

Avro Aircraft Limited  
INTER-DEPARTMENTAL MEMORANDUM

Date 24th, January 1958  
To Mr. F. Brame  
From S. Kwiatkowski  
Subject ARROW 1 - FIRST FLIGHT TAKE-OFF AND LANDING SPEEDS

Reference No: 5805/09/J

The following values are recommended for c.g. at .30 c with under-carriage down and weights between 49,000 lb and 60,000 lb.

1. Speed to raise the nose

The nose raising should not be initiated until the speed 10 knots below recommended take-off speed is reached. The nose raising should be done with a maximum of 10° of up elevators.

To keep nose wheel on the ground before take-off and after touch down the amount of down elevator should not exceed 5°.

2. Take-Off Speed

Take-off speed with military power should be 150 knots. Angle of attack will then be between 10° and 12° for the weight range quoted. With afterburner lit take-off speed should be 145 knots.

The angle of attack will then be the same as for military power.

3. Approach Speed

Approach speed should be 180 knots  $\pm$  10 knots Angle of Attack range 8° - 11 1/2°.

4. Touch Down Speeds

The recommended touch down speed is 160 knots for all weights. The maximum permissible tolerance on touch down speed is  $\pm$  20 knots.

5. Tail Clearance at Touch Down

Arrow 1 in one "g" landing has a tail clearance angle of  $16.5^\circ$ , with fully compressed undercarriage and 2" tire deflection this clearance angle is  $15.5^\circ$ .

For recommended touch down speeds the following clearances for one "g" landings will exist:

Speed	Angular	Clearance
	49000 lb.	60000 lb.
140	$3 \frac{1}{4}^\circ$	$3 \frac{1}{4}^\circ$
160	$5^\circ$	$4^\circ$
180	$7 \frac{3}{4}^\circ$	$6 \frac{1}{4}^\circ$

With fully compressed undercarriage these clearances will reduce by  $1^\circ$ . A one degree corresponds to approx. 5" clearance at the tail.

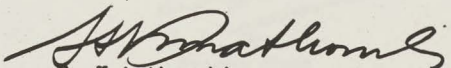
Above estimates include ground effects with no power.

6. Incidence Limitation

The limitation of true incidence is  $15^\circ$  for all flight conditions. The indicated angle of attack is affected by bending of the fwd fuselage. Therefore the indicated incidence limitations is  $15^\circ$  less  $1/2^\circ$  for each incremental "g".

Information contained in this note was derived from Report P/Control/86 a copy of which can be obtained from the writer.

SK/g

  
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