COMPUTATION NOTE BOOK

NATIONAL | 43-648 Made in U. S. A.

Course LEAM # 1

Name Otto E Berg

LEAM

SAVE

12-20-'00

My Analysis on my Lunar Apollo 17 LEAM Data. It was, at first, highly Controversial Data

See also page 28 this note book and next page for Lunar Stuff.

2 10 BIT WORDS PER ALSEP FRAME

12 WORDS FOR COMPLETE EXPERIMENT R/0

64 WORDS PER ALSEP FRAME

640 BITS PER FRAME

1060 BITS - SEC.

TIME / BIT 9.433×10^{-4} sec,

TIME / WORD 9.433×10^{-3} sec.

TIME / FRAME 6.037×10^{-1} sec.

TIME COMPLETE EXPERIMENT R/0 = 3.618 sec

TIME 90 FRAMES 54.333 sec.

15 R/0 PER 90 FRAMES

Moon Radius 1738 Km

$g = 1.62$ m/sec^2

Moon Circumference 10,900 Km (10920)

" Mass = 7.35×10^{25} grams

Earth mass = 5.975×10^{27} grams

Sun Mass = 1.97×10^{33} grams

Terminator moves at rate of 15.4 Km/hr (at equator) (16.65)

= 400 cm/sec (4.4)

Earth-Moon Distance = ~~384400~~ 348000 Km ($57 R_E$)

1 A.U. = 1.496×10^8 Km

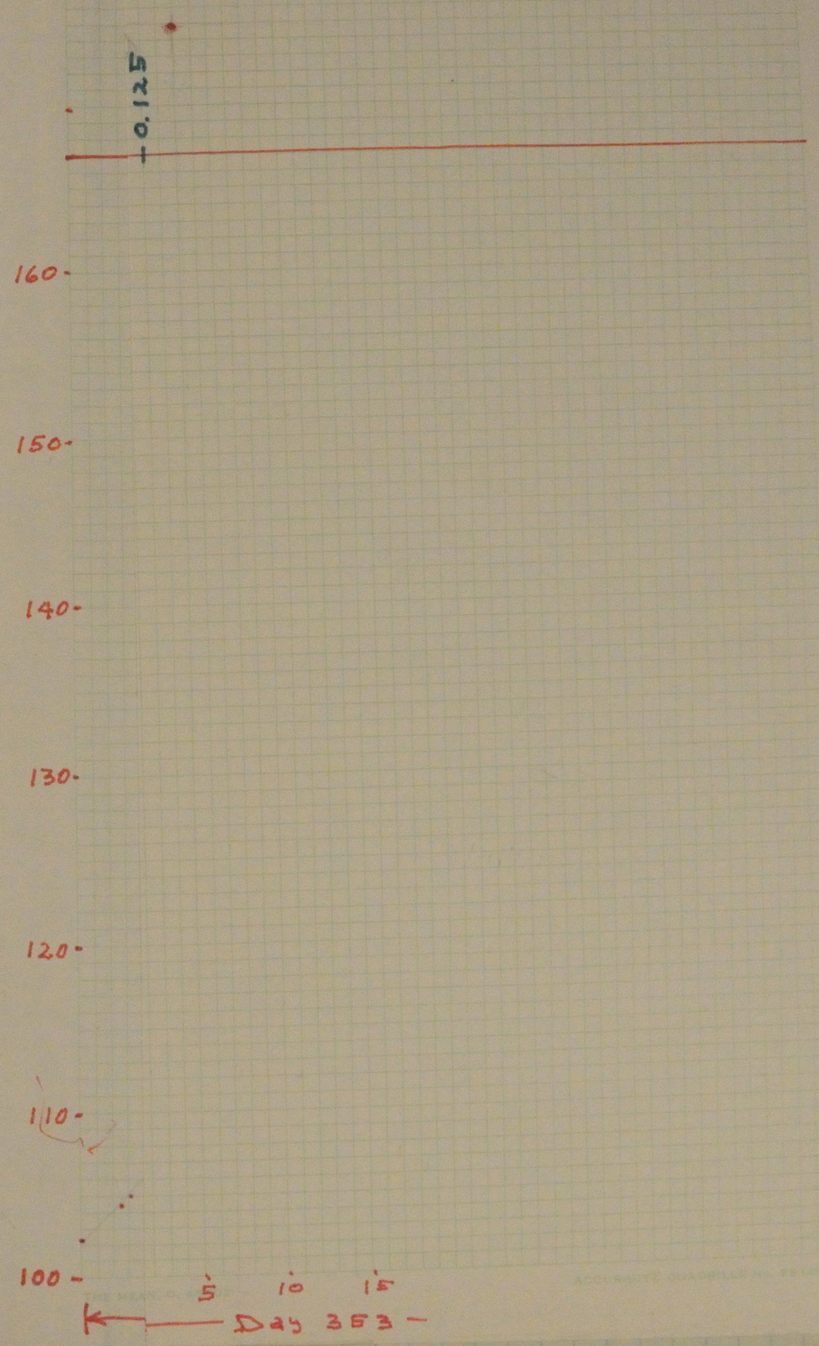
Lunar gravity = 1.6 m/sec (check on this)

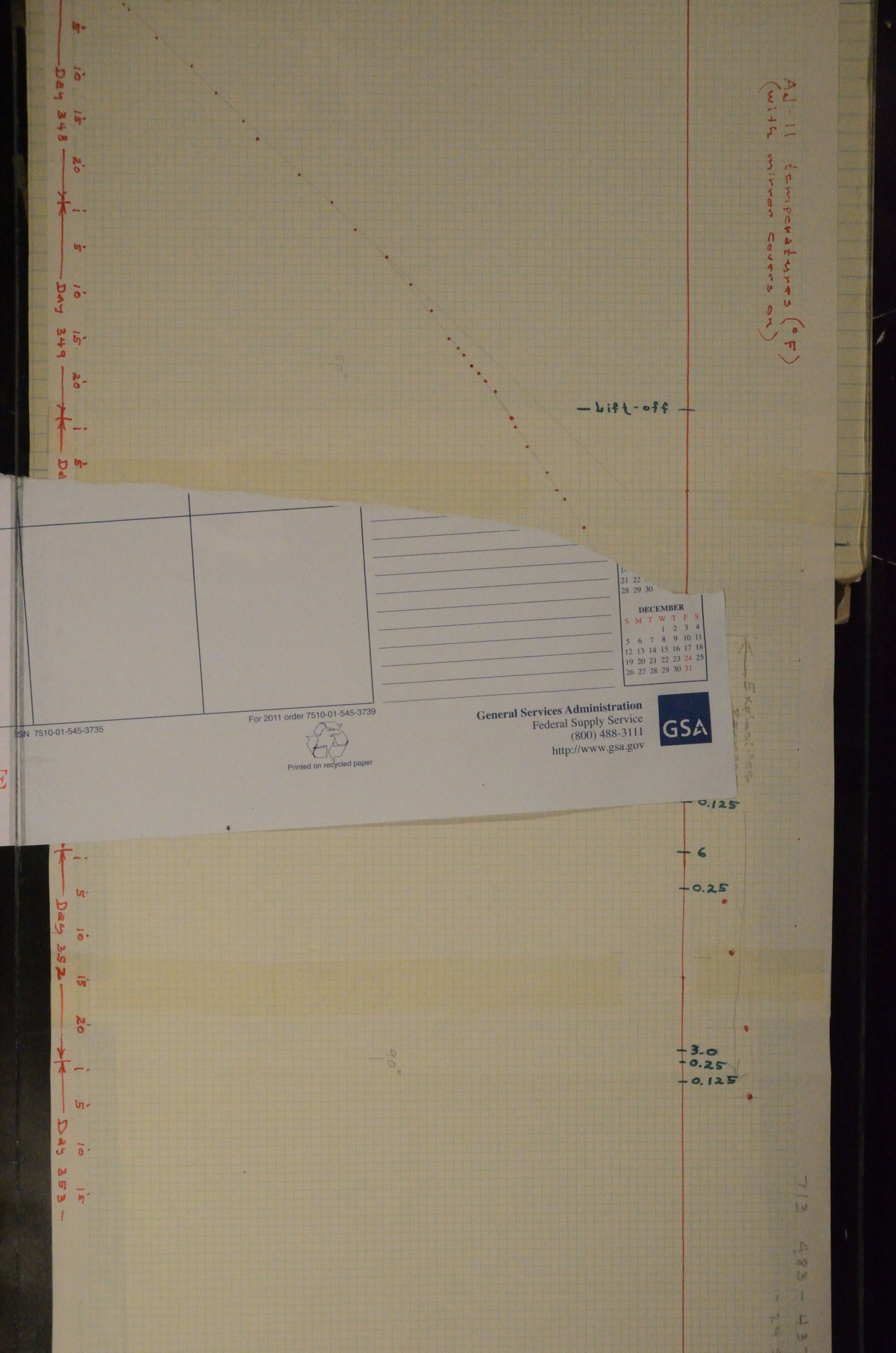
Solar Wind Velocity 400 Km/sec

See Also Page 28 This Note book for Moon facts

713 483-4375

-2454-5




AJ-11 temperatures (°F)
(with mirror covers on)
Lift-off
Day 348
Day 349
Day 352
Day 353
0.125
6
0.25
3.0
0.25
0.125
DECEMBER
S M T W T F S
1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31
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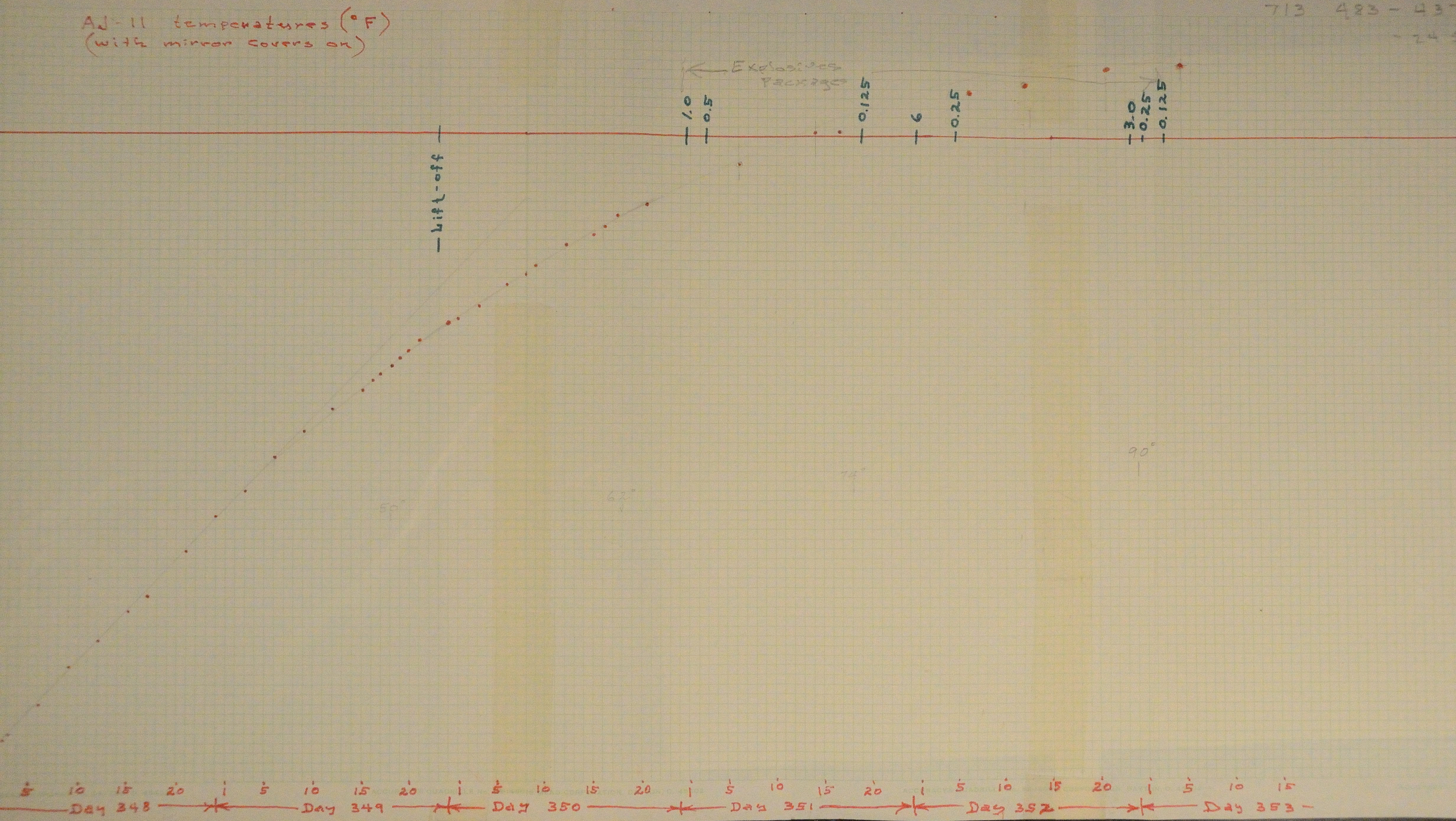

AJ-11 temperatures (°F)
(with mirror covers on)
713 483 - 43
Explosives Package
1.0
0.5
0.125
6
0.25
3.0
0.25
0.125
Lift-off
90°
74°
62°
50°
5 10 15 20 1 5 10 15 20 1 5 10 15 20 1 5 10 15 20 1 5 10 15 20 1 5 10 15
Day 348
Day 349
Day 350
Day 351
Day 352
Day 353

FIRST LUNAR Dawn for LEAM Was
Jan 9, 1973 15 hours 15
minutes GMT

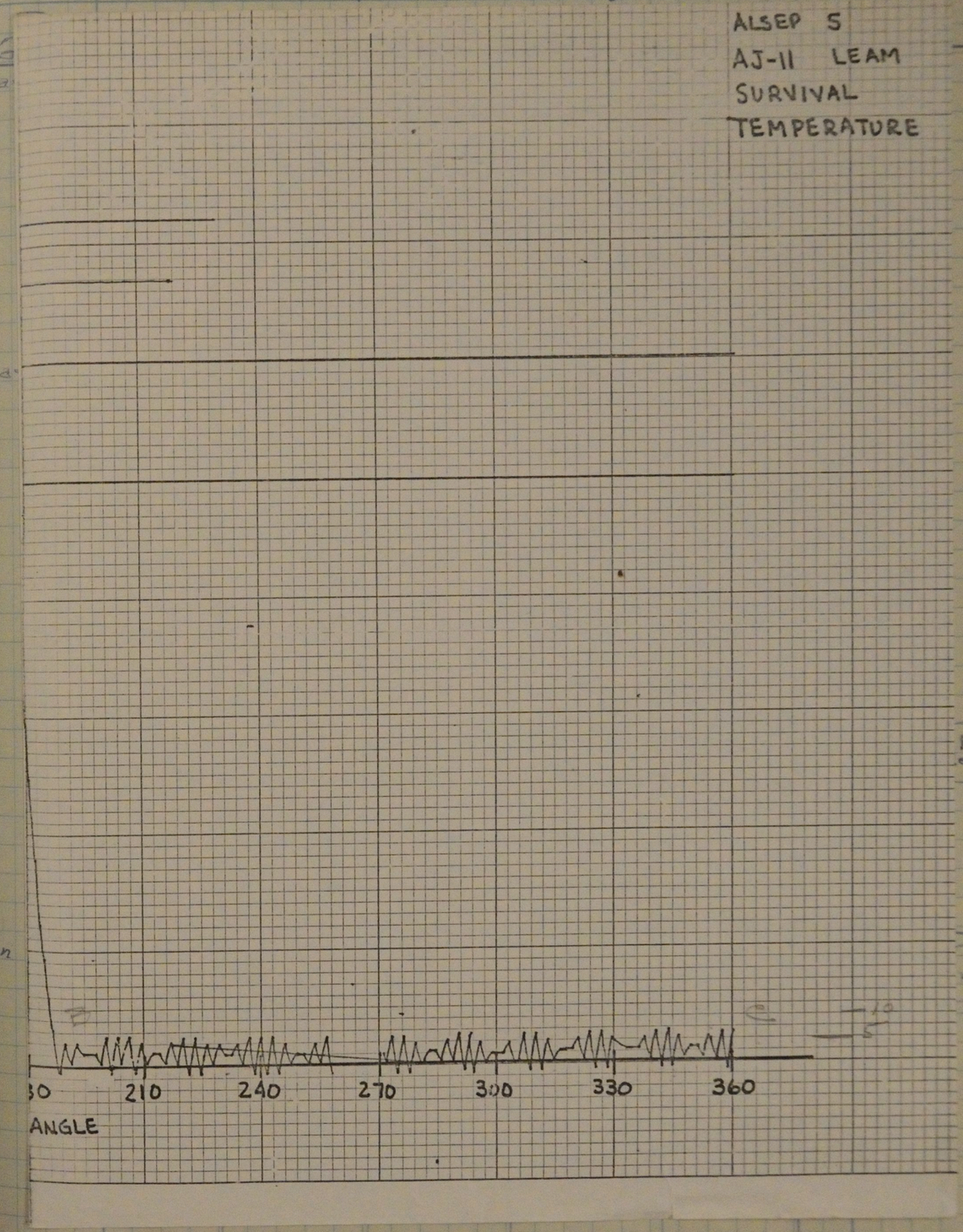
SENSOR COVERS Removed:
Dec 28, 1972 19hrs 57min GMT

LUNAR EMPLACEMENT
Dec. 11, 1972
1930 hours (CST)
by Astronaut Schmitt
Sun angle 13.8°

Zero LEAM DAY IS Dec 12, 72

LEAM Temperature at first Dawn Jan 9, 73

ALSEP 5
AJ-11 LEAM
SURVIVAL
TEMPERATURE



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1930 hours (CST)

by Astronaut Schmitt

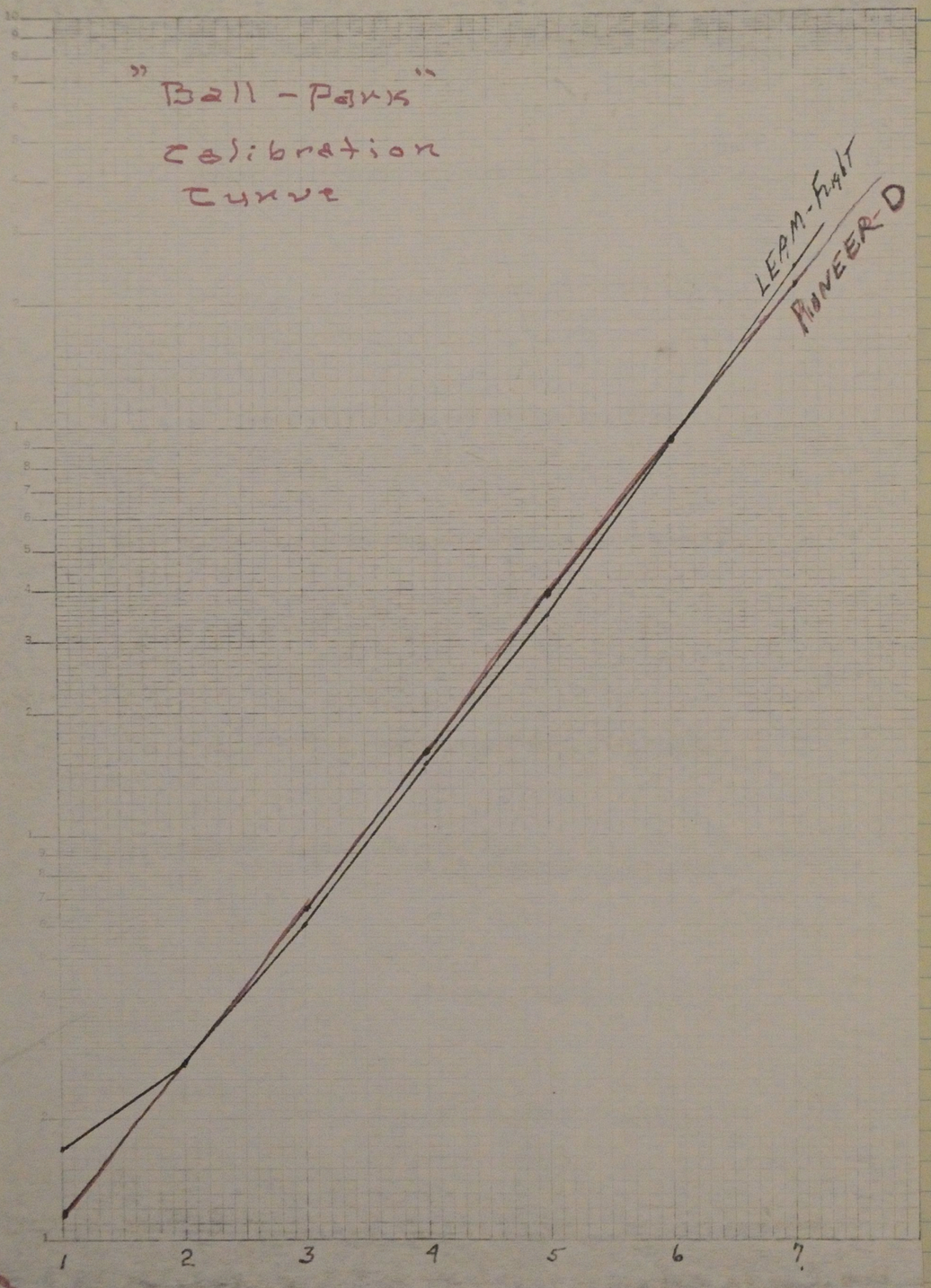
Sun angle 13.8°

Zero LEAM DAY IS Dec 12, 72

LEAM Temperature at first Dawn Jan 9, 73

Date GMT	AD11	AD09	AD07	AD08	AD06
Jan 9, 73					
1600 hrs	2.9	15.7			-1.4
1700	16.3	19.2			12.5
1800	32.6	32.9			30.3
1900	46.7	48.3			45
2000	61.5	61.7			59.8
2100	72.5	72.9			69.4
2200	84.5	85.6			81.1
2300	95.7	97.4			90.1
2400	105.9	105.6	100.1	101.9	98.3
Jan 10, 73					
0100	113.2	112.5	105.6	106.5	103.7
0300	129	129	120	118.5	115.5
0400	135.9	135	124.5	124.5	121.5
0500	142	139.5	129	129	126
0600	146.4	144	133.5	132	129
0700	151.2	149	136.5	135	133.5
0800	156.6	154	139.5	138	135.5
0900	160.9	159	142.5	139.5	138
1120	168.4	164	149	144	142.5
1134	"	"	"	"	"
1136	169.5	166.5	149	144	142.5 (15° elevation)
1138.30	Standby		OK LEAM		
1153	170.6				
1207	170.6				
1300	171.7				
1320	172.8				
1339-10		LEAM OFF			
Jan 11 01-18-14		Leam on (to re-blow covers) 2 mirror			
"	1695	cover and 2 sensor covers			
01-39-41	170.6	commands given here			
01-39-05		LEAM OFF			
02-14-39	170.6				
02-42-32	171.7		elevation 21.2		
03-09-50	171.7				

LEAM Flight System A Film



Jan 10, 78 (at Houston) Day 10 (1973)

"Typical" data from real time

Style for each sensor may be film-grid-pha-film-Grid m/c pha

GMT Time	~~EAST~~ UP	East ~~UP~~	WEST
02-31-38	2-1-6-0-0 m/c 0	8-2-7-0-2	← actually East occurred 3 sec early
02-49-48	2-1-6	8-1-7	← vice versa above
02-50-30	m/c 4	m/c 1	
02-50-50	1-4-7	8-8-7	UP sensor 3 seconds earlier
02-56-20		7-0-2	
03-51-41			m/c 3
04-10-52	0-0-0-8-0		
04-12-00	m/c 1		
04-23-35		14-1-3	
	8-1-1	1-6-7-0-2	May not have occurred together
05-06-20		m/c 1	
	8-0-1	2-12-2	may not have occurred together
			3-3-4

The above is a sample of data with all covers removed and on LEAMS first Down, which was Jan 9, 1973 15 hours 15 min GMT

Jan 10, 73 at Houston

Reblow Covers

On 11/01/17/22 GMT the LEAM was turned on for 23 minutes to give 2 cover removal commands for each cover and to see delta power values in an attempt to further evaluate the temperature problems.

Conclusions

1) Calibrations are normal

2) Delta power is 3 watts (normal)

3) heater is not stuck on

4) programmed temp curves are correct.

5) Covers are indeed removed.

6) Data sheets show no anomalies.

Jan 10, 73 at Houston

Background Noise Rates reviewed in an attempt to answer high temperature problems — are sensor covers off or not.

Compare these with page 5 data which were acquired after dawn with all covers removed (supposedly).

Day 357 (1972) (sensor covers still on here)

GMT	Up Sensor	East	West
23 59-37	13-0-2 (start only)		AJ11 - 139.4°F
23 47 00			$S_{M_{1c}}$ M_{1c} 2
23 47-19			$S_{M_{1c}}$ M_{1c} 3
Day 358			
02 24-09		2-0-1	AJ11 - 146.4
	end of	data → 358 (72)	02-47-11

The above represents a typical 5-hour period of LEAM with sensor covers on. This was the background quiet — noise pulse rate.

Temperatures on AJ 11 went from 139.4 F to 146.4 over this 5 hour period.

Compare this quiet background with page 5 which is real time data with covers removed and at LEAM's first Dawn

Jan 11, 73

★ Dave
Rice
Game

Charge
ment
Apol

★ CRISWE
Jenan

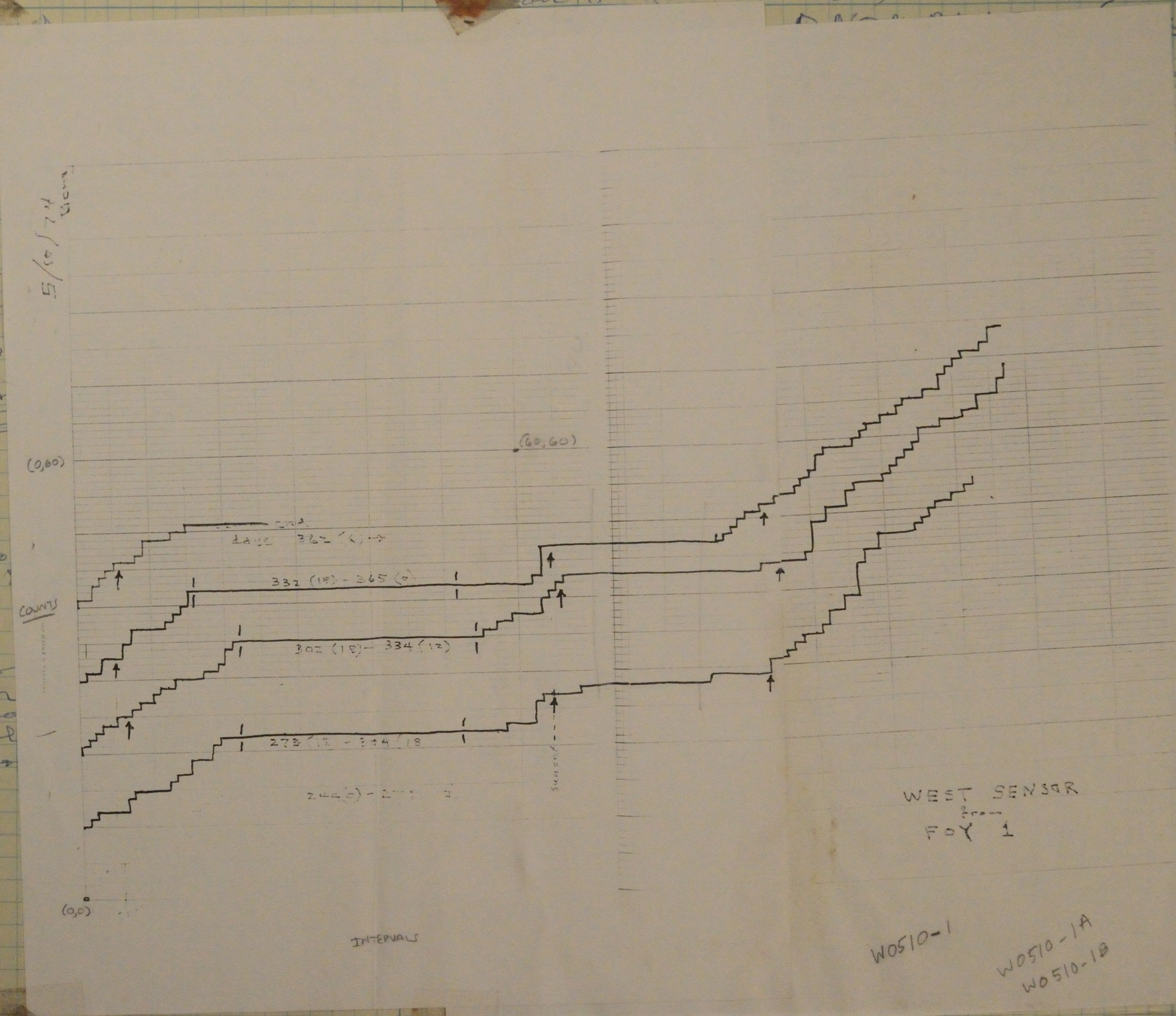
Vertica

See hi

★ Ask Bob

★ Get Apollo
for

★ Study
★ So
at Earth
★ mo
★ pl
★ so



Jan 11, 73 at Houston

★ Dave Reasoner (P.I. CPLEE)
Rice Univ. 713 528 6141 - 1135
home 713 667 6282

Charged Particle Lunar Environment Experiment (CPLEE
Apollo 14

★ CRISWELL
Lunar Science Institute

Vertical Soil transport at Dawn

See him at L.S.I.

★ Ask Bob Miley re: Lunar Eclipse.

★ Get Apollo 14 preliminary report for Reasoners Results.

★ Study
★ Solar wind arrival angles at Earth
★ magnetic tail
★ plasma sheets
★ solar wind fluxes

Jan 11 (at Houston)

ON DAWN ANOMALIES (Conjecture)

Dave Reasoner telecon #1

Lunar surface voltages may go from −200 volts at night to +20 volts at sunrise — depending on LEAM site relative to plasma sheet. (These voltage potentials are outside plasma sheet conditions) Night time in the sheet is −40 to −50 volts.

Surface dust sees the potential change in milliseconds of time and moves laterally (??) with a
1. + charge deposits on the −3 volt LEAM film. This changes the A/C and causes the expt to heat up. Bursts of these particles arriving on the film would account for the large pho signals.

St

Note The sensors see solar wind particles c. 5° earlier than direct sunlight (90 hours or 3 days 48 hours earlier)

—: (1)

Bendix Aerospace Systems Division

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1973

Apollo 12 ALSEP based on empirical data, all other values are "normalized"
Times shown are Date/GMT (EST); * indicates preceding date

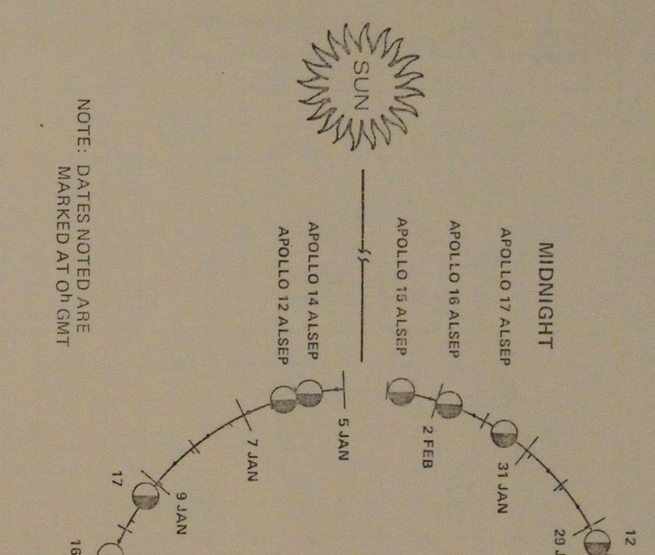
ALSEP Longitude	Apollo 17 30.75°E	Apollo 16 15.51°E	Apollo 15 3.65°E	Apollo 14 17.47°W	Apollo 12 23.39°W
Lunation	1	9	18	24	39
Sunrise	Dec 10/1513 (1013)	Dec 11/2124 (1624)	Dec 12/2047 (1547)	Dec 14/1428 (0928)	Dec 15/0218 (2118*)
Noon	Dec 18/0104 (2004*)	Dec 19/0715 (0215)	Dec 20/0643 (0143)	Dec 22/0031 (1931*)	Dec 22/1214 (0714)
Sunset	Dec 25/1008 (0608)	Dec 26/1716 (1216)	Dec 27/1641 (1141)	Dec 29/1021 (0521)	Dec 29/2113 (1613)
Midnight	Jan 1/2042 (1542)	Jan 3/0243 (2143*)	Jan 4/0204 (2104*)	Jan 5/1940 (1440)	Jan 6/0719 (0219)
Lunation	2	10	19	25	40
Sunrise	Jan 9/0558 (0058)	Jan 10/1201 (0701)	Jan 11/1126 (0626)	Jan 13/0507 (0007)	Jan 13/1705 (1205)
Noon	Jan 16/1544 (1044)	Jan 17/2153 (1653)	Jan 18/2122 (1622)	Jan 20/1509 (1009)	Jan 21/0252 (2152*)
Sunset	Jan 24/0147 (2047*)	Jan 25/0753 (0253)	Jan 26/0718 (0218)	Jan 28/0058 (1958*)	Jan 28/1140 (0640)
Midnight	Jan 31/1117 (0617)	Feb 1/1718 (1218)	Feb 2/1638 (1138)	Feb 4/1013 (0513)	Feb 4/2152 (1652)
Lunation	3	11	20	26	41
Sunrise	Feb 7/2029 (1529)	Feb 9/0231 (2131*)	Feb 10/0155 (2055*)	Feb 11/1936 (1436)	Feb 12/0741 (0241)
Noon	Feb 15/0609 (0109)	Feb 16/1217 (0717)	Feb 17/1145 (0645)	Feb 19/0530 (0030)	Feb 19/1712 (1212)
Sunset	Feb 22/1603 (1103)	Feb 23/2208 (1708)	Feb 24/2132 (1632)	Feb 26/1509 (1009)	Feb 27/0146 (2046*)
Midnight	Mar 2/0125 (2025*)	Mar 3/0723 (0223)	Mar 4/0642 (0142)	Mar 6/0014 (1914*)	Mar 6/1153 (0653)
Lunation	4	12	21	27	42
Sunrise	Mar 9/1026 (0526)	Mar 10/1626 (1126)	Mar 11/1548 (1048)	Mar 13/0926 (0426)	Mar 13/2136 (1636)
Noon	Mar 16/1954 (1454)	Mar 18/0200 (2100*)	Mar 19/0125 (2025*)	Mar 20/1908 (1408)	Mar 21/0649 (0149)
Sunset	Mar 24/0535 (0035)	Mar 25/1138 (0638)	Mar 26/1059 (0559)	Mar 28/0430 (2330*)	Mar 28/1506 (1006)
Midnight	Mar 31/1443 (0943)	Apr 1/2040 (1540)	Apr 2/1957 (1457)	Apr 4/1325 (0825)	Apr 5/0102 (2002*)
Lunation	5	13	22	28	43
Sunrise	Apr 7/2329 (1829)	Apr 9/0528 (0028)	Apr 10/0448 (2348*)	Apr 11/2223 (1723)	Apr 12/1033 (0533)
Noon	Apr 15/0844 (0344)	Apr 16/1447 (0947)	Apr 17/1410 (0910)	Apr 19/0750 (0250)	Apr 19/1930 (1430)
Sunset	Apr 22/1809 (1309)	Apr 24/0009 (1909*)	Apr 24/2330 (1830)	Apr 26/1701 (1201)	Apr 27/0335 (2235*)
Midnight	Apr 30/0305 (2205*)	May 1/0858 (0358)	May 2/0814 (0314)	May 4/0139 (2039*)	May 4/1315 (0815)
Lunation	6	14	23	29	44
Sunrise	May 7/1138 (0638)	May 8/1733 (1233)	May 9/1652 (1152)	May 11/1024 (0524)	May 11/2229 (1729)
Noon	May 14/2038 (1538)	May 16/0239 (2139*)	May 17/0201 (2101*)	May 18/1937 (1437)	May 19/0716 (0216)
Sunset	May 22/0551 (0051)	May 23/1149 (0649)	May 24/1109 (0609)	May 26/0438 (2338*)	May 26/1515 (1015)
Midnight	May 29/1435 (0935)	May 30/2027 (1527)	May 31/1941 (1441)	Jun 2/1304 (0804)	Jun 3/0040 (1940*)
Lunation	7	15	24	30	45
Sunrise	Jun 5/2259 (1759)	Jun 7/0453 (2353*)	Jun 8/0410 (2310*)	Jun 9/2140 (1640)	Jun 10/0936 (0436)
Noon	Jun 13/0750 (0250)	Jun 14/1350 (0850)	Jun 15/1310 (0810)	Jun 17/0644 (0144)	Jun 17/1823 (1323)
Sunset	Jun 20/1655 (1155)	Jun 21/2252 (1752)	Jun 22/2212 (1712)	Jun 24/1539 (1039)	Jun 25/0222 (2122*)
Midnight	Jun 28/0134 (2034*)	Jun 29/0726 (0226)	Jun 30/0639 (0139)	Jul 2/0001 (1901*)	Jul 2/1136 (0636)
Lunation	8	16	25	31	46
Sunrise	Jul 5/0953 (0453)	Jul 6/1548 (1048)	Jul 7/1504 (1004)	Jul 9/0833 (0333)	Jul 9/2024 (1524)
Noon	Jul 12/1842 (1342)	Jul 14/0041 (1941*)	Jul 15/0002 (1902*)	Jul 16/1736 (1236)	Jul 17/0515 (0015)
Sunset	Jul 20/0348 (2248*)	Jul 21/0935 (0435)	Jul 22/0903 (0403)	Jul 24/0232 (2132*)	Jul 24/1320 (0820)
Midnight	Jul 27/1228 (0728)	Jul 28/1819 (1319)	Jul 29/1733 (1233)	Jul 31/1056 (0556)	Jul 31/2232 (1732)
Lunation	9	17	26	32	47
Sunrise	Aug 3/2049 (1549)	Aug 5/0244 (2144*)	Aug 6/0201 (2101*)	Aug 7/1931 (1431)	Aug 8/0719 (0219)
Noon	Aug 11/0543 (0043)	Aug 12/1143 (0643)	Aug 13/1104 (0604)	Aug 15/0440 (2340*)	Aug 15/1619 (1119)
Sunset	Aug 18/1455 (0955)	Aug 19/2054 (1554)	Aug 20/2013 (1513)	Aug 22/1343 (0843)	Aug 23/0035 (1935*)
Midnight	Aug 25/2342 (1842)	Aug 27/0535 (0035)	Aug 28/0449 (2349*)	Aug 29/2214 (1714)	Aug 30/0951 (0451)
Lunation	10	18	27	33	48
Sunrise	Sep 2/0813 (0313)	Sep 3/1409 (0909)	Sep 4/1329 (0829)	Sep 6/0700 (0200)	Sep 6/1845 (1345)
Noon	Sep 9/1716 (1216)	Sep 10/2318 (1818)	Sep 11/2240 (1740)	Sep 13/1620 (1120)	Sep 14/0400 (2300*)
Sunset	Sep 17/0240 (2140*)	Sep 18/0842 (0342)	Sep 19/0803 (0303)	Sep 21/0134 (2034*)	Sep 21/1230 (0730)
Midnight	Sep 24/1139 (0639)	Sep 25/1735 (1235)	Sep 26/1651 (1151)	Sep 28/1019 (0519)	Sep 28/2156 (1656)
Lunation	11	19	28	34	49
Sunrise	Oct 1/2024 (1524)	Oct 3/0222 (2122*)	Oct 4/0143 (2043*)	Oct 5/1918 (1418)	Oct 6/0703 (0203)
Noon	Oct 9/0540 (0040)	Oct 10/1145 (0645)	Oct 11/1110 (0610)	Oct 13/0453 (2353*)	Oct 13/1639 (1139)
Sunset	Oct 16/1520 (1020)	Oct 17/2124 (1624)	Oct 18/2046 (1546)	Oct 20/1421 (0921)	Oct 21/0116 (2016*)
Midnight	Oct 24/0033 (1933*)	Oct 25/0630 (0130)	Oct 26/0549 (0049)	Oct 27/2320 (1820)	Oct 28/1058 (0558)
Lunation	12	20	29	35	50
Sunrise	Oct 31/0931 (0431)	Nov 1/1532 (1032)	Nov 2/1454 (0954)	Nov 4/0832 (0332)	Nov 4/2021 (1521)
Noon	Nov 7/1901 (1401)	Nov 9/0109 (2009*)	Nov 10/0036 (1936*)	Nov 11/1821 (1321)	Nov 12/0602 (0102)
Sunset	Nov 15/0455 (2355*)	Nov 16/1100 (0600)	Nov 17/1024 (0524)	Nov 19/0402 (2302*)	Nov 19/1454 (0954)
Midnight	Nov 22/1419 (0919)	Nov 23/2019 (1519)	Nov 24/1939 (1439)	Nov 26/1313 (0813)	Nov 27/0052 (1952*)
Lunation	13	21	30	36	51
Sunrise	Nov 29/2329 (1829)	Dec 1/0532 (0032)	Dec 2/0455 (2355*)	Dec 3/2236 (1736)	Dec 4/1029 (0529)
Noon	Dec 7/0910 (0410)	Dec 8/1519 (1019)	Dec 9/1448 (0948)	Dec 11/0835 (0335)	Dec 11/2018 (1518)
Sunset	Dec 14/1913 (1413)	Dec 16/0121 (2021*)	Dec 17/0045 (1945*)	Dec 18/1825 (1325)	Dec 19/0512 (0012)
Midnight	Dec 22/0445 (2345*)	Dec 23/1046 (0546)	Dec 24/1007 (0507)	Dec 26/0342 (2242*)	Dec 26/1522 (1022)

from Bob Miles

Bendix Aerospace Systems Division

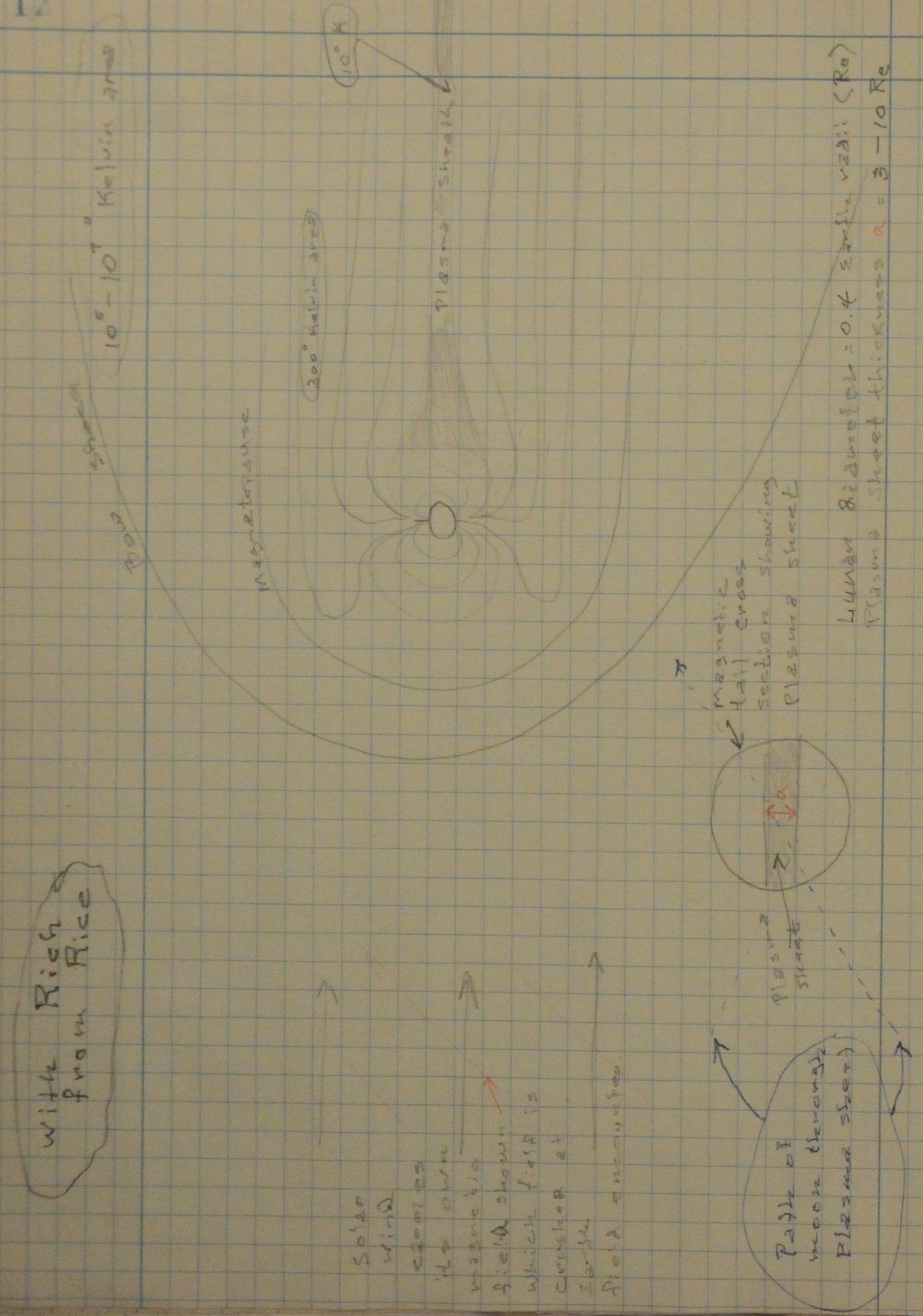
MOON POSITIONS RELATIVE TO EARTH-SUN LINE

5 JAN TO 3 FEB 1973



APOLLO (ALSEP)	DAY/HOUR, GMT			
	SUNRISE	NOON	SUNSET	MIDNIGHT
17	9 JAN/0553	(2ND) 16 JAN/1544	24 JAN/0147	31 JAN/1117
16	10 JAN/1201	(10TH) 17 JAN/2153	25 JAN/0753	1 FEB/1718
15	11 JAN/1126	(19TH) 18 JAN/2122	26 JAN/0718	2 FEB/1638
14	13 JAN/0507	(25TH) 20 JAN/1509	28 JAN/0058	
12	13 JAN/1705	(40TH) 21 JAN/0252	28 JAN/1140	

NOTE: DATES NOTED ARE MARKED AT 0^h GMT

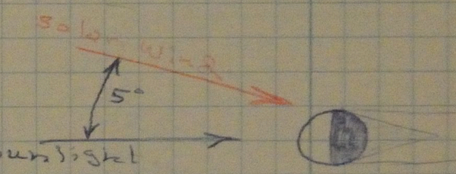


* "with difficulty" one can predict the time of passage of the moon thru the plasma sheet, but it is best to study history of sensors on the moon and on satellites.

Jan 12, 73 at Houston

On Lunar Surface Potentials

The Experiment sees the solar wind about 5° earlier than sunlight or about 10 hours earlier. In lunar night the surface potential is −200 volts outside of plasma sheath and perhaps −20 to −30 V in the plasma sheet. Since electrons travel faster than protons & ions – the solar wind causes the immediate area to go sun more negative by 30 volts.



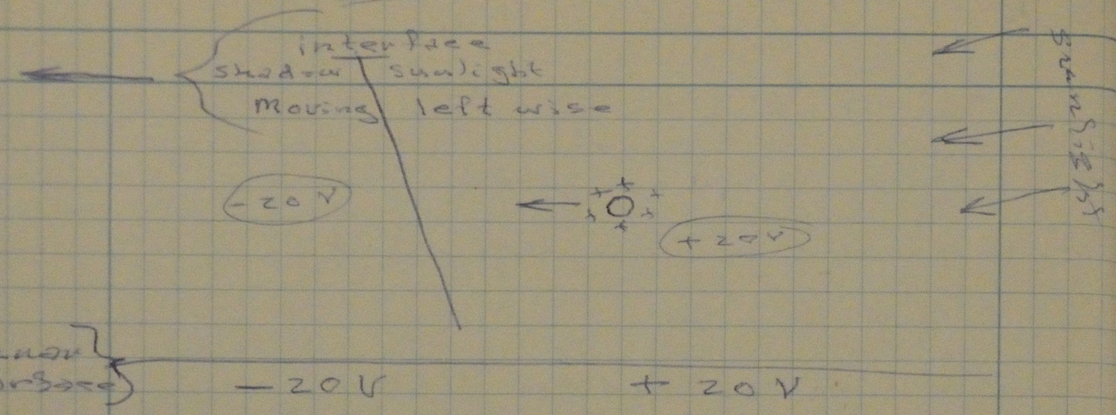
Note: previously in the limb a very complex mechanism may occur which is yet unknown because some people propose a shock wave or bow shocks in that region which is not understood

Then as the sun light impacts a site – photoemission drives the zone to +10 to +30 volts.

Consider a particle at the interface between sunlight & dark.

(over)

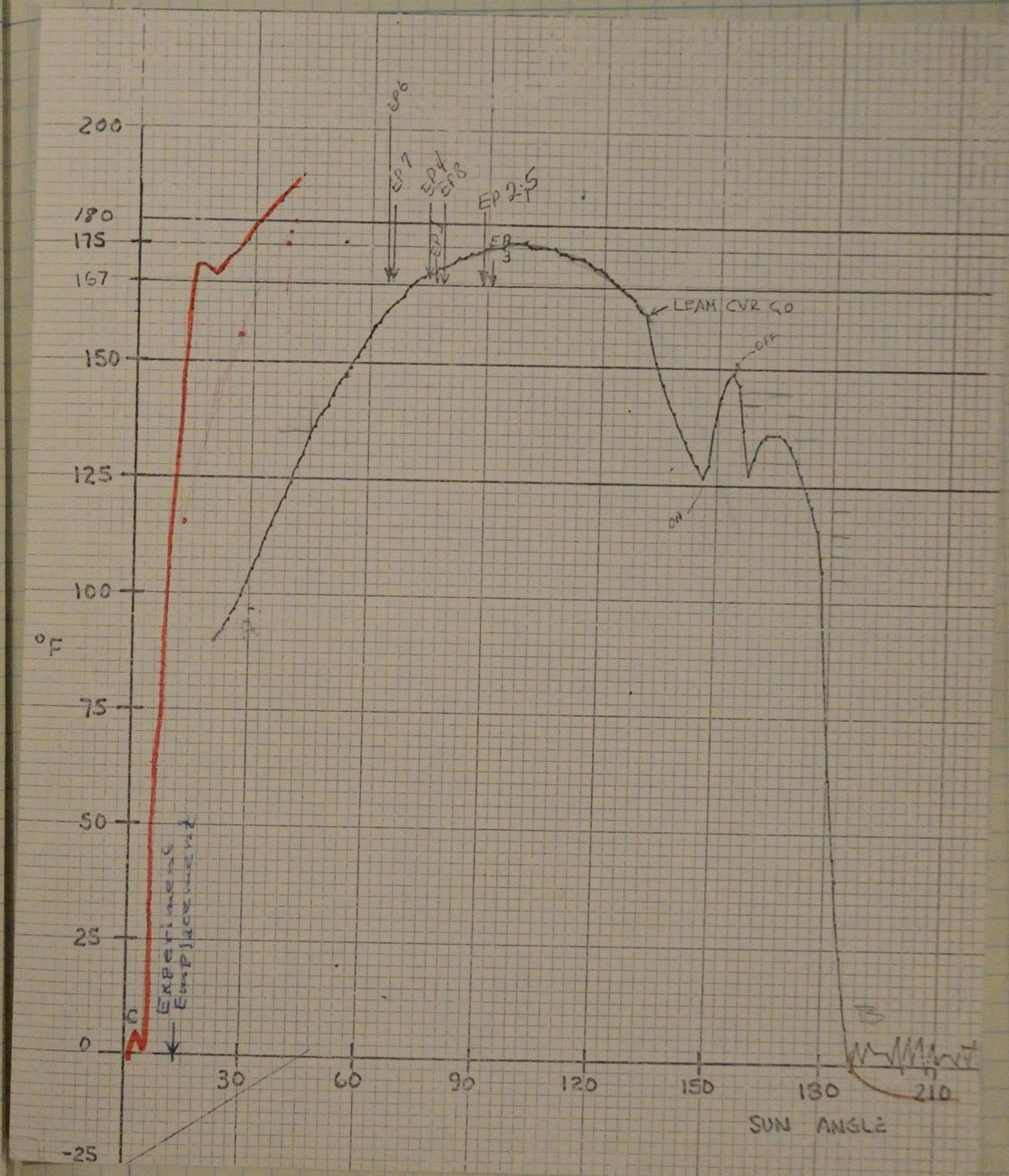
Dawn



The particle is driven leftward by 2 forces — sunrise:
(1) the interface line moves left
(2) the positively charged particle after (levitation) is repelled leftward.
(3) Solar radiation pressure also drives it leftward
(4) Solar wind forces are negligible.

Now at Sunset: Considering the west sensor and the danger of being coated with dust. The interface moves left and radiation pressure drives it left ~~the~~. But the interface line is moving oppositely or west

- The East sensor is more likely to be coated with dust at Sunrise than the west sensor at sunset only because of the interface movement.



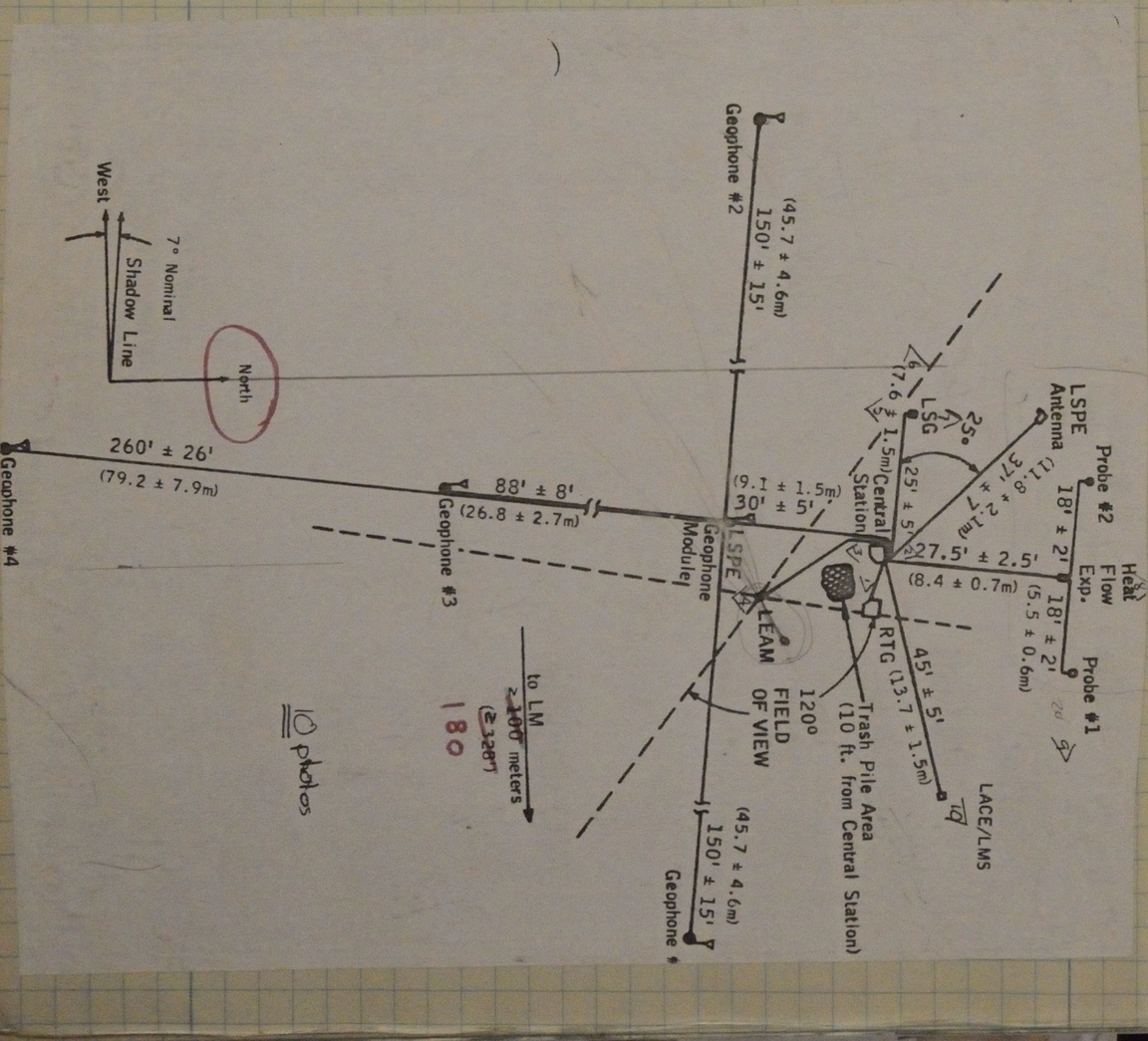
Jan 14, '73

— So how was LEAM Finally Placed on the Moon?

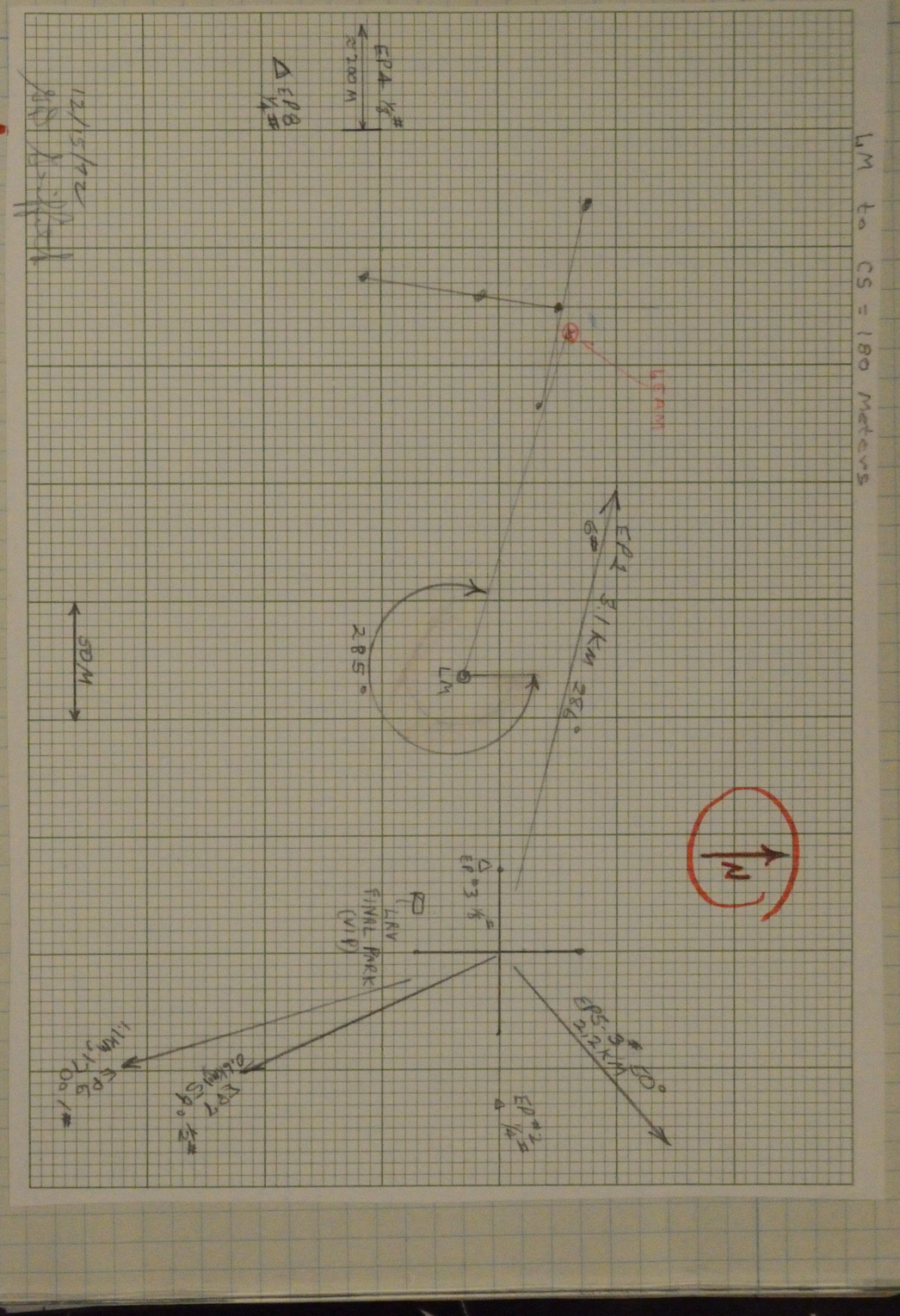
The East Sensor axis is 25° North of East

25

Apollo 17 ALSEP Array E Normal Deployment Arrangement



20.164 N Lat.
30.770 E Lon.
LEAM Surveyed Coordinates

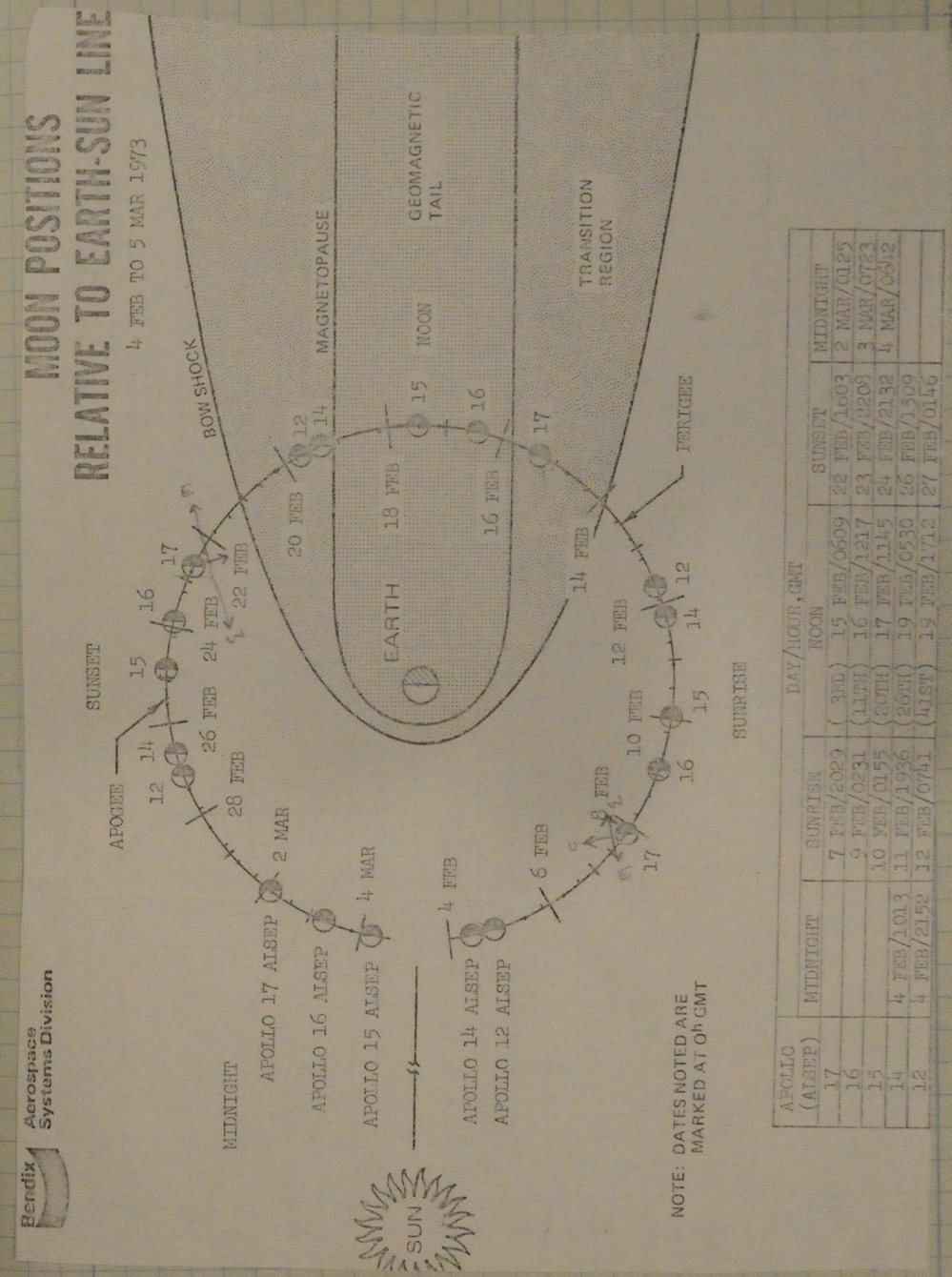


1/24/73

Lunar Surface Temperatures at Taurus-Littrow Site

from Mark Langseth

Sun Angle	°K	°C	°F
0° sun rise	103	-170	-274
10	210	- 63	- 81
20	278	+ 5	+ 41
30	308	+ 35	+ 95
40	332	+ 59	+ 138
50	350	+ 77	+ 171
60	363	+ 90	+ 194
70	372	+ 99	+ 210
80	378	+ 105	+ 221
90	380	+ 107	+ 225
100	378	+ 105	+ 221
150	375	+ 102	+ 216
120	366	+ 93	+ 199
130	355	+ 82	+ 180
140	341	+ 68	+ 156
150	322	+ 49	+ 120
160	279	+ 6	+ 43
170	233	- 40	- 40
180	133	- 140	- 220
190	121	- 152	- 242
200	116	- 157	- 251
210	114	- 159	- 254
220	112	- 161	- 258
230	109	- 164	- 263
240	108	- 165	- 265
260	107	- 166	- 267
280	106	- 167	- 268.6
300	105	- 168	- 270.4
320	104	- 169	- 272.2
340	103	- 170	- 274
360			



APOLLO (ALSEP)	MIDNIGHT
17	
16	
15	
14	4 FEB/1013
12	4 FEB/2152

	SUNRISE	NOON	SUNSET	MIDNIGHT
DAY/HOUR, GMT	7 FEB/2029	(3RD) 15 FEB/0609	22 FEB/1603	2 MAR/0125
	9 FEB/0231	(11TH) 16 FEB/1217	23 FEB/2208	3 MAR/0723
	10 FEB/0155	(20TH) 17 FEB/1145	24 FEB/2132	4 MAR/0642
	11 FEB/1936	(29TH) 19 FEB/0530	26 FEB/1509	
	12 FEB/0741	(41ST) 19 FEB/1712	27 FEB/0146	

shadow cone, or *umbra*. Within the umbra, light from all parts of the sun is cut off, since it is common to the shadow cone of them all. The vertex *E*

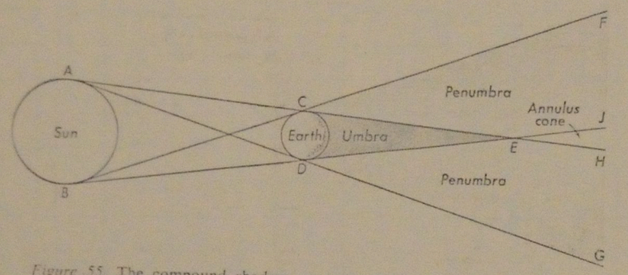


Figure 55. The compound shadow cone generated by the spherical earth (or moon) in the light of all points of the sun's surface from limb *A* to limb *B* consists of an umbra (the region common to the shadow cones of all points of the sun's surface), an annulus cone (the region common to points about the center of the sun's disk), and a penumbra (the region common to some but not all points on the limb of the sun's disk).

of the earth's shadow cone is on the average 859,000 miles from the center of the earth; the moon's shadow cone averages 232,000 miles in length.

Beyond the vertex *E* of the umbra is a conical volume *JEH* which is not a part of the shadow cone of any point on the sun's limb but in which

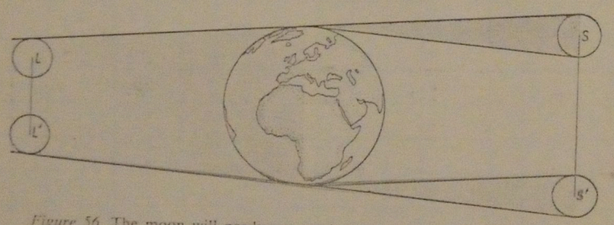


Figure 56. The moon will produce a total solar eclipse when it comes anywhere within the limits *S* and *S'* whereas it must be within the lesser limits *L* and *L'* to be totally eclipsed. This explains the difference between the ecliptic limits for solar and lunar eclipses. (Globe after a drawing by Richard Edes Harrison for *Fortune*.)

the center of the sun's disk is invisible. This region is called the *annulus cone*, since within it only a ring or annulus of points about the edge of the sun's disk can be seen. The remainder of the region of partial shadow

Earth - Moon distance 348,000 Km. (50 R_E)

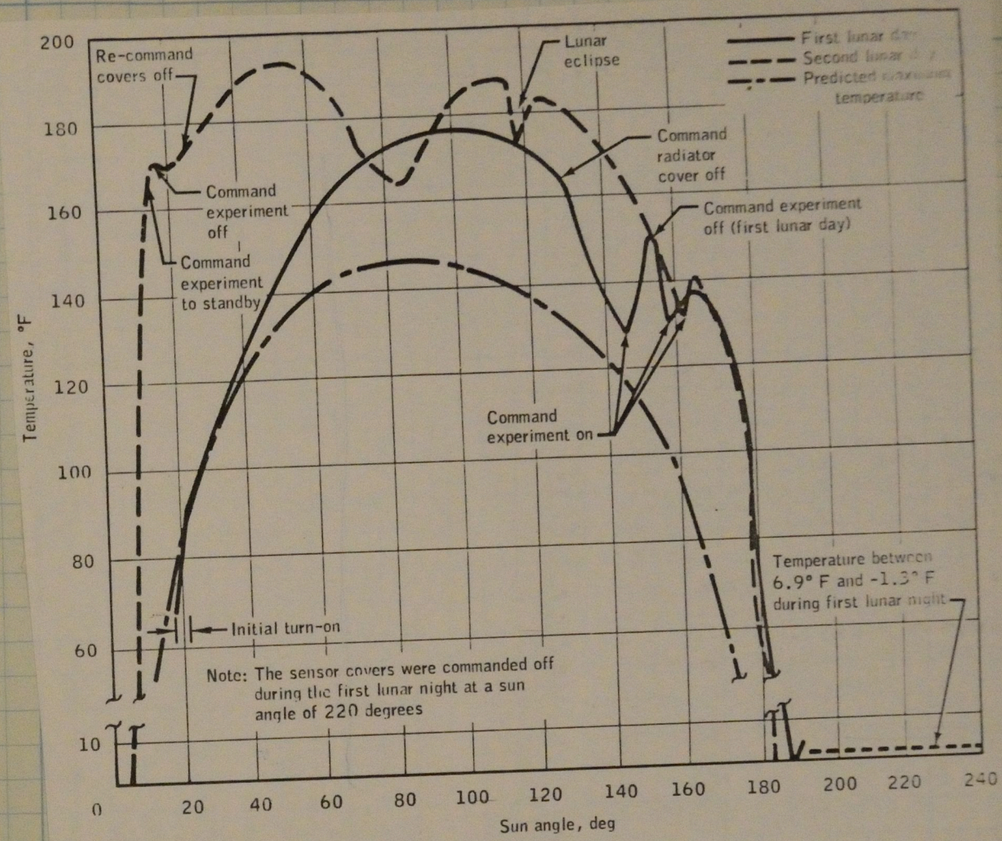
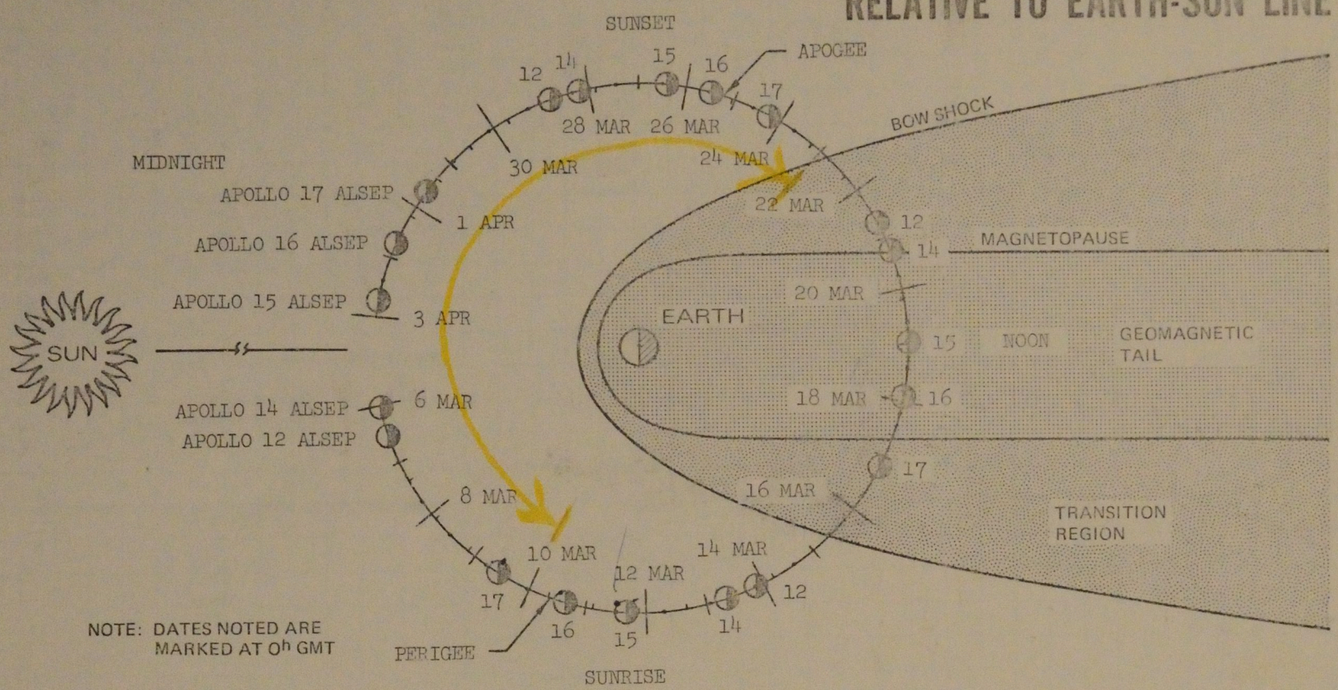


Figure 5-4.- Lunar ejecta and meteorite experiment temperature data.

Status	GMT	Date	Day	
ON	1631	Dec. 22 '72	357	
OFF	0737	Dec. 23, '72	358	
ON	1503	"	358	
OFF	1339	Jan. 10 '73	10	(1973) Standby at 1138
				OFF-on-off periods above
ON	1318	Jan 22 '73	22	on standby 1 hr before to ½ hr at
			23	on stdby at 1947 for 74 minutes
To standby from 0538			Feb 8 to	0618 on Feb 8
OFF	0320	Feb. 10, '73	41	
ON	1427	Feb 20	51	stdby from 53 11 2 to 53 12 57
to stdby for 78 minutes from				day 68 18 42 till 68 20 21
OFF	1633	Mar 11	70	
ON	2220	Mar 22	81	stdby from 82-2308 till 83-0504
OFF	0510	Apr 10	100	stdby ~~from~~ for 6½ hrs day 98
ON	1607	Apr 22	112	stdby for 7 hrs

Bendix Aerospace Systems Division

MOON POSITIONS RELATIVE TO EARTH-SUN LINE



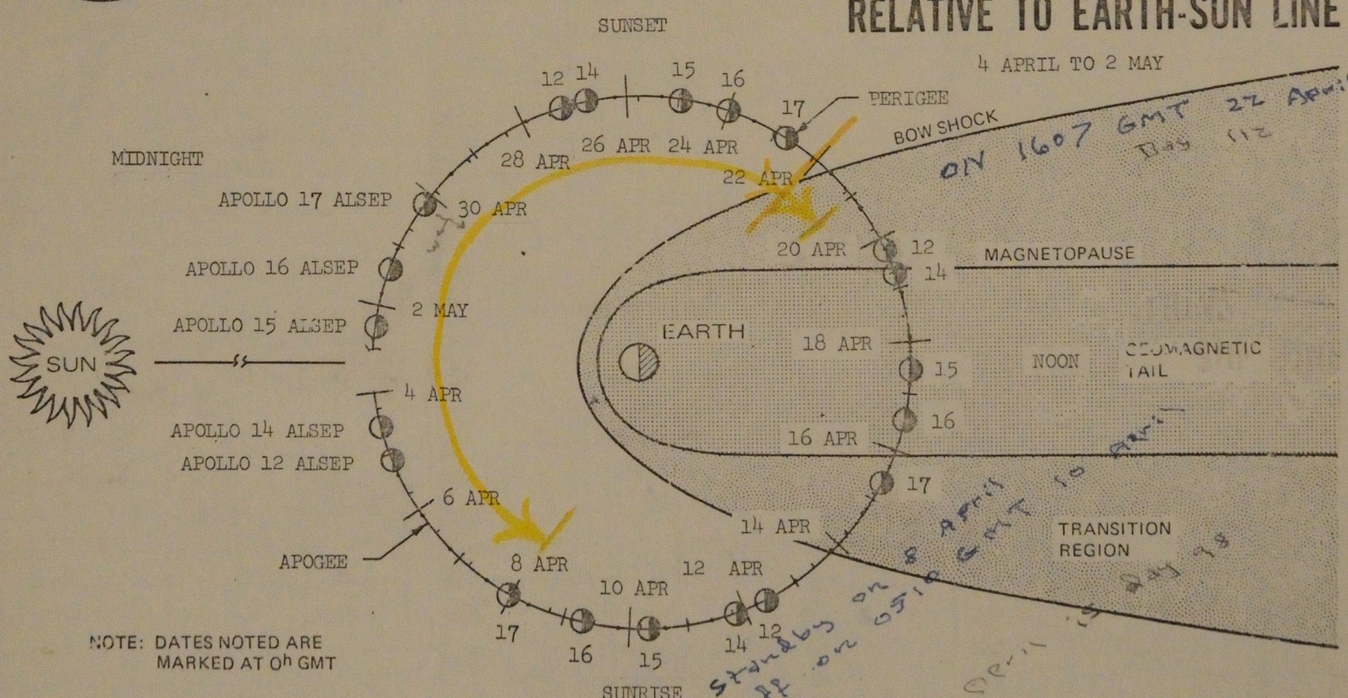
NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR,GMT				
	MIDNIGHT	SUNRISE	NOON	SUNSET	MIDNIGHT
17		9 MAR/1026	(4TH) 16 MAR/1954	24 MAR/0535	31 MAR/1443
16		10 MAR/1626	(12TH) 18 MAR/0220	25 MAR/1138	1 APR/2040
15		11 MAR/1548	(21ST) 19 MAR/0125	26 MAR/1059	2 APR/1957
14	6 MAR/0014	13 MAR/0926	(27TH) 20 MAR/1908	28 MAR/0430	
12	6 MAR/1153	13 MAR/2136	(42ND) 21 MAR/0649	28 MAR/1526	

Bendix Aerospace Systems Division

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

4 APRIL TO 2 MAY



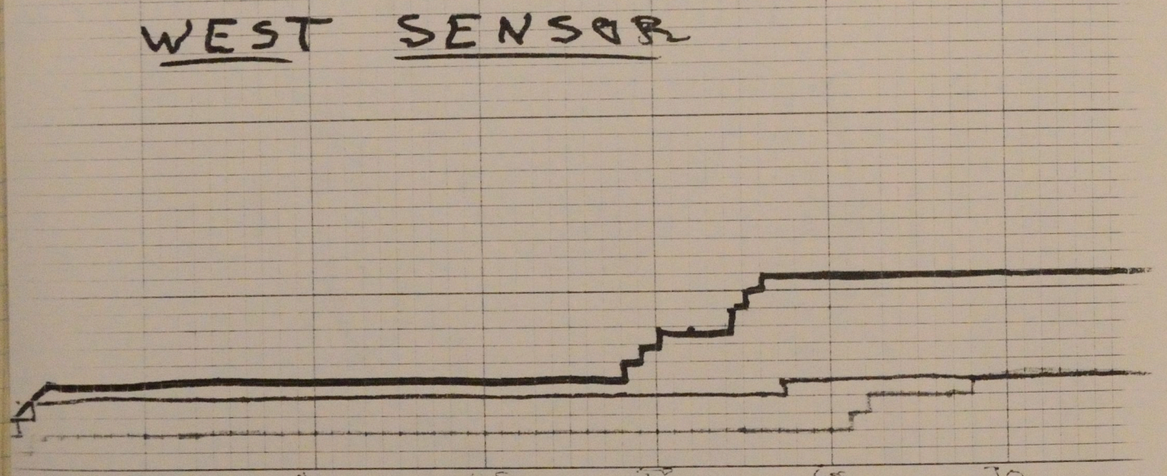
NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR,GMT				
	MIDNIGHT	SUNRISE	NOON	SUNSET	MIDNIGHT
17		7 APR/2329	(5TH) 15 APR/0844	22 APR/1809	30 APR/0305
16		9 APR/0528	(13TH) 16 APR/1447	24 APR/0009	1 MAY/0858
15		10 APR/0448	(22ND) 17 APR/1410	24 APR/2330	2 MAY/0814
14	4 APR/1325	11 APR/2223	(28TH) 19 APR/0750	26 APR/1701	
12	5 APR/0102	12 APR/1033	(43RD) 19 APR/1930	27 APR/0335	

tribution of coincidence events
multiples) only versus one lunation.

Not sufficiently accurate to publish

WEST SENSOR



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10 X 10 TO THE INCH 46 0702
7 X 10 INCHES

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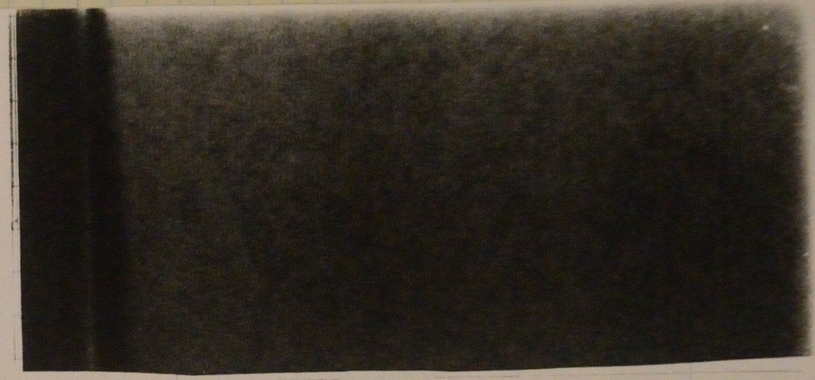
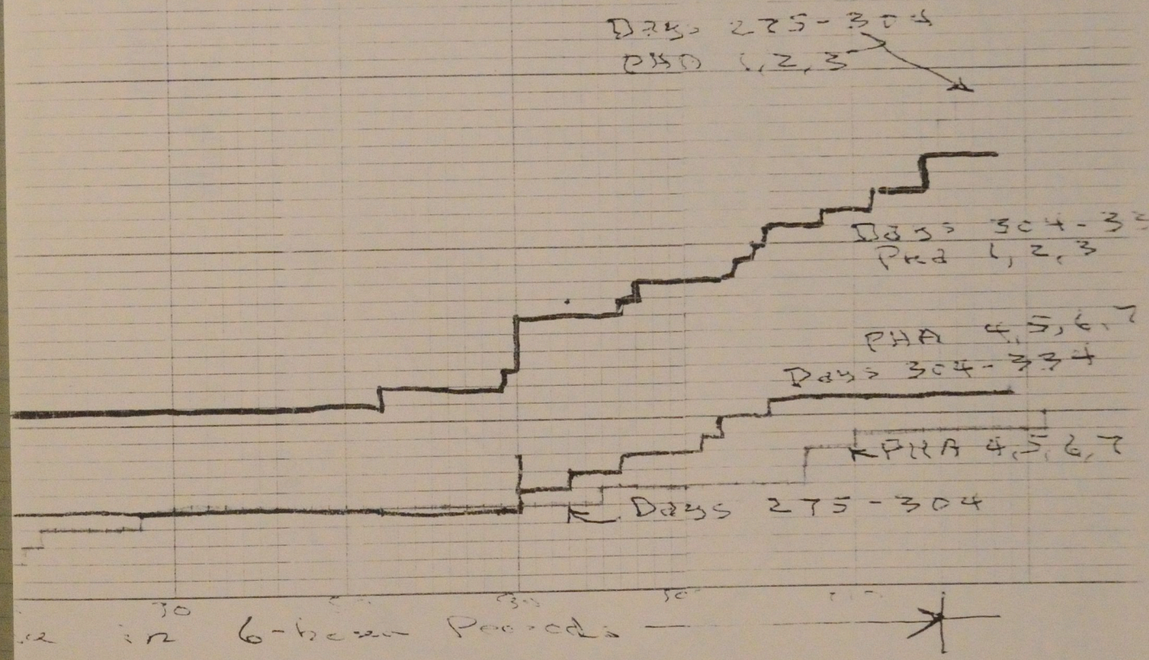
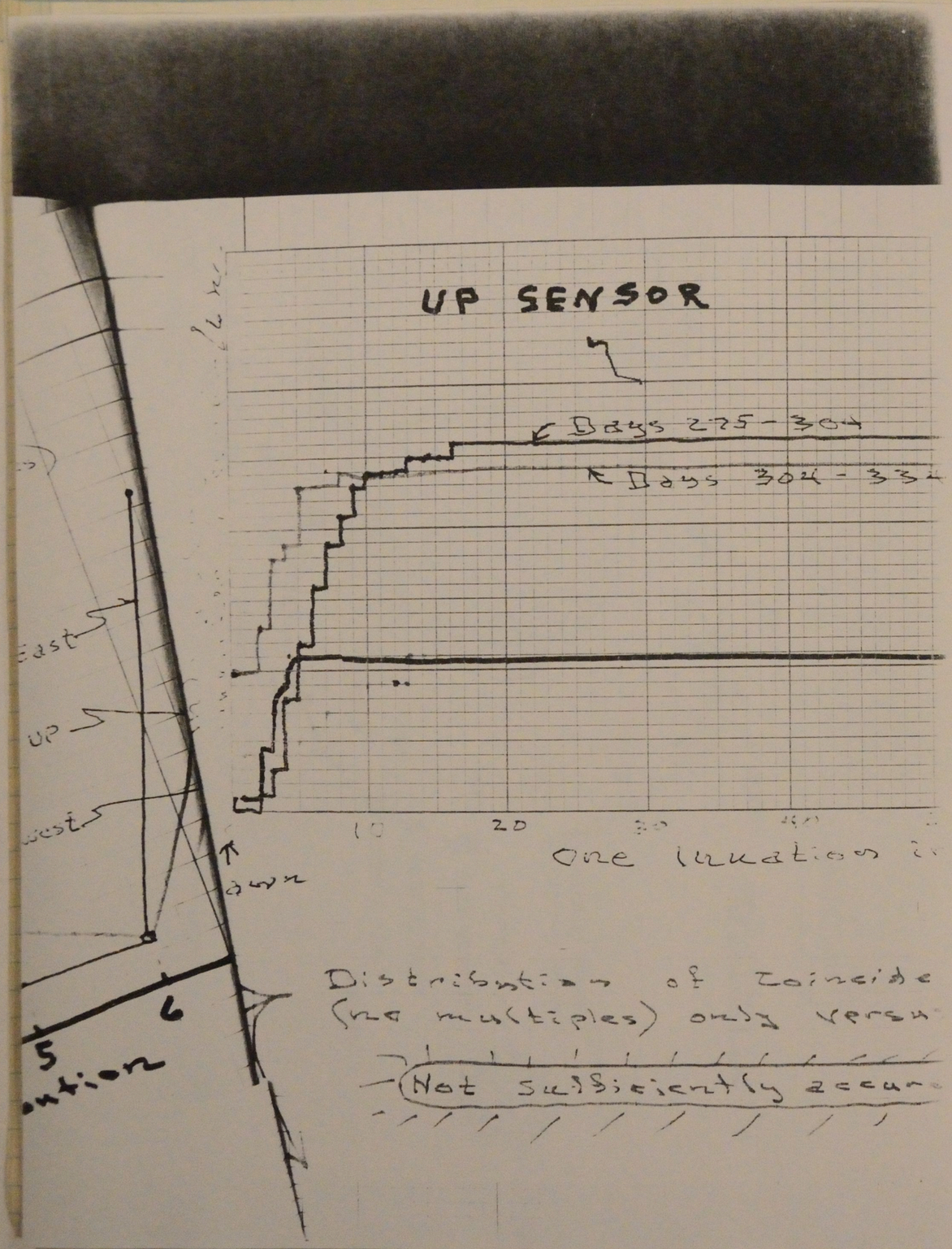
publish





KEUFFEL & ESSER CO.
10 X 10 TO THE INCH
7 X 10 INCHES



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Distribution of coincide
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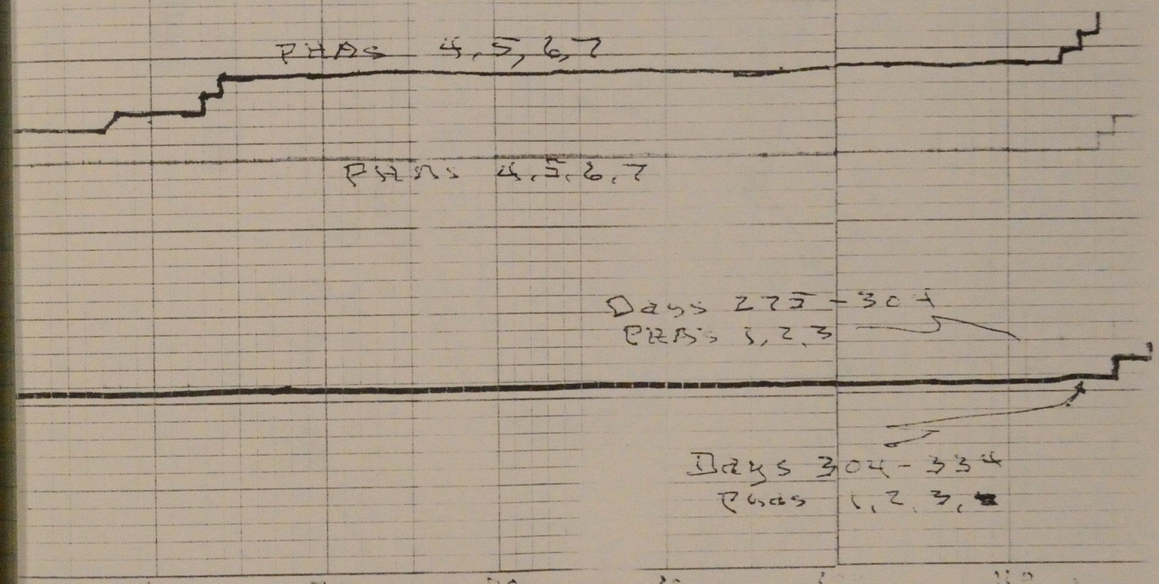

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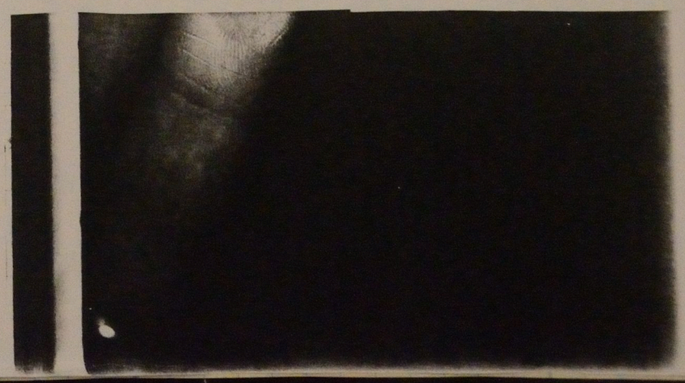
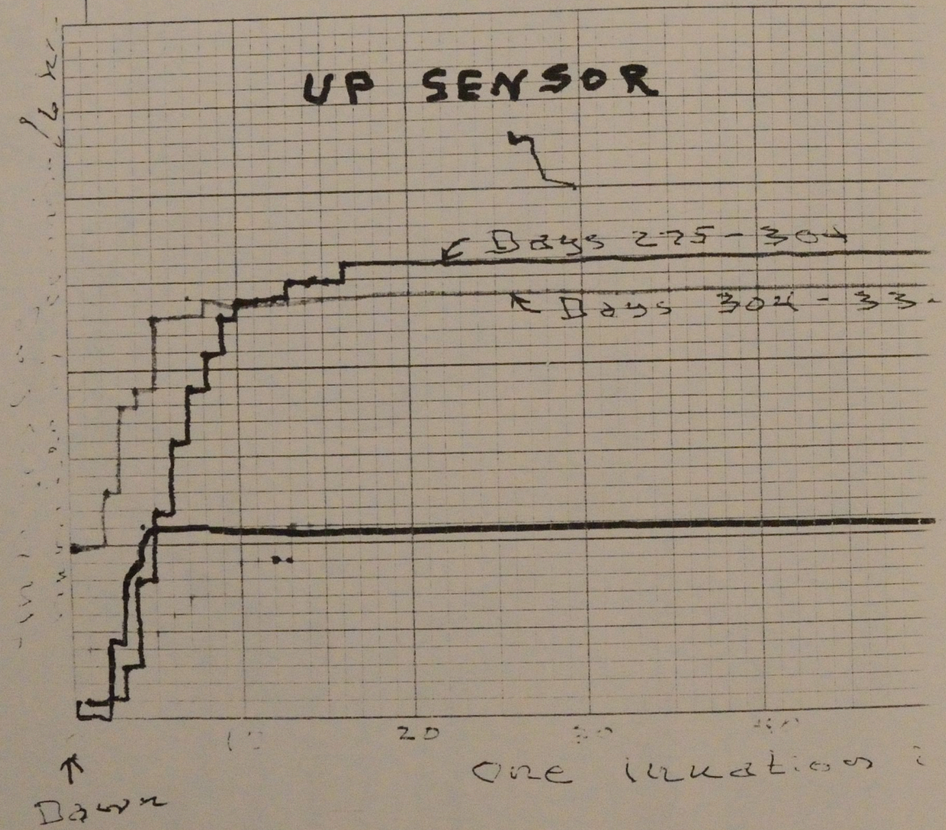
one lunation.
e to publish





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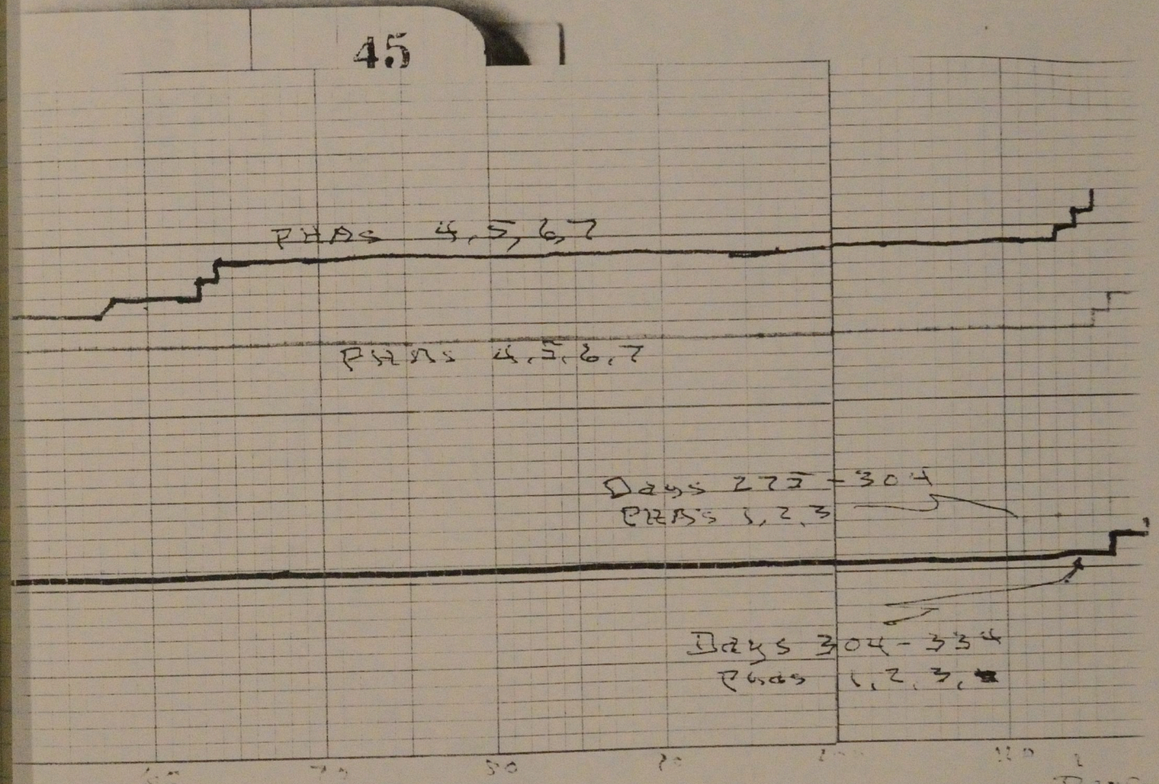

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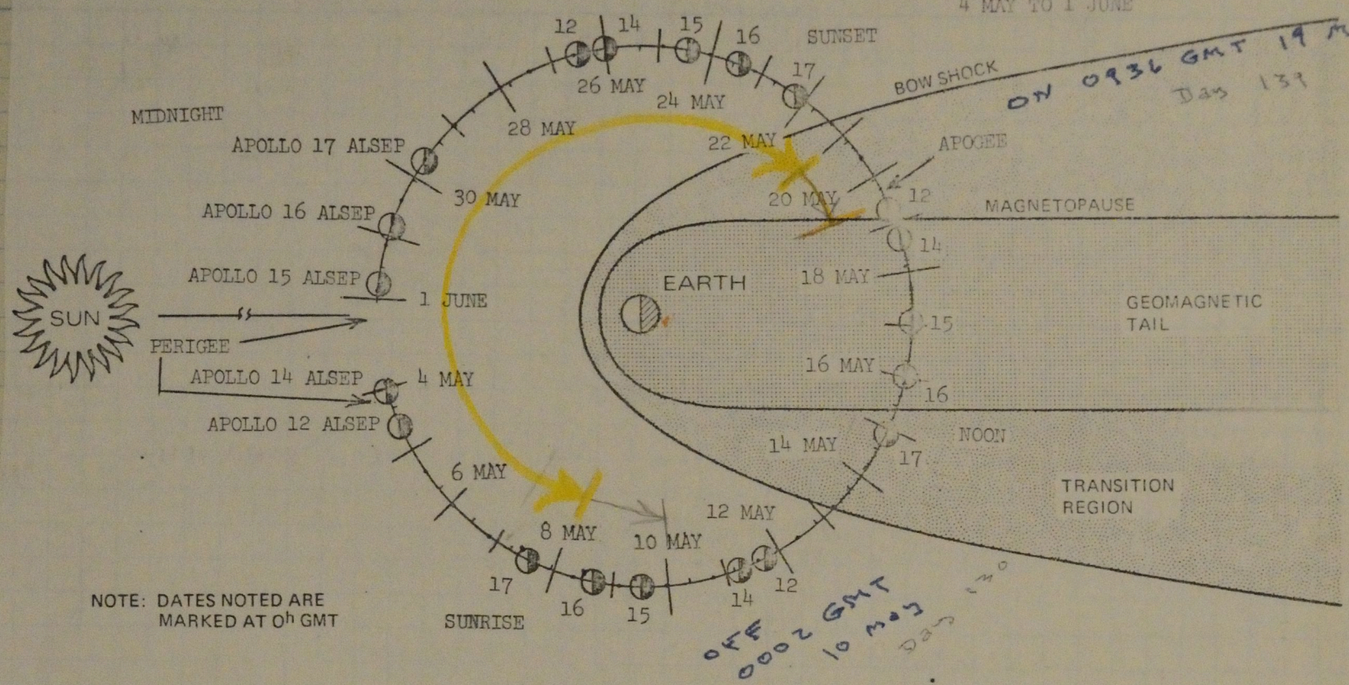
Bendix Aerospace Systems Division

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

4 MAY TO 1 JUNE



NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR(GMT)				
	MIDNIGHT	SUNRISE	NOON	SUNSET	MIDNIGHT
17		7 MAY/1138	(6TH) 14 MAY/2038	22 MAY/0551	29 MAY/1435
16		8 MAY/1733	(14TH) 16 MAY/0239	23 MAY/1149	30 MAY/2027
15		9 MAY/1652	(23RD) 17 MAY/0201	24 MAY/1109	31 MAY/1941
14	4 MAY/0139	11 MAY/1024	(29TH) 18 MAY/1937	26 MAY/0438	
12	4 MAY/1315	11 MAY/2229	(44TH) 19 MAY/0716	26 MAY/1515	

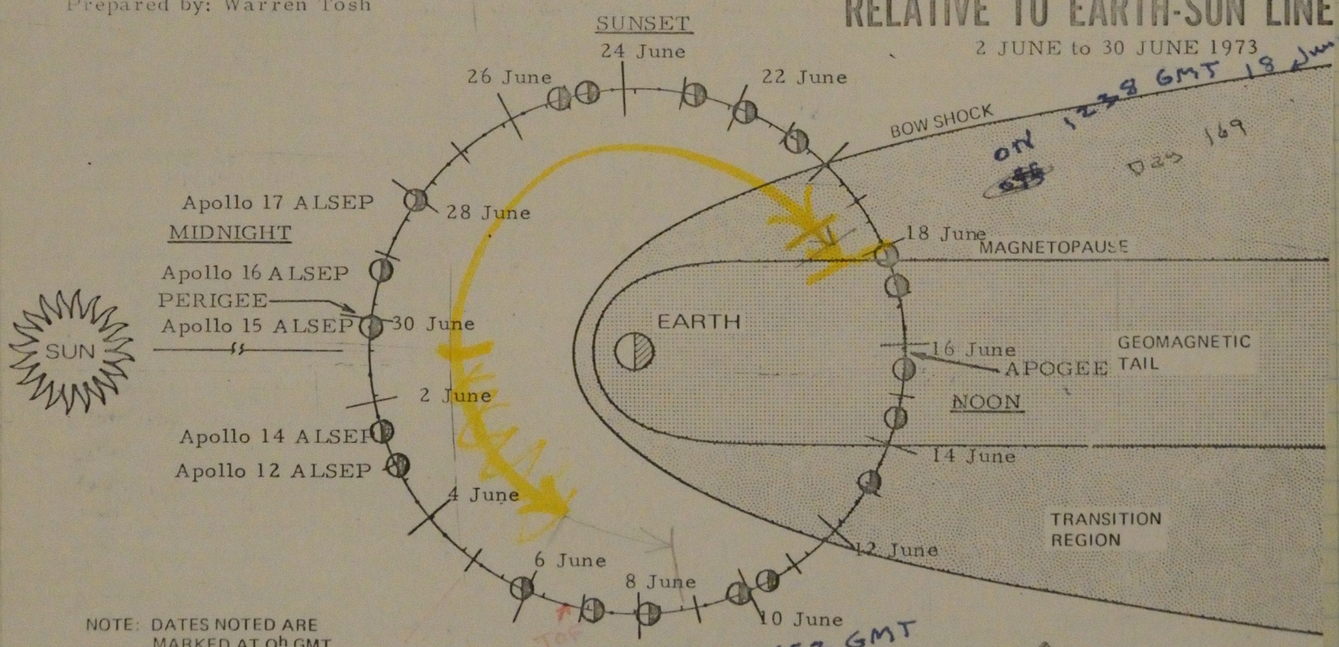
8 June is Day 159

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

2 JUNE to 30 JUNE 1973



NOTE: DATES NOTED ARE MARKED AT 0h GMT

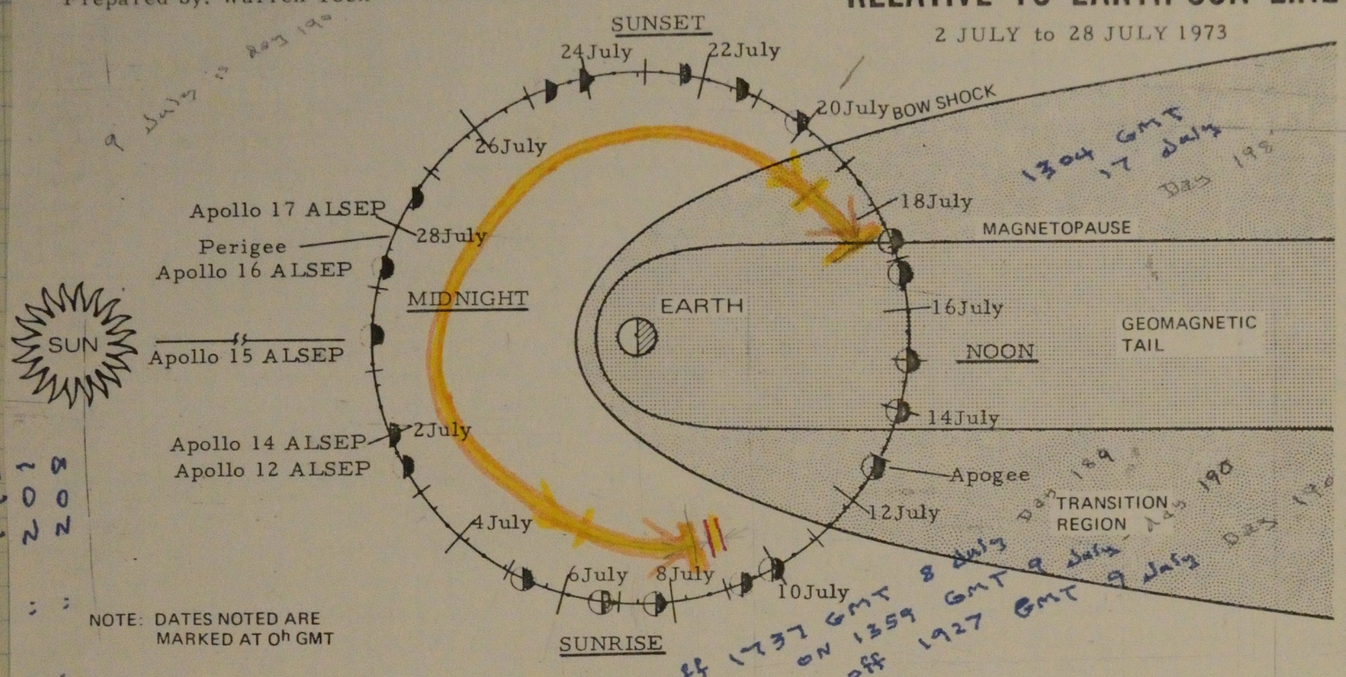
APOLLO (ALSEP)	DAY/HOUR(GMT)				
	MIDNIGHT	SUNRISE	NOON	SUNSET	MIDNIGHT
17		5JUNE/2259	(7th) 13JUNE/0250	20JUNE/1655	28JUNE/0134
16		7JUNE/0453	(15th) 14JUNE/1350	21JUNE/2252	29JUNE/0726
15		8JUNE/0410	(24th) 15JUNE/1310	22JUNE/2212	30JUNE/0639
14	2JUNE/1304	9JUNE/2140	(30th) 17JUNE/0644	24JUNE/1539	
12	3JUNE/0040	10JUNE/0936	(45th) 17JUNE/1823	25JUNE/0222	

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

2 JULY to 28 JULY 1973



NOTE: DATES NOTED ARE MARKED AT 0h GMT

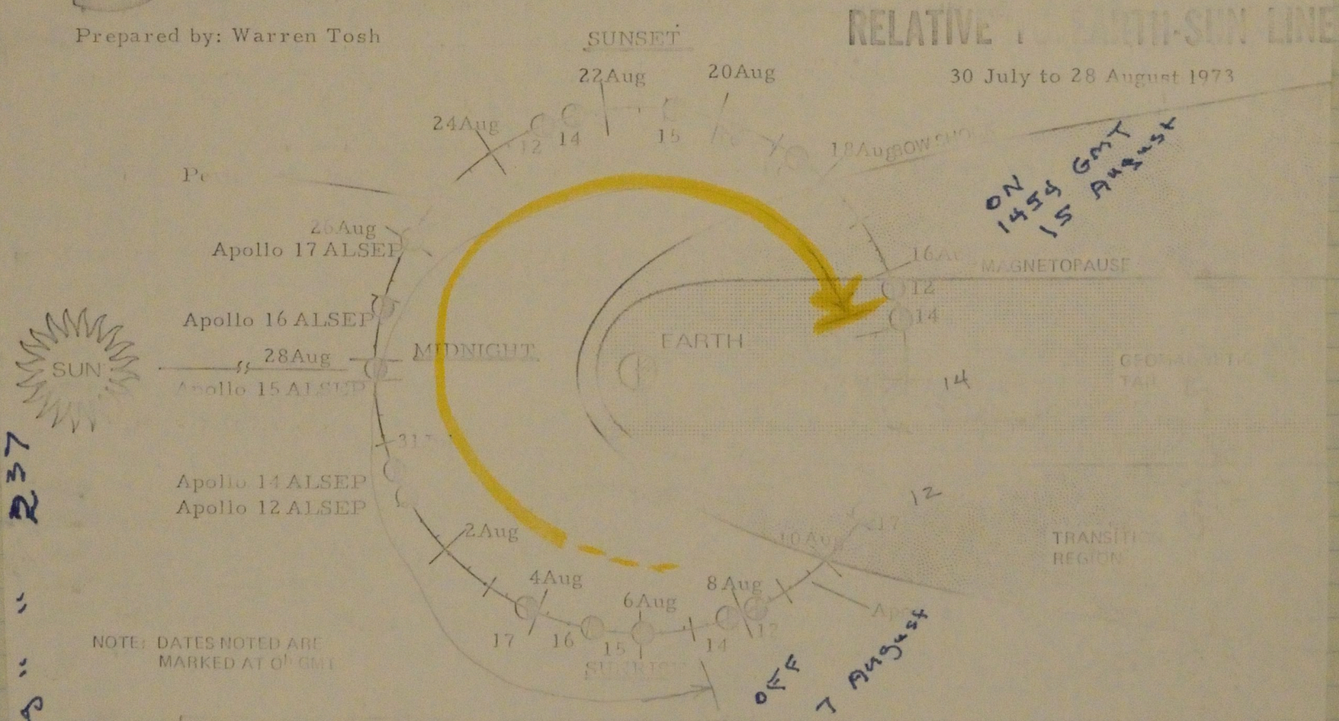
APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Noon	Sunset	Midnight
17		5 July/0953	(8th) 12 July/1842	20 July/0348	27 July/1228
16		6 July/1548	(16th) 14 July/0041	21 July/0935	28 July/1819
15		7 July/1504	(25th) 15 July/0002	22 July/0903	29 July/1733
14	2 July/0001	9 July/0833	(31st) 16 July/1736	24 July/0232	
12	2 July/1136	9 July/2024	(46th) 17 July/0515	24 July/1320	

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

30 July to 28 August 1973



NOTE: DATES NOTED ARE MARKED AT 0h GMT

Bendix Aerospace
Attn: R. Sanderson

8 October 1971
71-2187

Prototype System

A Film ID Threshold -	.9 MV
B Film ID Threshold -	.9 MV
A Collector ID Threshold -	.9 MV
B Collector I D Threshold 1-	.9 MV
A Film PHA Levels - 1	1.3 MV
- 2	2.8 MV
- 3	6.5 MV
- 4	16 MV
- 5	40 MV
- 6	90 MV
- 7	230 MV
B Film PHA Levels - 1	1.2 MV
- 2	2.9 MV
-3	6.5 MV
- 4	17 MV
- 5	40 MV
- 6	89 MV
- 7	250 MV

Qualification System

A Film ID Threshold	.7 MV
B Film ID Threshold	.7 MV
A Collector ID Threshold	.7 MV
B Collector ID Threshold	.7 MV
A Film PHA Levels - 1	1 MV
- 2	2.4 MV
- 3	6.1 MV
- 4	15 MV
- 5	35 MV
- 6	83 MV
- 7	200 MV
B Film PHA Levels - 1	1.1 MV
- 2	2.4 MV
- 3	6.1 MV
- 4	15 MV
- 5	35 MV
- 6	92 MV
- 7	200 MV

Bendix Aerospace
Attn: R. Sanderson

8 October 1971
71-2187

Flight System

A Film ID Threshold	.9 MV
B Film ID Threshold	.9 MV
A Collector ID Threshold	.8 MV
B Collector ID Threshold	.8 MV
A Film PHA Levels - 1	1.69 MV
- 2	2.7 MV
- 3	6.0 MV
- 4	15 MV
- 5	34.5 MV
- 6	91 MV
- 7	241 MV
B Film PHA Levels - 1	1.7 MV
- 2	2.6 MV
- 3	6.2 MV
- 4	15 MV
- 5	36 MV
- 6	91 MV
- 7	242 MV

Internal
Memorandum

Bendix Aerospace Systems Division

Ann Arbor, Michigan

Date April 26, 1976 Letter No. 9753-210

To F. A. Heinz, Jr.

From T. Breezy

Subject Partial Eclipse of the Moon, 13 May 1976

A partial eclipse of the moon will occur on 13 May 1976. The beginning of the umbral phase will be visible in Australia; Asia, except the northeastern part; eastern part of Europe; Africa, except the northwestern part; Artarctica; part of New Zealand, the Indian Ocean; and the eastern part of the South Atlantic Ocean.

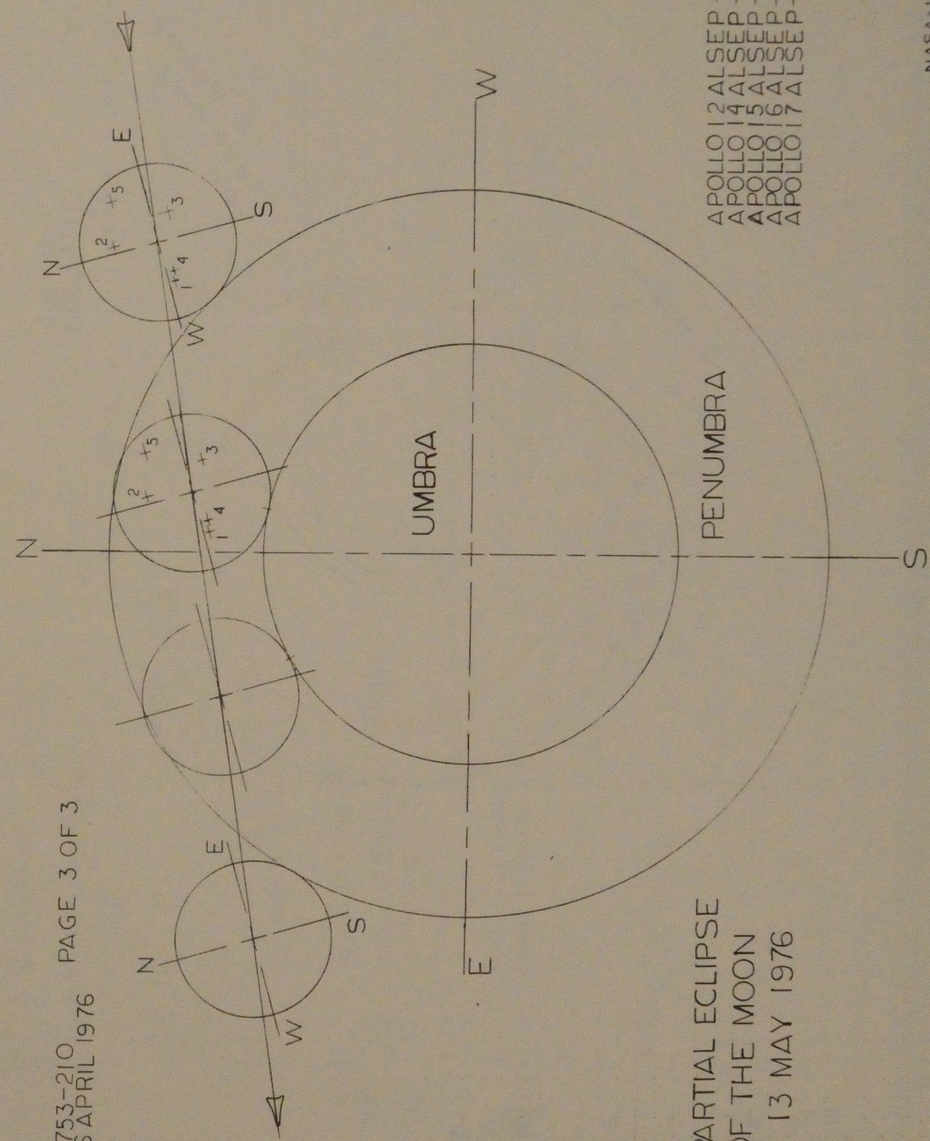
The end of the umbral phase will be visible in Australia, except the eastern part; Africa; Antarctica; the Indian Ocean; Asia, except the northeastern part; Europe, except the northwestern part; the South Atlantic Ocean; and the extreme northeastern part of South America.

All ALSEPs will experience only the penumbral phase of the eclipse. A summary of entry and exit of the penumbral phase are presented in the lunar events on page 2.

Ted A. Breezy

Ted A. Breezy

cc: TDX Standard
B. J. Rusky



Internal
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Ted A. Breezy

Ted A. Breezy

cc: TDX Standard
B. J. Rusky

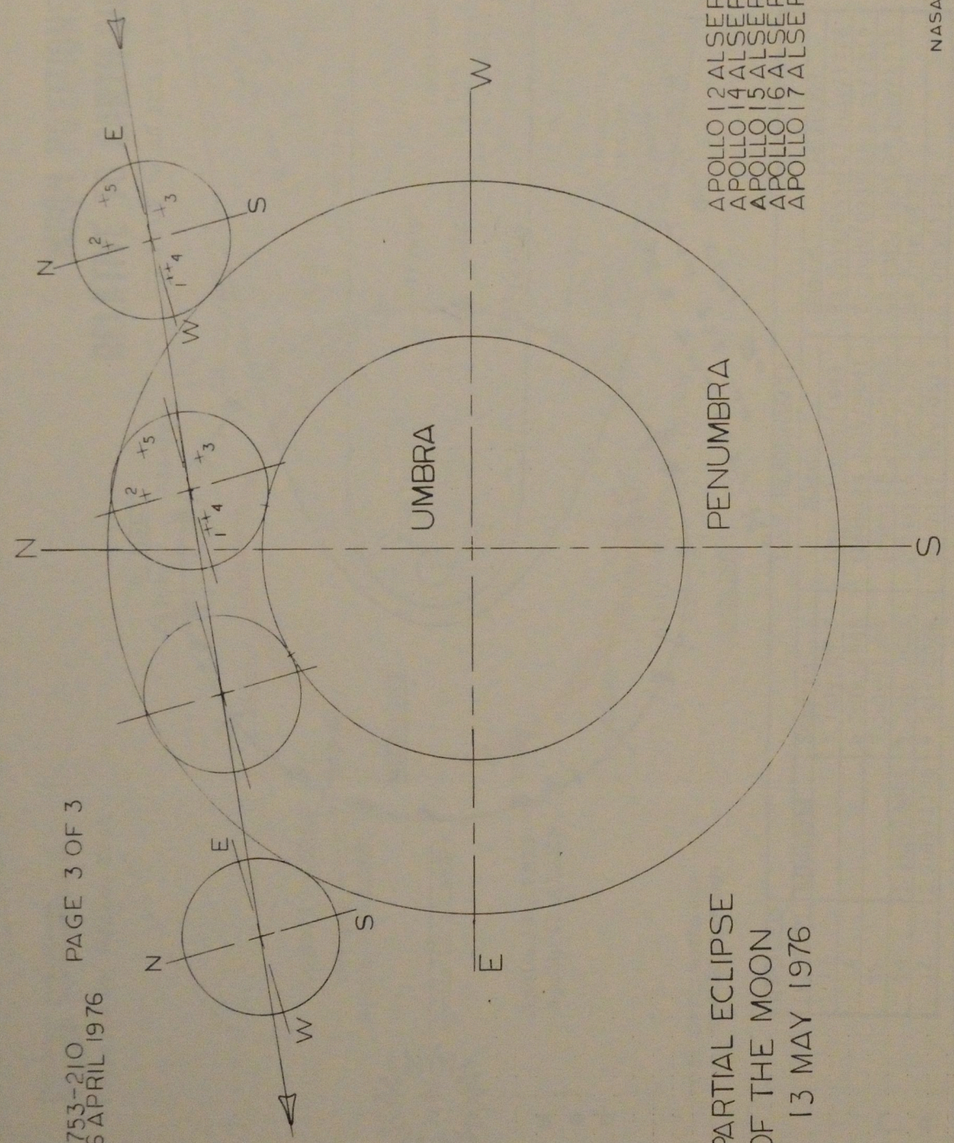
May 13, 1976

LUNAR EVENTS

	CDT	GMT
Moon enters penumbra	13/1247	13/1747
Moon enters umbra	13/1417	13/1917
Middle of eclipse	13/1455	13/1955
Moon exits umbra	13/1534	13/2034
Moon exits penumbra	13/1703	13/2203
Duration of eclipse (hrs + mins)	(4+16)	
Magnitude of eclipse	(0.128)	

ALSEP EVENTS (CDT - TIMES APPROXIMATE)

EVENT	ALSEP 1	4	3	2	5
Enters penumbra	13/1310	13/1313	13/1337	13/1355	13/1414
Leaves penumbra	13/1645	13/1650	13/1716	13/1629	13/1655
Penumbral duration (hrs + mins)	3+35	3+37	3+39	2+34	2+41

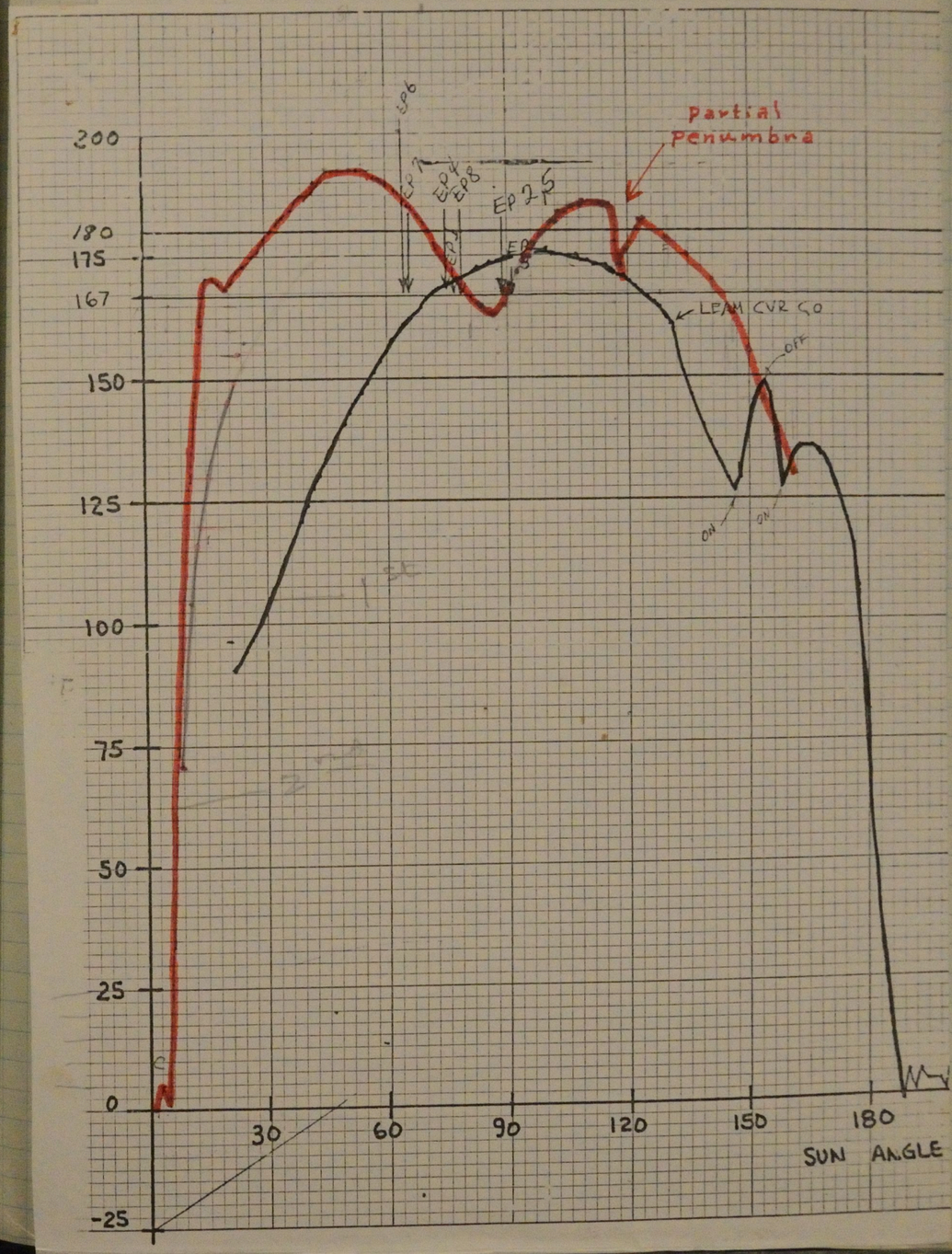


APOLLO 12 ALSEP-1
APOLLO 14 ALSEP-4
APOLLO 15 ALSEP-2
APOLLO 16 ALSEP-3
APOLLO 17 ALSEP-5

NASA-JSC

9753-210
26 APRIL 1976

PARTIAL ECLIPSE
OF THE MOON
13 MAY 1976



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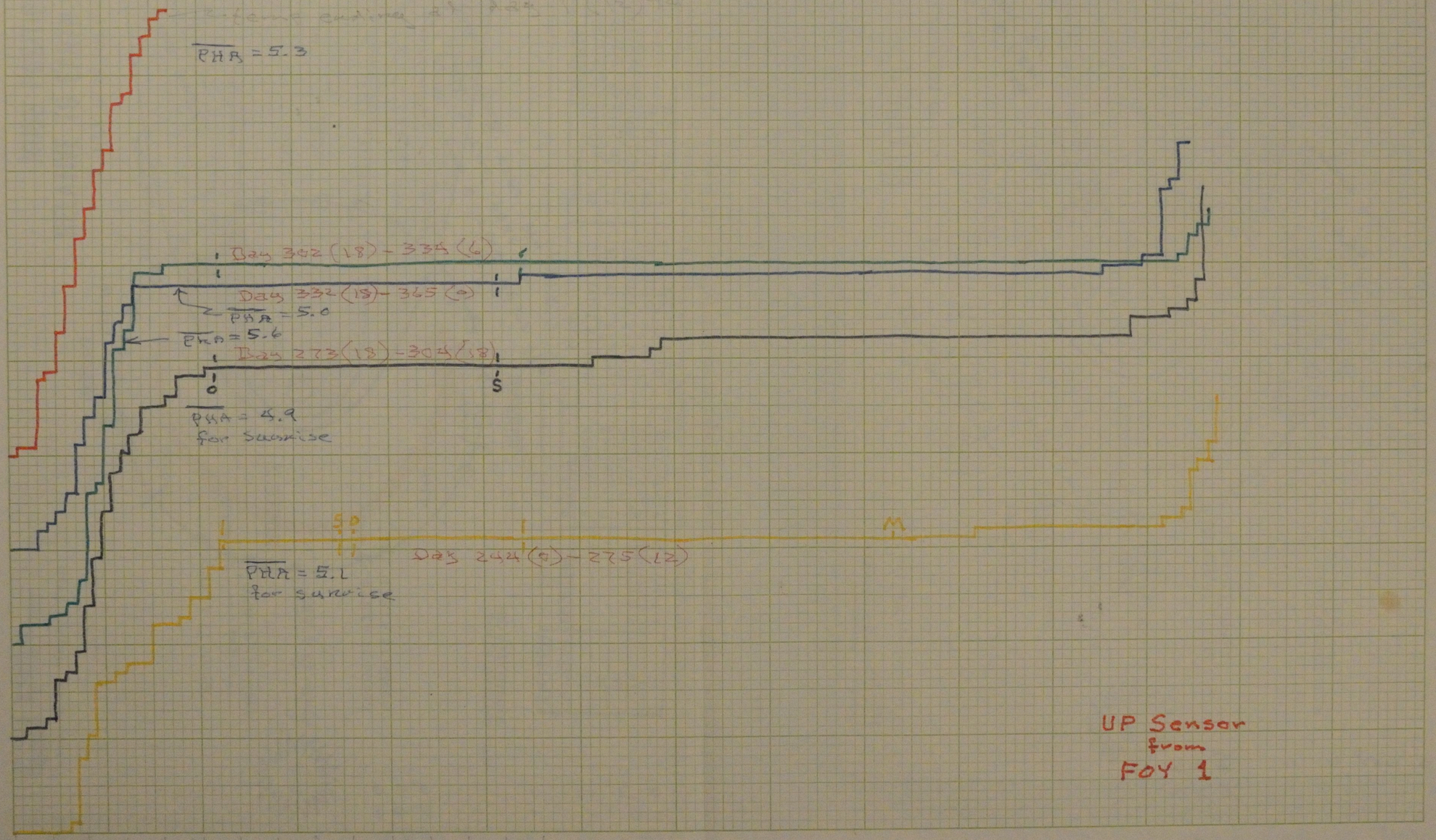
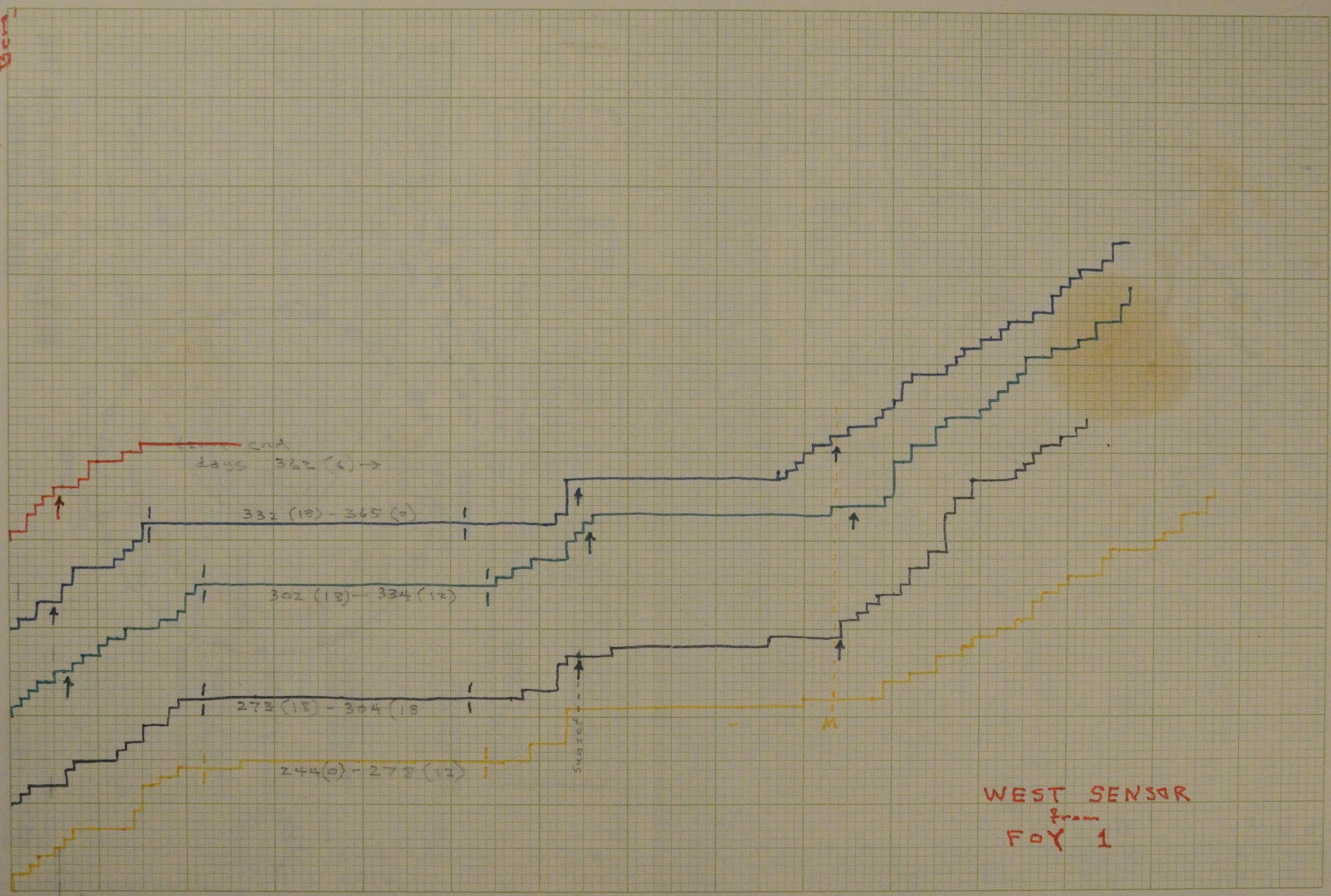
Bear



UP Sensor
from
FOV 1

K&E 10 X 10 TO THE INCH 47 0780
10 X 10 INCHES
KEUFFEL & ESSER CO.

5/10/74 Beam



WEST SENSOR
from
FOV 1

10 X 10 TO THE INCH 47 0780
KEUFFEL & ESSER CO.

5/10/

Cent End days 362 (2)

$\overline{PHA}$ = 5.3

332 (18) - 365 (0)

$\overline{PHA}$ = 5.3

302 (18) - 334 (0)

$\overline{PHA}$ = 5.1

Day 273 (18) - 304 (18)

$\overline{PHA}$ = 5.5

Day 244 (0) - 275 (18)

$\overline{PHA}$ = 4.5
(at Sunrise)

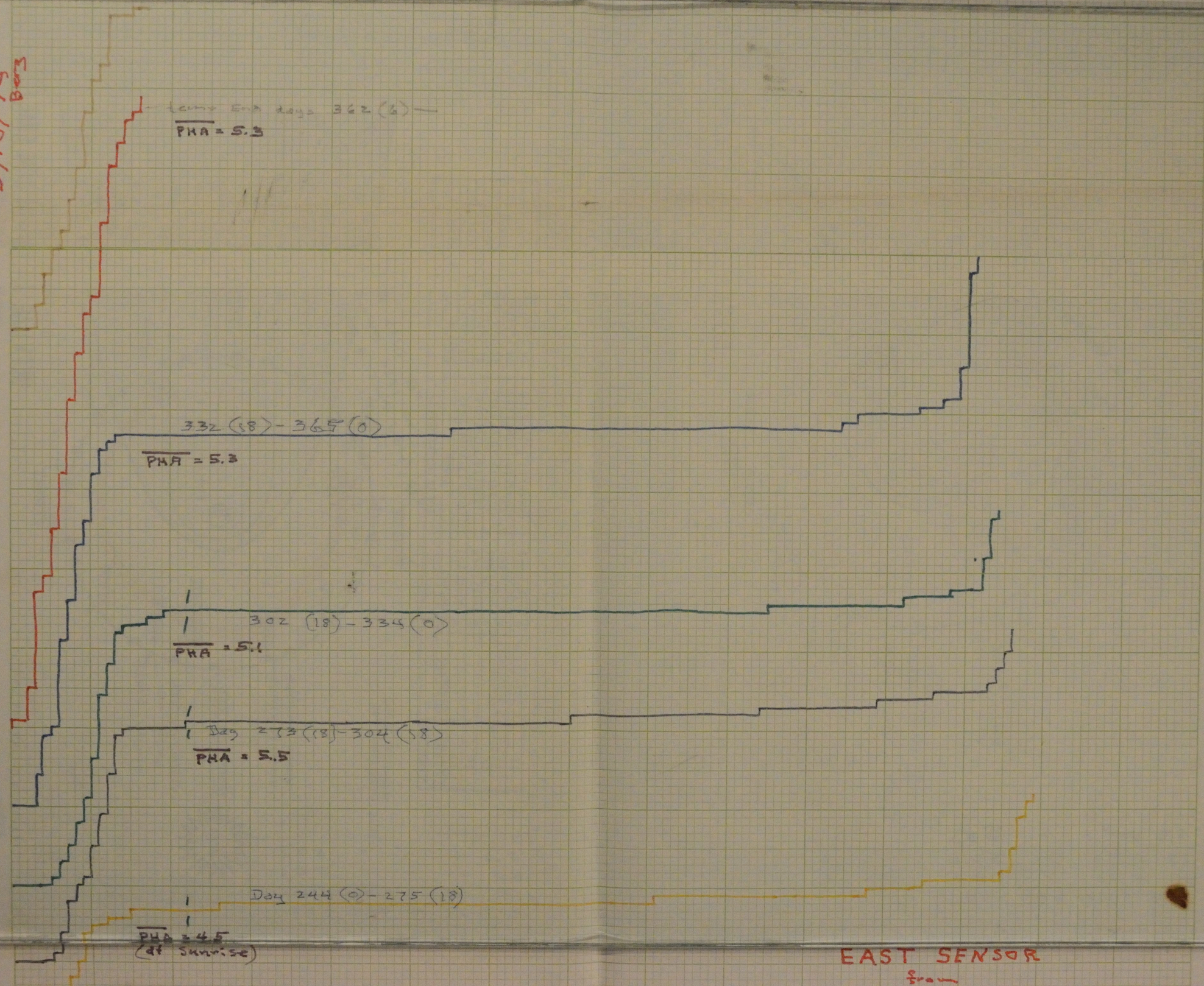
EAST SENSOR
from
FOY 1

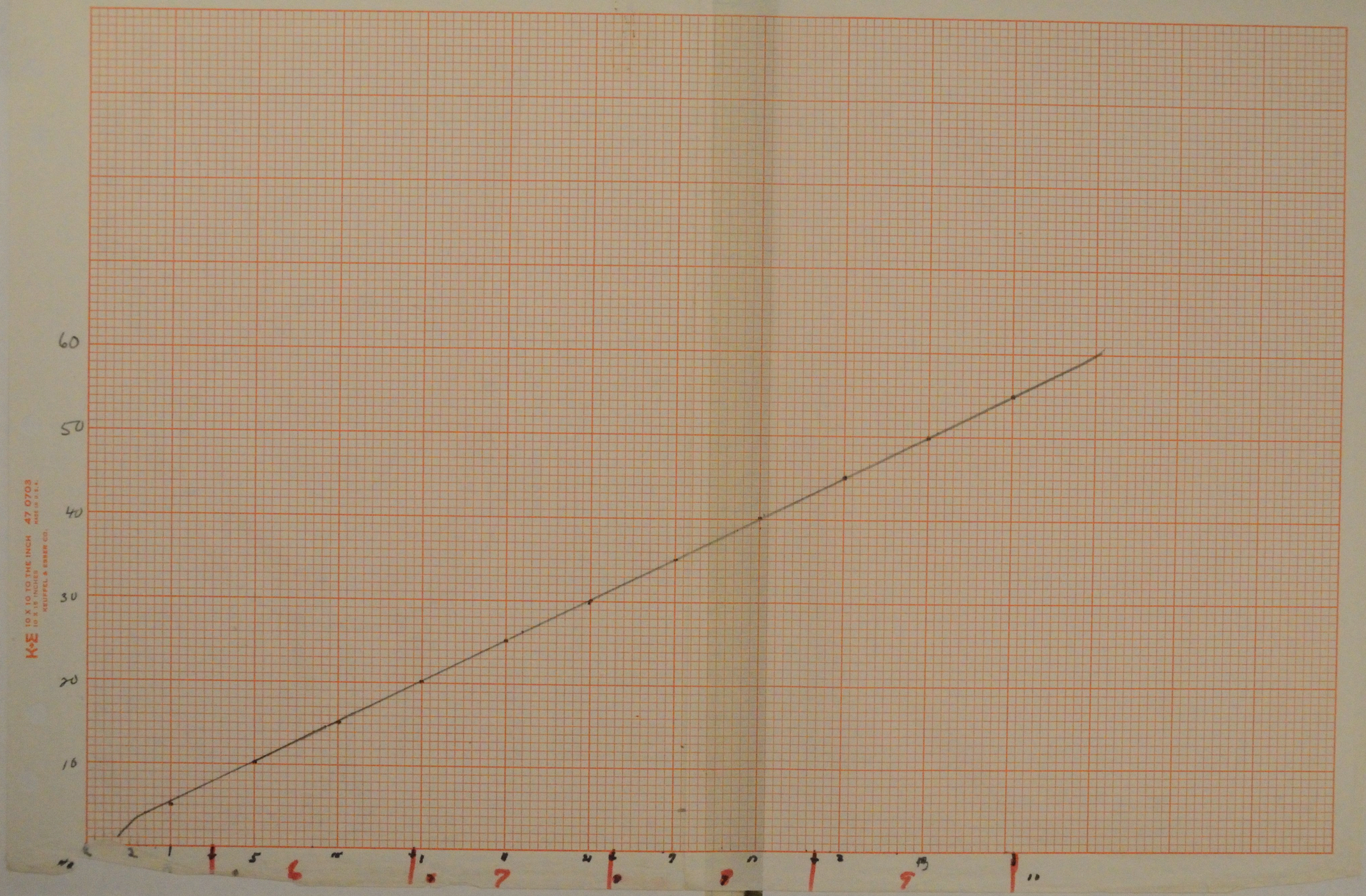
Integrating number of events

10 20 30 40 50 60 70 80 90 100 110 120

Number of 6-Hour Periods

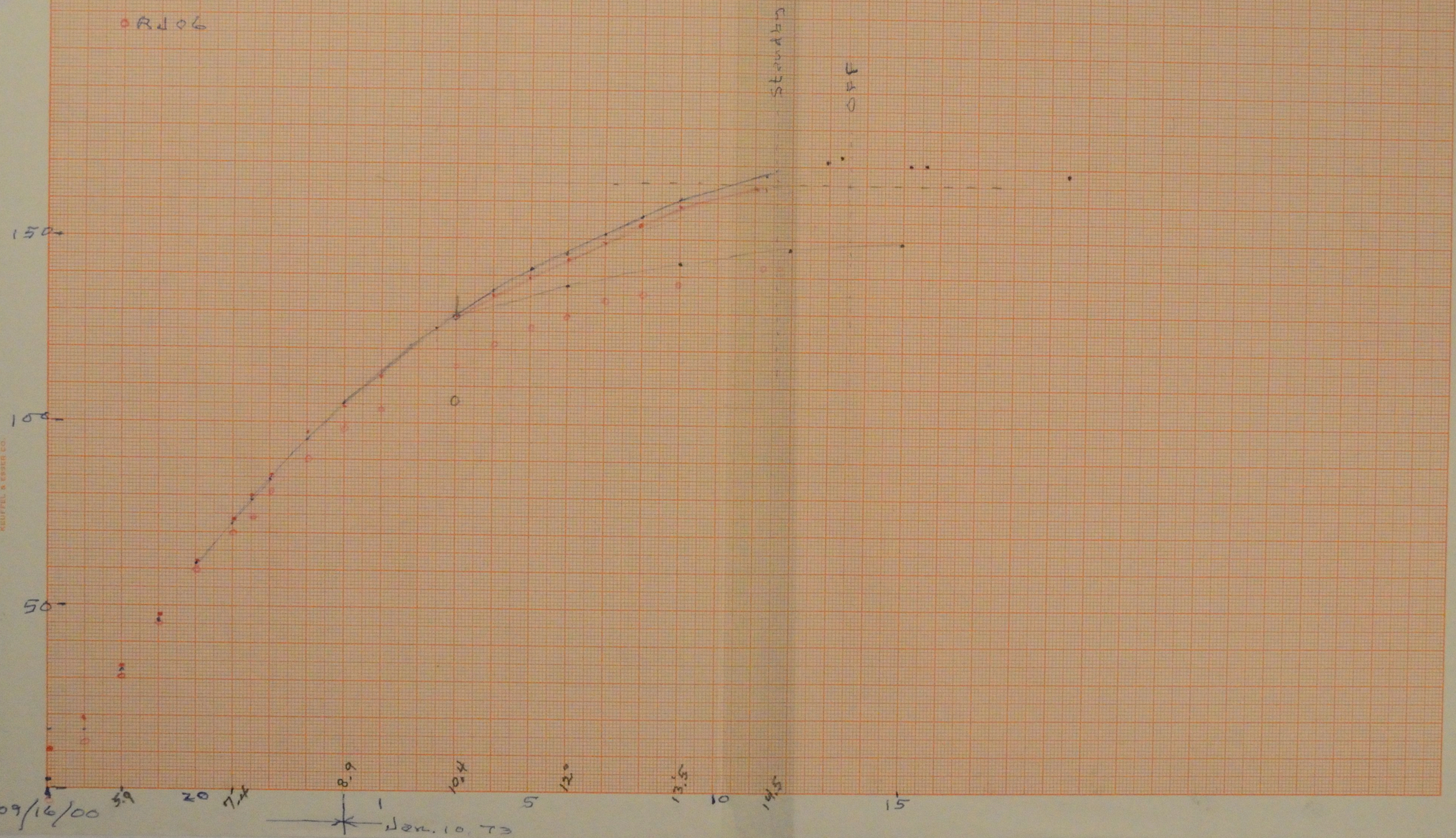
K&E 10 X 10 TO THE INCH 47 0780
10 X 10 INCHES
KEUFFEL & ESSER CO.
MADE IN U.S.A.


5/10/74
Box 3
Integrating number of events
Temp End days 362 (6)
PHA = 5.3
332 (18) - 365 (0)
PHA = 5.3
302 (18) - 334 (0)
PHA = 5.1
Day 273 (18) - 304 (18)
PHA = 5.5
Day 244 (0) - 275 (18)
PHA = 4.5
(at Sunrise)
EAST SENSOR
from


60
50
40
30
20
10
K+E 10 X 10 TO THE INCH 47 0703
KEUFFEL & ESSER CO.

LEAM Temperatures on First "Dawn"
Jan 9, 1973 1600 hrs GMT

- Ad 11
- Ad 09
- Ad 06



K+E 10 X 10 TO THE CENTIMETER 47 1513
20 X 25 CM
KEUFFEL & ESSER CO.

LEAM — Otto Berg 1/12/72 (2)

Counts/day on 10 cm × 10 cm

Momentum Threshold (dyne sec)	0≤V<100 (V in m/sec)	100≤V<250 (V in m/sec)	250≤V<1000 (V in m/sec)	Total (Counts/day)
10^{-5}	0.9	11	6	18
2×10^{-5}	0.6	4	2.7	7
10^{-4}	0.3	1.1	0.6	2
10^{-3}	0.07	0.09	0.035	0.2
10^{-2}	0.007	0.009	0.002	0.02
10^{-1}	0.0007	0.0009	0.0001	0.002

$M_{1/2} \simeq 6\times10^{-5}$ gm

Note: uncertainty of prediction increases as the momentum threshold becomes smaller. Factors of 5–10 should be expected (at least).

The above table does not account for any sheilding, either by parts of the LEAM itself or by the lunar surface. Also important is the fact that most of the ejecta is ejected at angles greater than 45° to the horizontal. Hence a horizontal plate is more efficient at seeing secondaries (as well as primaries) than is a plate whose face is at 90° relative to the lunar surface.

The above are cumulative counts. To get counts in some interval, subtract all counts below that interval.

LEAM 1/12/72 (1)

Otto:

The attached table gives the total number of lunar secondary ejecta particles whose momenta exceed some threshold value that would be expected to strike a flat plate 10 cm × 10 cm in dimension per day.

I used Figure 3 (page 20) of my paper entitled "The problem of secondary ejecta near the lunar surface" to obtain the results. The following effective velocities were used for the velocity intervals listed in Figure 3:

$V_1 = 50$ m/sec for interval $0 \le V < 100$

$V_2 = 150$ m/sec for interval $100 \le V < 250$

$V_3 = 400$ m/sec for interval $250 \le V < 1000$

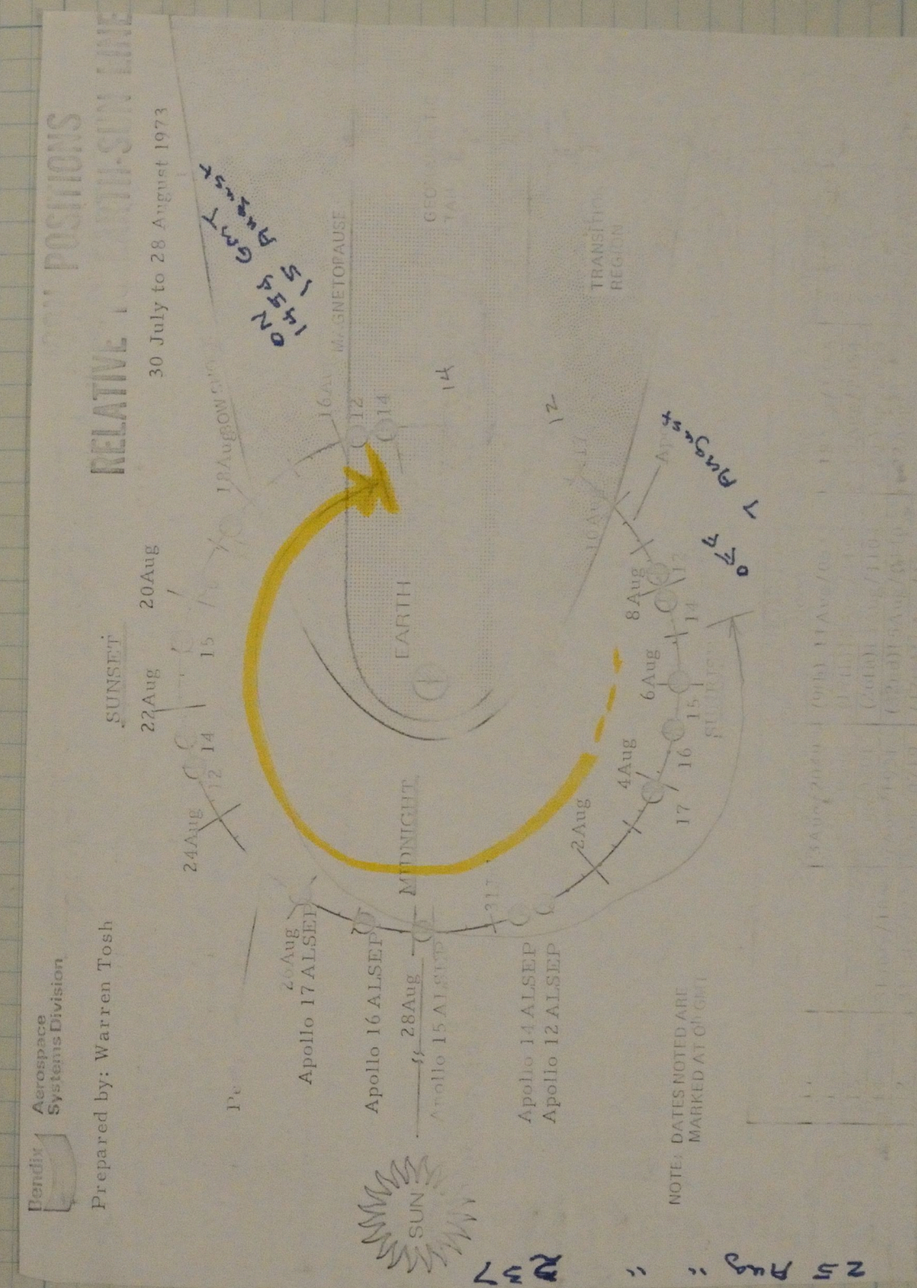
Also as I had used 30 km/sec as the impacting primary average meteoroid velocity in that paper and as the actual average velocity is nearer 15 km/sec, I shifted the horizontal axis in Fig. 3 by 0.6 (= log 4).

Herb Zook

SUNRISE 0953 JULY 5 electronics ↓ 40 from A511

TEMP	SUN ANGLE		TIME GMT	DAY		
-17.4	(4)	3.5	1616	186	~~185~~	July 5th
114.0	(14)	13°	1217	187	~~186~~	6"
155.5	(26)	26°	1305	188	~~187~~	7"
176.0	(38.5)	38°	1449	189	~~188~~	8"
177.5	(39.8)	39°	1652	189	~~189~~	8"
179.5	(40.5)	40°	OFF 1737	189	~~189~~	8"
165.2	(50)	49.5		1311		190 9th
166.3	(50.5)	50	ON	1359		
166.3	(50.5)	50.5		1409		

5 July is day 186
12 " " " 193



3 Aug is day 215
11 " " " 223
18 " " " 230
25 Aug " " 237

RHEE

Forces acting on a 5 μ size particle

1. solar gravity — 1.16×10^{-10} dynes
2. earth — 5.3×10^{-11} dynes
3. moon — $\boxed{3.32 \times 10^{-8} \text{ dynes}}$
4. Rad Pressure — 9.09×10^{-12} dynes
5. PR drag — 8.9×10^{-16} dynes
6. corpuscular pressure of the sun — 3.34×10^{-15} dynes
7. Electrostatic force — $\boxed{10^{-9} \sim 10^{-8} \text{ dynes}}$ (lunar potential 6 ~ 200 volts)
8. magnetic force — negligible
9. Cohesive force — $\boxed{1.96 \times 10^{-5} \text{ dynes}}$

Electric field needed to lift the particle

$E = 70$ volts/cm

By John Rhee

Van der Waal's Polarization force on a 1 μ Particle is 10^{-12} dynes

See also first 2 cover pages this book for other good Lunar facts

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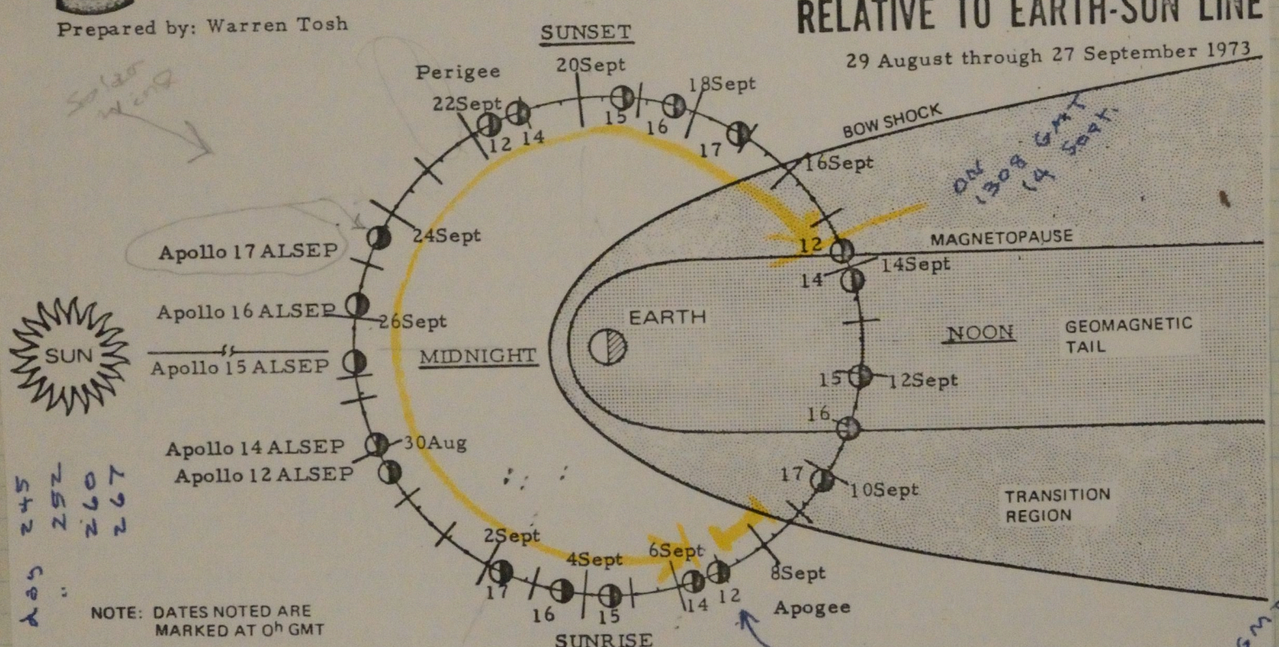
Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

29 August through 27 September 1973



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

APOLLO (ALSEP)	DAY/HOUR (GMT) Midnight	Sunrise	Noon	Sunset	Midnight
17		2 Sept/0813	(10th) 9 Sept/1716	17 Sept/0240	24 Sept/1139
16		3 Sept/1409	(18th) 10 Sept/2318	18 Sept/0842	25 Sept/1735
15		4 Sept/1329	(27th) 11 Sept/2240	19 Sept/0803	26 Sept/1651
14	29 Aug/2214	6 Sept/0700	(33rd) 13 Sept/1620	21 Sept/0134	28 Sept/1019
12	30Aug/0951	6 Sept/1845	(48th) 14 Sept/0400	21 Sept/1230	28 Sept/2156

2 Sept. is day 245
9 " " " 252
17 " " " 260
24 " " " 267

Off 1608 GMT 6 Sept
On 0842 " 7 "
Off 1758 " 8 "

29

El Goresy of MPI – at visit with him on Aug 29, 1973 at Heidelberg.

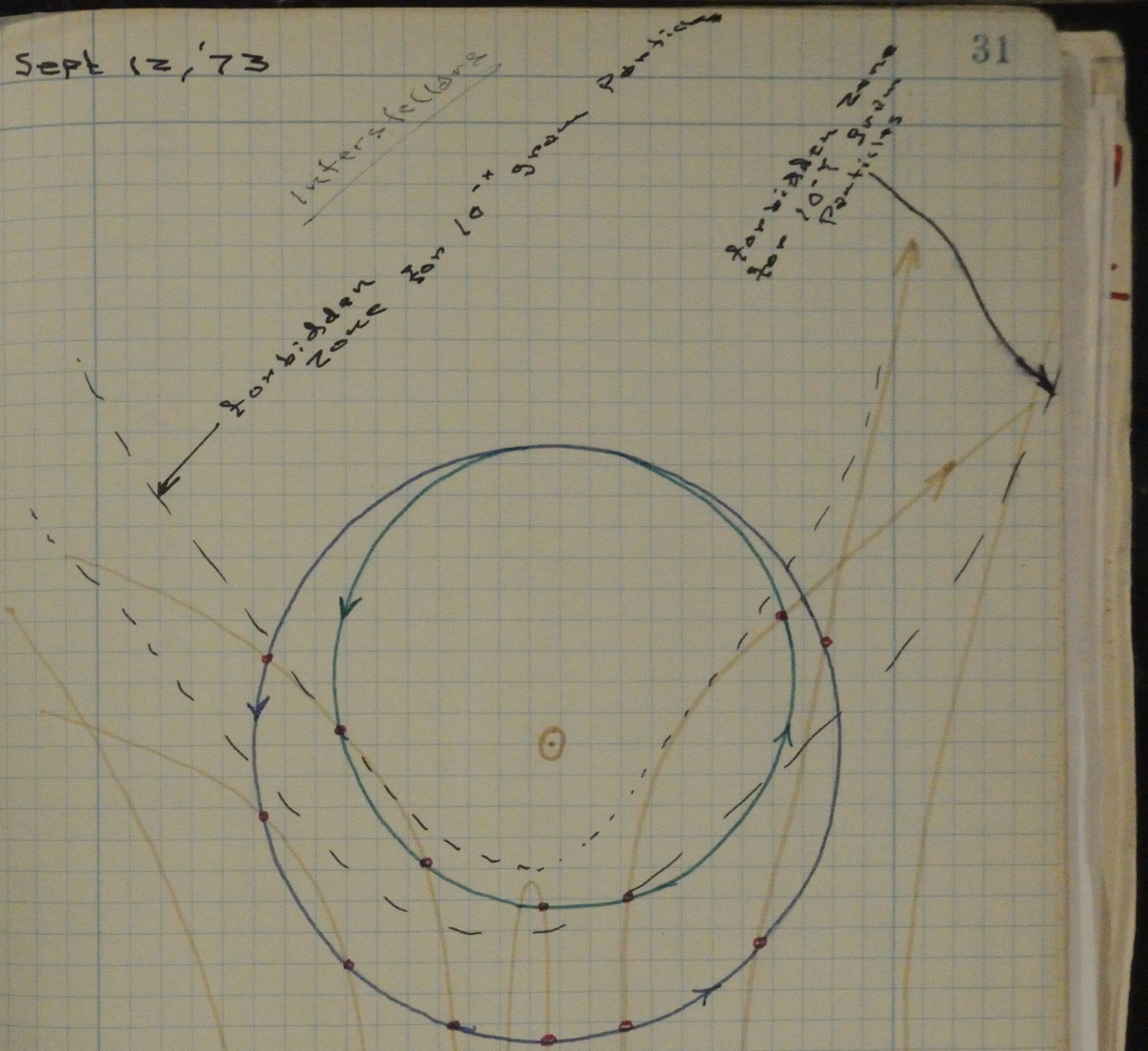
★ "Earth sodium abundance is about 200 P.P.M." (Dr Muller of MPI)

★ Iron carbonyl particles are probably devoid of Na or K because of the method by which they are produced.

★ Lunar soil content of Na and K is 2000 – 5000 PPM.

★ MPI (Hoffman, Grün etc) found that when using pure projectiles & targets the plasma signal was very small or absent none. The plasma pulse is there because of the omni-present Na or K.

For original & complete notes on El Goresy interview see page 22 of MPI Dissertation of Hans Hoffman recorded MPI ★



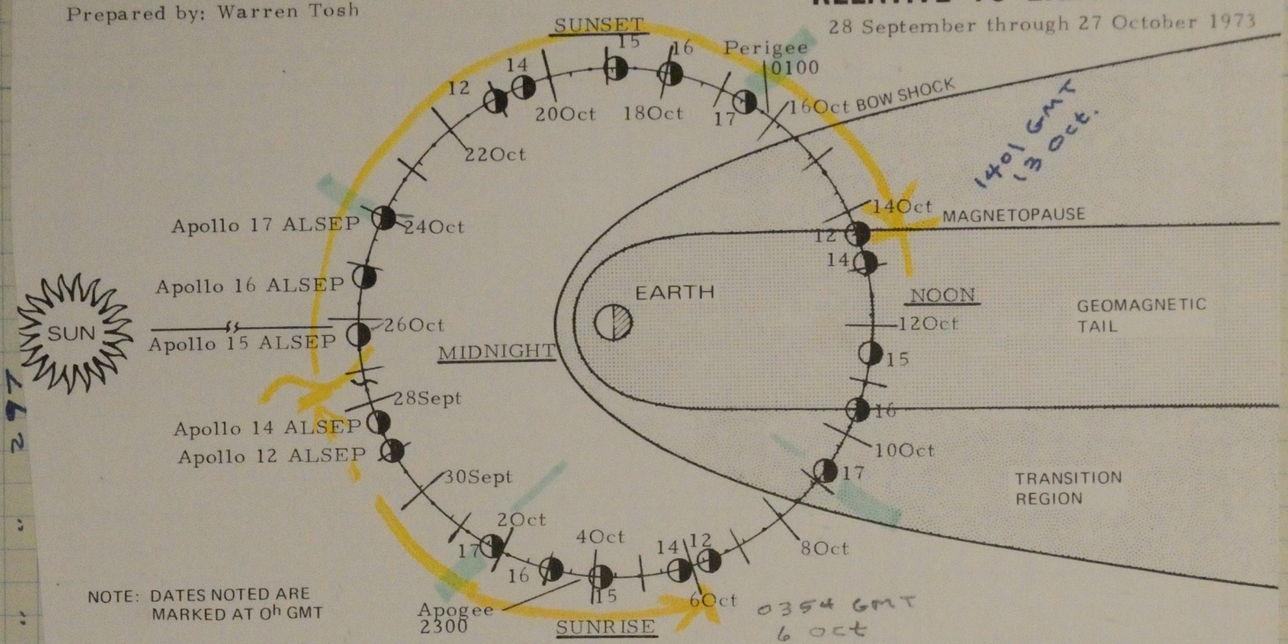
• Determine V_{rel} s/c for different β values

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

28 September through 27 October 1973



NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR (GMT)				
	Midnight	Sunrise	Noon	Sunset	Midnight
17		1 Oct/2024	(11th)9 Oct/0540	16 Oct/1520	24 Oct/0033
16		3 Oct/0222	(19th)10 Oct/1145	17 Oct/2124	25 Oct/0630
15		4 Oct/0143	(28th)11 Oct/1110	18 Oct/2046	26 Oct/0549
14	28 Sept/1019	5 Oct/1918	(34th)13 Oct/0453	20 Oct/1421	27 Oct/2320
12	28 Sept/2156	6 Oct/0703	(49th)13 Oct/1639	21 Oct/0116	28 Oct/1058

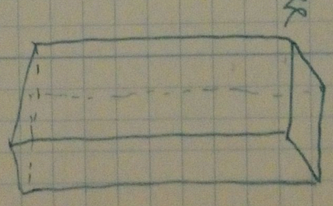
Dawn to Dawn 29 days 11 minutes

1 Oct 24 hrs
2 " 24 hrs
3 " 24 hrs
4 " 24 hrs
5 " 24 hrs
6 " 24 hrs
7 " 24 hrs
8 " 24 hrs
9 " 24 hrs
10 " 24 hrs
11 " 24 hrs
12 " 24 hrs
13 " 24 hrs
14 " 24 hrs
15 " 24 hrs
16 " 24 hrs
17 " 24 hrs
18 " 24 hrs
19 " 24 hrs
20 " 24 hrs
21 " 24 hrs
22 " 24 hrs
23 " 24 hrs
24 " 24 hrs
25 " 24 hrs
26 " 24 hrs
27 " 24 hrs
28 " 24 hrs
29 " 24 hrs
30 " 24 hrs
31 " 24 hrs

Oct 24, 1973

On the Prob Distribution of LEAM Data as Compared to Pioneer

* When we 10^5 atoms/cm^3 on the lunar surface in daytime
* the scale height on the moon is 5 Km (5×10^6 cm)
∴ a 1 cm^2 diameter particle with integral: $(10^5)(5 \times 10^6)(10^{-8})$ atoms as it impacts the moon (assumed 10^{-8} in front-rear-torial area & particle)
or
5×10^3 atoms



John Freeman suggests that the radiation may account for the apparent absence of alpha particles on LEAM.

John W. Freeman
Dept of Space Physics and Astronomy
Rice University
Houston, Texas 77001

also
H. Kent Hills
is with Lockheed also.

Question - what is interaction effect of such a mechanism?

How much is the particle slowed down or what percent of its K.E. is removed?

Does particle achieve a + ve -

charge as it passes through the lunar atmosphere?

Experiment - what charge & how much charge does a particle take on as it impacts into Good atoms

Question: Are the atoms He, argon, or what is average mass encountered.

Scale Height H =

$$\frac{KT}{mg}$$

where K = Constant ≥

T =

m = atomic mass of atoms

g = lunar gravity

Does the charge developed on the particle enable or desensitize the sensors.

Do experiment!!

TOF Event #1 for LEAM

* 6 June 1973 17 hrs. 47 min. 41 sec.
  (Sunrise 5 June 2259 GMT)
* "A" Film 4; "A" Grid 2; "B" film 4; "B" grid 2
* A Pha — 4 B Pha - 4
* TOF 25
  - 12 Km/sec 10^{-11} grams
* Occured on UP Sensor viewing the Apex Direction

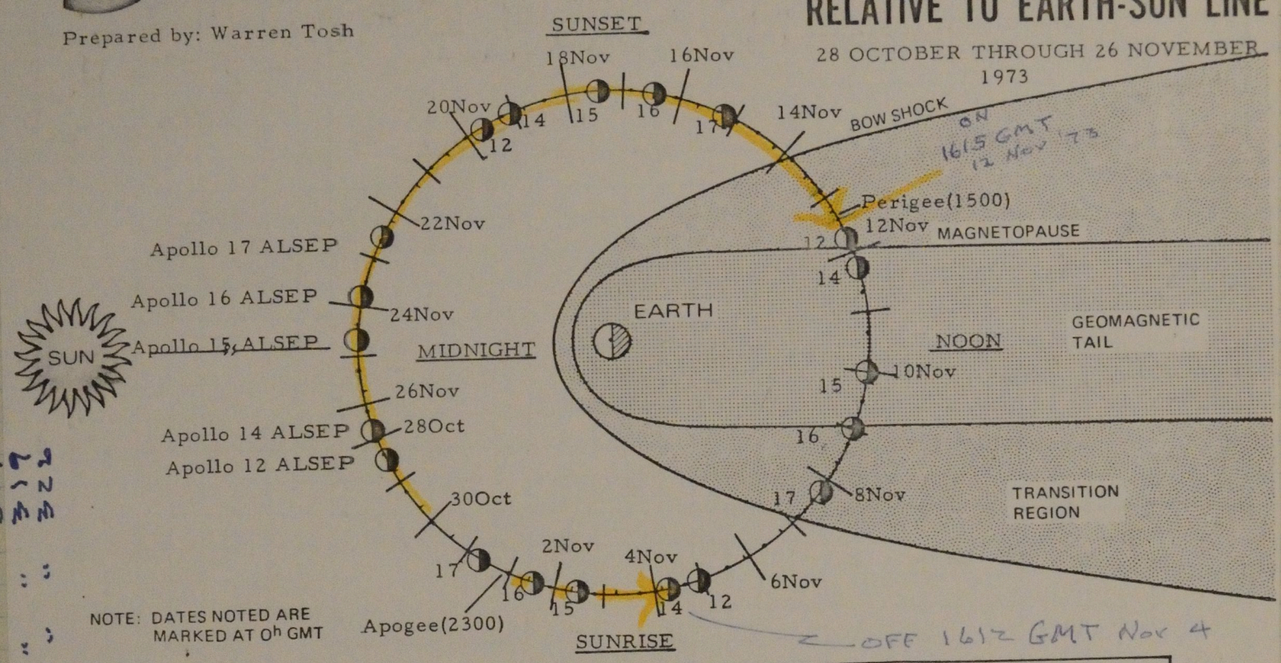
- F.F. Richardson

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

28 OCTOBER THROUGH 26 NOVEMBER 1973



NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR (GMT)				
	Midnight	Sunrise	Noon	Sunset	Midnight
17		31 Oct/0931	(12th) 7 Nov/1901	15 Nov/0455	22 Nov/1419
16		1 Nov/1532	(20th) 9 Nov/0109	16 Nov/1100	23 Nov/2019
15		2 Nov/1454	(29th) 10 Nov/0036	17 Nov/1024	24 Nov/1939
14	27Oct/2320	4 Nov/0832	(35th) 11 Nov/1821	19 Nov/0402	26 Nov/1313
12	28 Oct/1058	4 Nov/2021	(50th) 12 Nov/0602	19 Nov/1454	27 Nov/0052

31 Oct is day 304
7 Nov " " 311
15 " " " 319
22 Nov " " 322

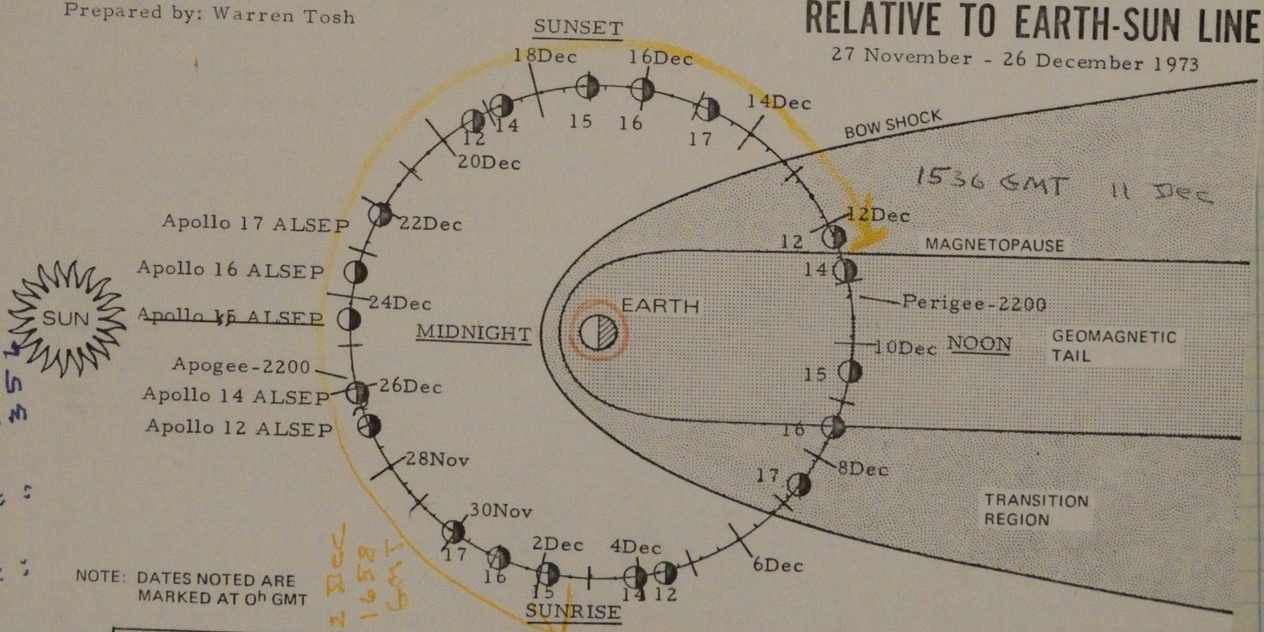
Dawn to Dawn 29 days 13 hrs 7 min.

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

27 November - 26 December 1973



NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR (GMT)				
	Midnight	Sunrise	Noon	Sunset	Midnight
17		29 Nov/2329	(13th) 7 Dec/0910	14 Dec/1913	22 Dec/0445
16		1 Dec/0532	(22nd) 8 Dec/1519	16 Dec/0121	23 Dec/1046
15		2 Dec/0455	(30th) 9 Dec/1448	17 Dec/0045	24 Dec/1007
14	26 Nov/1313	3 Dec/2236	(36th) 11 Dec/0835	18 Dec/1825	26 Dec/0342
12	27 Nov/0052	4 Dec/1029	(51st) 11 Dec/2018	19 Dec/0512	26 Dec/1522

29 Nov is day 333
7 Dec " " 341
14 " " " 348
22 " " " 357

Dawn to Dawn 29 days 9 hrs

Sodium + Potassium
concentration in Lunar Soil

APOLLO 17 site:

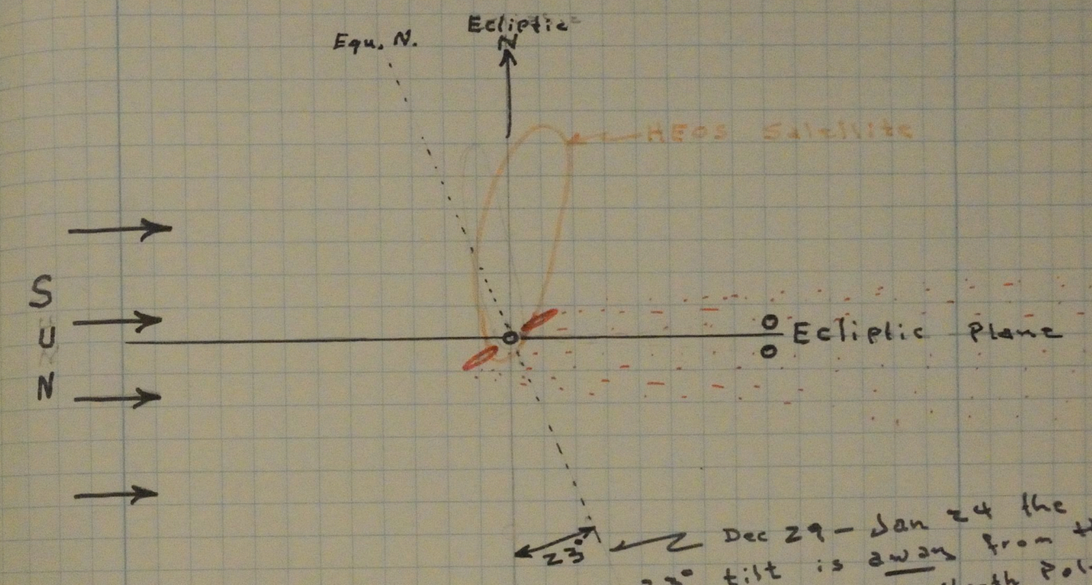
K 0.07% – 0.14%

Na 0.28% – 0.33%

The above values are from Johnson
O'Keefe – from EOS

Dec 4, 73

The Aggson Rings

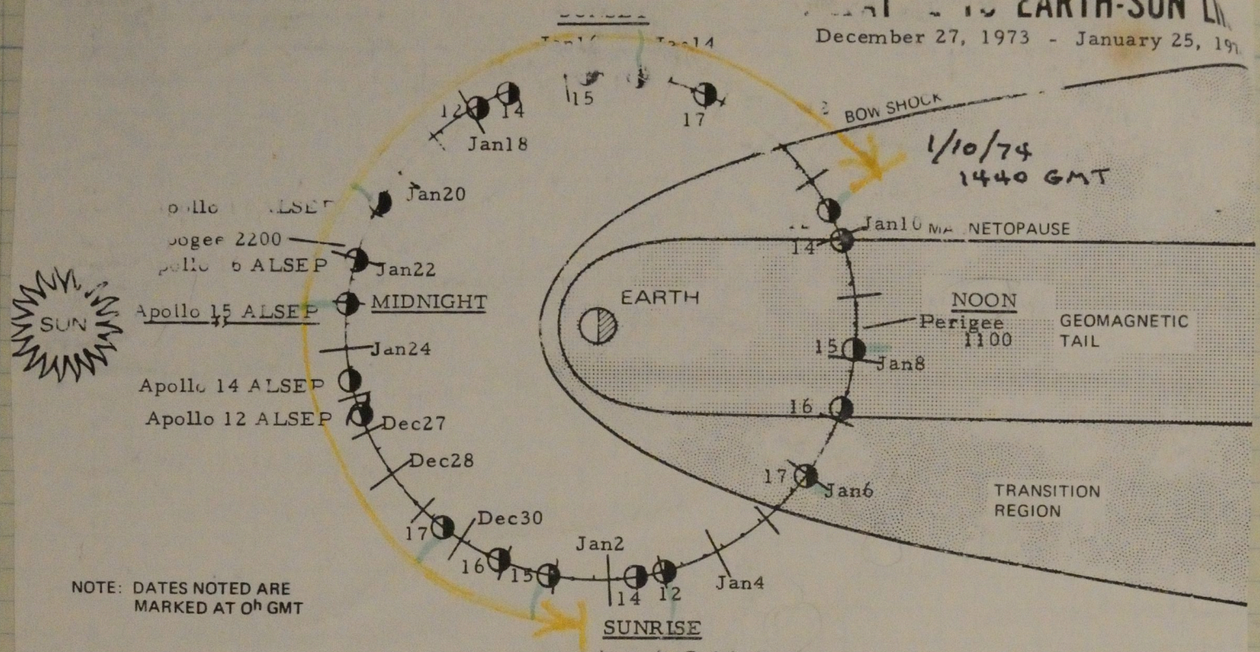


Inclination of Lunar Orbit to Ecliptic = 5° 9'

Bendix

[illegible] POSITIONS
[illegible] EARTH-SUN LI[illegible]

December 27, 1973 - January 25, 19[illegible]



NOTE: DATES NOTED ARE MARKED AT 0h GMT

22 Dec is day 356
29 Dec is " 363 (Dawn)

APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Noon	Sunset	Midnight
17	22Dec/0445	29Dec/1401	(14th)5Jan/2346	13Jan/0952	20Jan/1924
16	23Dec/1046	30Dec/2052	(22nd)7Jan/0556	14Jan/1559	22Jan/0125
15	24Dec/1007	31Dec/1928	(31st)8Jan/0524	15Jan/1524	23Jan/0046
14	26Dec/0342	2Jan/1310	(37th)9Jan/2314	17Jan/0904	24Jan/1821
12	26Dec/1522	3Jan/0109	(52nd)10Jan/1056	17Jan/1945	25Jan/0600

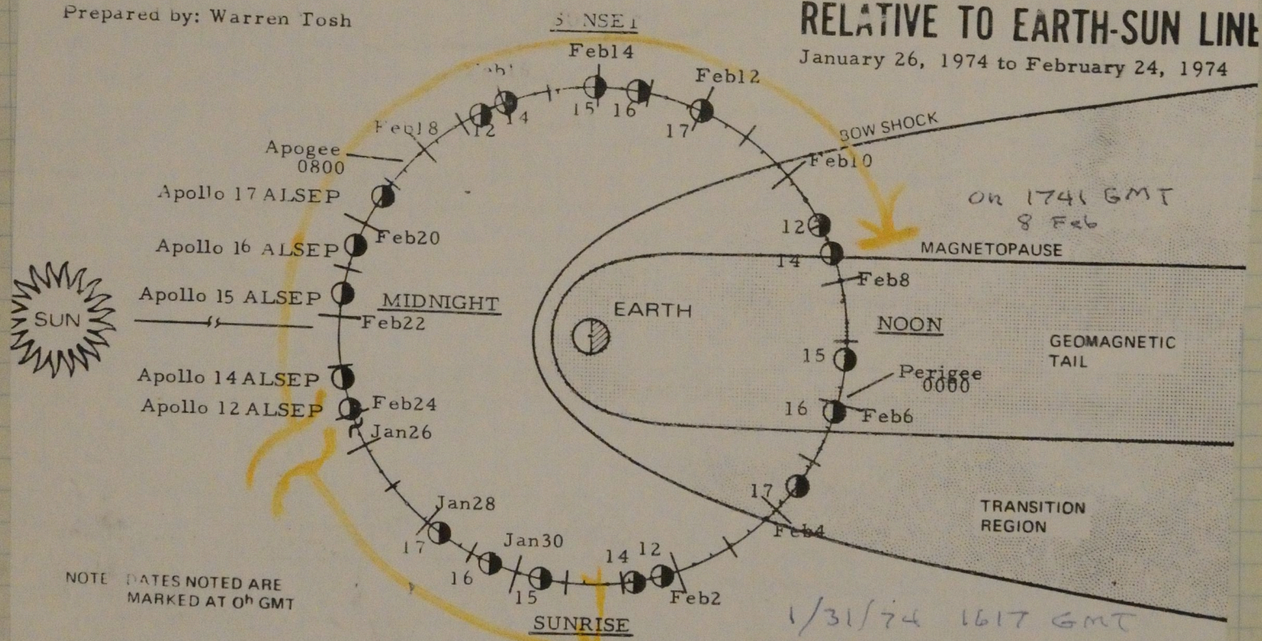
Dawn to Dawn 29 days 14 hrs 32 min

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS
RELATIVE TO EARTH-SUN LINE

January 26, 1974 to February 24, 1974



NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR (GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	20Jan/1924	28Jan/0438	(15)4Feb/1421	20Feb/0020	19Feb/0958
16	22Jan/0125	29Jan/1041	(23)5Feb/2030	13Feb/0626	20Feb/1545
15	23Jan/0046	30Jan/1005	(32)6Feb/1958	14Feb/0550	21Feb/1505
14	24Jan/1821	1 Feb/0346	(38)8Feb/1345	15Feb/2329	23Feb/0838
12	25Jan/0600	1 Feb/1552	(53)9Feb/0128	16Feb/1005	23Feb/2017

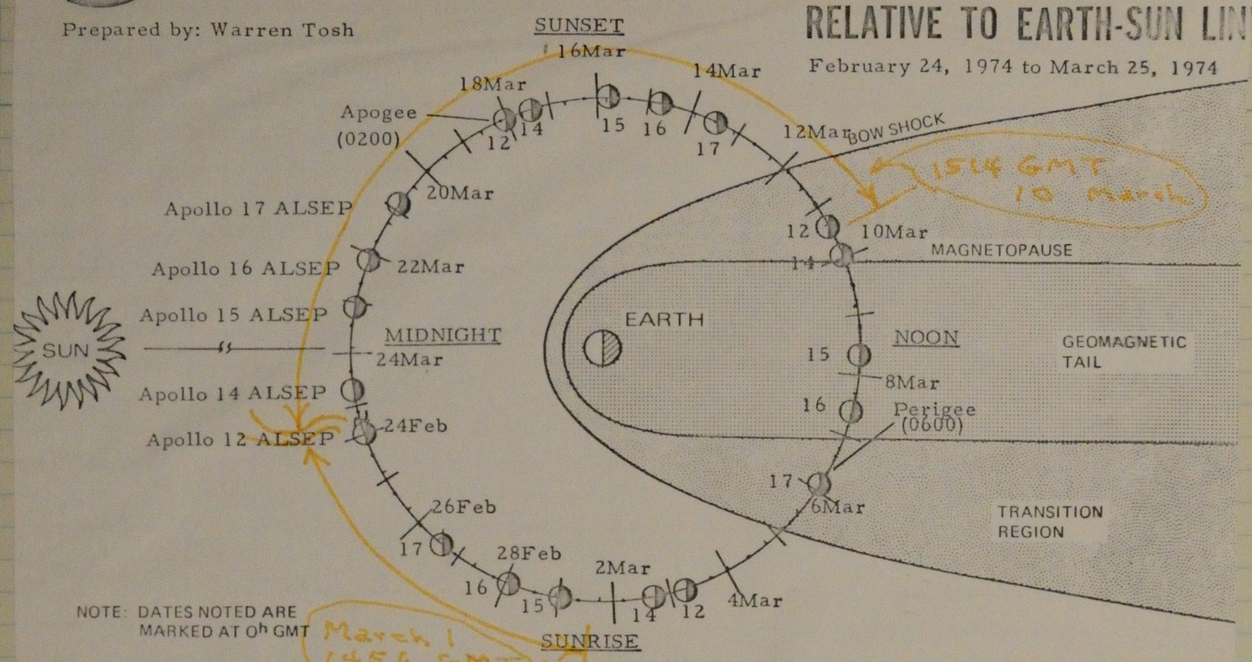
Look for next on Jan 15 1533 GMT

Bendix Aerospace Systems Division

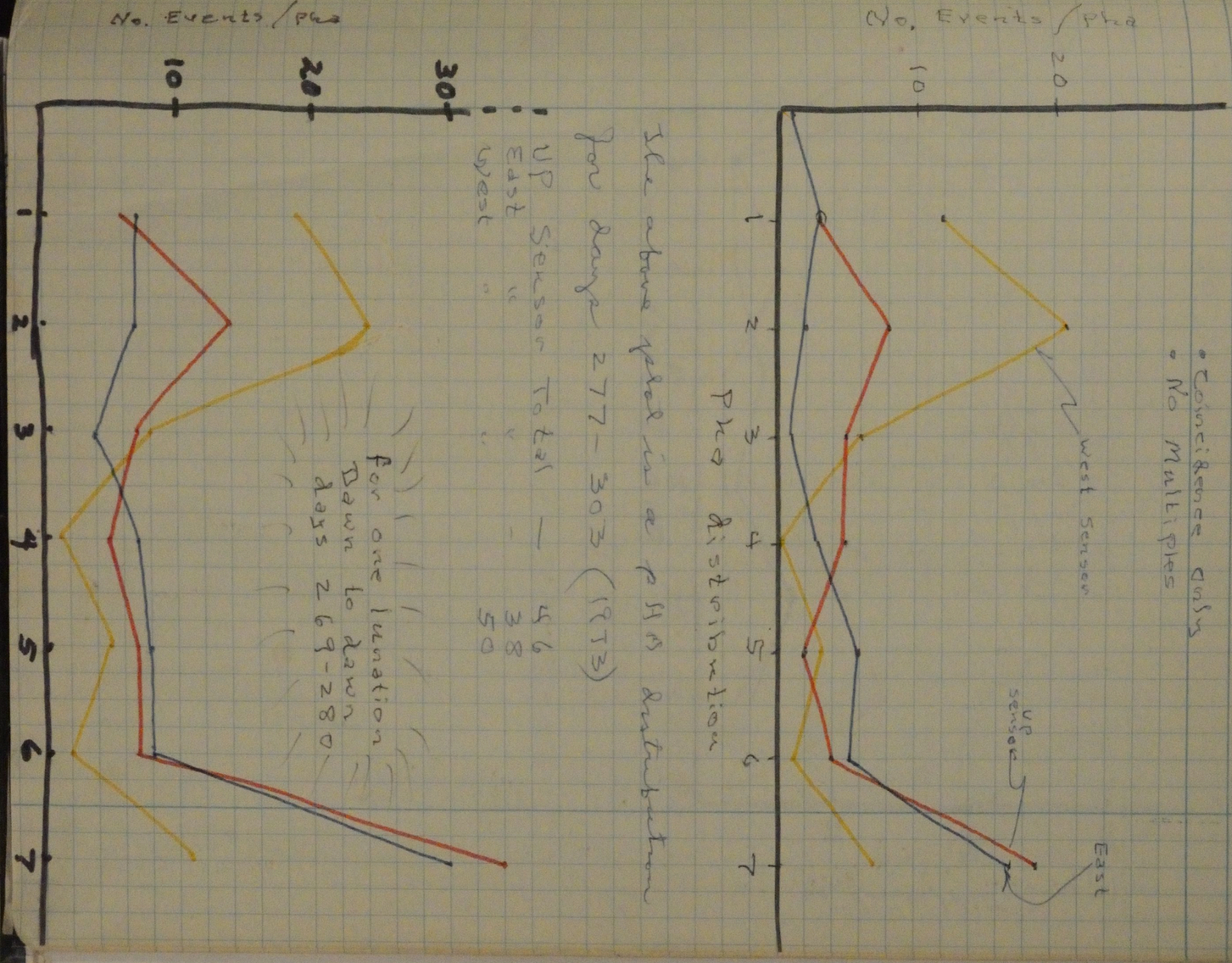
Prepared by: Warren Tosh

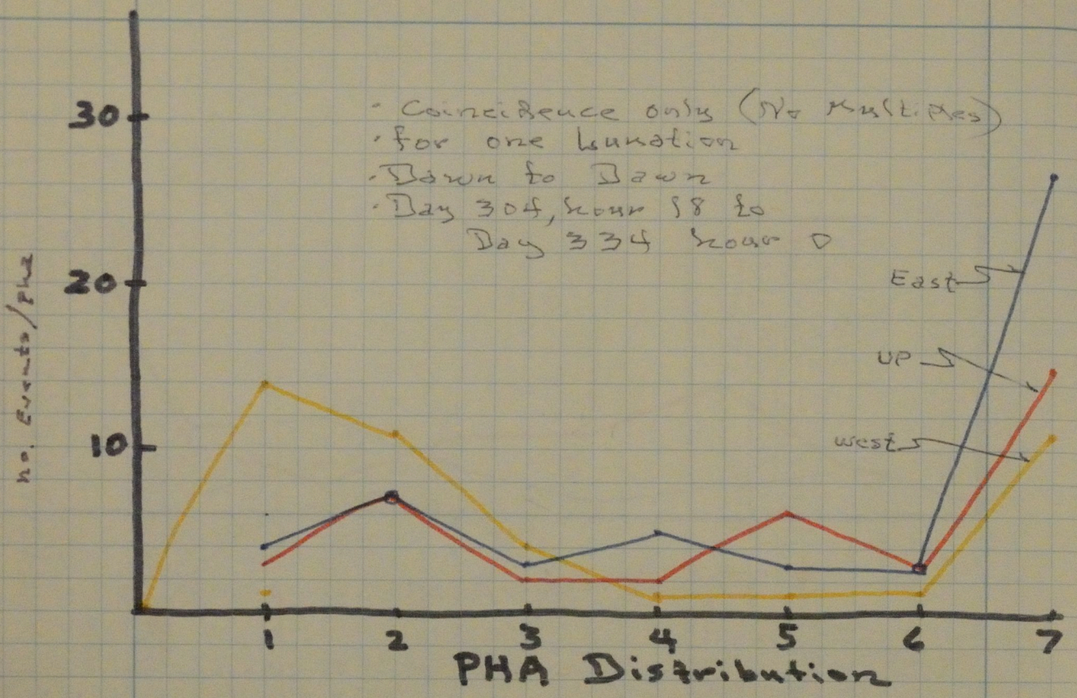
MOON POSITIONS RELATIVE TO EARTH-SUN LIN

February 24, 1974 to March 25, 1974

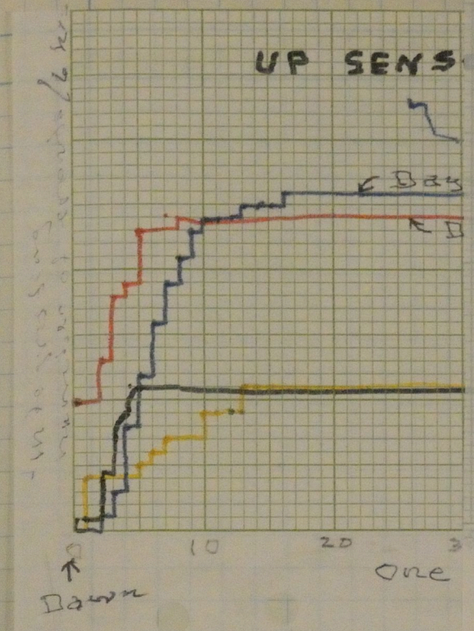


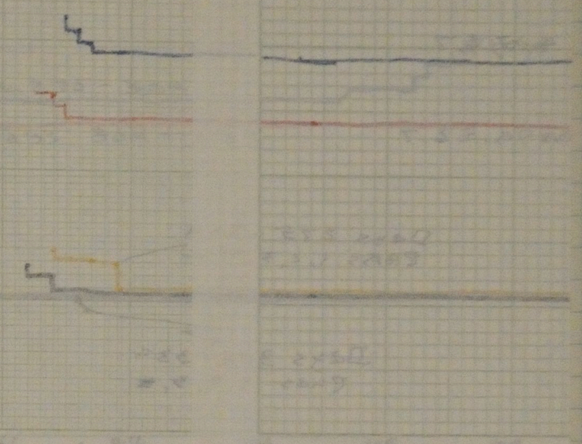
APOLLO (ALSEP)	DAY/HOUR (GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	19Feb/0958	26Feb/1852	(16)6Mar/0424	13Mar/1412	20Mar/2325
16	20Feb/1545	28Feb/0052	(24)7Mar/1031	14Mar/2015	22Mar/0522
15	21Feb/1505	1Mar/0014	(33)8Mar/0958	15Mar/1937	23Mar/0440
14	23Feb/0838	2Mar/1754	(39)10Mar/0342	17Mar/1314	24Mar/2210
12	23Feb/2017	3Mar/0605	(54)10Mar/1524	17Mar/2348	25Mar/0948





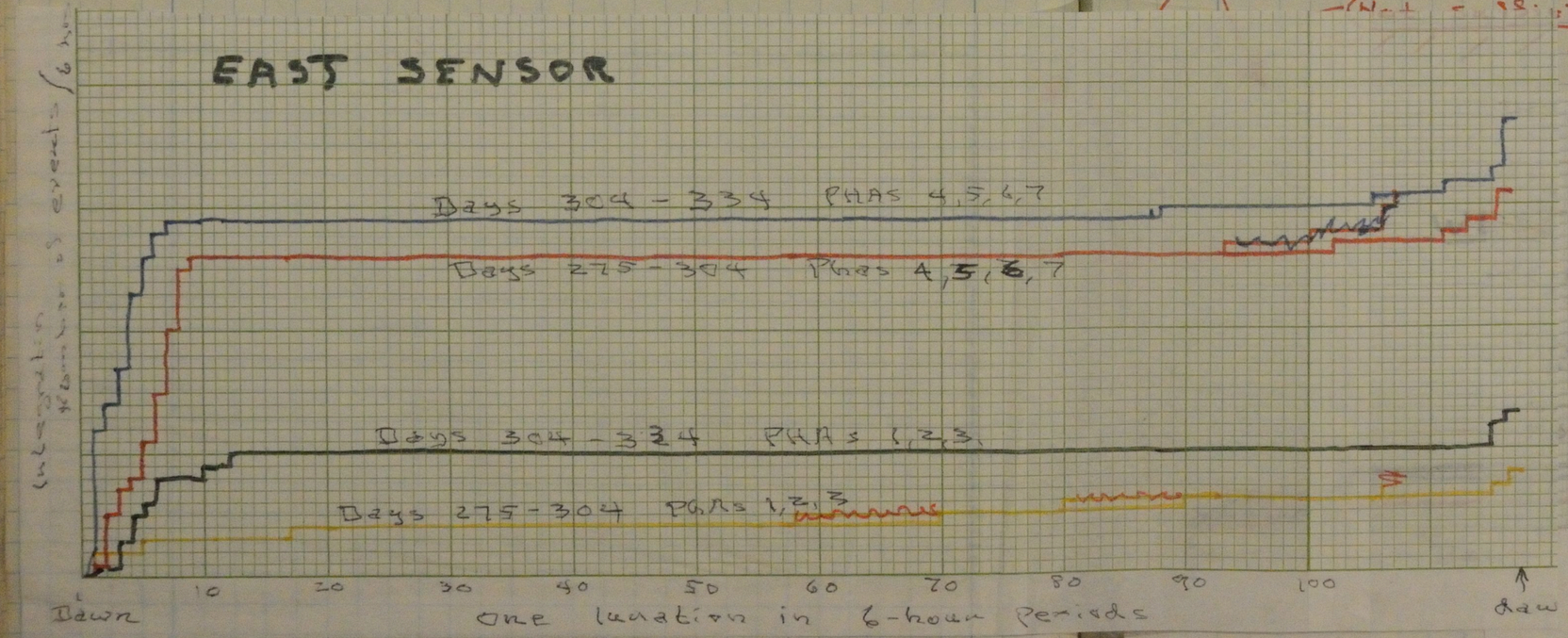
- Coincidence only (No Multiples)
- for one lunation
- Dawn to Dawn
- Day 304, hour 18 to Day 334 hour 0

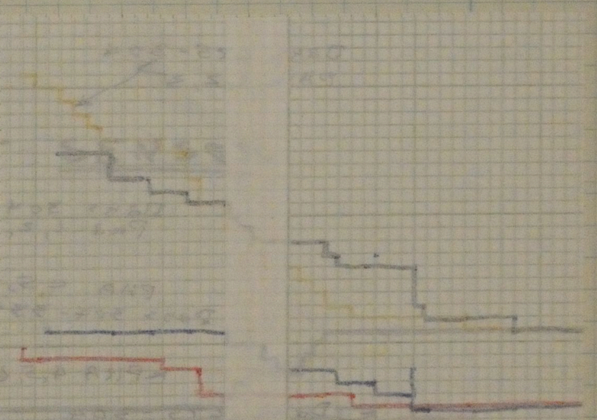


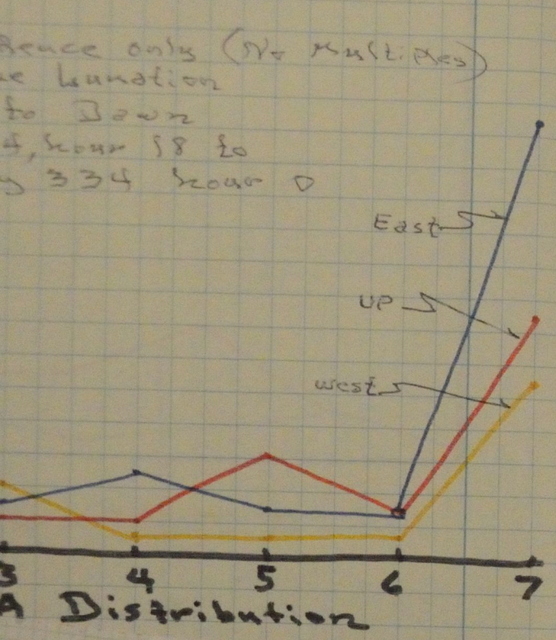


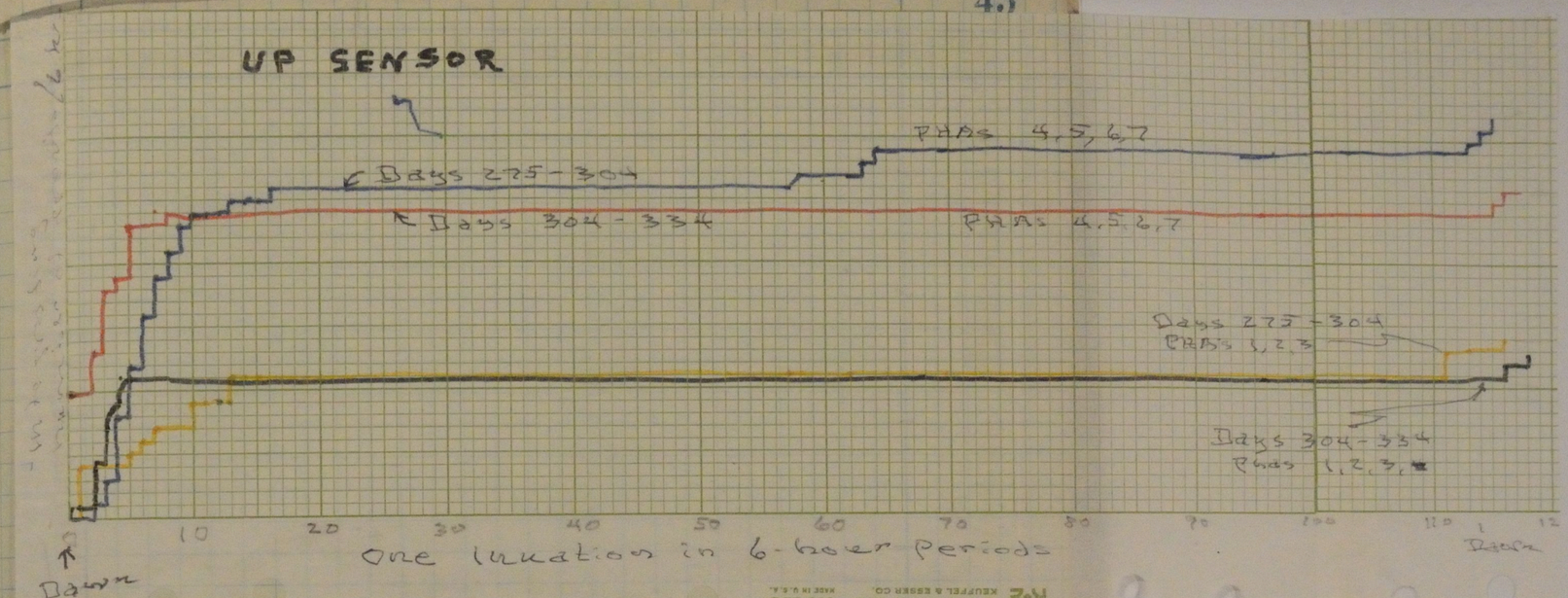
Distribution of coincidence events (no multiples) only versus one lunation.

Not sufficiently accurate to publish



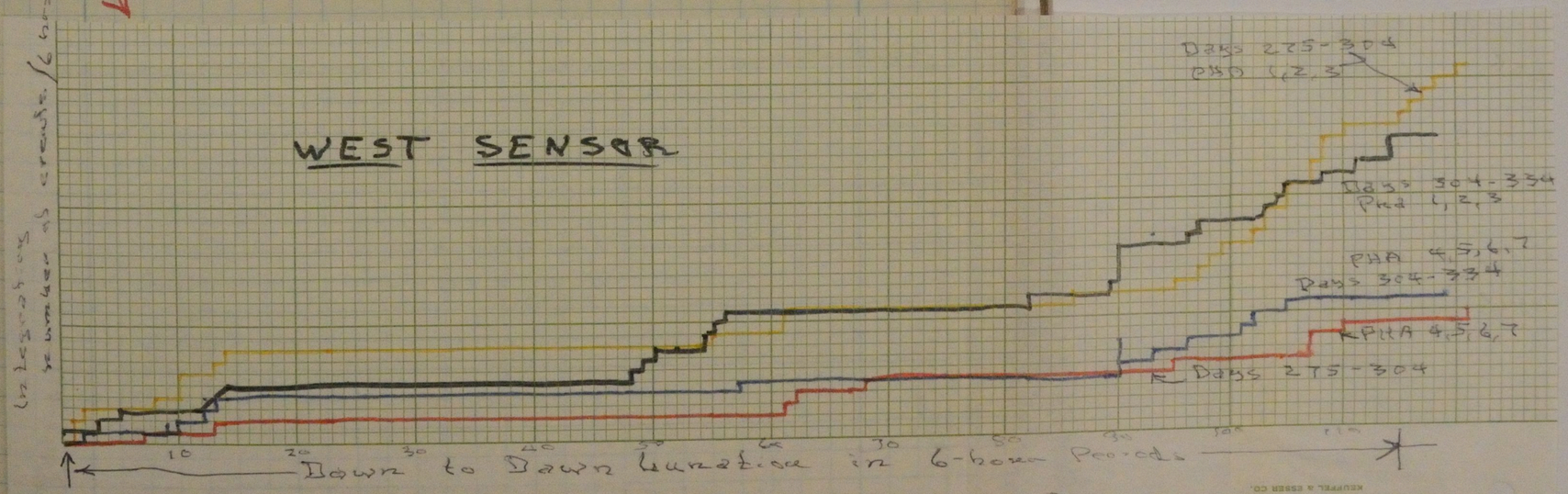






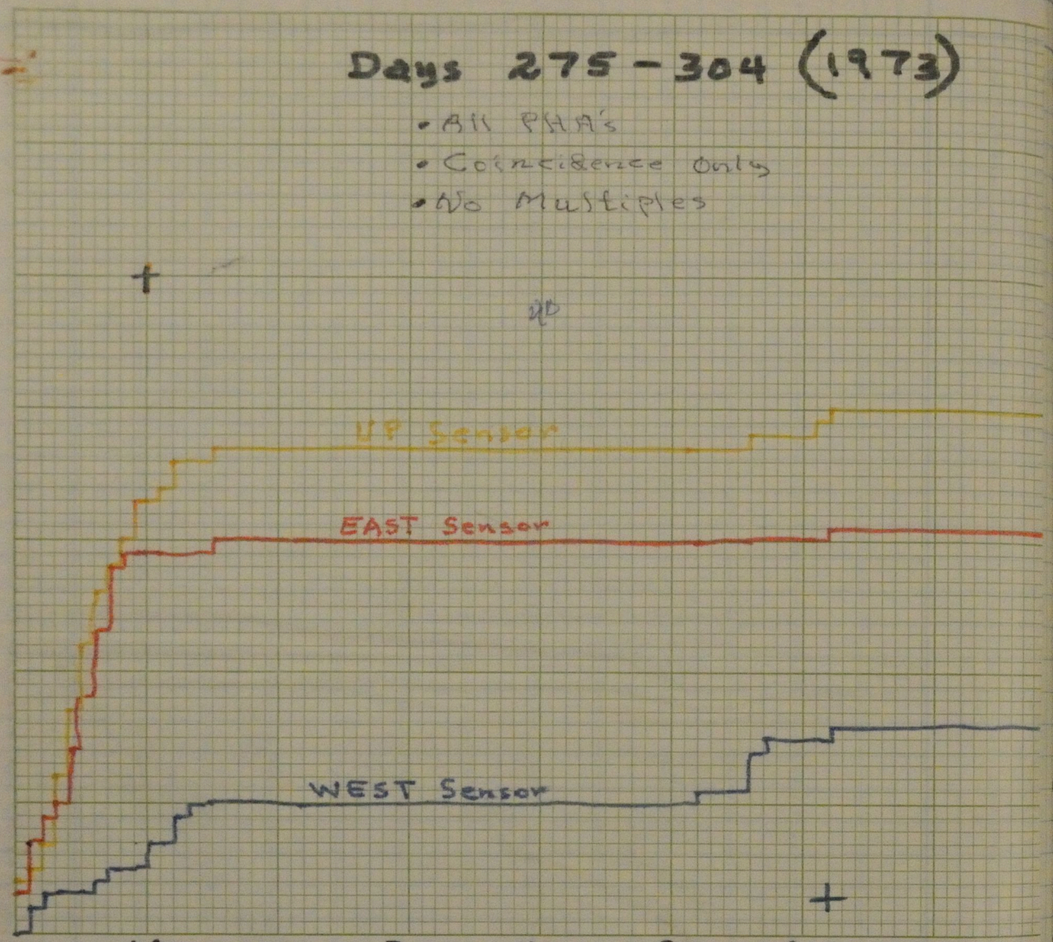
Distribution of coincidence events (no multiples) only versus one lunation.

Not sufficiently accurate to publish



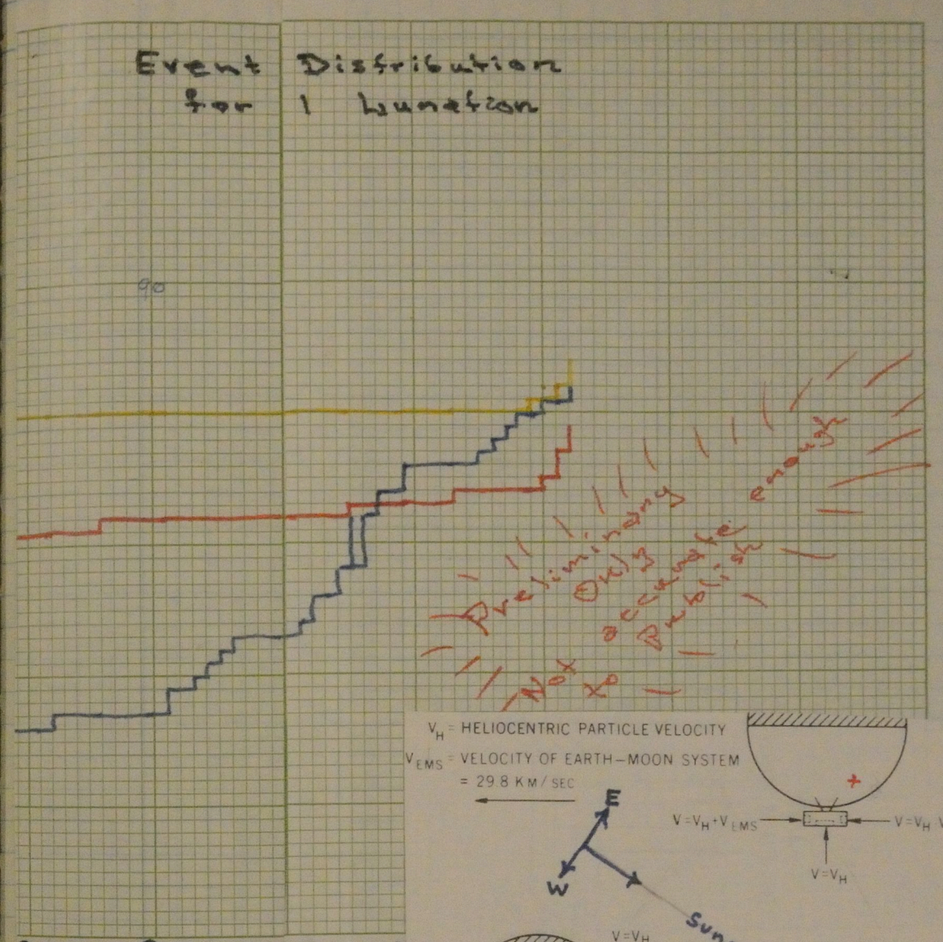
Days 275 - 304 (1973)

- All PHA's
- Coincidence Only
- No Multiples



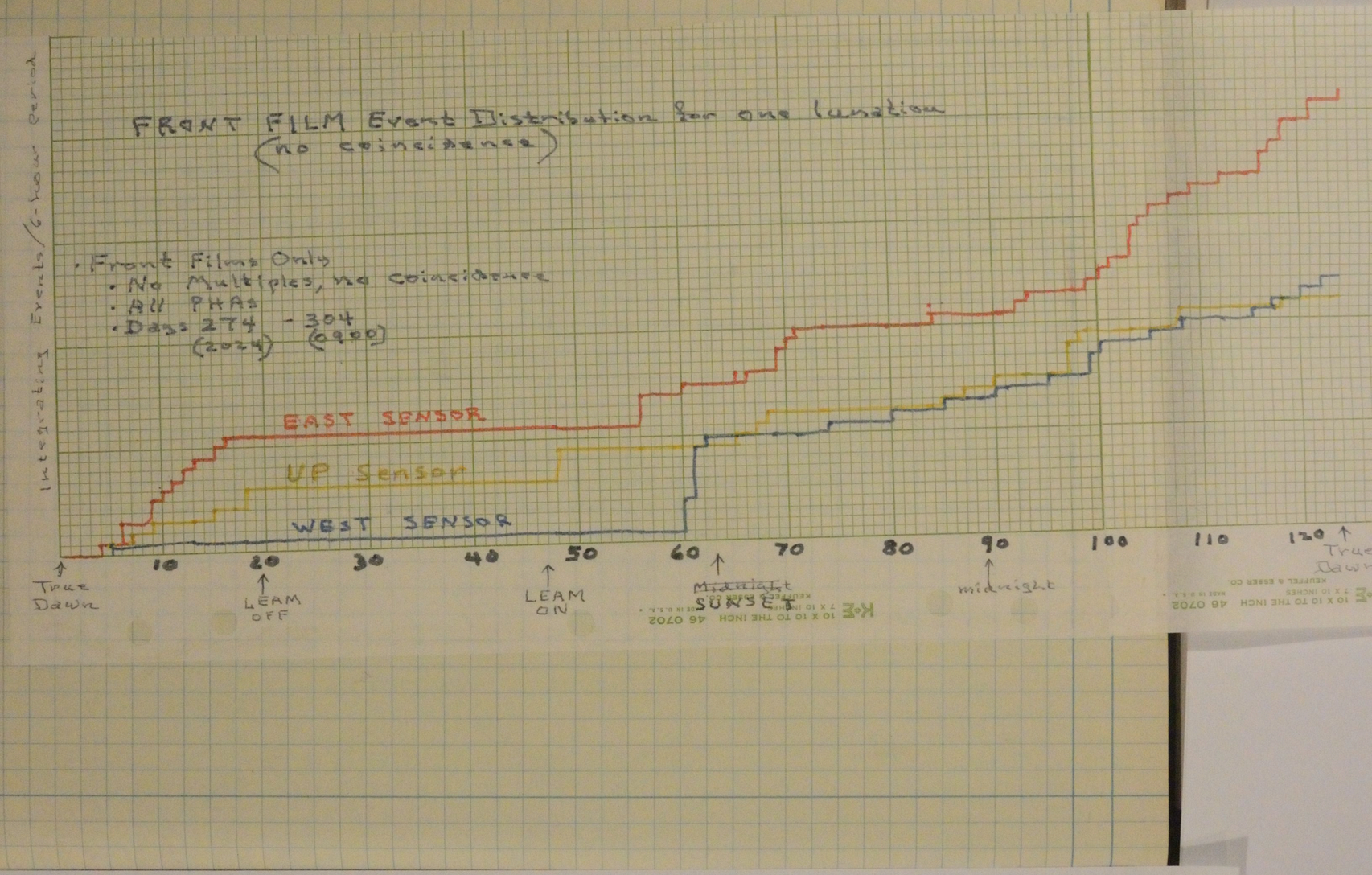
Integrating number of events / 6-hour interval

Event Distribution for 1 Lunation



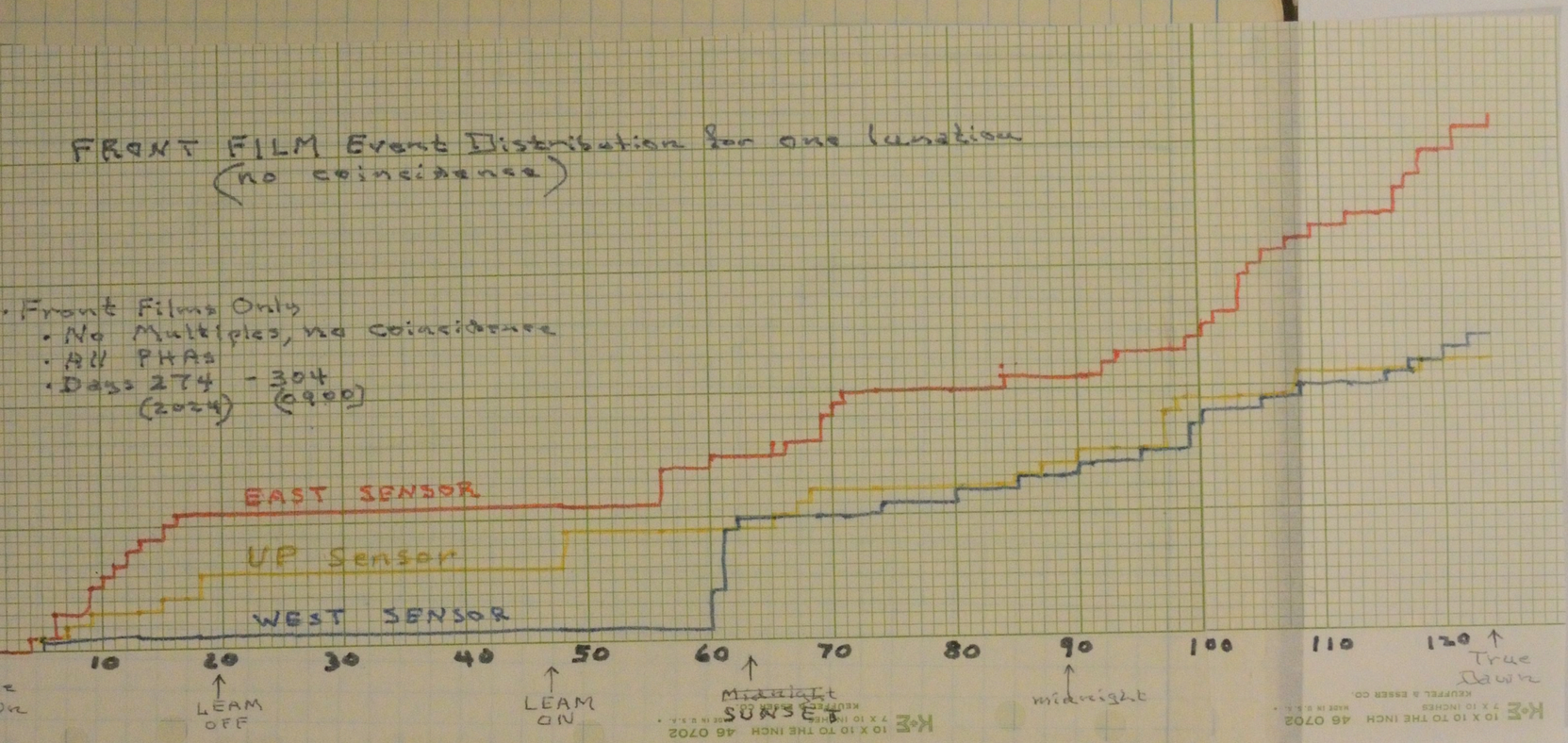
LEAM
Position :

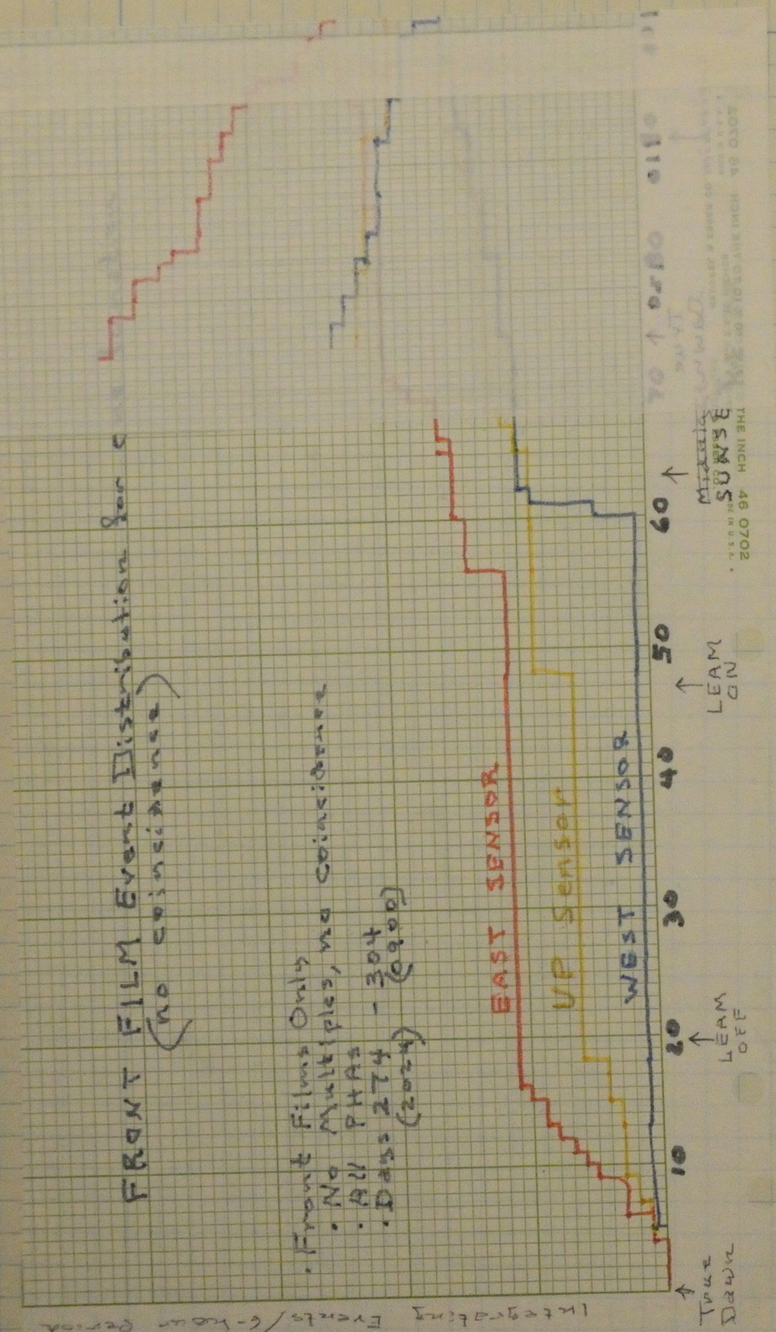
20.164 N. Latitude
30.77 E. Longitude


FRONT FILM Event Distribution for one lunation
(no coincidence)
• Front Films Only
• No Multiples, no coincidence
• All PHAs
• Days 274 - 304
(2024) (0900)
EAST SENSOR
UP Sensor
WEST SENSOR
Integrating Events/6-hour period
10
20
30
40
50
60
70
80
90
100
110
120
True Dawn
LEAM OFF
LEAM ON
SUNSET
midnight

FRONT FILM Event Distribution for one lunation
(no coincidence)

- Front Films Only
- No Multiples, no coincidence
- All PHAs
- Days 274 - 304
  (2024) (9900)





LEAM off-on times

	GMT	Date 1974	
OFF	2159	31 Mar '74	AS-11 was 192.5°F
ON	1436	8 April '74	AS11 was 180.5°F Sun Angle 132°
OFF	1418	30 April	AS11 was 192.5°F
ON	1357	9 May	AS-11 was 151.2°F
off	1505	30 Day 150 May	AS-11 was 196° Sun angle 52.6°
ON	1924	6 Day 157 June	AS-11 = 173.8
ON	1949	4 Day 155 June	AS-11 went from 188.5° to 118.4°
OFF	1045	5 Day 156 June	AS-11 - 196.0
ON	1924	6 Day 157 June	
OFF	1355	28 Day 179 June	AS-11 = 189.5°F
ON	1613	5 Day 186 July	
OFF	1441	28 July	AS-11 - 183.5 Day 209
ON	1321	4 Aug	AS-11 - 176.0 Day 216
OFF	1533	26 Aug	AS-11 was 192.5
ON	1438	3 Sept	AS-11 - was 169.5°F
OFF	1525	24 Sept	AS-11 - was 188.0°F
ON	1428	2 Oct	AS-11 - 180.5°
OFF	1539	23 Oct	" 182.0°F
ON			
OFF			
ON	1438	29 Nov	AS-11 - 196.5 Eclipse
OFF	1821	29 Nov	AS-11
ON	1618	30 Dec. '74	(AS-11 was 200° on 28 Dec.)
OFF	1539	20 Jan '75	
ON	1518	29 Jan '75	
OFF	1436	19 Feb	
			(note 2-19-75)
OFF	1501	20 Mar	Telemetry Parameter AS-04 (Reports Status of LEAM) is indicating on out of tolerance (0°)

Eclipse → 1974

PHA Distribution For 5 Lunation (Dawns only)

EAST

Lunation Dates	← PHA → 0	1	2	3	4	5	6	7	$\overline{\text{Pha}}$
1973 days 244 (9) →	4	5	2	0	5	7	0	9	4.5
" " 273 (18) →	1	2	1	1	3	3	5	17	5.5
" " 302 (19) —	0	5	5	3	4	4	3	23	5.1
" " 332 (19) ...	0	5	7	5	3	3	2	26	5.3
" " 362 (6) ...	0	7	10	5	4	5	7	46	5.3

UP Sensor

Lunation Dates	— Pha — 0	1	2	3	4	5	6	7	$\overline{\text{Pha}}$
	0	2	3	4	1	6	4	12	5.1
	0	3	6	5	3	2	4	17	4.9
Same as above	0	3	8	2	2	5	3	17	5.6
	0	3	4	1	3	3	0	14	5.0
	0	1	5	6	4	4	6	22	5.3

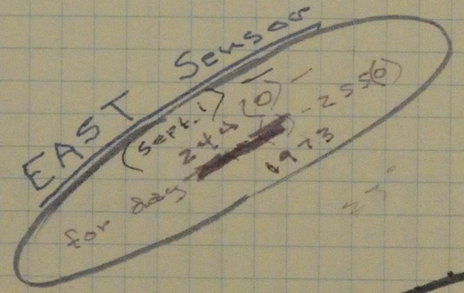
West Sensor

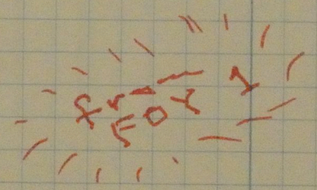
Lunation Dates	— Pha — 0	1	2	3	4	5	6	7	$\overline{\text{Pha}}$
	0	3	4	0	1	0	1	2	3.2
Same as above	0	8	9	2	0	1	2	3	2.8
	0	8	1	2	1	2	0	1	2.5
	0	4	8	4	1	0	1	5	3.3
	1	6	11	4	0	2	1	2	2.6

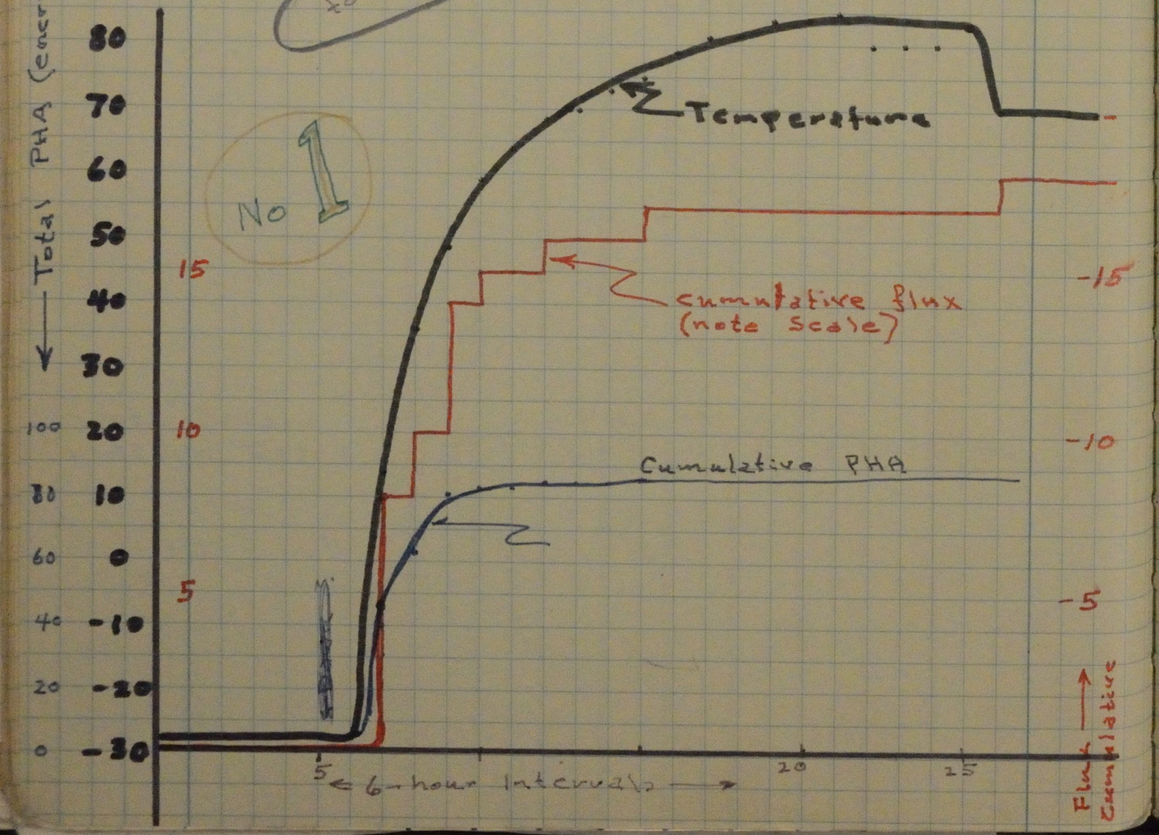
4/11/74

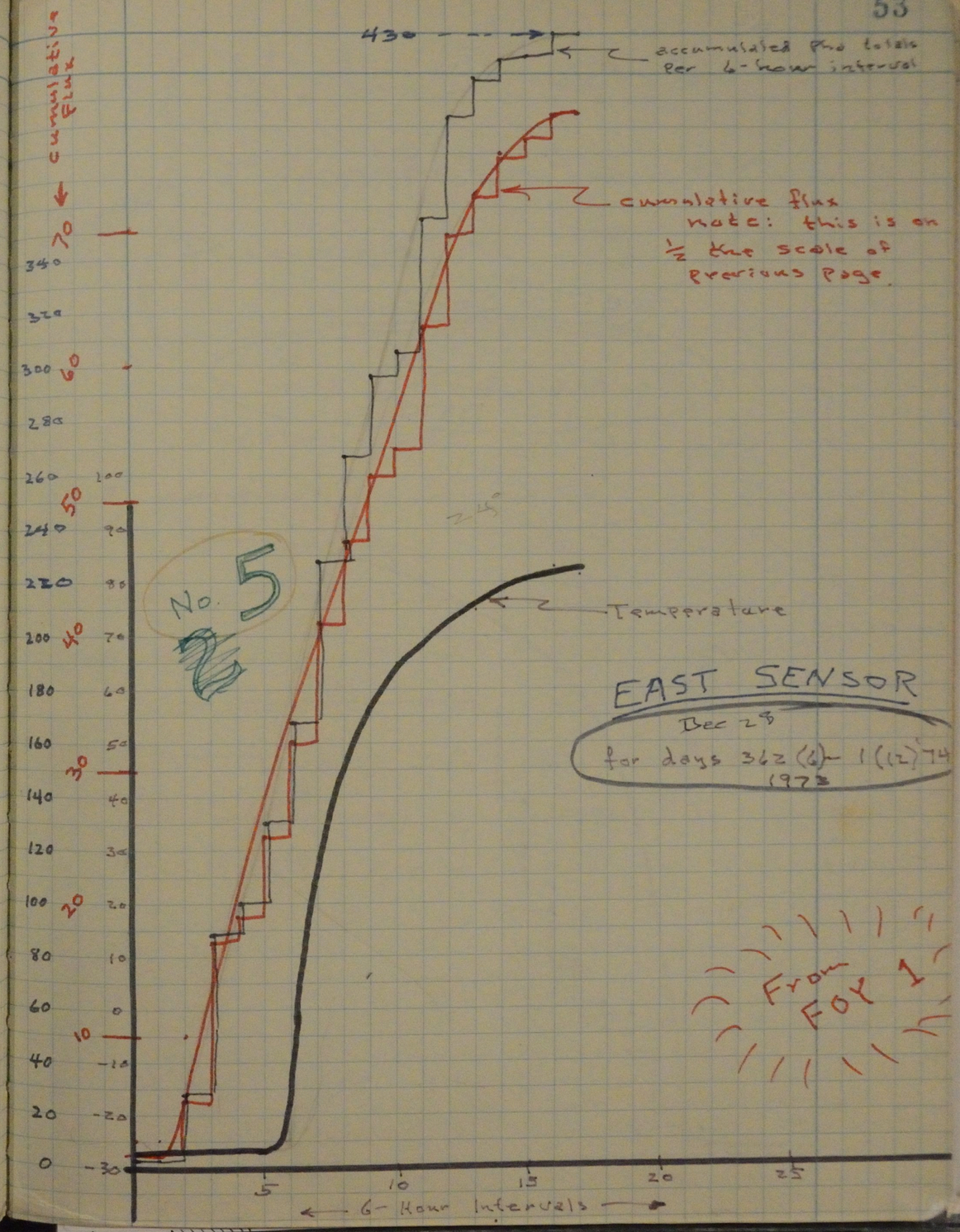
Note These tables go with the 3 large plots marked Fay 1 which show accumulated fits for 5 lunations individually for East, West, and UP sensors.

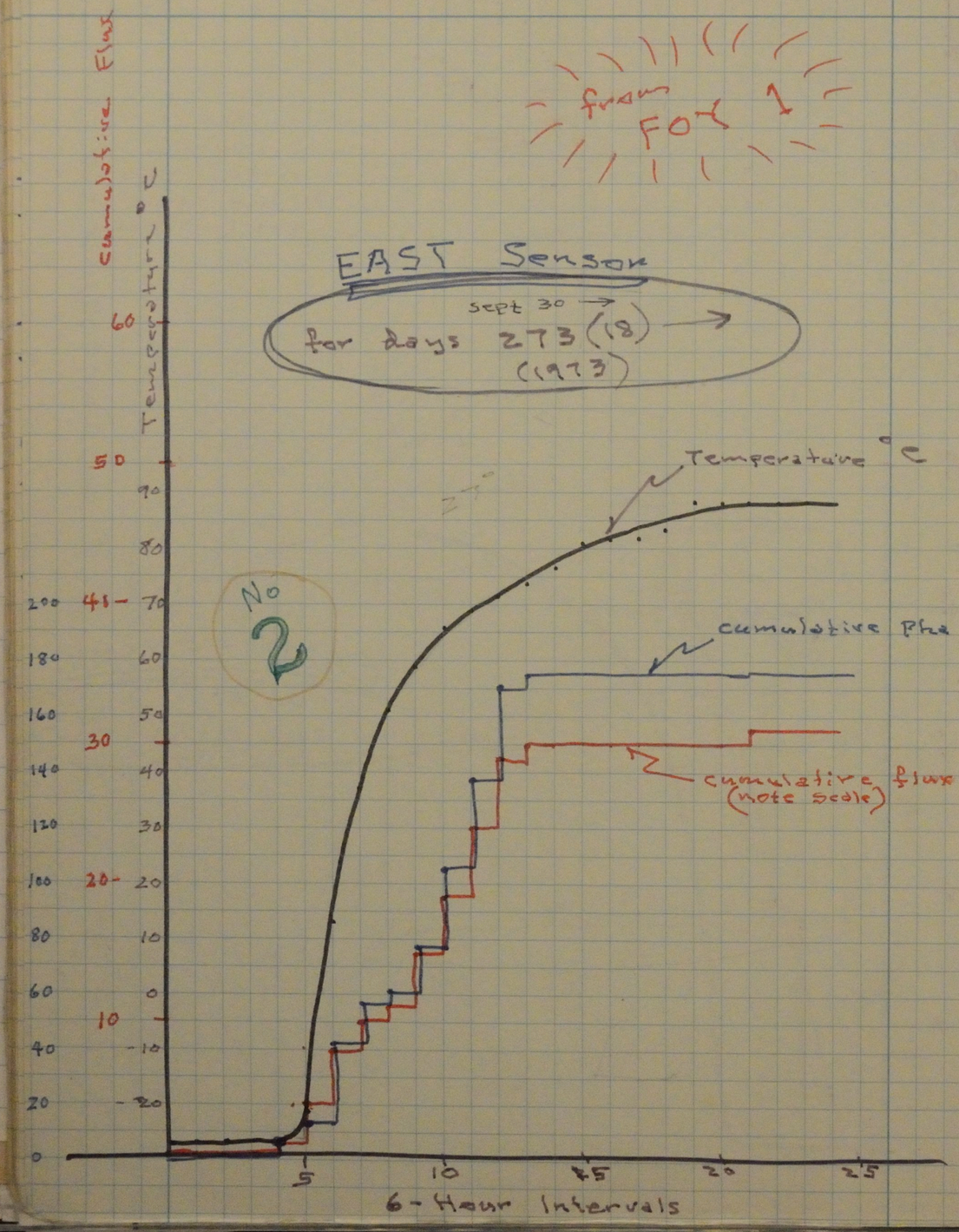
The plot below shows (for dawn period of one lunation): the temperature (ASIS) of the instrument; the accumulated flux for dawn period; and the total pha value per 6-hour period. The total pha value is obtained by adding sum of counts in each pha and multiplying by the pha value.











Notes and Comments on Preceding 3 Pages

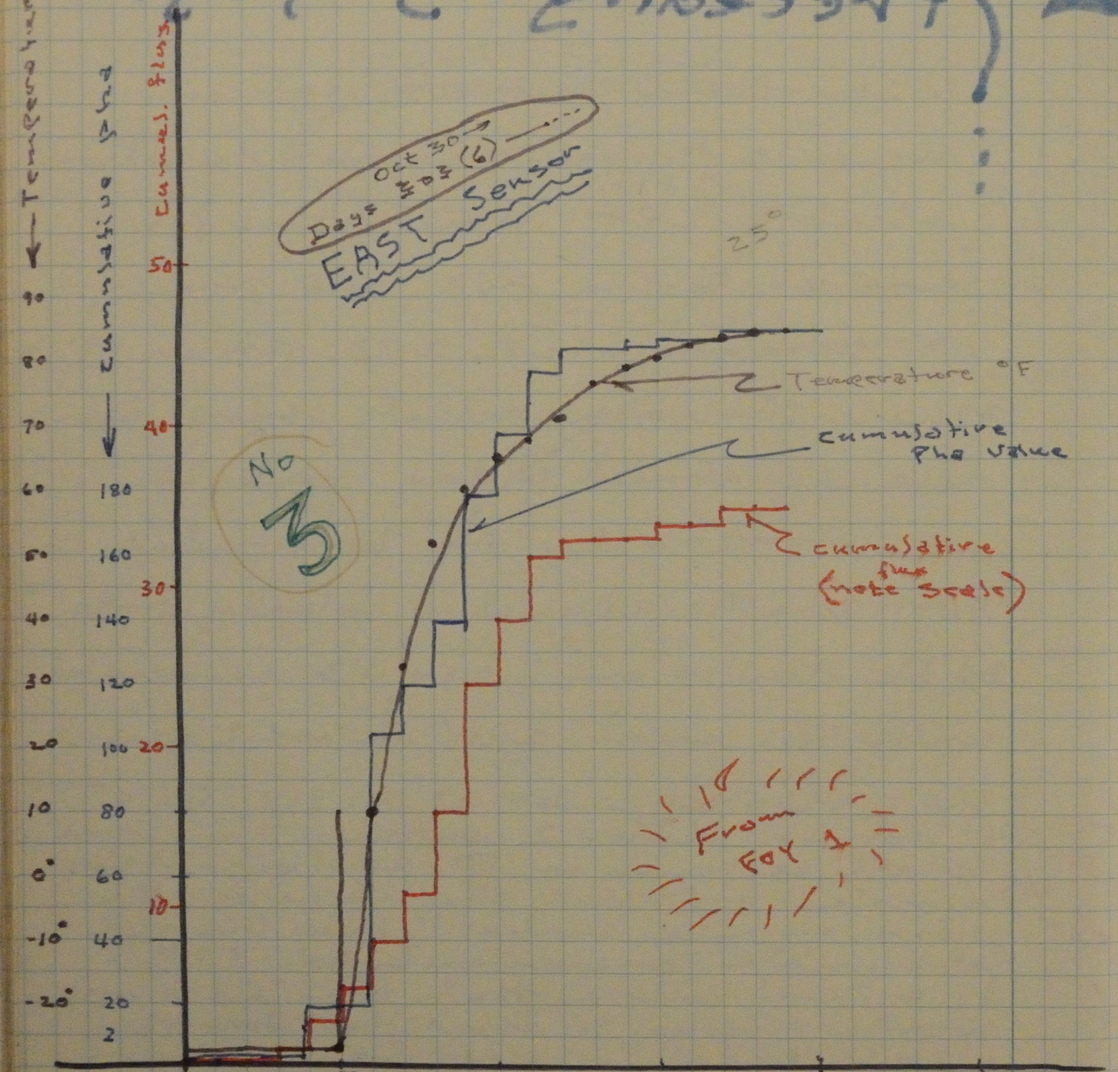
1) The lunations are not in sequence – page 52 is for lunation starting 244; page 53 is for lunation starting 362; and page 54 lunation starts 273. All in 1973

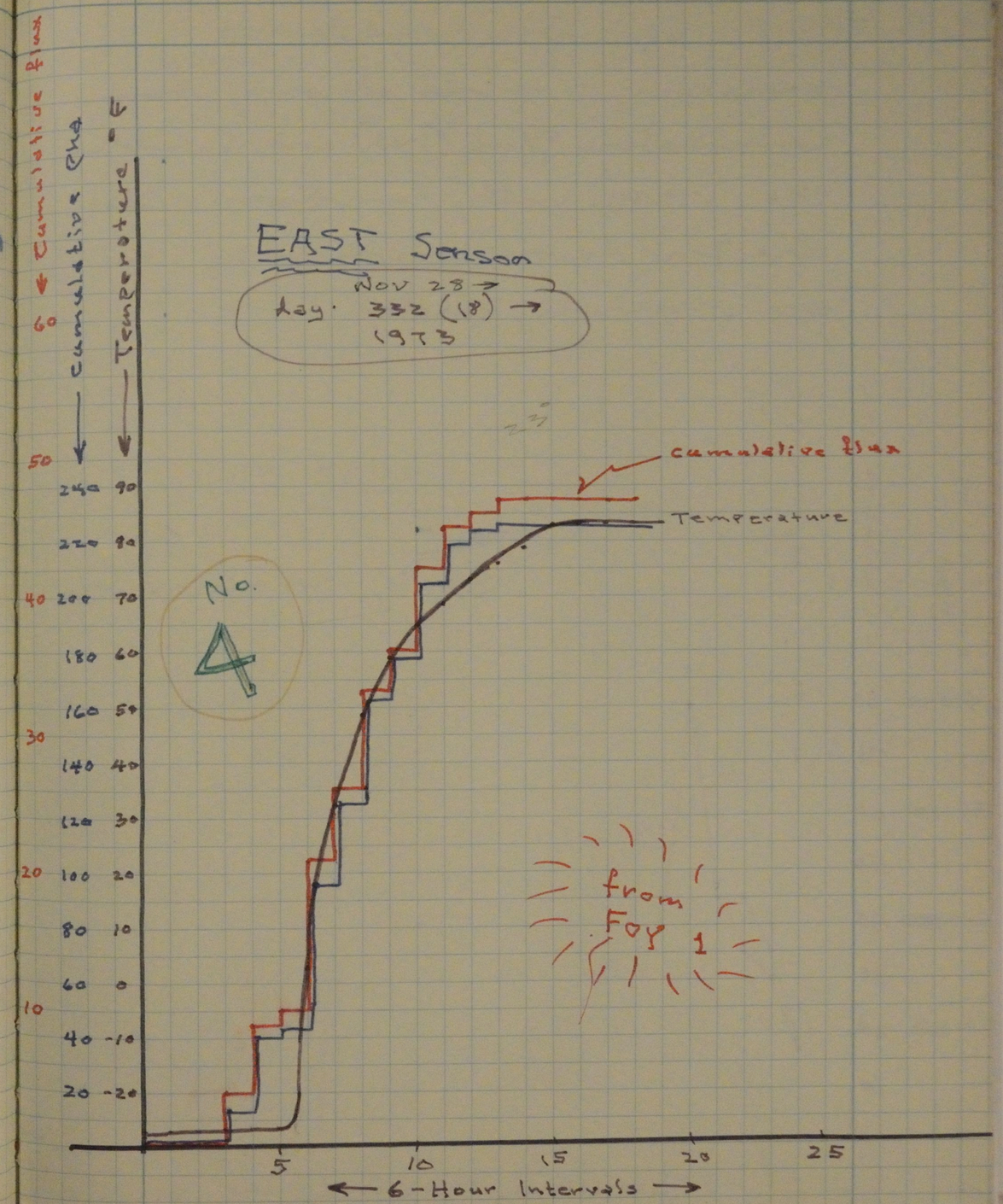
2) Note the early activity before sunrise by almost a day and the persistence after 45° temperature of AJ-11 with almost a steady rate.

3) Is down on page 53 associated with the sun's apex in orbit around the galactic center at A = 318°, D = 49°

4) Note on later 2 sunrises the events start as much as 18-20 hours before sunrise and that the slope is the same as after sunrise. Does this not eliminate temperature effects ??? If a temperature effect then the slope would change to show the thermal effects added to pre-dawn causes.

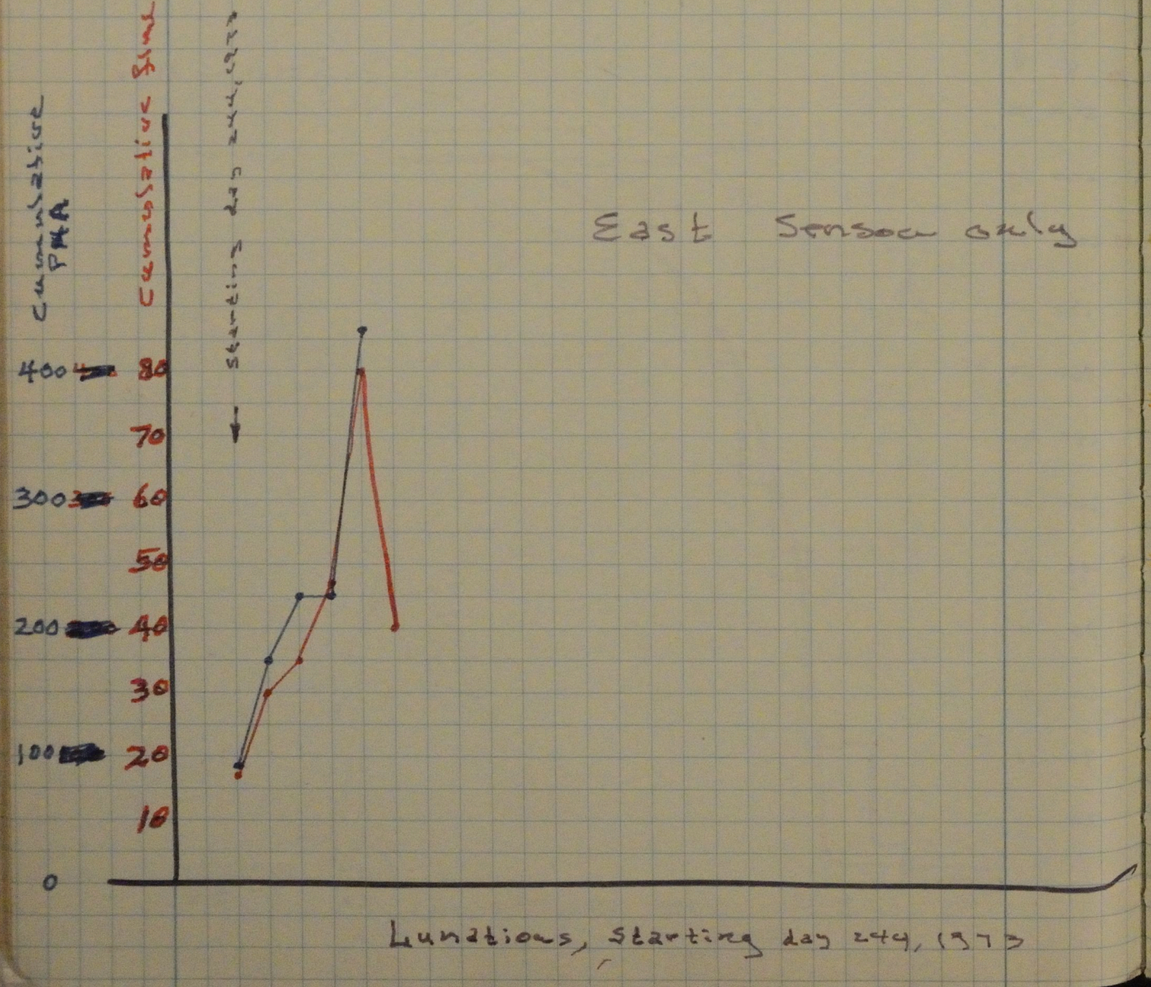
Notes and Comments on Preceding 3 Pages





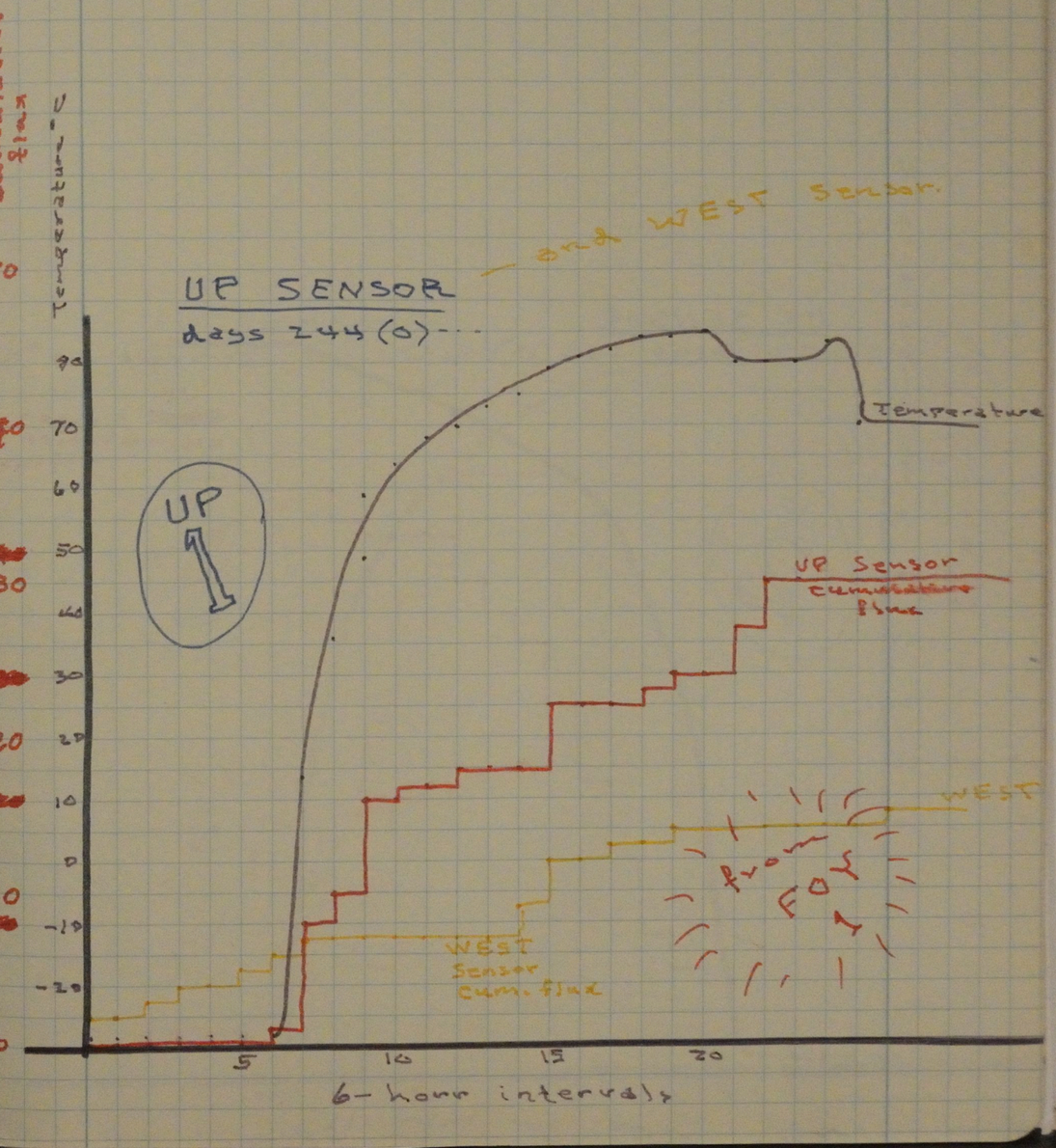
4/16/74 Summary plot of preceding 5 plots showing how cumulative flux (red) and cumulative PAR vary with lunations. These are for dawn periods only, as are preceding plots

East Sensor only



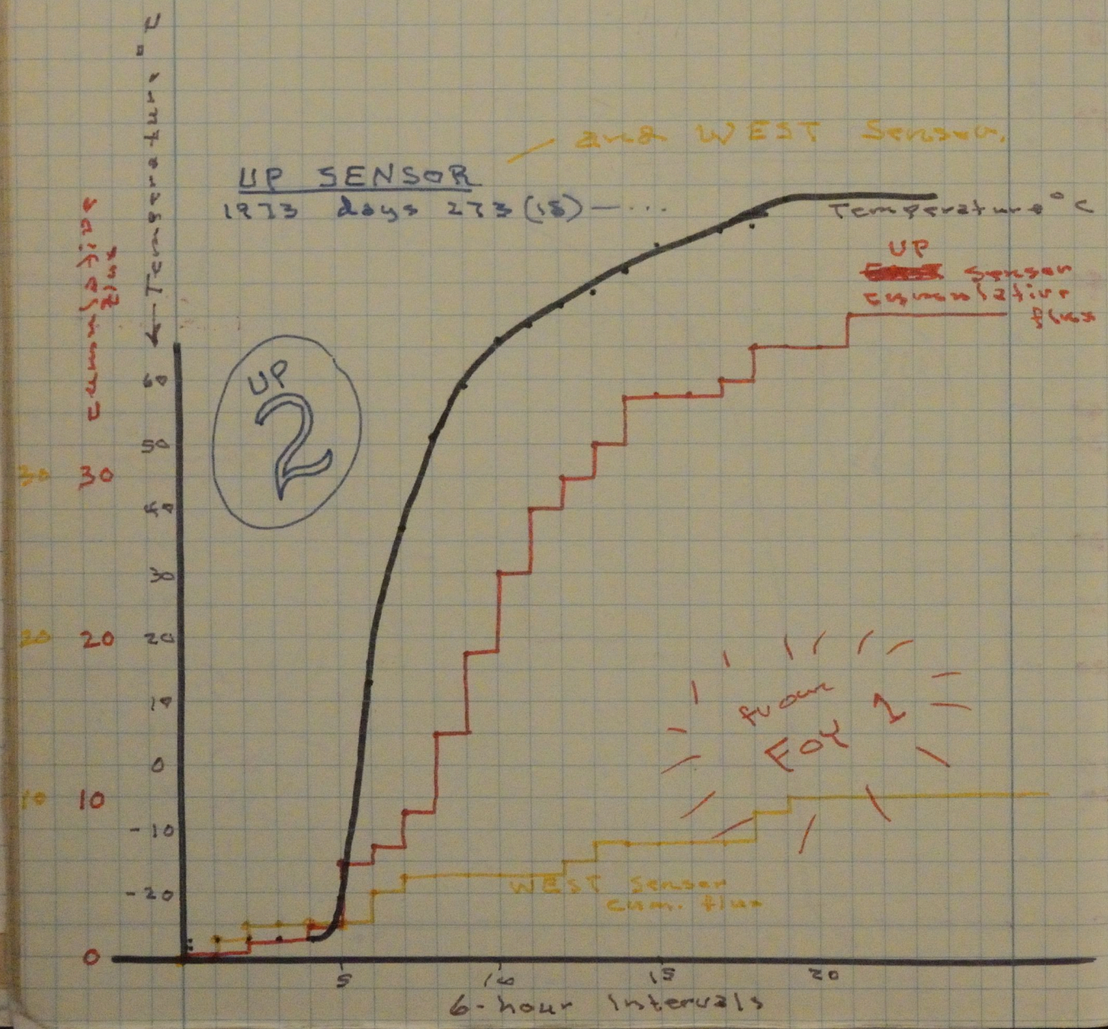
Lunations, starting day 249, 1973

4/17/74 Start of same treatment for coincidence events only (multiples excluded) for UP sensor and West sensor as in previous 6 pages

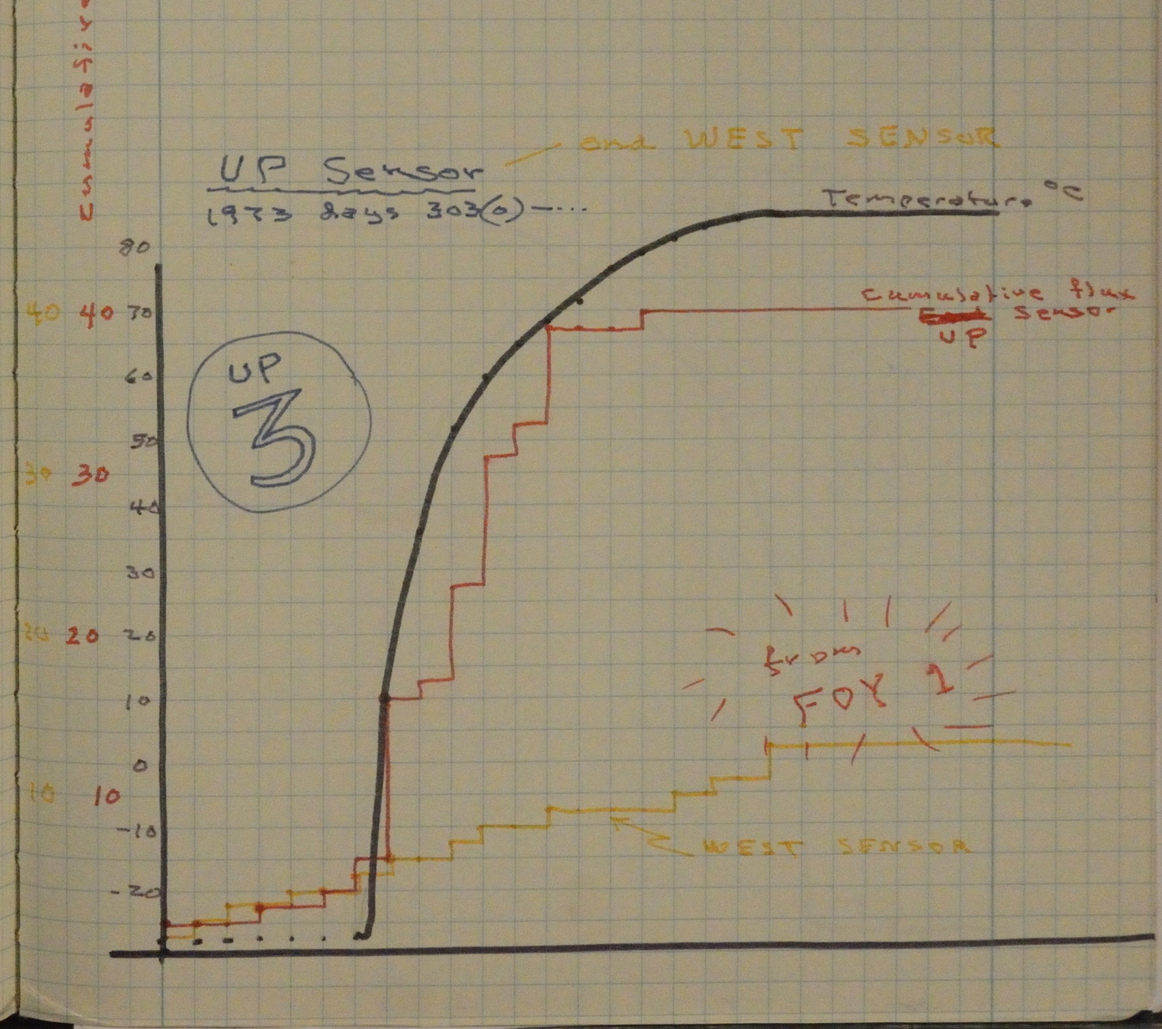


6-hour intervals

Continued



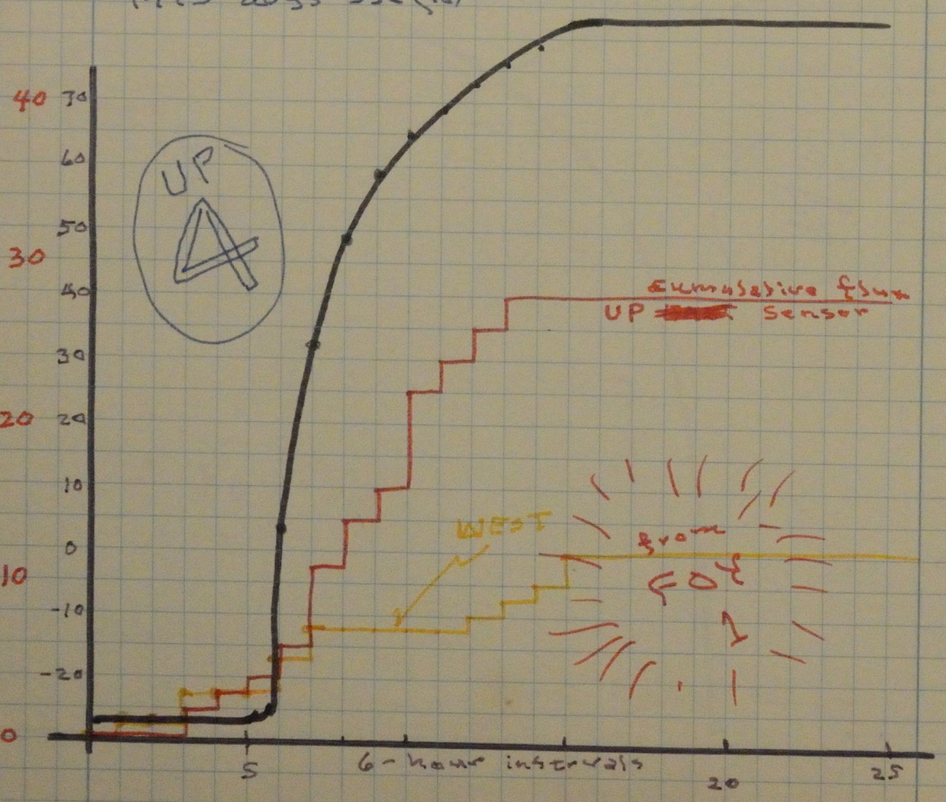
Continued



Continued —

UP Sensor — and WEST Sensor

1973 days 332 (18) — ...

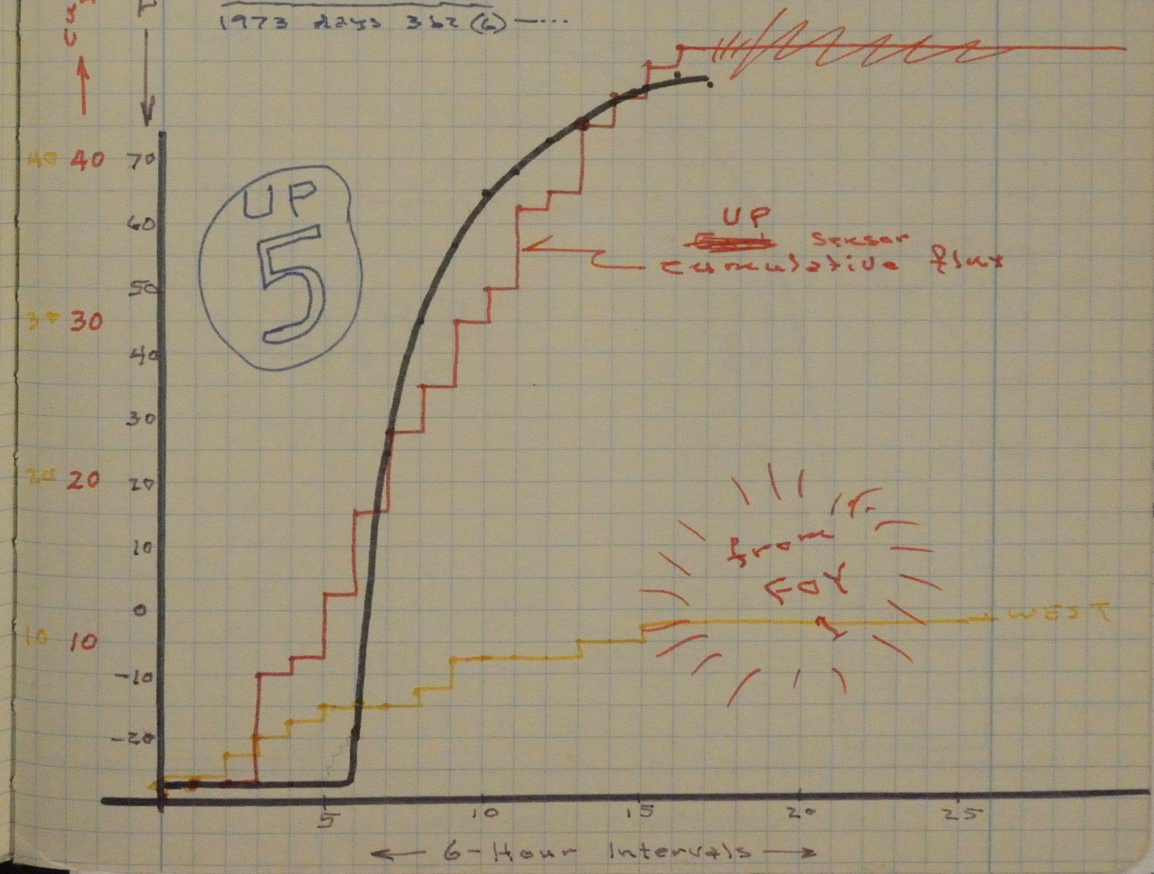


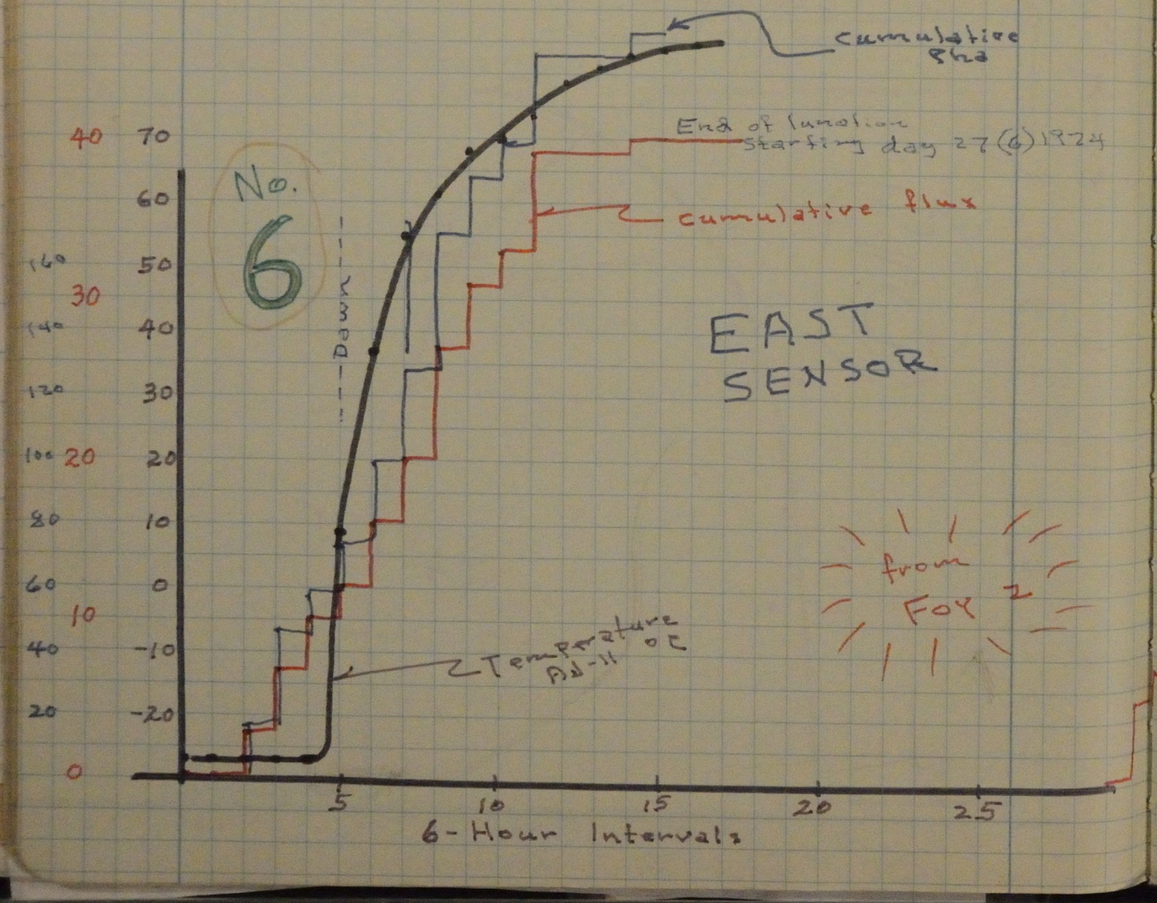
Continued

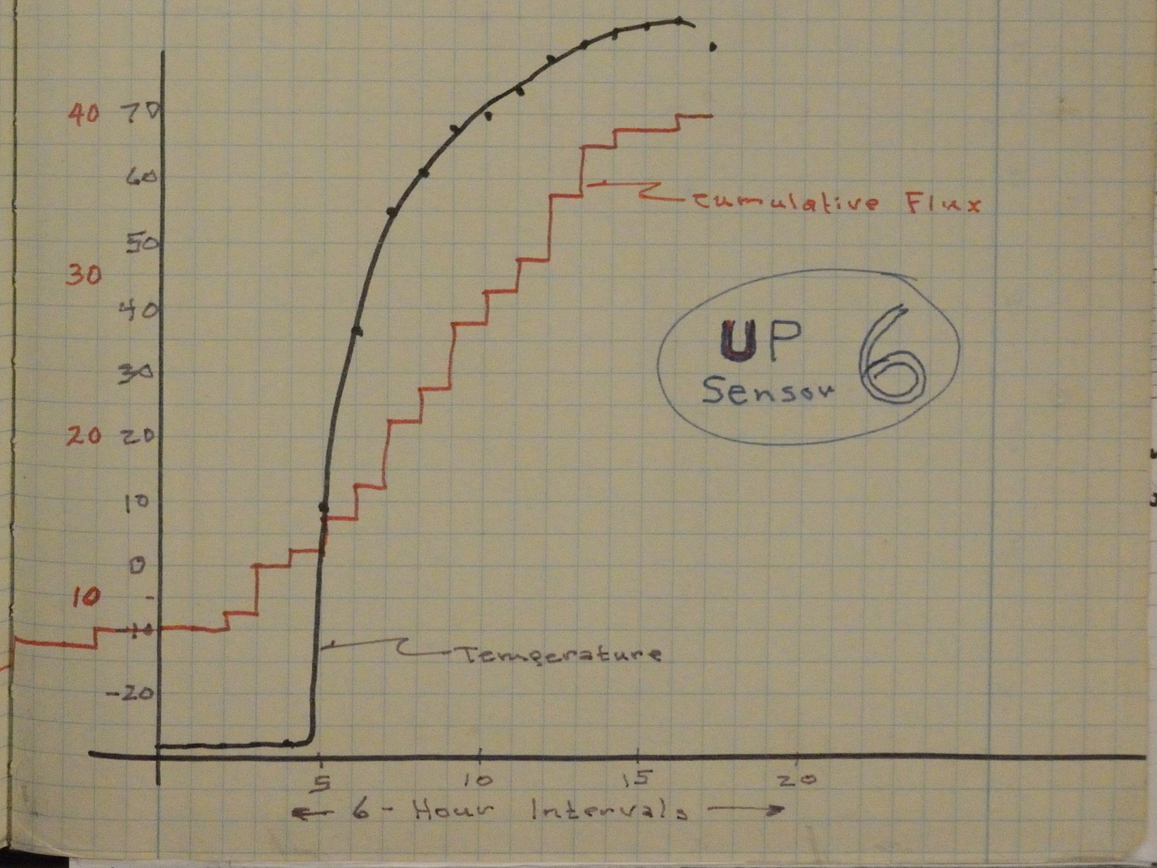
Note The UP Sensor (for this dawn and partially for previous dawn) sees events about 15 - 18 hours before dawn and the rate curve slope does not change as the ionospheric temperature rises. This is true for East and UP sensor but not for west sensor.

UP Sensor — and WEST SENSOR

1973 days 362 (6) — ...

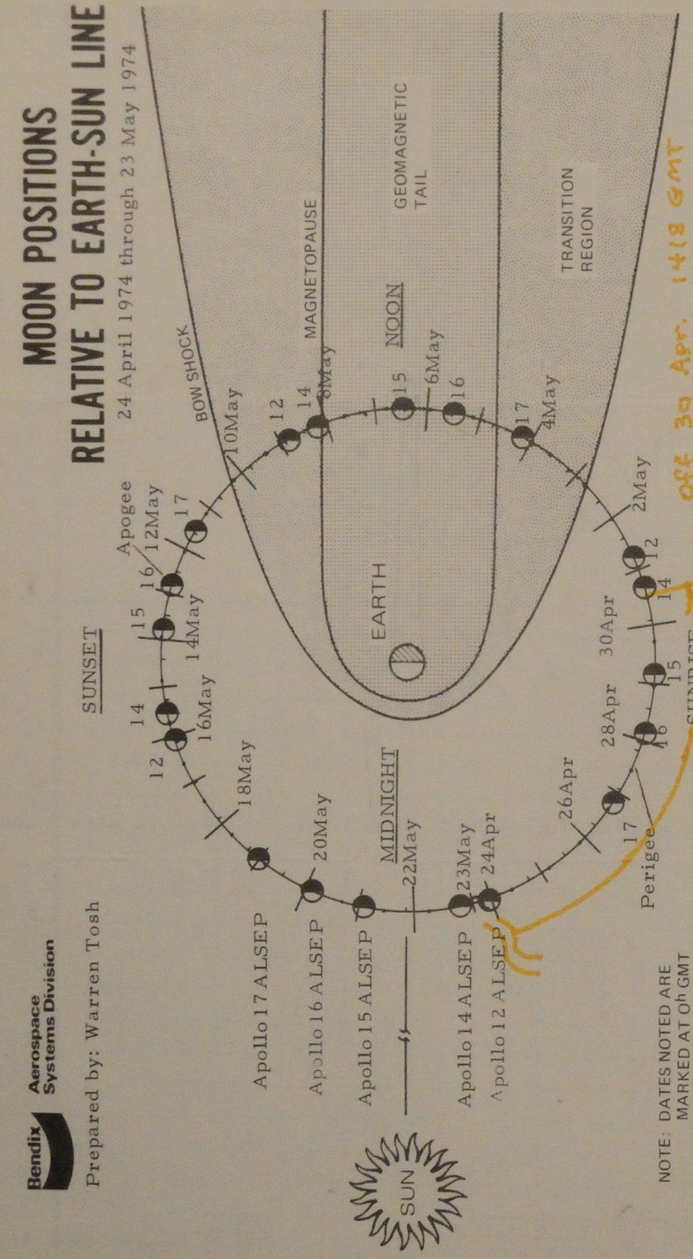



cumulative Pha
End of lunation starting day 27 (6) 1924
cumulative flux
No. 6
Dawn
EAST SENSOR
from Fox 2
Temperature Ad-11 °C
6-Hour Intervals


cumulative Flux
UP Sensor 6
Temperature
6-Hour Intervals

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

24 April 1974 through 23 May 1974



Bendix Aerospace Systems Division

Prepared by: Warren Tosh

NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR(GMT) Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	19Apr/1207	26Apr/2045	(18)4May/0551	11May/1508	18May/2355
16	20Apr/1802	28Apr/0242	(26)5May/1153	12May/2108	20May/0548
15	21Apr/1718	29Apr/0200	(35)6May/1115	13May/2026	21May/0502
14	23Apr/1045	30Apr/1933	(41)8May/0452	15May/1355	22May/2226
12	23Apr/2222	1 May/0737	(56)8May/1632	16May/0034	23May/1002

off 30 Apr. 1418 GMT

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1974

Bendix Aerospace Systems Division

Apollo 12 ALSEP based on empirical data; all other values are "normalized"
Time is shown as GMT (EST): * indicates preceding date
Prepared by: Warren Tosh - January 1974 Rev. A April 1974

ALSEP Longitude	Apollo 17 30.75°E	Apollo 16 15.51°E	Apollo 15 3.65°E	Apollo 14 17.47°W	Apollo 12 (1) 23.39°W
Lunation	13	21	30	36	51
Sunrise	Nov 29/2329 (1829)	Dec 1/0532 (0032)	Dec 2/0455 (2355*)	Dec 3/2236 (1736)	Dec 4/1029 (0529)
Noon	Dec 7/0910 (0410)	Dec 8/1519 (1019)	Dec 9/1448 (0948)	Dec 11/0835 (0335)	Dec 11/2018 (1518)
Sunset	Dec 14/1913 (1413)	Dec 16/0121 (2021*)	Dec 17/0045 (1945*)	Dec 18/1825 (1325)	Dec 19/0512 (0012)
Midnight	Dec 22/0445 (2345*)	Dec 23/1046 (0546)	Dec 24/1007 (0507)	Dec 26/0342 (2242*)	Dec 26/1522 (1022)
Lunation	14	22	31	37	52
Sunrise	Dec 29/1401 (0901)	Dec 30/2004 (1504)	Dec 31/1928 (1428)	Jan 2/1310 (0810)	Jan 3/0109 (2009*)
Noon	Jan 5/2346 (1846)	Jan7 /0556 (0056)	Jan 8/0524 (0024)	Jan 9/2314 (1814)	Jan 10/1056 (0556)
Sunset	Jan 13/0952 (0452)	Jan 14/1559 (1059)	Jan 15/1524 (1024)	Jan 17/0904 (0404)	Jan 17/1945 (1445)
Midnight	Jan 20/1924 (1424)	Jan 22/0125 (2025*)	Jan 23/0046 (1946*)	Jan 24/1821 (1321)	Jan 25/0600 (0100)
Lunation	15	23	32	38	53
Sunrise	Jan 28/0438 (2338*)	Jan 29/1041 (0541)	Jan 30/1005 (0505)	Feb 1/0346 (2246*)	Feb 1/1552 (1052)
Noon	Feb 4/1421 (0921)	Feb 5/2030 (1530)	Feb 6/1958 (1458)	Feb 8/1345 (0845)	Feb 9/0128 (2028*)
Sunset	Feb 12/0020 (1920*)	Feb 13/0626 (0126)	Feb 14/0550 (0050)	Feb 15/2329 (1829)	Feb 16/1005 (0505)
Midnight	Feb 19/0958 (0458)	Feb 20/1545 (1045)	Feb 21/1505 (1005)	Feb 23/0838 (0338)	Feb 23/2017 (1517)
Lunation	16	24	33	39	54
Sunrise	Feb 26/1852 (1352)	Feb 28/0052 (1952*)	Mar 1/0014 (1914*)	Mar 2/1754 (1254)	Mar 3/0605 (0105)
Noon	Mar 6/0424 (2324*)	Mar 7/1031 (0531)	Mar 8/0958 (0458)	Mar 10/0342 (2242)	Mar 10/1524 (1024)
Sunset	Mar 13/1412 (0912)	Mar 14/2015 (1515)	Mar 15/1937 (1437)	Mar 17/1314 (0814)	Mar 17/2348 (1848)
Midnight	Mar 20/2325 (1825)	Mar 22/0522 (0022)	Mar 23/0440 (2340*)	Mar 24/2210 (1710)	Mar 25/0948 (0448)
Lunation	17	25	34	40	55
Sunrise	Mar 28/0817 (0317)	Mar 29/1416 (0916)	Mar 30/1336 (0836)	Apr 1/0712 (0212)	Apr 1/1923 (1423)
Noon	Apr 4/1736 (1236)	Apr 5/2341 (1841)	Apr 6/2305 (1805)	Apr 8/1648 (1148)	Apr 9/0426 (2326*)
Sunset	Apr 12/0309 (2209*)	Apr 13/0909 (0409)	Apr 14/0829 (0329)	Apr 16/0205 (2105*)	Apr 16/1238 (0738)
Midnight	Apr 19/1207 (0707)	Apr 20/1802 (1302)	Apr 21/1718 (1218)	Apr 23/1045 (0545)	Apr 23/2222 (1722)
Lunation	18	26	35	41	56
Sunrise	Apr 26/2045 (1545)	Apr 28/0242 (2142*)	Apr 29/0200 (2100*)	Apr 30/1933 (1433)	May 1/0737 (0237)
Noon	May 4/0551 (0051)	May 5/1153 (0653)	May 6/1115 (0615)	May 8/0452 (2352*)	May 8/1632 (1132)
Sunset	May 11/1508 (1008)	May 12/2108 (1608)	May 13/2026 (1526)	May 15/1355 (0855)	May 16/0034 (1932*)
Midnight	May 18/2355 (1855)	May 20/0548 (0048)	May 21/0502 (0002)	May 22/2226 (1726)	May 23/1002 (0502)
Lunation	19	27	36	42	57
Sunrise	May 26/0822 (0322)	May 27/1416 (0916)	May 28/1334 (0834)	May 30/0704 (0204)	May 30/1859 (1359)
Noon	June 2/1716 (1216)	June 3/2316 (1816)	June 4/2237 (1737)	June 6/1612(1112)	June 7/0351 (2251*)
Sunset	June 10/0224 (2124*)	June 11/0821 (0321)	June 12/0740 (0240)	June 14/0107 (2007*)	June 14/1151 (0651)
Midnight	June 17/1103 (0603)	June 18/1654 (1154)	June 19/1609 (1109)	June 21/0930 (0430)	June 21/2106 (1606)
Lunation	20	28	37	43	58
Sunrise	June 24/0137(2037*)	June 26/0117(2017*)	June 27/0001(1901*)	June 28/1803(1303)	June 29/0553(0053)
Noon	July 2/0413(2313*)	July 3/1013(0513)	July 4/0933(0433)	July 6/0306(2206*)	July 6/1445(0945)
Sunset	July 9/1317 (0817)	July 10/1915 (1415)	July 11/1832 (1332)	July 13/1201 (0701)	July 13/2250 (1750)
Midnight	July 16/2155 (1655)	July 18/0347 (2247*)	July 19/0301 (2201*)	July 20/2023 (1523)	July 21/0758(0258)
Lunation	21	29	38	44	59
Sunrise	July 24/0616 (0116)	July 25/1211 (0711)	July 26/1128 (0628)	July 28/0457 (2357*)	July 28/1635 (1135)
Noon	July 31/1508 (1008)	Aug 1/2108 (1608)	Aug 2/2029 (1529)	Aug 4/1403 (0903)	Aug 5/0143 (2043*)
Sunset	Aug 8/0017 (1917*)	Aug 9/0615 (0115)	Aug 10/0533 (0033)	Aug 11/2302 (1802)	Aug 12/0956 (0456)
Midnight	Aug 15/0900 (0400)	Aug 16/1453 (0953)	Aug 17/1407 (0907)	Aug 19/0731 (0231)	Aug 19/1907 (1407)
Lunation	22	30	39	45	60
Sunrise	Aug 22/1728 (1228)	Aug 23/2323 (1823)	Aug 24/2241 (1741)	Aug 26/1613 (1113)	Aug 27/0356 (2256*)
Noon	Aug 30/0300 (2200*)	Aug 31/0828 (0328)	Sept 1/0751 (0251)	Sept 3/0127 (2027*)	Sept 3/1307 (0807)
Sunset	Sept 6/1146 (0646)	Sept 7/1746 (1246)	Sept 8/1706 (1206)	Sept 10/1038 (0538)	Sept 10/2133 (1633)
Midnight	Sept 13/2041 (1541)	Sept 15/0234 (2134*)	Sept 16/0151 (2051*)	Sept 17/1917 (1417)	Sept 18/0654 (0154)
Lunation	23	31	40	46	61
Sunrise	Sept 21/0520 (0020)	Sept 22/1117(0617)	Sept 23/1037 (0537)	Sept 25/0412(2312*)	Sept 25/1557 (1057)
Noon	Sept 28/1504 (1004)	Sept 29/2035 (1535)	Sept 30/1959 (1459)	Oct 2/1339 (0839)	Oct 3/0120 (2020*)
Sunset	Oct 6/0004 (1904*)	Oct 7/0606 (0106)	Oct 8/0528 (0028)	Oct 9/2303 (1803)	Oct 10/0957 (0457)
Midnight	Oct 13/0912 (0412)	Oct 14/1508 (1008)	Oct 15/1426 (0926)	Oct 17/0756 (0256)	Oct 17/1934 (1434)
Lunation	24	32	41	47	62
Sunrise	Oct 20/1805 (1305)	Oct 22/0005 (1905*)	Oct 22/2326 (1826)	Oct 24/1703 (1203)	Oct 25/0453 (2353*)
Noon	Oct 28/0403 (2303*)	Oct 29/0936 (0436)	Oct 30/0903 (0403)	Nov 1/0246 (2146*)	Nov 1/1428 (0928)
Sunset	Nov 4/1318 (0818)	Nov 5/1923 (1423)	Nov 6/1846 (1346)	Nov 8/1224 (0724)	Nov 9/2315 (1815)
Midnight	Nov 11/2238 (1738)	Nov 13/0437 (2337*)	Nov 14/0357 (2257*)	Nov 15/2130 (1630)	Nov 16/0909 (0409)
Lunation	25	33	42	48	63
Sunrise	Nov 19/0745 (0245)	Nov 20/1346 (0846)	Nov 21/1309 (0809)	Nov 23/0650 (0150)	Nov 23/1844 (1344)
Noon	Nov 26/1755 (1255)	Nov 27/2330 (1830)	Nov 28/2258 (1758)	Nov 30/1642 (1142)	Dec 1/0427 (2327*)
Sunset	Dec 4/0321 (2221*)	Dec 5/0928 (0428)	Dec 6/0654 (0154)	Dec 8/0233 (2133*)	Dec 8/1318 (0818)
Midnight	Dec 11/1252 (0752)	Dec 12/1853 (1353)	Dec 13/1813 (1313)	Dec 15/1148 (0648)	Dec 15/2328 (1828)
Lunation	26	34	43	49	64
Sunrise	Dec 18/2206(1706)	Dec 20/0410 (2310*)	Dec 21/0333 (2233*)	Dec 22/2155 (1655)	Dec 23/0916 (0416)
Noon	Dec 26/0822 (0322)	Dec 27/1400 (0900)	Dec 28/1328 (0828)	Dec 30/0717 (0217)	Dec 30/1900 (1400)
Sunset	1975	1975	1975	1975	1975
Midnight	1975	1975	1975	1975	1975

X41	East	West	UP	From page 46
0	3	0	4	
1	4	2	1	
2	2	1	2	
3	1	0	5	
4	4	0	5	
5	4	0	5	
6	5	1	5	
7	5	1	2	
8	1	0	2	
9	0	0	3	
10	0	0	0	
	3	2	1	
	0	0	2	
	0	0	0	
	3	2	0	
—	1	1	1	
	-	0	0	
	-	0	0	
	-	0	0	
	-	0	0	
20	-	0	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
—	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
30	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
—	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
46	-	-	-	

All Phas	East	West	UP
41	-	-	0
42	-	-	0
43	-	-	0
44	-	-	0
45	-	-	0
	-	-	-
	-	-	-
	-	-	-
52	-	-	-
	-	-	-
	1	-	-
	-	1	-
	-	-	-
—	-	-	-
	-	-	1
	-	3	-
	-	1	-
	-	0	-
60	-	0	-
	-	0	1
	-	1	1
	-	-	0
	-	-	0
—	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
70	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
—	-	-	-
	1	-	-
	-	-	-
	-	-	-
	-	-	-
80	-	-	-

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1974

X42	East	West	UP
81	-	0	-
83	-	1	-
83	-	-	-
84	-	-	-
85		-	-
-	1	-	-
	-	-	-
	-	-	-
	-	-	-
90	-	-	-
-	-	2	-
	-	0	-
-	-	1	-
	-	1	-
—	-	1	-
	-	1	-
	-	0	-
	-	0	-
	-	0	-
100	-	0	-
		1	-
	-	2	-
	-	0	-
	-	2	-
—	1	0	-
	-	4	-
	-	2	-
	-	0	-
	-	2	0
110	-	0	-
	-	0	-
	-	0	-
	1	0	-
	-	0	-
-	-	1	-
	-	1	-
	-	1	-
	-	1	-
	-	0	1
120	1	1	0
	2	0	1
	2	1	2

	East	West	UP
	2	0	1
	2	1	2

130

140

From page 44

These are data extracted from the plots on pages 46-47.

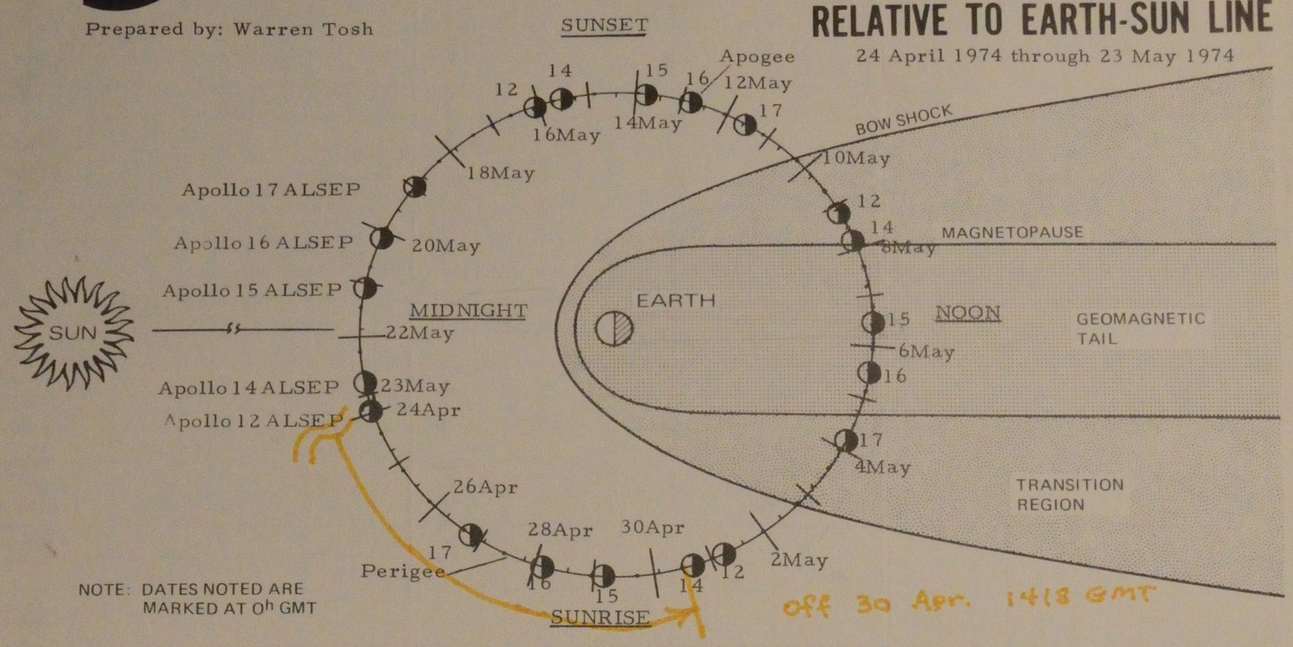
3 All Phases — 6 Number
22 events per 6-hour Period
2 Dawn to Dawn
1

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

24 April 1974 through 23 May 1974



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

APOLLO	DAY/HOUR (GMT)				
(ALSEP)	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	19Apr/1207	26Apr/2045	(18)4May/0551	11May/1508	18May/2355
16	20Apr/1802	28Apr/0242	(26)5May/1153	12May/2108	20May/0548
15	21Apr/1718	29Apr/0200	(35)6May/1115	13May/2026	21May/0502
14	23Apr/1045	30Apr/1933	(41)8May/0452	15May/1355	22May/2226
12	23Apr/2222	1 May/0737	(56)8May/1632	16May/0034	23May/1002

Bendix Aerospace Systems Division

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1974

Prepared by: Warren Tosh, January 1974 Rev. A April 1974

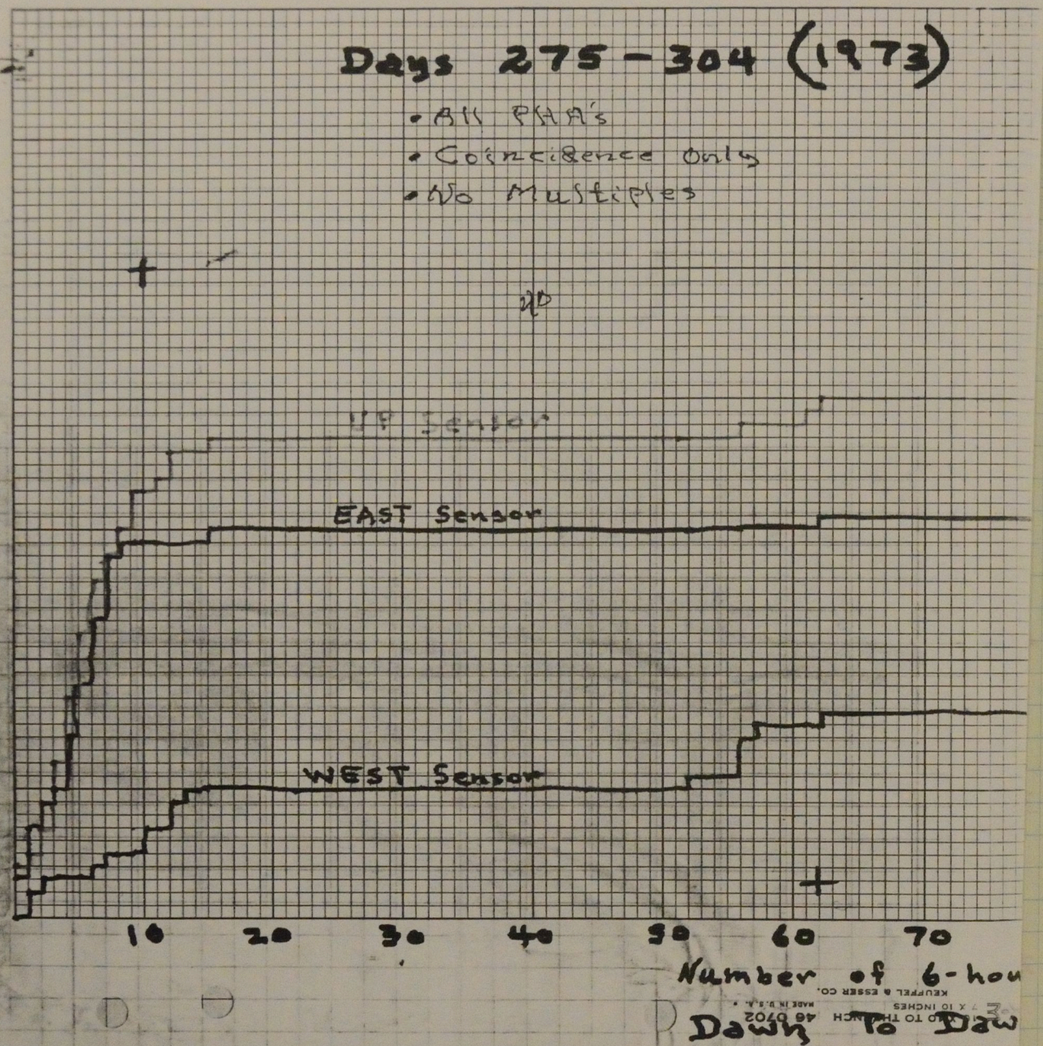
Apollo 12 ALSEP based on empirical data; all other values are "normalized"

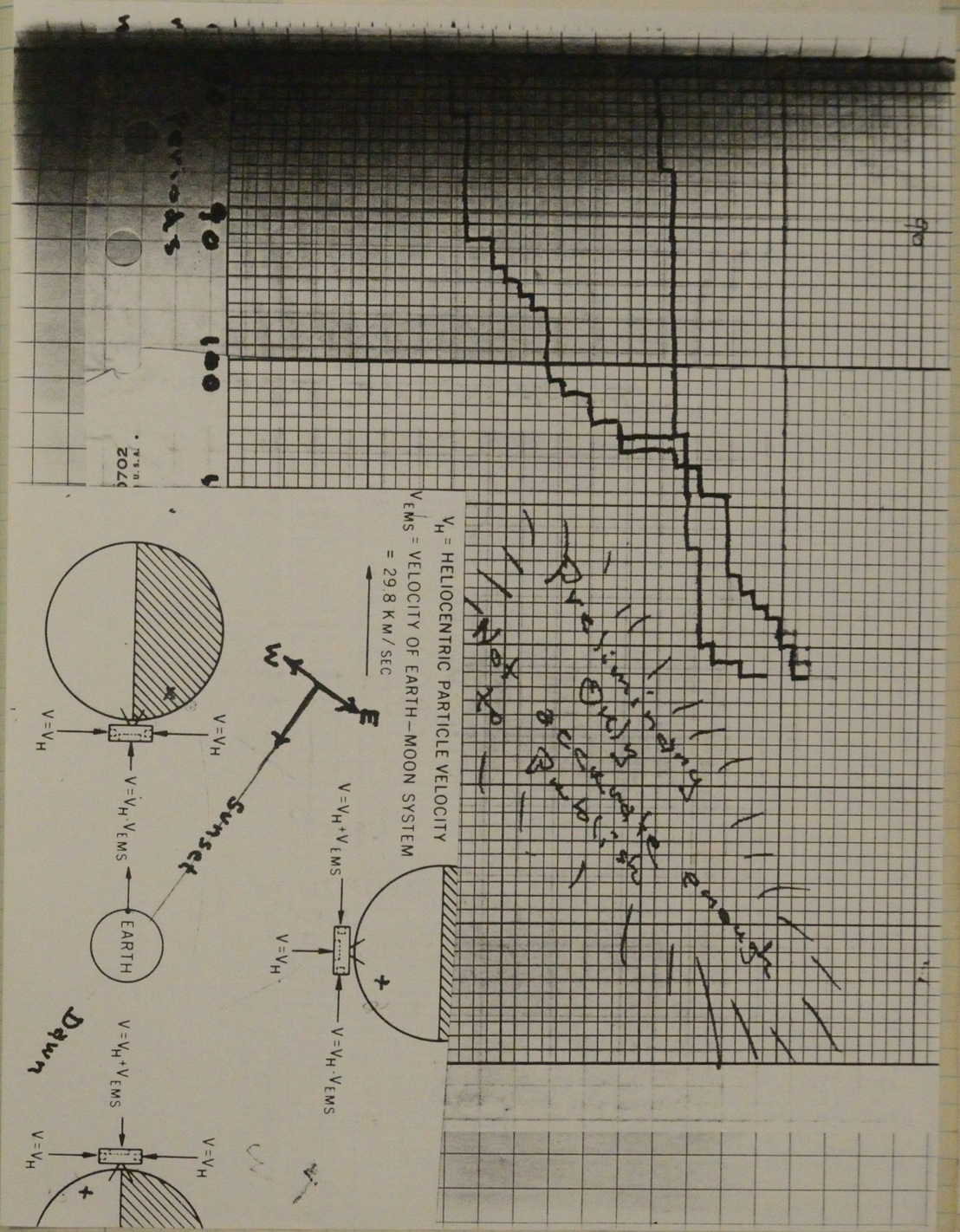
Time is shown as GMT (EST); * indicates preceding date

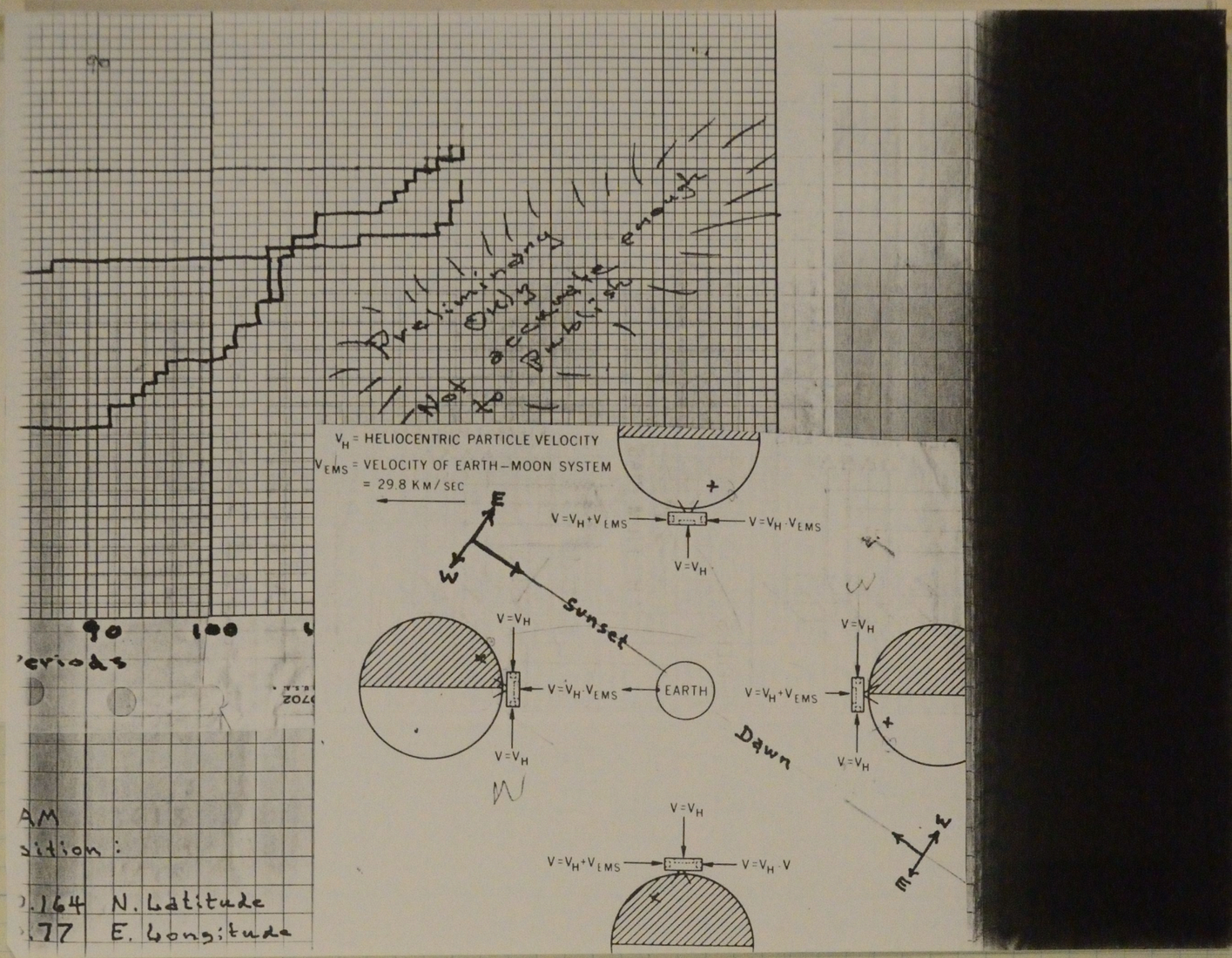
ALSEP Longitude	Apollo 17 30.75°E	Apollo 16 15.51°E	Apollo 15 3.69°E	Apollo 14 17.47° W	Apollo 12 (1) 23.39° W
13 Lunation	Nov 29/2329 (1829)	Dec 1/0532 (0032)	Dec 2/0455 (2355*)	Dec 3/2236 (1736)	Dec 4/1029 (0529)
Sunrise	Dec 7/0910 (0410)	Dec 8/1519 (1019)	Dec 9/1442 (0942)	Dec 10/1305 (0805)	Dec 11/2018 (1518)
Noon	Dec 14/1913 (1413)	Dec 16/0121 (2021*)	Dec 17/0048 (1548)	Dec 17/1825 (1325)	Dec 19/0512 (0012)
Sunset	Dec 22/0445 (2345*)	Dec 23/1046 (0546)	Dec 24/1007 (0507)	Dec 26/0342 (2242*)	Dec 26/1522 (1022)
Midnight					
14 Lunation	Dec 25/1401 (0901)	Dec 30/2004 (1504)	Dec 31/1928 (1428)	Jan 2/1310 (0810)	Jan 3/0109 (2009*)
Sunrise	Jan 5/2346 (1846)	Jan 7/0556 (0056)	Jan 8/0524 (0024)	Jan 9/2314 (1814)	Jan 10/1056 (0556)
Noon	Jan 13/0952 (0452)	Jan 14/1559 (1059)	Jan 15/1524 (1024)	Jan 17/0904 (0404)	Jan 17/1945 (1445)
Sunset	Jan 20/1924 (1424)	Jan 22/0125 (2025*)	Jan 23/0046 (1946*)	Jan 24/1821 (1321)	Jan 25/0600 (0100)
Midnight					
15 Lunation	Jan 28/0438 (2338*)	Jan 29/1041 (0541)	Jan 30/1005 (0505)	Jan 31/1552 (1052)	Feb 1/1552 (1052)
Sunrise	Feb 4/1421 (0921)	Feb 5/2054 (1554)	Feb 6/1958 (1458)	Feb 8/1345 (0845)	Feb 9/0128 (2028*)
Noon	Feb 12/0020 (1620*)	Feb 13/0626 (1126)	Feb 14/0550 (0050)	Feb 15/2232 (1832)	Feb 16/1005 (0505)
Sunset	Feb 19/0958 (0458)	Feb 20/1546 (1046)	Feb 21/1508 (1008)	Feb 23/0938 (0338)	Feb 23/2017 (1517)
Midnight					
16 Lunation	Feb 26/1852 (1352)	Feb 28/0052 (1952*)	Mar 1/0014 (1914*)	Mar 2/1754 (1254)	Mar 3/1045 (0545)
Sunrise	Mar 6/0424 (2324*)	Mar 7/1031 (0531)	Mar 8/0958 (0458)	Mar 10/0342 (2242)	Mar 10/1324 (0824)
Noon	Mar 13/1412 (0912)	Mar 14/2015 (1515)	Mar 15/1937 (1437)	Mar 17/1314 (0814)	Mar 17/2346 (1846)
Sunset	Mar 20/2325 (1825)	Mar 22/0522 (0022)	Mar 23/0440 (2340*)	Mar 24/2210 (1710)	Mar 25/0548 (0448)
Midnight					
17 Lunation	Mar 28/0317 (0317)	Mar 29/1416 (0916)	Mar 30/1336 (0836)	Mar 31/1054 (0554)	Apr 1/1923 (1423)
Sunrise	Apr 4/1736 (1236)	Apr 5/2341 (1841)	Apr 6/2305 (1805)	Apr 8/1648 (1148)	Apr 9/0426 (2326*)
Noon	Apr 12/0309 (2209*)	Apr 13/0909 (0409)	Apr 14/0829 (0329)	Apr 16/0205 (2105*)	Apr 16/1238 (0738)
Sunset	Apr 19/0707 (0707)	Apr 20/1302 (1302)	Apr 21/1218 (1218)	Apr 23/1045 (0545)	Apr 23/2222 (1722)
Midnight					
18 Lunation	Apr 26/2045 (1545)	Apr 28/0242 (2142*)	Apr 29/0200 (2100*)	Apr 30/1933 (1433)	May 1/0737 (0237)
Sunrise	May 4/0551 (0051)	May 5/1153 (0653)	May 6/1115 (0615)	May 8/0452 (2352*)	May 8/1632 (1132)
Noon	May 11/1508 (1008)	May 12/2108 (1608)	May 13/2026 (1526)	May 15/1355 (0855)	May 16/0034 (1934*)
Sunset	May 18/2355 (1855)	May 20/0548 (0048)	May 21/0502 (0002)	May 22/2226 (1726)	May 23/1002 (0502)
Midnight					
19 Lunation	May 26/0822 (0322)	May 27/1416 (0916)	May 28/1334 (0834)	May 30/0704 (0204)	May 30/1859 (1359)
Sunrise	June 2/1716 (1216)	June 3/2316 (1816)	June 4/2237 (1737)	June 6/1612 (1112)	June 7/0351 (2251*)
Noon	June 10/0224 (2124*)	June 11/0821 (0321)	June 12/0740 (0240)	June 14/0107 (2007*)	June 14/1151 (0651)
Sunset	June 17/1103 (0603)	June 18/0654 (1154)	June 19/0609 (1109)	June 21/0030 (0430)	June 21/1206 (1606)
Midnight					
20 Lunation	June 24/0337 (0037*)	June 26/0117 (2017*)	June 27/0001 (1901*)	June 28/1803 (1303)	June 29/0553 (0053)
Sunrise	July 1/0051 (2351*)	July 2/0731 (0231)	July 3/0653 (0153)	July 5/0306 (2206*)	July 6/1145 (0945)
Noon	July 8/0017 (1917*)	July 8/1302 (1802)	July 9/1232 (1732)	July 11/0000 (0700)	July 11/1250 (1750)
Sunset	July 16/2155 (1655)	July 18/0347 (2247*)	July 19/0301 (2201*)	July 20/2021 (1521)	July 21/0758 (0258)
Midnight					
21 Lunation	July 24/0616 (0116)	July 25/1211 (0711)	July 26/1128 (0628)	July 28/0457 (2357*)	July 28/1635 (1135)
Sunrise	July 31/1508 (1008)	Aug 1/2108 (1608)	Aug 2/2027 (1527)	Aug 4/1403 (0903)	Aug 5/0143 (2043*)
Noon	Aug 8/0017 (1917*)	Aug 9/0615 (0115)	Aug 10/0533 (0033)	Aug 11/2302 (1802)	Aug 12/0956 (0456)
Sunset	Aug 15/0900 (0400)	Aug 16/1453 (0953)	Aug 17/1407 (0907)	Aug 19/0731 (0231)	Aug 19/1907 (1407)
Midnight					
22 Lunation	Aug 22/1728 (1228)	Aug 23/2323 (1823)	Aug 24/2241 (1741)	Aug 26/1613 (1113)	Aug 27/0356 (2356*)
Sunrise	Aug 30/0300 (2200*)	Aug 31/0028 (0328)	Sept 1/0751 (0251)	Sept 3/0127 (2027*)	Sept 3/1307 (0807)
Noon	Sept 6/1746 (1646)	Sept 7/1746 (1246)	Sept 8/1706 (1206)	Sept 10/1038 (0538)	Sept 10/2133 (1633)
Sunset	Sept 13/2041 (1541)	Sept 15/0234 (2134*)	Sept 16/0151 (2051*)	Sept 17/1917 (1417)	Sept 18/0654 (0154)
Midnight					
23 Lunation	Sept 21/0520 (0020)	Sept 22/1117 (0617)	Sept 23/1037 (0537)	Sept 25/0412 (2312*)	Sept 25/1557 (1057)
Sunrise	Sept 28/1504 (1004)	Sept 29/2035 (1535)	Sept 30/1959 (1459)	Oct 2/1339 (0839)	Oct 3/0120 (2020*)
Noon	Oct 6/0004 (1904*)	Oct 7/0606 (0106)	Oct 8/0528 (0028)	Oct 9/2303 (1803)	Oct 10/0457 (0457)
Sunset	Oct 13/0912 (0412)	Oct 14/1508 (1008)	Oct 15/1426 (0926)	Oct 17/0756 (0256)	Oct 17/1934 (1434)
Midnight					
24 Lunation	Oct 20/1805 (1305)	Oct 22/0005 (1905*)	Oct 22/2326 (1826)	Oct 24/1703 (1203)	Oct 25/0453 (2353*)
Sunrise	Oct 28/0403 (2303*)	Oct 29/0936 (0436)	Oct 30/0903 (0403)	Nov 1/0246 (2146*)	Nov 1/1428 (0928)
Noon	Nov 4/1318 (0818)	Nov 5/1923 (1423)	Nov 6/1846 (1346)	Nov 8/1224 (0724)	Nov 9/2315 (1815)
Sunset	Nov 11/2238 (1738)	Nov 13/0437 (2337*)	Nov 14/0357 (2257*)	Nov 15/2130 (1630)	Nov 16/0049 (0349)
Midnight					
25 Lunation	Nov 19/0745 (0245)	Nov 20/1346 (0846)	Nov 21/1309 (0809)	Nov 23/0650 (0150)	Nov 23/1844 (1344)
Sunrise	Nov 26/1755 (1255)	Nov 27/2330 (1830)	Nov 28/2258 (1758)	Nov 30/1642 (1142)	Dec 1/0427 (2327*)
Noon	Dec 4/0321 (2221*)	Dec 5/0928 (0428)	Dec 6/0854 (0154)	Dec 8/0233 (2133*)	Dec 8/1318 (0818)
Sunset	Dec 11/1252 (0752)	Dec 12/1853 (1353)	Dec 13/1813 (1313)	Dec 15/1148 (0648)	Dec 15/2328 (1828)
Midnight					
26 Lunation	Dec 18/2206 (1706)	Dec 20/0410 (2310*)	Dec 21/0333 (0233*)	Dec 22/2155 (1655)	Dec 23/0916 (0416)
Sunrise	Dec 26/0822 (0322)	Dec 27/1400 (0900)	Dec 28/1328 (0828)	Dec 30/0717 (0217)	Dec 30/1900 (1400)
Noon	1975	1975	1975	1975	1975
Sunset	1975	1975	1975	1975	1975
Midnight	1975	1975	1975	1975	1975

Days 275 – 304 (1973)

- All PHA's
- Coincidence Only
- No Multiples



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Data
accurate enough
Publish
Not to
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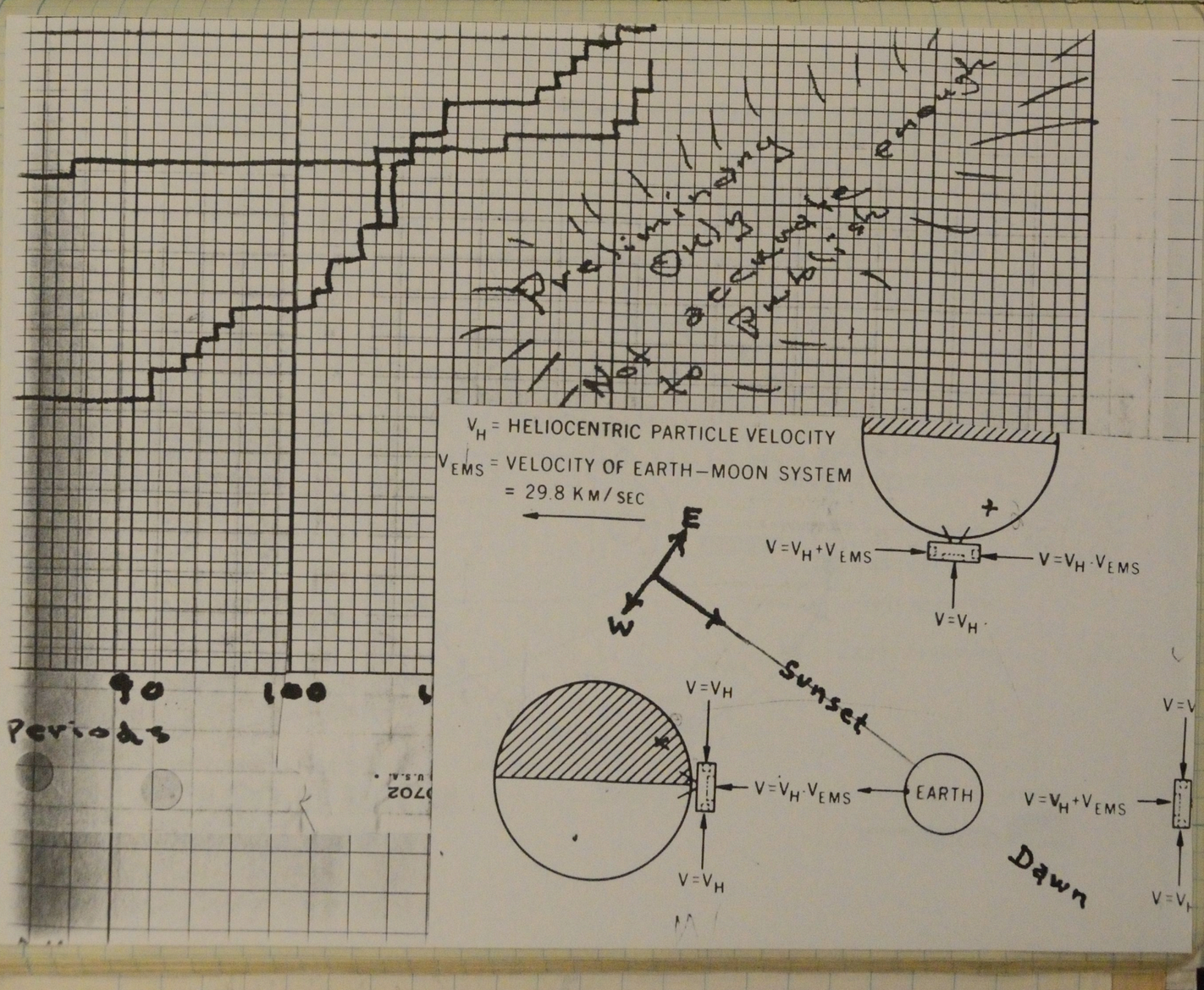
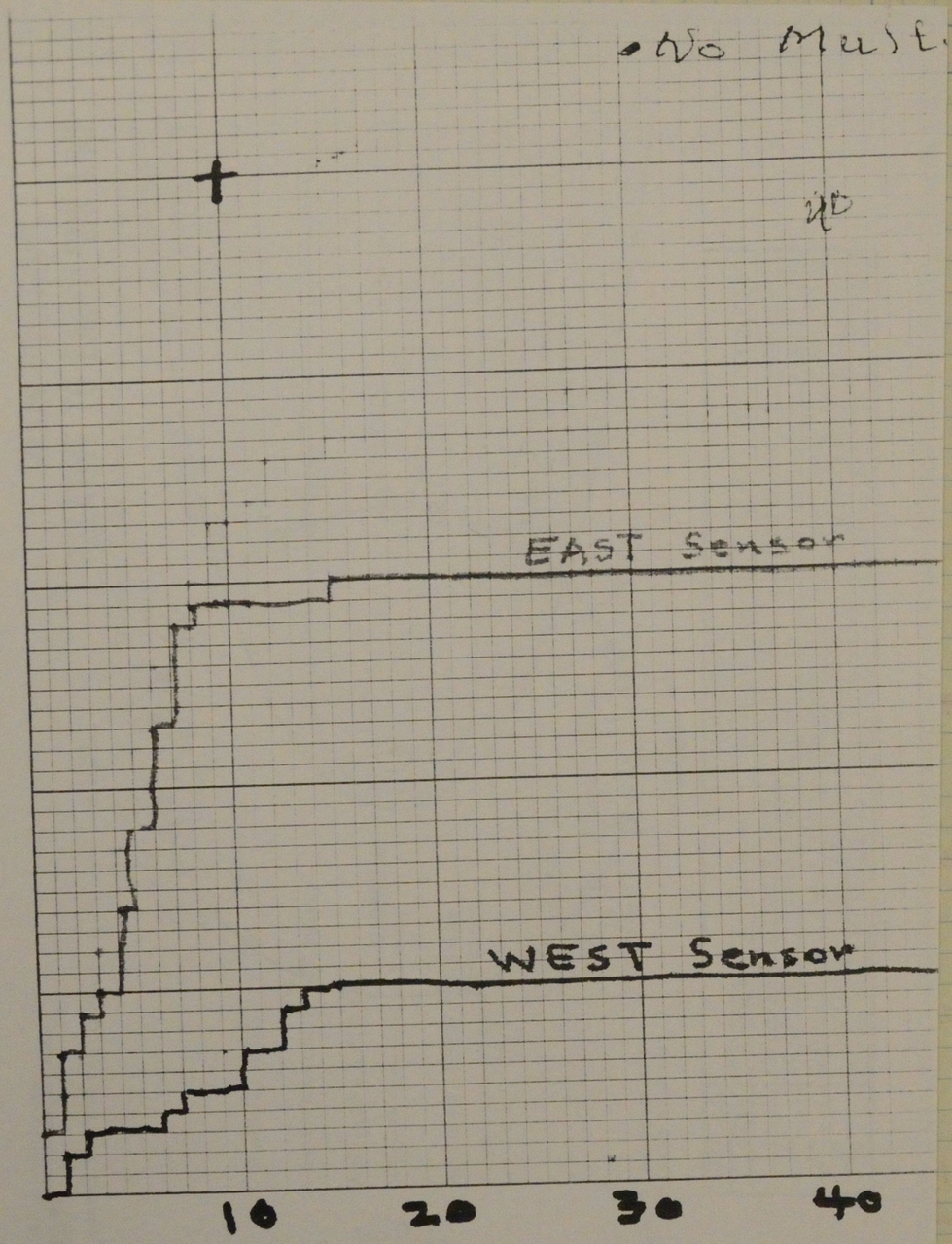
V_{EMS} = VELOCITY OF EARTH–MOON SYSTEM
= 29.8 KM/SEC
E
W
Sunset
Dawn
EARTH
$V=V_H+V_{EMS}$
$V=V_H-V_{EMS}$
$V=V_H$
90
100
Periods
AM
sition :
.164 N. Latitude
.77 E. Longitude


Preliminary
Data
accurate enough
Publish
Not to
V_H = HELIOCENTRIC PARTICLE VELOCITY
V_{EMS} = VELOCITY OF EARTH–MOON SYSTEM
= 29.8 KM/SEC
E
W
Sunset
Dawn
EARTH
$V=V_H+V_{EMS}$
$V=V_H-V_{EMS}$
$V=V_H$
90
100
Periods



Number of events / 6 - hour

Longitude

Bendix Aerospace Systems Division

Prepared by: Ted A. Breezy - January 1976

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1976

Note: Apollo 12 ALSEP based on empirical data
Apollo 14 - 17 are "normalized"
Time is shown as GMT (EST)
* Indicates previous day

ALSEP Longitude	Apollo 17 30.75°E	Apollo 16 15.51°E	Apollo 15 3.65°E	Apollo 14 17.47°W	Apollo 12 23.39°W
Lunation	39	47	56	62	77
Sunrise	Jan 6/2053 (1553)	Jan 8/0255 (2155)*	Jan 9/0219 (2119)*	Jan 10/2003 (1503)	Jan 11/0813 (0313)
Noon	Jan 14/0638 (0138)	Jan 15/1245 (0745)	Jan 16/1215 (0715)	Jan 18/0604 (0104)	Jan 18/1750 (1250)
Sunset	Jan 21/1643 (1143)	Jan 22/2249 (1749)	Jan 23/2213 (1713)	Jan 25/1556 (1056)	Jan 26/0230 (2130)*
Midnight	Jan 29/0214 (2114)*	Jan 30/0813 (0313)	Jan 31/0735 (0235)	Feb 2/0111 (2011)*	Feb 2/1254 (0754)
Lunation	40	48	57	63	78
Sunrise	Feb 5/1128 (0628)	Feb 6/1729 (1229)	Feb 7/1653 (1153)	Feb 9/1035 (0535)	Feb 9/2247 (1747)
Noon	Feb 12/2107 (1607)	Feb 14/0314 (2214)*	Feb 15/0242 (2142)*	Feb 16/2031 (1531)	Feb 17/0816 (0316)
Sunset	Feb 20/0705 (0205)	Feb 21/1309 (0809)	Feb 22/1234 (0734)	Feb 24/0613 (0113)	Feb 24/1648 (1148)
Midnight	Feb 27/1618 (1118)	Feb 28/2225 (1725)	Feb 29/2144 (1644)	Mar 2/1519 (1019)	Mar 3/0300 (2200)*
Lunation	41	49	58	64	79
Sunrise	Mar 6/0130 (2030)*	Mar 7/0729 (0529)	Mar 8/0652 (0152)	Mar 10/0031 (1931)*	Mar 10/1239 (0739)
Noon	Mar 13/1058 (0558)	Mar 14/1714 (1214)	Mar 15/1629 (1129)	Mar 17/1014 (0514)	Mar 17/2159 (1659)
Sunset	Mar 20/2042 (1542)	Mar 22/0244 (2144)*	Mar 23/0206 (2106)*	Mar 24/1944 (1444)	Mar 25/0622 (0122)
Midnight	Mar 28/0552 (0052)	Mar 29/1147 (0647)	Mar 30/1104 (0604)	Apr 1/0436 (2336)*	Apr 1/1616 (1116)
Lunation	42	50	59	65	80
Sunrise	Apr 4/1439 (0939)	Apr 5/2036 (1536)	Apr 6/1956 (1456)	Apr 8/1333 (0833)	Apr 9/0132 (2032)*
Noon	Apr 11/2353 (1853)	Apr 13/0556 (0056)	Apr 14/0519 (0019)	Apr 15/2302 (1802)	Apr 16/1046 (0546)
Sunset	Apr 19/0923 (0423)	Apr 20/1521 (1021)	Apr 21/1442 (0942)	Apr 23/0815 (0315)	Apr 23/1857 (1357)
Midnight	Apr 26/1817 (1317)	Apr 28/0010 (1921)*	Apr 28/2326 (1826)	Apr 30/1654 (1154)	May 1/0434 (2334)*
Lunation	43	51	60	66	81
Sunrise	May 4/0253 (2153)*	May 5/0847 (0347)	May 6/0804 (0304)	May 8/0138 (2038)*	May 8/1332 (0832)
Noon	May 11/1153 (0653)	May 12/1753 (1253)	May 13/1714 (1214)	May 15/1055 (0555)	May 15/2237 (1737)
Sunset	May 18/2108 (1608)	May 20/0306 (2206)*	May 21/0225 (2125)*	May 22/1956 (1456)	May 23/0642 (0142)
Midnight	May 26/0543 (0043)	May 27/1144 (0644)	May 28/1059 (0559)	May 30/0424 (2324)*	May 30/1601 (1101)
Lunation	44	52	61	67	82
Sunrise	Jun 2/1417 (0917)	Jun 3/2010 (1510)	Jun 4/1926 (1426)	Jun 6/1259 (0759)	Jun 7/0047 (1947)*
Noon	Jun 9/2308 (1808)	Jun 11/0508 (0008)	Jun 12/0430 (2330)*	Jun 13/2207 (1707)	Jun 14/0949 (0449)
Sunset	Jun 17/0818 (0318)	Jun 18/1413 (0913)	Jun 19/1331 (0831)	Jun 21/0701 (0201)	Jun 21/1752 (1252)
Midnight	Jun 24/1656 (1156)	Jun 25/2247 (1747)	Jun 26/2159 (1659)	Jun 28/1524 (1024)	Jun 29/0302 (2202)*
Lunation	45	53	62	68	83
Sunrise	Jul 2/0116 (2016)*	Jul 3/0708 (0208)	Jul 4/0625 (0125)	Jul 5/2356 (1856)	Jul 6/1140 (0640)
Noon	Jul 9/1006 (0506)	Jul 10/1604 (1104)	Jul 11/1525 (1025)	Jul 13/0902 (0402)	Jul 13/2044 (1544)
Sunset	Jul 16/1912 (1412)	Jul 18/0108 (2008)*	Jul 19/0026 (1926)*	Jul 20/1757 (1257)	Jul 21/0449 (2349)*
Midnight	Jul 24/0352 (2252)*	Jul 25/0942 (0442)	Jul 26/0856 (0356)	Jul 28/0220 (2120)*	Jul 28/1359 (0859)
Lunation	46	54	63	69	84
Sunrise	Jul 31/1213 (0713)	Aug 1/1806 (1306)	Aug 2/1724 (1224)	Aug 4/1056 (0556)	Aug 4/2221 (1721)
Noon	Aug 7/2107 (1607)	Aug 8/0307 (2207)*	Aug 10/0229 (2129)*	Aug 11/2006 (1506)	Aug 12/0748 (0248)
Sunset	Aug 15/0619 (0119)	Aug 16/1216 (0716)	Aug 17/1135 (0635)	Aug 19/0506 (0006)	Aug 19/1558 (1058)
Midnight	Aug 22/1504 (1004)	Aug 23/2055 (1555)	Aug 24/2011 (1511)	Aug 26/1338 (0838)	Aug 27/0117 (2017)*
Lunation	47	55	64	70	85
Sunrise	Aug 29/2335 (1835)	Aug 31/0529 (0029)	Sep 1/0448 (2348)*	Sep 2/2223 (1723)	Sep 3/1006 (0506)
Noon	Sep 6/0838 (0338)	Sep 7/1438 (0938)	Sep 8/1401 (0901)	Sep 10/0742 (0242)	Sep 10/1924 (1424)
Sunset	Sep 13/1759 (1259)	Sep 14/2358 (1858)	Sep 15/2318 (1818)	Sep 17/1653 (1153)	Sep 18/0342 (2242)*
Midnight	Sep 21/0255 (2155)*	Sep 22/0849 (0349)	Sep 23/0806 (0306)	Sep 25/0136 (2036)*	Sep 25/1316 (0816)
Lunation	48	56	65	71	86
Sunrise	Sep 28/1137 (0637)	Sep 29/1736 (1236)	Sep 30/1655 (1155)	Oct 2/1034 (0534)	Oct 2/2221 (1721)
Noon	Oct 5/2054 (1554)	Oct 7/0258 (2158)*	Oct 8/0222 (2122)*	Oct 9/2005 (1505)	Oct 10/0748 (0248)
Sunset	Oct 13/0629 (0129)	Oct 14/1231 (0731)	Oct 15/1153 (0653)	Oct 17/0531 (0031)	Oct 17/1616 (1116)
Midnight	Oct 20/1540 (1040)	Oct 21/2136 (1636)	Oct 22/2054 (1554)	Oct 24/1428 (0928)	Oct 25/0208 (2108)*
Lunation	49	57	66	72	87
Sunrise	Oct 28/0036 (1936)*	Oct 29/0636 (0136)	Oct 30/0558 (0058)	Oct 31/2338 (1838)	Nov 1/1132 (0632)
Noon	Nov 4/1006 (0506)	Nov 5/1612 (1112)	Nov 6/1537 (1037)	Nov 8/0924 (0424)	Nov 8/2108 (1608)
Sunset	Nov 11/1955 (1455)	Nov 13/0159 (2059)*	Nov 14/0123 (2023)*	Nov 15/1904 (1404)	Nov 16/0544 (0044)
Midnight	Nov 19/0520 (0020)	Nov 20/1118 (0618)	Nov 21/1037 (0537)	Nov 23/0413 (2313)*	Nov 23/1555 (1055)
Lunation	50	58	67	73	88
Sunrise	Nov 26/1429 (0929)	Nov 27/2030 (1530)	Nov 28/1953 (1453)	Nov 30/1336 (0836)	Dec 1/0142 (2042)*
Noon	Dec 4/0010 (1910)*	Dec 5/0617 (0117)	Dec 6/0543 (0043)	Dec 7/2332 (1832)	Dec 8/1118 (0618)
Sunset	Dec 11/1008 (0508)	Dec 12/1614 (1114)	Dec 13/1540 (1040)	Dec 15/0923 (0423)	Dec 15/1959 (1459)
Midnight	Dec 18/1942 (1442)	Dec 20/0142 (2042)*	Dec 21/0102 (2002)*	Dec 22/1840 (1340)	Dec 23/0621 (0121)
Lunation	51	59	68	74	89
Sunrise	Dec 26/0458 (2358)*	Dec 27/1100 (0600)	Dec 28/1025 (0525)	Dec 30/0410 (2310)*	Dec 30/1619 (1119)
Noon	Jan 2/1443 (0943)	Jan 3/2052 (1552)	Jan 4/2020 (1520)	Jan 6/1410 (0910)	Jan 7/0155 (2055)*
Sunset	Jan 10/0048 (1948)*	Jan 11/0654 (0154)	Jan 12/0619 (0119)	Jan 14/0002 (1902)*	Jan 14/1041 (0541)
Midnight	Jan 17/1023 (0523)	Jan 18/1622 (1122)	Jan 19/1542 (1042)	Jan 21/0920 (0420)	Jan 21/2101 (1601)

NASA-JSC

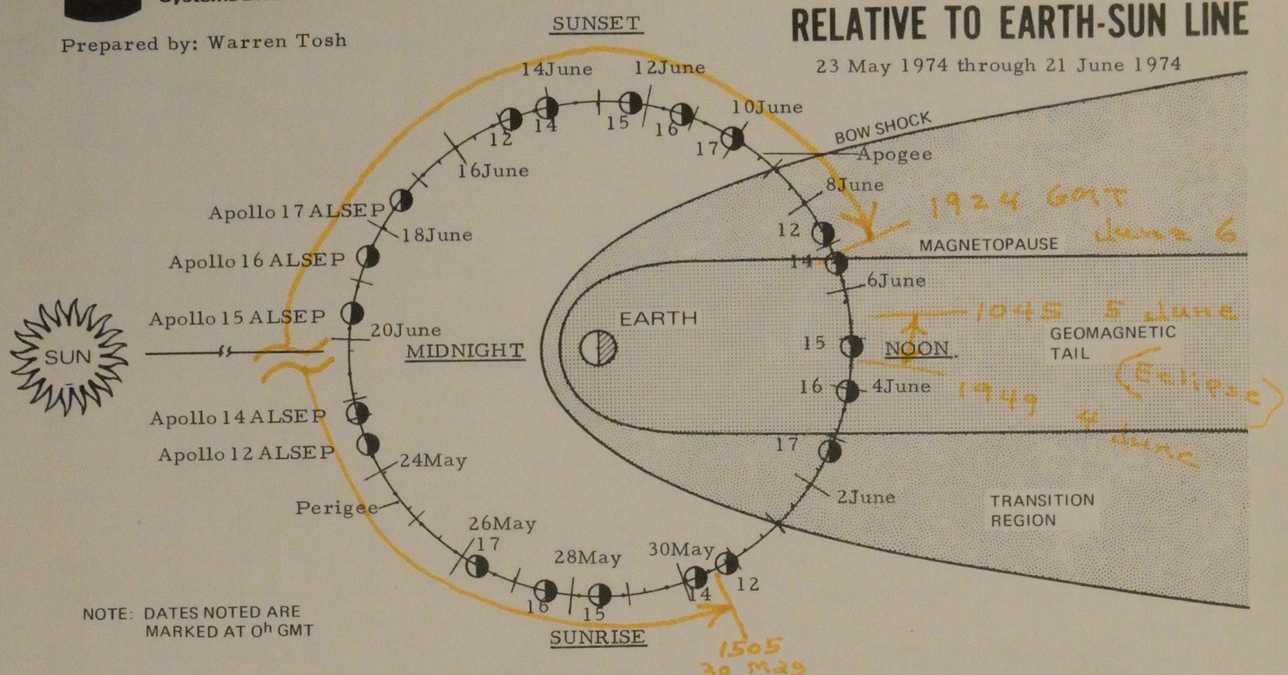
Midnight	1975	1975	1975	1975	1975

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

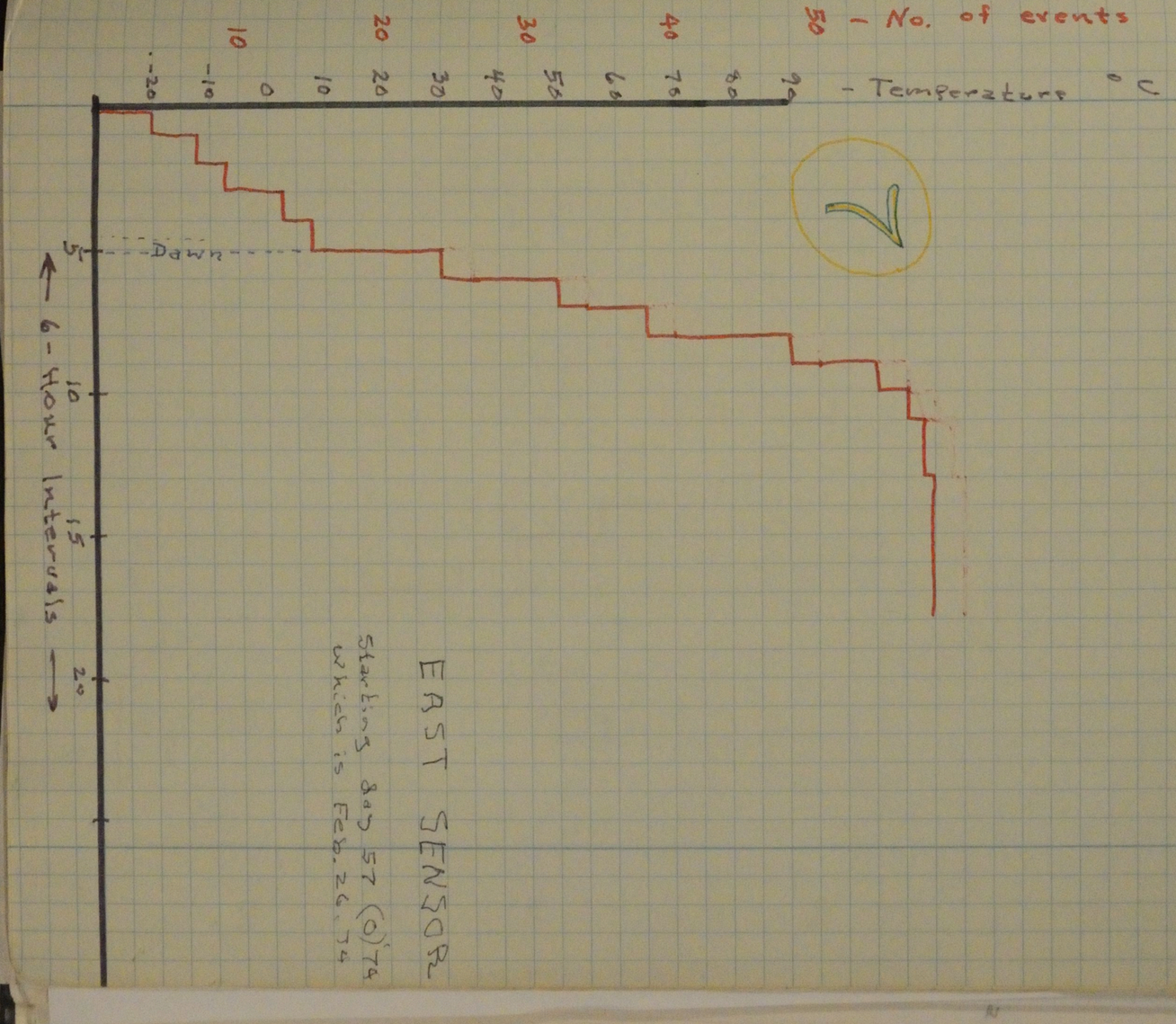
MOON POSITIONS RELATIVE TO EARTH-SUN LINE

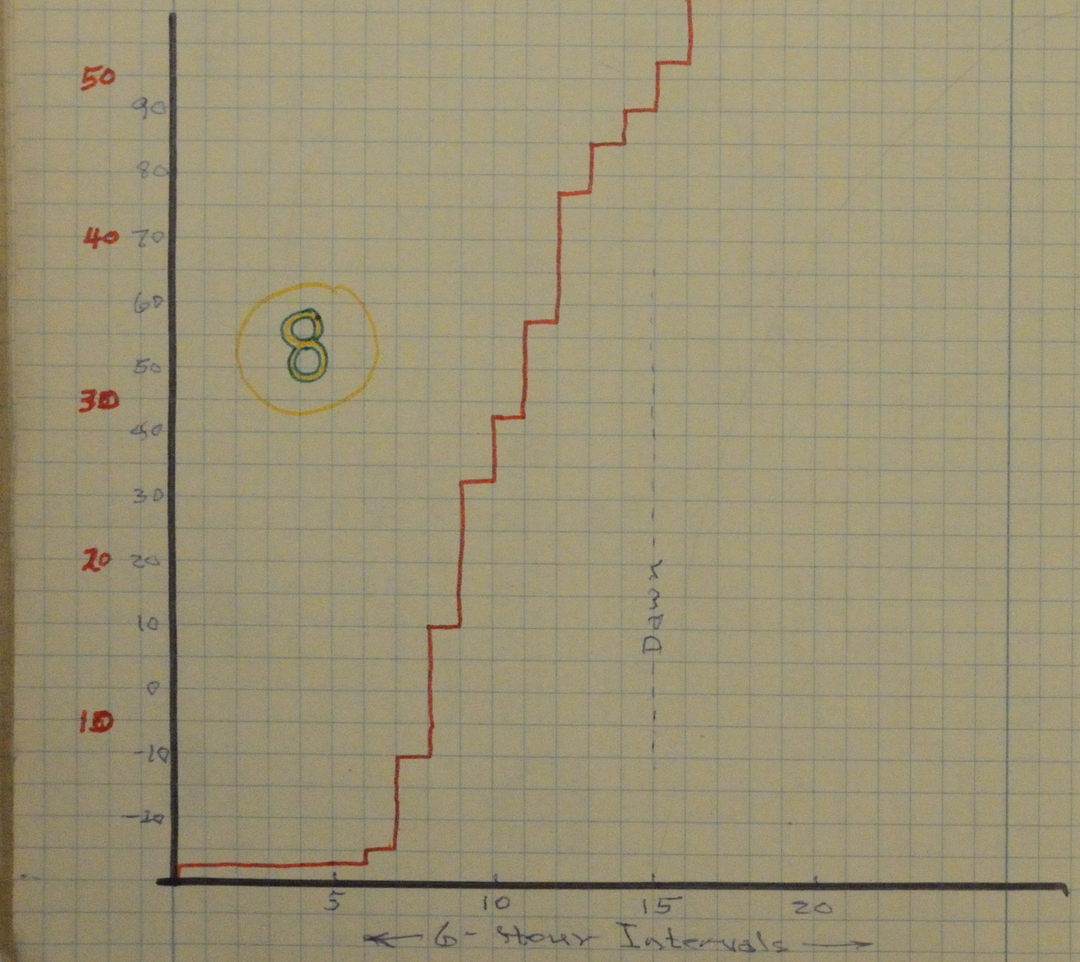
23 May 1974 through 21 June 1974



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	18May/2355	26May/0822	(19)2June/1716	10June/0224	17June/1103
16	20May/0548	27May/1416	(27)3June/2316	11June/0821	18June/1654
15	21May/0502	28May/1334	(36)4June/2237	12June/0740	19June/1609
14	22May/2226	30May/0704	(42)6June/1612	14June/0107	21June/0930
12	23May/1002	30May/1859	(57)7June/0351	14June/1151	21June/2106





Comments and Thoughts on LEAM data and my plots to date:

★ From Berg plot 6-5-74 and lunar year drawing — Berg 6-3-74 I observe the following: If one thinks of interstellars coming in as a bundle of wires and being dispersed by the sun into a sort of forbidden zone then — due to the lunar body shielding — one expects to see more particles at dawn in March than in corresponding (symmetrical about the solar apex) month of Sept. This is observed. This is because the particles would be shielded in Sept by the moon body.

Prediction: I predict that the up sensor will see very few — if any — interstellars during dawn in June.

Why ??? — because if they come in from an angle of 53° above the ecliptic at 271° longitude (in 21 June) they would have to be severely deflected to come in from below the moon.

Accordingly one can get a good handle on the degree of deflection of the particles and thus crank in β and get particle size.

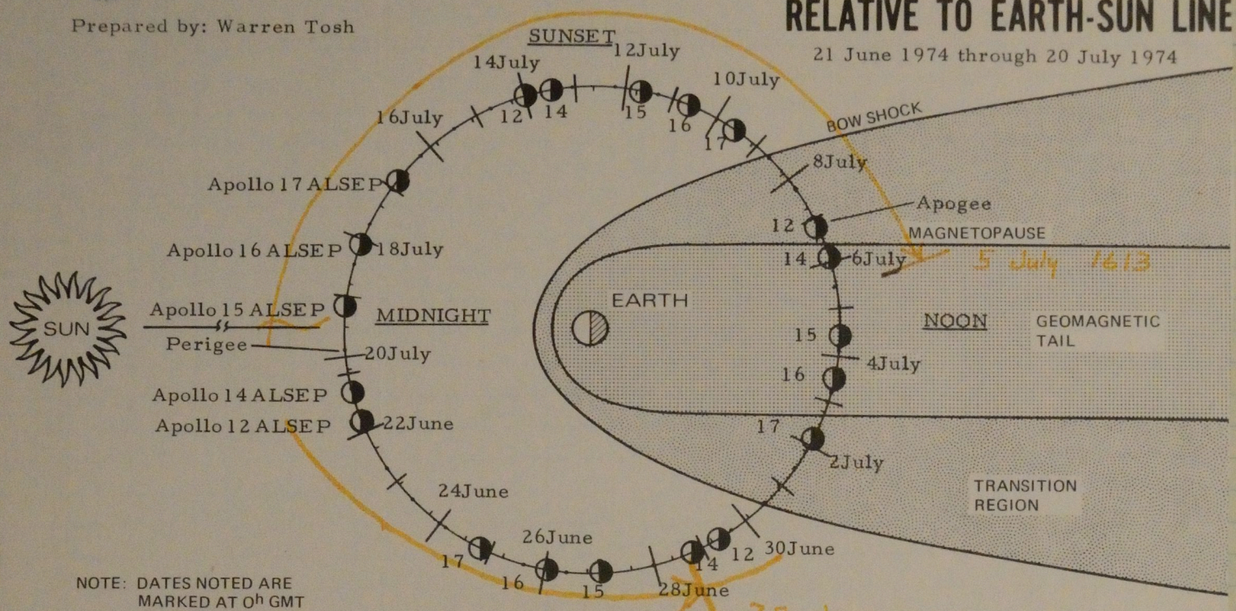
Further, since the west sensor sees no interstellar enhancement it means that they are only slightly deflected so as not to arrive from ~~the~~ a quasi-plane of the ecliptic.

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

21 June 1974 through 20 July 1974



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

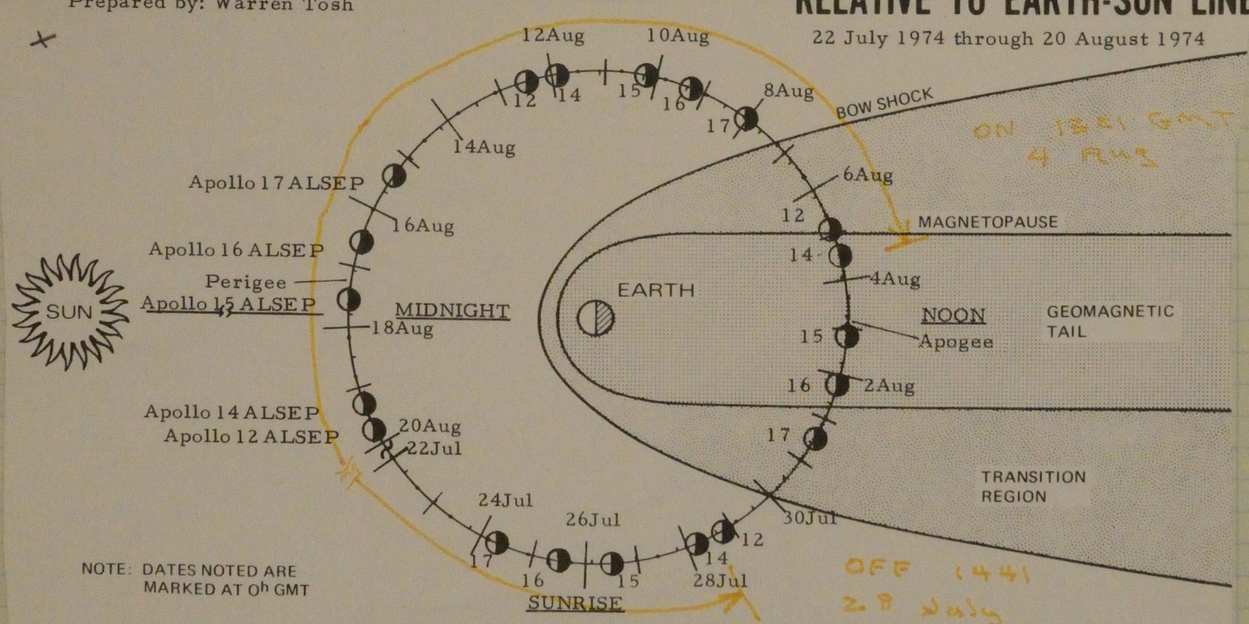
APOLLO (ALSEP)	DAY/HOUR (GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	17June/1103	24June/1924	(20)2July/0413	9July/1317	16July/2155
16	18June/1654	26June/0117	(28)3July/1013	10July/1915	18July/0347
15	19June/1609	27June/0034	(37)4July/0933	11July/1832	19July/0301
14	21June/0930	28June/1803	(43)6July/0306	13July/1201	20July/2023
12	21June/2106	29June/0553	(58)6July/1445	13July/2250	21July/0758

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

22 July 1974 through 20 August 1974



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

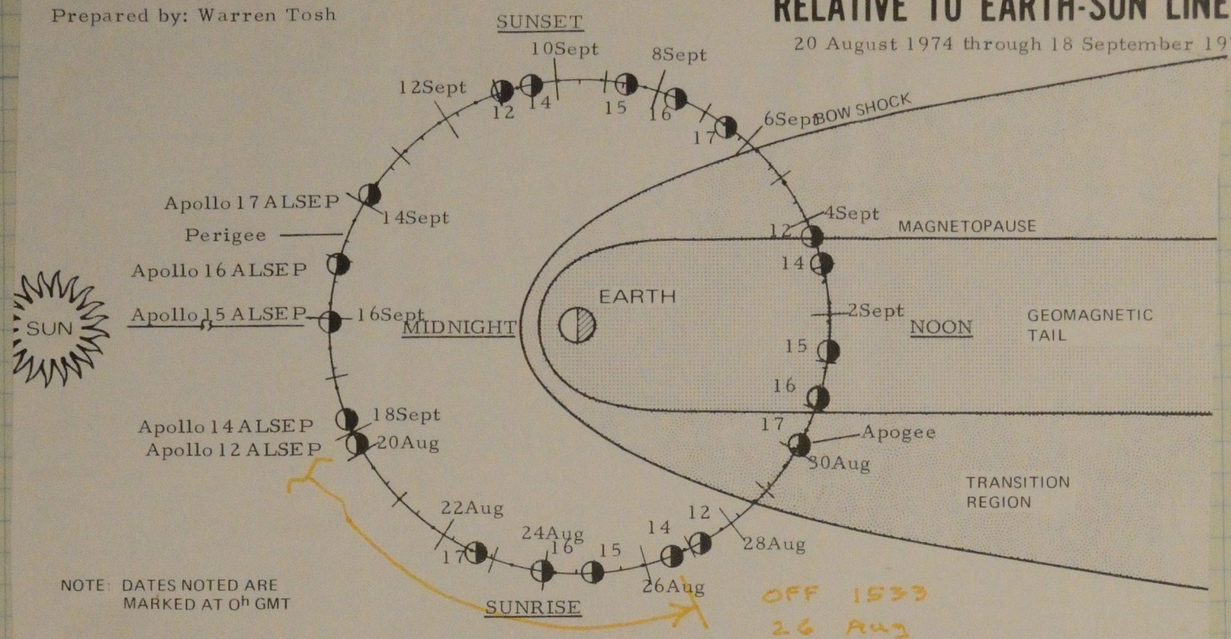
APOLLO (ALSEP)	DAY/HOUR (GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	16Jul/2155	24Jul/0616	(21)31Jul/1508	8Aug/0017	15Aug/0900
16	18Jul/0347	25Jul/1211	(29) 1Aug/2108	9Aug/0615	16Aug/1453
15	19Jul/0301	26Jul/1128	(38) 2Aug/2029	10Aug/0533	17Aug/1407
14	20Jul/2023	28Jul/0457	(44) 4Aug/1403	11Aug/2302	19Aug/0731
12	21Jul/0758	28Jul/1635	(59) 5Aug/0143	12Aug/0956	19Aug/1907

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

20 August 1974 through 18 September 1974



NOTE: DATES NOTED ARE MARKED AT 0h GMT

OFF 1533
26 Aug

APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	15Aug/0900	22Aug/1728	(22)30Aug/0300	6Sept/1146	13Sept/2041
16	16Aug/1453	23Aug/2323	(30)31Aug/0828	7Sept/1746	15Sept/0234
15	17Aug/1407	24Aug/2241	(39)1Sept/0751	8Sept/1706	16Sept/0151
14	19Aug/0731	26Aug/1613	(45)3Sept/0127	10Sept/1038	17Sept/1917
12	19Aug/1907	27Aug/0356	(60)3Sept/1307	10Sept/2133	18Sept/0654

74

On Multiple Events by Frank 75

9-13-74

All events through day 1591 (1974)

Film Only Events
- Multiples including - 2545
- Multiples excluded - 1554 (37%)

Coincidence Only Events
- Multiples [included - 3785 (46%)
- Multiples excluded - 2059

Observations on film, coincidence, etc

* Coincidence only events and coincidence multiples are very common as seen during Apollo Summer Lunar Orbital Science and Solar Max 75

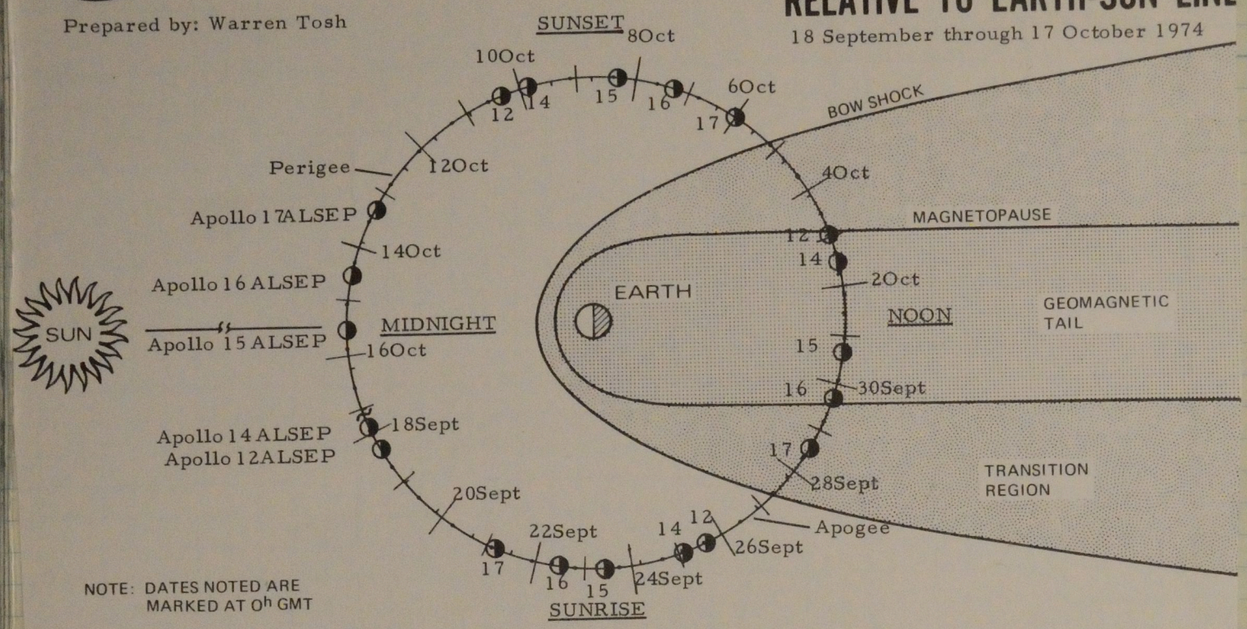
* Silver Only events are found almost as often as Green Coincidence events although Green Coincidence events exclusive of (the Coincidence and Silver only events) are very often seen. Most events 2 or 3 Green Coincidence 1972 about 2 Green Coincidence events per event. Only a few events have the Green coincidence which is the Silver Coincidence. Most Silver Coincidence events are seen about AX1

Bendix Aerospace Systems Division

Prepared by: Warren Tosh

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

18 September through 17 October 1974



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	13Sept/2041	21Sept/0520	(23)28Sept/1504	6Oct/0004	13Oct/0912
16	15Sept/0234	22Sept/1117	(31)29Sept/2035	7Oct/0606	14Oct/1508
15	16Sept/0151	23Sept/1037	(40)30Sept/1959	8Oct/0528	15Oct/1426
14	17Sept/1917	25Sept/0412	(46)2Oct/1339	9Oct/2303	17Oct/0756
12	18Sept/0654	25Sept/1557	(61)3Oct/0120	10Oct/0957	17Oct/1934

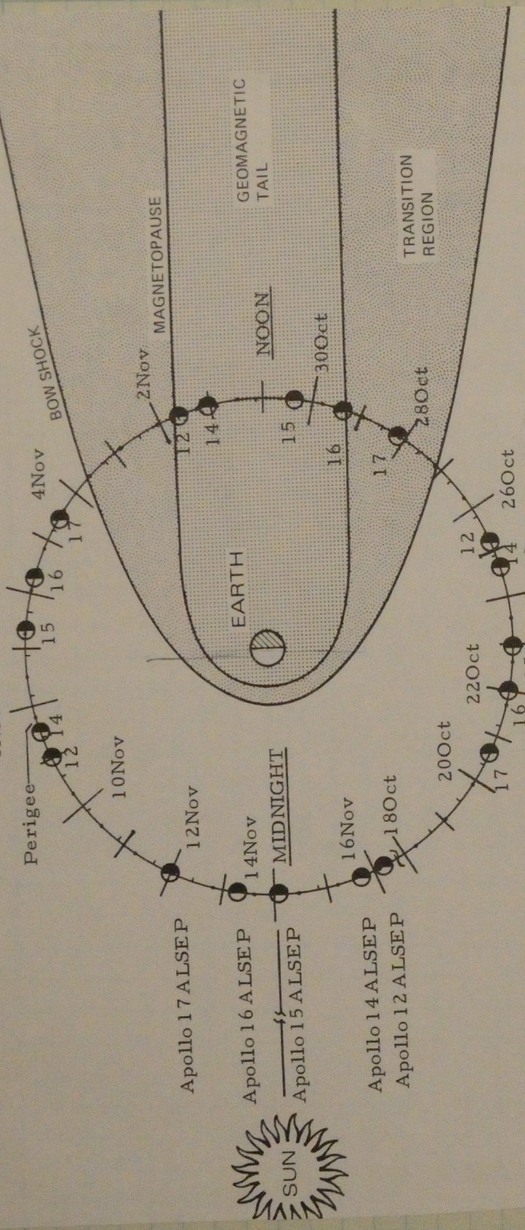
Telephone 607-256-5234

Tom Gold called me 10-22-74

- Orange Soil - all spheres from 200 μ to 20 μ
- all are damaged ocre - no matter what size. Are they damaged by infall? - did they arrive from outside of moon. He
- the wants to use our gun to simulate damage and derive velocity which caused single damage
  if less than 2.4 Km/sec then local & volcanic
  if > 2.4 Km/sec then along is different.
- he will furnish metal-coated glass beads for our gun - of uniform size like 10 μ etc.

MOON POSITIONS RELATIVE TO EARTH-SUN LINE

18 October through 16 November 1974



Bendix Aerospace Systems Division

Prepared by: Warren Tosh

NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO (ALSEP)	DAY/HOUR(GMT) Sunrise	Midnight	Lunation/Noon	Sunset	Midnight
17	20Oct/1805	13Oct/0912	(24)28Oct/0403	4Nov/1318	11Nov/2238
16	22Oct/0005	14Oct/1508	(32)29Oct/0936	5Nov/1923	13Nov/0437
15	22Oct/2326	15Oct/1426	(41)30Oct/0903	6Nov/1846	14Nov/0357
14	24Oct/1703	17Oct/0756	(47) 1Nov/0246	8Nov/1224	15Nov/2130
12	25Oct/0453	17Oct/1934	(62) 1Nov/1428	8Nov/2315	16Nov/0909

Apollo 17 ALSEP

Time G.m.t.

Parameter	1340	1417	1532	1702	1731	1821
LEAM AJ06 °F	156.5	151.5	136.5	112.5	110.1	OFF
LEAM AJ07 °F	156.5	154.0	139.5	117.0	115.5	OFF
LEAM AJ08 °F	166.5	159.0	141.0	118.5	118.5	OFF
LEAM AJ09 °F	185.6	181.4	164.0	139.5	136.5	OFF
LEAM AJ11 °F	196.0	186.5	155.5	123.7	122.9	137.7

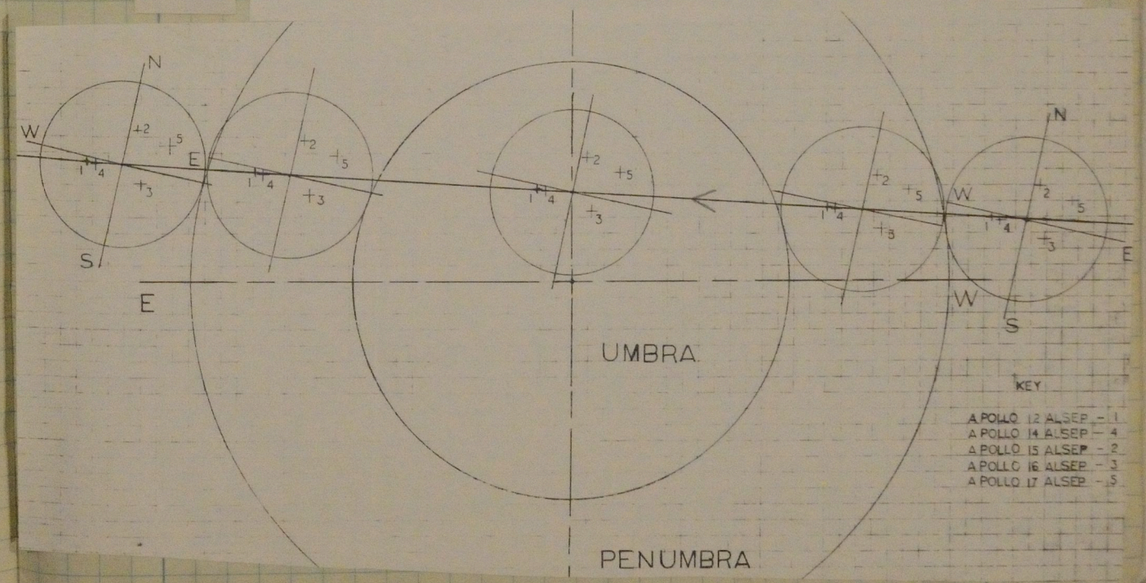
NOVEMBER 29, 1974

LUNAR EVENTS

	CST	GMT
Moon enters penumbra	0626	1226
Moon enters umbra	0729	1329
Middle of eclipse	0914	1514
Moon exits umbra	1059	1659
Moon exits penumbra	1202	1802
Duration of eclipse (hrs + mins)	5+36	
Magnitude of eclipse	(1.295)	

ALSEP EVENTS (CST - TIMES APPROXIMATE)

	1	4	3	2	5
ALSEP enters penumbra	0644	0647	0659	0704	0716
ALSEP enters umbra	0747	0751	0800	0810	0819
ALSEP middle of eclipse	0902	0906	0918	0919	0931
ALSEP exits umbra	1014	1018	1033	1020	1038
ALSEP exits penumbra	1116	1120	1135	1125	1143
Penumbral duration (hrs + mins)	4+32	4+33	4+36	4+21	4+27
Umbral duration (hrs + mins)	2+27	2+27	2+33	2+10	2+19

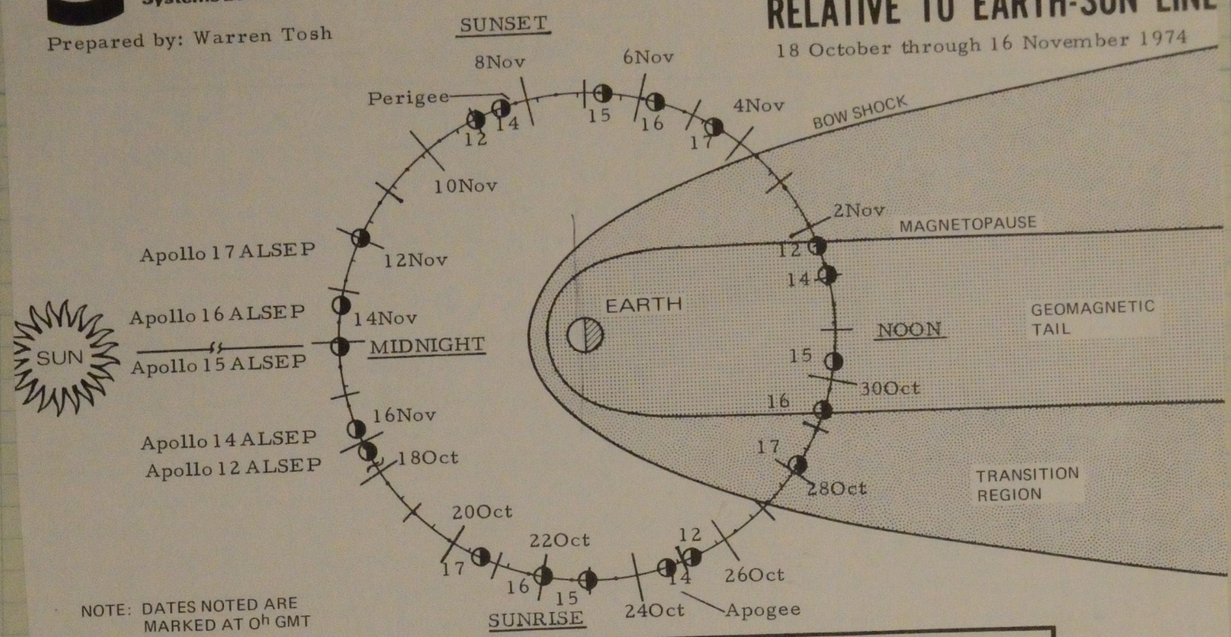


Bendix Aerospace Systems Division

Prepared by: Warren Tosh

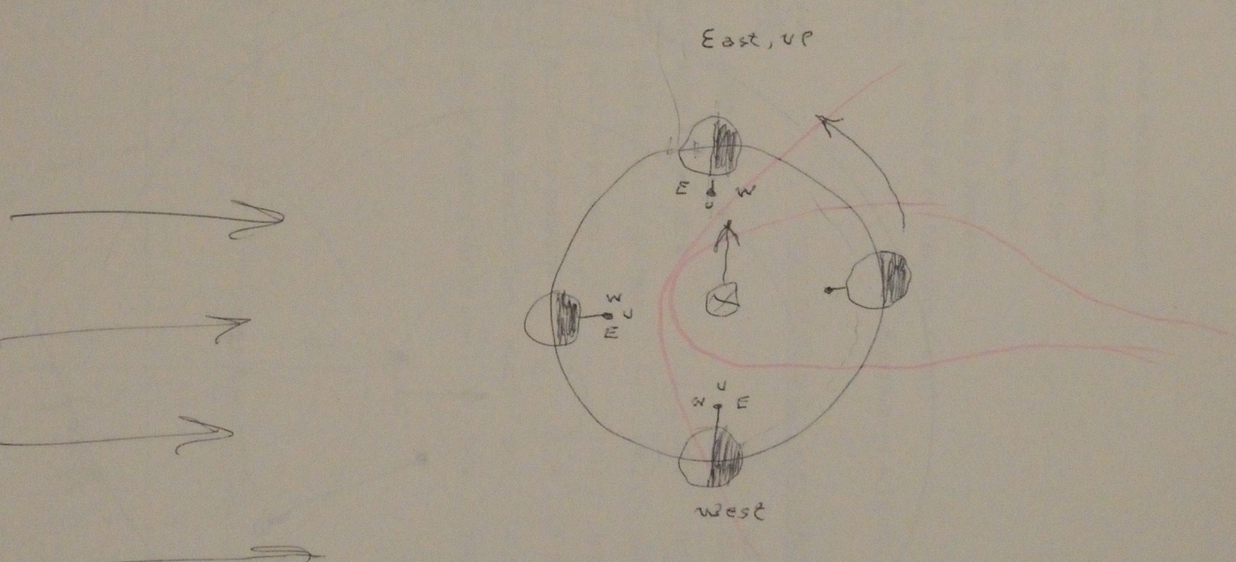
MOON POSITIONS RELATIVE TO EARTH-SUN LINE

18 October through 16 November 1974

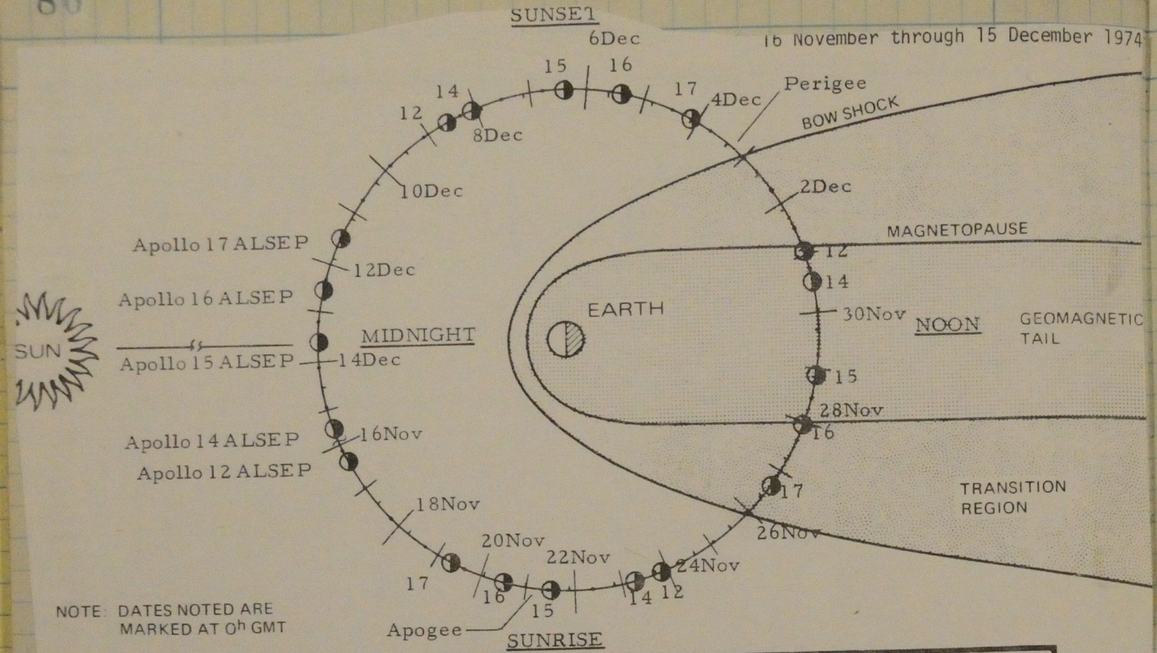


NOTE: DATES NOTED ARE MARKED AT 0^h GMT

APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	13Oct/0912	20Oct/1805	(24)28Oct/0403	4Nov/1318	11Nov/2238
16	14Oct/1508	22Oct/0005	(32)29Oct/0936	5Nov/1923	13Nov/0437
15	15Oct/1426	22Oct/2326	(41)30Oct/0903	6Nov/1846	14Nov/0357
14	17Oct/0756	24Oct/1703	(47) 1Nov/0246	8Nov/1224	15Nov/2130
12	17Oct/1934	25Oct/0453	(62) 1Nov/1428	8Nov/2315	16Nov/0909



NOVEMBER 29, 1974

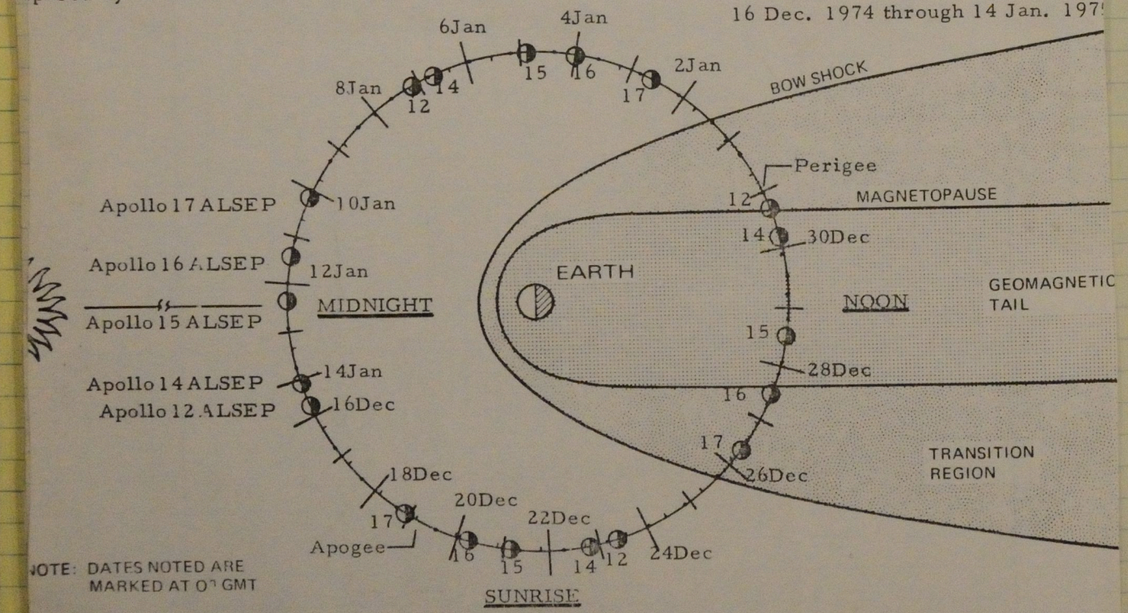


16 November through 15 December 1974

NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO	DAY/HOUR (GMT)				
(ALSEP)	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	11Nov/2238	19Nov/0745	(25)26Nov/1755	4Dec/0321	11Dec/1252

Prepared by: Warren Tosh



RELATIVE TO EARTH SUR

16 Dec. 1974 through 14 Jan. 197

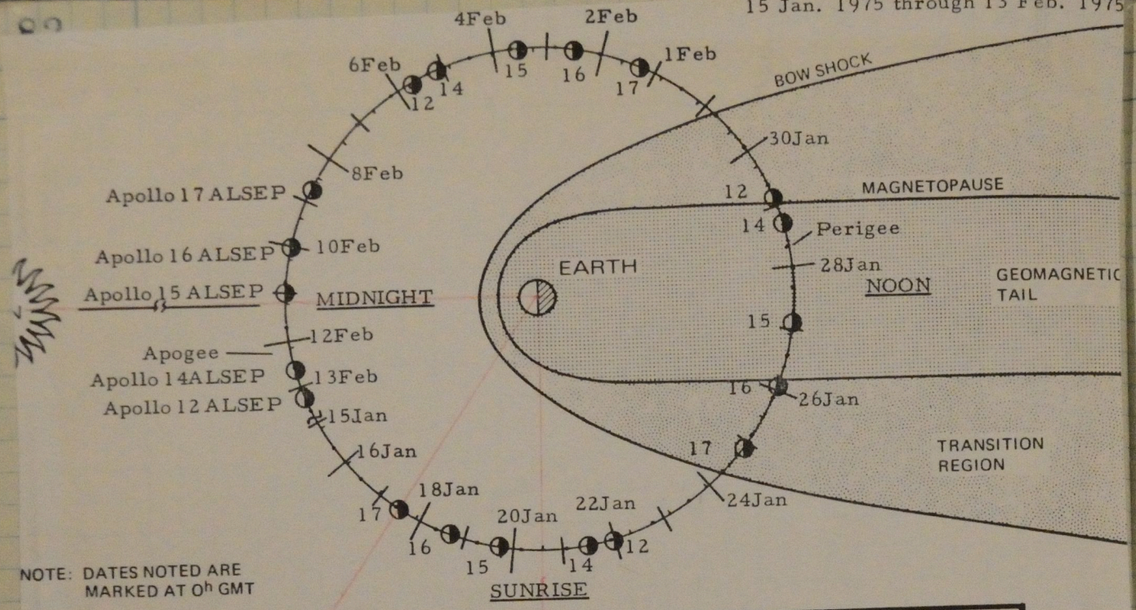
NOTE: DATES NOTED ARE MARKED AT 0h GMT

APOLLO	DAY/HOUR(GMT)				
(ALSEP)	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	11Dec/1252	18Dec/2206	(26)26Dec/0822	2Jan/1756	10Jan/0329

Sunrises

1973		Hoffman	Langseth		
Jan	9	1540	9	1457	
Feb	8	0545	39	0429	1332
Mar	9	1830	68	1907	1433
Apr	8	1850	98	0733	1234
May	7	2040	127	2029	1256
June	10	2210	157	0748	1121
July	5	1910	186	1848	1100
Aug	3	2230	216	0547	1059
Sep	2	1815	245	1728	1141
Oct	2	0700	275	0602	1234
Nov			304	1917	
			334	0812	
			363	2224	
			28	1300	
			58	0256	
			87	1703	
			117	0526	
			146	1702	
			176	0432	
			205	1521	

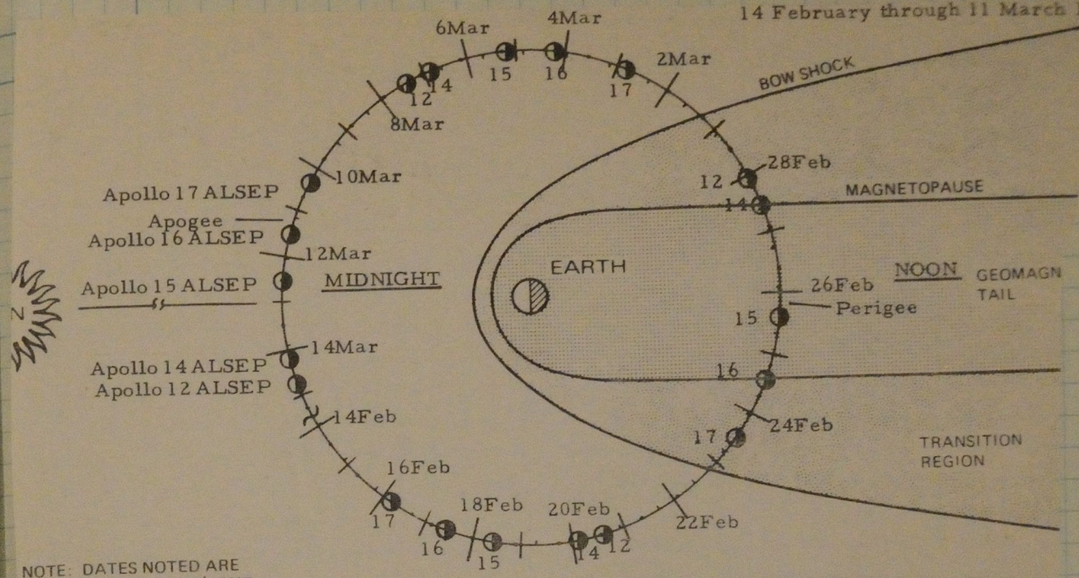
15 Jan. 1975 through 13 Feb. 1975



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	10Jan/0329	17Jan/1246	(27)24Jan/2230	1Feb/0833	8Feb/1802
16	11Jan/0931	18Jan/1846	(35)26Jan/0439	2Feb/1439	10Feb/0001
15	12Jan/0852	19Jan/1812	(44)27Jan/0407	3Feb/1404	10Feb/2322
14	14Jan/0227	21Jan/1154	(50)28Jan/2155	5Feb/0743	12Feb/1656
12	14Jan/1406	22Jan/0001	(65)29Jan/0938	5Feb/1819	13Feb/0435

14 February through 11 March 1975



NOTE: DATES NOTED ARE MARKED AT 0^h GMT

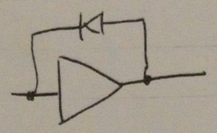
APOLLO (ALSEP)	DAY/HOUR(GMT)				
	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	10Mar/0759	17Mar/1657	(29)25Mar/0221	1Apr/1200	8Apr/2103
16	11Mar/1357	18Mar/2257	(37)26Mar/0826	2Apr/1802	10Apr/0259
15	12Mar/1316	19Mar/2218	(46)27Mar/0752	3Apr/1723	11Apr/0217
14	14Mar/0648	21Mar/1555	(52)29Mar/0135	5Apr/1056	12Apr/1944
12	14Mar/1826	22Mar/0403	(67)29Mar/1316	5Apr/2133	13Apr/0722

Derek Perkins, Feb. 14th, 1975

1st mode slow and highly charged particle

PHA is designed to measure PH of short pulses only;
if pulse is long (~240μs), it measures large PH

2nd mode slow and highly charged particle

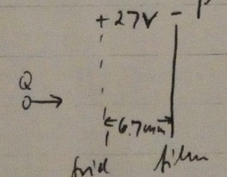


also high PHA reading

when signal comes back from saturation, the output swings
designed for input signals up to 200mV (if short);
if input signal is long enough, saturation is achieved with an input amplitude of only 30mV or more

From Telecon between Auer and Derek P. 2/14/75

Is it possible that a particle is ~~de~~ decelerated by the bias voltage?



what velocity does a particle gain if it starts from rest (v=0) and is extremely high charged ($E = 2.5\times10^9$ V/m)

$\frac{m}{2}v^2 = Q \times 27V$, $Q = 4\pi\varepsilon_0 E r^2$, $m = \frac{4}{3}\pi\rho r^3$

$\rho = 3\,g/cm^3 = 3\times10^3\ \frac{kg}{m^2}$

$r = 1m \xrightarrow{2.8\times10^{-1}As} v = 35mm/s$, $r = 1cm \xrightarrow{2.8\times10^{-5}As} v = 35cm/s$, $r = 100\mu \xrightarrow{2.8\times10^{-9}As} v = 3.5m/s$, $r = 1\mu \xrightarrow{2.8\times10^{-13}As} v = 35m/s$

by Auer

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1975

Bendix Aerospace Systems Division
Prepared by: Warren Tosh - January 1975

Note: Apollo 12 ALSEP based on empirical data; Apollo 14-17 are "normalized"
Time is shown as GMT (EST)
* indicates previous day

ALSEP Longitude	Apollo 17 30.75°E	Apollo 16 15.51°E	Apollo 15 3.65°E	Apollo 14 17.47°W	Apollo 12 23.39°W
Lunation	26	34	43	49	64
Sunrise	Dec 18/2206 (1706)	Dec 20/0410 (2310)*	Dec 21/0333 (2233)*	Dec 22/2155 (1655)	Dec 23/0916 (0416)
Noon	Dec 26/0822 (0322)	Dec 27/1400 (0900)	Dec 28/1328 (0828)	Dec 30/0717 (0217)	Dec 30/1900 (1400)
Sunset	Jan 2/1756 (1256)	Jan 4/0004 (1904)*	Jan 4/2328 (1828)	Jan 6/1709 (1209)	Jan 7/0350 (2250)*
Midnight	Jan 10/0329 (2229)*	Jan 11/0931 (0431)	Jan 12/0852 (0352)	Jan 14/0227 (2127)*	Jan 14/1406 (0906)
Lunation	27	35	44	50	65
Sunrise	Jan 17/1246 (0746)	Jan 18/1849 (1349)	Jan 19/1812 (1312)	Jan 21/1154 (0654)	Jan 22/0001 (1901)*
Noon	Jan 24/2230 (1730)	Jan 26/0439 (2339)*	Jan 27/0407 (2307)*	Jan 28/2155 (1655)	Jan 29/0938 (0438)
Sunset	Feb 1/0833 (0333)	Feb 2/1439 (0939)	Feb 3/1404 (0904)	Feb 5/0743 (0243)	Feb 5/1819 (1319)
Midnight	Feb 8/1802 (1302)	Feb 10/0001 (1901)*	Feb 10/2322 (1822)	Feb 12/1656 (1156)	Feb 13/0435 (2335)*
Lunation	28	36	45	51	66
Sunrise	Feb 16/0312 (2212)*	Feb 17/0913 (0413)	Feb 18/0836 (0336)	Feb 20/0216 (2116)*	Feb 20/1427 (0927)
Noon	Feb 23/1247 (0747)	Feb 24/1856 (1356)	Feb 25/1823 (1323)	Feb 27/1209 (0709)	Feb 27/2352 (1852)
Sunset	Mar 2/2242 (1742)	Mar 4/0446 (2346)*	Mar 5/0409 (2309)*	Mar 6/2146 (1646)	Mar 7/0819 (0319)
Midnight	Mar 10/0759 (0259)	Mar 11/1357 (0857)	Mar 12/1316 (0816)	Mar 14/0648 (0148)	Mar 14/1826 (1526)
Lunation	29	37	46	52	67
Sunrise	Mar 17/1657 (1157)	Mar 18/2257 (1757)	Mar 19/2218 (1718)	Mar 21/1555 (1055)	Mar 22/0403 (2303)*
Noon	Mar 25/0221 (2121)*	Mar 26/0826 (0326)	Mar 27/0752 (0252)	Mar 29/0135 (2035)*	Mar 29/1316 (0816)
Sunset	Apr 1/1200 (0700)	Apr 2/1802 (1302)	Apr 3/1723 (1223)	Apr 5/1056 (0556)	Apr 5/2133 (1633)
Midnight	Apr 8/2103 (1603)	Apr 10/0259 (2159)*	Apr 11/0217 (2117)*	Apr 12/1944 (1444)	Apr 13/0722 (0222)
Lunation	30	38	47	53	68
Sunrise	Apr 16/0547 (0047)	Apr 17/1144 (0644)	Apr 18/1103 (0603)	Apr 20/0437 (2337)*	Apr 20/1640 (1140)
Noon	Apr 23/1456 (0956)	Apr 24/2059 (1559)	Apr 25/2022 (1522)	Apr 27/1401 (0901)	Apr 28/0142 (2042)*
Sunset	May 1/0020 (1920)*	May 2/0619 (0119)	May 3/0538 (0038)	May 4/2309 (1809)	May 5/0950 (0450)
Midnight	May 8/0910 (0410)	May 9/1504 (1004)	May 10/1419 (0919)	May 12/0744 (0244)	May 12/1920 (1420)
Lunation	31	39	48	54	69
Sunrise	May 15/1741 (1241)	May 16/2335 (1835)	May 17/2253 (1753)	May 19/1624 (1124)	May 20/0417 (2317)*
Noon	May 23/0238 (2138)*	May 24/0839 (0339)	May 25/0801 (0301)	May 27/0136 (2036)*	May 27/1316 (0816)
Sunset	May 30/1149 (0649)	May 31/1747 (1247)	June 1/1705 (1205)	June 3/1033 (0533)	June 3/2119 (1619)
Midnight	June 6/2031 (1531)	June 8/0222 (2122)*	June 9/0136 (2036)*	June 10/1859 (1359)	June 11/0635 (0135)
Lunation	32	40	49	55	70
Sunrise	June 14/0452 (2352)*	June 15/1046 (0546)	June 16/1003 (0503)	June 18/0332 (2232)*	June 18/1521 (1021)
Noon	June 21/1343 (0843)	June 22/1943 (1443)	June 23/1903 (1403)	June 25/1238 (0738)	June 26/0017 (1917)*
Sunset	June 28/2249 (1749)	June 30/0446 (2346)*	July 1/0404 (2304)*	July 2/2132 (1632)	July 3/0822 (0322)
Midnight	July 6/0727 (0227)	July 7/1318 (0818)	July 8/1232 (0732)	July 10/0554 (0054)	July 10/1730 (1230)
Lunation	33	41	50	56	71
Sunrise	July 13/1947 (1047)	July 14/2140 (1640)	July 15/2057 (1557)	July 17/1427 (0927)	July 18/0212 (2112)*
Noon	July 21/0038 (1938)*	July 22/0637 (0137)	July 23/0558 (0058)	July 24/2332 (1832)	July 25/1111 (0611)
Sunset	July 28/0944 (0444)	July 29/1541 (1041)	July 30/1459 (0959)	Aug 1/0827 (0327)	Aug 1/1922 (1422)
Midnight	Aug 4/1825 (1325)	Aug 6/0016 (1916)*	Aug 6/2331 (1831)	Aug 8/1653 (1153)	Aug 9/0429 (2329)*
Lunation	34	42	51	57	72
Sunrise	Aug 12/0249 (2149)*	Aug 13/0844 (0344)	Aug 14/0801 (0301)	Aug 16/0134 (2034)*	Aug 16/1317 (0817)
Noon	Aug 19/1146 (0646)	Aug 20/1747 (1247)	Aug 21/1708 (1208)	Aug 23/1044 (0544)	Aug 23/2223 (1723)
Sunset	Aug 26/2059 (1559)	Aug 28/0258 (2158)*	Aug 29/0218 (2118)*	Aug 30/1949 (1449)	Aug 31/0644 (0144)
Midnight	Sept 3/0549 (0049)	Sept 4/1143 (0643)	Sept 5/1059 (0959)	Sept 7/0424 (2324)*	Sept 7/1600 (1100)
Lunation	35	43	52	58	73
Sunrise	Sept 10/1424 (0924)	Sept 11/2021 (1521)	Sept 12/1939 (1439)	Sept 14/1313 (0813)	Sept 15/0058 (1958)*
Noon	Sept 17/2332 (1832)	Sept 19/0534 (0034)	Sept 20/0457 (2357)*	Sept 21/2236 (1736)	Sept 22/1016 (0516)
Sunset	Sept 25/0858 (0358)	Sept 26/1459 (0959)	Sept 27/1420 (0920)	Sept 29/0753 (0253)	Sept 29/1847 (1347)
Midnight	Oct 2/1801 (1301)	Oct 3/2356 (1856)	Oct 4/2313 (1813)	Oct 6/1642 (1142)	Oct 7/0419 (2319)*
Lunation	36	44	53	59	74
Sunrise	Oct 10/0248 (2148)*	Oct 11/0847 (0347)	Oct 12/0808 (0308)	Oct 14/0144 (2044)*	Oct 14/1335 (0835)
Noon	Oct 17/1209 (0709)	Oct 18/1903 (1403)	Oct 19/1739 (1239)	Oct 21/1148 (0648)	Oct 21/2302 (1802)
Sunset	Oct 24/2150 (1650)	Oct 26/0353 (2253)*	Oct 27/0316 (2216)*	Oct 28/2053 (1553)	Oct 29/0743 (0243)
Midnight	Nov 1/0706 (0206)	Nov 2/1304 (0804)	Nov 3/1223 (0723)	Nov 5/0555 (0055)	Nov 5/1733 (1233)
Lunation	37	45	54	60	75
Sunrise	Nov 8/1607 (1107)	Nov 9/2209 (1709)	Nov 10/2131 (1631)	Nov 12/1511 (1011)	Nov 13/0306 (2206)*
Noon	Nov 16/0142 (2042)	Nov 17/0749 (0249)	Nov 18/0715 (0215)	Nov 20/0101 (2001)*	Nov 20/1243 (0743)
Sunset	Nov 23/1136 (0636)	Nov 24/1742 (1242)	Nov 25/1707 (1207)	Nov 27/1046 (0546)	Nov 27/2131 (1631)
Midnight	Nov 30/2104 (1604)	Dec 2/0304 (2204)*	Dec 3/0224 (2124)*	Dec 4/1959 (1459)	Dec 5/0738 (0238)
Lunation	38	46	55	61	76
Sunrise	Dec 8/0616 (0116)	Dec 9/1219 (0719)	Dec 10/1143 (0643)	Dec 12/0525 (0025)	Dec 12/1727 (1227)
Noon	Dec 15/1559 (1059)	Dec 16/2207 (1707)	Dec 17/2136 (1636)	Dec 19/1524 (1024)	Dec 20/0306 (2206)*
Sunset	Dec 23/0202 (2102)*	Dec 24/0809 (0309)	Dec 25/0735 (0235)	Dec 27/0116 (2016)*	Dec 27/1155 (0655)
Midnight	Dec 30/1136 (0636)	Dec 31/1737 (1237)	Jan 1/1658 (1158)	Jan 3/1033 (0533)	Jan 3/2213 (1713)
Lunation	39	47	56	62	77
Sunrise	Jan 6/2052 (1552)	Jan 8/0255 (2155)*	Jan 9/0219 (2119)*	Jan 10/2004 (1504)	Jan 11/0748 (0248)
Noon	--	--	--	--	--
Sunset	Jan 21/1643 (1143)	Jan 22/2249 (1749)	Jan 23/2213 (1713)	Jan 25/1556 (1056)	Jan 26/0340 (2240)*
Midnight	--	--	--	--	--

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1975

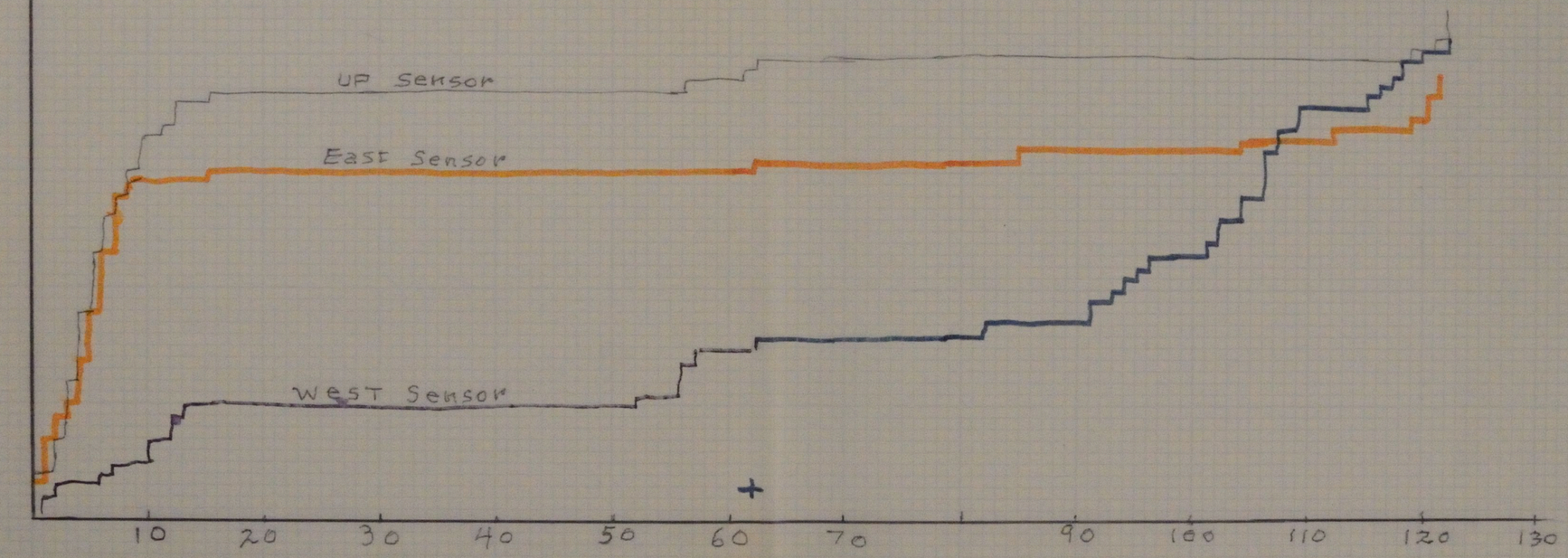
Bendix **Aerospace Systems Division**

Prepared by: Warren Tosh - January 1975

Note: Apollo 12 ALSEP based on empirical data; Apollo 14-17 are "normalized"
Time is shown as GMT (EST)
* indicates previous day

ALSEP Longitude	Apollo 17 30.75°E	Apollo 16 15.51°E	Apollo 15 3.65°E	Apollo 14 17.47°W	Apollo 12 23.39°W
Lunation	26	34	43	49	64
Sunrise	Dec 18/2206 (1706)	Dec 20/0410 (2310)*	Dec 21/0333 (2233)*	Dec 22/2155 (1655)	Dec 23/0916 (0416)
Noon	Dec 26/0822 (0322)	Dec 27/1400 (0900)	Dec 28/1328 (0828)	Dec 30/0717 (0217)	Dec 30/1900 (1400)
Sunset	Jan 2/1756 (1256)	Jan 4/0004 (1904)*	Jan 4/2328 (1828)	Jan 6/1709 (1209)	Jan 7/0350 (2250)*
Midnight	Jan 10/0329 (2229)*	Jan 11/0931 (0431)	Jan 12/0852 (0352)	Jan 14/0227 (2127)*	Jan 14/1406 (0906)
Lunation	27	35	44	50	65
Sunrise	Jan 17/1246 (0746)	Jan 18/1849 (1349)	Jan 19/1812 (1312)	Jan 21/1154 (0654)	Jan 22/0001 (1901)*
Noon	Jan 24/2230 (1730)	Jan 26/0439 (2339)*	Jan 27/0407 (2307)*	Jan 28/2155 (1655)	Jan 29/0938 (0438)
Sunset	Feb 1/0833 (0333)	Feb 2/1439 (0939)	Feb 3/1404 (0904)	Feb 5/0743 (0243)	Feb 5/1819 (1319)
Midnight	Feb 8/1802 (1302)	Feb 10/0001 (1901)*	Feb 10/2322 (1822)	Feb 12/1656 (1156)	Feb 13/0435 (2335)*
Lunation	28	36	45	51	66
Sunrise	Feb 16/0312 (2212)*	Feb 17/0913 (0413)	Feb 18/0836 (0336)	Feb 20/0216 (2116)*	Feb 20/1427 (0927)
Noon	Feb 23/1247 (0747)	Feb 24/1856 (1356)	Feb 25/1823 (1323)	Feb 27/1209 (0709)	Feb 27/2352 (1852)
Sunset	Mar 2/2242 (1742)	Mar 4/0446 (2346)*	Mar 5/0409 (2309)*	Mar 6/2146 (1646)	Mar 7/0819 (0319)
Midnight	Mar 10/0759 (0259)	Mar 11/1357 (0857)	Mar 12/1316 (0816)	Mar 14/0648 (0148)	Mar 14/1826 (1326)
Lunation	29	37	46	52	67
Sunrise	Mar 17/1657 (1157)	Mar 18/2257 (1757)	Mar 19/2218 (1718)	Mar 21/1555 (1055)	Mar 22/0403 (2303)*
Noon	Mar 25/0221 (2121)*	Mar 26/0826 (0326)	Mar 27/0752 (0252)	Mar 29/0135 (2035)*	Mar 29/1316 (0816)
Sunset	Apr 1/1200 (0700)	Apr 2/1802 (1302)	Apr 3/1723 (1223)	Apr 5/1056 (0556)	Apr 5/2133 (1633)
Midnight	Apr 8/2103 (1603)	Apr 10/0259 (2159)*	Apr 11/0217 (2117)*	Apr 12/1944 (1444)	Apr 13/0722 (0222)
Lunation	30	38	47	53	68
Sunrise	Apr 16/0547 (0047)	Apr 17/1144 (0644)	Apr 18/1103 (0603)	Apr 20/0437 (2337)*	Apr 20/1640 (1140)
Noon	Apr 23/1456 (0956)	Apr 24/2059 (1559)	Apr 25/2022 (1522)	Apr 27/1401 (0901)	Apr 28/0142 (2042)*
Sunset	May 1/0020 (1920)*	May 2/0619 (0119)	May 3/0538 (0038)	May 4/2309 (1809)	May 5/0950 (0450)
Midnight	May 8/0910 (0410)	May 9/1504 (1004)	May 10/1419 (0919)	May 12/0744 (0244)	May 12/1920 (1420)
Lunation	31	39	48	54	69
Sunrise	May 15/1741 (1241)	May 16/2335 (1835)	May 17/2253 (1753)	May 19/1624 (1124)	May 20/0417 (2317)*
Noon	May 23/0238 (2138)*	May 24/0839 (0339)	May 25/0801 (0301)	May 27/0136 (2036)*	May 27/1316 (0816)
Sunset	May 30/1149 (0649)	May 31/1747 (1247)	June 1/1705 (1205)	June 3/1033 (0533)	June 3/2119 (1619)
Midnight	June 6/2031 (1531)	June 8/0222 (2122)*	June 9/0136 (2036)*	June 10/1859 (1359)	June 11/0635 (0135)
Lunation	32	40	49	55	70
Sunrise	June 14/0452 (2352)*	June 15/1046 (0546)	June 16/1003 (0503)	June 18/0332 (2232)*	June 18/1521 (1021)
Noon	June 21/1343 (0843)	June 22/1943 (1443)	June 23/1903 (1403)	June 25/1238 (0738)	June 26/0017 (1917)*
Sunset	June 28/2249 (1749)	June 30/0446 (2346)*	July 1/0404 (2304)*	July 2/2132 (1632)	July 3/0822 (0322)
Midnight	July 6/0727 (0227)	July 7/1318 (0818)	July 8/1232 (0732)	July 10/0554 (0054)	July 10/1730 (1230)
Lunation	33	41	50	56	71
Sunrise	July 13/1547 (1047)	July 14/2140 (1640)	July 15/2057 (1557)	July 17/1427 (0927)	July 18/0212 (2112)*
Noon	July 21/0038 (1938)*	July 22/0637 (0137)	July 23/0558 (0058)	July 24/2332 (1832)	July 25/1111 (0611)
Sunset	July 28/0944 (0444)	July 29/1541 (1041)	July 30/1459 (0959)	Aug 1/0827 (0327)	Aug 1/1922 (1422)
Midnight	Aug 4/1825 (1325)	Aug 6/0016 (1916)*	Aug 6/2331 (1831)	Aug 8/1653 (1153)	Aug 9/0429 (2329)*
Lunation	34	42	51	57	72
Sunrise	Aug 12/0249 (2149)*	Aug 13/0844 (0344)	Aug 14/0801 (0301)	Aug 16/0134 (2034)*	Aug 16/1317 (0817)
Noon	Aug 19/1146 (0646)	Aug 20/1747 (1247)	Aug 21/1708 (1208)	Aug 23/1044 (0544)	Aug 23/2223 (1723)
Sunset	Aug 26/2059 (1559)	Aug 28/0258 (2158)*	Aug 29/0218 (2118)*	Aug 30/1949 (1449)	Aug 31/0644 (0144)
Midnight	Sept 3/0549 (0049)	Sept 4/1143 (0643)	Sept 5/1059 (0559)	Sept 7/0424 (2324)*	Sept 7/1600 (1100)
Lunation	35	43	52	58	73
Sunrise	Sept 10/1424 (0924)	Sept 11/2021 (1521)	Sept 12/1939 (1439)	Sept 14/1313 (0813)	Sept 15/0058 (1958)*
Noon	Sept 17/2332 (1832)	Sept 19/0534 (0034)	Sept 20/0457 (2357)*	Sept 21/2236 (1736)	Sept 22/1016 (0516)
Sunset	Sept 25/0858 (0358)	Sept 26/1459 (0959)	Sept 27/1420 (0920)	Sept 29/0753 (0253)	Sept 29/1847 (1347)
Midnight	Oct 2/1801 (1301)	Oct 3/2356 (1856)	Oct 4/2313 (1813)	Oct 6/1642 (1142)	Oct 7/0419 (2319)*
Lunation	36	44	53	59	74
Sunrise	Oct 10/0248 (2148)*	Oct 11/0847 (0347)	Oct 12/0808 (0308)	Oct 14/0144 (2044)*	Oct 14/1335 (0835)
Noon	Oct 17/1209 (0709)	Oct 18/1903 (1403)	Oct 19/1739 (1239)	Oct 21/1148 (0648)	Oct 21/2302 (1802)
Sunset	Oct 24/2150 (1650)	Oct 26/0353 (2253)*	Oct 27/0316 (2216)*	Oct 28/2053 (1553)	Oct 29/0743 (0243)
Midnight	Nov 1/0706 (0206)	Nov 2/1304 (0804)	Nov 3/1223 (0723)	Nov 5/0555 (0055)	Nov 5/1733 (1233)
Lunation	37	45	54	60	75
Sunrise	Nov 8/1607 (1107)	Nov 9/2209 (1709)	Nov 10/2131 (1631)	Nov 12/1511 (1011)	Nov 13/0306 (2206)*
Noon	Nov 16/0142 (2042)*	Nov 17/0749 (0249)	Nov 18/0715 (0215)	Nov 20/0101 (2001)*	Nov 20/1243 (0743)
Sunset	Nov 23/1136 (0636)	Nov 24/1742 (1242)	Nov 25/1707 (1207)	Nov 27/1046 (0546)	Nov 27/2131 (1631)
Midnight	Nov 30/2104 (1604)	Dec 2/0304 (2204)*	Dec 3/0224 (2124)*	Dec 4/1959 (1459)	Dec 5/0738 (0238)
Lunation	38	46	55	61	76
Sunrise	Dec 8/0616 (0116)	Dec 9/1219 (0719)	Dec 10/1143 (0643)	Dec 12/0525 (0025)	Dec 12/1727 (1227)
Noon	Dec 15/1559 (1059)	Dec 16/2207 (1707)	Dec 17/2136 (1636)	Dec 19/1524 (1024)	Dec 20/0306 (2206)*
Sunset	Dec 23/0202 (2102)*	Dec 24/0809 (0309)	Dec 25/0735 (0235)	Dec 27/0116 (2016)*	Dec 27/1155 (0655)
Midnight	Dec 30/1136 (0636)	Dec 31/1737 (1237)	Jan 1/1658 (1158)	Jan 3/1033 (0533)	Jan 3/2213 (1713)
Lunation	39	47	56	62	75
Sunrise	Jan 6/2052 (1552)	Jan 8/0255 (2155)*	Jan 9/0219 (2119)*	Jan 10/2004 (1504)	Jan 11/0748 (0248)
Noon	--	--	--	--	--
Sunset	Jan 21/1643 (1143)	Jan 22/2249 (1749)	Jan 23/2213 (1713)	Jan 25/1556 (1056)	Jan 26/0340 (2240)*
Midnight	--	--	--	--	--

All PHA Counts



5-1-75

Temperature Anomalies Anew

The high temperatures of LEAM may well be attributable to the lunar soil transport phenomena.

A) The first lunar day the sensor covers remained on so no deposits on sensors

B.) The first lunar night also the covers remained on even after the command to remove them. The proof of this is in the cycling temperature of heater on, off on automatic. There was no change in cycling after command signal

C) The covers apparently came off after the sun hit LEAM (or after sunrise) so sunrise terminator effect had passed and sensors were probably clean.

D) The temperature on this dawn rose faster & higher than any other sunrise after or before. The sunset temperatures for this lunation, however, was similar to the following ones.

E) Mr GRANHOLM of Ann Arbor Bendix is doing a study on the LEAM temperatures. So far he sees an A/e of 1.0 during day and 0.5 at night. The A/e of 1.0 corresponds to a dirty film and the A/e of 0.5 at night corresponds to a clean film.

Bendix Trimmer

5/29/75

FILM ONLY EVENTS (22 lunations)
MULT SEN EVENTS INCLUDED
MULT ACC EVENTS INCLUDED (3hrs interval)

TOTAL EVENTS	UP	EAST	WEST
3072	411	1968	693

PHA DISTRIBUTION PERCENTAGES:

	0	1	2	3	4	5	6	7
UP SENSOR	3.8	3.0	3.5	2.1	0.4	0.1	0.1	0.5
EAST SENSOR	3.3	10.4	27.6	13.0	5.0	1.8	0.5	2.5
WEST SENSOR	3.2	11.5	4.4	1.5	1.2	0.4	0.2	0.2

PERCENTAGE :

T(HRS)	UP	EAST	WEST
-531	0	0	0
-528	0	0	0
-525	0	0	0
-522	0	0	0
-519	0	0	0
-516	0	0	0
-513	0	0	0
-510	0	0	0
-507	0	0	0
-504	0	0	0
-501	0	0	0
-498	0	0	0
-495	0	0	0
-492	0	0	0
-489	0	1	1
-486	0	1	0
-483	1	0	1
-480	0	0	0
-477	0	0	0
-474	0	0	0
-471	0	0	0
-468	0	0	0
-465	0	0	0
-462	0	0	0
-459	0	0	0
-456	0	0	0
-453	0	0	0
-450	0	0	0
-447	1	0	1
-444	1	2	0
-441	2	0	0
-438	3	3	0
-435	0	1	0
-432	1	1	0
-429	0	0	0
-426	1	1	2
-423	2	1	1
-420	1	3	3
-417	2	2	2
-414	1	3	2
-411	1	1	2
-408	3	3	6
-405	3	7	2
-402	1	8	25
-399	3	16	22
-396	0	18	6
-393	2	9	7
-390	6	9	60

9 3-hour intervals are added to give a total (t) To obtain number of events per day we use

$t\left(\frac{24}{9 \times 22}\right)$ 24 hours/day
22 lunations of data

UP	East	West
0.1 / 1 0.04		0.1 / 1 0.04
0.1 / 1 0.04	0.2 / 2 0.08	0.2 / 2 0.08
	0	0
0.7 / 7 0.3		0.1 / 1 0.04
1.2 / 11 0.4	1.0 / 9 0.3	0.4 / 4 0.1
1.3 / 12 0.4	1.7 / 15 0.6	2.0 / 18 0.7
1.8 / 16 0.6	7.4 / 67 2.7	8.2 / 74 2.9
2.0 / 18 0.7	12 / 108 4.0	20.3 / 183 7.0

Otto 3-12-97 here I have added 9 (3-hour) events and shown the total on the yellow line. It seems I have ignored the events in the yellow line

5-1-75

Temperature Anomalies Anew

The high temperatures of LEAM may well be attributable to the lunar soil transport phenomena.

A) The first lunar day the sensors covers remained on so on sensors

B) The first lunar night covers remained on so command to remove th proof of this is in temperatures of heater automatic. There was in cycling after com

C) The covers apparently after the sun hit after sunrise) so se inatse effect had sensors ever profoun

D) The temperature on the faster & higher than sunrise after or be sunset temperatures for however, was similar ones.

E) Mr GRANHOLM of Bendix is doing a stud LEAM temperatures. So f sees an A/e of 1.0 dur and 0.5 at night. Th 1.0 corresponds to a dirty the A/e of 0.5 at night a clean film.

5/29/75

FILM ONLY EVENTS (22 lunations)
MULT SEN EVENTS INCLUDED (3 hrs interval)
MULT ACC EVENTS INCLUDED

TOTAL EVENTS	UP	EAST	WEST
3072	411	1968	693

PHA DISTRIBUTION PERCENTAGES:

	0	1	2	3	4	5	6	7
UP SENSOR	3.8	3.0	3.5	2.1	0.4	0.1	0.1	0.5
EAST SENSOR	3.3	10.4	27.6	13.0	5.0	1.8	0.5	2.5
WEST SENSOR	3.2	11.5	4.4	1.5	1.2	0.4	0.2	0.2

f x 8 ÷ 11 = 0.36

UP	EAST	WEST
	.036	.036
	.036	
.04		.04
.04		.04
.04	.08	
.08		
.12	.12	
	.04	
.04	.04	
.04	.04	.08
.08	.04	.04
.04	.12	.12
.08	.08	.08
.04	.12	.08
.04	.04	.08
.12	.12	.24
.12	.28	.08
.04		

	up	East	West			
-387	1	14	11	•	2.2 20 0.8	14.6 131 5.3	19.7 177 7.2
-384	2	10	25	•			
-381	2	12	12	•			
-378	1	12	13	•			
-375	4	26	17	•	2.1 19 0.8	7.2 65 2.6	11.3 102 4.1
-372	5	45	18	•			
-369	1	5	25	•			
-366	1	4	42	•			
-363	3	3	14	•			
-360	2	1	0	!	2.2 20 0.8	1.7 15 0.6	0.3 3 0.1
-357	0	3	2	!			
-354	2	2	0	•			
-351	4	1	1	•			
-348	1	1	0	•			
-345	1	1	0	•			
-342	1	3	0	•	2.0 18 0.7	1.9 17 0.7	0 0
-339	3	3	0	•			
-336	3	0	0	•			
-333	5	1	0	•			
-330	0	1	0	!			
-327	2	1	0	•			
-324	2	3	0	•	1.6 14 0.5	1.8 16 0.6	0.2 2 0.1
-321	2	3	0	!			
-318	0	2	0	•			
-315	3	1	1	•			
-312	2	2	0	•			
-309	2	1	1	•	1.8 16 0.6	1.7 15 0.6	0.3 3 0.1
-306	1	1	0	!			
-303	0	2	0	!			
-300	1	2	0	•			
-297	1	1	1	•			
-294	1	1	1	•			
-291	5	5	0	•			
-288	3	0	0	•			
-285	4	2	0	•	2.1 19 0.7	1.8 16 0.6	0.4 4 0.1
-282	1	2	0	•			
-279	1	1	1	•			
-276	1	2	1	•			
-273	2	2	0	•	1.7 15 0.6	1.9 17 0.6	0.9 8 0.3
-270	1	3	1	•			
-267	3	1	1	•			
-264	1	1	0	•			
-261	0	2	0	!			
-258	5	3	4	•	1.9 17 0.6	1.4 13 0.5	1.1 10 0.4
-255	1	0	2	•			
-252	2	0	0	•			
-249	2	3	1	•			
-246	1	2	1	•			
-243	2	1	1	•	1.8 16 0.6	1.8 16 0.6	0.8 6 0.3
-240	2	1	0	•			
-237	1	4	0	•			
-234	1	2	2	•			
-231	2	2	1	•	1.7 15 0.6	2.1 19 0.7	1.0 9 0.3
-228	3	1	0	•			
-225	2	0	0	•			
-222	2	3	0	•			
-219	2	0	1	•			
-216	1	3	4	•	1.7 15 0.6	3.2 28 1.0	1.2 11 0.4
-213	1	4	1	•			
-210	1	2	0	•			
-207	3	4	3	•			
-204	3	2	1	•			
-201	1	7	1	•			
-198	1	3	0	•			
-195	1	3	1	•	2.4 22 0.8	4.3 39 1.5	1.4 13 0.5
-192	2	4	1	•			
-189	3	4	4	•			
-186	4	5	1	•			

	up	E	W				
-183	4	7	1	•	2.3 25 0.8	7.1 64 2.6	8.8 79 3.2
-180	2	9	4	•			
-177	3	8	15	•			
-174	0	5	48	!			
-171	1	6	4	•	1.6 14 0.6	9.1 82 3.3	9.1 82 3.3
-168	2	6	1	•			
-165	2	13	4	•			
-162	3	11	0	•			
-159	2	11	3	•			
-156	0	7	3	!			
-153	1	15	4	•	1.4 13 0.5	13.2 119 4.8	2.8 25 1.0
-150	3	19	3	•			
-147	1	14	3	•			
-144	2	13	1	•			
-141	1	16	2	•			
-138	0	13	5	!	1.9 17 0.57	16.1 145 5.5	3.0 27 1.08
-135	1	20	4	•			
-132	1	11	4	•			
-129	6	17	2	•			
-126	2	20	3	•			
-123	3	21	3	•			
-120	0	13	3	!	2.4 22 0.9	18 162 6.5	3.6 32 1.3
-117	2	28	5	•			
-114	1	16	1	•			
-111	6	15	6	•			
-108	1	21	5	•	1.9 17 0.7	20.6 185 7.4	2.7 24 0.97
-105	2	25	1	•			
-102	3	27	1	•			
-99	2	16	0	•			
-96	0	17	2	!	1.9 17 0.7	20.3 183 7.3	1.9 17 0.7
-93	0	20	2	!			
-90	1	20	2	•			
-87	5	22	3	•			
-84	7	20	4	•			
-81	0	15	1	!	2.9 26 1.0	19.7 177 7.1	3.0 27 1.08
-78	2	26	2	•			
-75	1	21	1	•			
-72	1	21	3	•	2.8 25 1.0	19 171 6.8	4.6 41 1.66
-69	3	19	7	•			
-66	3	11	3	•			
-63	4	22	3	•			
-60	1	23	4	•			
-57	4	27	4	•			
-54	8	21	2	•			
-51	1	14	8	•			
-48	0	13	7	!	2.7 24 0.97	17.7 159 6.4	4.7 42 1.7
-45	3	24	4	•			
-42	3	15	2	•			
-39	1	18	2	•			
-36	1	12	6	•			
-33	3	15	7	•	3.3 30 1.2	15.9 143 5.7	3.2 29 1.2
-30	2	14	1	•			
-27	3	12	4	•			
-24	2	19	4	•			
-21	7	17	2	•			
-18	8	21	1	•	4.6 41 1.7	19.2 173 6.9	3.6 32 1.3
-15	6	20	1	•			
-12	2	10	6	•			
-9	5	12	3	•			
-6	1	24	4	•			
-3	7	38	7	•	5.9 44 1.8	46.2 416 16.6	7.4 67 2.7
0	7	69	16	•			
3	6	71	17	•			
6	3	71	7	•			
9	7	59	5	•			
12	6	62	2	•	5.1 46 1.8	39.4 355 14.2	4.9 44 1.8
15	2	35	0	•			
18	4	20	3	•			
21	9	17	5	•			

	UP	EAST	West	
24	4	9	0	•
27	5	11	4	•
30	3	8	2	•
33	4	8	0	•
36	3	10	1	•
39	3	17	0	•
42	1	6	3	•
45	8	17	0	•
48	2	7	3	•
51	2	24	1	•
54	2	9	2	•
57	2	16	1	•
60	1	0	1	•
63	0	7	0	|
66	2	6	2	•
69	1	5	1	•
72	3	4	0	•
75	0	7	1	|
78	0	3	1	|
81	1	1	1	•
84	0	3	0	|
87	0	2	2	|
90	3	2	0	•
93	0	0	0	|
96	0	0	0	|
99	0	0	0	|
102	0	0	0	|
105	0	0	0	|
108	0	1	0	|
111	0	1	0	|
114	0	3	0	|
117	0	0	0	|
120	0	0	0	|
123	0	0	0	|
126	0	0	0	|
129	0	0	0	|
132	0	0	0	|
135	0	0	0	|
138	0	0	0	|
141	0	0	0	|
144	0	0	0	|
147	0	0	0	|
150	0	0	0	|
153	0	0	0	|
156	0	0	0	|
159	0	0	0	|
162	0	0	0	|
165	0	0	0	|
168	0	0	0	|
171	0	0	0	|
174	0	0	0	|

Switch #1

Switch #2

4.0 36 1.4 | 11.8 106 4.2 | 2.0 18 .72

3.0 27 1.0 | 12.7 114 4.6 | 1.2 11 0.4

1.7 15 0.6 | 9.7 87 3.5 | 1.2 11 0.4

0.8 7 0.28 | 4.2 38 1.5 | 0.9 8 0.3

0.4 4 .15 | 1.2 11 0.4 | 0.4 4 .15

0 | 0.6 5 0.2 | 0

SUNRISE DISTRIBUTION FOR 3072 EVENTS

LEAM SUNRISE TABLE EPOCH: JAN 0, 1973 BASED ON HOUSTON SUNRISE TABLES CORRECTED BY 8.7 HRS

SUNRISE	DAY	HR
1	-19	-23.85
2	9	14.67
3	39	5.18
4	68	19.13
5	98	8.18
6	127	20.33
7	157	7.68
8	186	18.58
9	216	5.52
10	245	16.98
11	275	4.10
12	304	18.22
13	334	8.17
14	363	22.72
15	393	13.32
16	423	3.56
17	452	16.97
18	482	5.45
19	511	17.06
20	541	4.10
21	570	14.96
22	600	2.17

5-30-15

Coincidence with multiplex

add 9 numbers & multiply by 0.06 Conversion

(total of 9 lines) $\frac{24 \text{ hours}}{9 \times 2 \times 22} = T \times .06 =$ events/day

24 hours/day
22 durations
2-hour intervals

	UP	East	West
-508	0	0	0
-506	0	0	0
-504	0	0	0
-502	0	0	0
-500	0	0	0
-498	0	0	0
-496	0	0	0
-494	0	0	0
-492	0	0	0
-490	0	0	1
-488	0	0	3
-486	0	0	2
-484	0	0	0
-482	1	2	1
-480	0	0	0
-478	0	0	0
-476	0	0	0
-474	0	0	0
-472	0	0	0
-470	0	0	0
-468	0	0	0
-466	0	0	0
-464	0	0	0
-462	0	0	0
-460	0	0	0
-458	0	0	0
-456	0	0	0
-454	0	0	0
-452	0	0	0
-450	0	0	0
-448	0	0	2
-446	2	0	0
-444	0	0	1
-442	0	2	0
-440	1	6	0
-438	1	6	0
-436	1	7	2
-434	0	8	1
-432	0	3	0
-430	1	7	0
-428	0	4	0
-426	4	3	1
-424	2	4	1
-422	2	4	2
-420	1	1	0
-418	1	4	1
-416	0	6	2
-414	0	2	2
-412	0	3	2
-410	0	1	2

.06 1 | .12 2 | .42 7

.06 1 | .12 2 | .36 6

0 | 0 | 0

.12 2 | .12 2 | .18 3

0.3 5 | 1.92 32 | 0.4 6

.66 11 | 2.8 46 | .42 7

0.6 10 | 31 | .66 11

.12 2 | 2 34 | 0.8 12

-408	1	2	1
-406	0	6	0
-404	0	6	2
-402	0	4	0
-400	0	3	3
-398	1	10	6
-396	1	6	4
-394	0	9	0
-392	0	5	2
-390	0	6	4
-388	1	6	2
-386	0	7	4
-384	1	5	5
-382	1	7	6
-380	0	14	2
-378	2	12	4
-376	0	8	0
-374	4	7	3
-372	2	7	18
-370	1	6	20
-368	0	0	7
-366	3	0	22
-364	0	0	21
-362	2	1	6
-360	0	0	1
-358	0	0	0
-356	0	0	0
-354	0	1	0
-352	0	0	0
-350	0	0	0
-348	0	0	0
-346	0	0	0
-344	0	0	0
-342	0	0	0
-340	0	0	0
-338	0	0	0
-336	0	0	0
-334	2	0	0
-332	1	1	1
-330	2	0	0
-328	1	0	0
-326	0	0	0
-324	0	0	0
-322	0	0	0
-320	0	0	0
-318	0	0	0
-316	0	0	0
-314	2	0	0
-312	0	0	0
-310	0	0	0
-308	0	0	0
-306	0	0	1
-304	0	0	0
-302	0	0	0
-300	0	0	1
-298	0	0	0
-296	0	1	0

.18 3 | 3. 51 | 1.1 18

.3 5 | 3.7 61 | 2.0 33

.66 11 | 4.4 73 | 2.6 44

0.8 14 | 2.5 41 | 6.1 101

.3 5 | .12 2 | 3.4 57

0 | .06 1 | 0

.18 3 | .06 1 | .06 1

.36 6 | .06 1 | .06 1

.18 3 | 0 | 0

.12 2 | 0 | .06 1

0 | .06 1 | .12 2

-294	0	0	0
-292	0	0	0
-290	0	0	0
-288	0	0	1
-286	0	0	0
-284	0	0	1
-282	0	0	0
-280	0	1	0
-278	0	0	0
-276	0	0	0
-274	0	0	0
-272	0	0	0
-270	0	0	0
-268	0	1	0
-266	0	0	0
-264	0	0	1
-262	0	1	0
-260	0	1	0
-258	0	0	0
-256	0	1	0
-254	0	2	0
-252	0	2	0
-250	0	1	0
-248	0	2	1
-246	0	2	0
-244	0	1	0
-242	0	0	0
-240	0	0	0
-238	0	0	1
-236	0	1	1
-234	0	0	1
-232	0	0	2
-230	0	0	0
-228	0	0	0
-226	0	2	0
-224	1	1	0
-222	0	0	1
-220	0	1	1
-218	1	0	1
-216	0	1	1
-214	0	0	4
-212	0	1	0
-210	0	0	8
-208	0	0	1
-206	2	2	4
-204	1	0	2
-202	0	1	1
-200	0	2	2
-198	1	1	2
-196	1	1	3
-194	0	2	1
-192	0	1	4
-190	0	0	3
-188	0	3	2
-186	0	0	3
-184	0	2	3
-182	0	2	1
-180	0	0	0
-178	0	0	4
-176	0	1	7
-174	1	1	8

0 | .06 1 | .12 2

0 | .06 1 | .12 2

0 | .12 2 | .06 1

0 | .66 11 | .06 1

0 | .36 6 | .36 6

.06 1 | .24 4 | .36 6

.12 2 | .36 6 | .48 8

.24 4 | .30 5 | 1.3 22

.3 5 | .6 10 | 1.2 20

.12 2 | .72 12 | 1.3 22

.06 1 | .6 10 | 1.9 31

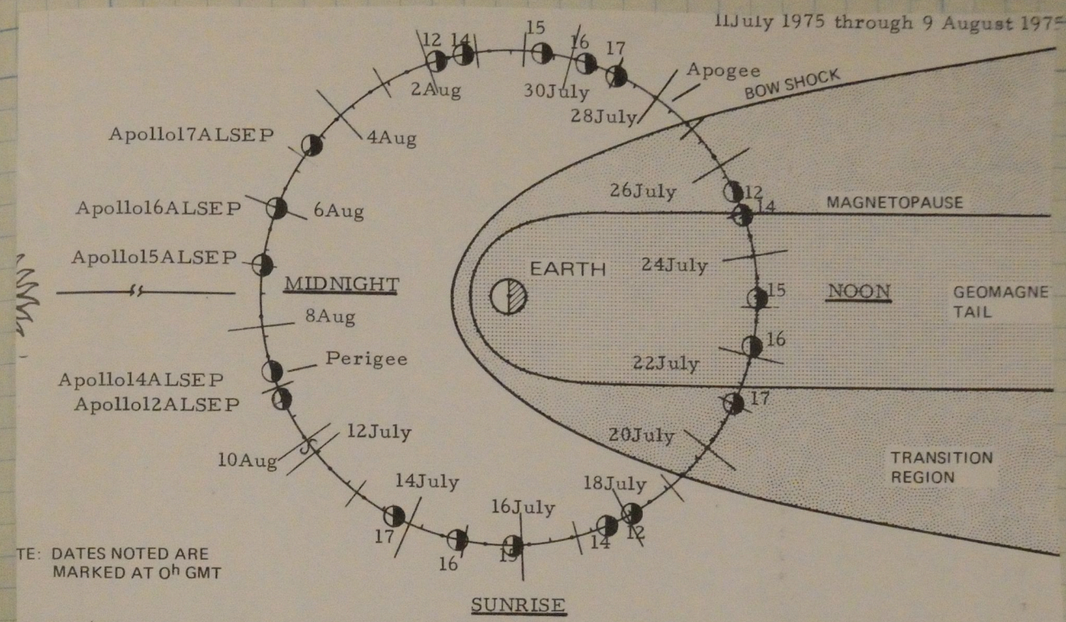
	UP	EAST	WEST			
-172	0	1	3	.24	1.0	2.7
-170	2	4	3	4	16	45
-168	0	1	8			
-166	0	4	3			
-164	0	1	3			
-162	1	3	6	.18	1.55	3.0
-160	0	4	6	3	26	51
-158	1	2	7			
-156	0	2	7			
-154	1	4	5			
-152	0	5	6	.24	1.7	4.1
-150	1	2	9	4	29	68
-148	0	3	13			
-146	0	4	7			
-144	1	3	8			
-142	0	4	6	.12	2.0	4.9
-140	0	6	13	2	33	81
-138	1	3	13			
-136	0	3	10			
-134	0	5	6			
-132	0	2	5	.06	2.6	6.0
-130	0	3	13	1	44	100
-128	0	2	18			
-126	0	8	16			
-124	0	10	8	.06	4.1	6.4
-122	0	8	11	1	68	106
-120	0	3	11			
-118	0	14	9			
-116	1	7	7			
-114	0	5	12	.12	4.9	5.1
-112	0	11	14	2	81	85
-110	0	9	8			
-108	0	11	6			
-106	1	6	6			
-104	0	8	11			
-102	0	10	12	.24	4.5	4.4
-100	1	11	8	4	75	74
-98	1	10	7			
-96	0	8				
-94	1	5	7			
-92	0	6	8	.42	3.6	4.8
-90	1	4	10	7	60	80
-88	1	7	10			
-86	0	6	10			
-84	1	5	6			
-82	2	5	14	.72	3.8	5.4
-80	1	3	12	12	63	90
-78	2	7	6			
-76	0	4	10			
-74	1	10	7			
-72	4	12	15	.78	3.7	5.6
-70	4	10	13	13	62	94
-68	1	5	15			
-66	0	5	10			
-64	0	3	12			
-62	1	2	6	.48	3.2	5.5
-60	1	3	6	8	54	91
-58	0	5	14			
-56	0	9	8			

	UP	EAST	WEST			
-54	1	11	9	0.9	4.5	5.2
-52	4	7	11	15	75	87
-50	2	11	14			
-48	1	6	3			
-46	2	5	9			
-44	2	10	6	1.1	3.9	5.1
-42	3	11	13	19	65	85
-40	1	7	11			
-38	3	8	14			
-36	2	2	6			
-34	3	9	8	4.2	7.9	5.2
-32	2	7	15	70	131	86
-30	6	7	8			
-28	9	17	7			
-26	15	22	11			
-24	15	30	9			
-22	15	29	8	7.6	17.0	5.0
-20	12	31	13	125	283	84
-18	13	22	9			
-16	18	41	6			
-14	9	35	11	8.9	18.8	5.0
-12	21	46	10	148	314	84
-10	3	30	7			
-8	17	32	12			
-6	25	24	6			
-4	18	24	7			
-2	34	62	16	17.2	32.5	7.9
72 0	52	86	14	286	541	131
2	43	98	19			
4	32	73	12			
6	29	68	18	16.9	34.9	7.0
8	35	70	14	281	581	116
10	24	58	9			
12	23	52	6			
14	41	62	14			
16	24	49	6			
18	31	55	12	13.6	25.9	4.9
20	23	42	11	227	431	81
~~22~~	~~29~~	~~56~~	~~6~~			
~~24~~	~~29~~	~~59~~	~~6~~			
22	29	56	6			
24	29	59	6			
~~26~~	~~26~~	~~60~~	~~8~~			
28	27	59	12	11.1	20.6	4.5
30	17	36	10	185	343	75
32	29	37	12			
34	20	37	7			
36	13	29	9	8.7	12.8	4.7
38	21	30	6	145	213	78
40	14	26	10			
42	15	17	14			
44	8	15	8			
46	10	14	1	4.8	7.1	4.3
48	15	8	11	80	118	71
50	7	18	9			
52	6	14	11			
54	5	10	8			
56	5	10	5			
58	9	12	4	2.7	5.0	3.4
60	7	8	2	45	83	60
62	3	6	5			

64	2	3	10
66	5	7	6
68	3	3	9
70	3	3	3
72	2	5	7
74	1	3	3
76	3	3	3
78	4	2	2
80	0	3	2
82	1	0	1
84	1	1	0
86	2	0	0
88	1	0	0
90	4	1	2
92	2	2	1
94	0	0	0
96	0	0	0
98	0	0	0
100	0	0	0
102	0	0	0
104	0	0	0
106	0	0	0
108	0	0	0
110	0	0	1
112	0	1	0
114	0	1	0
116	0	6	1
118	0	5	0
120	0	0	0
122	0	0	0
124	0	0	0
126	0	0	0
128	0	0	0
130	0	0	0
132	0	0	0
134	0	0	0
136	0	0	0
138	0	0	0

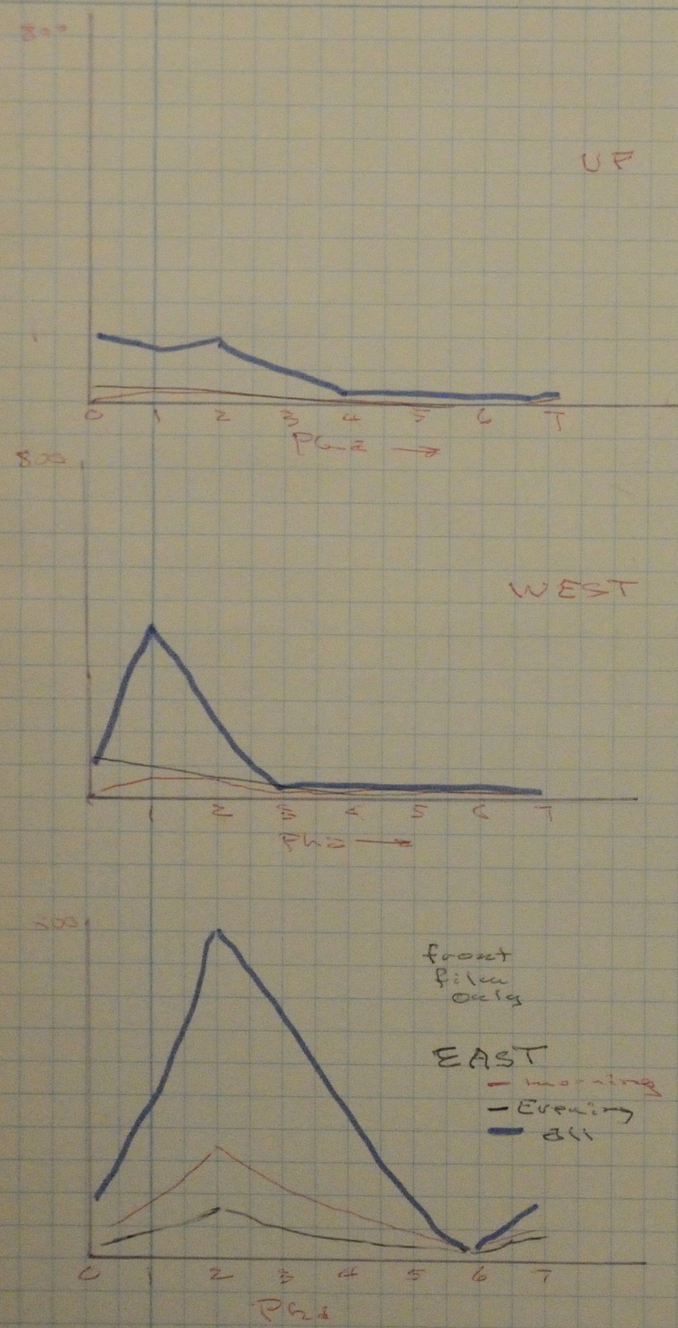
1.6	2.1	2.9
26	35	48
0.9	1.02	1.1
15	17	18
.66	.24	.24
11	4	4
.12	.12	.06
2	2	1
	0.78	0.12
0	13	2
	0.78	0.06
0	13	1
0	0	0

11July 1975 through 9 August 1975



APOLLO	DAY/HOUR(GMT)				
(ALSEP)	Midnight	Sunrise	Lunation/Noon	Sunset	Midnight
17	6July/0727	13July/1547	(33)21July/0038	28July/0944	4Aug/1825

July 25, 75



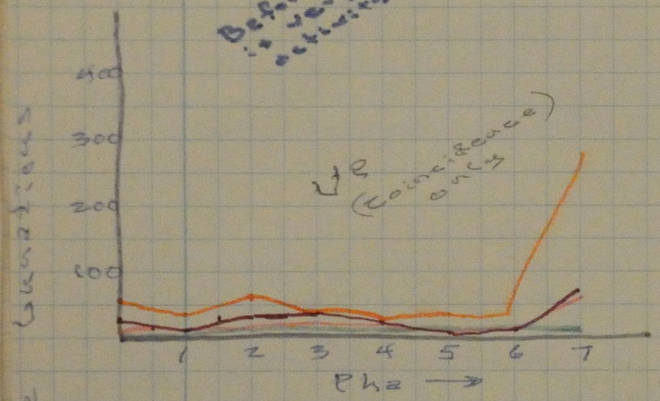
Here data from film only: morning is ± 45 hours; Evening is ± 45 hours. All is everything. This could mean that the peaks at pha 2 show no lower charge particles are able to leave the surface. ∴ It takes a charge high enough to give a pha 2 for a particle to have enough energy to leave the surface on the East sensor and a charge high enough to give a pha of 1 to leave the surface & enter the West sensor.

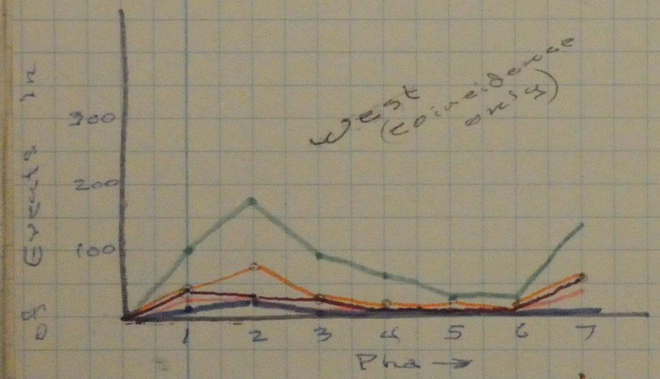
Observations on Data 8/13/75

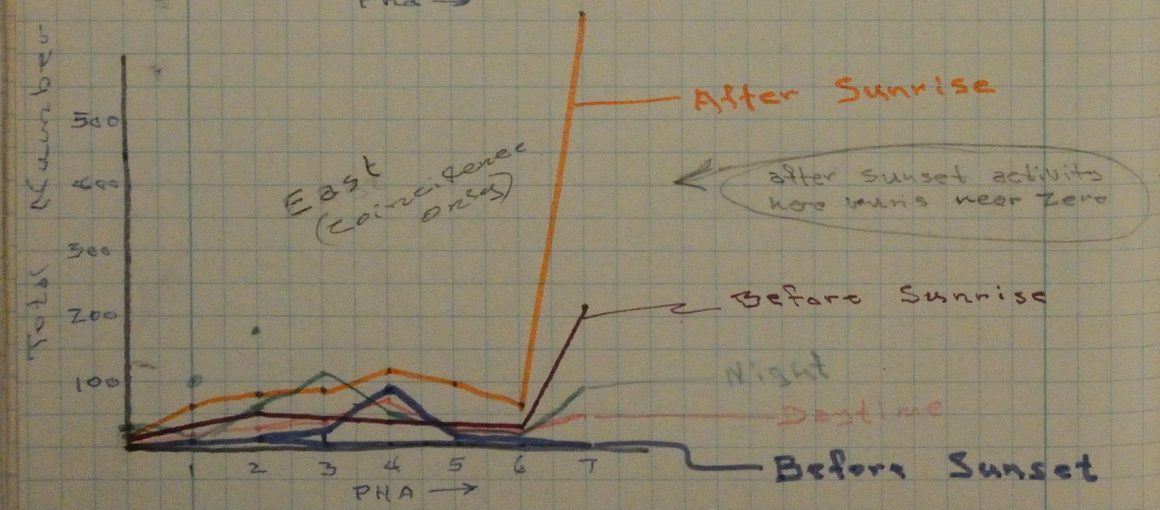
★ ~~[illegible]~~

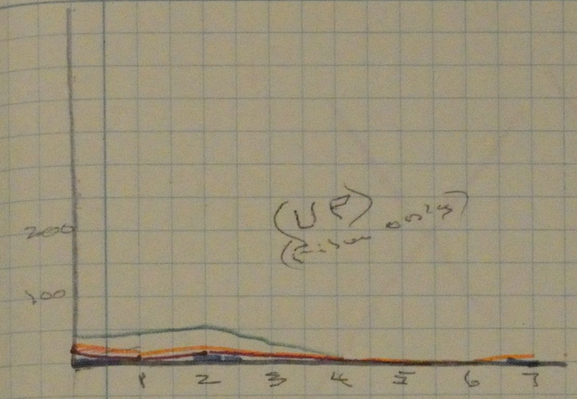
★ Assume the phenomenon is a terminator effect primarily. Then the greatest flux would occur while the Jeam is in the terminator zone, and the flux would drop off with distance away from the terminator.

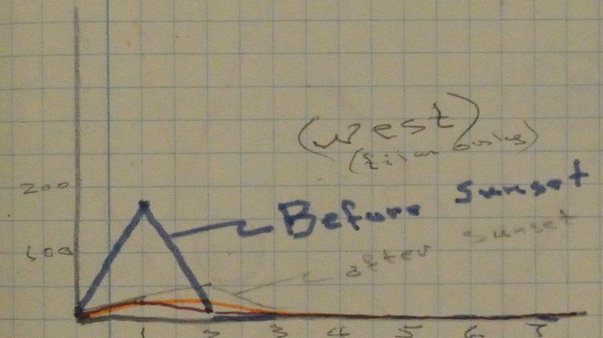
and after
Before sunset
is very
activity.

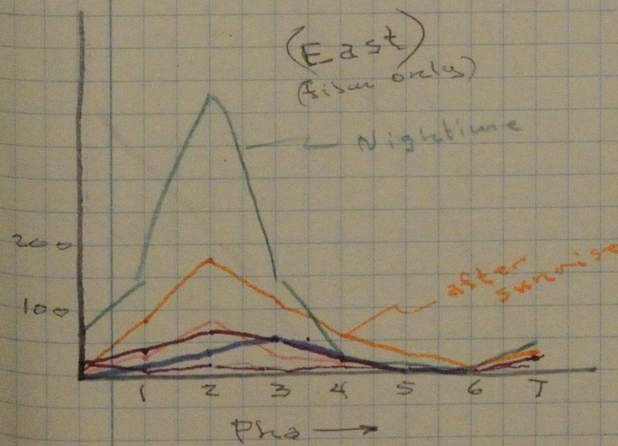


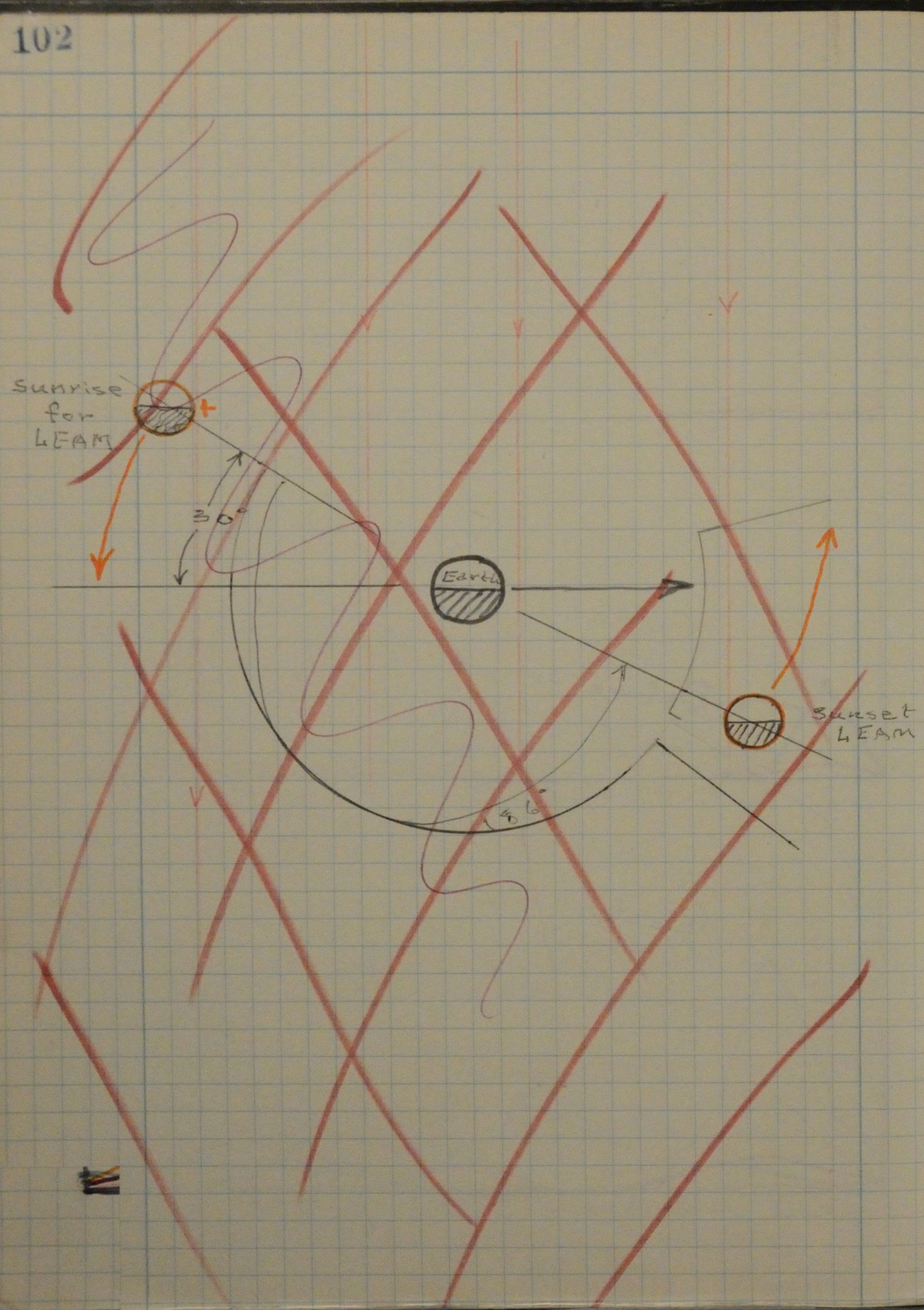


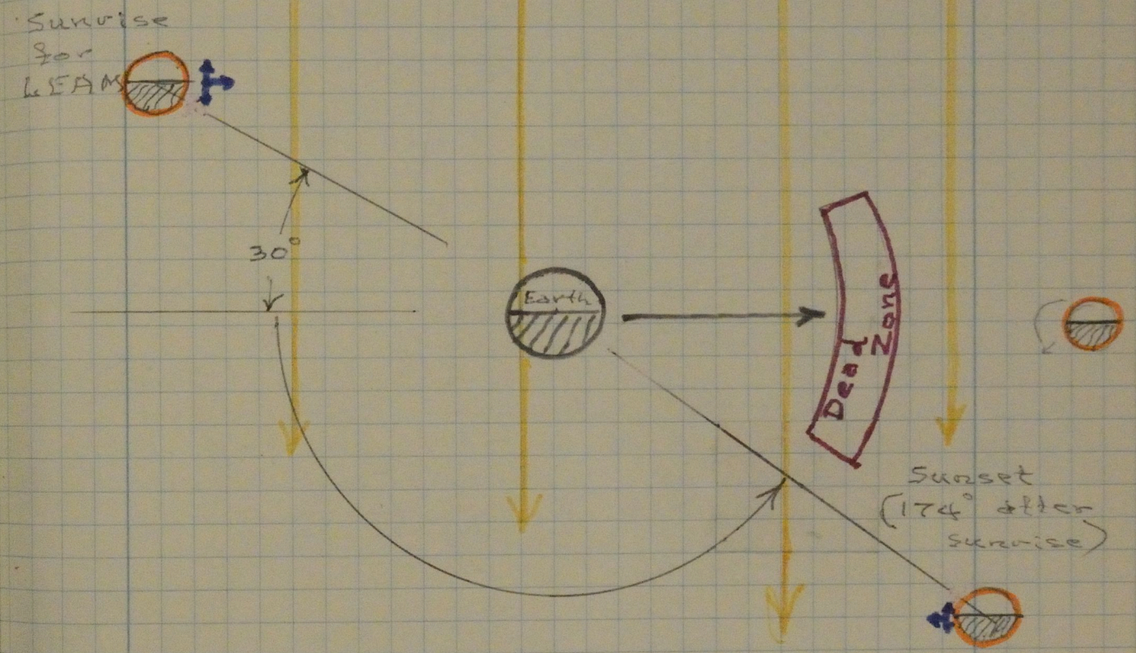












Note the dead zone is quite centered in the earth-moon apex direction at a time when the earth and moon are aligned with the ~~apex~~ earth moon velocity vector and the moon in in front of earth.

On the number of Elemental Charges on a 10^{-12} gram particle with a potential of 10 volts.

$\phi = 10$ volts

radius $r = 10^{-4}$ cm $= 10^{-6}$ m

$\phi = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$ $\quad \frac{1}{4\pi\varepsilon_0}$: Permittivity of free space $= 9\times10^9$

q in coulombs $= \frac{(\phi \text{ volts})(r)}{\left(\frac{1}{4\pi\varepsilon_0}\right)}$

$q = \frac{(10 \text{ volts})(10^{-6} \text{ m})}{(9\times10^9)}$

$= \frac{10^{-5}}{9\times10^9} = 10^{-15}$ coulombs

$1e = 1.6\times10^{-19}$ coulombs

$\frac{10^{-15}}{1.6\times10^{-19}} = 6\times10^3$ electrons (charges)

Not so good

On the speed of an electrostatically Accelerated Particle

$\frac{mv^2}{2} = q\phi$

$v^2 = \frac{2q\phi}{m}$

v in km/sec
m in kilograms
Assume mass 10^{-15} kg
" $q = 10^{-13}$ coulombs
ϕ = accelerating potential of 20 KV

$v^2 = \frac{2(10^{-13})(2\times10^4)}{10^{-15}\text{ kg}} = \frac{4\times10^{-9}}{10^{-15}} = 4\times10^6$

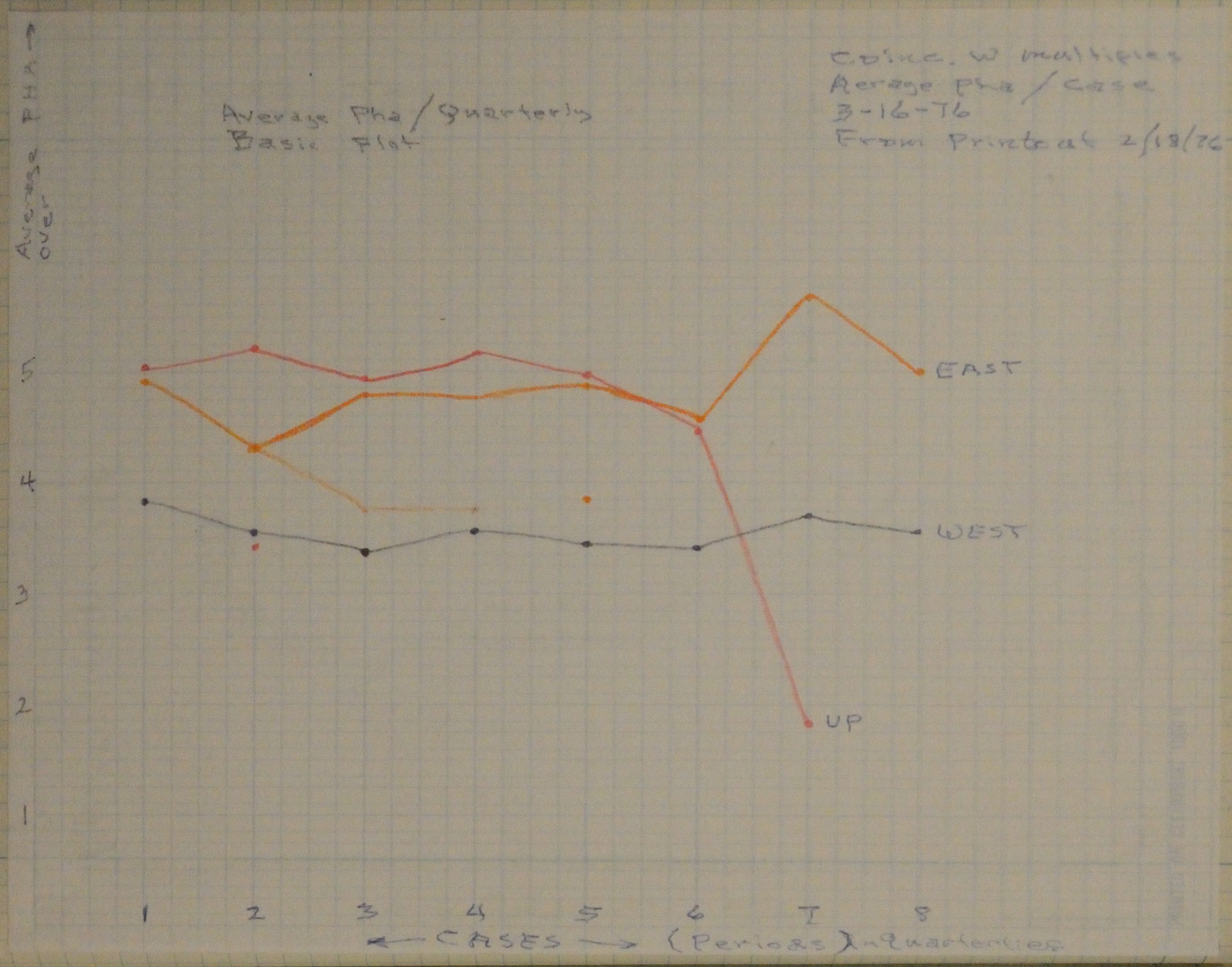
$v = \sqrt{4\times10^6} = 2000$ meters/sec

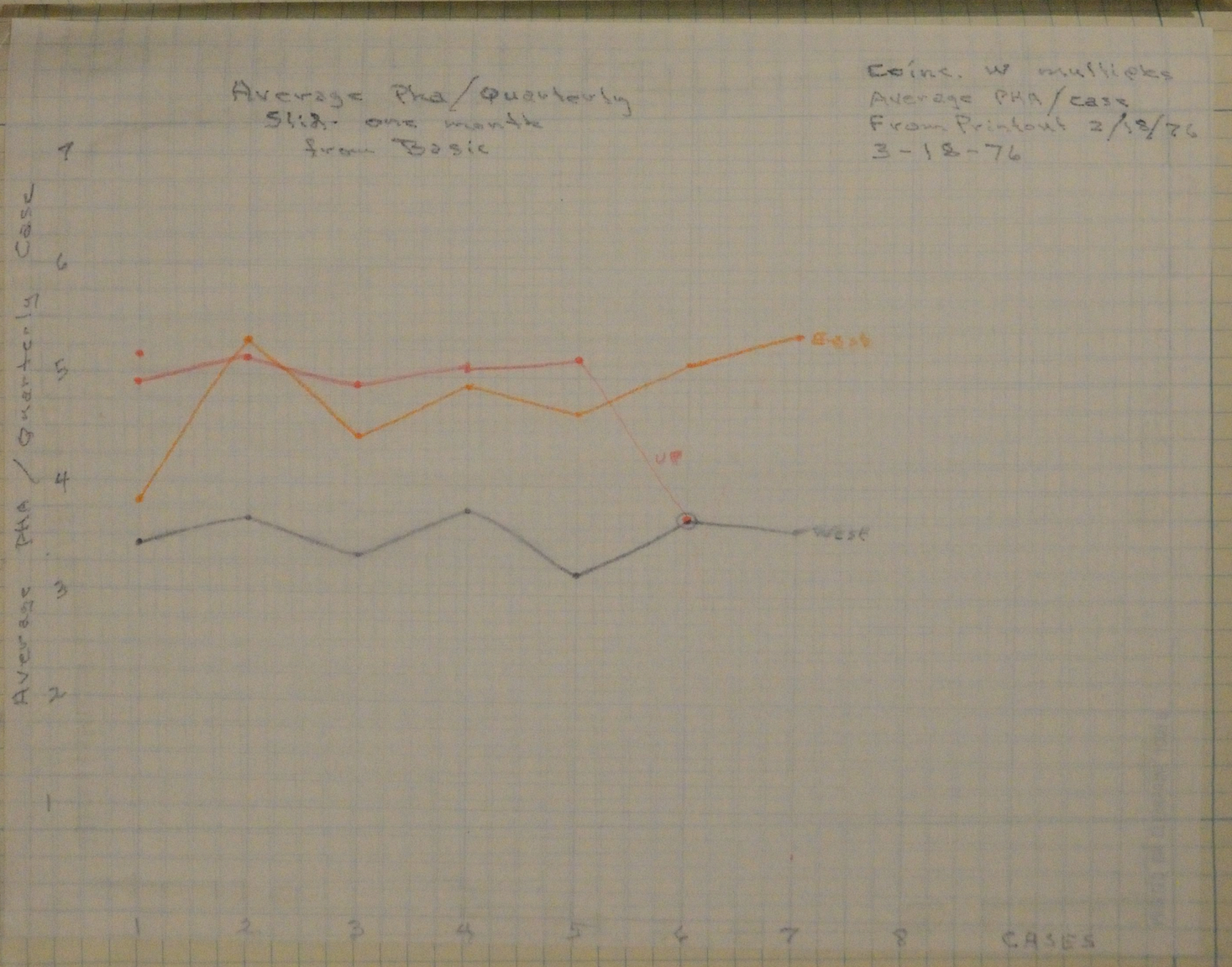
2 Km/sec

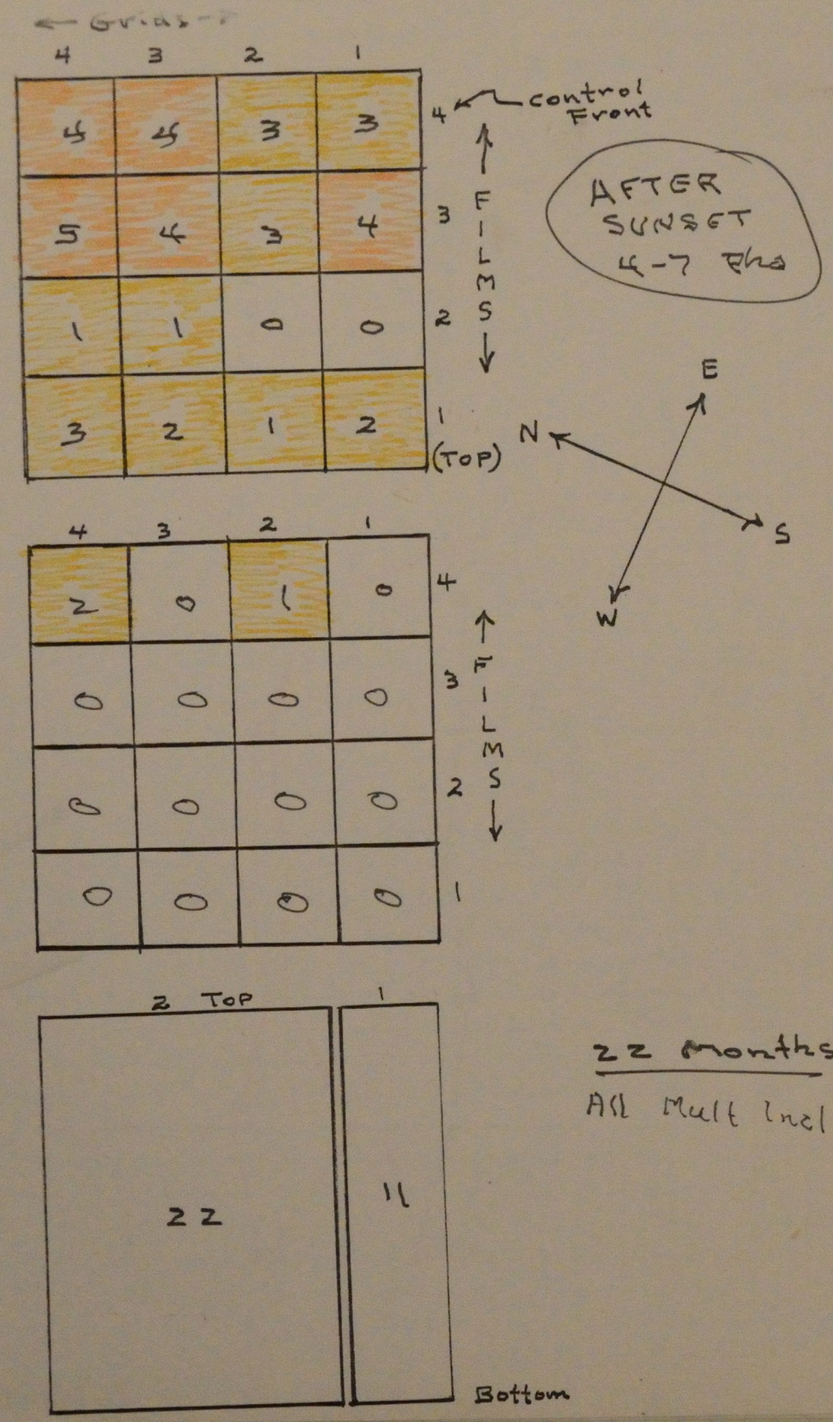
Coagulation
Use 10,000 volts
" lower particle charges

Lower particle charge is more easily obtained (by using a larger charging voltage) and gives more consistent distributions of particle charges.

Good

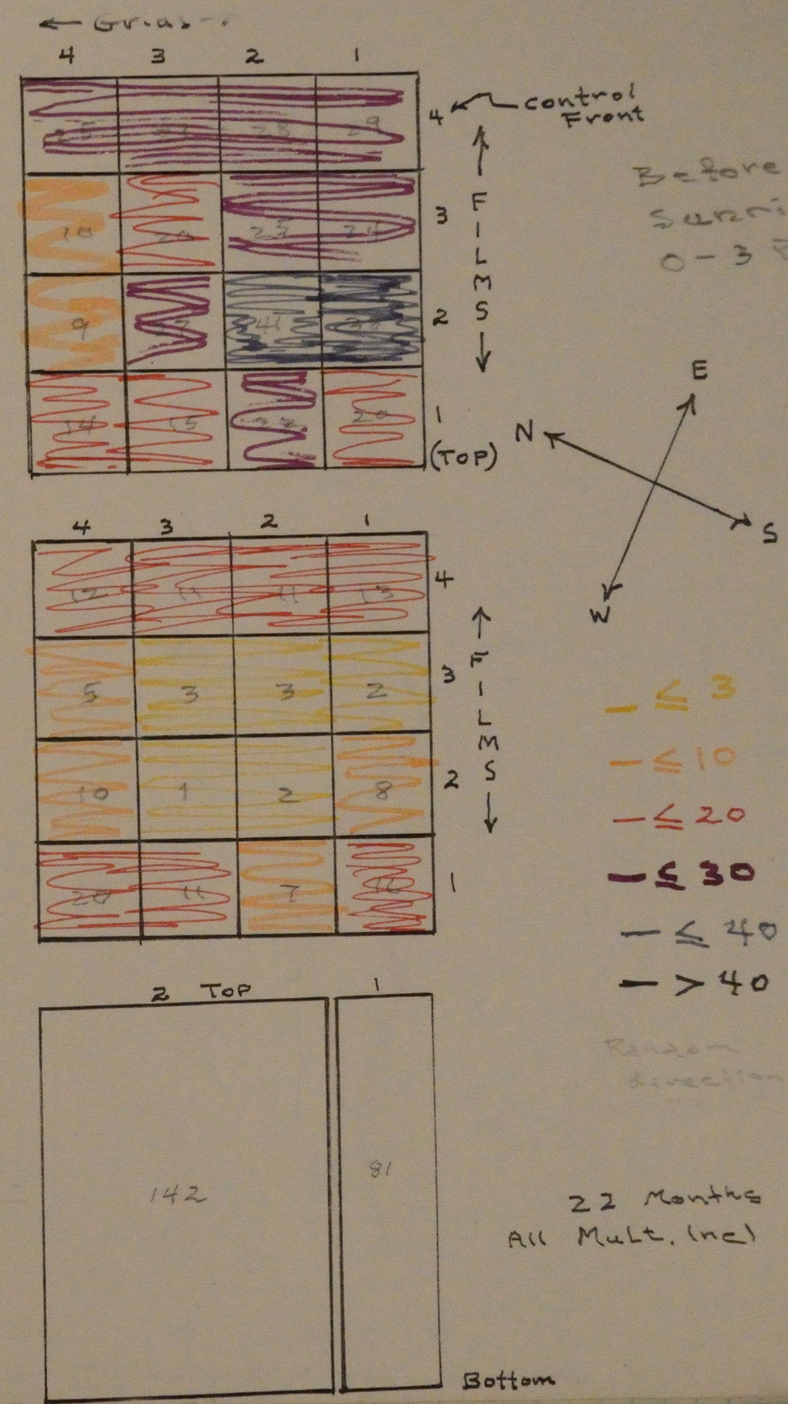

Coinc. w multiples
Aerage Pha / case
3-16-76
From Printout 2/18/76
Average Pha / Quarterly
Basic Plot
Average PHA over
5
4
3
2
1
EAST
WEST
UP
1 2 3 4 5 6 7 8
← CASES → (Periods) in Quarterlies


Coinc. w multiples
Average PHA / case
From Printout 2/18/76
3-18-76
Average Pha / Quarterly
Slid. one month
from Basic
Average PHA / Quarterly Case
7
6
5
4
3
2
1
East
UP
West
1 2 3 4 5 6 7 8
CASES



22 Months

All Mult Incl



22 Months

All Mult. Incl

← Grids →

4	3	2	1	
0	0	0	0	4
0	0	1	0	3
0	0	0	0	2
0	0	0	0	1 (TOP)

← control Front

FILMS ↓

NEAR Sunset (4-7 Pka)

N E S W

4	3	2	1	
3	0	0	0	4
1	0	0	0	3
2	0	0	0	2
1	0	0	0	1

OK

FILMS ↓

2 TOP	1
34	4

← CASES → (Periods) Inquarterlies

← Grids →

4	3	2	1	
2	1	2	2	4
1	1	2	1	3
1	4	4	2	2
1	4	4 ~~2~~	2 ~~0~~	1 (TOP)

← control Front

FILMS ↓

AFTER SUNSET 0-3 Pka

N E S W

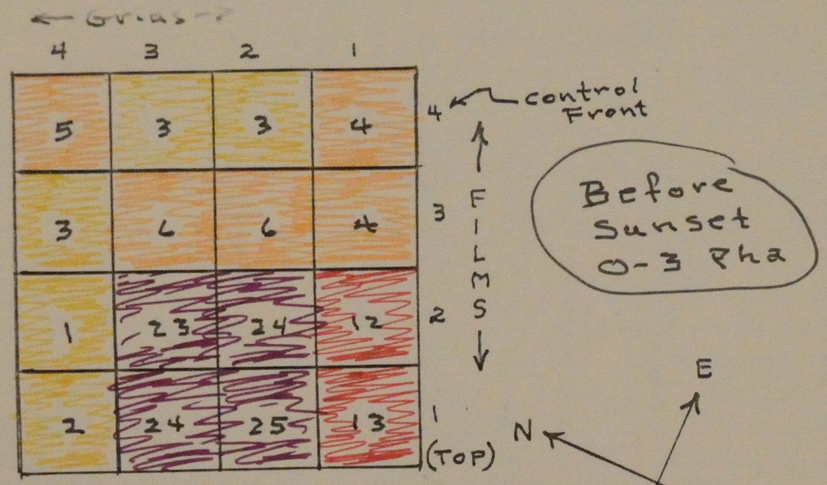
4	3	2	1	
0	3	1	4	4
0	0	1	2	3
2	2	2	2	2
0	0	2	2	1

FILMS ↓

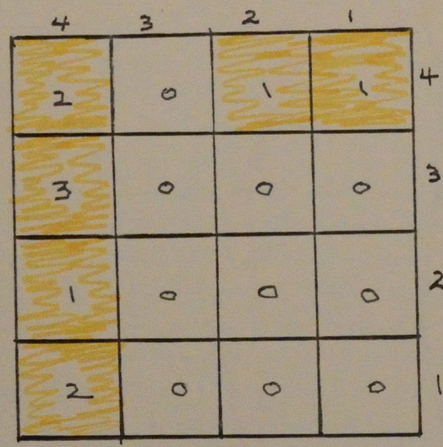
2 TOP	1
91	77

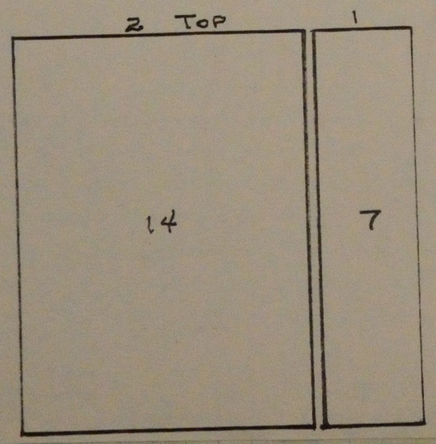
Bottom

22 Months
All Mult Incl.



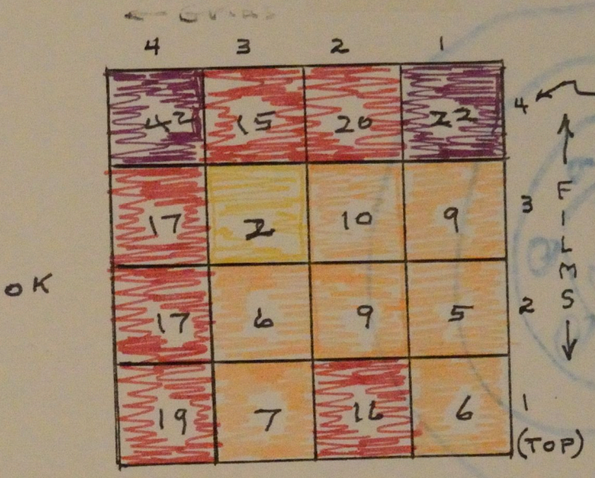
Before Sunset 0-3 Pha





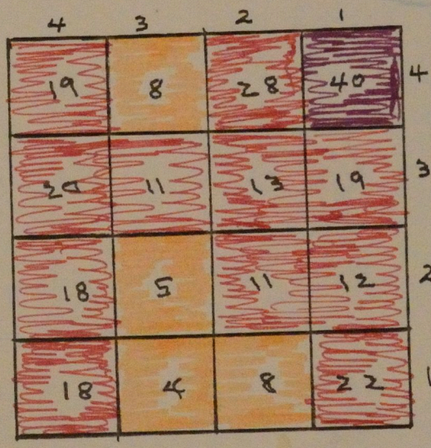
CASES → (Periods) ← Quarters

22 Months
All Mult Incl



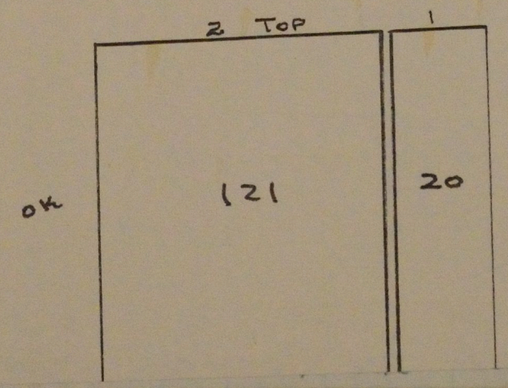
OK

NEAR Sunrise (0-3 Pha)

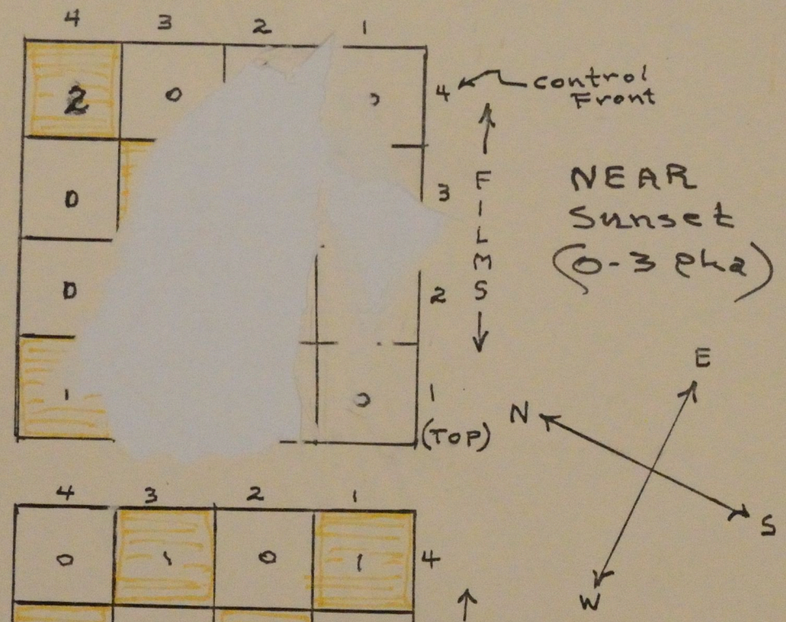


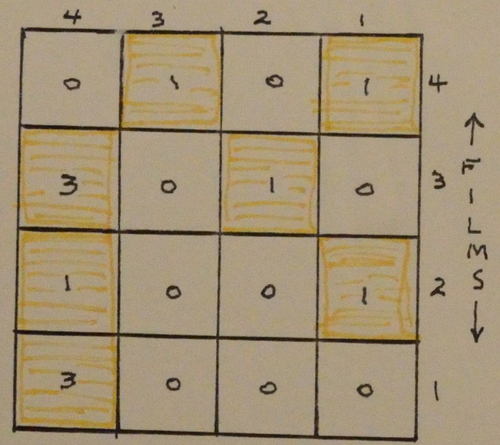
OK

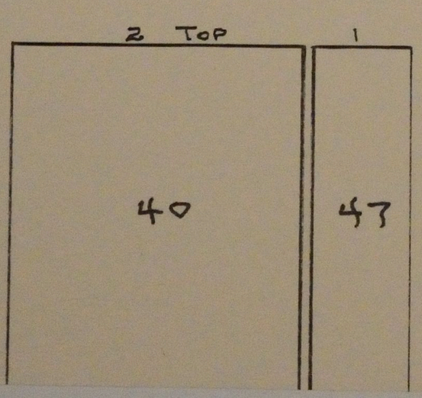
faster Particles

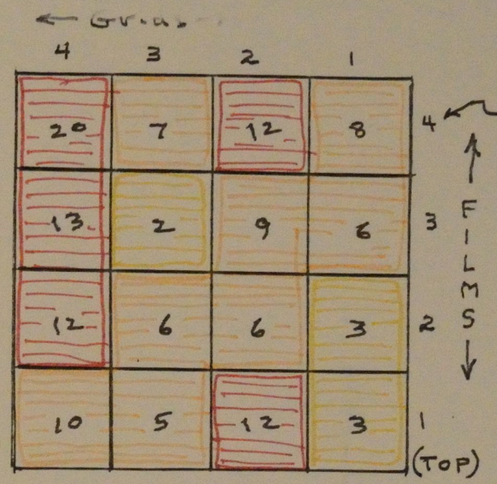


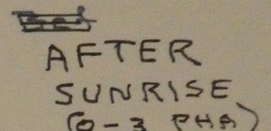
OK

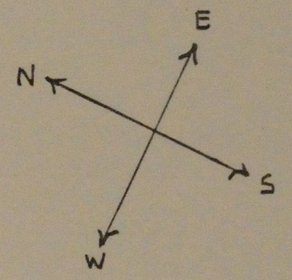


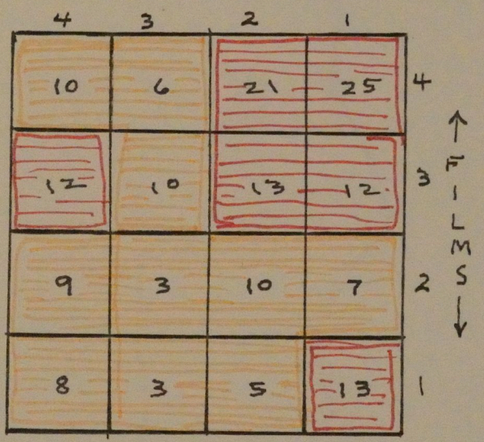


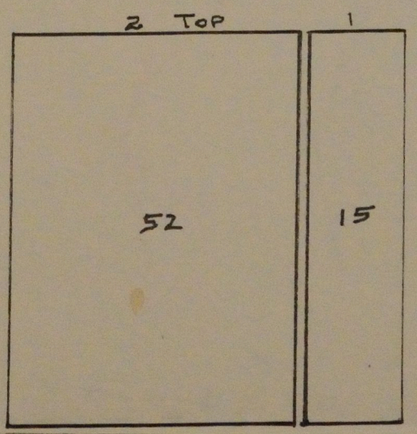






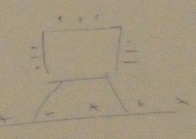


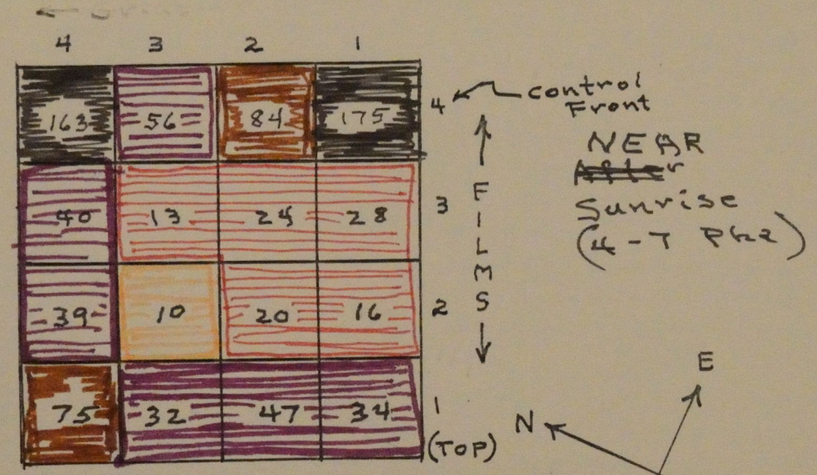


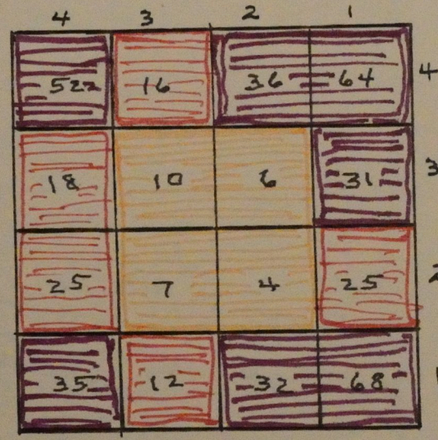


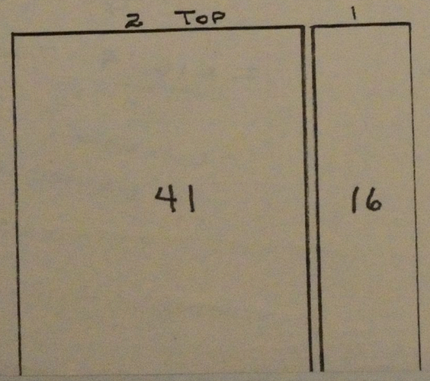
No Must
Coincidence
only

faster particles

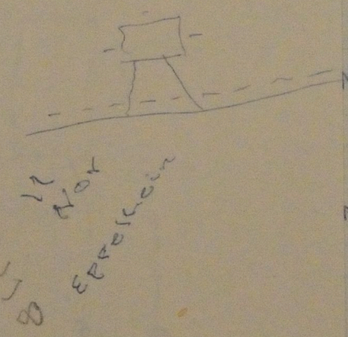


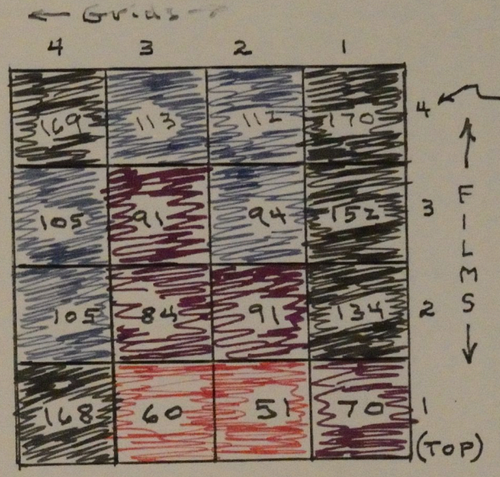




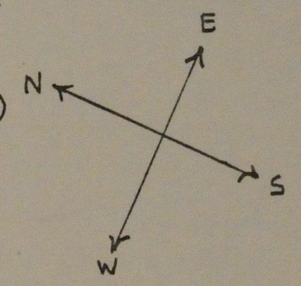


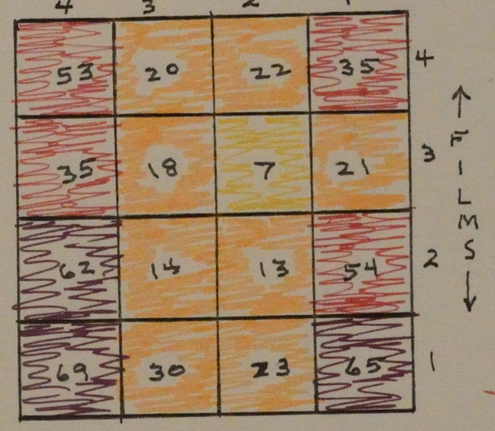
Remember outside grid is 4 x 4

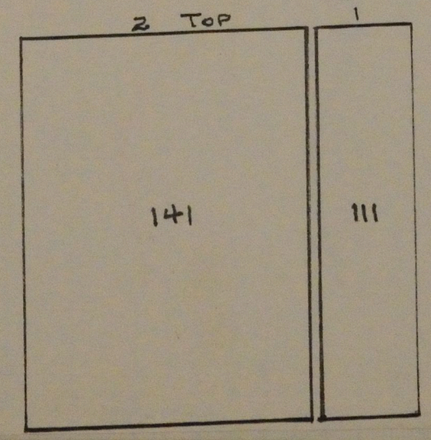




~~Before~~ AFTER SUNRISE 4-7 Phe

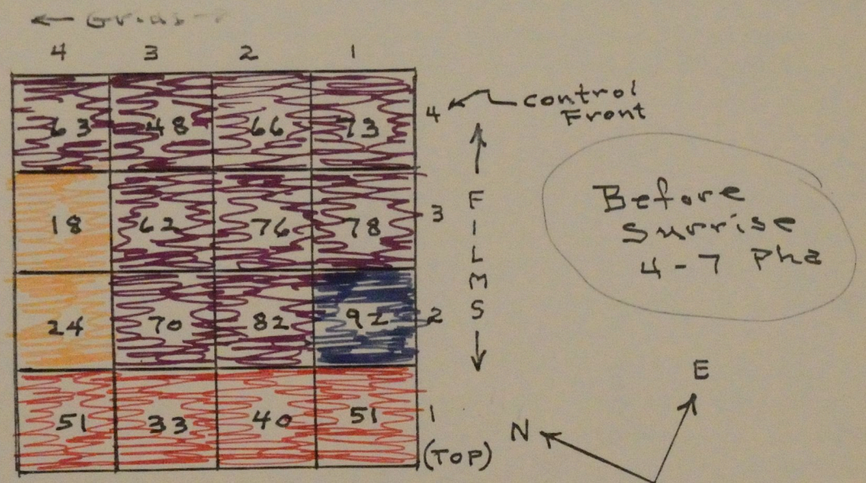


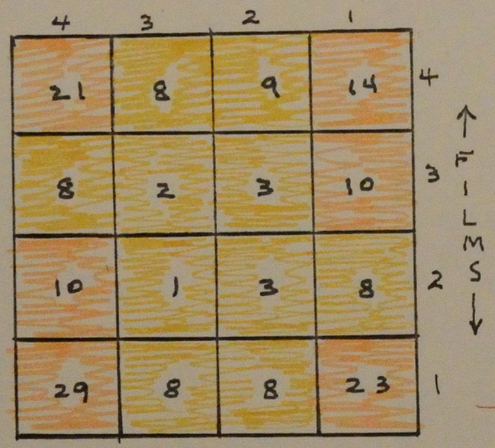


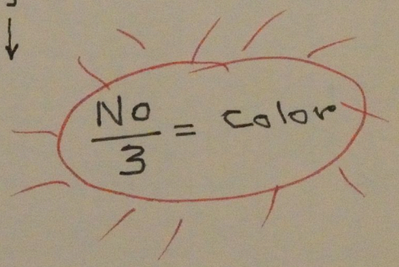


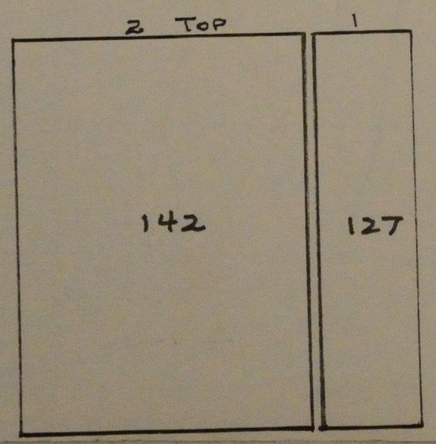
$\frac{No}{3}$ = Color

22 Months
All Malt Incl.

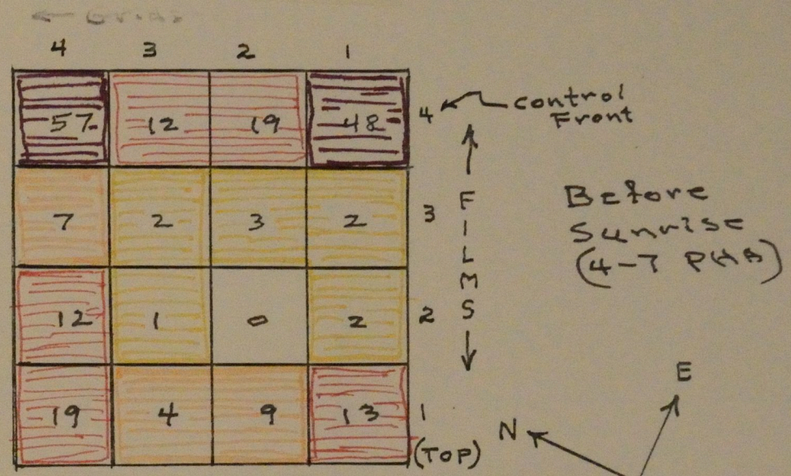


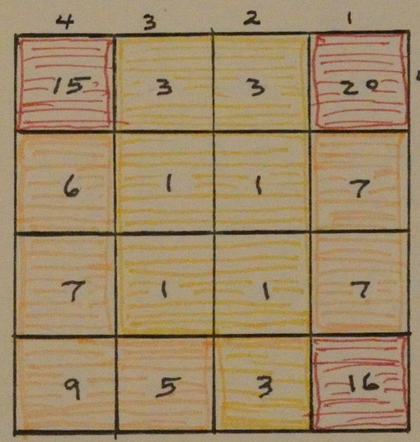


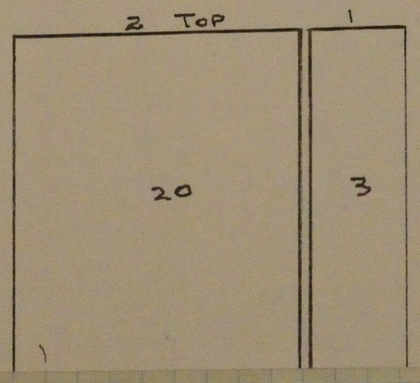


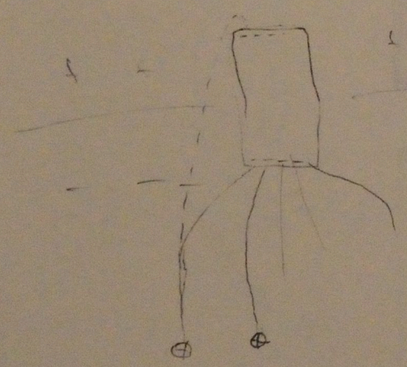


22 Months
All Mult Incl.









mass m kg
length meters
time seconds
charge coulombs

$QV = \frac{1}{2} m v^2$

$\frac{2 \times 10^{-14} \times 7 \times 10^{-15}}{10^{-15}} = v^2$

~~1.4×10^{-1}~~

~~.14 m/sec~~

1400 m/sec
40 m/sec

CASES (Periods) in quarterlies

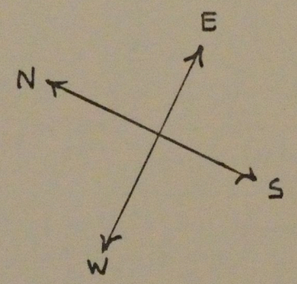
← Grids →

	4	3	2	1
4	53	52	52	52
3	69	69	68	68
2	10	12	9	9
1 (TOP)	13	13	12	12

control Front

FILMS ↓

Before Sunset 4-7 PHA



	4	3	2	1
4	3	2	1	2
3	2	1	0	1
2	1	1	0	0
1	1	1	0	0

FILMS ↓

2 Top	1
14	7

Bottom



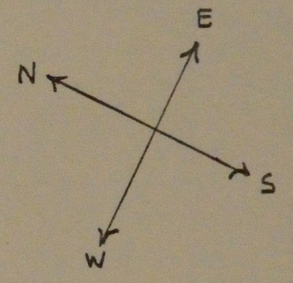
22 Months
All Mult Incl

	4	3	2	1
4	106	49	65	127
3	33	11	21	26
2	27	9	20	14
1 (TOP)	56	28	38	21

control Front

FILMS ↓

AFTER Sunrise (4-7 PHA)



	4	3	2	1
4	37	13	33	44
3	12	9	5	24
2	18	3	6	18
1	26	T	29	53

FILMS ↓

2 Top	1
21	13

Bottom

← Grids →

4 3 2 1

0	2	1	0
0	0	1	0
2	2	0	0
2	2	3	4

4 3 2 1 ← control Front

FILMS ↓

(TOP)

Nightime (4-7 Phd)

E N S W

52	16	36	64
18	10	6	31
25	4	7	25
35	12	32	68

4 3 2 1

FILMS ↓

2 Top 1

84	4

Outside grids

Descending dust somewhat from sun direction slow, large change

← Grids

4 3 2 1

29	40	42	52
15	35	43	64
16	45	47	69
12	17	18	23

4 3 2 1 ← control Front

FILMS ↓

(TOP)

AFTER SUNRISE 0-3 Phd

E N S W

4 3 2 1

17	16	12	17
15	14	6	15
28	17	15	18
33	17	14	24

4 3 2 1

FILMS ↓

2 Top 1

134	145

Bottom

22 Months All Mult Incl.

4	3	2	1
3	0	1	2
3	3	2	1
3	0	2	1
3	3	5	0

control Front

FILMS

(TOP)

Daytime
(0-3 Pha)

N E S W

4	3	2	1
1	1	0	11
0	0	3	2
0	1	0	5
2	1	1	5

FILMS

CASES

2 TOP	1
35	3

Coincidence only

All multiples excluded

← Grids →

4	3	2	1
2	1	1	0
1	1	0	0
1	1	3	2
2	3	3	2

control Front

FILMS

(TOP)

(Nighttime
(0-3 Pha)

N E S W

4	3	2	1
19	8	28	40
20	11	13	19
18	5	11	12
18	4	8	22

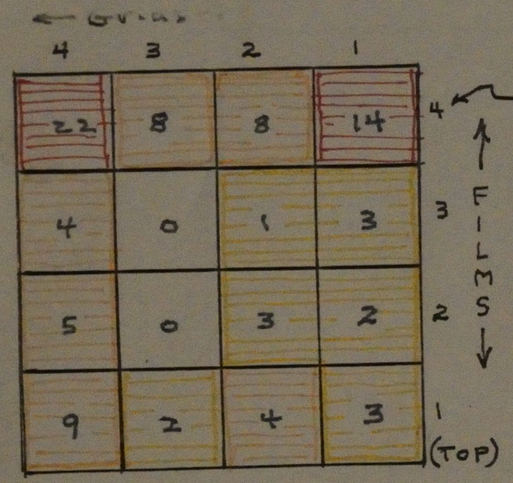
FILMS

2 TOP	1
227	12

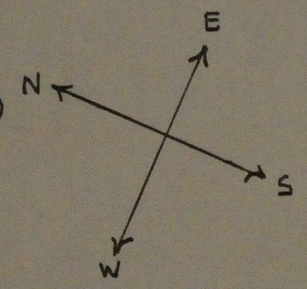
Coincidences only

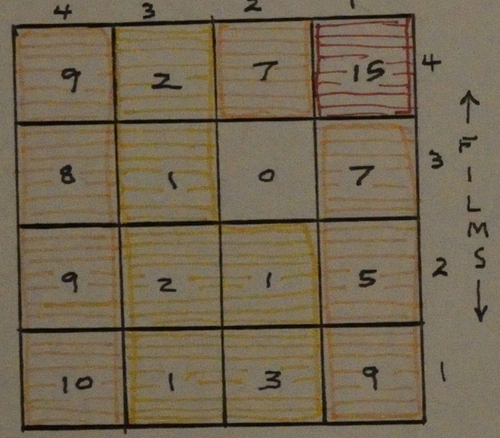
All multiples excluded

EAST ~~SOUTH~~



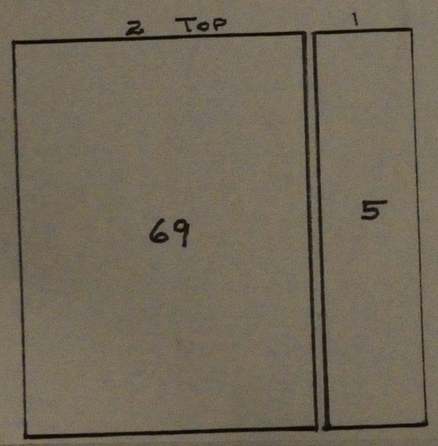
Before Sunrise (0-3 PHA)

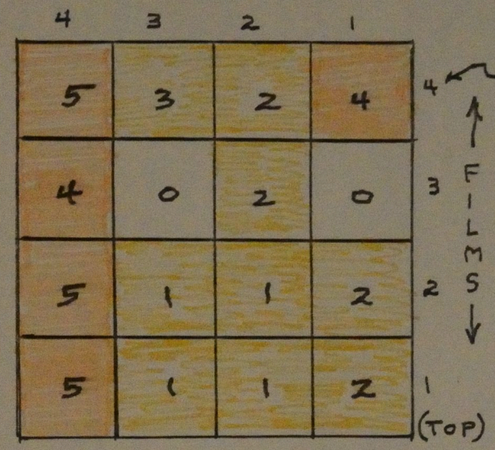




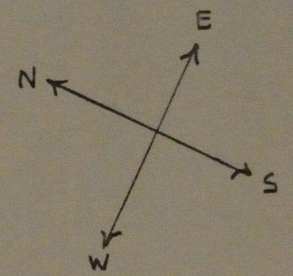
* No Multiples
* Coincidence only

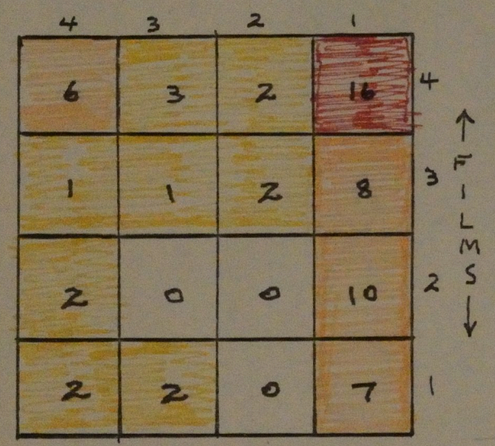
similar to (4-7)

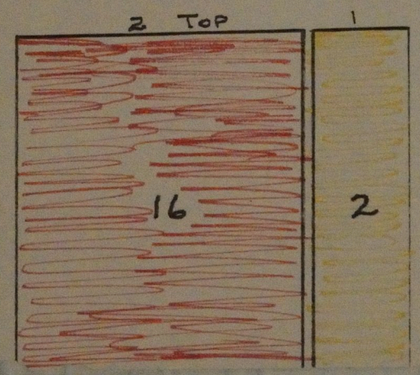




Daytime (4-7 PHA)







Coincidence only

All Multiples excluded

CONCORDIA COLLEGE

MOORHEAD, MINNESOTA

PHYSICS DEPARTMENT

30 March 1978

Dear Otto:

Very nice. Thanks very much for your letter and the extremely helpful and interesting comments. We agree with everything and are doing rewriting in accordance with it.

As far as the charge stripping is concerned we're very glad to have your advice and help. To tell the truth we were very uneasy about a foil, for much the same reasons ss you gave. We'd certainly be happy to have you tell us about the successful techniques used by the MPI people. I don't want to have anything to do with the CIA; they might put a tap on my telephone, or something.

Yes, we agree that we should say that the cosmic dust data is overshadowed by the anomalous events. and yes, we agree that the computer simulations ought to be mentioned.

So we'kl rewrite as you suggest and we thank you a lot for your comments.

In the charge-stripping description we'll just say something general such as that the particle will pass through a space containing an electron stream. I don'tksuppse we need to put in every constructional detail, especially since we haven't worked out every detail yet.

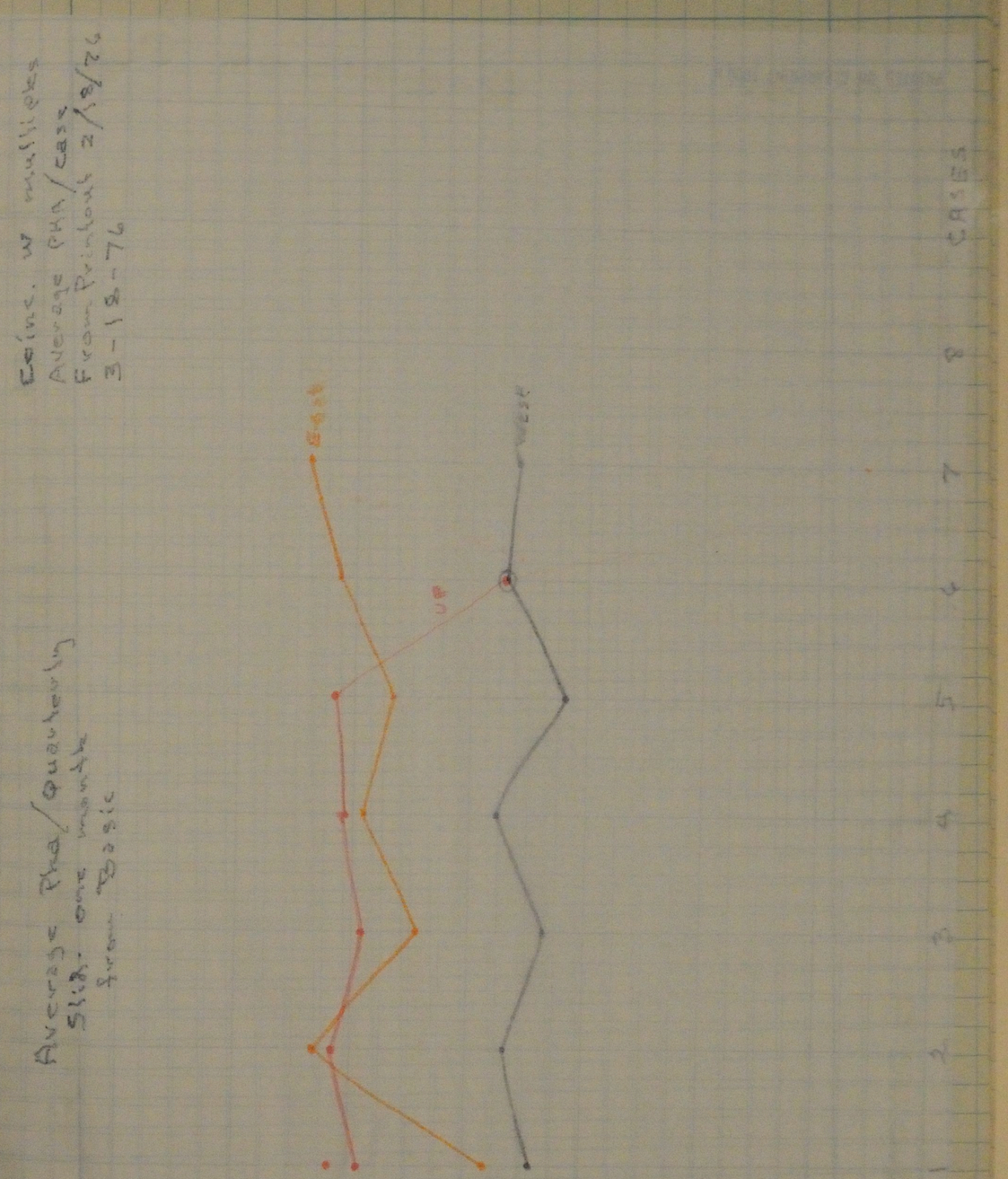
One thing we'll have to leave out: if NASA knew that you were a Latin dropout, they"d take ~~XX~~ away your retirement and make you go back to work as a stockboy or something. So we'll keep that detail to ourselves. There is Watergate all over again!

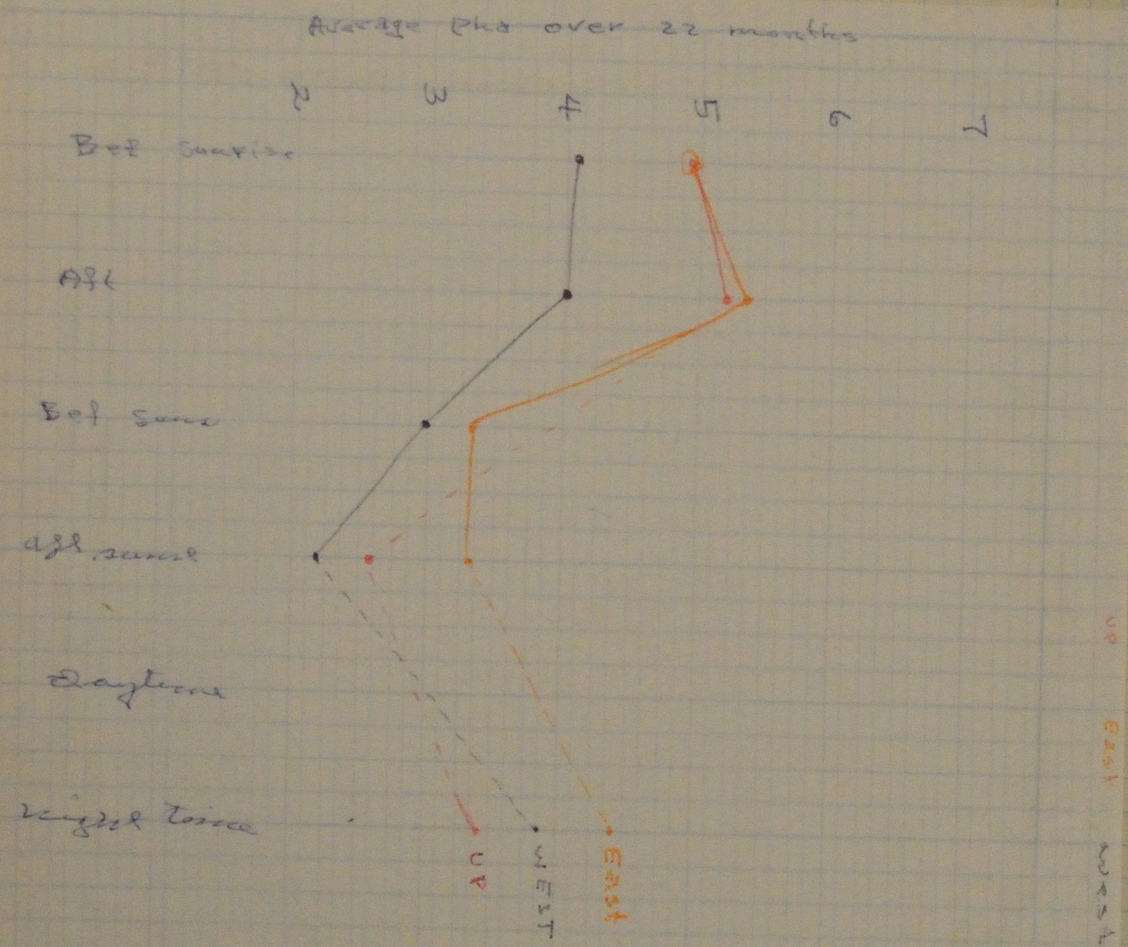
Best regards from all of us.

dSincerely,

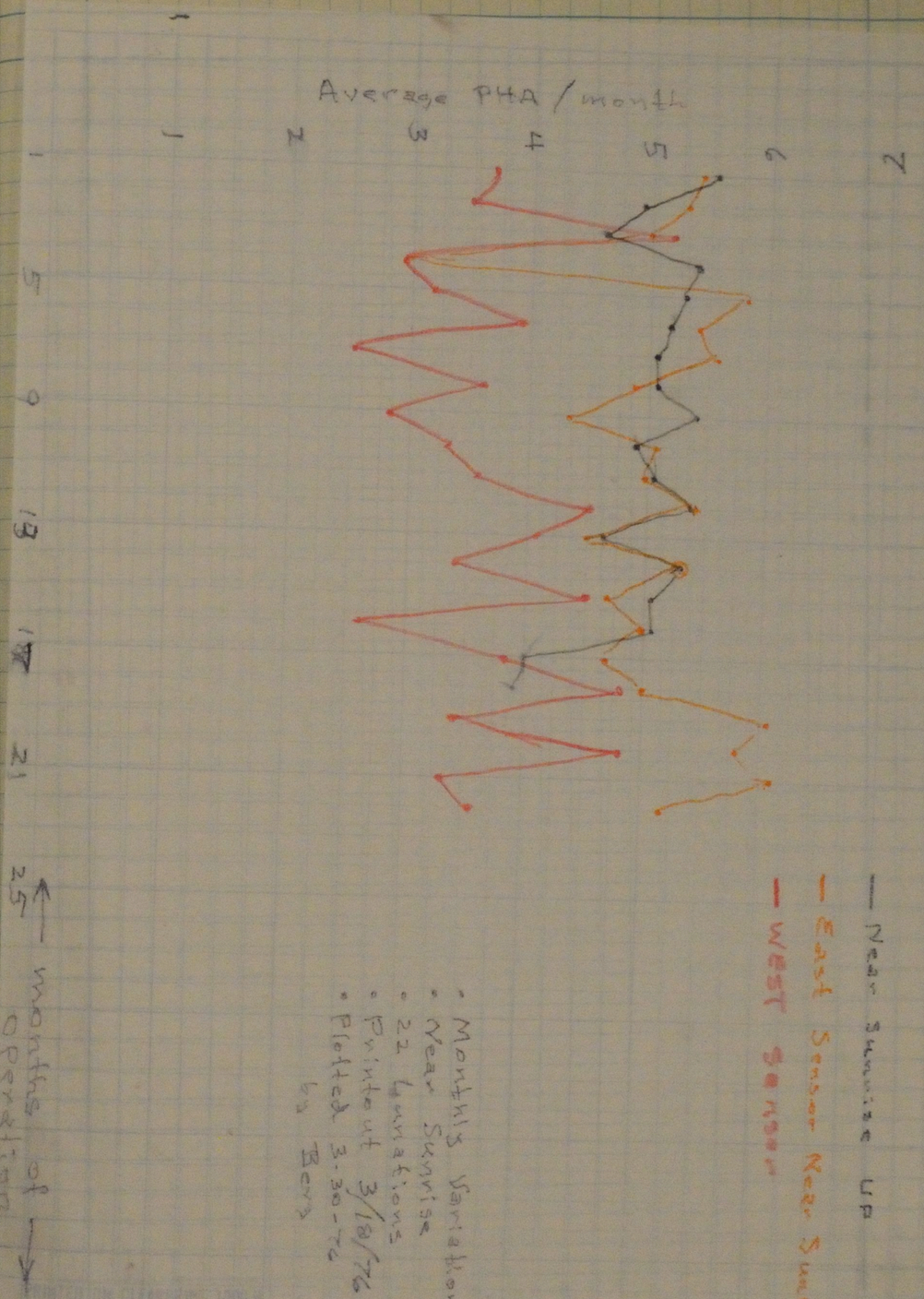
Carl Bailey

Please forgive my typing. I'm not familiar with electric typewriters and my fingers are always resting too hard on the keys, so I get maverick letters here and there.





Average PHA
Time W West
3-16-75



6-2-76

No events/month (case) for 36 months

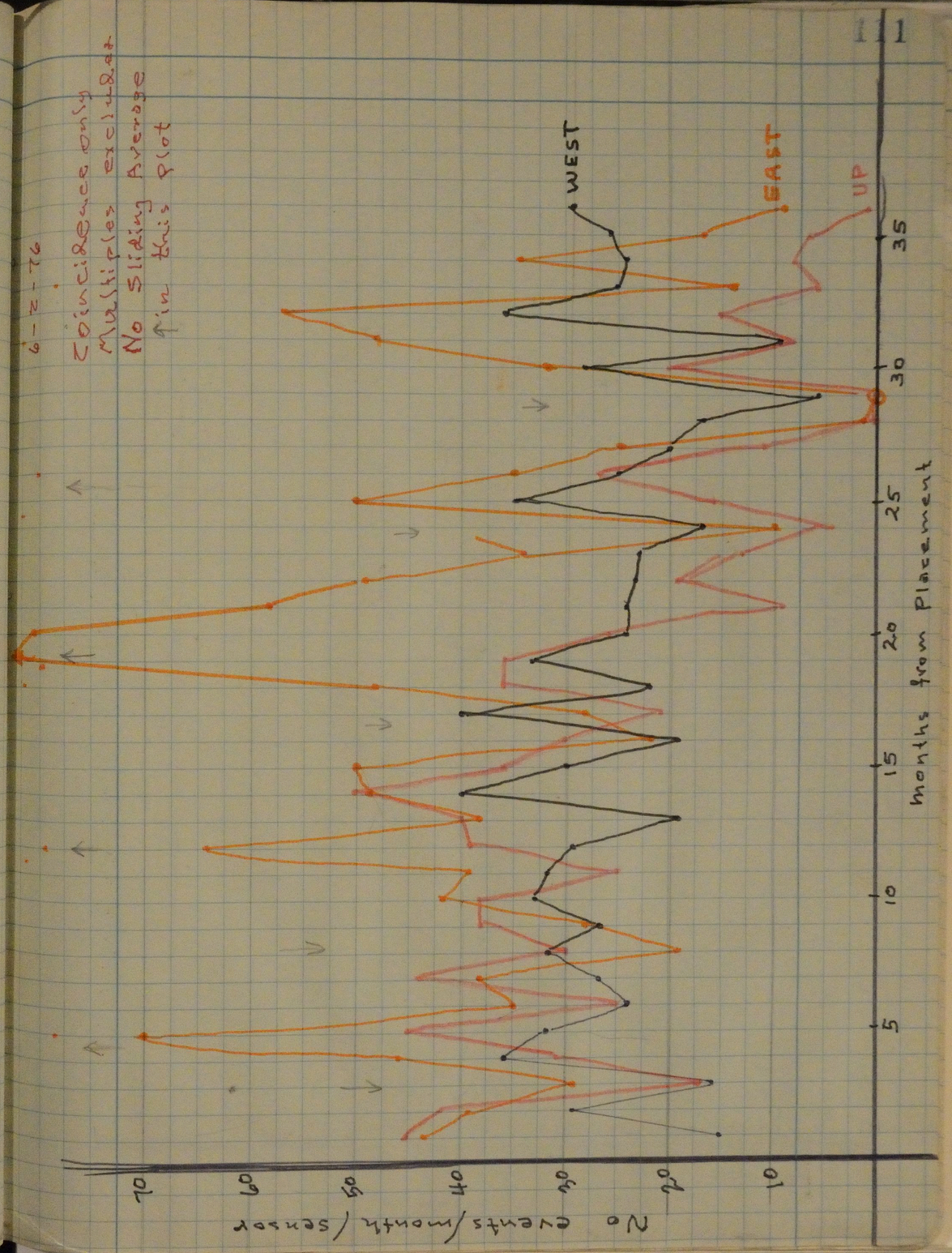
Case	Total	UP	EAST	WEST	Average PHA UP	EAST	WEST
1	103	45 44	43 42	15 20	5.4	6.1	2.4
2	110	42 38	39 37	29 20	5.0	5.2	2.7
3	63	17 30	29 38	17 27	4.8	5.0	3.1
4	113	31 31	46 48	36 28	5.4	3.6	2.0
5	147	45 34	70 50	32 31	5.3	6.0	2.5
6	84	25 38	35 48	24 28	4.7	5.7	3.4
7	109	44 33	38 31	27 28	4.9	5.8	2.4
8	81	30 37	19 32	32 29	5.0	4.4	3.0
9	93	38 39	28 30	27 31	4.8	5.3	2.4
10	113	38 34	42 36	33 31	4.8	5.0	2.2
11	96	25 37	39 48	32 31	5.0	5.1	2.3
12	132	39 35	64 47	29 27	5.3	5.3	2.7
13	97	40 43	38 52	19 29	4.5	5.6	2.2
14	138	50 42	48 45	40 30	5.5	4.8	2.2
15	116	36 39	50 40	30 30	4.9	4.5	2.6
16	71	30 29	22 33	19 30	4.9	4.8	2.1
17	89	21 29	28 33	40 27	4.8	4.6	2.2
18	106	36 31	48 54	22 32	4.4	5.1	2.4
19	155	36 33	86 72	33 26	3.2	6.3	2.8
20	131	26 24	81 75	24 27	1.3	5.8	2.9
	91	9 30	58 63	24 23	0	5.9	2.3
	91	19 14	49 47	23 23	0	5.3	2.3
	69	13 12	34 31	22 21	0	5.8	2.2
	31	4 11	10 28	17 25		4.3	3.1
25	101	16 16	50 32	35 26		5.0	2.6
	87	27 18	35 37	25 27		4.5	2.1
	56	11 13	25 20	20 21		5.6	2.3
dam 83 75 to 113 75	18	0 4	1 9	17 14		5.0	2.1
dam 113 75 to 142 75	6	0 7	0 11	6 17		0	1.7
30	80	20 9	32 27	28 18		5.1	2.7
	75	8 14	48 46	19 28		4.8	2.8
	108	15 10	57 40	36 27		5.5	2.6
	45	6 10	14 35	25 28		4.3	2.8
	66	8 7	34 27	24 29		4.2	3.1
	50	7 5	17 20	26 26		5.4	2.7
	39	1 3	9 12	29 28		3.0	2.2

Pencilled numbers are slide-averaged over 3 months

6-2-76

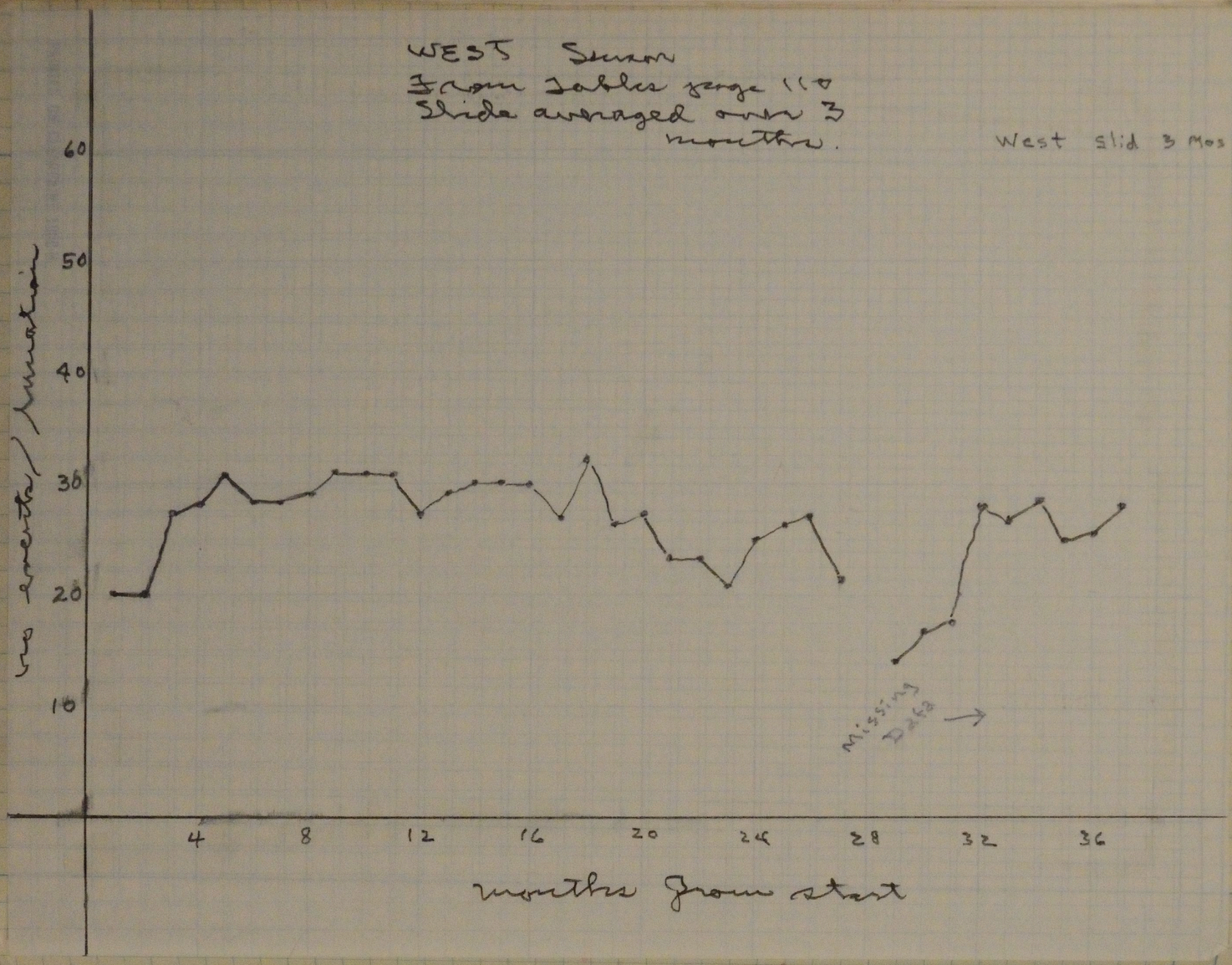
Coincidence only
Multiples excluded

No sliding Average
in this plot



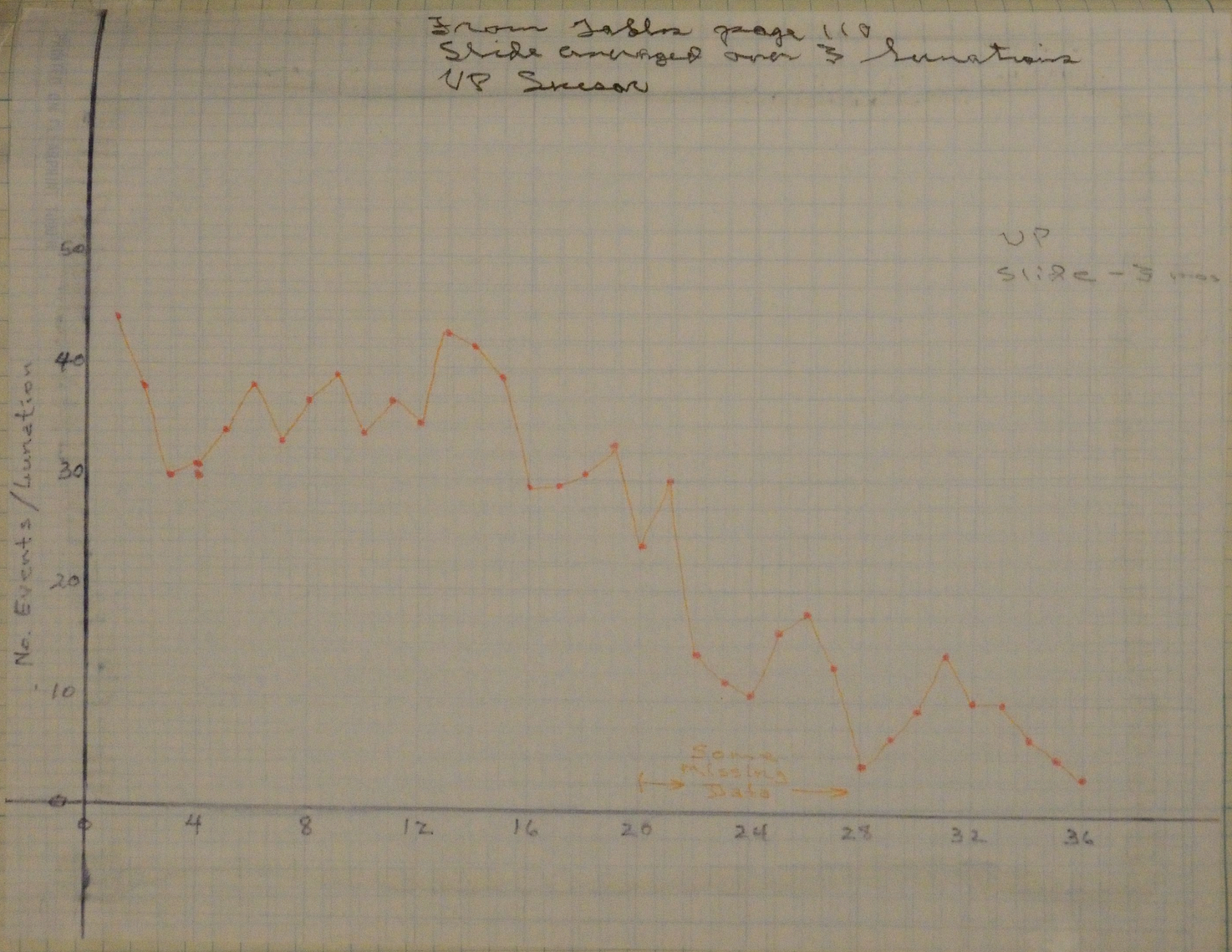
WEST Season
From Tables page 110
Slide averaged over 3 months.

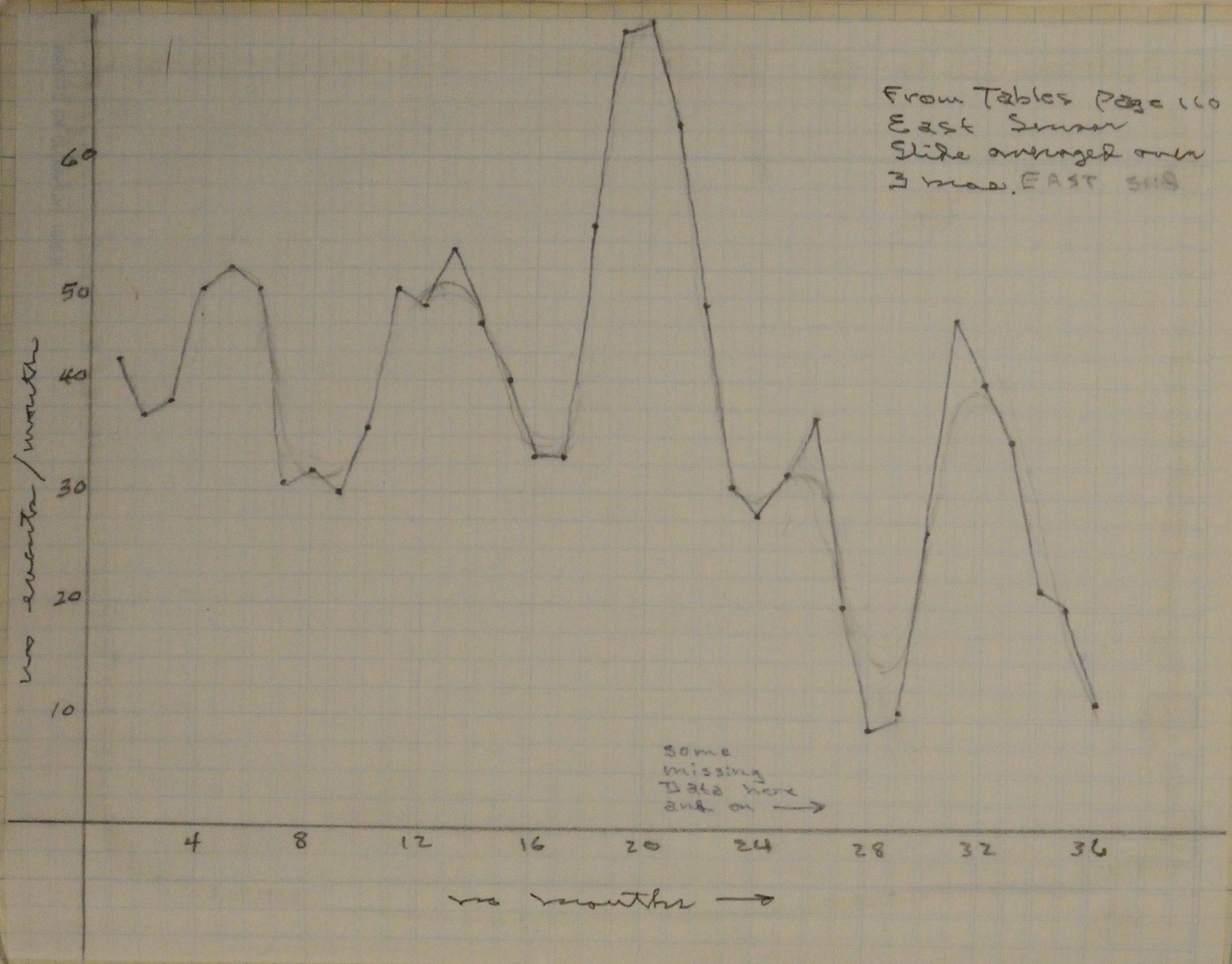
West slid 3 Mos



From Tables page 110
Slide averaged over 3 lunations
UP Season

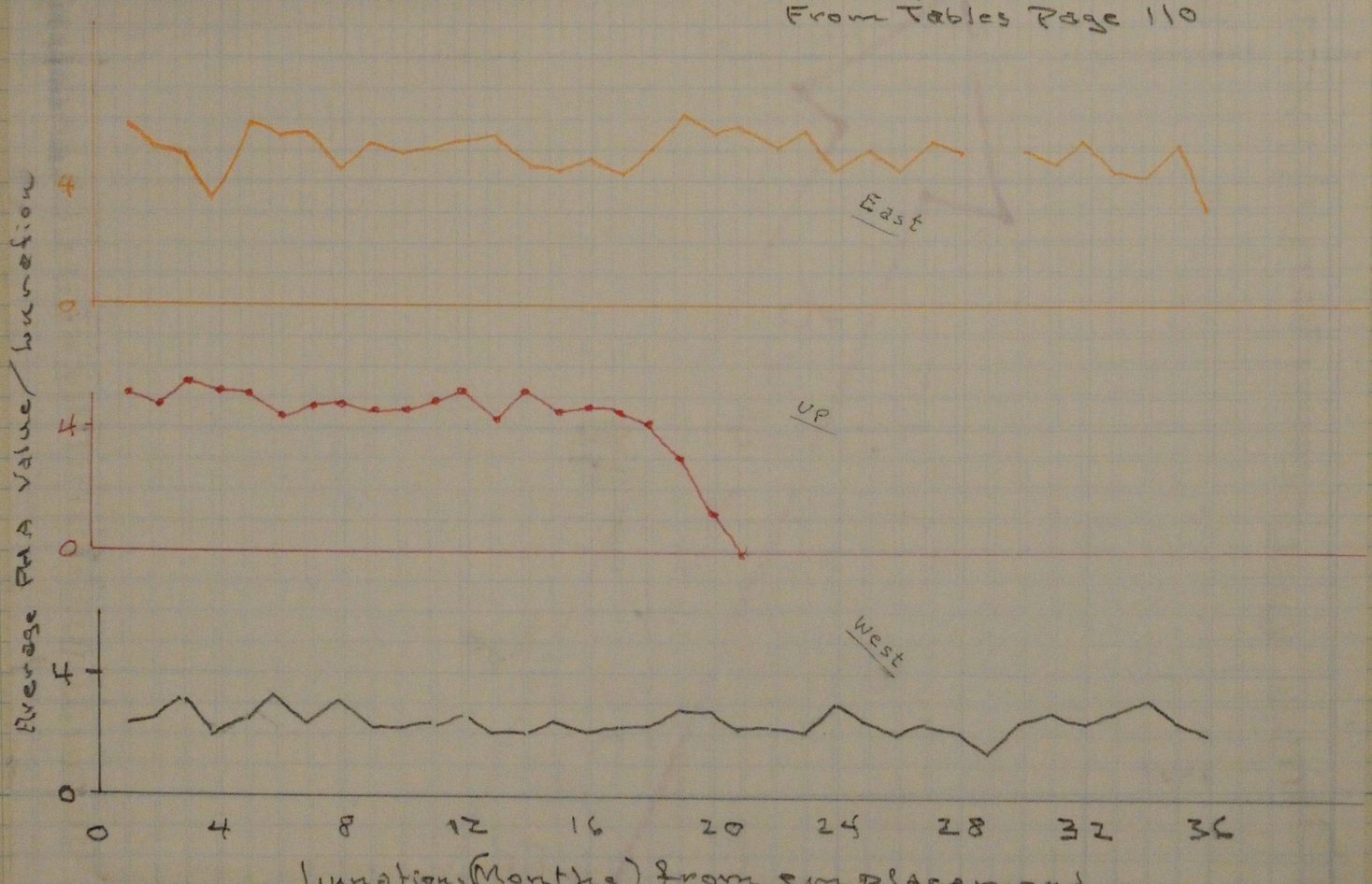
UP
slide - 3 mos

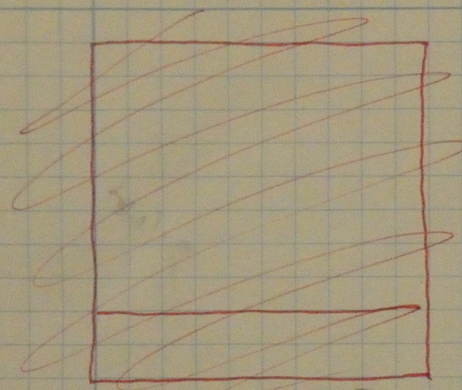




PHA Average/month
vs
Months after start

Coincidence Only
Multiples Excluded
From Tables Page 110





WEST

TOP

Grids →

FILMS ↓	1	2	3	4
1	39	63	43	86
2	24	33	17	59
3	35	37	18	54
4	160	88	63	181

NORTH

EAST

Bottom

FILMS	1	2	3	4
1	93	36	17	55
2	52	17	9	39
3	47	21	17	36
4	119	60	29	75

NORTH

~~WEST~~

EAST

Superceded

south

film & Grid

1	101
2	506

NORTH

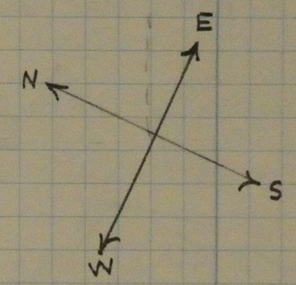
WEST (films up + Down)

← Grids →

	4	3	2	1	
4 (bottom)	181	63	88	160	(control) front film
3	54	18	37	35	
2	59	17	33	24	
1 (top)	86	43	63	39	

FILMS ↑

EAST



	4	3	2	1
4	75	29	60	119
3	36	17	21	47
2	39	9	17	52
1	55	17	36	93

FILMS ↑

no control on UP sensor

UP

S

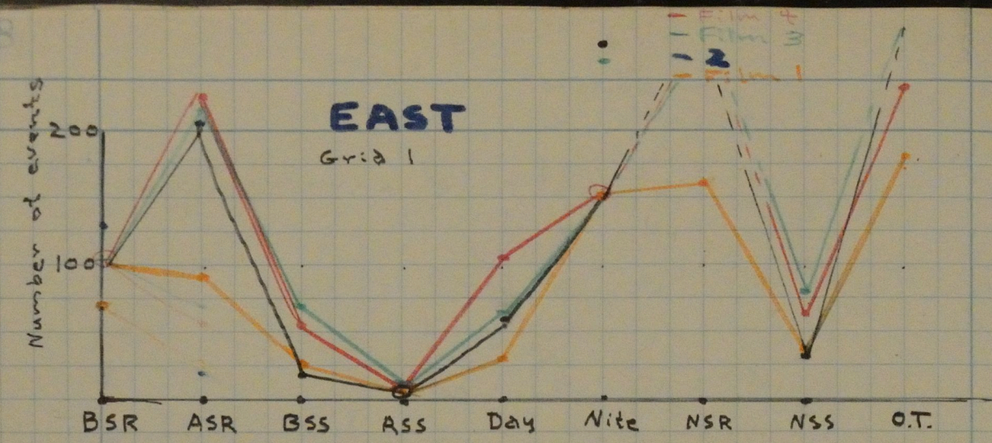
Data are from Dan Tomandle's Printout. The orientations vs grid and film numbers are from Derek Perkins and were rechecked 7-15-76

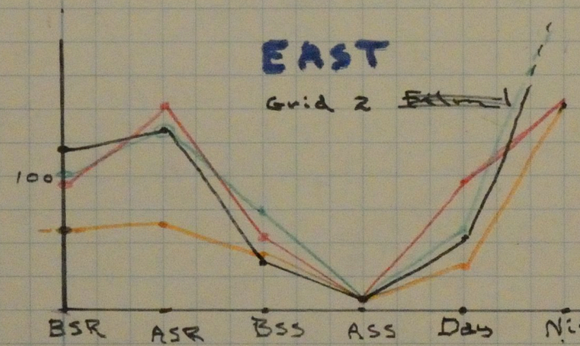
	2	1
(Top)	506	101
(Bottom)		

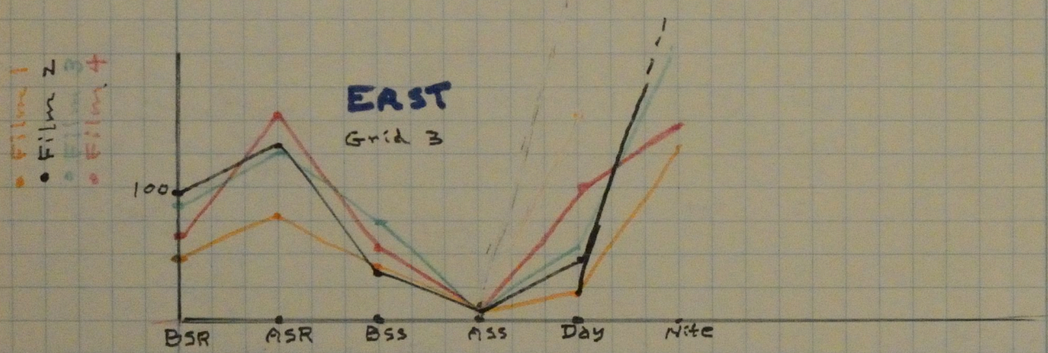
WEST

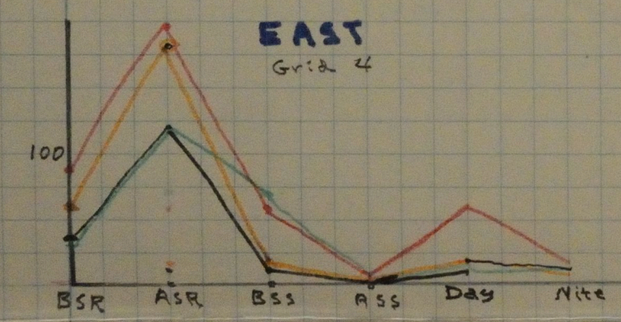
Films and Grids on West sensor run up and down.

Sept. 14, '76 From Printout









On Satellite Charging (Synchronous)

References

(1) "Spacecraft Charging at High Altitudes - The SCATHA Satellite" by D.A. Hamilton et al; AIAA 13th Aerospace Sciences meeting; Pasadena Jan 20, 1975 AIAA paper 75-92;

(2) "Large Discharges and Arcs on Spacecraft" by Alan Rosen; Aeronautics and Astronautics; June, 1975

* Effect in between midnight & dawn
* Up to hundreds of volts negative in sunlight

  Thousands of volts negative in eclipse conditions.

Charges on Particles

From F.S. Johnson

The max electron charge on a 1 μ sphere is 10^6 electrons — limited by electron emission

The Max Positive charge is limited by the the forces binding the atoms to their lattice sites. Iron this is 2×10^{10} volts/meter

Bendix Aerospace Systems Division

Prepared by: Ted A. Breezy - November 1976

ALSEP SUNRISE/SUNSET PREDICTIONS FOR 1977

Note: Apollo 12 ALSEP based on empirical data
Apollo 14 - 17 are "normalized"
Time is shown as GMT (EST)
* Indicates previous day

ALSEP Longitude	Apollo 17 30.75°E	Apollo 16 15.51°E	Apollo 15 3.65°E	Apollo 14 17.47°W	Apollo 12 23.39°W
Lunation	51	59	68	74	89
Sunrise	Dec 26/0458 (2358)*	Dec 27/1100 (0600)	Dec 28/1025 (0525)	Dec 30/0410 (2310)*	Dec 30/1613 (1113)
Noon	Jan 2/1443 (0943)	Jan 3/2052 (1552)	Jan 4/2020 (1520)	Jan 6/1410 (0910)	Jan 7/0155 (2155)*
Sunset	Jan 10/0048 (1948)*	Jan 11/0654 (0154)	Jan 12/0619 (0119)	Jan 14/0002 (1902)*	Jan 14/1037 (0537)
Midnight	Jan 17/1023 (0523)	Jan 18/1622 (1122)	Jan 19/1542 (1042)	Jan 21/0920 (0420)	Jan 21/2101 (1601)
Lunation	52	60	69	75	90
Sunrise	Jan 24/1937 (1437)	Jan 26/0139 (2039)*	Jan 27/0102 (2002)*	Jan 28/1848 (1348)	Jan 29/0658 (0158)
Noon	Feb 1/0520 (0020)	Feb 2/1127 (0627)	Feb 3/1055 (0555)	Feb 5/0445 (2345)*	Feb 5/1630 (1130)
Sunset	Feb 8/1520 (1020)	Feb 9/2124 (1624)	Feb 10/2049 (1549)	Feb 12/1431 (0931)	Feb 13/0108 (2008)*
Midnight	Feb 16/0047 (1947)*	Feb 17/0646 (0146)	Feb 18/0606 (0106)	Feb 19/2341 (1841)	Feb 20/1123 (0623)
Lunation	53	61	70	76	91
Sunrise	Feb 23/0954 (0454)	Feb 24/1554 (1054)	Feb 25/1517 (1017)	Feb 27/0859 (0359)	Feb 27/2104 (1604)
Noon	Mar 2/1926 (1426)	Mar 4/0132 (2032)*	Mar 5/0059 (1959)*	Mar 6/1846 (1346)	Mar 7/0631 (0131)
Sunset	Mar 10/0516 (0016)	Mar 11/1119 (0619)	Mar 12/1041 (0541)	Mar 14/0420 (2320)*	Mar 14/1459 (0959)
Midnight	Mar 17/1430 (0930)	Mar 18/2026 (1526)	Mar 19/1945 (1445)	Mar 21/1317 (0817)	Mar 22/0058 (1958)*
Lunation	54	62	71	77	92
Sunrise	Mar 24/2324 (1824)	Mar 26/0522 (0022)	Mar 27/0442 (2342)*	Mar 28/2220 (1720)	Mar 29/1017 (0517)
Noon	Apr 1/0842 (0342)	Apr 2/1446 (0946)	Apr 3/1410 (0910)	Apr 5/0754 (0254)	Apr 5/1937 (1437)
Sunset	Apr 8/1817 (1317)	Apr 10/0018 (1918)*	Apr 10/2337 (1837)	Apr 12/1713 (1213)	Apr 13/0357 (2257)*
Midnight	Apr 16/0317 (2217)*	Apr 17/0909 (0409)	Apr 18/0827 (0327)	Apr 20/0155 (2055)*	Apr 20/1336 (0836)
Lunation	55	63	72	78	93
Sunrise	Apr 23/1156 (0656)	Apr 24/1752 (1252)	Apr 25/1709 (1209)	Apr 27/1045 (0545)	Apr 27/2240 (1740)
Noon	Apr 30/2100 (1600)	May 2/0301 (2201)*	May 3/0225 (2125)*	May 4/2005 (1505)	May 5/0747 (0247)
Sunset	May 8/0623 (0123)	May 9/1221 (0721)	May 10/1139 (0639)	May 12/0511 (0011)	May 12/1559 (1059)
Midnight	May 15/1508 (1008)	May 16/2100 (1600)	May 17/2016 (1516)	May 19/1342 (0842)	May 20/0122 (2022)*
Lunation	56	64	73	79	94
Sunrise	May 22/2336 (1836)	May 24/0530 (0030)	May 25/0447 (2347)*	May 26/2220 (1720)	May 27/1006 (0506)
Noon	May 30/0830 (0330)	May 31/1430 (0930)	Jun 1/1352 (0852)	Jun 3/0730 (0230)	Jun 3/1913 (1413)
Sunset	Jun 6/1743 (1243)	Jun 7/2340 (1840)	Jun 8/2258 (1758)	Jun 10/1628 (1128)	Jun 11/0319 (2219)*
Midnight	Jun 14/0223 (2123)*	Jun 15/0813 (0313)	Jun 16/0728 (0228)	Jun 18/0052 (1952)*	Jun 18/1230 (0730)
Lunation	57	65	74	80	95
Sunrise	Jun 21/1043 (0543)	Jun 22/1636 (1136)	Jun 23/1553 (1053)	Jun 25/0924 (0424)	Jun 25/2108 (1608)
Noon	Jun 28/1932 (1432)	Jun 30/0131 (2031)*	Jul 1/0053 (1953)*	Jul 2/1830 (1330)	Jul 3/0612 (0112)
Sunset	Jul 6/0441 (2341)*	Jul 7/1038 (0538)	Jul 8/0955 (0455)	Jul 10/0325 (2225)*	Jul 10/1418 (0918)
Midnight	Jul 13/1319 (0819)	Jul 14/1908 (1408)	Jul 15/1823 (1323)	Jul 17/1147 (0647)	Jul 17/2326 (1826)
Lunation	58	66	75	81	96
Sunrise	Jul 20/2138 (1638)	Jul 22/0332 (2232)*	Jul 23/0248 (2148)*	Jul 24/2020 (1520)	Jul 25/0803 (0303)
Noon	Jul 28/0630 (0130)	Jul 29/1230 (0730)	Jul 30/1152 (0652)	Aug 1/0530 (0030)	Aug 1/1711 (1211)
Sunset	Aug 4/1542 (1042)	Aug 5/2137 (1637)	Aug 6/2055 (1555)	Aug 8/1426 (0926)	Aug 9/0117 (2017)*
Midnight	Aug 12/0023 (1923)*	Aug 13/0614 (0114)	Aug 14/0529 (0029)	Aug 15/2254 (1754)	Aug 16/1034 (0534)
Lunation	59	67	76	82	97
Sunrise	Aug 19/0849 (0349)	Aug 20/1442 (0942)	Aug 21/1401 (0901)	Aug 23/0736 (0236)	Aug 23/1919 (1419)
Noon	Aug 26/1748 (1248)	Aug 27/2348 (1848)	Aug 28/2311 (1811)	Aug 30/1650 (1150)	Aug 31/0432 (2332)*
Sunset	Sep 3/0306 (2206)*	Sep 4/0905 (0405)	Sep 5/0824 (0324)	Sep 7/0157 (2057)*	Sep 7/1245 (0745)
Midnight	Sep 10/1158 (0658)	Sep 11/1750 (1250)	Sep 12/1707 (1207)	Sep 14/1036 (0536)	Sep 14/2214 (1714)
Lunation	60	68	77	83	98
Sunrise	Sep 17/2036 (1536)	Sep 19/0230 (2130)*	Sep 20/0151 (2051)*	Sep 21/1927 (1427)	Sep 22/0716 (0216)
Noon	Sep 25/0547 (0047)	Sep 26/1149 (0649)	Sep 27/1113 (0613)	Sep 29/0455 (2355)*	Sep 29/1637 (1137)
Sunset	Oct 2/1543 (1043)	Oct 3/2117 (1617)	Oct 4/2039 (1539)	Oct 6/1415 (0915)	Oct 7/0058 (1958)*
Midnight	Oct 10/0023 (1923)*	Oct 11/0618 (0118)	Oct 12/0536 (0036)	Oct 13/2307 (1807)	Oct 14/1047 (0547)
Lunation	61	69	78	84	99
Sunrise	Oct 17/0913 (0413)	Oct 18/1512 (1012)	Oct 19/1434 (0934)	Oct 21/0813 (0313)	Oct 21/2005 (1505)
Noon	Oct 24/1839 (1339)	Oct 26/0043 (1943)*	Oct 27/0008 (1908)*	Oct 28/1754 (1254)	Oct 29/0539 (0039)
Sunset	Nov 1/0423 (2323)*	Nov 2/1026 (0526)	Nov 3/0949 (0449)	Nov 5/0329 (2229)*	Nov 5/1411 (0911)
Midnight	Nov 8/1342 (0842)	Nov 9/1940 (1440)	Nov 10/1900 (1400)	Nov 12/1234 (0734)	Nov 13/0015 (1915)*
Lunation	62	70	79	85	100
Sunrise	Nov 15/2247 (1747)	Nov 17/0448 (2348)*	Nov 18/0411 (2311)*	Nov 19/2154 (1654)	Nov 20/0951 (0451)
Noon	Nov 23/0825 (0325)	Nov 24/1431 (0931)	Nov 25/1359 (0859)	Nov 27/0747 (0247)	Nov 27/1931 (1431)
Sunset	Nov 30/1809 (1309)	Dec 2/0026 (1926)*	Dec 2/2350 (1850)	Dec 4/1834 (1334)	Dec 5/0413 (2313)*
Midnight	Dec 8/0353 (2253)*	Dec 9/0952 (0452)	Dec 10/0912 (0412)	Dec 12/0249 (2149)*	Dec 12/1430 (0930)
Lunation	63	71	80	86	101
Sunrise	Dec 15/1306 (0806)	Dec 16/1908 (1408)	Dec 17/1832 (1332)	Dec 19/1218 (0718)	Dec 20/0017 (1917)*
Noon	Dec 22/2252 (1752)	Dec 24/0500 (0000)	Dec 25/0427 (2327)*	Dec 26/2218 (1718)	Dec 27/1002 (0502)
Sunset	Dec 30/0854 (0354)	Dec 31/1500 (1000)	Jan 1/1426 (0926)	Jan 3/0809 (0309)	Jan 3/1853 (1353)
Midnight	Jan 6/1830 (1330)	Jan 8/0030 (1930)*	Jan 8/2350 (1850)	Jan 10/1727 (1227)	Jan 11/0509 (0009)

NASA-JSC

BEN - 20A

1-7-77

On Calibration Curves

Pre-flight and Concordia

Pre-flight

For constant speed at 2 Km/sec region, the Pha goes up 1 for each mass (N charge) factor of 2.1 at low or small masses and a factor of 73.5 at larger masses of 10^{-12} grams + up

$Area_{sphere} = 4\pi r^2$

$Volume_{sphere} = \frac{4}{3}\pi r^3$

Concordia

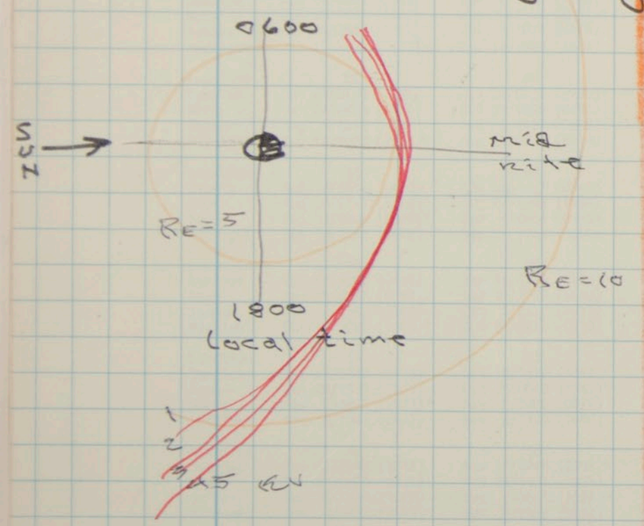
for constant speed at 2 Km/sec region, the Pha goes up 1 for each factor charge of 1.55

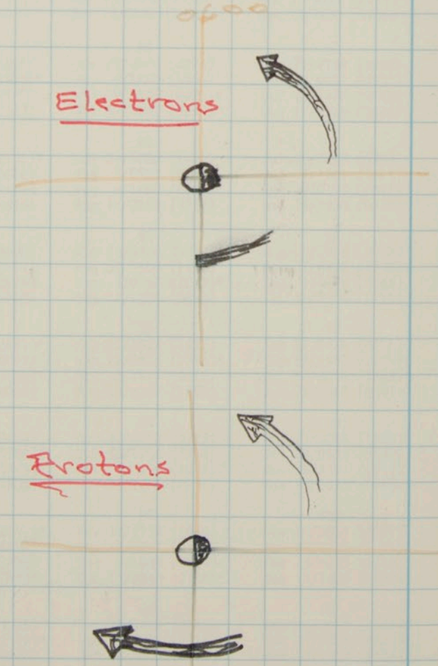
For Constant Charge

4-24-77 — a call to Carl Bailey at Concordia. They have now succeeded in accelerating 10^{-13} coulomb 5-μ spheres to 0.1 km/sec and essentially all pulse heights are 7. Moreover the Pha seems to be independent of charge as soon as the threshold is reached.

0.1 km/sec

De Forest Spoke here on Spacecraft charging





At M.P.I.

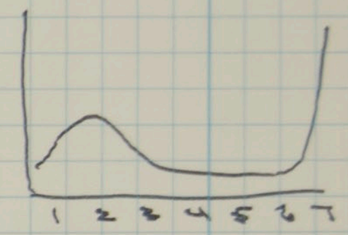
Starting Oct 10, 1977

Questions

1) (See starting page 52 of this book) Why do events arrive earlier and earlier, relative to sunrise, for the first 6 lunations? This is true for all 3 sensors

Check out printouts on this

2) The Pha Distribution observed could mean the slower particles with high charge are being excluded from the sensor film because of the +27 volt potential on the 2nd grid. Or that there is a distribution of slow speeds which accounts for the pha distribution.



A test for Concordia

Why is Pha Distribution high at 7 and another peak at 2. ??

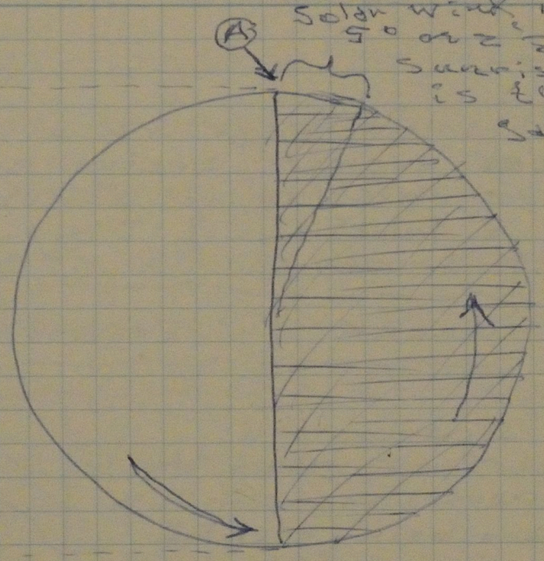
Take another book !!

Possibly also particles with charges so small as to give an pha of 1 cannot leave the surface.

3) Why is "Film Only" Pha Distribution so peaked on 2 whereas ~~Pha~~ coincidence pha distributions show the highest pha peak at 7 and a lesser one at 2.

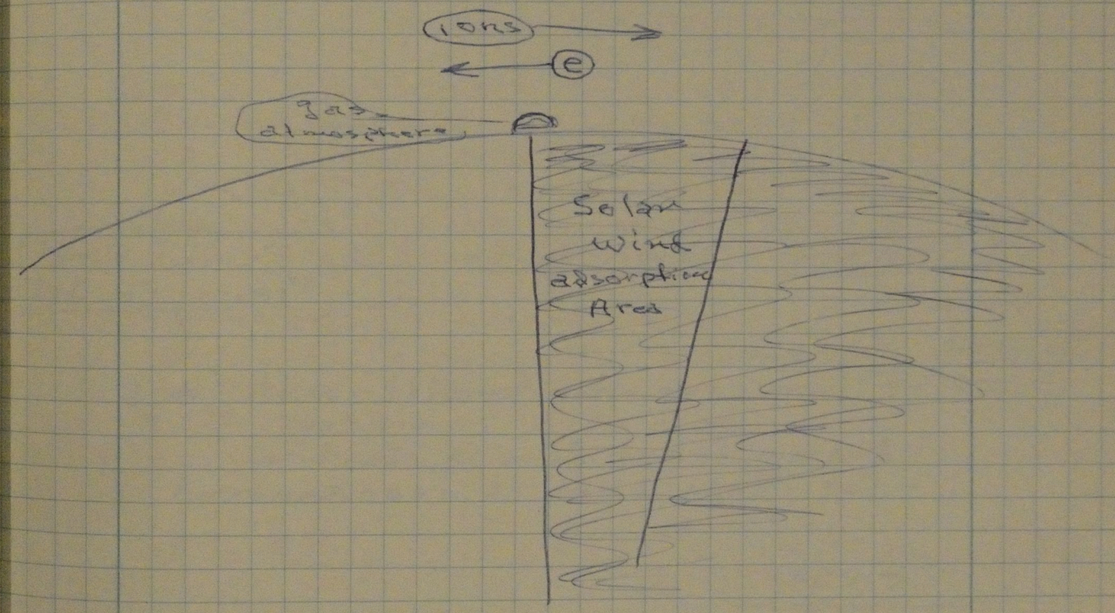
New Theory

Nov. 6, 1977



The Solar wind precedes the arrival of sunrise by 2½ hours. It follows the arrival of sunset by 2½ hours, ∴ the 5° of the lunar surface at sunrise is exposed to Solar wind ion implantation plus normal lunar outgassing of Argon 40 etc. At the moment the ionizing rays from the sun hit the line (A) above there is the combination of a high surface potential [(−1800) + (+6V)] on the

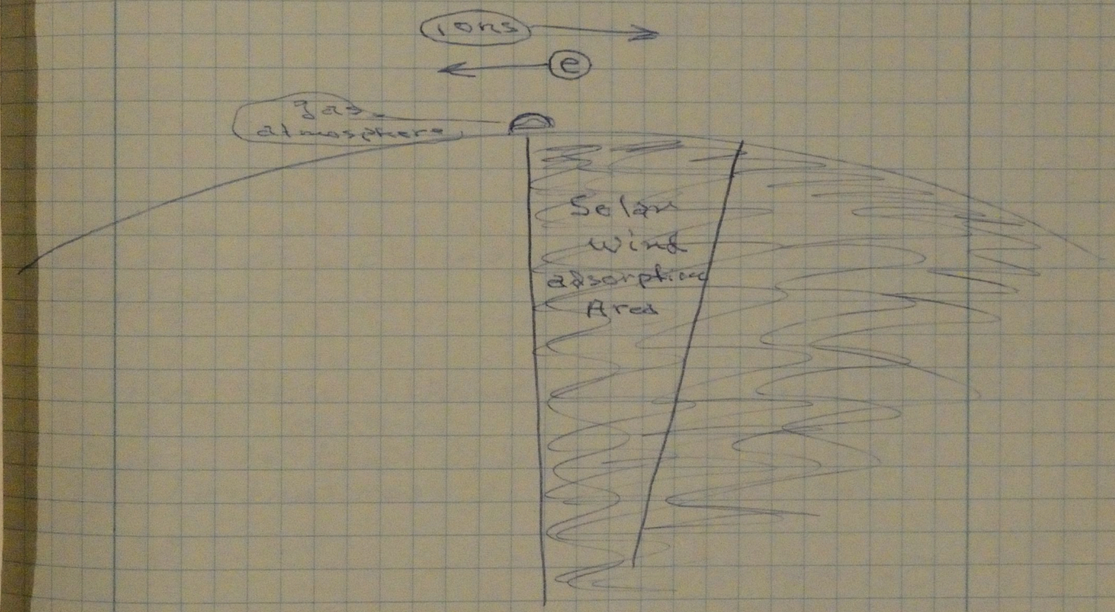
terminator and solar radiation which heats up and releases gases adsorbed in the surface and possibly triggers a gas-crustal discharge across the terminator as shown; the surface gases are moved either



mechanically by the electrical explosion or electrostatically by a more complex mechanism. The sunset terminator has the same potential difference but not the same

FRONT
File Chronologically in back

termination and solar radiation which heats up and releases gases adsorbed in the surface and possibly triggers a geomagnetic disturbance across the termination as shown; the surface gases are moved either



mechanically by the electrical explosion or electrostatically by a more complex mechanism. The sunset termination has the same potential difference but not the same

New Theory

To: Professor Carl Bailey

From Otto Berg
Code 691
Goddard Space Center, NASA
Greenbelt, MD 20771
FAX # 301-286-1683

Oct 21, '96

5 Pages

I faxed to him a set of my plots showing charge vs Pha and speed vs Pha

Dear Carl - here are the plots I spoke of. I will call you in a few days concerning them.

Data taken from your Final Report Pages A-II-4 to A-II-14

New Theory

425 Valley Ave
Moorhead MN 56560
12 November 1996

Dear Otto:

Here are some comments with respect to the faxed plots of LEAM data that you sent me on 21 October.

Your plots A and B (I have the impression that they were actually made by your friend) essentially reproduce--but only in part--the information on Graphs S-19 to S-26 inclusive in our 1977 Final Report. I read plots A and B as follows: "If the speed of the particle is roughly between 60 and 70 meters/sec, then the particle charge rises from roughly 1000 bergs to 2000 bergs as the LEAM pulse height rises from 1 to 7." [Incidentally, the data are not sufficiently precise to justify taking seriously the "humps" mentioned in plot B.] Whereas the plots contain only a more-or-less single particle speed, we observed particles in the "LOW" speed range with speeds from 30 meters/sec to about 100 meters/sec.

To give a more complete picture of what we observed, I enclose plots of data with

Pulse height	2	"slow" 30-100 m/sec
	3	"
	6	"
	7	"

from the data on pages A-II-2 to A-II-15 inclusive, of the Final Report.

One sees several things in these plots. Among them:

(1) There is quite a lot of overlap in the data points, going from one pulse height to another. For example, consider the "area" between 50 and 70 meters/sec and between 1000 and 2000 bergs. There are points for all the pulse heights plotted, in this "area." See page 20 of the Final Report for a comment on the overlap. Table VIII, page 20, is informative; for example, of particles in the charge range 1000-2000 bergs, 10% induced PH7, while 79% of the observed particles with charge greater than 3000 bergs induced PH7. However, as the text on page 20 says, one should not read

those percentages naively, especially with respect to PH7.

Thus, the meaning--for example--of PH7 is not sharply delineated. But we do see clearly that particles with Q greater than 3000 bergs, and very low speeds, usually give PH7 or PH6 (or PH5, which I did not plot.)

The plots may perhaps furnish a little insight into your remark that the moon LEAM yielded lots of PH7's and PH2's but not much in between.

(2) Particle kinetic energy is not by itself of much (if any) account in this region of charge and velocity. We see this in two ways. (a)Accelerating voltages from 8 KV to 25 KV gave essentially the same distribution of particle Q and v, for a given pulse height. (b)There is a very broad distribution of kinetic energy in each of the plots, as one finds by calculating for each point the product QV_o, where V_o is the accelerating voltage.

(3) Particle mass has no bearing, as far as I can discern, at least by itself. For each point, one can find the particle mass from $2QV_o/v^2$, and in each plot there is a very wide range of masses.

(4) The data are limited by the spectrum of particles which the accelerator yielded. For example, we could not obtain particles with velocities (say) between 60 and 100 meters/sec and charges over 3000 bergs. See Graph S-17 in the Final Report.

So. Suppose we see a LEAM event of PH7. What does that mean? Our data furnish only a partial answer. At any rate, we can surely and conservatively say (as we did in the Final Report) that the frequent occurrence of PH7 in the moon LEAM data is consistent with the existence of very slow and highly charged particles in the lunar dust flux. We can't say what other phenomena might induce PH7.

Your plot labelled "Accelerating voltage 2.0 MV" essentially reproduces--partially--the information in Graph S-15 of the Final Report. (Graph S-15 is a summary of Graphs S-2 to S-14 inclusive.) For example, I read your plot as follows: "If the pulse height is 2, and if the speed is about 1 kilometer/sec, then the particle charge is about 350 bergs; etcetera." But of course we observed

m| particles with speeds from about 0.3 km/sec to about 5 km/sec, and charges from about 15 bergs to about 2000 bergs, in our work with accelerating voltages 1.0 MV or higher.

To widen the picture, I enclose a plot for PH3 "FAST" using our data at accelerating voltages of 1.0, 1.4, and 2.0 MV. Some comments:

(5) There is a fairly good distinction between pulse heights, with respect to Q and v, in this region of operation; see Graph S-15 in the Final Report.

(6) Particle kinetic energy is not an important factor, at least by itself. In the enclosed PH3 plot, as an example, the various accelerating voltages give essentially the same charge-velocity distribution; and also there is a very broad range of particle kinetic energy, as one sees by calculating the product QV_o for each point.

(7) Particle mass is not much (if any) account, at least by itself. The calculated masses range very broadly, for the same pulse height.

(8) The data are limited by the particle spectrum which the accelerator yielded. See Graph S-1 in the Final Report. We could not get, for example, particles with velocity greater than (say) 3 km/sec with charge greater than about 200 bergs.

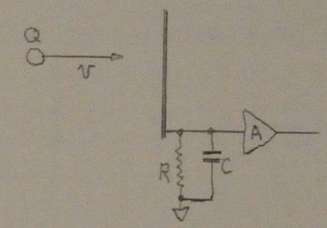
(9) The two plots for PH3, namely PH3 "SLOW" and PH3 "FAST," demonstrate the rather startling transition in the LEAM behavior, between the velocity region over 0.3 km/sec and the velocity region below 0.1 km/sec or 100 meters/sec. We remarked on that transition on pages 21-22 of the Final Report. To dramatize the effect, I tacked onto my PH3 "FAST" plot a piece at the bottom, showing the PH3 "SLOW" data on the same scale of Q and v.

It would have been interesting indeed, from the point of view of understanding the physics of the LEAM if not from any other point of view, to expose the LEAM to particles with velocities between 100 m/sec and 0.3 km/sec and charges from (say) 500 bergs to 2000 bergs. But our accelerators would not yield such particles.

So. Suppose that we see PH3. What does that mean? Our only

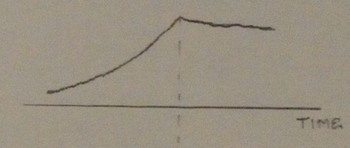
4| answer to that question--of course not a complete answer--is in the enclosed PH3 plots.

Without knowing anything of the LEAM electronics, I have been wondering if the Q-v dependence we observed might possibly be related to charge induction. In the sketch, a particle of charge Q and velocity v approaches a metal plate which is grounded through a resistance R. From the top of R, a lead goes to an amplifier A.



As Q approaches the plate, it induces an increasing charge, of opposite sign, on the plate. With Q positive, then negative charge flows from ground, through R, to the plate. Thus there is a current I through R, and a voltage IR appears at the input to the amplifier (positive voltage in the case assumed).

The voltage IR looks schematically like the sketch, as a function of time. When the particle hits the plate, there can be some complicated short-term activity, but the simplest possibility is that the net charge on the plate after impact (about Q/2, I think) just leaks to ground at a rate determined by the time constant RC, where C is the effective capacitance of the arrangement.



The height of this voltage pulse is determined, I think, by the product Qv; because the magnitude of the induced charge is proportional to Q while the rate of change of the induced charge, namely the current I, is proportional to v. The slope of the pulse, before impact, is determined by v; a fast particle gives a rapidly rising pulse, while a slow particle gives a slowly rising pulse.

How the pulse is handled by the amplifier depends on the amplifier characteristics and on the height and slope of the pulse. If the factors are favorable, the amplifier puts out some signal which I

5

think must depend on both Q and v. But, if the pulse height at R goes as the product Qv, I don't see how the LEAM output would vary with Q and v in the way which our observations show. Knowledge of the LEAM electronics might help me there.

I'm sure that these notions have occurred already to people like yourself and Perkins; so perhaps you have already considered and perhaps rejected this guess. It was fun to express it, anyway.

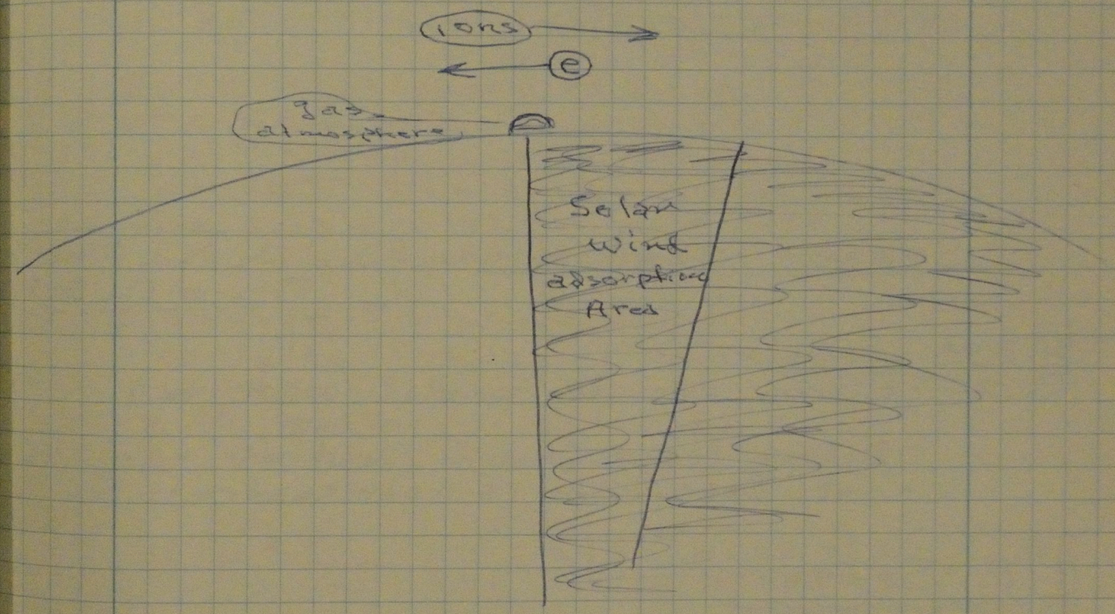
Thanks for the opportunity to do this exercise. I've been enjoying myself.

Best regards to you and Lil,

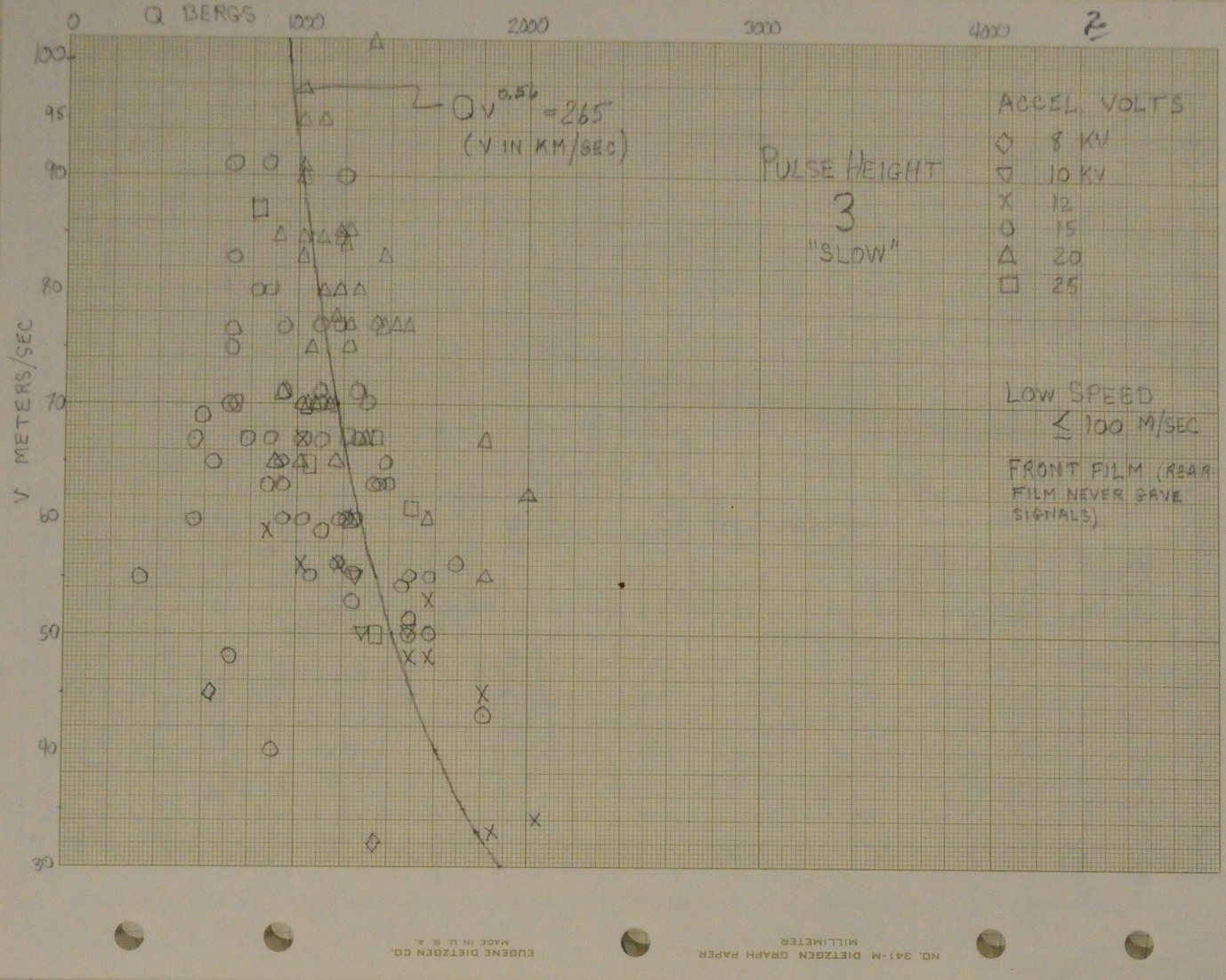
Carl

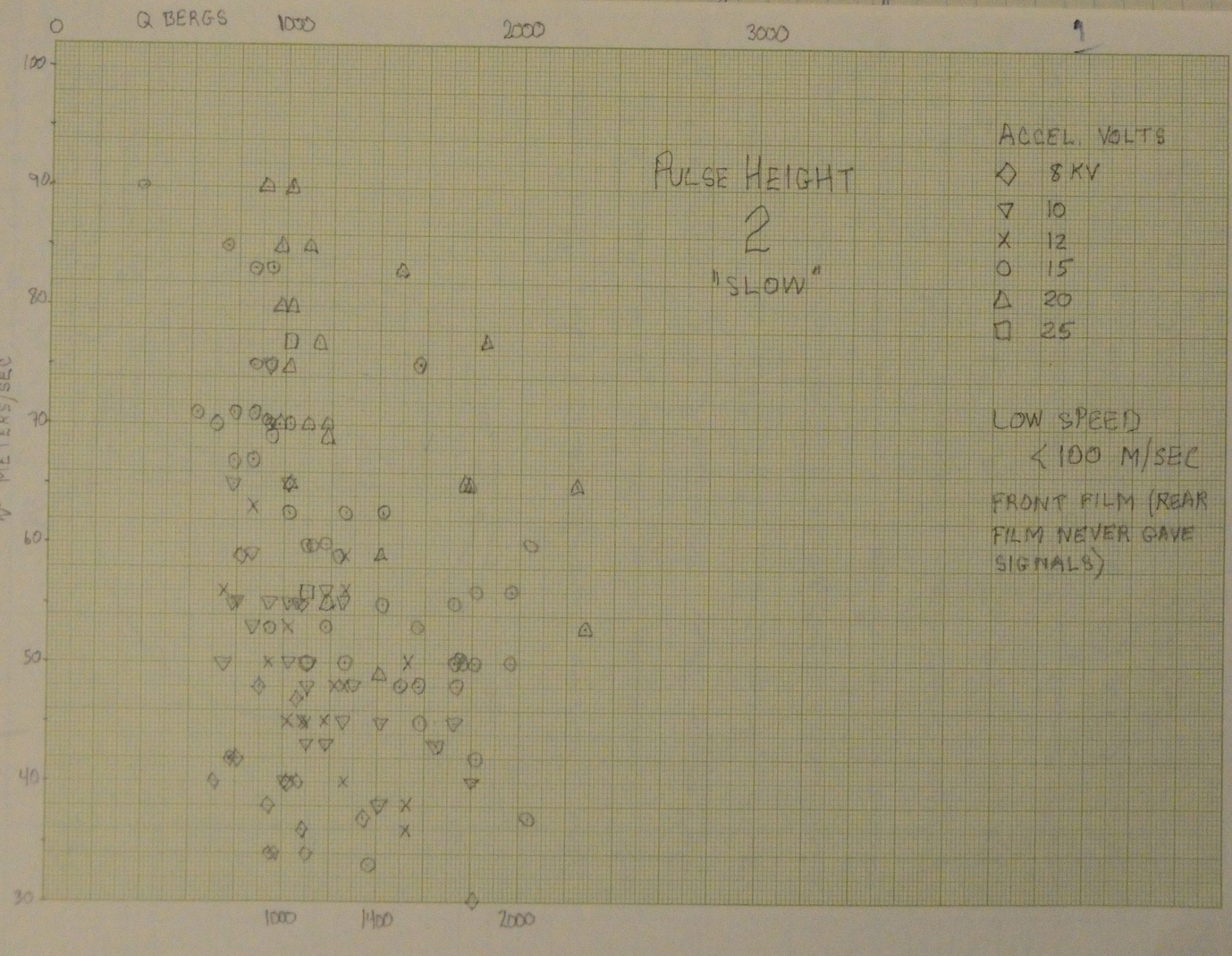
Carl Bailey

terminator and solar radiation which heats up and releases gases adsorbed in the surface and possibly triggers a gravi-coronal discharge across the terminator as shown; the surface fines are moved either

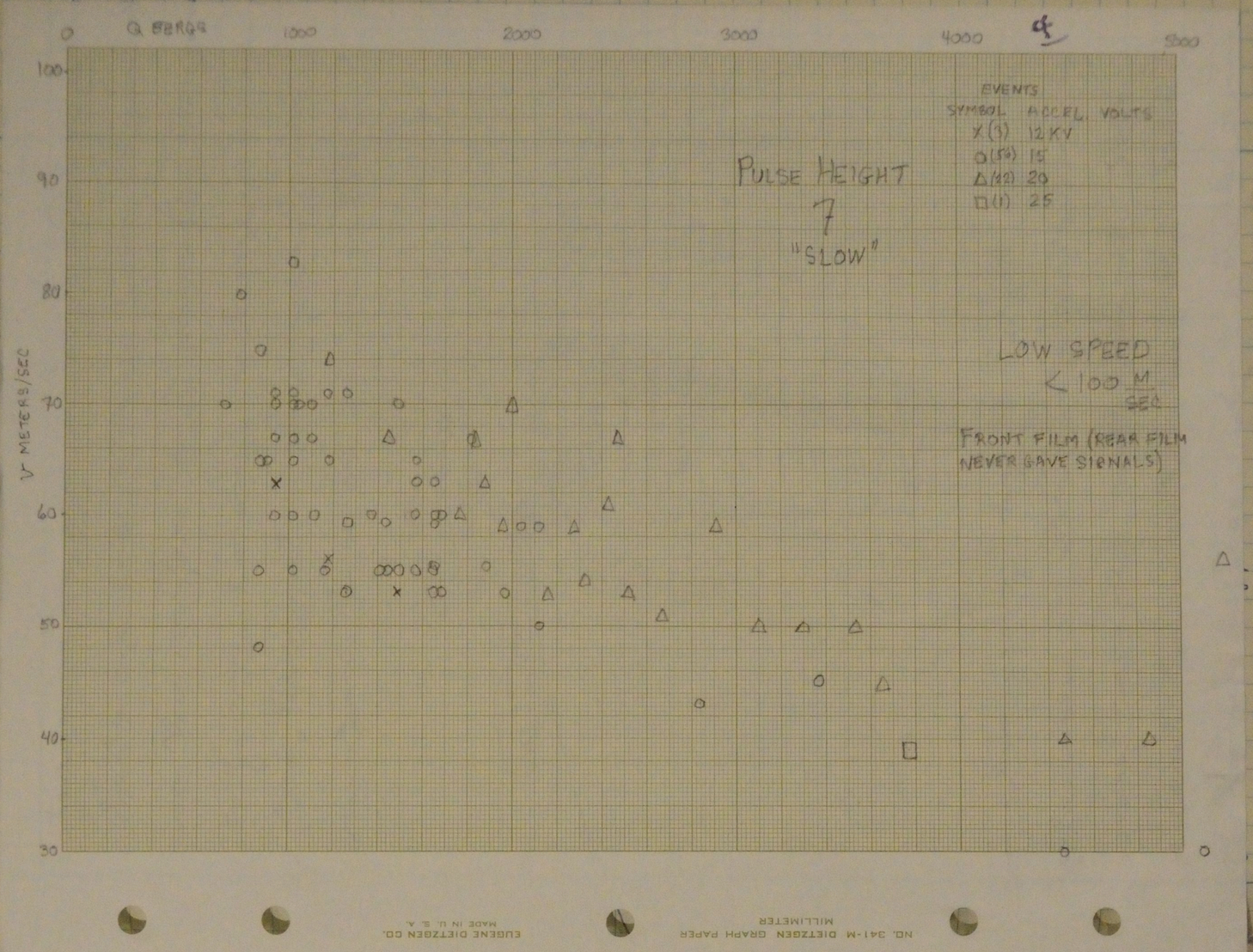


mechanically by the electrical explosion or electrostatically by a more complex mechanism. The sunset terminator has the same potential difference but not the same

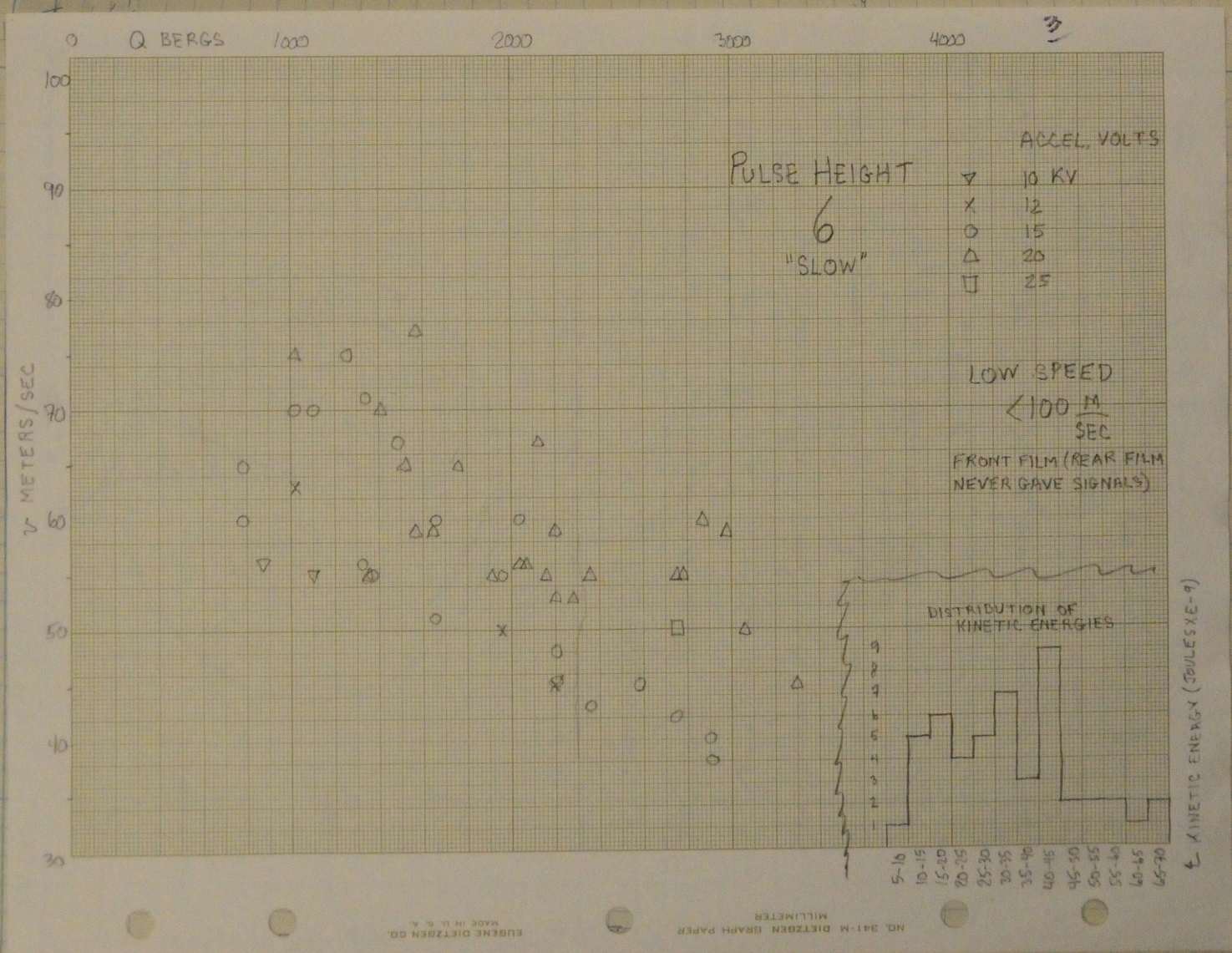

Q BERGS
0
1000
2000
3000
4000
V METERS/SEC
100
95
90
80
70
60
50
40
30
$QV^{3.56} = 265$
(V IN KM/SEC)
PULSE HEIGHT
3
"SLOW"
ACCEL. VOLTS
8 KV
10 KV
12
15
20
25
LOW SPEED
≤ 100 M/SEC
FRONT FILM (REAR FILM NEVER GAVE SIGNALS)


Q BERGS
0
1000
2000
3000
V METERS/SEC
100
90
80
70
60
50
40
30
1000
1400
2000
PULSE HEIGHT
2
"SLOW"
ACCEL. VOLTS
8 KV
10
12
15
20
25
LOW SPEED
< 100 M/SEC
FRONT FILM (REAR FILM NEVER GAVE SIGNALS)

125



New Theory



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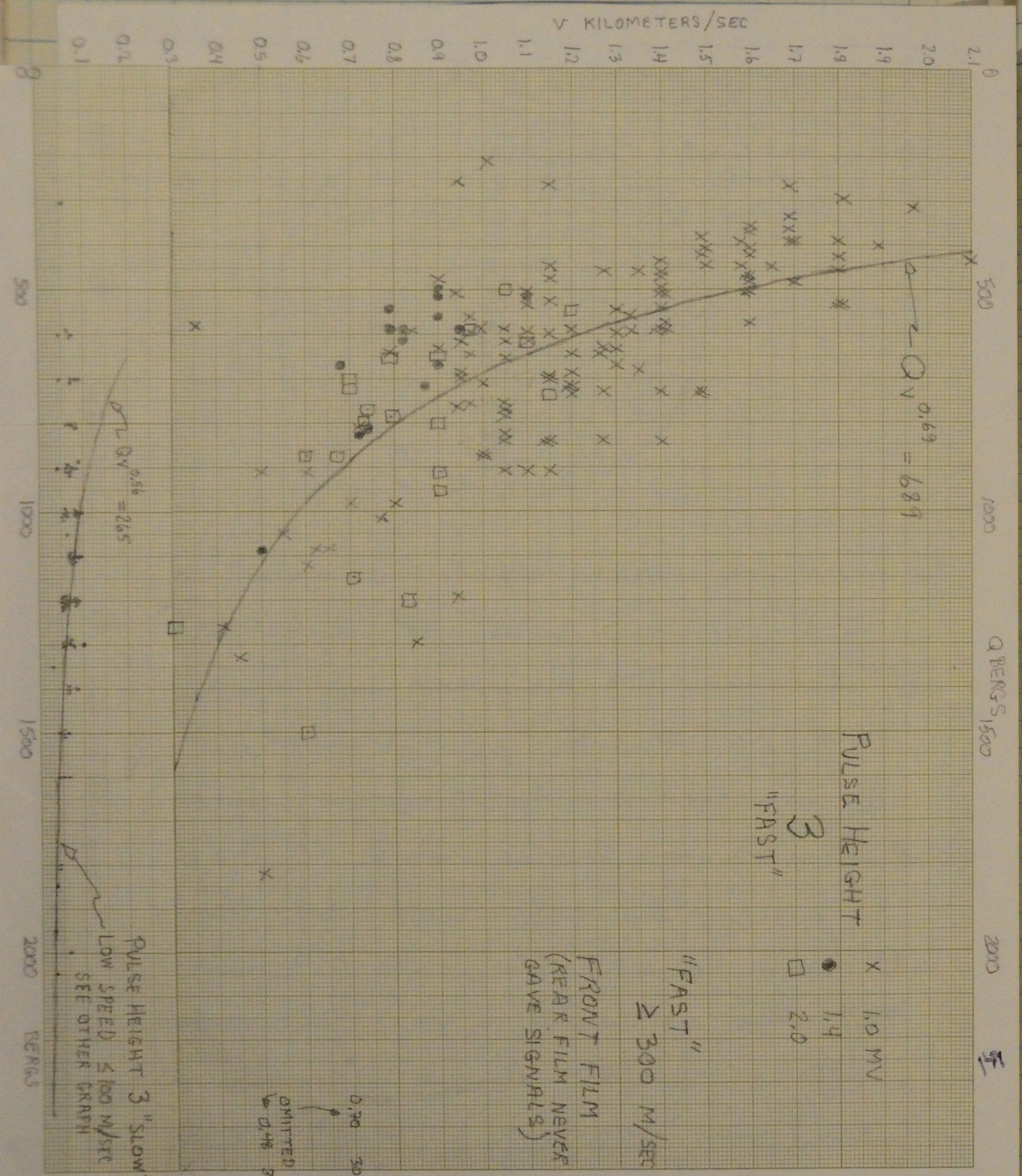
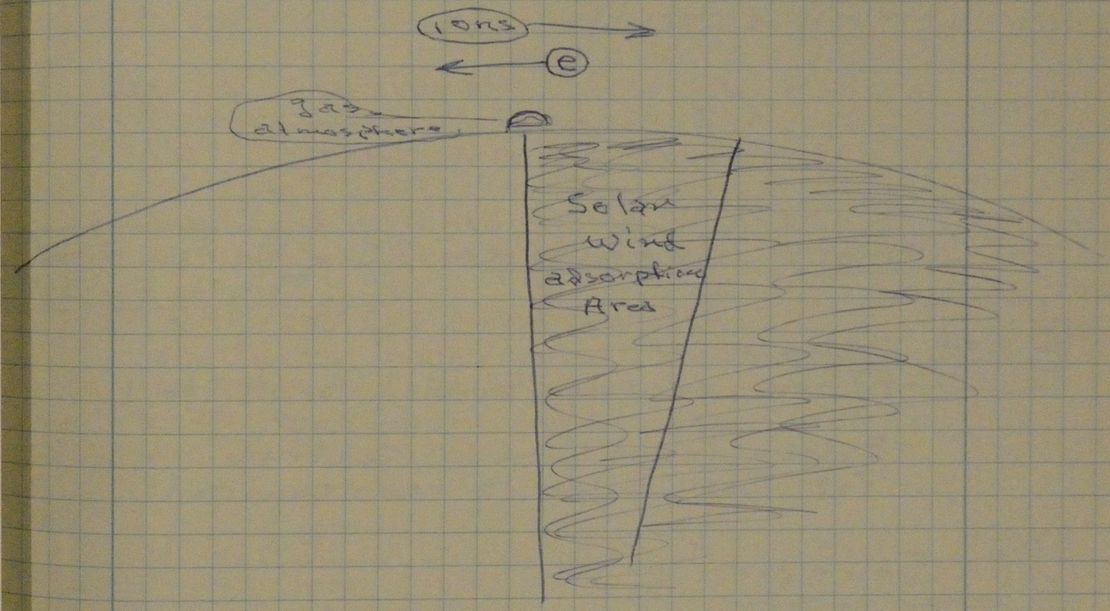
New Theory



termination and solar radiation which heats up and releases gases adsorbed in the surface and possibly triggers a gross-coronal discharge across the termination as shown; the surface gases are moved either



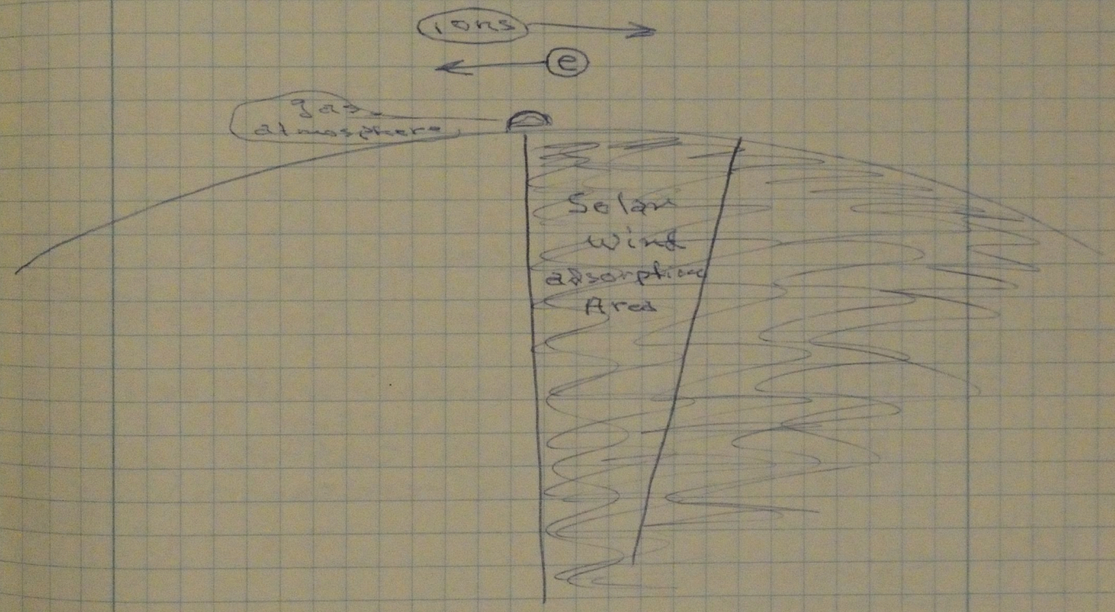
mechanically by the electrical explosion or electrostatically by a more complex mechanism. The sunset termination has the same potential difference but not the same

New Theory

Bailey, Carl

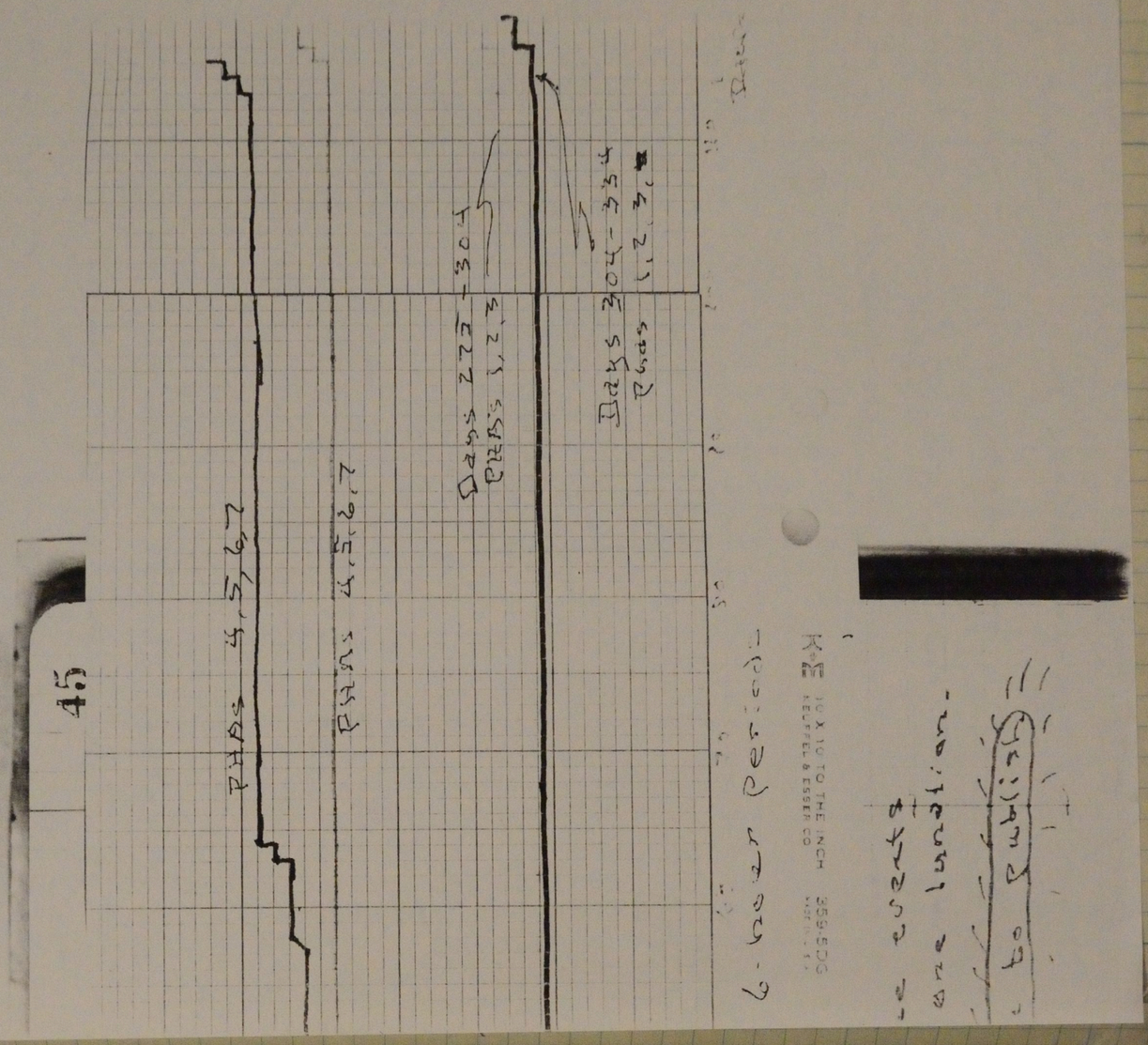
Rear

terminator and solar radiation which heats up and releases gases adsorbed in the surface and possibly triggers a quasi-coronal discharge across the terminator as shown; the surface lines are moved either



mechanically by the electrical explosion or electrostatically by a more complex mechanism. The sunset terminator has the same potential difference but not the same

125

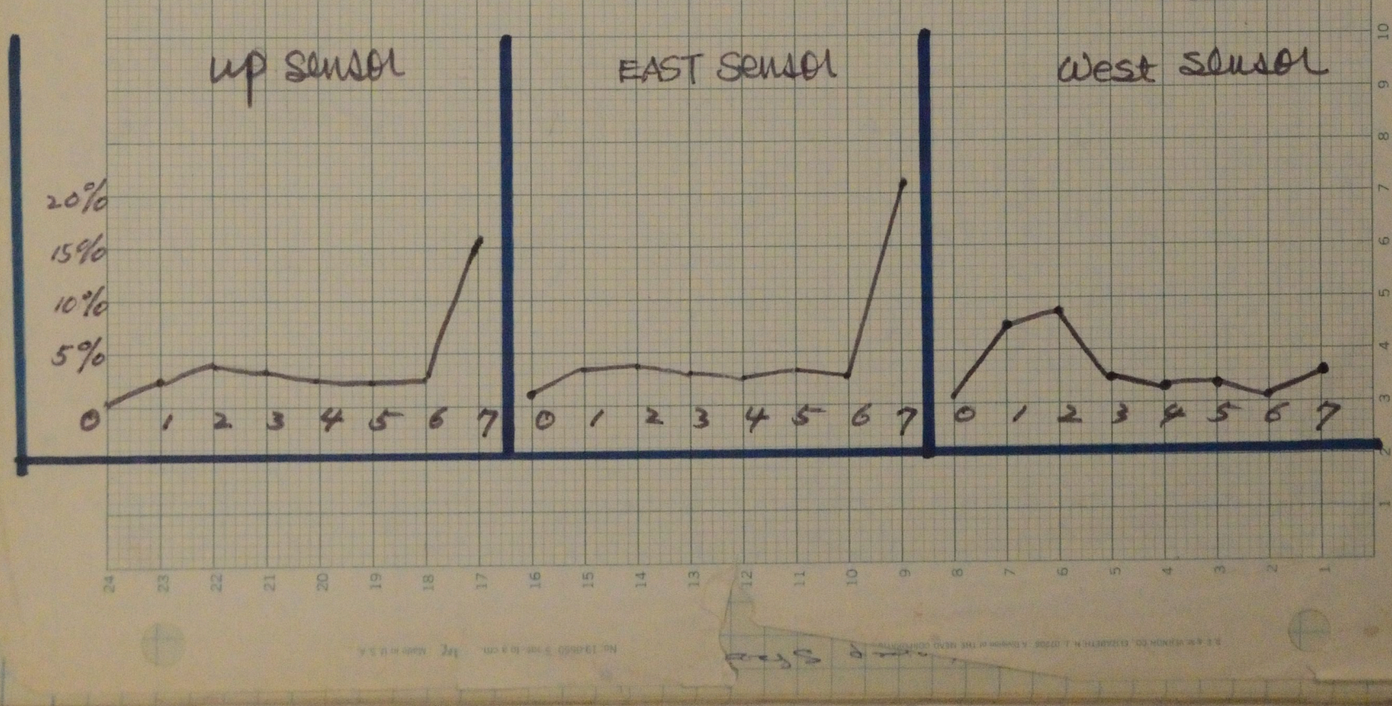


New Theorem

PHA Distribution Percentages

Coincidence ONLY events
(multiple Events Excluded)

total events : 2059

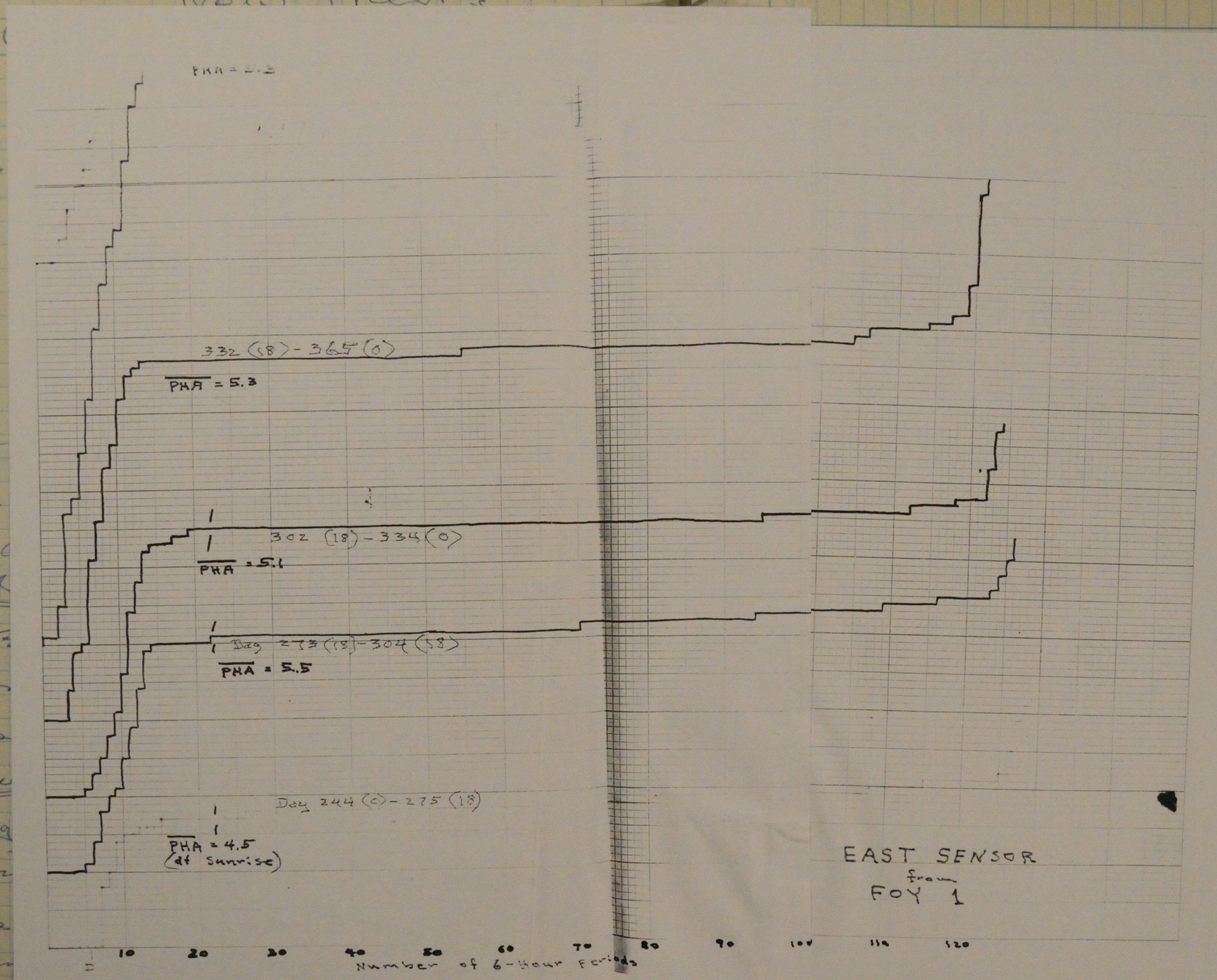


124

New Theory

Nov. (

This scheme shows to Fechtig Nov. 2, 77



New Theory

Nov. 6, 1977

This scheme stopped to Feeling Nov. 2, 77

The S...
of sen...
follow...
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lunar...
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Argon...
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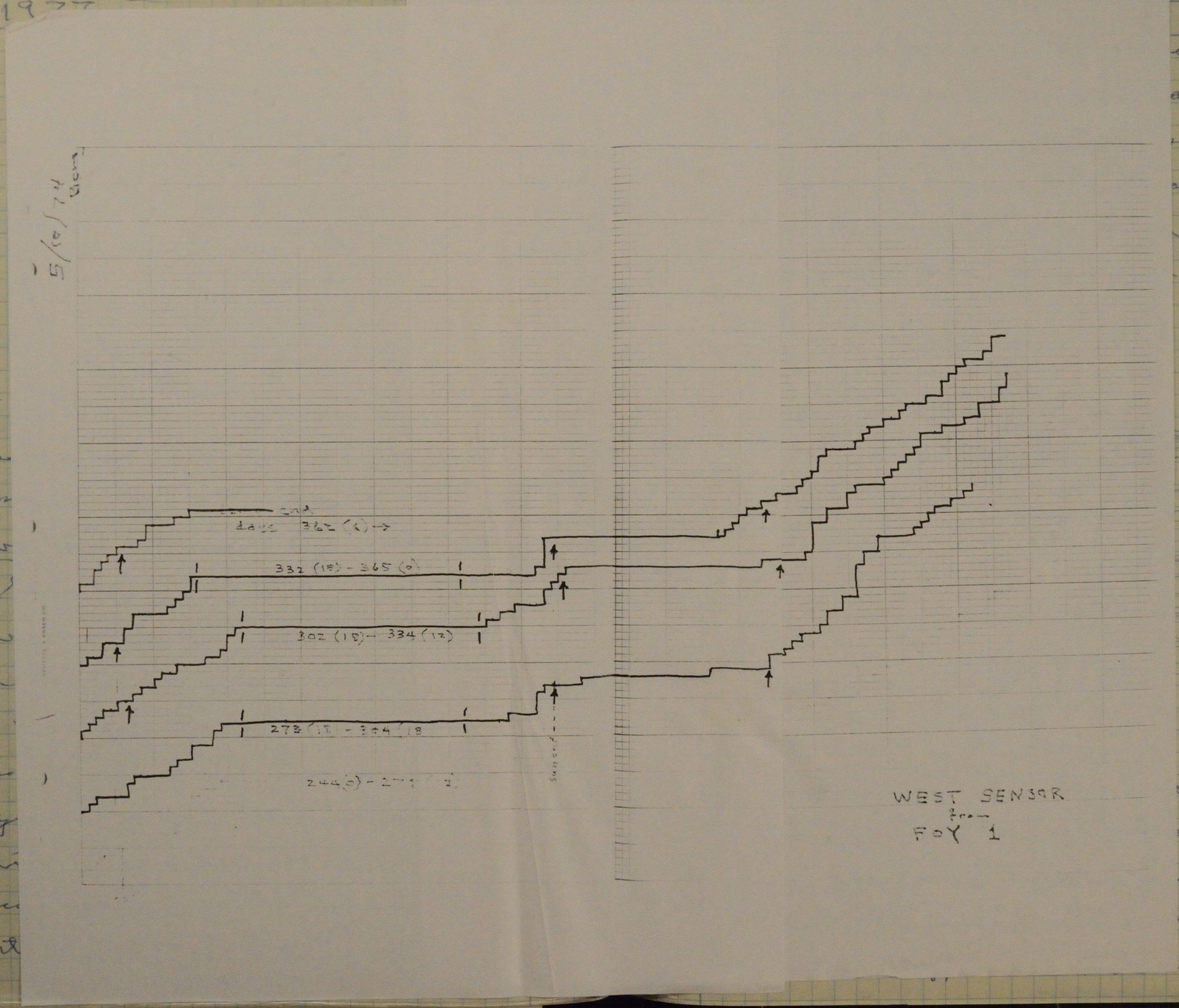


...adiation which
...ases absorbed
...sibly triggers
...ge across
...; the
...either

...trical ex-
...ky by a
...n. The
...the same
...d the same

Asymetry of gear and therefore the effect, if any, is much smaller.

Solar wind energy (Kev/Nucleon

Solar wind flux

(Hodges) Lunar ^{40}Argon diffuses out of moon at 5×10^{20} atoms/sec

(A Hoffman) Pre dawn methane concentrations (from mountain peaks ?) was 1.2×10^{3} /cm^3

Implantation depths ~~in~~ from Solar wind is 20 Å to 200 Å

see interactions corder review by Criswell

Sensor Orientation

See Bendix Final Report Fig 3-7

East Sensor

- Films are Horizontal with #1 on top
- Bottom front film is Control
- Top Rear film is rear control

Up Sensor

- Films Run N & South with film #1 on West end.
- No Controls

West Sensor

Films are Vertical with film #1 at small film end on S end
Grids ~~overlap~~ do not cross films, but films have same orientation and size as

On The Speed of a Stationary Positively Charged Particle deflected into LEAM

$$QV = \frac{1}{2} m v^2$$

Q in Coulombs
V = Volts
m = Kilograms
v = meters/sec

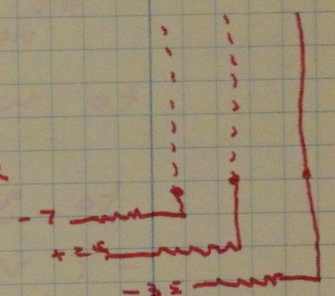
or

$$v^2 = \frac{2QV}{m}$$

try 10^{-15} gm particle
10^{-14} Coulombs

$$v = \sqrt{\frac{2 \times 10^{-14} \times 7}{10^{-15}}} = \sqrt{140}$$

$$= 12 \text{ meters/sec}$$



So a stationary charged particle with a mass of 10^{-12} grams and a charge of 10^{-14} Coulombs would be accelerated to 12 m/sec by the front grid.

However, It would need a Vo to overcome the + Potential of the 2nd grid in order to enter the film,

so

$$v^2 = \frac{2QV}{m} = \frac{2 \times 10^{-14} \times (24 - 7)}{10^{-15}} = 340$$

$V_o = 18$ m/sec = the initial speed of the above particle toward the sensor in order to be detected. Actually, it would impact onto the film with an additional speed of about 3 ½ m/second because of the -3.5 film potential or a total impact speed of

21 m/sec.

(More)

This means that a particle with:

- a positive charge of 10^{-14} coulombs
- a mass of 10^{-15} kg and a velocity < 18 m/sec would not be registered by the LEAM.

Now for Negatively Charged Particles

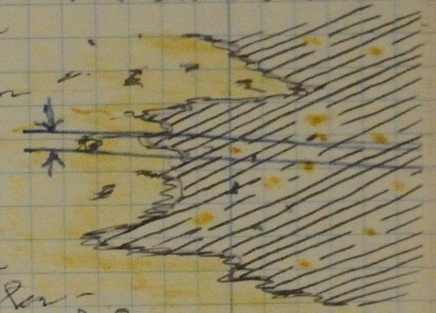
A particle with a negative charge of 10^{-14} coulombs
mass = 10^{-15} kg

would have to have a V_0 of 12 m/sec to get past the first grid of -7 volts. at this point it would see the +24 volt grid and finally reach the -3.5 volt film with a speed of 18 m/sec

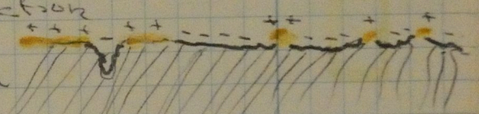
Nov. 16, '77

On The Terminator line

There is a tendency to think of the Terminator as a line separating sunlit and dark, but in reality the terminator must be an extremely irregular line as shown with perpendicular peaks extending over many kilometers and with sunlit splotches interspersed in the dark area and dark areas interspersed in the light or sunlit areas.

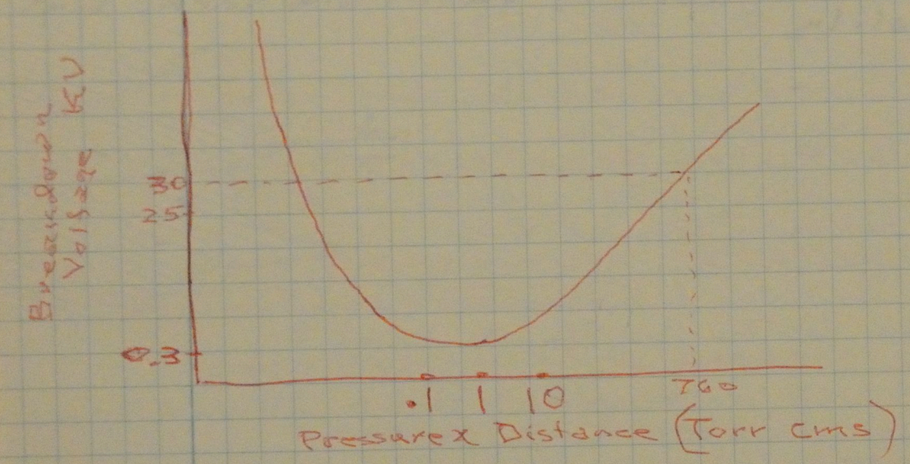


Now take an element perpendicular to the terminator line, as shown and examine it at 90° or a cross section of this element you would see protrusions on the dark side that would be sunlit and positive, and you would also see valleys on the sunlit area which would be dark (and possibly negative). These spots could be very small areas, and so the field could be very high and of the order of thousands of volts/cm. The nearby negative particles will be most apt to dislodge and jump up toward the + particles because the positively charged particles are electrostatically drawn downwards plus coherence forces possibly both the particles + and - will be dislodged and jump up into sunlight - become + charged by photo emission and be repelled by the + potential of the sunlit surface.

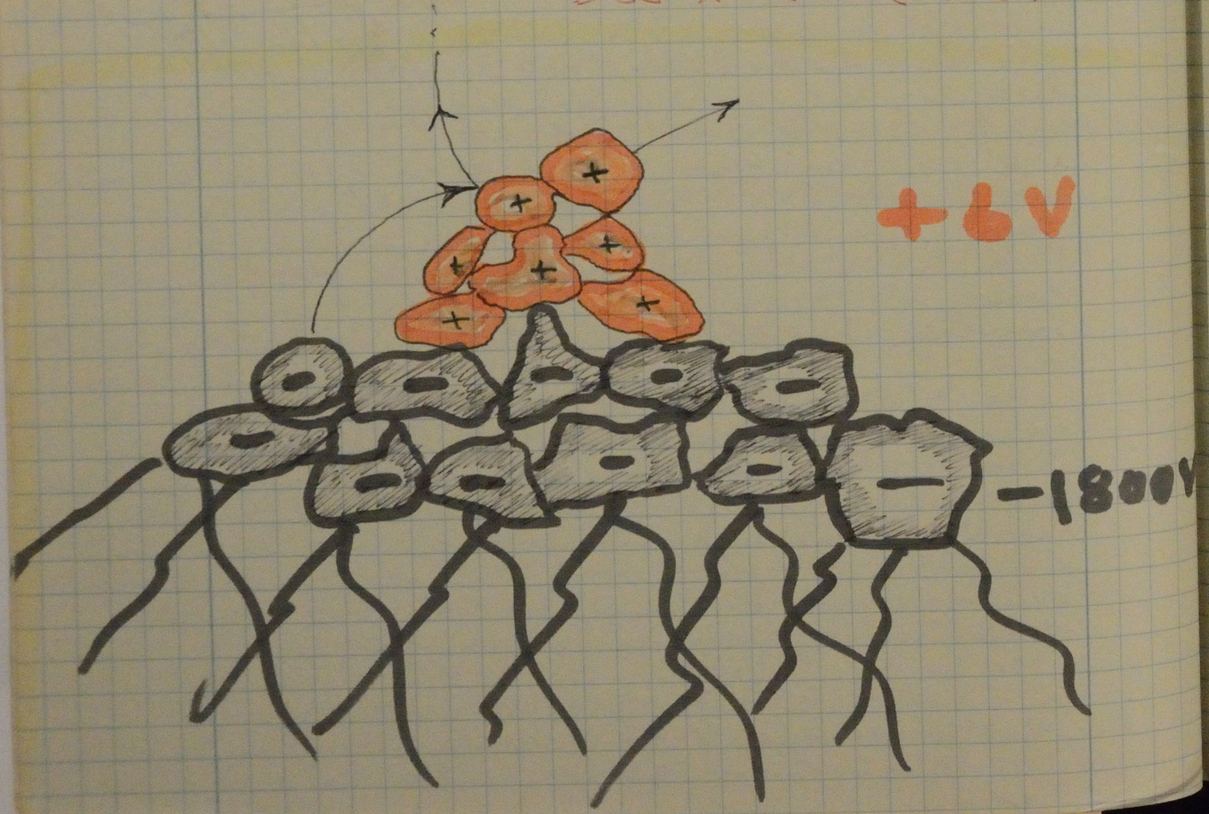


See sketch next page for enlarge view of cross sectional area shown above in translucent yellow

Nov 17, 77 Breakdown Potentials at Reduced Pressures



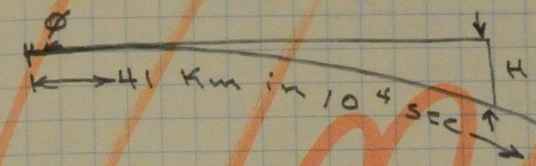
See NASA SP-205



Nov 30, 77 at MPI

Terminator travel Speeds

Lateral speed at equator is 4.1 ~~m~~ m/sec



Note: Without a calculator and so as to get more accuracy on vertical travel by increasing angle Ø I have used 41 Km rather than 4.1 meters/sec.

$\frac{41\ Km}{10^4\ Km}\left(360^\circ\right) = \left(4.1 \times 10^{-3}\right)\left(360^\circ\right) = 1.476^\circ$

i.e. the terminator has moved 1.476° in 10^4 sec

$\sin 1.476^\circ = \frac{H}{41\ Km}$ or $0.026 \times 41 = 1.066\ Km$

Vertical movement in 10^4 sec is 1.066 Km

~~$= 1.07$ Cm/sec~~

$= 1.07 \times 10^5$ Cm/sec

Terminator Lateral Speed at equator = 4 m/sec

Terminator Vertical Speed at Equator = ~~1.07×10^{-9} sec~~

~~$= 1.09$ cm/sec~~

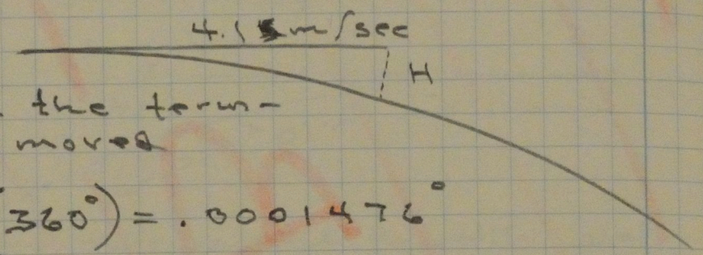
~~$= 10^{-9}$ cm/sec.~~

$= 10$ Cm/sec

Terminator Speeds

Dec 1, 77

Surface Speed (Latitudinal) at equator is 4.1 Km/sec



In one second the terminator has moved

$$\frac{4.1\ m}{10^7\ m}(360^\circ) = .0001476^\circ$$

(where 10^7 m is moon's circumference)

$$\sin\ (\text{or } \tan) .0001476^\circ = \frac{H}{4.1\ m}$$

or

$$(0.000002576)\ 4.1\ m = H = 0.0000116\ m$$

$$H = 0.00116\ cm/sec = 11.6\ \mu$$

$$1.2 \times 10^{-3}\ cm$$

Thus

Terminator Surface Speed = 4.1 m/sec

Vertical speed (at 4.1 meters) = 11.6 μ

Amazing

Lateral speed is actually 4.6 m/sec

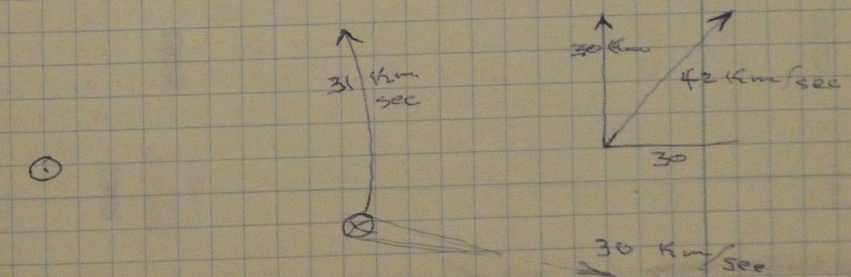
This is true only within the element of distance, 4.4 meters or one second of horizontal travel. At 3 elemental distances the vertical speed is 30 μ/sec and so on! That is: in 3 seconds the vertical ~~speed~~ distance is 100 μ

Electrostatic Soil Removal on Far Side Moon

- 1800 Volts in Magnetosheath (Manka: Zook) More than adequate for Elec. Soil Tray (EST)
- Explains far side appearance
- Possible answer to Pio 8 Anomalies (Book D)
- Divari says charged particles would accumulate in magnetohydrodynamic tail. Sov. Ast. Ad. 10; #6 June '67.
- Propelled out from moon as negative particles & become positive as they emerged from Lunar Umbra.
- The Gegenschein – Reddish and accepted as dust particles. If so there should be a Lunar cycle brightness function. ??
- Roosen's absorption – occurred only once.

(also above argument supplies dust particles during full moon)

★ If particles are focused by Earths gravitation and/or captured by and within the geomagnetic tail ~~They~~ (and probably accelerated outward by radiation pressure and the solar wind to extremely high velocities) then their total velocity relative to the sun may be considerable and high enough to produce ionization in impact with orbiting dust & atoms and this may account for the Gegenschein



East

Printout x13 Quarterly

Total events include 1st 6 Columns

Before sunrise	After sunrise	Before sunset	After sunset	Daytime	Night-time	Near sunrise	Near sunset	Other times	
42	162	31	2	0	48	204	3	48	
52	209	31	3	11	59	261	34	70	
28	144	9	5	44	47	172	14	91	
88	168	33	3	28	78	256	36	106	
75	153	11	0	33	69	228	11	102	
68	105	14	2	56	64	173	16	120	
92	203	8	0	49	25	295	8	74	
445	1124	137	15	221	390	1589	122	611	Total for 28 Junations
15.9	40.8	4.9	.54	7.9	13.9	56.8	4.4	21.8	Average number per Junation
19.	48.6	5.8	0.6	9.4	16.6	68.	5.2	26.	Total 2353 East events Percent Total East events
15.9	40.8	4.9	.54	3.6	1.0				Average events Per Junation normalized to a 45-hour Period

UP

Printout x13 Total Events include 1st 6 Colum

Before sunrise	After sunrise	Before sunset	After sunset	Daytime	Night-time	Near sunrise	Near sunset	Other times	
39	102	0	3	0	5	141	3	5	
30	106	2	1	8	6	136	3	14	
17	82	4	4	41	4	99	8	45	
36	100	1	4	12	4	136	5	16	
36	103	1	0	9	17	139	1	22	
35	61	1	0	28	5	96	1	33	
28	47	3	0	27	6	75	3	33	
8	15	1	2	0	4	23	3	4	one month only
221	601	12	12	125	47	922	24	122	Totals
7.9	21.5	.43	.43	4.5	1.7	29.5	.86	6.14	Average / Junation
21.7	59.	01.	01.	12.3	4.6	81	2.4	16.9	Total UP 1018 events Percent of total UP events
7.9	21.5	.43	.43	2.1	.24				Averag no. of Junatio normalized to a 45-hr Period

The Average Hours On Per Lunation vs Sunlight to correspond with printouts showing Sunlight conditions

Before Sunrise	45 hours
After Sunrise	45 hours
Before Sunset	45 hours
After Sunset	45 hours
Daytime	97 hours
Night time	265 hours
	542 hours (22.58 days) } Experiment off for rest of time

Before Sunrise	After Sunrise	Before Sunset	After Sunset	Daytime	Night-time	Near Sunrise	Near Sunset	Other times
31	36	3	5	0	72	67	8	72
32	37	7	12	7	97	69	19	104
27	34	7	25	32	69	61	32	101
32	34	7	18	19	114	66	25	133
28	39	8	9	23	93	67	17	116
21	27	14	12	26	84	48	26	110
25	37	10	11	24	82	62	21	106
196	244	56	82	133	511	440	148	742
7.0	8.7	2.0	2.9	4.75	18.25	15.7	5.3	26.5
16.	20	4.6	6.7	11.	41.8	36	12	60.1
7.0	8.7	2.0	2.9	2.2	3.1			

West Sensor Printout X13

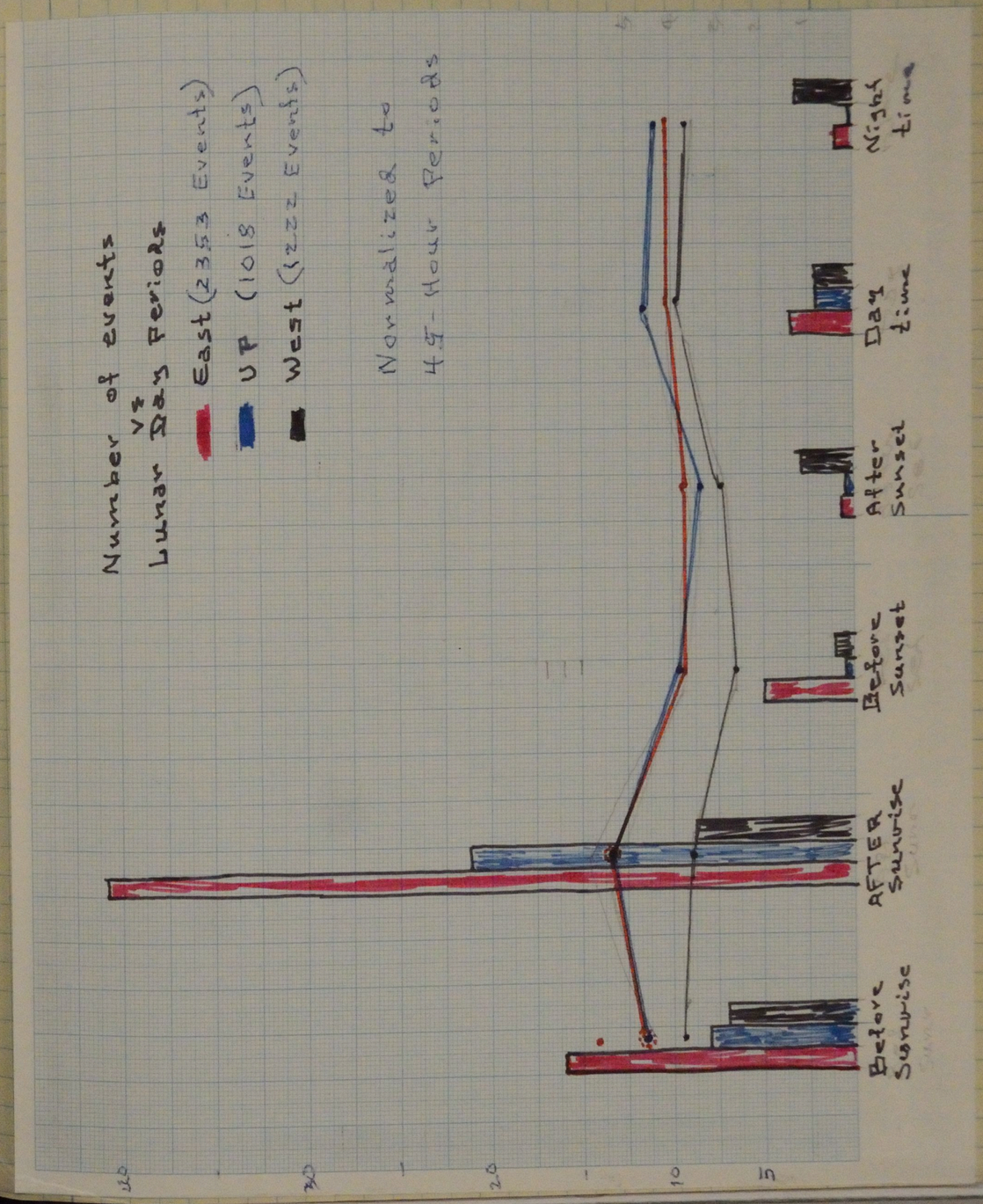
Total events include 1st 6 Columns

~~91.7 Total West Events~~

1222 Total West events

Percent of total West Events

Average events Per lunation normalized to a 45 hour Period



The Average Hours On Per Duration vs Sunlight
to correspond with printouts showing
Sunlight conditions

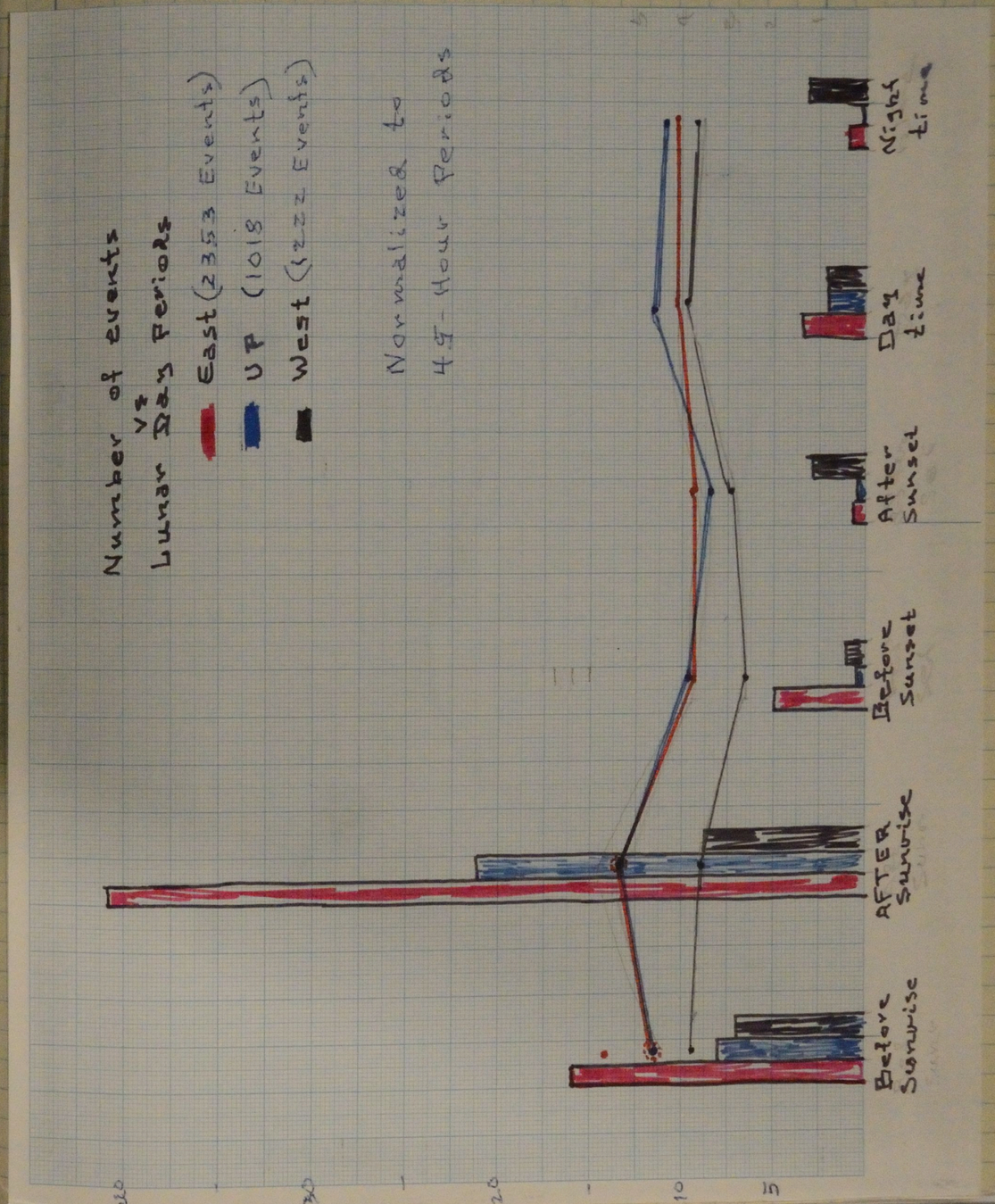
Before Sunrise	45 hours
After Sunrise	45 hours
Before Sunset	45 hours
After Sunset	45 hours
Daytime	97 hours
Nighttime	265 hours
	542 hours
	(22.58 days)

} Experiment ote for resl of time

Before sunrise	After sunrise	Before sunset	After sunset	Daytime	Nighttime	Near sunrise	Near sunset	Other times	West Sunlight + Twilight x 1.5 = events including Columns 1 & 2
31	36	3	5	0	72	67	8	72	
32	37	7	12	7	97	69	19	104	
27	34	7	25	32	69	61	32	101	
32	34	7	18	19	114	66	25	133	
28	39	8	9	23	93	67	17	116	
21	27	14	12	26	84	48	26	110	
25	37	10	11	24	82	62	21	106	
196	244	56	82	133	511	440	148	742	Total 1st
7.0	8.7	2.0	2.9	4.75	18.25	15.7	5.3	26.5	
16.	20	4.6	6.7	11.	41.8	36	12	60.1	
7.0	8.7	2.0	2.9	4.2	3.2				

Total West Events
1222
Percent of total West Events

Average Events Per Equation Normalized to a 45 hour Period



Before sunrise	After sunrise	Before sunset	After sunset	Daytime	Nighttime	[illegible] sunrise	[illegible] sunset	[illegible]	
4.92	5.23		2.57		3.90				
4.73	5.50	4.50		4.63	5.0				
3.53	5.52	3.25	3.9	4.85	4.9				UP
4.61	5.35		4.7	5.25	5.0				
5.3	5.0	7 [illegible]		3.78	4.76				
~~2.65~~	~~4.13~~	~~2.87~~			~~3.60~~				
4.95	5.4	3.4	3.5		4.48				
3.3	5.2	3.7	1.6	4.18	2.4				
4.2	5.4	3.7	4.0	3.5	4.6				EAST
4.8	5.4	4.0	3.1	3.5	4.1				
5.1	5.2	3.7		4.2	4.2				
4.8	5.0	3.9	3.5	4.1	4.1				
6.0	6.0	4.3		4.8	4.2				
4.5	5.6	4.0	6.0	4.0	4.5				
4.1	4.0	3.0	2.2		3.8				
3.3	3.4	2.3	3.7	4.8	3.7				
4.2	2.4	2.9	2.8	3.4	3.8				
3.7	3.9	1.9	3.1	3.2	3.7				
3.9	3.8	2.4	2.4	3.3	3.4				
3.8	3.4	1.8	2.7	4.4	3.5				WEST
4.1	3.7	3.4	2.9	4.3	3.5				
3.6	3.6	3.0	3.5		3.5				
~~3.83~~	~~2.4~~ 3.25	~~2.88~~	~~2.83~~						
4.62	5.32	3.88	3.42	4.63	4.43				UP Average
4.71	5.4	3.84	3.72	4.04	4.1				East Average
3.83	3.53	2.59	2.91	3.9	3.61				West Average

Sunlight → Averages of PHA Lunations (Synodic) (Sidereal) K-13

PHA Averages for 25 Lunations vs Sunlight conditions

Conditions Rivers + K

PHA

LEAM Sunrise Table – & with Wolf's hour
Corrections. starts ~~zero~~ at Jan 1, 1973 0000 hours

	LEAM Day	Sunrise Date	
1973	9	Jan 9	1440
	39	Feb 8	0511
	68	Mar 9	1905
	98	Apr 8	0911
	127	May	2020
	157		0741
	186		1835
	216		0530
	245		1720
	275		0406
	304		1813
	334		0810
	363		2272
1974	28	Jan 28	1332
	58	Feb 27	0756
	87		1697
	117		0545
	146		1706
	176		0410
	205		1496
	235		0217
	264		0922
	294		0278
	323		1645
	345		0680