NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

REPLY TO
ATTN OF: 70-FS55-200

DEC 1 1 1970

MEMORANDUM TO: See list attached

FROM : FS/Chief, Flight Support Division

SUBJECT : LGC Duty Cycle as determined by the Grumman FMES simulator

1. Reference is made to our memorandum 70-FS55-108 dated May 19, 1970, entitled "LGC Duty Cycle defined at last."

2. Enclosed are plots of three descent runs on the GAC FMES simulator. Each plot shows two parameters which are defined as follows:

SERVDURN - Word 67a in the Orbital Maneuvers downlist and word 13a in the Descent/Ascent downlist. A measure of the time that is required to complete the SERVICER calculations. The higher the Duty Cycle, the larger this value would be expected to be.

Duty Cycle - Computed by the following equation: $D.C. = 100-[.02402344(DUMLOOPS_{i+1}-DUMLOOPS_{i})]$; where DUMLOOPS is number of passes the LGC makes through DUMMYJOB and is word 67b in the Orbital Maneuvers and word 13b in the Descent/Ascent downlists.

For a thorough derivation and explanation of Duty Cycle, see the referenced memorandum.

3. Each plot starts at a time shortly before P63 ignition and the abscissa (which is LGC time) has been annotated with normal events and DSKY inputs for ease in evaluation. On all plots, the upper line is Duty Cycle and the lower is SERVDURN. Plot #1 is a nominal descent, run by GAC personnel with no TLOSS introduced. Plot #2 is also a nominal descent, except that the crew consisted of Astronauts Scott and Irwin. Plot #3 is different in that it was run with a 13.36% TLOSS (i.e., 13.36% of the LGC's available computation time was rendered unusable).

4. As can be seen from plots #1 and #2, the nominal Duty Cycle during descent is 85% $\pm$ 5%. This gives the LGC adequate margin and no alarms

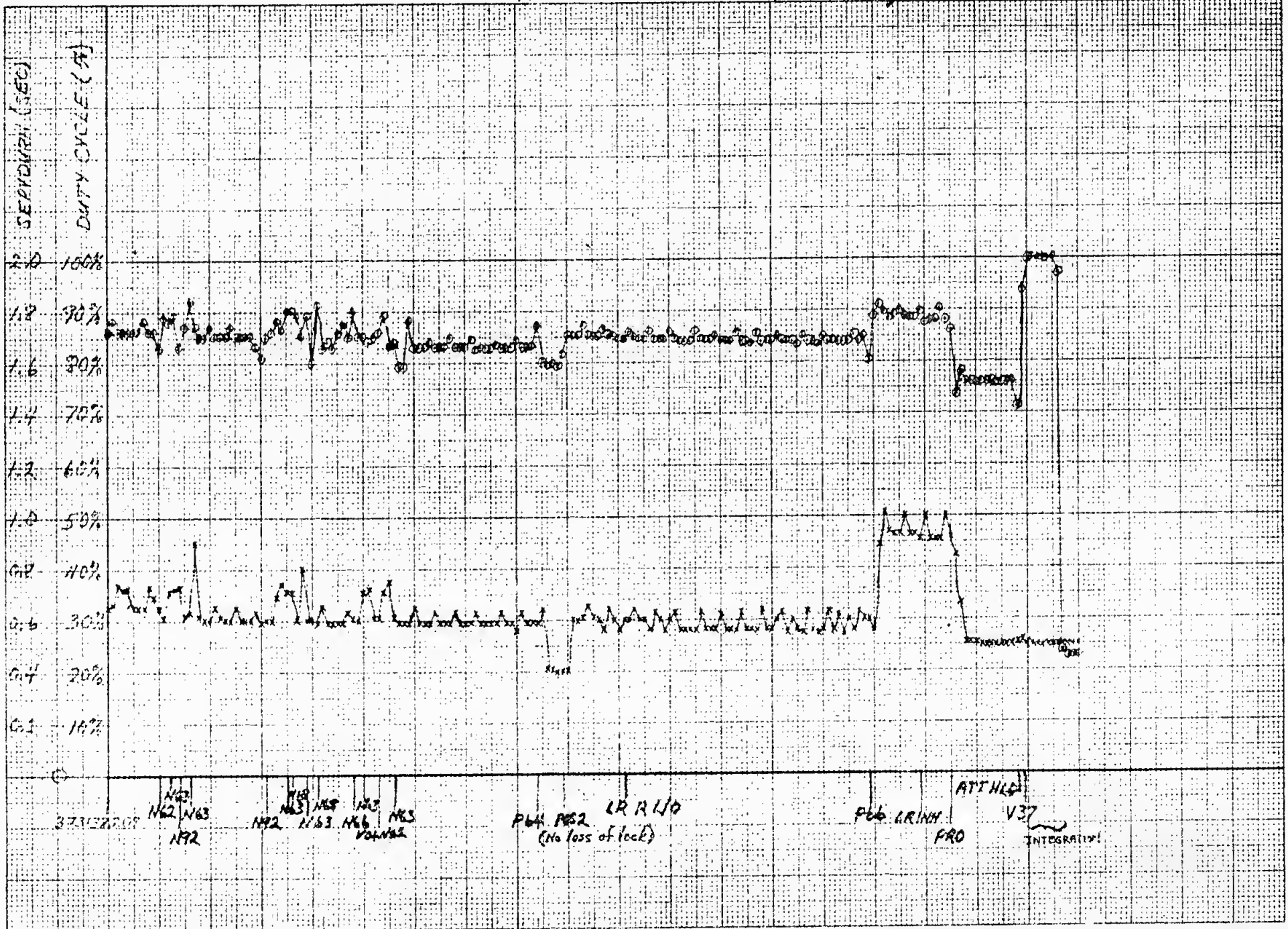
or other problems were experienced. On the run with 13.36% TLOSS, the landing was successfully accomplished with only one alarm (a 31201) despite the fact that Duty Cycle was at or near 100% and SERVDURN got as high as 1.6 seconds. In conclusion, these plots make the 12% margin quoted for the LGC sound very good.

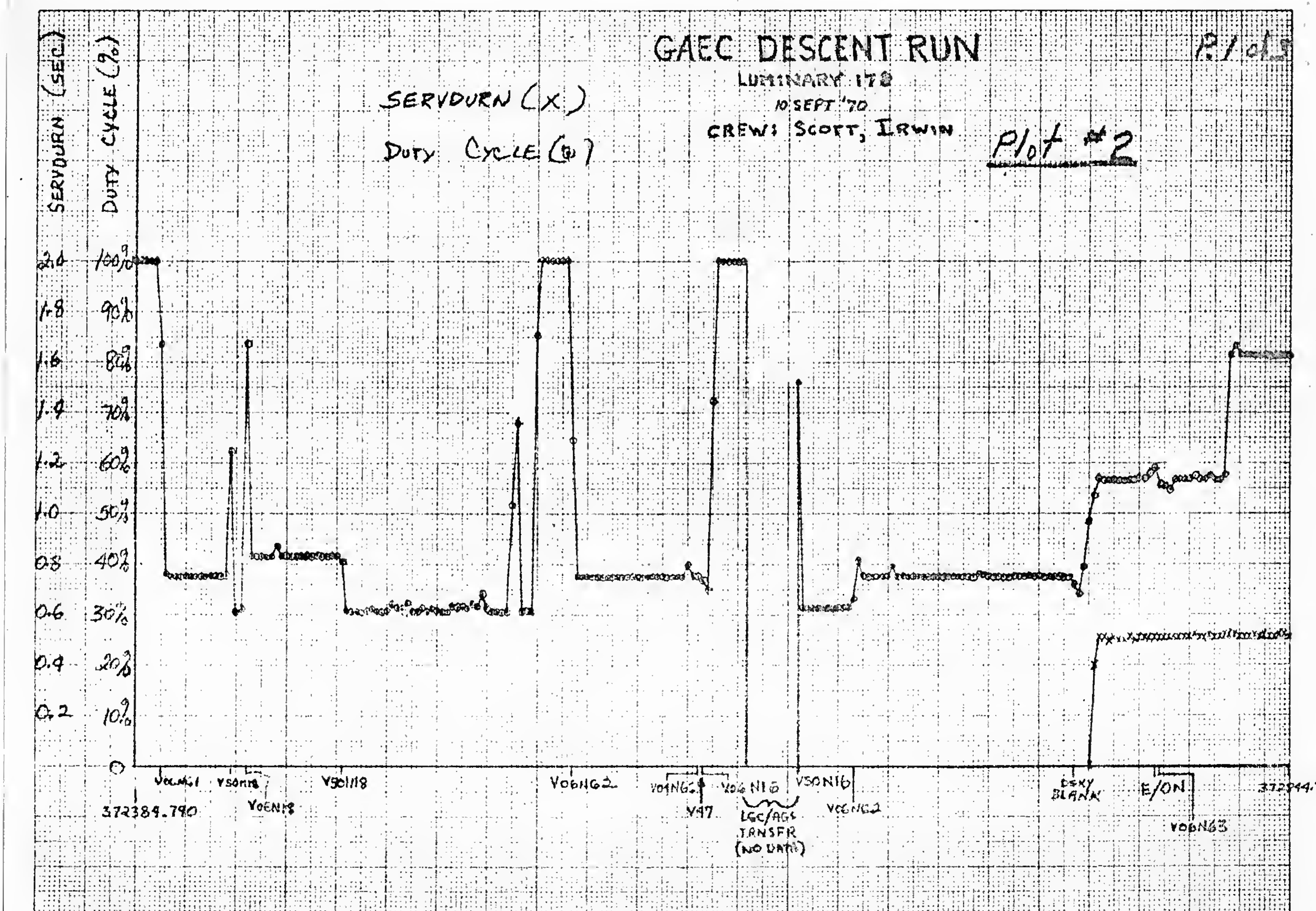
Lynwood C. Dunseith

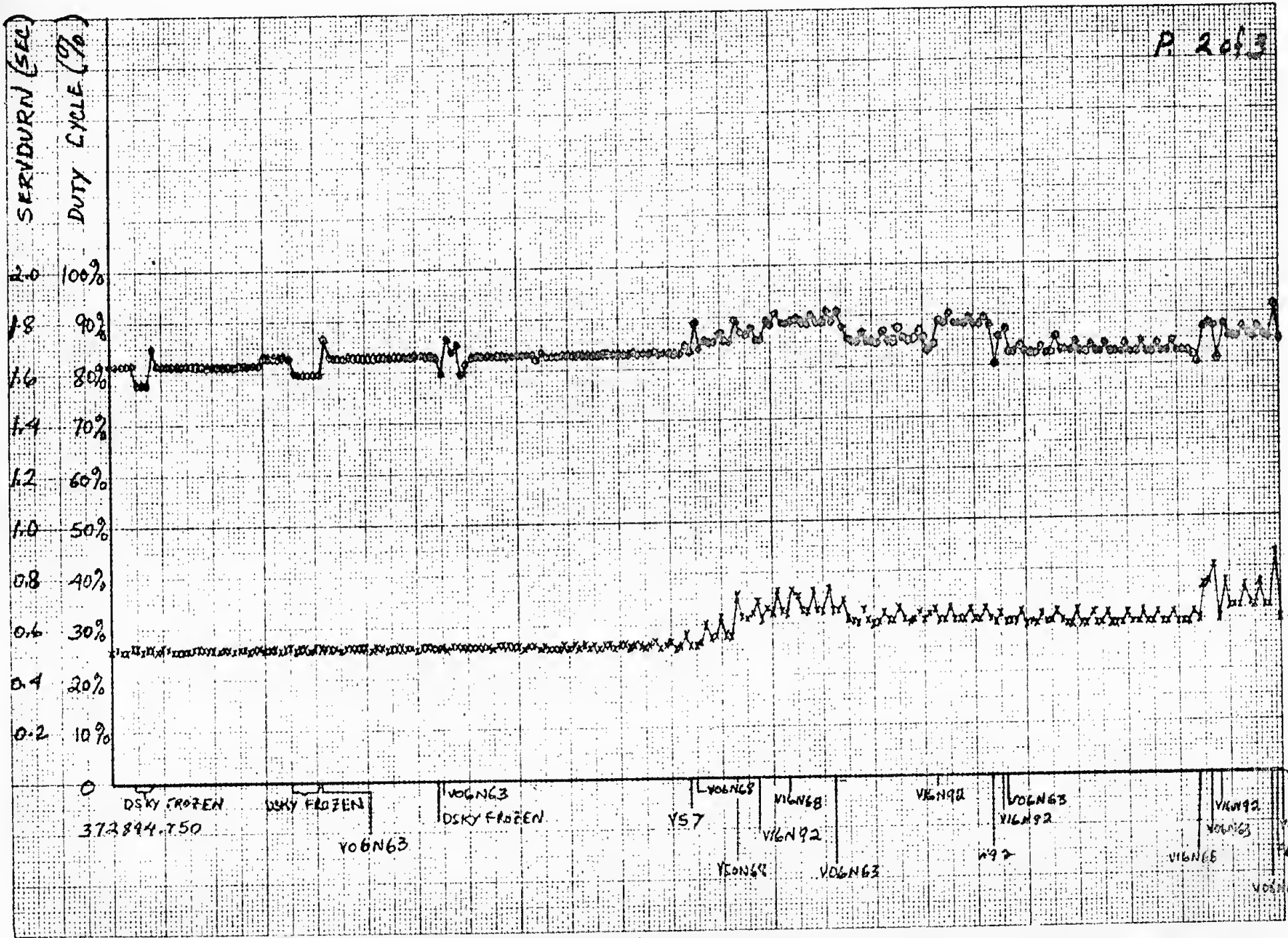
Enclosure

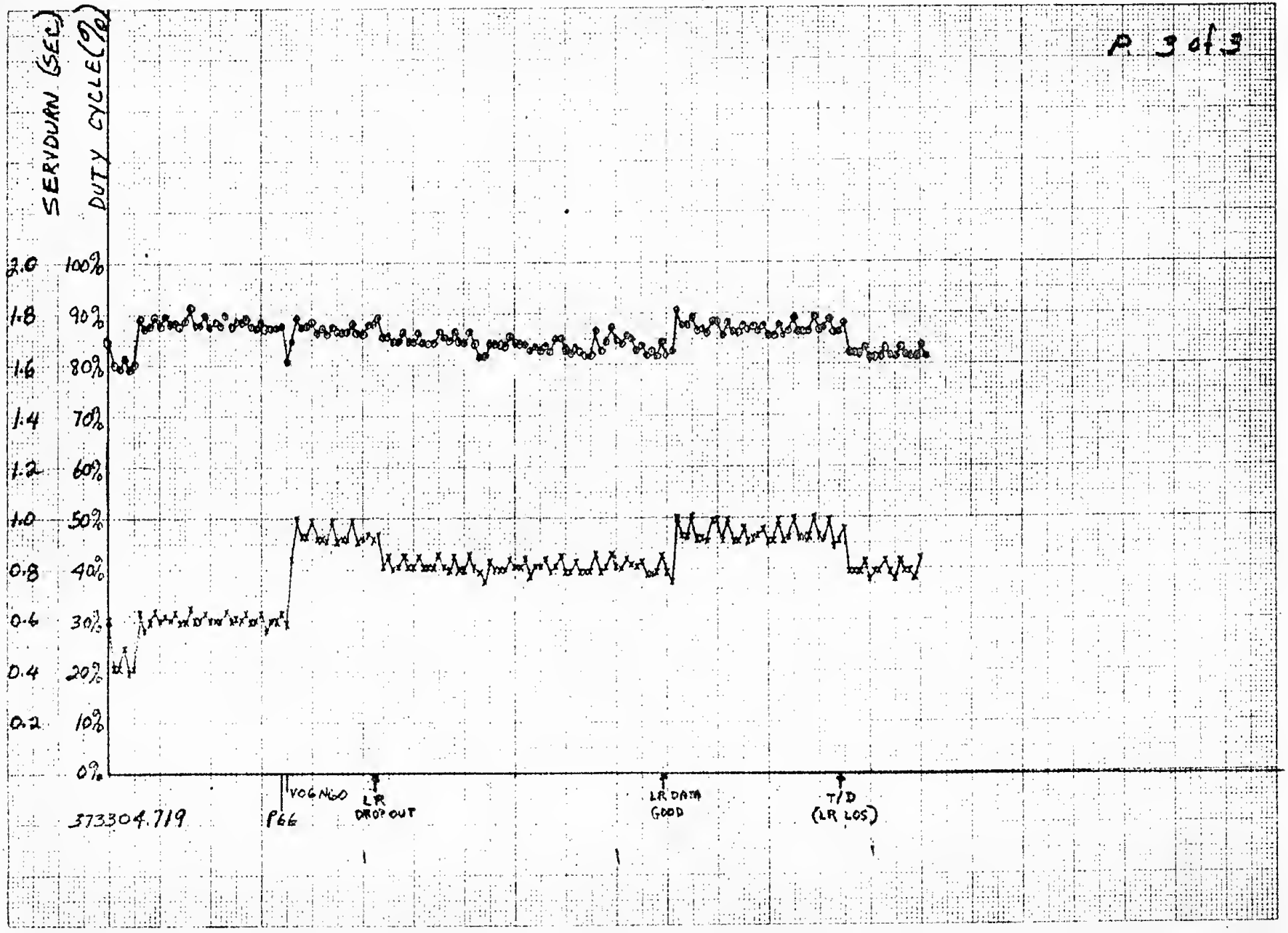
FS55:CDSykes:jvm

NOMINAL DESCENT (P.2 of 2)

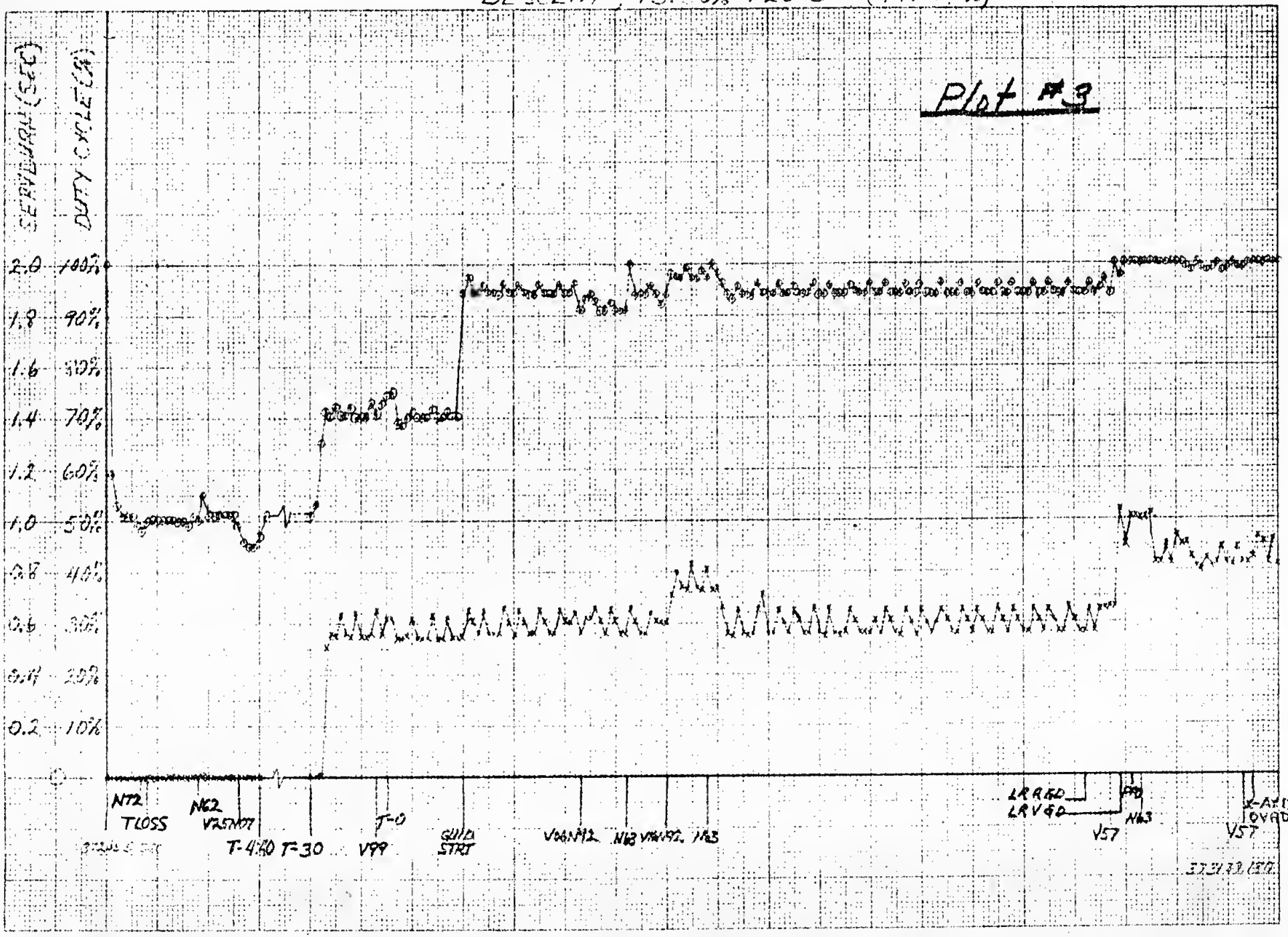



GAEC DESCENT RUN
LUMINARY 178
10 SEPT '70
CREW: SCOTT, IRWIN
Plot #2
SERVDURN (X)
DUTY CYCLE (⊙)
SERVDURN (SEC)
DUTY CYCLE (%)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0
V50N18
V06N18
V30N18
V06N62
V47
LGC/AGS TRNSFR (NO DATA)
V50N16
DSKY BLANK
E/ON
V06N63
372384.790


SERVOURN (SEC)
DUTY CYCLE (%)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
DSKY FROZEN
372844.750
DSKY FROZEN
V06N63
V06N63
DSKY FROZEN
V57
V06N68
V06N68
V16N68
V16N92
V06N63
V16N68
V16N92
V06N63
V16N92
V16N68
V06N63
V06N63


SERVDUAN (SEC)
DUTY CYCLE (%)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
373304.719
P66
VOG NGO
LR DROP OUT
LR DATA GOOD
T/D (LR LOS)

DESCENT, 13.36% TLOSS (P.1 of 2)



DESCENT, 13.30% TLOSS (Pg 2 of 2)