K before signal dropped (started @ 3500
at 6000 km)

But radio rose by RADAR @ 6052.5 km

2 more go down. rises to 6070 + 6060 m 2
pts. but ~~Temp~~ Temp. only rose to
750.

By extrapolation, Temp. 5 miles (6012.5 km) =
 740°K (Check at 6120 km)

Press. = 100% with atoms

Comp. = 95% CO_2 (actually more 97%)

No N_2 , No H_2O , 0.2-0.9% O_2
(at 6100 km)

- press. 1% @ surface
Rise found O_2 -
USA has not.

MARS

- Polar Caps
- Desert Regions
- Vegetation Regions } 3 climate
characteristics

CO_2 - 80-100%

Press. = $\frac{1}{100}$ of Earth (10 mb)

H_2O - v. sl. - 5 miles

Mars 4 passed 55400 mi.

Mars 4 $\rightarrow$ Craters & Poles - 12.4 miles
covered.

Mars 6 + 7

Mars 67

o TV - 2 cameras (vertical & 3 wide) - large area covered

No N_2 + in
most places
B. S. H. 2

Prev. 6 mch at middle
3 mch at caps

T 117° - night side

Martian NH_3 found
in Atmos - Mars VII

(Superficial 6
1 cm / cm² organic
0.005 / cm² N_2
 $n \approx 8000$ / cm²)

Impactor - Much bigger > with
Clouds cover
Large red spot - Color changes & turn N_2 with time
Colors - in red line

Do 7 H_2

Small area Martian NH_3

Finger NH_3 + red

" Vapor

Ice & ice

Water Vapor

" Vapor

H_2 - Metallic form by compression

Interim Temp = 500,000° C

Excess
purity

Layers

Forster -

All molecules move to cells & from by diffusion
& convection in cells

Incidence of Cap. H.P. $\rightarrow$ in lower (5000')

In lowville ab; circ. around

CO_2 - 1% in Atmos. its receptors but can handle more &
to much trouble

N_2 - More diff. if too high (Explains if too much N_2)
at 15, then overexposure etc.

H_2 - better but not perfect

Bands - 1 section

Structure Expl. by 70% by the gas pressure
of Venous Blood.

N_2 shows level of stress.

Foris -

Unbalanced Work

Excess gas is a problem

H_2 but not

N_2 has limitation

Resp. (K.R.S.)

I Ventilation { Vol. &
Distribution

II Diffusion

III Circulation

I $\frac{V_{\text{vent}}}{\text{Factor of Cap}}$

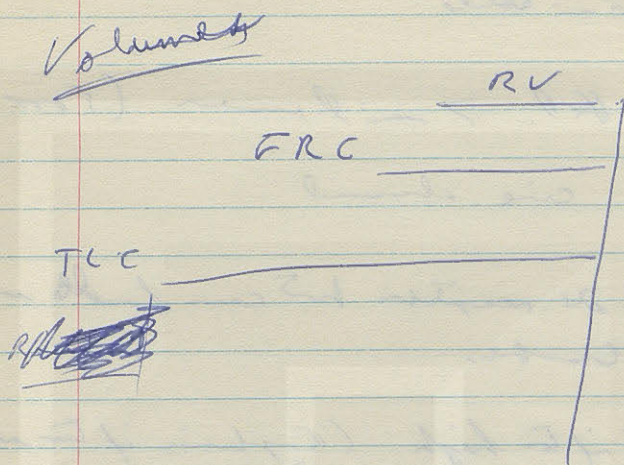
$$\text{Capillary } \frac{\Delta V}{\Delta P} = \frac{100 \text{ ml.}}{1 \text{ cm H}_2\text{O}}$$

$$\left. \begin{array}{l} \text{Chow } 600 \\ 50: 1-3 \\ \text{Chow } 200 \\ 200 \text{ ml} \\ 1 \text{ cm H}_2\text{O} \end{array} \right\} \begin{array}{l} \text{Chow } 200 \\ 200 \text{ ml} \\ 1 \text{ cm H}_2\text{O} \end{array}$$

In asthma

1-3 cm H₂O

1 L/sec



Distribution (A balance of D.L. & C.V.)

Flow by $\downarrow$ $O_2 \rightarrow$ open airways + $\uparrow$ constriction of bronchioles
A problem in Emphysema

G. Limitation on flow is resistance / hydrostatic press. $\uparrow$
vessels burst
- Can fill lungs & fluid + pressure.

Control of Resp

Drop (Very good)

control, chemical

1. Arterial CO_2 Tension (40 mmHg)

$\rightarrow$ Resp. Center of Medulla (pH)

2. Chem. Receptors

Central Chem.

" Boddy's (50% sensitive) of control

$\uparrow$ CO_2 $\uparrow$ 1% get 4% $\uparrow$ in Minute Ventilation

$\uparrow$ O_2 $\downarrow$ ③ Chem. Receptors + Respir. Resp. Center.
Not sensitive - don't react till O_2 $\downarrow$ 50%

Resp $\downarrow$ to Explores $\downarrow$ of Central Brain
 $\rightarrow$ stop breathing (apnoea)

Alt + SF important ($\uparrow$ p18 $\rightarrow$ $\uparrow$ CO_2 $\rightarrow$ $\uparrow$ Ventilation)

Lungs reflex - movement of lungs $\rightarrow$
 $\uparrow$ Resp. Rate

Medullary Response Time = 1 sec.

Volition - Breath Holding

Proportion $\uparrow$ Resp
Temp. $\uparrow$ Resp

Resp. Slows $\downarrow$ Sleep

Left cleaning action of lung

Re Bt Rutherford's work
on circulation

John Warren

A. Organized Circulation

3 Systems or Subsystems

I Tissue Blood - Capillary - 17.5
Expected

II Perfusion - B.P.

III Total Flow - Cardiac Output

B. Disorganized Circulation

Resting CO $3\text{L}/\text{min}^2$ body $1.8-1.9$ Ave Sq. Meter Body Surface / Person
Surface $\text{Total CO} = 6-38\text{L}/\text{min}$

Standing - Dr. Lee (Tilt Table, etc.)

Heart Failure - C.O. Restricted

Shock - Even More Restricted

Max. of CO - Fail

①

$$CO = \frac{O_2 \text{ Consumed}}{A-V O_2 \text{ Diff.}}$$

② Indirect Vibration

$\equiv$ but I disagree

$$\frac{280}{40} = 7\text{L CO}$$

③

Impedance Plethysmography

- Wavy chart as reflection of CO

Disorganized Circulation

① Stenosis in Circ.

Concept of Hydrostatic Pressure

Where does fluid come from when veins stand?

① Lungs

Abnormal Tilt Response can be ← Abnormal Pooling
or
← Abnormal CVS Response
to Normal Pooling
(NCA, Prolonged, Low, etc)

Pericardial Constriction

2. Examination & Thoughts

Difficult to separate Normal & Abnormal Pericardial Response

Syncope = Acute Pericardial Constriction Response

← Sudden ↓ in ^{Pericardial} Pericardial
compensating CO.

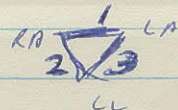
3. Heart Failure

ECG - Albers

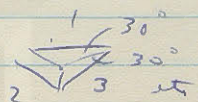
DIPOLAR

VCG - Aortic & Ventral

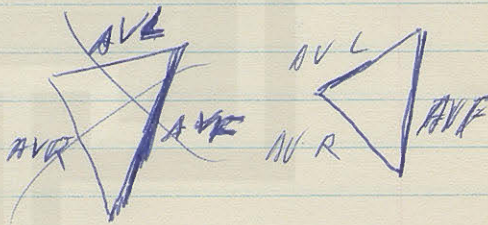
QRS & T - slope of upright, rel. small T wave



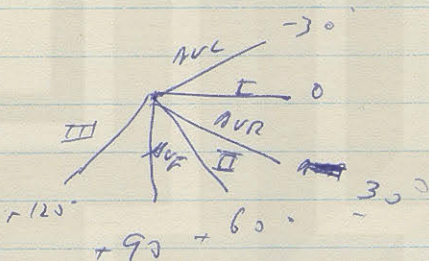
Wilson Leads all Indiff electrodes connected to central terminal, representing electrical center of mass.



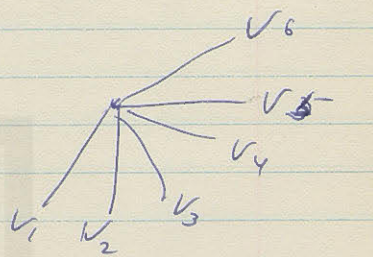
Burger - said $< 45^\circ$ not 30°



Axis - Hexaxial Ref System



FRONTAL



HORIZONTAL

Relationships

Choice of leads for Type or $\geq$ ventricular

ORTHOGONAL LEADS

GRAN LEADS

SINE-COSINE LEAD SELECTOR SYSTEM

Rosner

Water Balance

- 50% of Body is H_2O - Ave. Chattermore
- Net weight stays about constant

Intake

Output

Drinks 1500 cc	Urine 1500 cc
Food 500 cc	Insensible 800 cc
Dr of glucose 300	1 hr
Other solid	lungs
	skin
	Sweat
2300	2300

If H_2O intake $\uparrow$ - rely on kidney
for balance - it then
change little actively

$\therefore$ Renal Reg. most imp

Conc. of Na major controlling factor
Hypertonicity of B1.

1.5 Thirst

2nd ADH $\odot$ post. pit. $\rightarrow$ $\downarrow$ Urine

Mech.

1-27. $\uparrow$ in plasma osmolarity

$\rightarrow \uparrow$ ADH

Same $\downarrow \rightarrow \downarrow$ ADH

All bodies in Ant. Hypothalamus

Apex end in synapses
in post. pituitary -

Blod vessels at synapses.

ADH formed in cell
body - travel to

binding c-protein

carries to synapse (above)

axon) - liberates into
bl. vessel.

ADH carried via blood to
kidney

Glomerulus = High resistance circuit of
bl. vessels (cap.)

120 L/min pumped

Tubular Receptor returns to $1-1\frac{1}{2}$ L/min

Descending limb freely permeable to H_2O

Ascending limb of Loop impermeable
to H_2O but permeable to Na

$\therefore$ Tendency of H_2O to move out
is counteracted

ADH $\rightarrow$ on distal tubule (15%)

allows H_2O to be absorbed; if

absent H_2O reabsorption is low.

How gradient maintained?

Vasa Recta - balances by outflow
& medullary tissue.

Diabetes I

Nephrogenic Diabetes I

- Kidney unresponsive to ADH

18cc H_2O / min. Intake = Max which can
be put out.

If drink 19cc / min H_2O $\rightarrow$ more dilute

ADH secretion $\uparrow$ influenced by many things

Thirst

Distension

etc

$\therefore$ can $\downarrow$ urinary output

Fluid Compartments

$\frac{50\% H_2O}{90 \quad 40L (kg)}$

24L Intracellular

16L Extracellular

3L = Plasma

When I've lost a body - but not myself

Different $\bar{c}$ has of $K_2 + H_2O$

Extracellular Component 6

Na 143 my.

к 4

२१००

$\text{Fe}(\text{NO}_3)_3$

K 140

$$N_d \quad 4$$

Phos.

Portini

* EC H. B. vol. critically maintained
by Mc (i.e. critical factor)

No case. (5) part. part. to $\rightarrow$ ADIS

No excretion depends almost entirely on volume of body fluid. (not conc. of itself)

1 cc. $\bar{c}$ Water logging, No case. $\uparrow$
(most of)

If N_n with $T \rightarrow \text{ADH} \rightarrow T$ B.L. V.L.

No Education

Integrierte Systeme

is twenty cells in wall of heart

arterial (to glom.)

↓ Vol. $\rightarrow$ ⑤

↑ ... → Turn off

Grandes in cell 6 Review

↓ V.L. → Break into 12/13 parts →

Carbo E. part. $\rightarrow$ Angiotensin

Angiotensin $\rightarrow$ $\uparrow$ BP

$\rightarrow$ Adrenal Glands $\rightarrow$

aldosterone $\rightarrow$

Na retention $\therefore \uparrow$ Vol

Turns off angiotensin

Kidney tends to conserve Na (with excrete K or anything else) $\rightarrow$ A/B instead of being Na if not K.

Kidney chooses to maintain volume of fluids in face of other disorders - i.e. concentration of fluids

Address Volume - Aldosterone Na. but 2 Na 2 Vol to, BP falls etc

Low pH
Heart pH

}

loss of extracellular fluid
e.g. pH meters ⑤ & cycle without abnormality

pCO_2

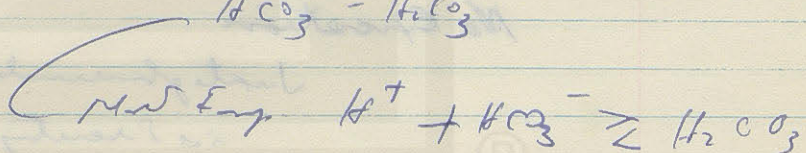
If LO_2 or HiCO_2 , what happens to A/B balance

Buffer systems pO_2

Na

$\text{HCO}_3^- - \text{H}_2\text{CO}_3$

pH limits 7.35-7.45



$$\text{H}^+ = K \frac{\text{H}_2\text{CO}_3}{\text{HCO}_3^-}$$

Hypoxia $\rightarrow$ Hyperventilation & $\downarrow$ CO_2
& reverse $\rightarrow \downarrow$ pH

Buffer help but do not $\rightarrow$ Absolute protection against pH change

Manfred G. L. & H. - Briggs Phillips

Experiments

→ Nervous; Gen. Muscles

1. Intracellular recording
2. Extracellular
a. Single cell
b. Multiple cells - may study using
Pierce's Rodent Tail
3. Evoked Potentials
a. Deep Probe
b. Scalp
4. EEG
a. Small fields
b. Scalp
5. D.C. Shifts
a. Direct Brain
b. Indirect (Scalp)
6. Impedance Meas. (Made by H. Day) - exp. 5
a. Direct Brain (Deep) BRAIN
No scalp.
7. Physical Measures
a. Temp. - Best indicator of STATE
OF ANIMAL
b. Flow
c. IR Absorption
d. etc.

Of these, look 5 EEG + Residual Potential

EEG - 2 diff. 5 2mm levels of depth - i.e.
go faster + shallower.

1. Looks unimodal (Spectral analysis a trap)
2. Appear to be independent generators at diff. levels.

Clinical EEG ex look for:

1. Symmetry - normally very symmetrical
2. Basic Frequency

a) 8-12 cycles = α - 80% of Normal Adults
slow & dominant when
at rest & doing nothing
(Hucksteping function).

b) 12-24 cycle = β - if active

c) 4-7 cycles = θ - if asleep

d) 1-4 cycles (usually 2-3) = Δ

Dravet, Aicardi, Rich
Brener etc. DEFINITIVE
PATH

IN ADULTS
In children
go thru these
waves of dominance
as grow older
By age 12 yrs
look like adults.

3. Unusual Events

a. Normal

b. Abnormal is Big Low Epileptic
Spikes.

Normal Spikes

Fast Spikes

etc.

Usually not symmetrical
Well localized, lead themselves
to automatic discharge systems.
Instantaneous reorganization
of the brain in some way.

Scalp electrodes may not
reflect deep probe changes
at all. Bad because higher
order functions can be

1. STATE - Smoke, Power, Ashes, Vibration,
Cannelling, Noise (Locality)

2. MICRO BEHAVIOR - can say much more behavior
- very small segments of time
- how well ~~it~~ able to perceive
a event during short sds of
time. Best way to look
at is by examining behavior
exp. past behavior.

ВІСЬОМ ПОТЕНЦІАЛ

Response to Light Flash (on Rapid Series) of Light
- esp. at dawn.

Is a way of looking at SIGNALING PATHWAYS

B.H. Springi & Van-Springi

Response series at first large sand

- late small, discrete - HABITUAL

If statements & a method - " & is
or disappears.

light shock ~~with~~ will cause return
of large wave if inhibited.

Rotation 45° of a square (5) will $\rightarrow$
different R.P. response.

FELDMAN - DATA PROCESSING OF ABOVE

REC - very hinted

Revised Response - Ave 10 responses & ave. noise

I ~~think~~ the variance get $\approx$ null then -

Can't determine with thing, but m.s.

able to do other kinds of analysis.

Have used computers (Various - cheap & expensive)

10¹⁰ Active
cells in
broom
10¹⁰-15²⁰ connect
5 each cell.

O. Schmitt

UNIFYING THEORY

Then techniques if we look at tech. to use
Tech. must be built around useful information
(or info code - a code which allows data
interpretation) - i.e. to answer questions
we have - i.e. (to establish what we want
to know).

Inequalities can be matched & can be in
biological systems - as well as equalities
can be reduced to engineering terms.

Information, Processing, Control, Communication
are translatable into not only bio-
systems, but also DOL, Social¹² & other
systems

TRANSFORMS (BIOMETRIC)

$$\Delta H = \sqrt{a(\Delta x^2 + \Delta y^2 + \Delta z^2) + \Delta T^2}$$

$H = \text{Happening}$
 $a = \text{Constant}$

Concept of TIME - Biol. vs. Physical

Consciousness of time vs. Clock Time

Spending $\propto T^2$ (Expl.)

Assume events & time are competitive

ECG plot of voltage against T



Can add integral of a curve to time dimension & get
useful info

Digital & Analogue Data are not qualitatively
different. Biological systems can
be primarily one or other or about half
of each.

Use Genetic Manipulation & get useful
data.

Another class of transducers - VCR - 2 planes of data
 These planes are not actual but only
 representation of spatial data (approximate 5
 that)

Can show this cheaply by using small
 computer & television tube (CRT)
 Use "shift key" for color (can show 5 or
 more dimensions). Easily recognized
 by people.

In Life Sciences: (EPPPS)
 Little computers can do:

1. On-line Transducers & Formatting
2. Transducer mode operation
3. Partial data reduction
4. Display Generation
5. Display buffering
6. "How Good Is It" Analysis
7. Computer Planning of Experiments. ⁱⁿ Detail
8. "Supervision of experiments."

Eggs: Coordinated EEG Data Acquisition System

Dynamic M. Ground (Adjustable Ground?)

Unit Gain Buffer Amplifiers have advantage - Throws out
 a reference to erroneous loop signals.

Can be adapted to EEG, GMR, GOC etc -

Is an audit band which lights up if problem

Cell Driver Amplifier (Lengthens effective cable wire)

Dynamic M. Ground

Electrode Polarization

System Gain Distribution - (Load Selector)

On-line impedance measurement system

- gives 1-2% accuracy in a hurry

(for 2-3 cycles down to .005 cycles)

- very selective measurement using only a

few cycles - particularly an ideal

5/15 & calculates departure. If

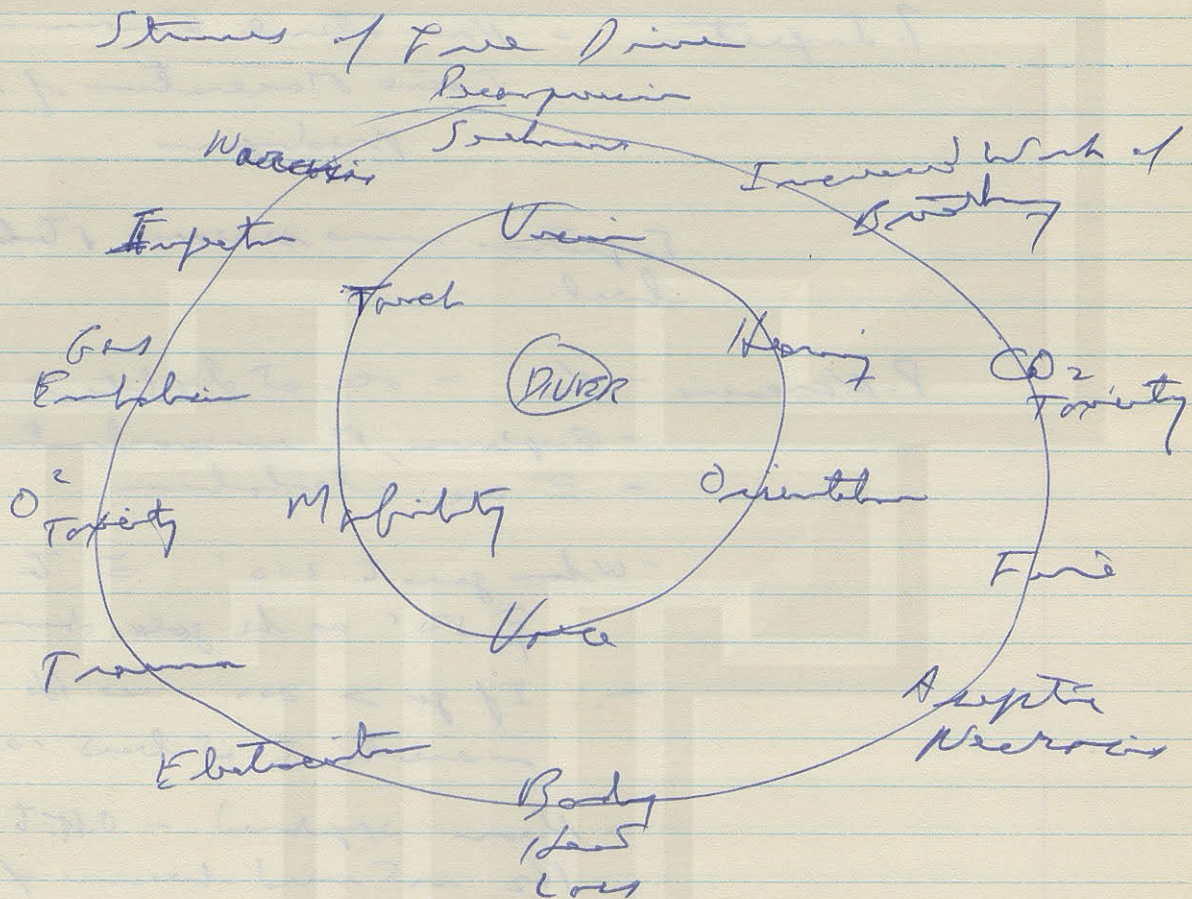
not consistent in 10 shots, does over again

If persists, informs the exper. is false.

Right hand adjustment
 up to 100%
 Main transducer
 on top of
 change all
 optical, start
 & magnification
 needs to be
 never with it

Kirkis - Loren

McGuinnis



BROTTEN PROBLEMS CONTRASTING THOSE FREE DIVER

Can compensate for minor ring problems -
not outer ring problems

Problems - order of seriousness

1. Decompression Sickness
2. Body Heat Loss - Can be 100% earth level
3. Elutriation - Much welding & cutting -
the average work.
4. Trauma
5. O₂ Toxicity - CNS
- Chronic - intermittent or sustained

for O₂ Exposure
O₂ 1/2, 3 & 1/2 Atmos.
for Decompression - 2-3 x "

6. Gas Embolism - $\leftarrow$ Ret. to surface while
breath holding. Even transient
breath holding (coughing or sneezing) $\rightarrow$
to avoid.

7. Infarction - Non-sterile embolism
Tissue Necrosis of Brain
Myocardium

Infarction more serious if to lungs &
heart.

8. Narcosis - N_2 - occ. at depths $> 100'$
- Euphoria, $M. incoordination$, etc.
- $\equiv$ ac. alcoholism

- When goes to $200'$ $\rightarrow$ to 1 minute
if $50'$ as he goes down.

$\therefore$ If go $> 200'$ use 10% - Non-
narcotic to at least $1000'$.

- Narcosis appeared - O.H. to $600'$
 10% not used because of euphoric
tendency

9. ↑ Work of Breathing

- In air must breathe gas at pressure of $1/2$ O₂
at his level.

- @ $600'$ gas 3.8x sea level -
Max. Breathing Cap. to 50% ?

10. CO₂ Tolerance - Max $5 \leq 7$ mm Hg

11. Toxic - High O₂ pp's $\rightarrow$ Hazard

12. Aseptic Necrosis - of Bone - usually
long bones. Islands of bone die.
Can be crippling if in joints
Chronic Necrosis

D.V. & text.

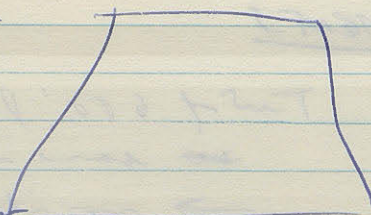
Diving Performance Consider

Pro N-P States

Have Factors Elements

Air-Water Interface
Current
Visibility
Temp.
H₂O Pressure

Pressure
Bottom Contour
Capacitance
Biol. Hazards



O₂, CO₂, H₂O Vapor,
Air Contaminants

Oxygen
Environments

N₂
H₂
He
Ne

Diving Equipment

Techniques

Brushy Place, Thermal Protection,
Communication, Navigation, Repulsion, Tools,
Pressure Chambers, Diving Schedule

H₂O Temp:

28-31 F over the world -

most in lower ranges.

Bottom with some variation for 1/2 hr

But need heating if go longer.

Be ~~for~~ 15 pt. 0.15

- Minimum Intervention

- Review Bar & Fresh H₂O after
each Dive

- RTG not good in repeated
diving → Oxygen & Cooling

- Pure Oil in seal ~~good~~
prior to diving good.

Rate of Compression a problem - if over 1-600'

100' / min O.K. to 1-600'

But at 800' may find minor, minor,
hard tissues, joint pains.

Oil gasket (5) to under expansion & diving now.

A SATURATED DIVER = one who spends > 24 hrs at given
pressure. No saturation after that.

Decompression after Sat = 100' / day - rest of time.

Heating in vacuum lined by H_2 / H_2O than
tubes in suit.

2 EXPERIMENT

#1 Test of 600' Pipe in Chamber $\bar{c}$
~~no~~ some stress & HeO_2 ~~to~~ stress.
→ no ill effects. Tests completed.

Physical study very difficult under vacuum
(EMBLAS 2)

Schaffner, Karl

@ 33' Depth (Tank H₂O) - Have 1 more tank
(32' Sea H₂O) press.

O₂ Tolerance - Exercise → Prob. limits
Chest restricted in full
inexp. & can't get enough
air.

CO₂ Tolerance - Wild Human Variation

Shallow breathers do not tolerate as well
(H. less total volume & other),

Persons who become accustomed to underwater
work → deeper, slower breathers as
tolerance ↑.

Underwater, the work of breathing ↑'s - either more
↑ depth or frequency of work or CO₂ buildup.

↑ differences in the rate of tissue saturation & rate
of uptake of gas.

Uptake & elimination of gas by tissues
balance - at saturation 200 = same.

Fast tissues & slow tissues.

↑ by perfusion

↓ by diffusion

Described as $t_{1/2} = 5$ to 240 min.

During rapid compression gas collapse from lungs
which open again after saturation.

∴ Compression rate very important - must be
done in steps ≈ decompression.

↓ K + ↑ Na (50.) at 800-1000' level

Burger
Lig. B. Smithy 11/20/00
FK 50 But Lenton

Gordon Howard

Certification to fly or drive is a privilege - not a right - because of responsibility of others.

Proving Medical Ground is PRODISPOSITION TO SUDDEN INCAPACITATION - i.e., proving present status,

ETOH, Malt Emphysema, & little smoking, A.D. Lungs H.O., Diabetes, Mental Dis., indurated - & ETOH, etc., Medications

(primarily because of underlying disease but also is smoking of Tx. & side effects)

Motor skills & SWIFTNESS M.B. improved

Classes of Licenses

Class I - Air Carrier - Certification ~~Pro~~ 6 mos.

II - Commercial - Unrestricted - Five flights, Capt. License, Pls for this etc. -

III - Private - 9 1 year 9 2 yrs certification

All Pls Controllers must carry Class II certification.

Pro's to Class III to Class I are progressively more intensive

MACHINE TWINS - People to Love Home - gives computer system trouble - May need Soc. Sec. No.

Stam Moller

Airplane Accidents - Air Carrier

- Gen. - Causes:
1. Alcohol - 30% of totals
 2. Unimpaired (Low Level) ^(Bugsy Ints) ~~Maneuvers~~ - 30% of totals
 3. Deliberate Restriction of Address Weather - 30% of totals

ETOH

		Total Accidents - (Air Carrier)				
		'63	'64	'65	'66	'67
Total		900	980	1020	1123	1200
Total Fatalities		477	510	543	564	605
Total Accidents		297	427	547	627	697
Total Alcohol		437	397	367	277	227
Total Impaired						

Are for persons who
= 0.015% B.L. (Bugsy Ints)
Alcohol
after 1000
(a) 1000
no more
etc.)

BD
Alcohol

Flying Impaired

Mr. Cuthbert
- Acting
Inspector

Public Law Prohibits Carrying Alcohol

One Drink is Illegal for Flying - FAA Reg. for
Safety. Legions

		1967
ETOH	< 50 mg %	26
30 mg %		
3-6 "	50-99 mg %	17
6-9 "	100-149 " "	19
>10 "	>150 " "	38
		100%

B.L. Alcohol 7's - 1's after 1-2 days of death.
after brief ETOH readings 1 markedly because of
triple decomposition

* Gas Chrom. - Highly Sp. for ETOH
* ETOH Dehydrogenase

591 - 29th. Lbs receive half of apple for KTOH Return

BUZZ JOBS

Build (1/2 hour 04) after finished - Manipulation of function.

WEATHER

- Today impossible to be trapped by weather except in extremely remote circumstances
- in 99% of ^{fatal} accident cases, weather was known

* - Avg MD's 4x the fatal accidents & the cause than non-MD's.

- Full. followed several months of very hard work - guilty and non-contact & finally - plans trip for family
- (Trip + saw point very close - threatening weather) - 2 light - ~~at~~ drove weather - crash.

* MD's - almost all fatal accidents in this category - not other two. ∴ MD should be more involved in this area.

All Airlines
Fatalities - fatal

GRN. AVIAT.

Age	Cat	11-29	30-39	40-59	60 +
	Commercial	60 ^{Accidents per 10,000 pilots}	94	111	82
	Student	126	118	120	113
	Private	254	146	109	123
	ATR	298	118	59	104
	in range	MOST DANGEROUS		LEAST DANGEROUS	

Research Program on Emergency Escape

3 ways to prevent fire & smoke fatalities -

1. Gelled Fuel

- Darn's flower at 1400 altitude - gets
stiff & rigid

2. Non flammable materials in planes

- not practiced
- NOMEX (Dacron)
- can't dye it
- very expensive ($50/\text{lb}^2$)
- not practiced

3. Provide self contained air space for each person to protect.

- PASSENGER AUTO - 574002 (2000 gives 5 min. of healthy air.
- Cost \$6 each.

please see
 590
 7-11-1954



Kilene

Airline

Do Po's - No 5th flying - When here, he must be in excellent physical condition. Hope he will come out OK at attachment 5 ago 6: (FAD about 5 man for 6 man) ∴ Airlines will sometimes drop in by pilot qualified by FAA exam.

After, pilot must report to med. dept. after any illness at all.

Grounding - If another MD. disagrees - (MD, can pick a 3rd man - both abide by decision of 3rd man - unbiased man)

ETOH - 24 hr rule - No flying 24 hrs after binge. Person should be 15 or 18 hrs

- Standalone ~~the~~ have 12 hr rule

- L. has terminal grade (quarter) @ 5-6 PM - launched at 12 AM for detox. Ale.

- VA has not grounded pilot for 30 yrs due to ETOH - Reason: loss of license (75 hr too far)

VAL flt. Po's - a preventive med. exam.

IECF, Markers, Observe Challenges, Toxicity, Andromedol, Intermediate Vision, A & Lat. Cholesterol.

CBC, ESR, Urine Acet, BUN, total cholesterol, Sugar, Bile Acid, Triglycerides (Total Hb, Imp. & Cholesterol - can reduce to Ref. AFRMID)

THREE EXERCISES Much higher in man - unavoidable exercises - elevated also before recurrence.

Summary:

7/7. Cont Vase.

Height in 40-49 yr of group

In age 10-19 - coming in greater number

Prunigenation 8.7 = Gbi-AL-

Deaths in flight

No passenger selection

If passenger looks sets & smells
Nasal & can make fit of steam -
OK to fly here

- .42 / Million = Deaths in flight
passenger
coming

All air carriers about same.

About 50% passed -
passenger flight, Gbi-AL,
turning CA's etc.

Ozone 5.55 ALD. & Radio & altitude 5.55 ALD
Read about 35-40 k ft.

Charged Ozone early in jet 1ks

Ozone → .06 ppm

Present more in weather systems

Is a local phenomenon

Ozone "chips" & do not move.

... N-poll

Radioactivity

Mean → phantom

Passenger 16.8
Altitude 88.4

} MK/year - cal just done
if 80 k ft / mo. at altitude

Chir
Indian
Dad
Ala.
002 MK/1hr
0.02
0.03
0.09

Bees can fly in formation - no interference in
transmission unless they are too close & can't
get the dose.

Bees of *Pachyschista* & *glauca* etc. - use tip of
nose for feeding.

Transmission

Jaeger's Friend

Notes

Temp
Speed of Sound
Depth
H₂O Speed
Magnetometer
Acoustic Device for det-
ecting 1B then
Chlorophyll's Minerals
in H₂O

Pressure (6)

- 2 Navy Bathy I H₂O
- 1 NAA
- Pincer

Particular completely is outside world
Data being analyzed now - complete in several more
(computer need).

in life here - C. Exp. System
Psychological

Did very well.

Ended mission as 6 friends

USS - Atomic Power

Air (O₂ 20-21%) - Oxygen level O₂ .36/liter

CO₂ absorbed in 6 hr 5H - 12 pounds -

changed 3 days.

Pressure system

H₂O - Hot & Cold

Isolated pressure - Oxygen Tanks
mineral water tank
Cooled but some
H₂O absorbed.

I₂ need

Still some Bathy after 4-5 days
but no problem.

Food - Frozen dog food $\approx$ Actors

Not good, but nutritional.

- Can be improved

partly because
add.

Dry fruits, Seeds, Soy, Protein - J.P. ate last
2 weeks of
days

3 lost a few pounds (are now healthy)
3 - no wt. change

Bob Brown interested because $\equiv$ AAP (Har!)

Chet May one of 6 crew members - interested
as shown in NP + USS - took piece of 2 min
- of crew. J.P. did not like. May did not mind
others did not mind

Counter under bunk to move each time.
Not good. Sometimes was on bunk to observe
them particularly.

Counter on ship to count movements & one
part of boat to other.

Pres. not retrievable & all
Comments by phone. } $\therefore$ Analog of AAP

1.6 Km/s of tide.

After 12 days in mid stream suddenly out of gulf
stream - first dr. of Cape Hatteras & turbulence or
bigger eddies. Used own power (300 kW for the pump)
Could not compensate - came to surface - turned
to center of stream again - 30 mi. away (to AVE)
Lynch was able to find center of stream.

Went down again - speed $\uparrow$ to 3 Km - passed
Cape Hatteras - speed kept $\uparrow$ to close to 4 Km
then for 5 or 6 hrs speed $\uparrow$ to over 5 Km.
Three speed calculated (for surface) but never
demonstrated. - surface - depth. Depth (6-200')
Made ~~100~~ up to 700 W.Mi. ~~at~~

Almost ran off chart, the Gulf stream turned so
stayed in margin of chart.

Party Schedule

Tried to keep normal day-night cycle

Very dark surround

Crew Free to do as wished. No rigid schedule

" Highly motivated. No problem because
all " " motivated.

± 8 Hrs. obs.

Remaining 11 Hrs. mostly for record

Some vegetation - bush

Most of the patches (28 of them)

Some monitoring

F1 lights on in dark in H2O - plankton

came gradually after light began -
in water light or heat of lights attracted.

After 2 Hrs small life seen $\approx$ mosquitoes.

little plankton - few fish (not to top)

Kind of light - could see bottom 5 20-30 ft
very small - soil toward ground rope

150 not too effective.

None liked large dead food

J.P. - ditched house

1. Ditcher out of pond

2. Good at beginning

3. ~~C~~ house poor - not

enough selection - Variety very important

Should be similar about same 7 top

Calorie consumption about same 7 top

Protein } standard well - too small.

Carb } standard well - too small.

Trace of H₂O - could have been - problem

I₂ very bad tasting. Better not I₂

or Cl₂

CO build up - to 45 ppm (not 5 min)

There was no overhead leak - nothing

overhead. No smoking. Did not have charcoal about.

Limit at 55°

5 inch only 1 meter - Aug. 1 - Lower N₂.

Holiday - community N₂ defense for independence

celebrated by lighting fires (fire signals used for

communications)

Used less O₂ & calculated .36/m²/man see for direct

- 15% ~~man~~ allowed. 13 men on Ben Franklin

Exercise - Working wheel on knees.
 Also rubber stretcher type
 Also foot pedal handle electronic exercise -
 blue gun & red lights - NTPA device.
 Reflex measurement. Reflexes better.

Better condition at end of mission & at
 beginning

Fast pace
 Smooth movement - enjoyable trip.

Names
 Crew { Don Harrison - Capt. - 1st Officer
 Eberhard Pilot - 2nd Officer
~~Preced~~ }
 Lead of Expedition
 Ken Hogue }
 Chas May }
 Brooks }

2 people inside at all times - 1 crew & 1 guest

Not deeper > 1800' - a guide - Movement down > 1000'
 Can stay at constant depth of 1800' & control density & temp
 & current.

So boat must 10-20 m even 160' up & down
 in 10 min. Had many undersea mania
 Had to watch gauges at all times.

Not OK at
 100 ft
 AT - 100 ft

Decision tree

Dir. of op
 Lead of Expedition - Preced
~~Chas~~ Capt. of Boat
 Chief Pilot
 Chief - etc.

Decision not complex.
 Surface & Boat agree on
 direction & decisions
 made by Director
 Ref: Decision & action
 & agreement of boat crew

Could have been
 more precisely
 defined - the
 good enough for
 this expedition

Water System

- At 1st no problem
- Later saw rigid the mountain.
- If one drops, but have sleep
- is much more relaxed.

Alarms:

- So. Acetone in air
- " Hydrogen
- LiOH ~~the~~ container drops $\rightarrow$ LiOH dust - very irritating to throat.
- CO_2 - never $> 1.5\%$ $\therefore$ LiOH sufficient

Should have had level defined at 0.1-1%
level 1.5% too high

- Some difficulty breathing 5 and 12 and beginning 13rd day

- Latrine had to shut H₂O - lost at 75% now
- level was much more + lost lower level = LiOH .

Total Pressure never over equivalent of 4' H₂O depth - showed crop regardless of depth.

Navigation entirely in upper ~~the~~ boat.

H₂O Tanks

- Spring H₂O pressure tanks - not steady.

Fire Vol

80 can with paraffin 13' by
16 cm wide paraffin - redwood 4'
16 cm wide in east end - equipment in it.
 ± 100 can meters open again - equipment in it.

~~If planned would have~~

Room for much over number = back, much over
above, place for things - PRIVACY - noise
insulation etc.

AD

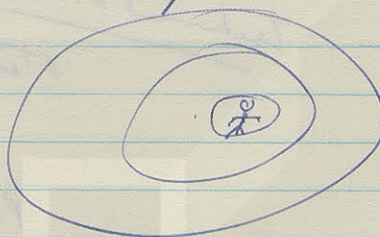
Pygmy - Deep Submersible Vehicle

Look 5:

Environment → Technology Level → Processing Level

Human Interface Level → Control

as concentric spheres



Main Functions of Ship Control

- 2. Navigation
- 3. Perception { optics, Acoustics
- 4. Prediction
- 5. (Communication)

Logistics Functions:

1. Effectors (Fuel)

2. Power

3. Environmental Control L & Support
Δ Removal

MATRIX of REP

	Sensors or Transducers	Transducer	Controls	Displays	Stops
1. Ship Control					
2. Navigation					
3. Perception					
4. Prediction					
5. Communication					
Logistics					
1. Effectors					
2. Power					
3. E - C					

Definition

Deep Submersible - Depth $> 600'$

Maneuver in 5 level 4' grid

2 Travel & Bm Franklin

not really deep submersible

DSRV is

Technical Needs

Materials

Hull

Buoyancy

- 30-35 #/ft³

Gasoline $\rightarrow$ X5 Vol.

Power Plant

- Use $\rightarrow$ X5 HS.

- Fuel cells had fuel

- State of Art = Batteries

Instrumentation - primary (handing) & processing

8-22-69

Berry

M.S. Ops = Med Support of Actual Being of Mission
Can't separate R&D from Ops.

HP - Hg Monitoring & Med Ops

Antagonism - Pilot & M.D. - traditional - M.D. & Thru

Grounding = Apparent mission failure

M.D./pt relationship difficult to maintain in NASA feedback.
Even R of R & H & H

3rd Problem - M.D.'s labeled "conventional" in general
Can't quantify man = hardware

Selection & Tr.

Apollo Ops - CCB is central input to - low chairs.
Has panels

All → ops & R&D decisions
Every meeting brings up problems & some medical
reconfiguration of medical input.

Flt. Plan
Mission Rules
Reentry Requirements
Med. Reg. Doc

Documentation

Services: Copy
Understand
Check

New road meeting

30 days before flt. **BRIEF CREW + Med Rx**

Px's
- 15 Days
- 5
- 1
- 60. AM

Immediately after recovery
+ 1 Day
+ 5
+ 20

Ap. 11 - Daily Rx's
5 days before flt.

Food - Note Personal Preferences

H2O - Problem Thru Ap - all kinds

1620 can't be split in flt. Have 12 scheduled for com
12 will show these people

Waste - Poorly solved problem.
M2 & A25 - planning / allocation per project.
Post-Elc Rebuilding

Post-Flr Rebriefing

April 11

Passive to the land water. ABC Mass has

2. Ca Loss
3. C-V ch.
4. & Enamine Co.
5. I hope R. H. H. H.
6. F. H. H.
7. EVA - H. H. H. H.

Beauty. Isolation can't be complete - 1/2d people, night, just get
illness. All viral type - 5 hrs $\leq \frac{VIR}{P}$ Duration varied.

Ap. 9 held up because of it

AP = Composite %C. 2 way crew properties & crew demands
- all time critical. Problems = a function of frequency
of flights. (2 mo centers trip - prefer 1 mo - CAB)

Q. maintenance per fl. good - worked very well Apr 10 - no
illness at all.

= Apr. 11 wanted to maintain record - esp. so because
 of pers. of Emma Bays. (2nd death 3 yrs ago that
 there was possibility of life on moon. Question:
 necessary?

ICBC planned procedures in detail.

Had to leave post flt. illness & night occur was out of lower ^{aria}

∴ Profit guarantee VERY IMPORTANT

Laurene scheduled international press interview

10 days prior to ~~menstruation~~ + one or 2 days before.

Had to impose constraints

N. pu-flor., ai-flor., or pent-flor. illuans

~ Apr 11.

Larrea Larrea Schultze

- Concern - energy cost
- Used Lins & Briggs Engineery to select. H₂ fuel: Work: HR
- Also. H₂, O₂ usage (over time) - not gross
- " H₂ left over in Press's (over)
- Collected time was when Neil Smithy ran around
surface and to get up. HR's to

point where he was told to be cautious.

Sleep - Sleep well to noon - 1st time.

- " poorly in PM - Trapped sleep in PM

- Got very cold (non shivering)

- Emotionally charged

- No sleep

- Sleep well again on return

Vertebral Problem - Occasional minor discomfort

- Notes Apr 8 & 9 Sp. suggest a stretch maneuver to be done.

- Apr 10, one incident of ataxic awareness

- Exercises → 45 min. stopped. 1 hour

maneuvers (rebel) undetermined so

far. Needs further evaluation.

- Still limits of movement done continuously

in S/C seems to work best.

Phases:

#1 Spinal Tension - Apr 11 - No complaint in food

#2 Lower Limb Tension

3 "

4 "

5 "

6 "

7 Enteral Control

8 LRL Operation

9 MPT

10 "

11 "

12 "

13 Lower Limb Tension Work

14 "

15 "

16 "

17 "

18 "

Lower Limb very awkward. Can

control and get it off completely

in 1/2 hr. & suggest that

can

Math. @ ghr heads

8-22-69

Review

Ops Mission Responsibilities

1. Trained Crew
2. Flight Plan
3. O.R. Handbook
4. Supporting 5/6 Check 0.5
5. Procedures & Check 0.5
6. Crew Desc. Flt. Equipment
(Equipment, Cameras, etc.)
7. Copy Comm.
8. Flt. Crew Support SR Schedulers
trainers, weather briefs, etc. & leaders

Crew identified on paper ~~the~~ 9-10 Mon prior to flt. -
usually Training time has crews.
Units take 3 mos. to build & must be
ready 6 mos. prior to flt. for training
in units.

Units

1. Chief of Crew Training Team Leader
2. Chief of Operations Simulator - 800 lbs / 400 lbs Tr.
3. " " Docking Simulator
4. LOR Trainer (Preceded by Tr 50 largely - a suspended
LOR Unit)
5. H-10 Unit - for 1500
6. POGO - " " "
7. Hufferman Targeting Flt.
8. Post-Flt. Equipment.

Post Equiv Practice

Review Practice

Nov. Training - take rel. little time.

8-5-59

Type of crew defined - Ap H.