

QCX
Avro
CF105
LOG
105-
50

ANALYZED

UNLIMITED
~~CONFIDENTIAL~~
UNCLASSIFIED

T473

Classification cancelled / Changed to UNCLASS
By authority of AVES
Date 27 Sept 06
Signature [Signature]
Unit / Rank / Appointment AVES

RUNWAY SURFACE REQUIREMENTS

Report No. LOG/105/50

March 1957

NRC - CISTI
J. H. PARKIN
BRANCH

JUN 8 1995

ANNEXE
J. H. PARKIN
CNRC - ICIST

Prepared by [Signature]
D.A. Ridler

Approved by [Signature]
J.P. Booth

Authorized for Release to RCAF [Signature]
p/p. A.R. Buley

ENGINEERING DIVISION

AVRO AIRCRAFT LIMITED, MALTON, ONTARIO



1. INTRODUCTION

In April 1955, Avro Aircraft Limited passed to the R.C.A.F. information concerning the Unit Construction Indices for CF-100 and CF-105 aircraft under various loading conditions. These data were based on U.S.A.F. Technical Memorandum WCLS-53-13 "Ground Flotation Evaluation" dated 31 March 1953, which has since been superceded by Figure 7-6 of ARDCM 80-1, dated October 1954. In January of this year the R.C.A.F. requested revised calculations based on this later chart, and information concerning the effect on the runway surface of the hot blast from the afterburner during take-off.

2. CALCULATIONS

Figure 7-6 of ARDCM 80-1 has been reproduced in this report and the equivalent-single-wheel loads and unit construction indices have been computed on it for the three operating conditions given below:

- 1) Maximum take-off weight (full internal and external fuel load) - 67,850 lb.
- 2) Normal combat mission take-off weight - 59,975 lb.
- 3) Maximum landing weight (Maximum take-off weight less jettisonable fuel) - 63,620 lb.

For each of these cases the aft limit for the centre of gravity (31% M.A.C.) has been used and the tire pressures have been selected to give tire deflections of 32%, the maximum recommended by the tire manufacturer. The pertinent values from the chart are summarized below:

	<u>Maximum Take-Off Weight</u>	<u>Normal Take-Off Weight</u>	<u>Maximum Landing Weight</u>
Weight (lb.)	67,850	59,975	63,620
Tire Pressure (p.s.i.)	255	240	255
Static load on each main wheel	15,500	13,700	14,525
Equivalent-single-wheel load (lb.)	18,000	15,300	16,500
Unit Construction Index	122	92	120



3. DISCUSSION

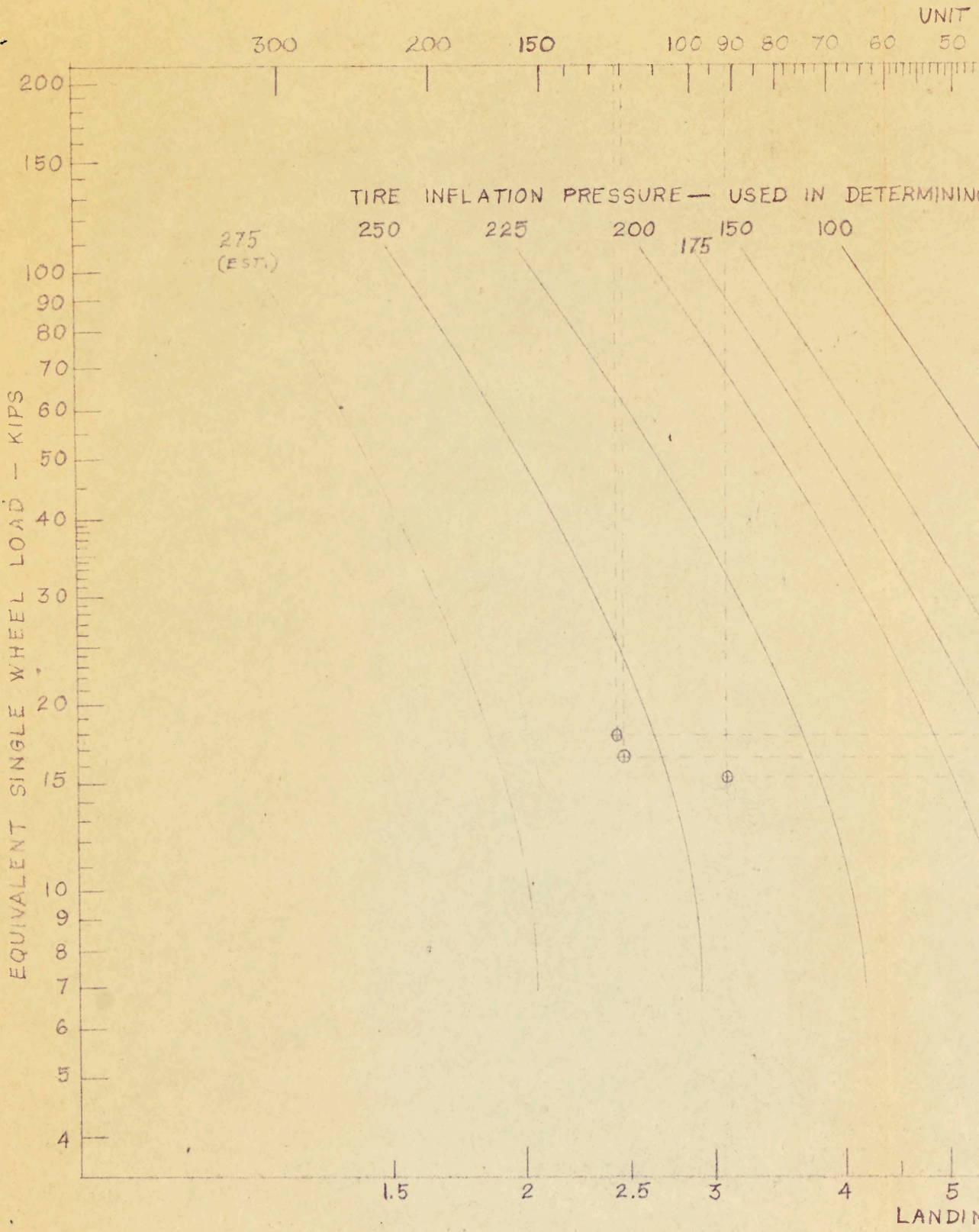
3.1 Runway Loadings

From Figure 7-6A of ARDCM 80-1, it is noted that "Full-Operational Runways" (concrete or high grade blacktop) are suitable for U.C.I. values up to 100. On this basis the existing type of runway construction should be adequate for all normal operations with the CF-105 aircraft. For the overload cases the U.C.I. values will exceed 100 if the recommended tire pressure of 255 p.s.i. is used. Thus two methods of operating the aircraft are possible:

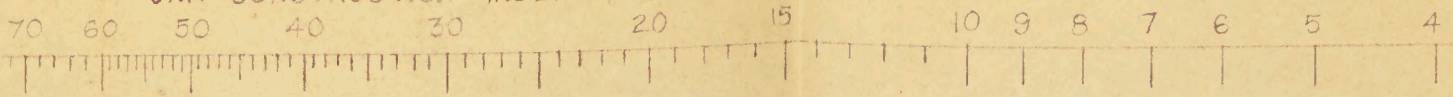
- a) Permit "overload" take-offs and landings at U.C.I. values higher than 100.
- b) Use a lower tire pressure (240 p.s.i.). At 240 p.s.i. pressure, the maximum static load of 15,500 lb. will cause a tire deflection of 35%. The effect of this deflection on tire heating during take-off and tire life is not known at the present time.

3.2 Effect of Afterburner During Take-Off

With the CF-105 Mk. 2 aircraft, the performance requirements can be met without using the afterburners below 30,000 foot altitude. Without the afterburners, the exhaust temperatures will be similar to those encountered with CF-100 aircraft, but the jet velocity and angle to the runway will be somewhat higher. This problem has not been assessed fully at the present time.



UNIT CONSTRUCTION INDEX -- U.C.I.

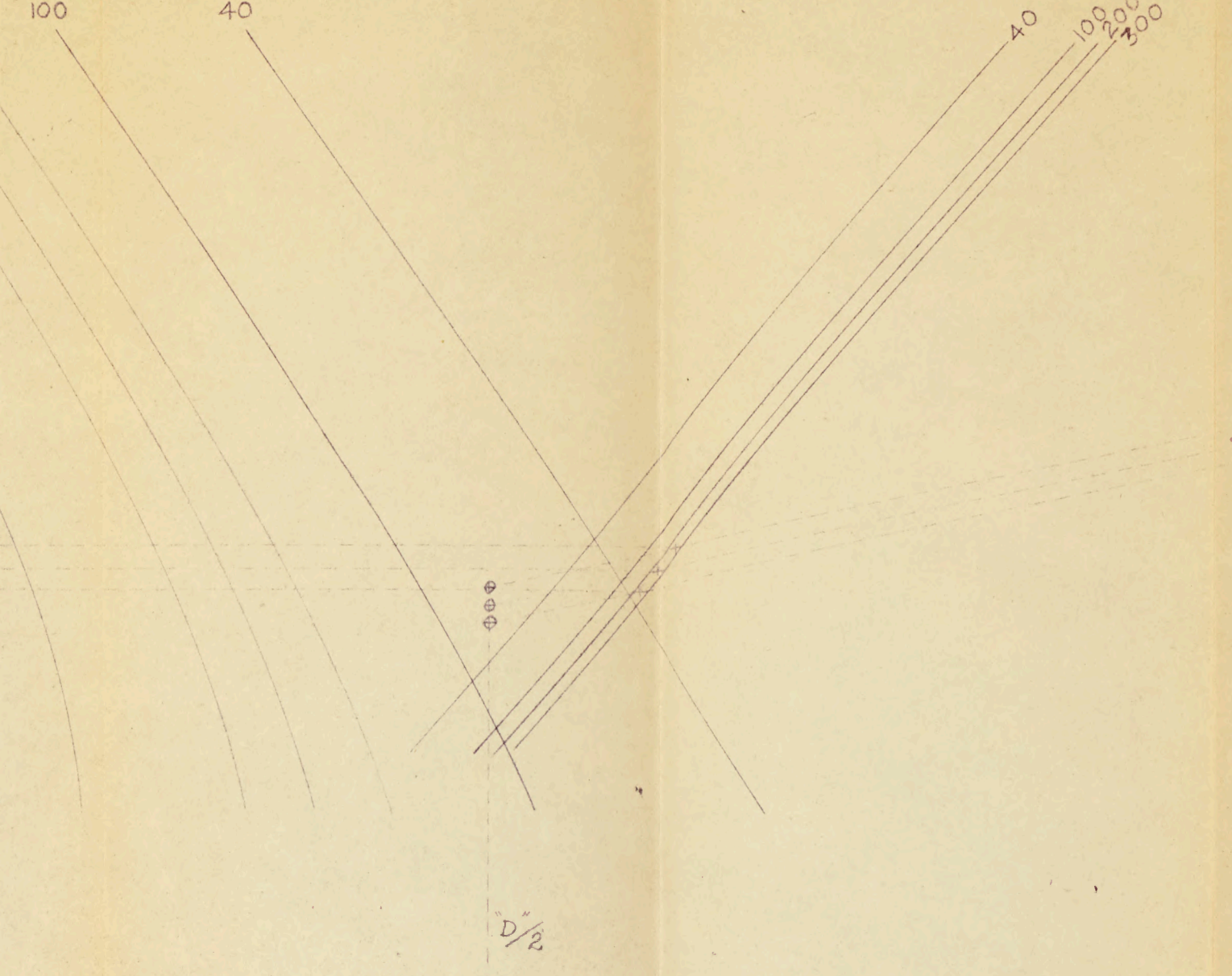


IN DETERMINING THE U.C.I.

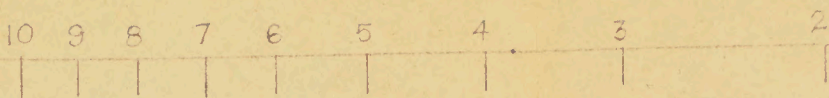
100 40

TIRE INFLATION PRE
USED IN DETERMINING
EQUIVALENT-SINGLE-WF

40 100 200 300

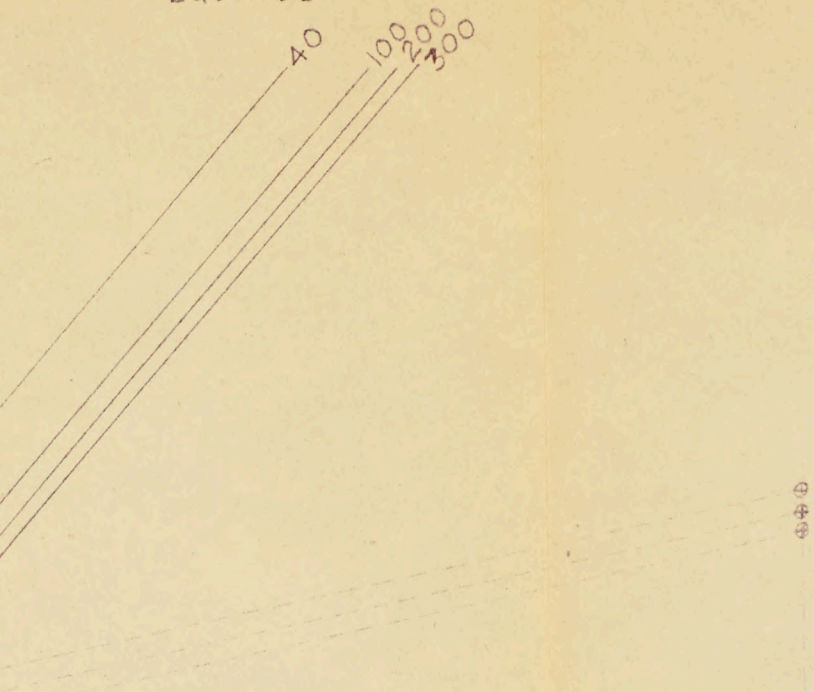


LANDING GEAR DIMENSIONS — INCHES



CF-105 GEOMET

TIRE INFLATION PRESSURE
USED IN DETERMINING THE
EQUIVALENT-SINGLE-WHEEL LOAD



STA. 215.65

C.G.

AFT. LIMIT
3 1/2 M.A.C
STA. 1548.25

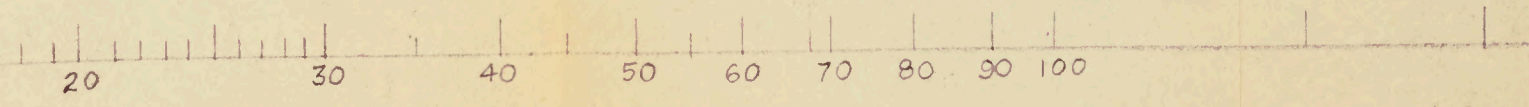
S = 34.0" D =
TIRE RADIUS = 14
= 12
TIRE DEFLECTION =
TIRE PRESSURE = 24
= 25

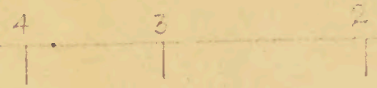
AIRCRAFT V

NORMAL TAKE-OFF
OVERLOAD TAKE-OFF
MAXIMUM LANDING

2.5"

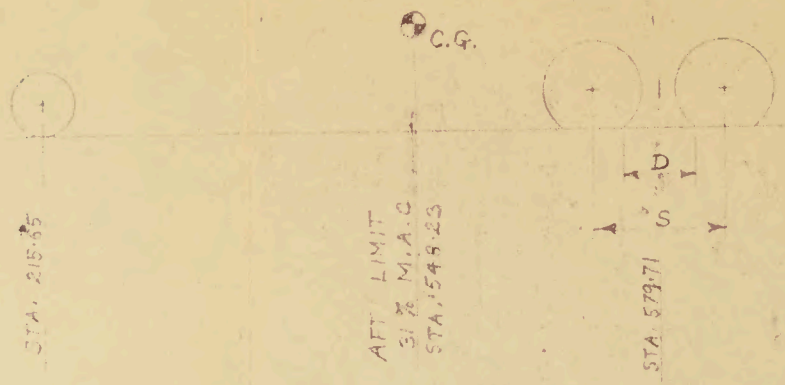
CHART FROM ARDCM 8





CF-105 GEOMETRY

IN PRESSURE
DURING THE
LE-WHEEL LOAD



$S = 34.0''$ $D = 19.4''$

TIRE RADIUS = 14.2" (FREE)
= 12.2" (LOADED)

TIRE DEFLECTION = 32%

TIRE PRESSURE = 240 P.S.I. (NORMAL)
= 255 P.S.I. (OVERLOAD)

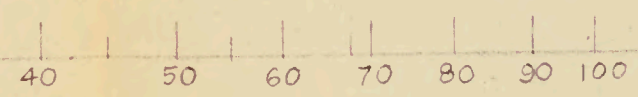
AIRCRAFT WEIGHT

NORMAL TAKE-OFF	59,975 LB.
OVERLOAD TAKE-OFF	67,850 LB.
MAXIMUM LANDING	63,620 LB.

440

2.5"

CHART FROM ARDCM 80-1 FIG. 7-6



DAK. 15/3/57



National Research Council Canada
Conseil national de recherches Canada

Canada Institute for Scientific and Technical Information
J. H. Parkin Branch

Institut canadien de l'information scientifique et technique
Annexe J. H. Parkin

Report No.: QCX Avro CF105 LOG 105-50

Has been: Downgraded to: As per letter 1463(A) 95/0043

De-Classified

By: (Name)

(Dept)

Date: JAN 9 96

B.J. Petzinger
Deputy Coordinator
Access to Information and Privacy

Signature

15783

05-501 . 607