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INTER-DEPARTMENTAL MEMORANDUM

Ref 5516/02A/J  
Date Jan. 15, 1958  
To S. E. Harper  
From J. D. Hodge  
Subject ARROW 2 - AIRCRAFT 25211 - INSTRUMENTATION

Herewith 72/FAR/8 "Instrumentation - Arrow 2 - Aircraft  
25211" which lists the instrumentation requirements for Aircraft  
25211.

Classification cancelled/changed to.....  
by authority of..... (date).....  
Signature..... Rank *F/C*

*J. D. Hodge*  
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Technical Flight  
Test Co-ordinator

AA/bb

c.c.

Messrs J. Chamberlin  
F. Brame  
C. Lindow  
D. Scard (5)  
A. Buley  
J. Ames  
J. Booth  
A. Stenning (4)  
S. Kwiatkowski  
C. Marshall  
J. Lucas  
H. Malinowski

R. Young  
J. Scott  
S. Whiteley (2)  
W. Alford  
R. Wade  
J. McKillop  
J. Gale  
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Aircraft: Arrow 2  
A/C 25211

Report No 72/FAR/8

No of Sheets: \_\_\_\_\_

#### INSTRUMENTATION

ARROW 2 - AIRCRAFT 25211

Prepared By	<i>A. J. Dickinson</i>	Date	15th JAN 1958
Checked By	<i>Wm C. Ettinger</i>	Date	17 Jan. 1958
Supervised By	<i>[Signature]</i>	Date	
Approved by	<i>[Signature]</i>	Date	



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INSTRUMENTATION - ARROW 2 - AIRCRAFT 25211

This report is issued to cover instrumentation requirements for Aircraft 25211. This aircraft will be primarily used for Structural Integrity Testing.



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ARROW 2 - AIRCRAFT 25211

STRUCTURAL INTEGRITY

Structural Strain Gauges

Strain gauges are required at 400 points on the aircraft structure, plus such spares and duplicates as the Flight Test Department considers necessary. The basic distribution of these gauges is shown below and their detailed positioning has been agreed to by the Flight Test Department and the Stress Department.

These gauges will give strain monitoring of major structural members and an approximate distribution of wing loads.

DISTRIBUTION

<u>Component</u>	<u>Gauges</u>
Forward Fuselage	40
Aft. Fuselage	60
Inner Wing L.H.	160
Inner Wing R.H.	40
Outer Wing L.H.	45
Outer Wing R.H.	15
Fin	40
Total	<u>400</u>



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## ARROW 2 - AIRCRAFT 25211

### STRUCTURAL INTEGRITY

#### Vibration Pick up Accelerometers

As in aircraft 25201 and 25202, figure 1 shows the approximate location of 57 vibration pick-up accelerometers. The precise location of these may be obtained from Flight Test Drawings Nos.

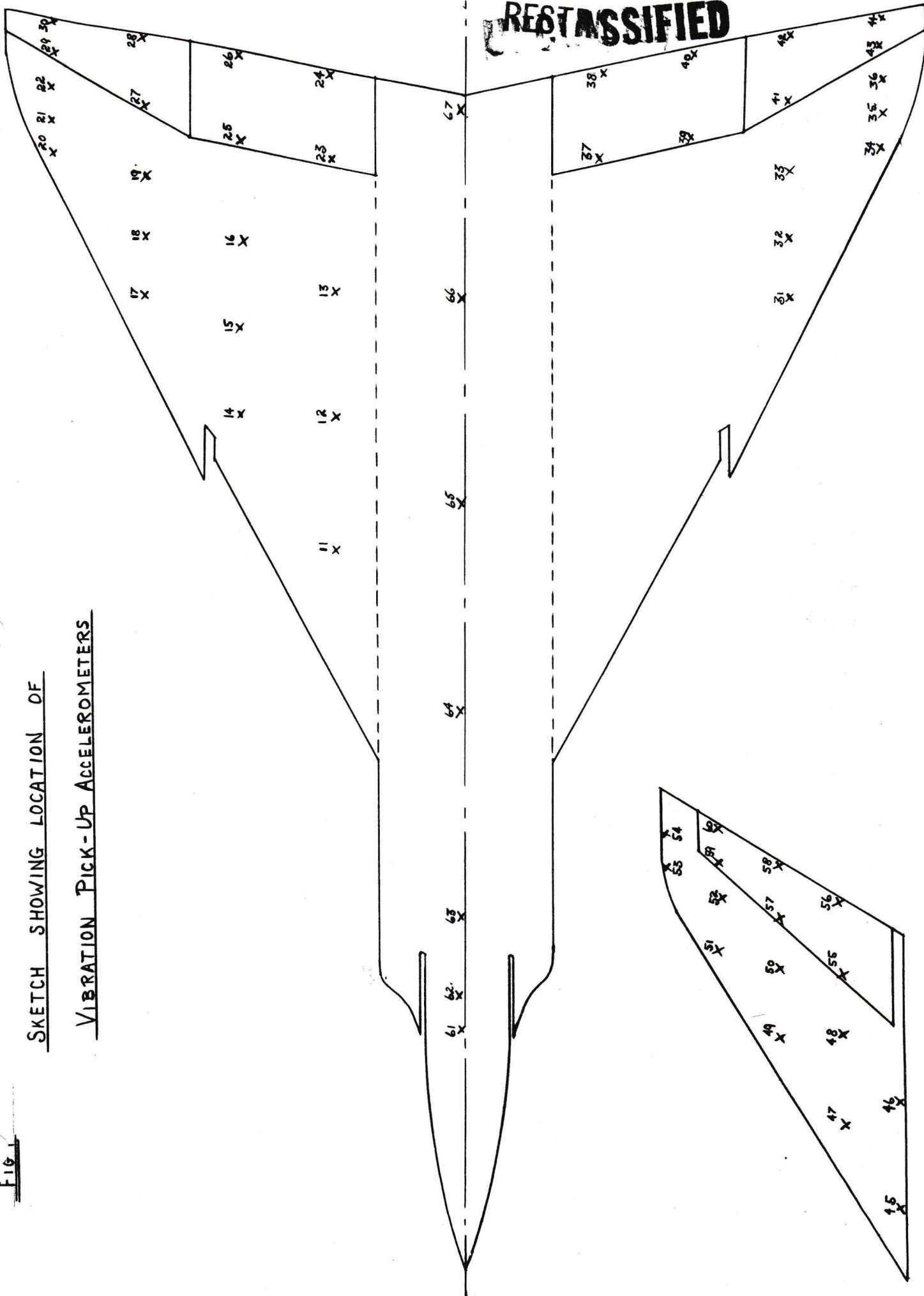
7-0782-1  
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7-0774-2  
7-0764-1  
7-0764-2  
7-0762-1  
7-0762-2  
7-0784-1  
7-0783-1  
7-0759-1  
7-0758-1  
7-0756-1  
7-0754-301  
7-0752-1  
7-0751-51

The required range is -10g to +10g with an accuracy of  $\pm 0.25g$  and the instruments should be capable of recording frequencies up to 60 cycle/sec. Under normal flight test conditions it will not be necessary to record any information from the accelerometers, but should any flutter problem arise it will be necessary to provide telemetering or continuous trace recording.

SKETCH SHOWING LOCATION OF

VIBRATION PICK-UP ACCELEROMETERS

**REST ASSIFIED**





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ARROW 2 - AIRCRAFT 25211

STABILITY AND CONTROL INSTRUMENTATION

1. Ambient Conditions

ITEM	RANGE	ACCURACY	ACCURACY % OF FULL RANGE	SAMPLING FREQUENCY
Aircraft Static Pressure	0 - 2160 lb/ft <sup>2</sup>	± 15 lb/ft <sup>2</sup>	± .75%	2/sec
Differential Pressure	0 - 2880 lb/ft <sup>2</sup>	± 20 lb/ft <sup>2</sup>	± .75%	2/sec
Free Air Total Temp.	-65 to +350°F	± 2°F	± 0.5%	2/sec

2. Motion of Aircraft

ITEM	RANGE	ACCURACY	ACCURACY % OF FULL RANGE	SAMPLING FREQUENCY
Angle of Attack $\alpha$	-6 to +30°	±0.1°	± 0.3%	Cont.
Angle of Sideslip $\beta$	-15 to +15°	±0.1°	± 0.5%	Cont.
Rate of Roll $\dot{\phi}$	-300 to +300°	±2.0°	± 0.5%	Cont.
Normal Acceleration (near C.G.)	-3 to +8g	±.06g	± 0.5%	Cont.
Normal Acceleration (fwd)	-3 to +8g	±.06g	± 0.5%	Cont.
Lateral Acceleration (near C.G.)	-1 to +1g	±.01g	± 0.5%	Cont.
Lateral Acceleration (fwd)	-1 to +1g	±.01g	± 0.5%	Cont.

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### 3. Control Surface Motion

ITEM	RANGE	ACCURACY	ACCURACY % OF FULL RANGE	SAMPLING FREQUENCY
Left Elevator Angle $\delta e$	-30 to +20°	$\pm 0.3^\circ$	$\pm 0.5\%$	Cont.
Left Aileron Angle $\delta a$	-19 to +19°	$\pm 0.2^\circ$	$\pm 0.5\%$	Cont.
Angle of Rudder $\delta k$	-20 to +30°	$\pm 0.3^\circ$	$\pm 0.5\%$	Cont.
Left Aileron Angular Acceleration $\delta a$	-200 to +200°/sec <sup>2</sup>	$\pm 2^\circ/\text{sec}^2$	$\pm 0.5\%$	Cont.

### 4. Control Mechanism

ITEM	RANGE	ACCURACY	ACCURACY % OF FULL RANGE	SAMPLING FREQUENCY
Left Elevator Damper Servo Position	-0.6 to +0.6"	$\pm 0.01"$	$\pm 1\%$	Cont.
Left Aileron Damper Servo Position	-0.6 to +0.6"	$\pm 0.01"$	$\pm 1\%$	Cont.
Rudder Damper Servo Position	-0.5 to +0.5"	$\pm 0.01"$	$\pm 1\%$	Cont.
Elevator Stick Force	-80 to +120 lb	$\pm 2$ lb	$\pm 1\%$	Cont.
Limited Range	-20 to +40 lb	$\pm 0.6$ lb	$\pm 1\%$	Cont.
Aileron Stick Force	-30 to +30 lb	$\pm 1$ lb	$\pm 1\%$	Cont.
Elevator Jack Load	0 to 71000 lb	$\pm 1400$ lb	$\pm 2\%$	Cont.
Aileron Jack Load	0 to 42000 lb	$\pm 800$ lb	$\pm 2\%$	Cont.
Rudder Jack Load	0 to 31000 lb	$\pm 600$ lb	$\pm 2\%$	Cont.