

QC
Aveo
CF-105
P-FFM-1

24

C-105

P/FREE FLIGHT MODELS/1

SUMMARY OF FIRINGS OF
FREE FLIGHT MODELS 1 AND 2
WEEK COMMENCING DECEMBER 12TH 1954

W. Taylor

January 5, 1955.

Avro Aircraft Limited
INTER-DEPARTMENTAL MEMORANDUM

~~SECRET~~
UNCLASSIFIED

Date January 10, 1955
To Mr. J.C. Floyd - Vice-President Engineering
From W. Taylor - Project Leader
Subject SUMMARY OF FIRINGS OF FREE FLIGHT MODELS 1 AND 2

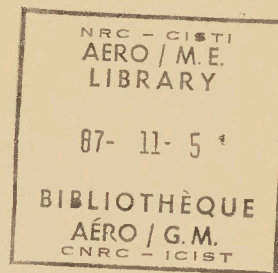
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Attached herewith the following report:-

P/Free Flight Model/1 - Summary of Firings of Free Flight Models
1 and 2

Week Commencing December 12th 1954.

Classification cancelled/changed to.....
by authority of..... (date).....
Signature..... Bank.....



W. Taylor.

WT/ym

W. Taylor

c.c. Messrs. R.N. Lindley
J.A. Chamberlin
J. Dobrzanski
W. Czerwinski
J. Kenny
S.E. Harper
G. Hake
R. Adey
T.A.G. Randell

A. Duguid - C.A.R.D.E.
R. Chinnick - Picton Range

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A. V. ROE CANADA LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

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AIRCRAFT: C-105

REPORT NO. P/F.F. MODEL/1

FILE NO.

NO OF SHEETS: _____

TITLE

SUMMARY OF FIRINGS OF FREE FLIGHT MODELS 1 AND 2

WEEK COMMENCING DECEMBER 12TH 1954

PREPARED BY W. Taylor

DATE Jan. 5/55

CHECKED BY

DATE

SUPERVISED BY

DATE

APPROVED BY

DATE

ISSUE NO	REVISION NO	REVISED BY	APPROVED BY	DATE	REMARKS

TECHNICAL DEPARTMENT (Aircraft)

REPORT No P/F.F. MODELS/1

SHEET No 1

AIRCRAFT

C-105

PREPARED BY DATE

W. Taylor Jan. 5, 1955.

CHECKED DATE

UNCLASSIFIED

SUMMARY OF FIRINGS OF FREE FLIGHT MODELS 1 AND 2

WEEK COMMENCING DECEMBER 12TH 1954.

FREE FLIGHT MODEL 1

Assembly of Booster Fittings to Booster commenced December 12th.

December 13th

Alignment completed.

Telemetry installation and checks commenced, power supply built and activated in the evening. It was discovered during check-out that the Booster spoon plunger was shorting the micro-switches to earth (i.e. cutting the insulation of the wiring). The complete fittings were removed, modified, rewired and replaced.

December 14th

Telemetry checks to external power and internal power completed, the model was mated to the booster and the combination 'swung' for C.G. check.

The armed combination was placed on the launcher and wheeled to the launching pad immediately after the tracking test vehicle had been fired. After aligning the combination and connecting internal power supply, the launcher was elevated to the firing position and all safety screws removed.

On learning that the ^{*}f launches were satisfactory, the pad was cleared of all except two personnel to allow the firing circuit to be made.

At this stage, it was discovered that one of the less important telemetry channels had failed and that full camera coverage was not available. It was decided to proceed without. The firing plugs were inserted (the last one is inserted at the Control Building) and firing took place at 14.08 hours.

Launch and separation were successful. Telemetry records were good throughout the duration of the flight. No excessive accelerations were recorded at separation. Integration of boost acceleration indicates that a Mach No. of 1.74 was reached. Separation signal shows separation at 3.38 seconds.

* sub-carrier frequencies at launch.

A. V. ROE CANADA LIMITED
MELTON - ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. P/F.F. MODELS/1

SHEET NO. 2

AIRCRAFT:

PREPARED BY DATE

W. Taylor Jan. 5, 1955

CHECKED BY DATE

FREE FLIGHT MODEL 2

The procedure followed was identical to Model 1.

Firing took place at 15.20 hours, December 16th.

Launching and separation were successful. All telemetry channels were successfully recorded. Small amplitude high frequency angular acceleration in pitch is noticeable a little before separation. Otherwise, the records are almost identical. Telemetry indicates separation took place at 3.45 seconds. Integration of the boost acceleration gives a Mach No. of 1.69.

Reduced data from two of the telemetry channels are attached.

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TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. P/F.F. MODELS/1

SHEET NO. 3

AIRCRAFT:

C-105

APPENDIX 1

PREPARED BY DATE

W. Taylor Jan. 5, 1955

CHECKED BY DATE

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CRUDE MODEL 1

See Chart - Telemeter Data Crude F.F. 1

Power Supply

Activated at 9 p.m., Monday 13, December)
Fired at 2 p.m., Tuesday 14 December) 17 hours stand time.

<u>No Load Voltage</u>	<u>Filament</u>	<u>108 Volt Line</u>	<u>180 Volt Line</u>	<u>Ref.</u>
	7.3	128.1	206	5.3
After 3 min. load	5.7	107.8	175	5.2
20 mins. later on for .75 min.	5.7	109	179	5.2

On at launcher at 13.35)
Fired at 14.07 $\frac{1}{2}$) 32.5 mins.

Total use of power supply 36.25 mins.

* Weather Conditions at Time of Firing

Ground

Barometer 1000
Temperature 34.3°F
Wind E/North East
Speed 12 m.p.h.

Upper Air

<u>Height</u>	<u>Wind (m.p.h.)</u>	<u>Direction °</u>
5,000	24	175
10,000	14	145
15,000	19	186
20,000	33	176
25,000	72	192

* Extracted from C.A.R.D.F. Range Officer's Report.

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MILTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. P/F.F. MODELS/1

SHEET NO. 4

AIRCRAFT:
C-105

APPENDIX 1

PREPARED BY DATE

W. Taylor Jan. 5, 1955

CHECKED DATE

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Upper Air (Continued)

<u>MB</u>	<u>HT. (ft.)</u>	<u>TEMP. (°C)</u>	<u>D.P. (°C)</u>
1000	210	+ 3.28	+ 1.1
850	4639	+ 2.5	+ 1.5
700	9596	- 4.0	- 5.6
500	18064	-19.9	-22.2
400	23392	-26.7	-28.2

TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. P/F.F. MODELS/1

SHEET NO. 5

AIRCRAFT:

C-105

APPENDIX 1

PREPARED BY DATE

W. Taylor Jan. 5, 1955

CHECKED BY DATE

CRUDE MODEL 2

See Chart - Telemeter Data Crude F.F. 2

Power Supply

Activated at 12 a.m., Thursday, December 16)
Fired at 15.22 Thursday, December 16) 3 hours, 20 mins. stand
time

<u>No Load Voltage</u>	<u>Filament</u>	<u>108 Volt Line</u>	<u>180 Volt Line</u>	<u>Ref.</u>
	7.5	<u>2.2 A</u>	133.8	<u>12 mA</u> 216.5 <u>111 mA</u> 5.4
On at 12.40 for 3.5 mins.	5.8		109	179.5 5.2

On at launcher at 15.00)
Fired at 15.22) 22 mins.

Total use of power supply 25.5 mins.

Voltages read on Simpson Model 260 meter and corrected after calibration with Polyranger.

★ Weather Conditions at Time of Firing

Ground

Barometer 1002.5
Temperature 27°F
Wind North West
Speed 14 m.p.h.

Upper Air

<u>Height</u>	<u>Wind (m.p.h.)</u>	<u>Direction °</u>
5,000	19	340
10,000	31	342
15,000	36	308
20,000	31	290
25,000	38	278
30,000	60	278

★ Extracted from C.A.R.D.E. Range Officer's Report.

A. V. ROE CANADA LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

REPORT NO P/F.F. MODELS/1

SHEET NO 6

AIRCRAFT:

C-105

APPENDIX 1

PREPARED BY

DATE

W. Taylor

Jan. 5, 1955

CHECKED BY

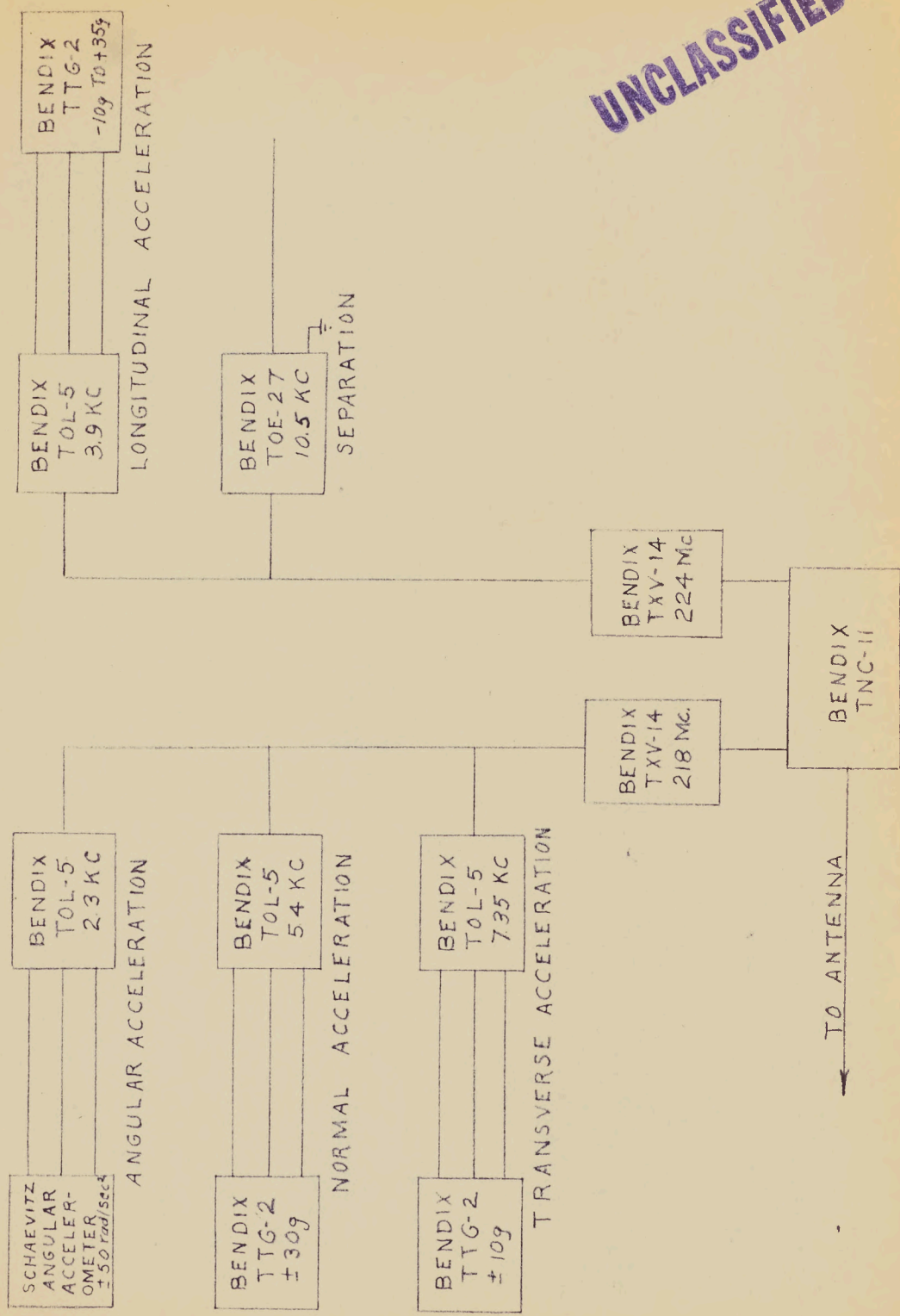
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Upper Air (Continued)

<u>MB</u>	<u>HT. (ft.)</u>	<u>TEMP. (°C)</u>	<u>D.P. (°C)</u>
1000	807	- 1.9	- 7.6
850	5047	- 5.5	-20.7
700	9944	-13.8	-29.7

BLOCK DIAGRAM OF TELEMETRY PACKAGE FOR C-105
 CRUDE MODELS 1&2



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TELEMETER DATA CRUDE F.F. 1

CHANNEL	OSCILLATOR TYPE	TRANSDUCER TYPE	FUNCTION	LOW FREQ. LIMIT	f_h	f_L	Δf TOLERANCE
2.3 K.C.	TOL-5 B-5317	Shaevitz Angular Acceleration. ± 50 rad./sec. ² Serial No. 363	Angular Acceleration	2100	2344	2344	± 7 c.p.
5.4 K.C.	TOL-5 B-5342	Bendix TTG-2 B-1554 ± 30 g	Pitch Acceleration	5085	5489	5492	± 16 c.p.
7.35 K.C.	TOL-5 B-4669	Bendix TTG-2 B-1910 ± 10 g	Transverse Acceleration	6872	7350	7350	± 22 c.p.
3.9 K.C.	TOL-5 B-5309	Bendix TTG-2 B-1900 - 10 + 35 g	Longitudinal Acceleration	3643	3799	3809	± 12 c.p.
10.5 K.C.	TOE-27 B-1900	+ 5V Applied at Separation	Separation	9712			

- NOTE:
- (1) Two Bendix type TXV-14 Transmitters were used, one operating at 218 mc. and modulated. The other transmitter operated at 224 mc. and was modulated by the 3.9 K.C. and 10.5 K.C.
 - (2) The two Transmitters were connected to a single notch antenna through a Bendix TNC-11.
 - (3) Power applied at 13³⁵ and Model fired at 14^{07.5}
 - (4) First frequency check started at 13²⁶ and completed at 13²⁹ (Model approximately horizontal).
Second Frequency check started at 13⁴⁹ and completed at 13⁵¹ (Model in launching position).
Third frequency check started at 14⁰¹ and completed at 14⁰² (Model in launching position).
Fourth frequency check started at 14⁰⁶ and completed at 14⁰⁷ (Model in launching position).
 - (5) f_h - Desired frequency with model in horizontal position.
 f_L - Desired frequency with model in launching position.
 - (6) 5.4 K.C. Channel failed just prior to firing.

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TELEMETER DATA CRUDE F.F. 1

FUNCTION	LOW FREQ. LIMIT	f _h	f _L	Δ f TOLERATED	HIGH FREQ. LIMIT	MAX. FREQ. RESPONSE	1st FREQ. CHECK	2nd FREQ. CHECK	3rd FREQ. CHECK	4th FREQ. CHECK
Acceleration	2100	2344	2344	± 7 c.p.s.	2500	35 c.p.s.	2346	2350	2350	2350
Acceleration	5085	5489	5492	± 16 c.p.s.	5710	80 c.p.s.	5506	5510	5509	-
Acceleration	6872	7350	7350	± 22 c.p.s.	7737	7392	7393	7392	7391	7391
Acceleration	3643	3799	3809	± 12 c.p.s.	4128	± 12 c.p.s.	3809	3818	3817	3817
	9712				11288	150 c.p.s.	11138	11133	11133	11131

used, one operating at 218 mc. and modulated by the 2.3 K.C., 54. K.C. and 7.35 K.C. Channels.
and was modulated by the 3.9 K.C. and 10.5 K.C. Channels.

single notch antenna through a Bendix TNC-11 Diplex Coupler.

407.5

completed at 13²⁹ (Model approximately horizontal)

completed at 13⁵¹ (Model in launching position)

completed at 14⁰² (Model in launching position)

completed at 14⁰⁷ (Model in launching position)

horizontal position.

launching position.

ending.

TELEMETER DATA CRUDE F.F. 2

CHANNEL	OSCILLATOR TYPE	TRANSDUCER TYPE	FUNCTION	LOW FREQ. LIMIT	f_h	f_L	Δf TOLERANCE
2.3 K.C.	TOL-5 B-5326	Shaevitz Angular Acceleration. Serial No. 409 ₂ ± 50 rad./sec. ²	Angular Acceleration	2127	2301	2301	± 7 c.p.
5.4 K.C.	TOL-5 B-5231	Bendix TTG-2 B-1878 ± 15 g	Pitch Acceleration	5013	5376	5382	± 16 c.p.
7.35 K.C.	TOL-5 B-5318	Bendix TTG-2 B-1908 ± 10 g	Transverse Acceleration	6845	7350	7350	± 22 c.p.
3.9 K.C.	TOL-5 B-5344	Bendix TTG-2 B-5344 - 10 g + 35 g	Longitudinal Acceleration	3650	3780	3790	± 12 c.p.
10.5 K.C.	TOL-5 B-1895	Five Volts applied at Separation	Separation	9712			

- NOTE: (1) Two Bendix type TXV-14 transmitters were used, one operating at 218 mc. and modulated by the 2.3 K.C. and 5.4 K.C. The other transmitter operated at 224 mc. and was modulated by the 3.9 K.C. and 10.5 K.C.
- (2) The two transmitters were connected to a single notch antenna through a Bendix type TNC-10.
- (3) Power applied at 15⁰⁰ and Model fired at 15²²
- (4) First frequency check started at 15⁰¹ and finished at 15⁰² (Model approximately horizontal)
 Second frequency check started at 15⁰⁷ and finished at 15⁰⁸ (Model in launching position)
 Third frequency check started at 15¹¹ and finished at 15¹² (Model in launching position)
 Fourth frequency check started at 15²¹ and finished at 15^{21.5} (Model in launching position)
- (5) f_h - Desired frequency with Model in horizontal position.
 f_L - Desired frequency with Model in launching position.

TELEMETER DATA CRUDE F.F. 2

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FUNCTION	LOW FREQ. LIMIT	f_h	f_L	Δf TOLERATED	HIGH FREQ. LIMIT	MAX. FREQ. RESPONSE	1st FREQ. CHECK	2nd FREQ. CHECK	3rd FREQ. CHECK	4th FREQ. CHECK
Acceleration	2127	2301	2301	± 7 c.p.s.	2450	35 c.p.s.	2305	2308	2309	2309
Acceleration	5013	5376	5382	± 16 c.p.s.	5791	80 c.p.s.	5390	5392	5397	5397
Acceleration	6845	7350	7350	± 22 c.p.s.	7740	80 c.p.s.	7386	7387	7386	7386
Acceleration	3650	3780	3790	± 12 c.p.s.	4160	60 c.p.s.	3786	3790	3794	3793
	9712				11288	150 c.p.s.	10922	10903	10902	10902

used, one operating at 218 mc. and modulated by the 2.3 K.C., 5.4 K.C. and 7.35 K.C. Channels.
and was modulated by the 3.9 K.C. and 10.5 K.C. Channels.

single notch antenna through a Bendix type TNC-11 Diplex Couper.

15²²

and finished at 15⁰² (Model approximately horizontal)

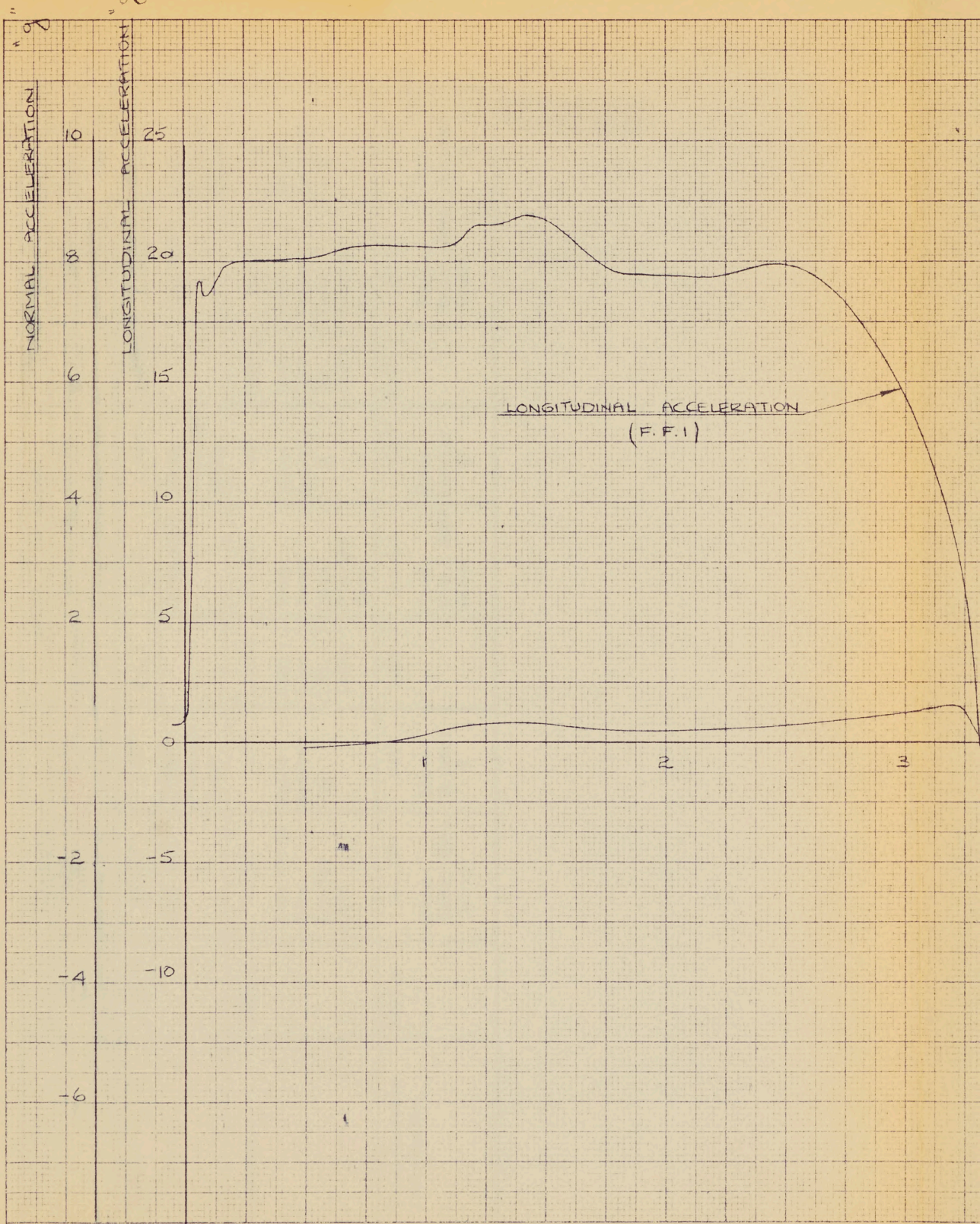
and finished at 15⁰⁸ (Model in launching position)

and finished at 15¹² (Model in launching position)

and finished at 15^{21.5} (Model in launching position)

horizontal position.

launching position.



359-11L

10 X 10 TO THE INCH
NEUTRAL & ENGINE CO.

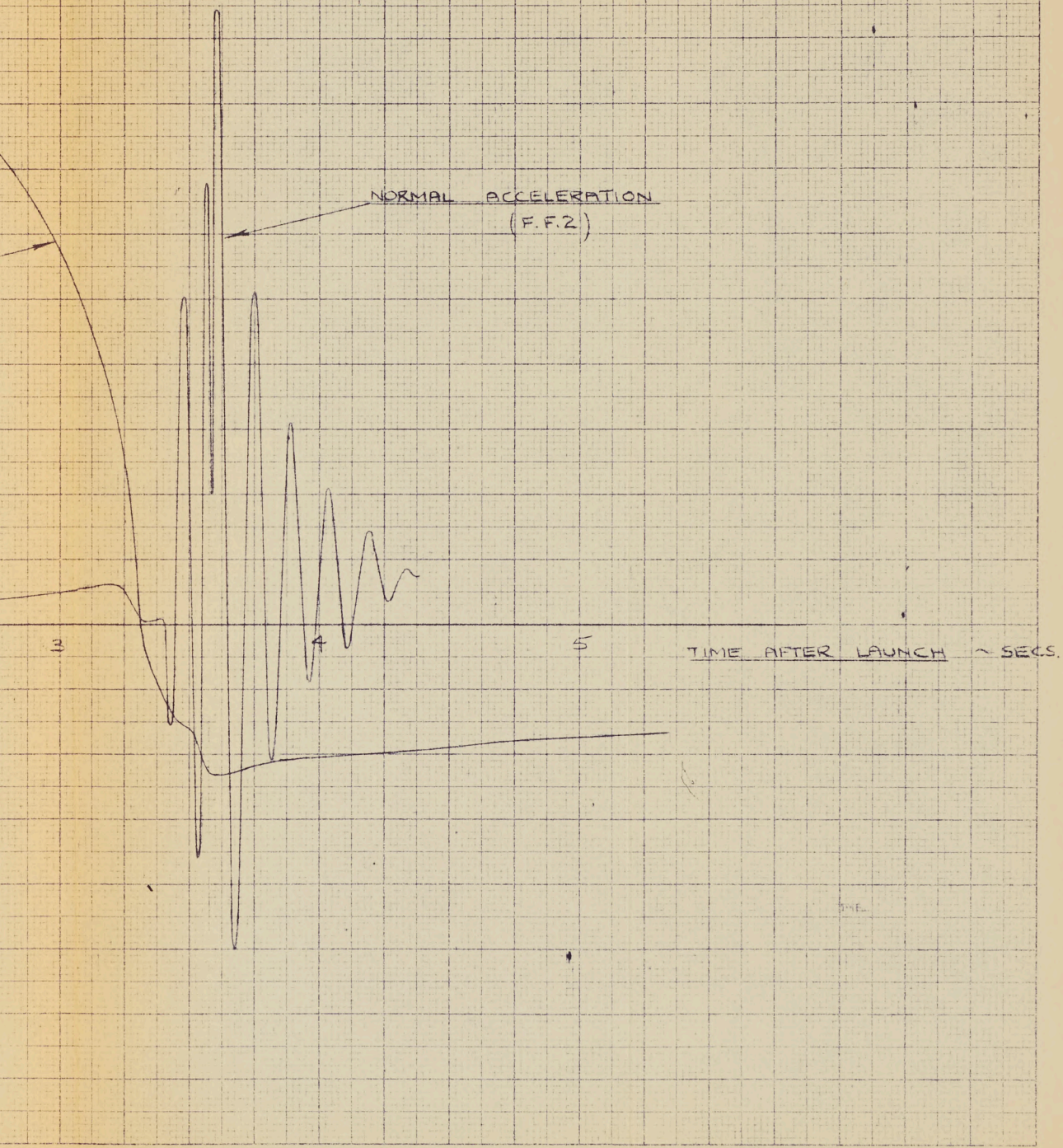
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FIGURE 1 P/FFM/1
D Stewart Jan '55.

C-105 FREE FLIGHT MODEL

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TYPICAL LONGITUDINAL & NORMAL ACCELERATIONS



COMPARISON OF ESTIMATED WEIGHT AND C.G. DATA WITH ACTUAL WEIGHT AND C.G. DATA
FOR 1ST AND 2ND CRUDE MODEL FIRINGS

	ESTIMATED				ACTUAL - 1ST MODEL				ACTUAL - 2ND MODEL			
	WEIGHT	CENTRE OF GRAVITY		WEIGHT	CENTRE OF GRAVITY		WEIGHT	CENTRE OF GRAVITY		WEIGHT	CENTRE OF GRAVITY	
		HORIZONTAL	VERTICAL		HORIZONTAL	VERTICAL		HORIZONTAL	VERTICAL			
Model	472.5	65.81" (25% MAC)	1.80" Above Fuselage Datum	463.0	65.81 (25% MAC)	1.865" Above Fuselage Datum	456.0	65.81 (25% MAC)	1.83 Above Fuselage Datum			
Booster	1788.1	71.56" From Front Face Booster Case	.29" Below Booster £	1820.0 (XM5-) (Ser.) (No.) (2471)	69.96" From Front Face Booster Case	.32" Below Booster £	1823.0 (XM5-) (Ser.) (No.) (2464)	70.09 From Front Face Booster Case	.31 Below Booster £			
Model-Booster Combination	2260.6	161.12" From Model Nose Datum	.034" Above Booster £	2283.0	160.60" From Model Nose Datum	.014" Above Booster £	2279.0	160.95 From Model Nose Datum	.010" Above Booster £			

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NEG. NO 8856



FREE FLIGHT MODELS.

2 Dec 54 ① 2 Crude - Launching technique - Picton
 ② Separation Telemetry. OK

9 May 55 ③ 1 Development Yaw model - Functional. Mechanical failure
 14 ④ of yaw mechanism.
 ⑤ 1 Refined drag model - Results OK
 Notch, no extension, no droop.

13 17 Jan 55 ④ 2 Level. Yaw Model - Yaw mechanism yawed OK
 100% success; except for range
 limitations.

— 11 —

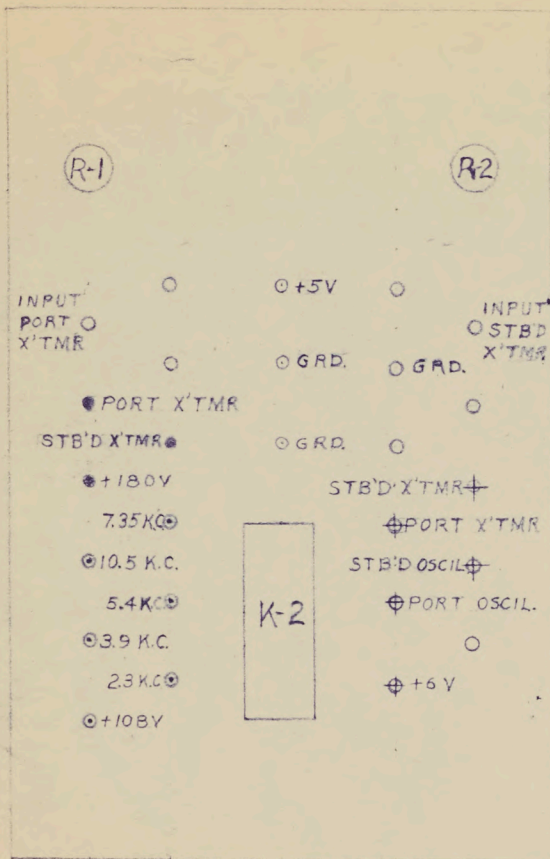
⑥ Drag Model - Represents Mock Up at present.
 ⑦ " " - Diff. in fore body shape.

To Wallops Island - 7 May 7 - 14 May.
 Delays from Jan 56 to May 56.
 Manufacturing delays account for July 55 to Dec 55

⑧ Yaw models. (Lateral). Hope 1 Jul (Picton
 ⑨ " " " " " " ?

⑩ Longitudinal (Pitch). Aug. 1 Sep (Picton
 ⑪ " " " " " "

FWD.

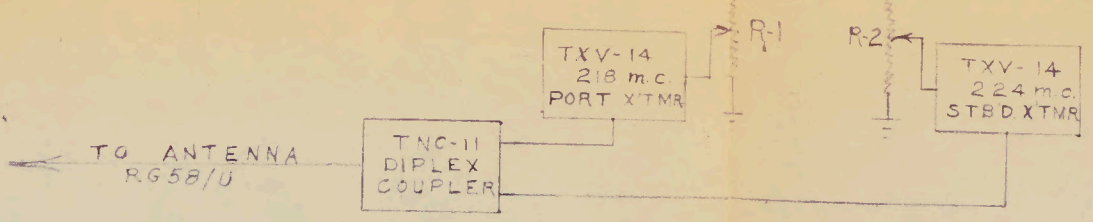
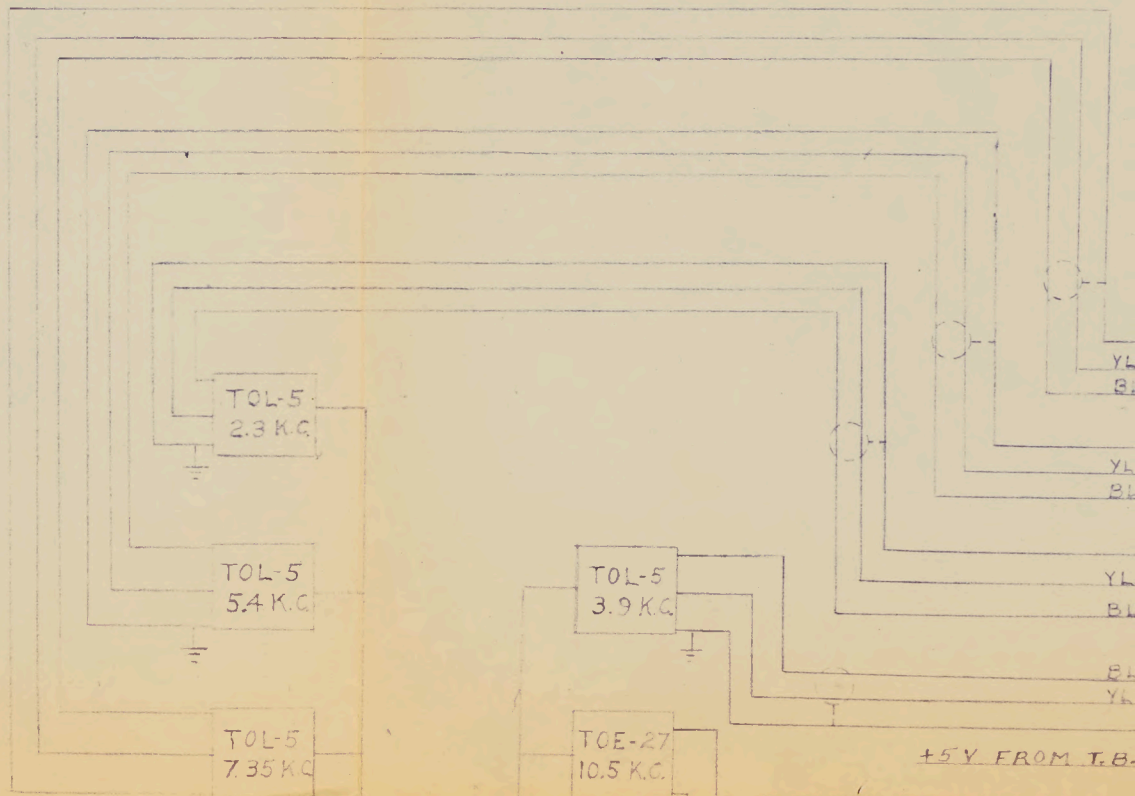


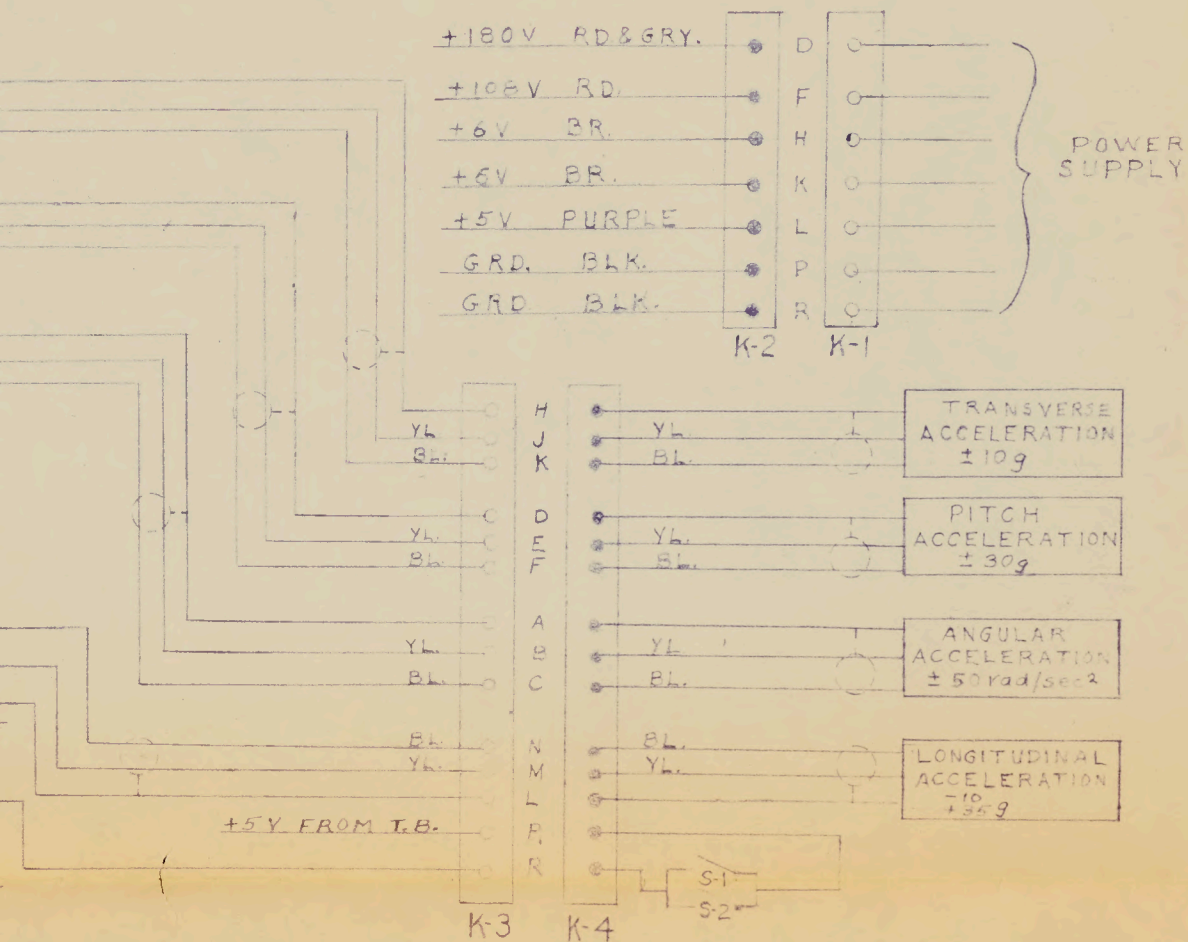
TERMINAL BOARD

← TO ANTENNA
RG58/U

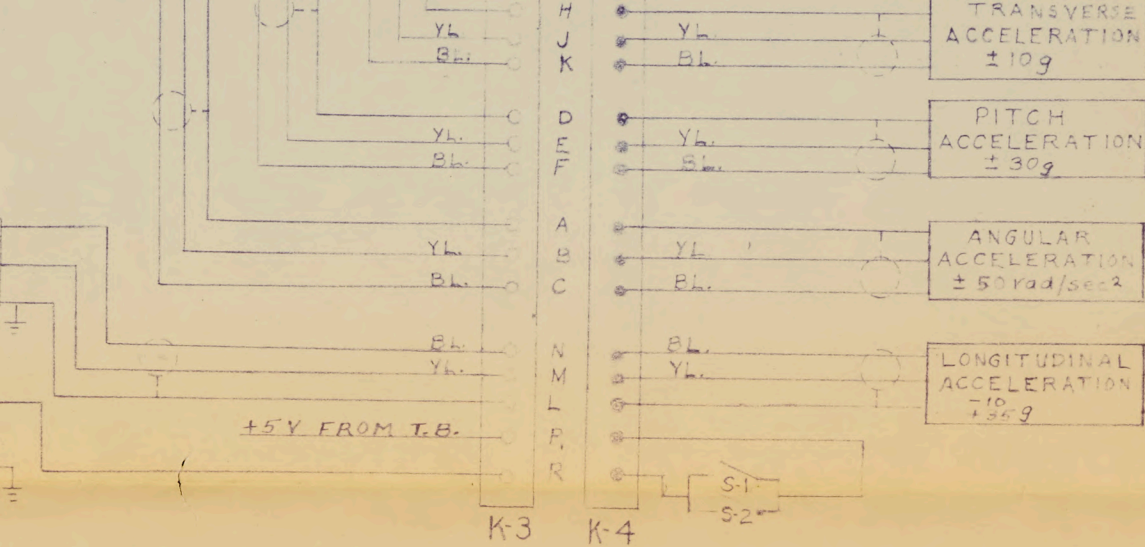
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DIP
CO

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K-1 & K-3 CONTINENTAL TYPE 14-20S
 K-2 & K-4 CONTINENTAL TYPE 14-20P
 R-1 & R-2 500K TELEMETER POT.
 S-1 & S-2 ELECTROSNAP S1-2 A5-1



K-1 & K-3 CONTINENTAL TYPE 14-20S
 K-2 & K-4 CONTINENTAL TYPE 14-20P
 R-1 & R-2 500K TELEMETER POT.
 S-1 & S-2 ELECTROSNAP SI-2 A5-1

DESCRIPTION	L.H.	R.H.	DESCRIPTION	SPEC ^N —COND ^N	LOFT REF.	EST.	ACT.
	UNIT No. OFF					FINISHED PART SPECIFICATION	
DRAWING PARTS LIST						TARGET WEIGHT LB.	
SCHEMATIC DIAGRAM TELEMETER SYSTEM CRUDE MODELS No. 1&2				UNCLASSIFIED		SCALE	
						FINISH TO DWG.	
						LIMITS UNLESS NOTED	
						TYPE/MARK SHOWN ON DRAWING	
DRAWING NUMBER							
A.V. ROE CANADA LTD.							
MALTON			ONTARIO				







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35583
MADE IN U.S.A.