QCX
Avro
CF105
R-7-0556-62
Iss-2

AVRO AIRCRAFT

TECHNICAL REPORT

A. V ROE CANADA LIMITED

MALTON - ONTARIO

ANALYZED

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: C105

REPORT No. 7/0556/62

FILE No.

No. OF SHEETS: 25

TITLE:

HYDRAULIC ACCESS DOOR
STRUCTURE

CONFIDENTIAL

Classification cancelled / Changed to UNCLASS
By authority of AVRS
Date 30 Sept 96
Signature
Unit / Rank / Appointment AVRS 5

NRC - CISTI
AERO / M.E.
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AÉRO / G.M.
CNRC - ICIST

PREPARED BY S. YOUNG DATE 9/28/55

CHECKED BY DATE

SUPERVISED BY DATE

APPROVED BY DATE

ISSUE No	REVISION No	REVISED BY	APPROVED BY	DATE	REMARKS
1	–	–	–	–	–
2	1	R BOUCHER		OCT. 56	INCORPORATE WORK ON DOOR. CHANGE TITLE

FORM 1916A

1586842

AVRO AIRCRAFT LIMITED
MALTON - ONTARIO
TECHNICAL DEPARTMENT

REPORT No. 7-6556-62
SHEET No.

AIRCRAFT:	HYDRAULIC ACCESS DOOR STRUCTURE	PREPARED BY	DATE
C105		R. [illegible]	OCT 12 '56
		CHECKED BY	DATE

INDEX

CONFIDENTIAL

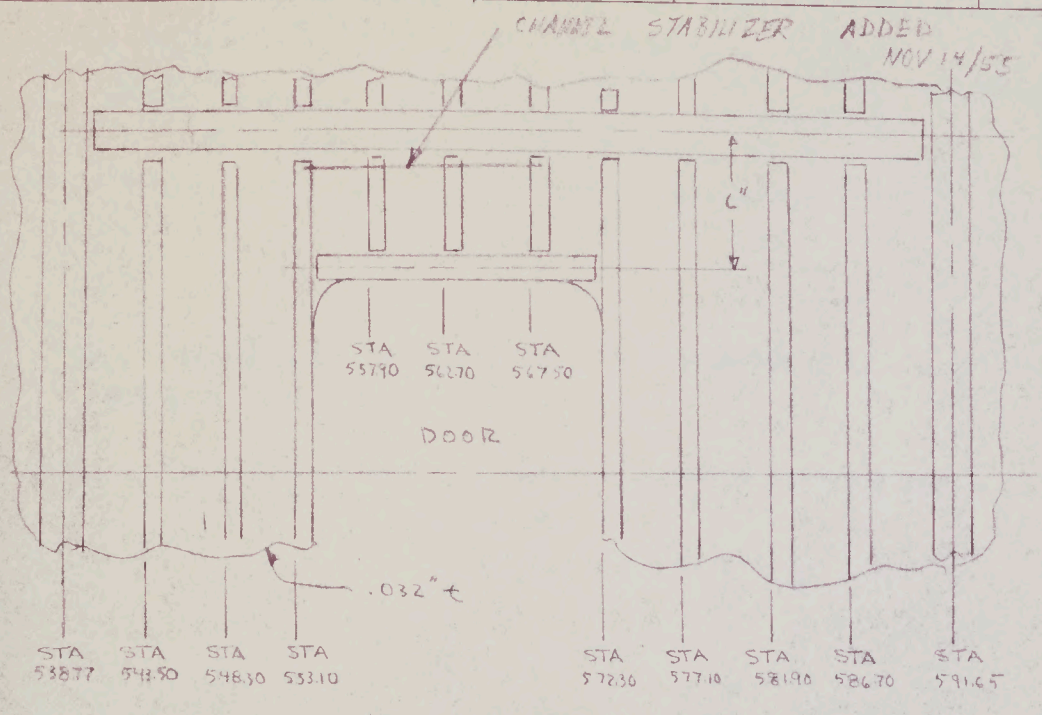
FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. 7-0556-62
SHEET NO. 1-1

AIRCRAFT:	STRUCTURE – HYDRAULIC ACCESS DOOR AREA C/S
C 105	

PREPARED BY	DATE
[illegible]	9/20/55
CHECKED BY	DATE



THE DOOR BEAM EXTENDING B/T STAS. 553.10 & 572.30 — LOADING —

(a) MEMBRANE TENSION OF DOOR ACTS THRU LOWER CAP INTO FUSELAGE SKIN (.032 t). ACTING THRU DOOR D'B'R. LOADING WILL BE ASSUMED UNIFORM (LOADING IN DOOR ASSUMED PARABOLIC – SEE PAGE 4).

$$\therefore \text{LOAD/in} = \left(2 \times \tfrac{2}{3} \times 7.8 + 2.6 + 3.3^{*}\right) \times 6550 \times .032 / 15.5$$
$$= 166\#/\text{in}.$$

(b) VERT LOAD DUE TO 5.5 PSI DUE TO PRESSURE ON O/B SECTION (6") OF FUSELAGE SKIN —

$4.8 \times 3 \times 5.5 = 79\#$ @ STAS 557.90, 562.70, & 567.50

* DISTANCE B/T END RIBS, RIV. &S, LOADING ASSUMED UNIFORM.

FORM 1316A

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

REPORT No. 7-0557-62
SHEET No. 1-2

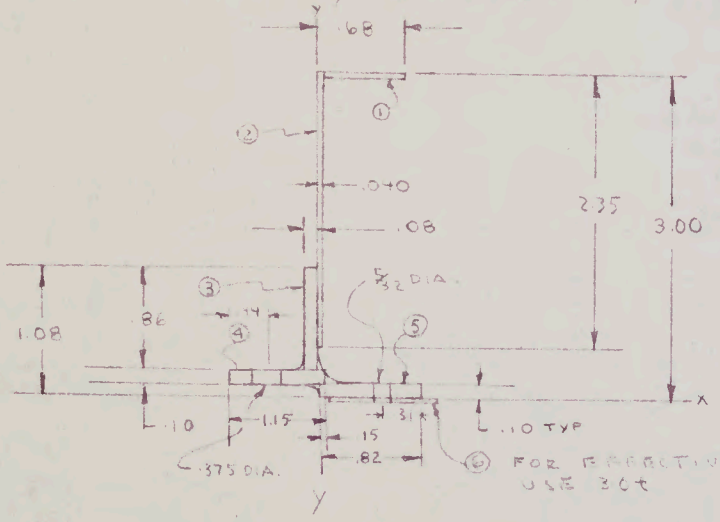
AIRCRAFT:	STRUCTURE -
C105	HYDRAULIC ACCESS DOOR AREA C/S

PREPARED BY	DATE
Ewell	9/20/55
CHECKED BY	DATE

(c) VERT PRESSURE LOADING FROM DOOR - ASSUME CONCENTRATED LOADS FOR BEAM BENDING (3 PLACES)
P = 327 # (SEE PAGE 5)
FOR LOCAL FLANGE BENDING

(d) SHEAR LOADING - 100 #/in ON BEAM LOWER CAP -

SECTION PROPERTY CALCS - R/H BEAM -



ITEM	A	X	Y	Ax	Ax²	Ay	Ay²	I_{ox}	I_{oy}
1	.0272	.36	2.80	.0098	.00350	.076	.213	—	.000865
2	.0924	.020	1.81	.0019	.00004	.167	.303	.0410	.00001
3	.0688	-.040	.65	-.0275	.00011	.0448	.0291	.00423	.00004
4	.1150	-.425	.166	-.04880	.02080	.0191	.0032	.00010	.01260
5	.0832	-.41	.05	-.03360	.01380	.0041	.00021	.00007	.00450
6	.0310	-.46	-.016	-.01430	.00656	-.0005	—	—	.00266
Σ	.4169			.0081	.0448	.31050	.5485	.0454	.0207
- CAM LOC	-.0375	-.56	.017	-.021	.0118	-.00064	.00001	—	—
- RIV.	-.0205	-.51	.050	-.0104	.0053	-.00103	.00005	—	—
Σ	.3587			.0187	.0277	.3089	.5484	.0454	.0207

FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-62
SHEET No 1-3

AIRCRAFT:	STRUC. HYDRAULIC ACCESS DOOR AREA
C105	5/5

PREPARED BY	DATE
[illegible]	9/20/55
CHECKED BY	DATE

SECTION PROPERTIES CONT'D -

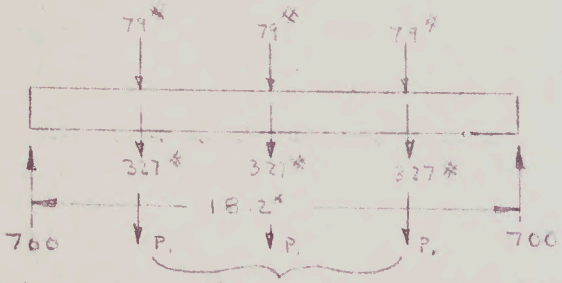
$\bar{y} = .3089 / .3584 = .865$

$\bar{x} = .0187 / .3584 = .052$

$\bar{I}_x = (.0454 + .5484) - (.3089 \times .865)$
$= .327 \text{ in}^4$

$\bar{I}_y = (.0207 + .0277) - .0187 \times .052$
$= .0387 \text{ in}^4$

CONSIDERING BEAM BENDING LOADS ONLY -



WHERE:
$P_1 = 276/4.5$
$= 61\,\text{\#} \times$ SEE P 16

ΣMAX M_o — SECONDARY LOADS SEE P 4 & P 16

$700 \times 9.1 - 467 \times 4.8 = 4480\ \text{\#-in}$

CHECKING COMP FLG. —

$f_b = \frac{4480 \times 2.135}{.327} = 29300 \text{ PSI}$

FOR LOCAL CRIPPLING TAKING COMP. CHORD AS AN EFFECTIVE .68 x .68 ANGLE
$F_{cc} = 33000 \text{ PSI}$

$\pm$ M.S. $= 33000 / 29300 - 1 = +.12$

TENSION IN LOWER CAP
$f_b = 4480 \times .865 / .327 = 11850 \text{ PSI MAX}$

SEE P 10 → FOR CRITICAL M.S WITH COMBINED LOADINGS

* DIST CLOSE

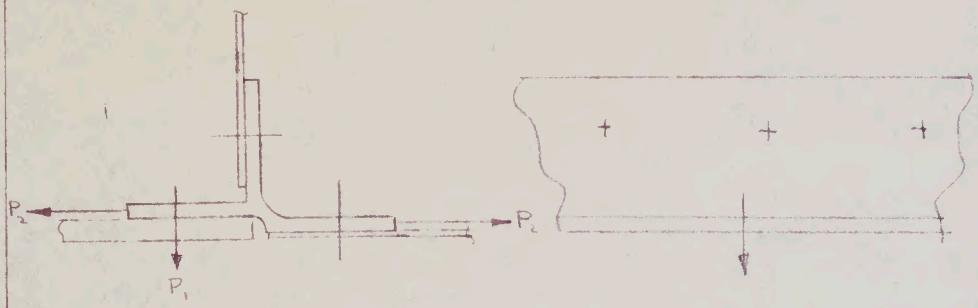
FORM 1319A

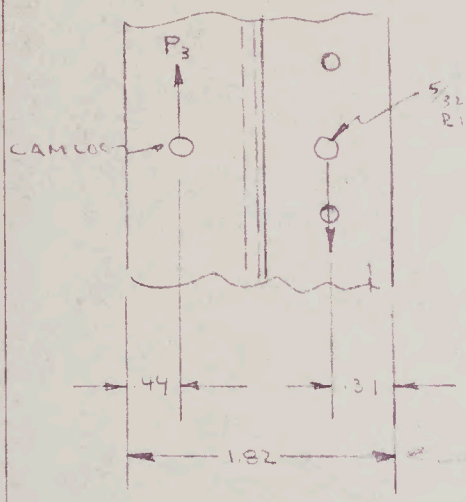
A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-62
SHEET No 1-4

AIRCRAFT:		PREPARED BY	DATE
C 105		[signature]	9/21/55
		CHECKED BY	DATE

CONSIDERING LOWER CAP - R/H BEAM





WHERE:
P_1 = 327 (SEE P_2)
P_2 = 160 #/m. (SEE P_1)
P_3 = 2.40" × 90 = 216 #

THE NORMAL LOAD OF 327 # WILL BE ASSUMED TO HAVE A RESISTANCE OVER AN EFFECTIVE WIDTH = $\frac{3}{5}$ × 2.40 = 1.6".

$\therefore I = \frac{1}{12} \times 1.6 \times .10^3$

$= 1335 \times 10^{-7}$

*CAMLOC SP.

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No Y-0556-62
SHEET No 1-5

AIRCRAFT:		PREPARED BY	DATE
C105			9/21/55
		CHECKED BY	DATE

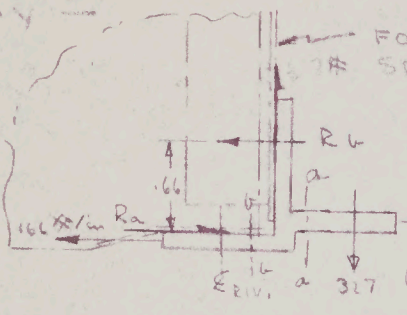
LOAD/CAM LOC ASSUMING D'B'R RIGID =
$5.5 \times 17 \times 25.5 / 16 = 1150$ #

USING CONCENTRATION FACTOR OF 1.5 @ STA LOCS.
LOAD/CAM-LOC = $150 \times 1.5 = 225$ #

$M_0 = 225 \times 1.41 = 92.3$ #m & $f_b = \frac{92.3 \times .05}{133.5 \times 10^{-6}} = 34600$ PSI

TENSILE STRESS ACROSS FLANGES =
$166 / .10 = 1660$ PSI

CONSIDERING LOWER CAP AS FREE BODY —



TOTAL TORQUE ABOUT C.g. OF CAP =
$4.8^{*} \times 166 \times .120 + 327 \times .55 = 276$ #m

$R_B = R_a = 276 / .66 = 418$ #

NOTE SEE R...

∴ TOTAL RIVET LOAD AT R_a @ STA. TIE
$166 \times 1.5^{\Delta} - 418 = 328$ # SHEAR ← C/B
& RIV. TIED TO WEB TIE OF SUB STRUC.
= 327 SHEAR & 418 # TENSION.

∴ BENDING OF UPSTANDING LEG ABOUT FILLET =
$M = 418 \times .154 = 226$ #m

TAKING I OF EFFECTIVE SECTION
$= \frac{1}{2} \times 4.8 = 2.4$

$I = \frac{1}{12} \times 2.4 \times .10^3 = 200 \times 10^{-6}$

* 4.8 = SPACING OF STIFFNERS Δ RIV. SP.

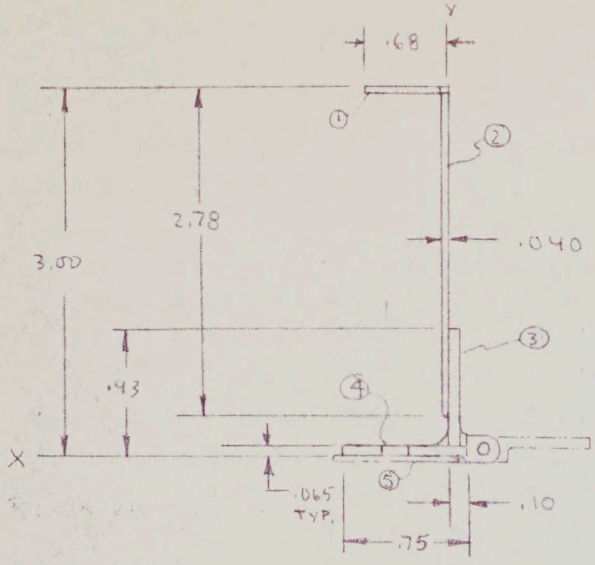
ARM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. T-0556-62
SHEET No. 1-6

AIRCRAFT		PREPARED BY	DATE
C105	1	[illegible]	9/2/[illegible]
		CHECKED BY	DATE

SECTION PROPERTY CALCS. L/H BEAM —



NOTE
THIS SECTION ABOUT SIMILAR TO L/H BEAM SEE SHT 2 HYDRAULIC DOOR CUTOUT

ITEM	A	X	Y	Ax	Ax^2	Ay	Ay^2	I_{ox}	I_{oy}
1	.0272	.36	2.80	.0098	.00350	.076	.213	—	.00087
2	.0924	.020	1.63	.00185	.00004	.1510	.2460	.0717	.00001
3	.0558	.032	.50	.00179	.00006	.0279	.0139	.00344	.00002
4	.0488	.280	.032	.01370	.00383	.00156	.00005	.00001	.00226
5	.0310	.480	.016	.01440	.00710	.00041	—	—	.00275
Σ	.2552			.03846	.01453	.2560	.473	.0752	.00591
- R.V.	.0151	.34	.0165	.00514	.00175	.0002	—	—	—
Σ	.2400			.03332	.01278	.2558	.473	.0752	.00591

$\bar{Y} = .2558 / .2400 = 1.06"$

$\bar{X} = .0333 / .2400 = .138"$

$\bar{I}_x = .0752 + .473 - .2558 \times 1.06$
$= .278 \text{ in}^4$

$\bar{I}_y = .00591 + .01278 - .0333 \times .138$
$= .01411 \text{ in}^4$

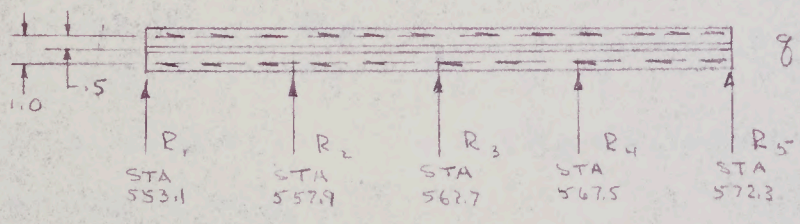
ORM 1319A

THEN BENDING ABOUT FILLET —

$\frac{226 \times .04}{200 \times 10^{-6}} = 45200$ PSI (ON UPSTANDING LEG)

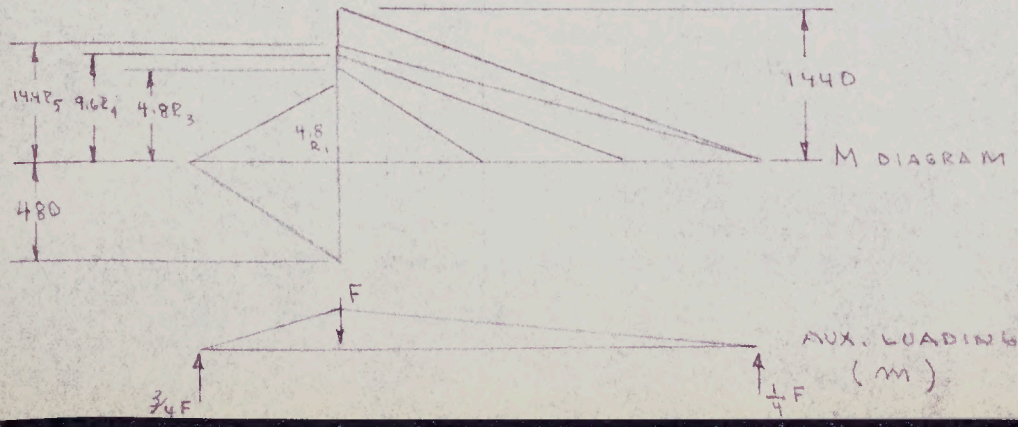
CAP LOCAL BENDING DUE TO SHEAR LOADS P_3 —

THE SKIN WILL BE CONSIDERED INEFFECTIVE IN RESISTING APPLIED LOAD. THE RESISTANCE TO LOADING WILL BE SUPPLIED AT STA LOCS. & THE STRUC. IS 3rd DEGREE REDUNDANT. THE APPLIED LOAD WILL BE SIMPLIFIED AS AN APPLIED CONTINUOUS SHEAR SINCE THE CRITICAL SECTIONS OF LOWER CAP WILL OCCUR AT STA RESISTANCE PTS. —



USING "ELASTIC ENERGY THEORY" VANDEN BROEK

(a) EQ. FOR $\delta_{R_2} = 0 = \Sigma M m dx$



7-0556-6L
1-9

PLOT OF MOMENTS ABOUT CAP C.L
E/H LOWER CAP

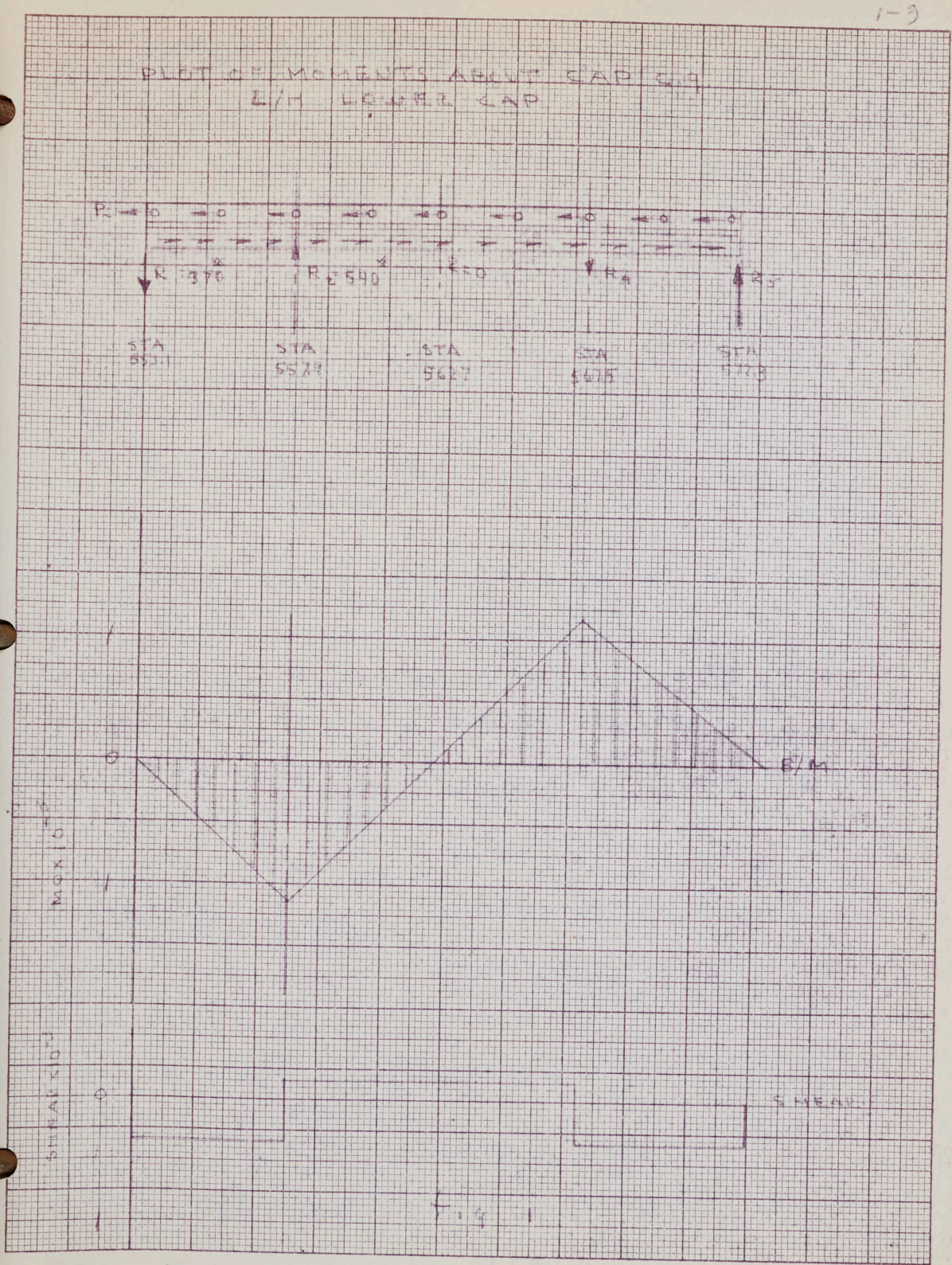


Fig 1

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. T-0556-62
SHEET No. 1 / 10

AIRCRAFT:		PREPARED BY	DATE
C105		Gnell	9/27/55
		CHECKED BY	DATE

M_o MAX = 1300 # in.

I (REF P 2) –

$\bar{x} = (-.00275 - .04880 + .03360) / (.2658 - .0575)$

$= -.00548 / .208 = -.0264$ "

$\therefore \bar{I}_y = .0171 - .0171 + .0346 - .208 \times .0264^2$

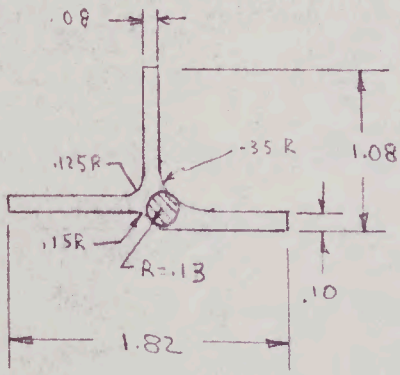
$= .0344$ in^4

$\therefore f_b = \frac{1300 \times .88}{.0344 \times} = 34200$ PSI TENSION OR COMP.

BEFORE CHECKING STRENGTH OF BOTTOM CAP, THE TORSIONAL SHEAR STRESSES WILL BE INVESTIGATED –

TOTAL TORQUE = 276 # in (P 5)

FINDING TORQUE SHEAR CONSTANTS –



MAX T @ PT OF TANGENCY OF .15R & INSCRIBED CIRCLE

$J = J_F + J_W + 16 \alpha R^4$

WHERE J_F =

$ab^3 \left[\frac{1}{3} - .21 \frac{b}{a} \left(1 - \frac{b^4}{12 a^4} \right) \right]$

$= 1.82 \times .001 \left[\frac{1}{3} - .21 \times .055 \left(1 - \frac{.0001}{12 \times 1.82^4} \right) \right]$

$= .000587$ in^4

$J_W = c d^3 \left[\frac{1}{3} - .105 \frac{d}{c} \left(1 - \frac{d^4}{192 c^4} \right) \right]$

$= .86 \times .0005^3 \left[\frac{1}{3} - .105 \times .093 \left(1 - \frac{.000041}{192 \times .55} \right) \right]$

$= .000140$ in^4

FORM 1396A

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

REPORT No. 7-0556-62
SHEET No. 1-11

AIRCRAFT:		PREPARED BY	DATE
		Snell	9/23/55
		CHECKED BY	DATE

$K = .08/.10 = .8$

$\therefore \alpha = K(.15 + .10\, r/b)$

$= .8\,(.15 + .10 \times .125/.10)$

$= .220$

$\therefore J = J_F + J_W + 16\alpha R^3$

$= .000587 + .00140 + 16 \times .220 \times .13^3$

$= .008827\ m^4$

$\therefore \tau_{max} =$

$$\frac{2R}{1+m^2}\left[1 + \tanh\frac{2B}{\pi}\left\{.118\,\log_e(1 - R/\rho) - .238\,R/\rho\right\}\right]\frac{T}{J}$$

$\rho = 1.2 \quad R = .13 \quad R/\rho = -1.08$

$(1 - R/\rho) = 2.08 \quad .238 \times R/\rho = -.258$

$\log_e 2.08 = .7134 \quad .118 \log_e 2.08 = .0840$

$B = 90° \quad \therefore 2B/\pi = 1.0$

$\therefore \tanh 2B/\pi = .762$

$\left\{.118\,\log_e(1 - R/\rho) - .238\,R/\rho\right\} = .0840 + .258$

$= .342$

$m = \pi R^2/A =$

$= \pi \times .13^2/.208 = .255$

$\therefore m^2 = .065 \quad \therefore 1 + m^2 = 1.065$

$2R/1 + m^2 = .26/1.065 = .244$

$\therefore MAX\ T = .244\,[1 + .762 \times .342]\ T/J$

$= .308\ T/J = .308 \times 276/.008827$

$= 9650$ PSI SHEAR DUR TO TORQUE.

FORM 1319A

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

REPORT No. 7-0506 64
SHEET No. 1-12

AIRCRAFT:	PREPARED BY	DATE
C 105	Fmd	9/23/58
	CHECKED BY	DATE

CHECKING STR OF R/H BEAM LOWER CAP —

FROM PAGE (6B) f_b = 34200 PSI TENSION OR COMP.

FROM PAGE (3) f_b = 11,850 TENSION

f_c = 45050 PSI

FROM PAGE (5) f_t = 1660 PSI TENSION

FROM PAGE (9) f_s = 0 AT EDGE

FROM fig. 1 f_s = 370/.208 = 1780 PSI

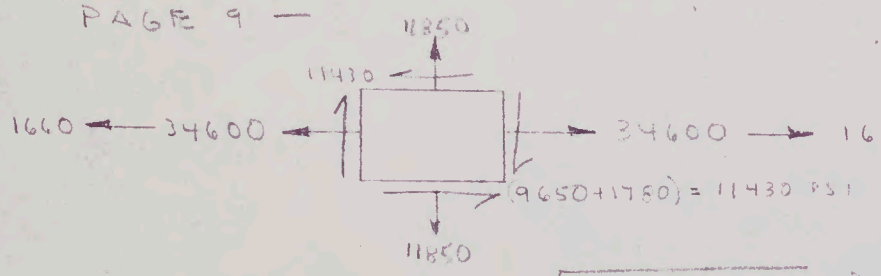
∴ M.S. = 78000/45050 − 1 = +.73

BENDING & SHEAR ABOUT FILLET (SEE SECTION a–a PAGE 5)

M = 225 X .41 = 90 ✻ m (SEE P 5)

∴ f_b = 34600 PSI " "

TAKING SHEAR STRESS MAX PER PAGE 9 —



$$\sigma_{MAX} = \frac{36260 + 11850}{2} + \sqrt{\left(\frac{25410}{2}\right)^2 + 11430^2}$$

= 42410 PSI

∴ M.S. = 78000/42410 − 1 = +.84

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 2-9556-62
SHEET No. 1-13

AIRCRAFT:		PREPARED BY	DATE
C105		[illegible]	9/23/55
		CHECKED BY	DATE

CHECKING BENDING ABOUT FILLET OF UPSTANDING LEG –

$f_b = 45200$ PSI (P 6)

$f_s = 9650$ PSI (P 9)

$f_t = 225^{*}/2.4 \times .08 = 1170$ PSI

$$\sigma_{MAX} = 23185 + \sqrt{23185^2 + 1170^2}$$

$$= 46385$$

& M.S. $= 78000/46385 - 1 = +.68$

* SEE P 5

FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. D-0506-6
SHEET NO. 1-19

AIRCRAFT: C 105

PREPARED BY: [illegible] DATE: 9/23/55
CHECKED BY: DATE:

CHECKING BENDING OF LOWER R/H BEAM CAP @ SECTION b-b (SEE P 5)

SINCE VERTICAL REACTION @ CAMLOC IS TAKEN THRU WEB @ RIVS. BENDING IS NOT CRITICAL -

CHECKING CRIPPLING OF HORIZ. FLG.

f_b = 34200 PSI (P 8)

F_{cc} = 65000 PSI (REPUBLIC CURVE)

∴ M.S. = 65000 / 34200 − 1 = +.90

FROM ABOVE MARGINS BOTTOM CAP OF R.H. BEAM IS O.K. —

CHECKING L/H BEAM LOWER CAP -

SECTION PROPERTIES — (REF. P 6)

ITEM	A	x	Ax	Ax^2	I_{oy}
3	.0558	-.032	-.00179	.00001	.00002
4	.0488	.280	.01370	.00383	.00226
Σ'	.1046		.0135	.00384	
− RIV.	.0101	.34	-.00514	.00175	—
Σ	.0945		.00836	.00209	.00228

$\bar{x} = .00836/.0945 = .088$

$I_y = .00228 + .00209 - .00836 \times .088$

$= .00464\ in^4$

CHECKING LOWER CAP FOR ECCENTRIC AXIAL SHEAR

$q = 100\ \#/in$

$M = 100 \times .55 = 55\ \#in/in$

FORM 1318A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 740526-22
SHEET No. 1-15

AIRCRAFT:	PREPARED BY	DATE
C 105	[signature]	9/25/58
	CHECKED BY	DATE

PER ANALYSIS OF LOWER R/H CAP AS CONTINUOUS BEAM P-6 -

EQ (1) BECOMES

$$40.35\,R_1 + 13.5\,R_4 + 12220 = 0$$

EQ (2) -

$$19.2\,R_1 - 9.6\,R_4 + 1055 = 0$$

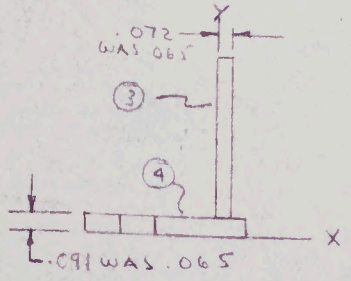
$\therefore R_1 = 13705/67.35$
$= -204$ #

$R_4 = 29655/9.6 = 308$ #

$\therefore M_{MAX} = 204 \times 4.8 - 55 \times 4.8$
$= 715$ #m.

$f_b = 715 \times .572 / 464 \times 10^{-5}$
$= 88000$ PSI

CHOOSING NEW SECTION FOR LOWER CAP L/H BEAM - (REF. P6)



ITEM	A	$\bar{x}$	Ax	Ax^2	I_{oy}
B	.0597	.036	.00217	.00008	.00003
4	.0683	.280	.01920	.00537	.00307
Σ'	.1280		.01703	.00545	.00310
-R1V	.0142	.34	.00482	.00165	—
Σ	.1138		.01221	.00480	.00310

$\bar{X} = .01221 / .1138 = .108"$

$I_y = .00310 + .00480 - .01221 \times .108$
$= .00668$ in^4

$\therefore f_b = 715 \times .542 / .00668 = 58100$ PSI

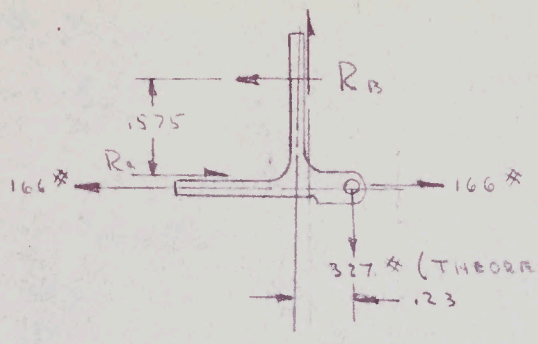
#

A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-62
SHEET No. 1-16

AIRCRAFT:		PREPARED BY	DATE
C105		[illegible]	9/25/55
		CHECKED BY	DATE

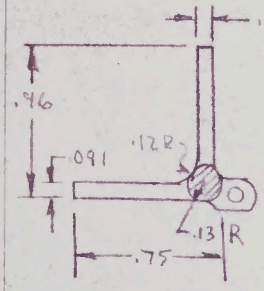
NEXT CONSIDERING TORQUE LOADING ON BOTTOM CAP L/H BEAM - (SEE P5)



TOTAL TORQUE ON CROSS SECTION -
= 327 x .23 = 75 #in.

∴ $R_B = R_a = 75/.575 = 131$ #

SOLVING FOR TORQUE SHEAR CONSTANTS -



$J = J_F + J_w + 16\alpha R^4$

WHERE :

$J_F = a b^3 \left[\frac{1}{3} - 0.21 \frac{b}{a}\left(1 - \frac{b^4}{12a^4}\right)\right]$

$= .75 \times .00075 \left[\frac{1}{3} - .21 \times .121 \left(1 - \frac{.000068}{12 \times .32}\right)\right]$

$= .000173$ in^4

$J_w = c d^3 \left[\frac{1}{3} - .105 \frac{d}{c}\left(1 - \frac{d^4}{192 c^4}\right)\right]$

$= .87 \times .000236 \left[\frac{1}{3} - .105 \times \frac{.072}{.87}\left(1 - \frac{.000036}{192 \times .57}\right)\right]$

$= .0000667$ in^4

$\alpha = .b/d \left(.107 + .0776 \times \frac{.12}{.091}\right) = \frac{.091}{.072}(.177)$

$= .224$

DRM 1319A

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

REPORT NO. >-0556-62
SHEET NO. 1-17

AIRCRAFT:	PREPARED BY	DATE
C105	[illegible]	9/25/58
	CHECKED BY	DATE

$\therefore J = J_F + J_W + 16 \alpha R^4$

$= .000173 + .0000467 + 16 \times .224 \times .0028$

$= .00124$

T_{MAX} CALC. —

$$\frac{2R}{1+m^2}\left[1+\tanh\frac{2B}{\pi}\left\{.118\log_e\left(1-\frac{R}{\rho}\right)-.238\frac{R}{\rho}\right\}\right]\frac{T}{J}$$

$\rho = .13 \quad R = .13 \quad R/\rho = 1.0$

$(1 - R/\rho) = 2.00 \quad .238\ R/\rho = -.238$

$\log_e 2.00 = .693 \quad .118 \times \log_e 2.00 = .0820$

$\beta = 90° \quad \therefore 2\beta/\pi = 1.0$

$\tanh 2\beta/\pi = .762$

$\left\{.118\log_e(1-R/\rho) - .238\ R/\rho\right\} = .0820 + .238$

$= .320$

$m = \pi R^2/A = \pi \times .13^2/.114$

$= .465$

$\therefore m^2 = .215 \quad \therefore 1 + m^2 = 1.215$

$2R/1+m^2 = .26/1.215 = .2140$

$\therefore T_{MAX} = .2140\left[1 + .762 \times .320\right] T/J$

$= .266\ T/J = .266 \times 75/.00124$

$= 16100$ PSI

CHECKING BENDING OF UPSTANDING LEG @ FILLET

$M_o = 131 \times .55 = 72.2$ #in.

TAKING I FOR EFFECTIVE $W = \frac{1}{2} \times 4.8$

$= 2.4"$

$I = \frac{1}{12} \times 2.4 \times .072^3 = 72 \times 10^{-6}$

ORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. 7-0558-62
SHEET NO. 1-18

AIRCRAFT: C105

PREPARED BY	DATE
[signature]	9/25/58
CHECKED BY	DATE

$$f_b = \frac{72.2 \times .072}{2 \times 72 \times 10^{-6}} = 36100 \text{ PSI}$$

CHECKING BEAM BENDING WITH REVISED LOWER CAP — REF P 6 -

ITEM	A	x	y	Ax	Ax^2	Ay	Ay^2	I_{ox}	I_{oy}
1	.0272	.36	2.80	.00980	.00350	.076	.213	—	.00087
2	.0924	.020	1.63	.00185	.00004	.1510	.2460	.0717	.00001
3	.0597	-.032	.50	-.00217	.00008	.02985	.01493	.00355	.00003
4	.0683	.280	.032	.01920	.00537	.0218	.00007	.00005	.00307
5	.0310	.480	-.016	.01490	.00710	-.00050	—	—	.00275
Σ	.2786			.01358	.01609	.2586	.474	.0753	.00673
- R.V.	.0193	.34	.0165	.00656	.00223	.00032	—	—	—
Σ	.2593			.03702	.01386	.2583	.474	.0753	.00673

$\bar{x} = .03702 / .2593 = .143"$

$\bar{y} = .2583 / .2593 = 1.00"$

$\bar{I}_x = .474 + .0753 - .2583$
$= .291 \text{ in}^4$

$\bar{I}_y = .00673 + .01386 - .03702 \times .143$
$= .0153 \text{ in}^4$

$\therefore f_b = \frac{4060^* \times 2}{.291} = 28000 \text{ PSI}$

FOR COMP FLG. $F_{cc} = 33000$ (REF. P 3)

$\therefore M.S. = 33000 / 28000 - 1 = +.18$

SEE P FOR UPPER CHORD CHECK AS COLUMN.

* SEE P16

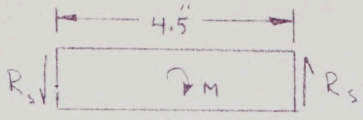
FORM 1319A

A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-62
SHEET No 1-19

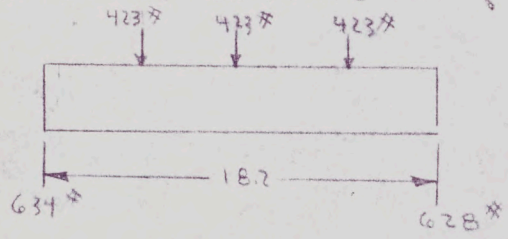
AIRCRAFT:		PREPARED BY	DATE
C105		[illegible]	9/26/55
		CHECKED BY	DATE

CHECKING LOWER CAP FOR TENSION —
IN ADDITION TO LOADING PER P (3)
THE BEAM WILL BE SUBJECT TO A
SECONDARY DOWNWARD LOAD AT EACH
STA. LOC. (TIE IN FOR STUB STIFFENERS)



WHERE M = 75 #m
$\therefore R_s = 75/4.5 = 16.5$ #

REVISED BEAM LOADING IS: (REF. P 3)



$\therefore$ MAX M_o = 4060 #in

$$\# \quad f_b = \frac{4060 \times 1}{.291} = 14000 \text{ PSI (TENSION)}$$

CHECKING LOWER CAP L/H BEAM FOR
COMBINED LOADING —

FROM P12	$f_{b_1} = 58100$ PSI	LATERAL BENDING
" P14	$f_{s_2} = 16100$ PSI	TORQUE SHEAR
" P15	$f_{b_3} = 36100$ PSI	LOCAL BENDING
" P15	$f_t = 1660$ PSI	MEMBRANE TEN.
" P15	$f_{b_4} = 28000$ PSI	BEAM BENDING

FORM 1316A

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

REPORT No 7-0566-66
SHEET No 124

AIRCRAFT:		PREPARED BY	DATE
C 105		[signature]	9/26/55
		CHECKED BY	DATE

TOTAL STRESS AT FILLET OF UPSTANDING LEG -

$f_b = 36100$ T

$f_s = 16100$

$f_t = 1170$ PSI SEE P(10A).

$f_{MAX} = \frac{18635}{2} + \sqrt{18635^2 + 16100^2}$

$= 43435$ PSI T

$\therefore M.S. = 78000/43435 - 1 = +.80$

TOTAL STRESS @ EDGE OF SKIN FLG. -

$f_b = 58100$ PSI T

$f_{b_1} = 14000$ PSI T

$\Sigma = 72100$

$\therefore M.S. = 78000/72100 - 1 = +.08$

CHECKING CRIPPLING -

$f_b = 58100$

$F_{cc} = 65000$ (REPUBLIC CURVES)

$\therefore M.S. = 65000/58100 - 1 = +.11$

FORM 1319A

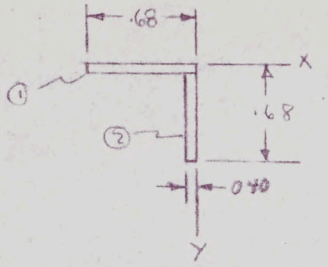
A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. 7-0556-62
SHEET NO. 1-21

AIRCRAFT: C105		PREPARED BY Powell	DATE 9/16/55
		CHECKED BY	DATE

CHECKING UPPER FLG. FOR COLUMN STABILITY -

THE EFFECTIVE CROSS SECTION OF CAP -



ITEM	A	x	A x	Ax^2	I_{oy}
1	.0272	.34	.00925	.00315	.00105
2	.0256	.020	.00051	.00001	—
Σ	.0528	.360	.00976	.00316	.00105

$\bar{x} = \bar{y} = .00976 / .0528 = .184$

$\bar{I}_x = \bar{I}_y = .00316 + .00105 - .00976 \times .184$
$= .00237$

$\therefore \rho = \left(\frac{.00237}{.0528}\right)^{\frac{1}{2}} = .213$

USING CAP FULL LENGTH = 18.2"

$\frac{L}{\rho} = 18.2 / .213 = 85$

F_{cr} BASED ON EULER EQ -

$\frac{P}{A} = \frac{\pi^2 E I}{L^2 A} = \frac{3.14^2 \times 10.5 \times 10^6 \times .00237}{18.2^2 \times .0528}$

$= 14100$ PSI

IN VIEW OF STRESS = 28000 PSI (P 15) THE CAP WILL BE STABILIZED AT STA. 562.7

ARM 1319A

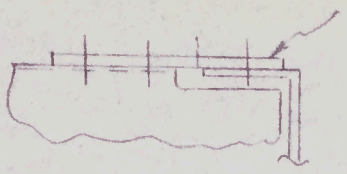
A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0566-62
SHEET No. 1-22

AIRCRAFT:

PREPARED BY	DATE
[illegible]	9/26/55
CHECKED BY	DATE

CAP STABILIZED AT STA 562.7 —



THEN:

$\frac{L}{\rho} = \frac{9.1}{.213} = 42.8$

∴ F_{COL} = 40000 PSI (REPUBLIC CURVE)

∴ USE F_{CL} = 33000

∴ M.S. = 33000/29300 − 1 = +.12

CHECKING ENDS OF BEAM FOR SHEAR TRANSFER —

USING (3) AD4 RIVS:

LOAD/RIV. = 700/3 = 233 #

PALLOW AD4 IN .032" = 365

∴ M.S. = 365/233 − 1 = +.57

CHECKING BEAM WEBS FOR SHEAR —

LOAD/in. = 700/2.1 = 333 #/in.

F_{cr} (BUCKLING) =

PANEL WIDTH = 2.1 t = .040

LENGTH = 4.8

∴ f_{cr} = 28500 PSI (REPUBLIC CURVE)

∴ f_{allow} = 28500 × .04 = 1140 #/in.

∴ M.S. = 1140/333 − 1 = +2.4

* DIST B/T UPPER CHORD C.G. & LOWER CHORD RIVS. —

FORM 1319A

A. V. ROE CANADA LIMITED
MALTON : ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

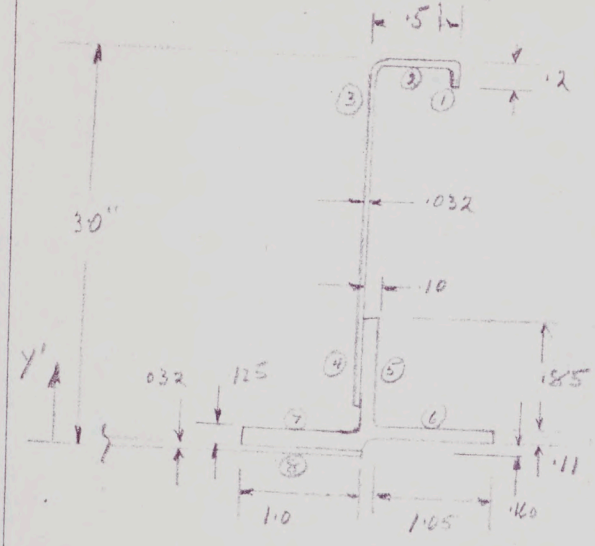
AIRCRAFT:		REPORT NO. 7/0556/62
		SHEET NO. 1-23
		PREPARED BY: S. YOUNG — DATE: JAN 8/63.
		CHECKED BY: — DATE:

REVISED BEAM SECTION PROPERTIES

FROM PG 3; MAX. SHEAR = 700 #

MAX. B.M. = 4480 "#

DIVE BRAKES OPEN
-5.5 P.S.I. ULT. SUCTION



ITEM	b × t	A	Y'	AY'	AY'²
1	.2 × .032	.0064	2.9	.0185	.0538
2	.5 × .032	.0160	3.0	.0480	.1440
3	.5 × .032	.0160	2.75	.0440	.1210
4	.5 × .036	.0180	.695	.0111	.0077
5	.085 × .10	.0850	.695	.0590	.0410
6	1.05 × .11	.1155	.247	.0285	.0071
7	1.0 × .125	.1250	.0945	.0118	.0011
8	30 × .032	.0307	.016	.0008	—
Σ		.4106	.54	.2217	.3757

$I = .3757 - .4106 \times .54^2 = .2911 \text{ IN}^4$

FORM 1319A

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

REPORT No. 7/0556/22
SHEET No. 1-24

AIRCRAFT:		PREPARED BY	DATE
		S. YOUNG	JAN 16/55
		CHECKED BY	DATE

COMP CAP $y' = \frac{.1105}{.0384} = 2.92$ $\quad Y = 2.92 - .54 = 2.38$

TENSION CAP $y' = \frac{.1112}{.3722} = .298$ $\quad Y = .54 - .298 = .24$

$$f_{b_c} = \frac{4480 \times 2.38}{.2911} = 36700 \text{ PSI}$$

ITEM	$b_c t$	b/t	F_c	A	P
1	.2×.032	6.2	65000	.0165	1200
2	.5×.032	15.6*	65000	.0480	3120
3	.5×.032	15.6	19000	.0480	865
Σ			45300	.1145	5185

$$MS = \frac{45300 \times .795}{36700} - 1 = 0$$

SHEAR

EFFECTIVE DEPTH = 2.38 + .24 = 2.62"

$$f = \frac{700}{2.62} = 267 \text{ \#/"} \qquad Y = \frac{267}{.032} = 8350 \text{ PSI}$$

$$\gamma_{cr/y} = 5.35 \times 10^{7} \left(\frac{.032}{2.1}\right)^{2} = 12400 \text{ PSI}$$

SHEAR RESISTANT WEB

FORM 1319A

A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7/0556/62
SHEET No 1-25

AIRCRAFT:		PREPARED BY	DATE
		S. YOUNG	JAN 16/62
		CHECKED BY	DATE

SHEAR ATTACH TO 552 & 572

MAX RIVET LOAD = $\frac{200}{5} + \frac{200 \times 5}{1.65} = 316^{\#}$

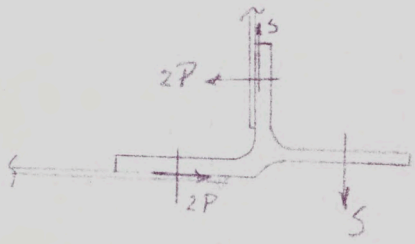
1N470AD5 SHEAR = .187 × 596 =

BRG OBG 1 = .775 × 509 = 405#

$MS = \frac{405}{316} - 1$ .28

EXTRUDED 'T' ATTACHMENT TO STUB FORMERS

SEE PG 5.21



S = 327# -5.5 PSI SUCTION CASE

$2P = \frac{.65 \times 327}{180} = 266^{\#}$

$P = 133^{\#}$

BM AT MID POINT OF RADIUS

$= \left(.30 - \frac{.125}{2}\right) 133 = 31.5^{11\#}$

$I/c = \frac{.9 \times .064^3}{6} = .000615$

$f_b = \frac{31.5}{.000615} = 51200$ PSI

$MS = \frac{.73 \times 70000}{51200} - 1$ 0

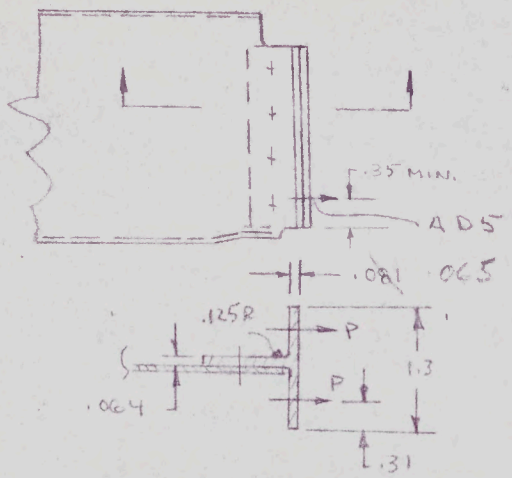
FORM 1319A

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

REPORT No. 7-0516-62
SHEET No. 1-21

AIRCRAFT:		PREPARED BY	DATE
		[signature]	9/26/55
		CHECKED BY	DATE

DUE TO HIGH LOCAL LOADING ON RIV. THRU UPSTANDING LEG (SEE P 5) THE CONNECTION OF STUB STIFFS. TO BEAMS WILL BE REVISED —



WHERE: $P = 418/2 = 209$ #

ASSUMING EFFECTIVE WIDTH = .7"

$I = \frac{1}{12} \times .7 \times .081^3 = 319 \times 10^{-7}$

$M = 209 \times .3 = 62.7$

$f_b = \frac{62.7 \times .0405}{319 \times 10^{-7}} = 79500$ PSI

$M.S. = 78000/79500 - 1 = -.02$

WITHOUT REGARD FOR SECTION FORM FACTOR M.S. IS ADEQUATE.

LOCKHEED STRESS MANUAL

$t = .065$ 75ST $\quad c = .31$

ALLOW $P = 250 + \frac{70000 F_{TY_L}}{40000} = 437$ #

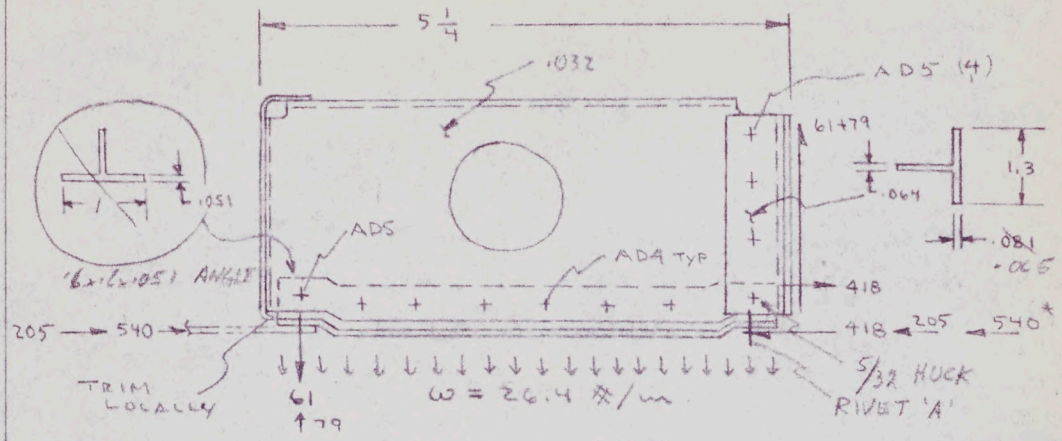
$M.S. = \frac{437}{209} - 1$ 1.0

FORM 1319A

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

REPORT NO. T-0556-62
SHEET NO. 1-27

AIRCRAFT:	ANALYSIS OF STUB STIFFENERS STA 557, 562 & 567	PREPARED BY	DATE
C105		[signature]	9/27/55
		CHECKED BY	DATE



FOR ABOVE LOADING SEE . . . . . .

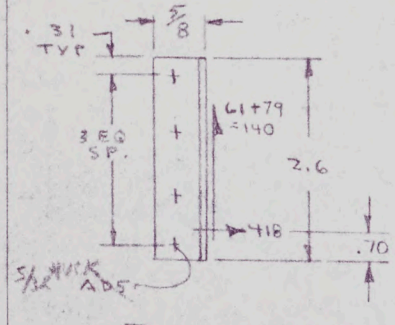
CHECKING END RIVS. IN BOTTOM CAP -

P_{ALLOW} - 2 ADS IN .051 = 2 x 590 = 1180 #

P_{ACTUAL} = 418 + 205 + 540 = 1163 #

∴ M.S. = 1180/1163 − 1 = +.01

CHECKING END TEE RIVS -



I_p RIVS -

$= \Sigma 2 \times [1^2 + .33^2] = 2.2$

∴ $M_o = 418 \times .63 + 140 \times .31$

$= 306$ # in

$P_{MX} = \frac{306 \times 1.33}{2.2} = 185$ #

$P_{X\,TOT.} = 185 + 418/4 = 290$ #

$P_{Y} = 140/4 = 35$ #

∴ $P_{T.T} = (290^2 + 35^2)^{1/2}$

$= 293$ #

* SEE P7

FORM 1319A

A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No 7-0556-6
SHEET No 1-38

AIRCRAFT: C 105

PREPARED BY	DATE
Paul	7/27/55
CHECKED BY	DATE

* M.S = 450/293 − 1 = +.53

CHECKING TENSION RIV. —

F_t = 750* (REF. GLM RIV. TENSION ALLOW.)

F_s = 590

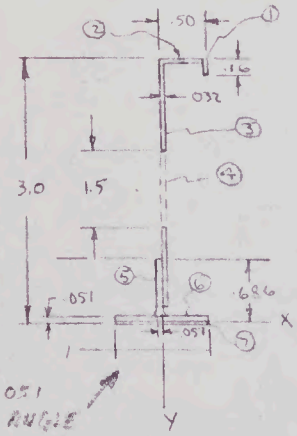
$R_t = \frac{210}{750} = .291$ $\qquad R_s = \frac{140}{590} = .238$

$M.S. = \frac{1}{\sqrt{R_t^2 + R_s^2}} - 1$ (CONSERV.)

$= \frac{1}{\sqrt{.291^2 + .238^2}} - 1 = \frac{1}{.377} - 1 = +1.65$

FOR BENDING CHECK OF END TAB SEE P 21 REPORT - - - - .

CHECKING BENDING OF STUB STIFFNER —



ITEM	A	y	Ay	Ay²	I_{ox}
1	.0051	2.92	.0149	.0435	—
2	.0160	2.98	.0476	.1420	—
3	.090	1.60	.1440	.2300	.058
4	.048	1.50	.072	.1080	.009
5	.032	.368	.0118	.0043	.0011
6	.051	.025	.0013	—	—
7	.099	.016	.0016	—	—
Σ	.2431		.2212	.3118	.0501
− RIV.	.026	.010	.0026	.0003	—
Σ	.2671		.2186	.3115	.0501

$\bar{y} = .2186/.2671 = .82$

$\bar{I}_x = .0501 + .3115 - .2671 \times .82$

$= .1426 \text{ in}^4$

ORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 2-0226-62
SHEET No. 1-29

AIRCRAFT: C105

PREPARED BY	DATE
[illegible]	9/27/55
CHECKED BY	DATE

COMP IN BOTTOM CAP —

MAX M_0 = 276 ft-m AT INBD RND

FOR FULL BEAM SECTION (REF. P 2)

$A = .3631$ $\quad Ay^2 = .5275$

$Ay = .3626$ $\quad I_{0x} = .0681$

$\therefore \bar{Y} = \frac{.3630}{.3626} = 1.0$

$I = .0681 + .5275 - .3631 \times 1.0$

$= .2325$

$f_b = \frac{276 \times 1}{.2325} = 1190$ PSI C

$f_c = 745/.3631 = 2050$ C

$\Sigma = 3240$ PSI C

$F_{cr} = 24000$ FOR LOWER CAP SKIN FLGS.

$\therefore$ M.S. $= 24000/3240 = +6.15$

CHECKING WEB SHEARS —

$f_s = 140/.032(3-1.5) = 2920$ PSI

WEB COLLAPSING SHEAR* —

$$\tau = k\left[\tau_h\left(1-\left(\frac{D}{h}\right)^2\right) + \tau_c\sqrt{D/h}\right]^{c'/b}$$

$$= .797\left[14000(1-.287) + 22700 \times .686\right]^{1.25/2.25}$$

$$= .797\left[25600\right]^{.555}$$

$$= 11300 \text{ PSI}$$

$\therefore$ M.S. $= 11300/1460 = +6.3$

* FORMULA PER NACA ARR 158

RM 1310A

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

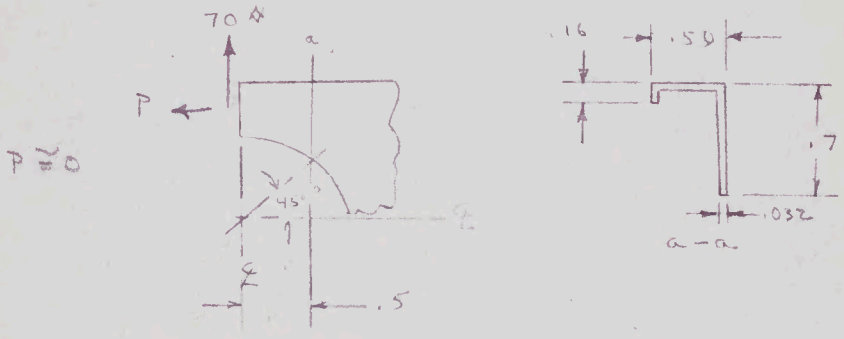
REPORT No. 7-0556-62
SHEET No 1-30

AIRCRAFT:	PREPARED BY	DATE
C105	[signature]	9/26/55
	CHECKED BY	DATE

CHECKING UPPER FLG.

$f_b = \frac{276 \times 2}{.2375} = 2380$ PSI T (NEGLIGIBLE)

IN REGION OF LIGHTENING HOLE —



SECTION PROPERTIES (REF P 2)

$A_f = .0425$ $\quad A_y^2 = .3375$ $\quad M = 35$

$A_y = .1195$ $\quad \Sigma I_{ox} = .0008$

$\bar{y}' = .1195/.0425 = 2.82$

$\bar{I}_x' = .0008 + .3375 - .1195 \times 2.82$

$= .0023$ in^4

$f_b = \frac{35 \times .18}{.0023} = 27400$ PSI COMP. UPPER FLG.

F_{cc} FOR ½" PORTION OF FLG. = 67500 PSI
(REPUBLIC MANUAL)

$\therefore MS = 67500/27400^{-1} = +1.46$

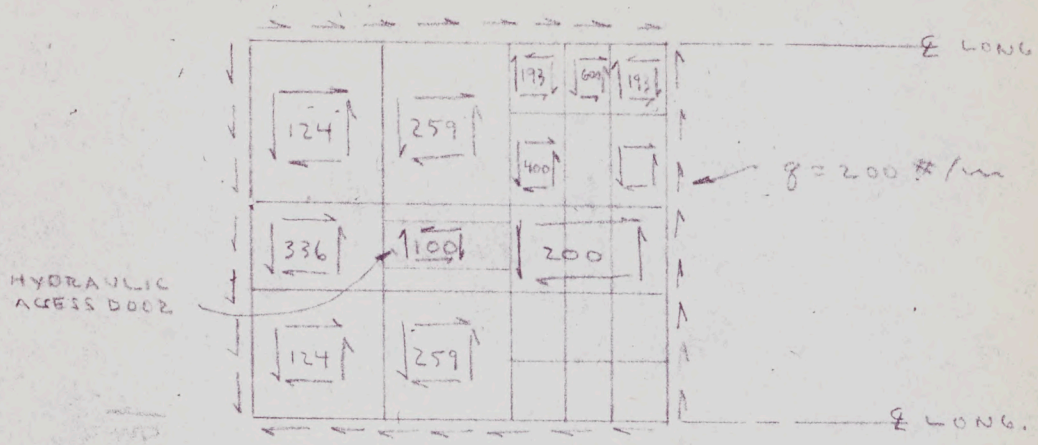
FORM 1310A

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

REPORT No. 1-0538 62
SHEET No. 2-1

AIRCRAFT:		PREPARED BY	DATE
C105	ACCESS DOOR HYDRAULIC C/S	[illegible]	
		CHECKED BY	DATE

THE LOADING SYSTEM FOR LOWER SKIN IS AS FOLLOWS -



IN ADDITION TO THE ABOVE GENERAL LOADING A PRESSURE DIFFERENTIAL OF 5.5 PSI IS ACTING ON DOOR AREA.

CHECKING STRESS IN DOOR SKIN -

A CERTAIN ADDITIONAL TENSION LOAD WILL BE ASSUMED ACTING IN CONCERT WITH THE MEMBRANE EFFECTS OF THE 5.5 PSI LOADING. SINCE AT STA 485 NO LOWER SKIN IS AVAILABLE THE SKIN TENSION STRESS WILL BE ZERO AT THIS POINT (DUE TO ANY NEG. FUSELAGE BENDING) FROM "DIVE BRAKE BAY STA 499.7 - 1-524.2" REPORT NO. - - - - , AN EFFECTIVE SKIN TENSION OF 2858 PSI WAS CALC. AT STA 538. THEREFORE BY SIMILAR REASONING - ASSUMING SKIN PANELS CAN ACCEPT ONLY THE UPPER LIMIT OF CRITICAL BUCKLING SHEAR (75#/in).

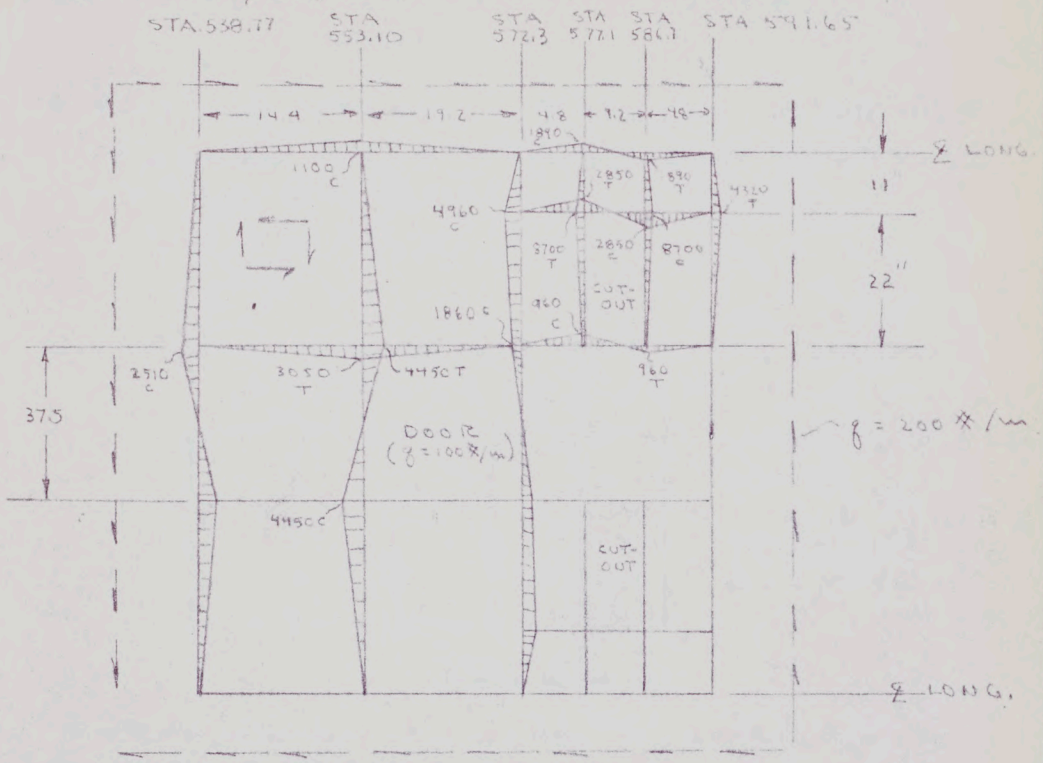
FORM 1319A

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

REPORT NO. 7-6-32-62
SHEET NO 2 - 2

AIRCRAFT:	PREPARED BY	DATE
C105	Ewell	9/19/55
	CHECKED BY	DATE

AXIAL LOADING IN LOWER PANEL DUE TO 200 #/in. APPLIED SHEAR —



NOTE:
ABOVE LOADINGS ARE REVERSIBLE
AXIAL LOADINGS ARE LOADS APPLIED TO STIFFENING MEMBERS.

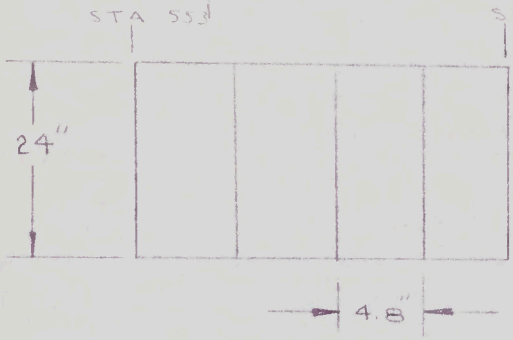
FORM 1319A

THEN MAX SHEAR FROM CONGERON PER SIDE = 75(591.65 - 538.77) + 4030
= 8030 #

& TENSILE STRESS = 8030/1.6 = 5000 PSI
ASSUMING 2/3 OF THIS LOAD ACTS AT CENTER OF DOOR,

f_t = 3330 PSI

CHECKING MEMBRANE EFFECTS ON DOOR -



t = .032
b = 4.8
a = 24.0
E = 10.5×10^6
P = 5.5 PSI

THEN USING RAS. DATA SHEETS 02.09.01 & 02.09.02 -

FOR EDGES FREE TO ROTATE -

$(P/E)(b/t)^4 = \left(\frac{5.5}{10.5\times10^6}\right)\left(\frac{4.8}{.032}\right)^4 = 265$

$E(t/b)^2 = 10.5 \times 10^6 (.032/4.8) = 467$

$a/b = 24.0/4.8 = 5.0$

FROM CURVES -

$f_1/E(b/t)^2 = 24.3$

$f_3/E(b/t)^2 = 14$

$\therefore f_1 = 24.3 \times 467 = 11350$ PSI

$f_3 = 14.0 \times 467 = 6550$ PSI

WHERE f_1 IS TENSION (MAX.) @ CENTER OF PLATE & f_3 IS MEMBRANE TENSION.

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

REPORT NO. 7-0356-62
SHEET NO 2-4

AIRCRAFT:		PREPARED BY	DATE
C.105	ACCESS DOOR HYDRAULIC C/S		
		CHECKED BY	DATE

CONSIDERED PLATE AS HAVING FIXED EDGES & USING CURVES ON R.A.S. DATA SHEET 02.09.02 -

FOR ABOVE CONSTANTS

$f_1/E(b/t)^2 = 23.2 \quad \therefore \quad f_1 = 10850$ PSI

$f_2/E(b/t)^2 = 71.0 \quad \therefore \quad f_2 = 33200$ PSI

$f_3/E(b/t)^2 = 10.5 \quad \therefore \quad f_3 = 4900$ PSI

WHERE:

f_1 = MAX STRESS @ CENTER OF PLATE

f_2 = " " @ MID POINT OF LONG SIDE

f_3 = MEMBRANE TENSION.

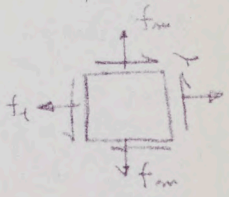
THE HIGHER STRESSES DUE TO A FIXED EDGE CONDITION WILL BE USED FOR MEMBRANE EFFECTS.

CHECKING PRINCIPLE STRESSES IN SKIN -

$f_t = 33200 + 3330 = 36500$ PSI

$\tau = 100/.032 = 3130$ PSI

$f_m = 4900$



$$\therefore \sigma_{MAX} = \frac{36500+4900}{2} + \sqrt{\left(\frac{31600}{2}\right)^2 + 3130^2}$$

$= 36800$ PSI

$M.S. = {}^{*}58000/36800 - 1 = +.57$

* F_{tu} @ 250° F. (REF ANC-5)

FORM 1319A

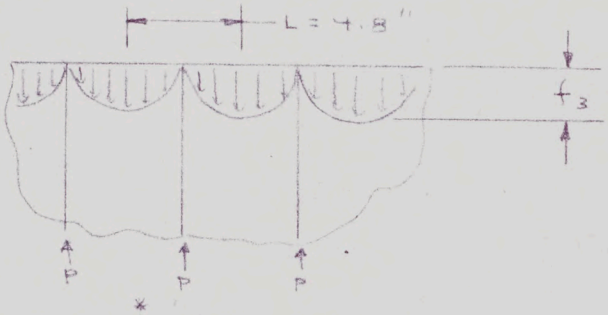
A. V. ROE CANADA LIMITED
MALTON - ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-62
SHEET No. 2 - 5

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S	PREPARED BY	DATE
C105		Paull	
		CHECKED BY	DATE

THE MEMBRANE TENSION EFFECTS ON EDGE MEMS –

- DUE TO MEMBRANE TENSION THE DOOR EDGE MEMBERS WILL BE SUBJECT TO A UNIFORM LOADING WHOSE DISTRIBUTION WILL BE ASSUMMED AS PARABOLIC. ON THE SHORT SIDE OF THE PANEL THIS WILL RESULT IN AXIAL COMP. IN FRAME SEGMENTS FORMING THE DOOR TRANSUERSE STIFFENERS –



$P = \frac{2}{3} \times 4.8 \times 6550^{*} \times .032$

$= 672$ # C

THESE STIFFENERS WILL ALSO BE SUBJECT TO A UNIFORM LOADING EQUAL TO . 5.5 x 4.8 = 26.4 #/in

THE FASTENERS ON THE EDGES WILL BE LOADED TO –

6550 x .032 = 210 #/in

∴ TOTAL LOAD / RIV. –

$\sqrt{200^2 + 210^2} = 293$ #/in SHEAR

NEGLECTING SLIGHT TENSION COMPONENT – USE AN426-AD4 PALLOW = 210#
USING 5/8" SPACING –

M.S. = 336/293 - 1 = +.15

* MEMBRANE TENSION WITH PINNED EDGES

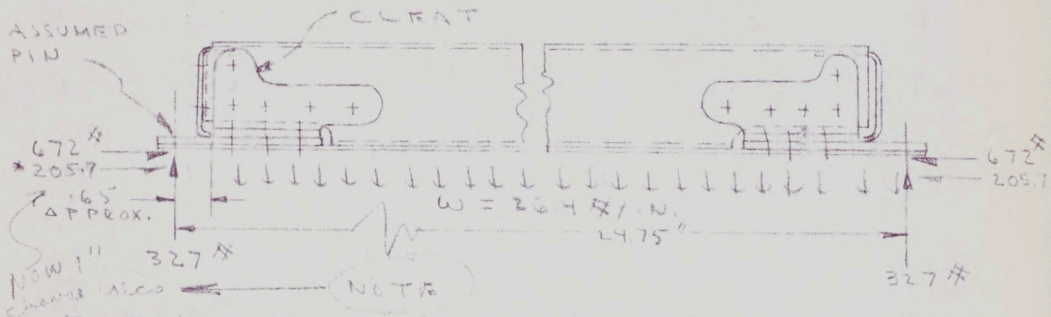
FORM 1219A

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

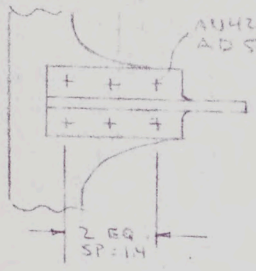
REPORT NO. 7-0536-62
SHEET NO. 2 - 6

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S	PREPARED BY	DATE
C105			
		CHECKED BY	DATE

CHECKING TRANSVERSE STIFFENERS -



END LOADING SHOWN ENTERS STIFF. BY WAY OF 6 RIVS. THRU END D'B'RS & CLEATS.



∴ LOAD / RIVET : (SHEAR)

$S_b = 878/6 = 146$ #

CALC. FOR TENSILE LOADS -

MOMENT AT BASE OF CLEAT
= 327 x .65 = 213 # in.

ASSUMING RIVS. THRU BASE OF CLEAT ARE LOADED ACCORDING TO Σx^2 -

$P = \frac{M x}{\Sigma x^2}$ WHERE $\Sigma x^2 = (.31^2 + 1.01^2 + 1.71^2)2$
$= 8.032$

$= \frac{213 \times 1.71}{8.032} = 45.3$ # TENSION

ALLOW LOADS FOR ANGLEADS -
TENSION — 683 #
SHEAR — 560 #

$\therefore R_b = 146/560 = .131$

$R_s = 45.3/683 = .067$

$\therefore M.S = \frac{1}{\sqrt{.131^2 + .067^2}} - 1 = +2.16$

* SEE [illegible]

FORM 1319A

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

REPORT No 7-0556-82
SHEET No 2 - 7

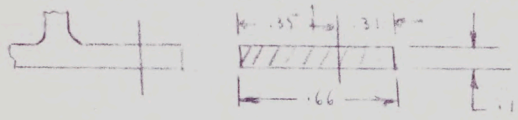
AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S
C 105	

PREPARED BY	DATE
CHECKED BY	DATE

CHECKING FOR BENDING @ FILLET OF END CLEAT-

$M_o = 45.3 \times 31 = 14.0$ in-lbs.

I - TAKING FLG WIDTH = .35 + .31 = .66

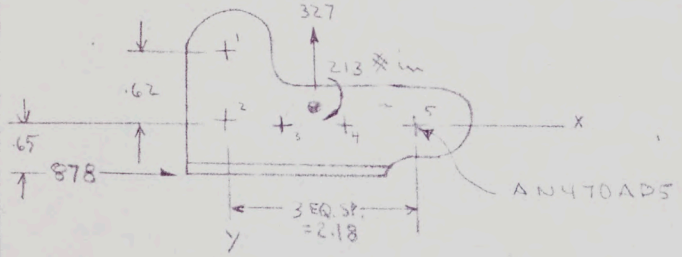


$I = \frac{1}{12} \times .66 \times .125^3 = .00011 \text{ in}^4$

$f_b = \frac{14 \times}{2 \times 8 \times 11 \times 10^{-5}} = 8000 \text{ PSI}$

M.S. = 72000/8000 − 1 = +8.0

CHECKING CLEAT RIV. LOADS AT STIFFENER ATTACHMENT—



$\Sigma M = 213 - 878 \times .77 = 464$ #/in

$P_x = 878/5 = 177 \rightarrow$

$P_y = 327/5 = 65 \uparrow$

$\Sigma y^2 = .62^2 = .382 \text{ in}^2$

$\Sigma x^2 = .72^2 + 1.4^2 + 2.18^2 = 7.126 \text{ in}^2$

$\bar{x} = 4.30/5 = .86''$

$\bar{y} = .62/5 = .124''$

$\bar{I}'_x = .3820 - .075 = .307$

$\bar{I}'_y = 7.126 - 3.70 = 3.426$

$I_p = \Sigma = 3.733$

Riv.	P_{Mx}	P_{My}	P_x	P_y	P
1	← 62.2	107 ↓	177 →	65 ↑	122
2	15.5 →	107 ↓			198
3	15.5 →	17.3 ↓			200
4	15.5 →	71 ↑			237
5	15.5 →	164 ↑	177 →	65 ↑	330

CRM 1318A

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

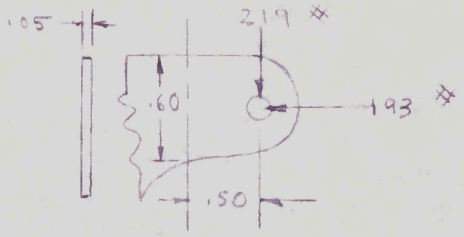
REPORT No. 7-0556-62
SHEET No 2 - 8

AIRCRAFT:		PREPARED BY	DATE
C105	ACCESS DOOR HYDRAULIC C/S	Buell	
		CHECKED BY	DATE

USING AN470AD4 —
PALLOW = 385 #

∴ M.S. = 385/330 − 1 = +.16

CHECKING END OF CLEAT



M = 219 x .5 = 110 # in.

f_c = 193/.030 = 6430 PSI

$I = \frac{1}{12} \times .05 \times .60^3 = .00081$

∴ f_b = 110 x .30 / .00081 = 40800 PSI

∴ TOTAL STRESS

f_t = 40800 − 6430 = 33370

∴ M.S. = 78000/33370 − 1 = +1.33

f_c = 40850 + 6430 = 47230 PSI

∴ M.S. = 70000/47230 − 1 = +.48

CHECKING STABILITY OF COMP. EDGE

CONSIDER AS "ENDS PINNED, ONE SIDE FREE, ONE SIDE PINNED".

a = .72 ∴ a/b = 1.8 $t/b = \frac{.050}{.40}$
b = .40 *K = .7 = .125

∴ $F_{cr} = K E (t/b)^2$
= .7 x 10.5 x 10^6 x .0156 = 115000 PSI ∴ USE COMP. YIELD AS ABOVE

* BRUHN PAGE D2.3

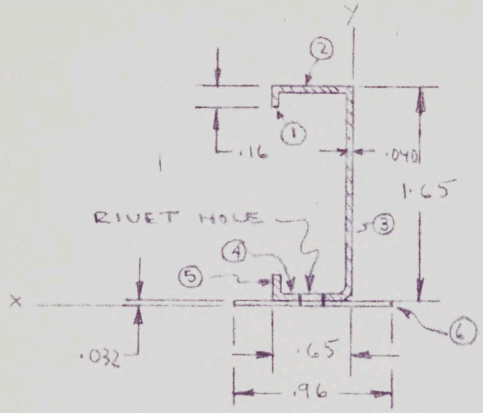
FORM 1319A

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

REPORT No 7-0556-12
SHEET No 2 - 9

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S	PREPARED BY	DATE
C105		[illegible]	9/1
		CHECKED BY	DATE

CHECKING STIFFENER



MAT'L - 75ST6

ITEM	A	Y	AY	AY²	X	AX	AX²	I'_{ox}	I'_{oy}
1	.0064	1.602	.01025	.01642	.630	.00403	.00254	.00001	—
2	.0244	1.662	.04055	.06739	.305	.00744	.00227	—	.00075
3	.0628	.857	.05382	.04612	.020	.00126	.00003	.012687	.00001
4	.0244	.052	.00127	.00006	.305	.00744	.00227	—	.00075
5	.0064	.112	.00071	.00008	.630	.00403	.00254	.00001	—
6	.0307	.016	.00049	.00001	.320	.00982	.00314	—	—
Σ'	.1551		.10709	.13008		.03402	.01179	—	—
− RIVET	−.0090	0	0	0	.32	−.00288	−.00092	—	—
Σ	.1461		.10709	.13008		.03114	.01187	.012887	.00151

$\bar{Y} = .732$

$\bar{X} = .2131$

$\bar{I}_x = .14247 - .10709 \times .732 = .06458 \text{ in}^4$

$\bar{I}_y = .01338 - .03114 \times .2131 = .00674 \text{ in}^4$

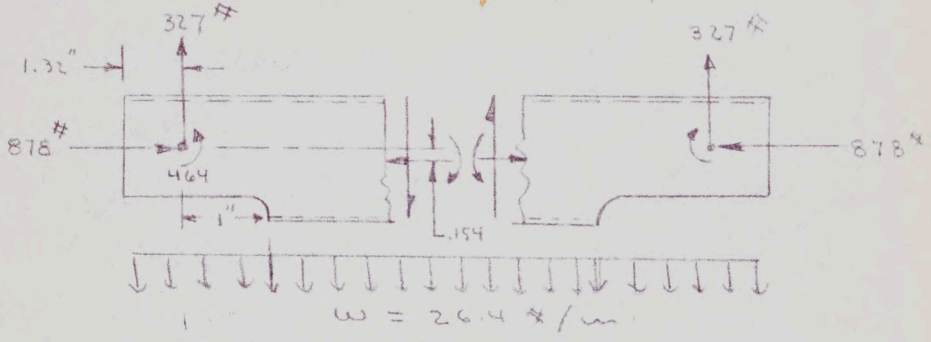
FORM 1319A

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

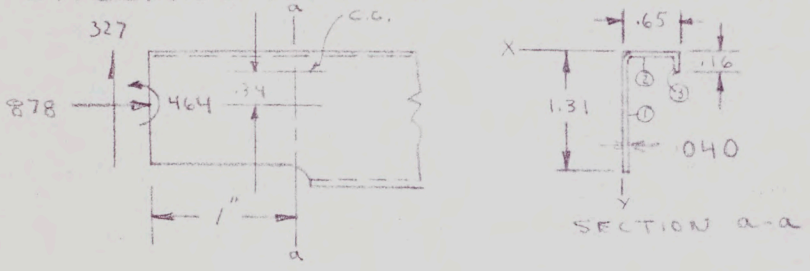
REPORT No. 7-0556-62
SHEET No. 2 - 10

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S	PREPARED BY	DATE
C105		[illegible]	9/1/55
		CHECKED BY	DATE

CONSIDERING STIFFENER UNDER LOAD -



CHECKING END OF STIFF FOR LOCAL EFFECTS-



CALC. FOR SECTION PROPERTIES:

ITEM	A	Y	AY	AY^2	X	AX	AX^2	I_{ox}	I_{oy}
1	.0524	.655	.0343	.0225	.020	.00105	.00002	.00748	—
2	.0228	.020	.0005	.00001	.325	.00742	.00241	—	.00062
3	.0064	.030	.0005	.0004	.610	.00390	.00238	.00001	—
Σ	.0816		.0353	.02291		.01237	.00481	.00749	.00062

$\therefore \bar{Y} = .0353/.0816 = .433"$

$\bar{X} = .01237/.0816 = .152"$

$\bar{I}_x = (.02291 + .00749) - .0353 \times .433$

$= .02353 - .01530 = \boxed{.01510\ in^4}$

$\bar{I}_y = (.00481 + .00062) - .01237 \times .152$

$= \boxed{.00355\ in^4}$

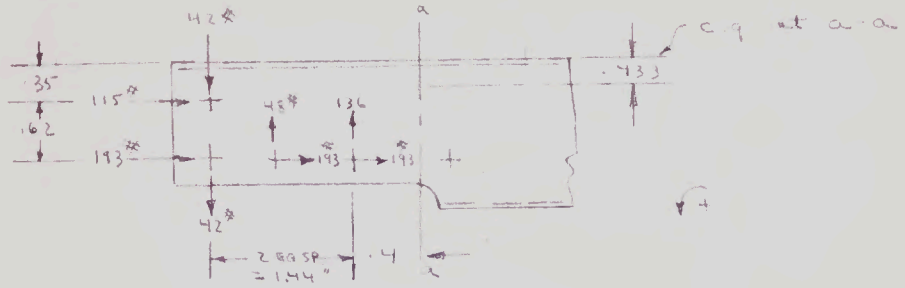
FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0552-66
SHEET NO. 2 of 11

AIRCRAFT		PREPARED BY	DATE
C105	ACCESS DOOR HYDRAULIC -1/8	[illegible]	9/7/55
		CHECKED BY	DATE

LOCAL BENDING CHECK -



ΣM_{a-a} -

$= 193 \times 2 \times .54 + 84 \times 1.84 - 115 \times .08 - 48 \times 1.12 - 136 \times .4$

$= 351$

$f_b = \frac{351 \times .88}{.0151} = 20500$ PSI C

$f_c = 878 / .0816 = 10750$ PSI C

$\Sigma = 31250$ PSI C

$\therefore M.S. = 64000 / 31250 - 1 = +1.05$ SEE BELOW

CHECKING CRIPPLING ON UNSUPPORTED EDGE - @ a-a

ASSUME STABILIZED WITH PIN CONDITION AT C.g. - THEN FOR 3 SIDES PINNED 1 SIDE FREE -

$a = .40$
$b = .88$
$a/b = .455$ $K = 3$

$\therefore F_{cy} = 3 \times 10.5 \times 10^6 \left(\frac{.040}{.88}\right)^2$

$* = 65000$ PSI

$\therefore M.S. = 65000 / 31250 - 1 = +1.07$

*COMP. YIELD GOVERNS

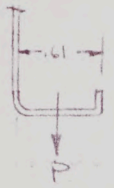
FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. 7-0556-62
SHEET NO. 2 - 12

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S	PREPARED BY	DATE
C 105		[illegible]	9/9/55
		CHECKED BY	DATE

CHECKING SKIN FLG. FOR LOCAL BENDING



$w = 26.4$ #/IN

LOAD / RIV (RIV. SP = .165)

$P = 26.4 \text{ \#/IN} \times .165 = 17.2$ #

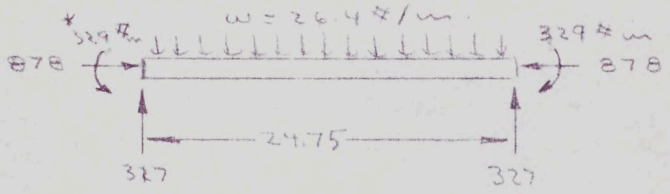
$M_o = .305 \times 17.2 = 5.25$ #in.

$$I = \frac{1}{12} \times .65 \times .040^3$$
$$= 348 \times 10^{-8} \text{ in}^4$$

$$\therefore f_b = \frac{5.25 \times .020}{348 \times 10^{-8}} = 30100 \text{ PSI}$$

THIS STRESS WILL BE COMBINED ORTHOG-ONALLY WITH AXIAL & BEAM BENDING STRESS EXISTING IN AREA. — SEE P 12

CHECKING STIFFENER AS BEAM-COL.



CONSIDERING BEAM COL. SUBJECT TO UNIFORM LOAD DIST. —

$$M_{MAX} = W J^2 \left(\sec \frac{U}{2} - 1 \right)$$

WHERE:

$$J^2 = EI/P = \frac{10.5 \times 10^6 \times .06458}{878}$$
$$= 772 \quad \& \; J = 27.8$$

$$U = L/J = 24.75/27.8 = .881 \text{ RAD} = 50.5 \text{ DEG.}$$

$$\sec \frac{U}{2} = 1.06$$

* (764 − 878 × .154)

FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-62
SHEET No. 2-13

AIRCRAFT:		PREPARED BY	DATE
C105	ACCESS DOOR HYDRAULIC C/S	J. Arnold	9/9/55
		CHECKED BY	DATE

$\therefore M_{MAX} = 264 \times 772 \left(.106\right) = 1224$ # in

CONSIDERING BEAM AS COMPOSED OF AXIAL + END COUPLES -

$M_{MAX} = M_{sec\ U/2}$
$= -329 \times 1.06 = -350$ # in

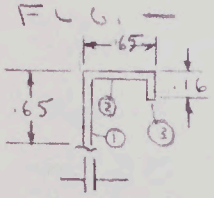
$\therefore$ TOTAL $M_{MAX} = 1224 - 350$
$= +874$ # in

$f_b = \frac{874 \times .92}{.06458} = 12400$ PSI

$f_c = 878/.1461 = 6000$ PSI

$\therefore f_{TOTAL} = 18400$ PSI

CHECKING CRIPPLING ALLOW ON COMP. FLG. -



ELEMENT	F_{cc}	$F_{cc} \times b$
1	70000	11200
2	70000	45500
3	26500	17200
		Σ = 73900

$F_{CULT} = 73900/1.46 = 50600$ PSI (AV.)

$\therefore$ M.S. $= 50600/18400 - 1 = +1.75$

FOR TENSION FLG. -

$f_t = 12400 - 6000 = 6400$ t

COMBINING WITH LOCAL RIV. BENDING

$f_{t\ TOTAL} = \left(6400^2 + 30100^2\right)^{1/2} = 30700$ PSI

$\therefore$ M.S. $= 72000/30700 - 1 = +1.34$

ORM. 17-9A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

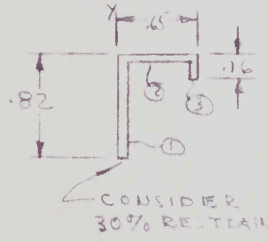
REPORT No. 7-0396 (2)
SHEET No. 2 - 14

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S.	PREPARED BY	DATE
C105		[signature]	9/7/55
		CHECKED BY	DATE

CHECKING FOR COLUMN STABILITY —

THE BEAM WILL BE CONSIDERED TO BE STABLE SO LONG AS THE UPPER PORTION OF CROSS SECTION CAN RESIST THE APPLIED LOADS —

USING FOLLOWING EFFECTIVE CROSS SECTION —



ELEMENT	A	x	Ax	Ax²	I_{oy}'
1	.0328	.020	.00066	.00001	—
2	.0228	.325	.00742	.00241	.00062
3	.0064	.610	.00390	.00238	—
Σ	.0620		.01198	.00480	.00062

$\therefore \bar{x} = .01198/.0620 = .193$

$\bar{I}_{ox} = .00542 - .01198 \times .193 = .00311$ in⁴

$\therefore \rho = \sqrt{\frac{.00311}{.0620}} = .225$

$\frac{L}{\rho} = 24.75/.225 = 110$

CALC. AV. CRIPPLING ALLOW —

ITEM	b/t	Fcc	Fcc x b
1	.82	27500*	22500
2	.65	70000	45500
3	.16	70000	17200
	Σ = 1.63		Σ = 85200

$\therefore F_{cc\ ULT} = 85200/1.63 = 52000$ PSI

USING JOHNSON-EULER CURVES - BRUHN P B1.7
FOR C = 1 & f = 52000 $P_{ALLOW} = 9000$ PSI

WITH f_b TOTAL = 12400

M.S. = $9000/12400 - 1 = -.51$

* INTERPOLATED FOR 30% FIXITY. * SEE P 12

ORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. A-0330 62-1
SHEET No. 2 - 15

AIRCRAFT:	ACCESS DOOR HYDRAULIC
C105	C/S

PREPARED BY	DATE
Ewell	9/12/55
CHECKED BY	DATE

DUE TO FOREGOING NEC MARGIN BATTENS WILL BE USED TO STABILIZE THE INB'D (COMP.) FLG. THE BATTENS WILL BE SPACED TO DIVIDE THE UNSUPPORTED FLG. INTO THIRDS — CONSIDERING BATTENS ACTING IN PAIRS — FOR OVERALL COLUMN EFFECT

$$*P_{cr} = \frac{\pi^2 EI}{L^2} \times \frac{1}{1 + \frac{\pi^2 EI}{L^2}\left(\frac{ab}{12EI_b} + \frac{a^2}{24EI_c}\right)}$$

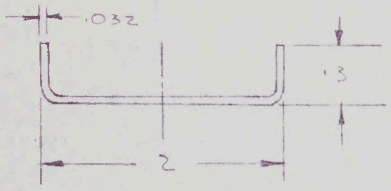
WHERE

$I_c = .00311$ SEE P 13

$$I = 2I_c + \frac{A_c b^2}{2} = 2 \times .00311 + .0620 \times \frac{4.8^2}{2}$$

$$= .721 \text{ in}^4$$

CONSIDERING BATTENS —



$$I_b = \frac{1}{12} \times .032 \times 1.936^3 + \left(.3 \times .032 \times .984^2\right) \times 2$$

$$= .01925 + .01920$$

$$= .03845 \text{ in}^4$$

$a = 25.50/3 = 8.50$

$b = 4.8$

$L = 25.50$

$$\frac{\pi^2 EI}{L^2} = \frac{\pi^2 \times 10.5 \times 10^6 \times .721}{25.50^2} = 115000$$

$$\frac{ab}{12EI_b} + \frac{a^2}{24EI_c} = \frac{8.50 \times 4.8}{12 \times 10.5 \times 10^6 \times .03845} + \frac{8.50^2}{24 \times 10.5 \times 10^6 \times .00311}$$

$$= 8.4 \times 10^{-6} + 92 \times 10^{-6}$$

$$= 100.4 \times 10^{-6}$$

* SEE P 145 "ELASTIC STABILITY" TIMOSHENKO

FORM 1319A

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

REPORT NO. 7-0326 (2)
SHEET NO 2-10

AIRCRAFT:	ACCESS DOOR HYDRAULIC 5/5	PREPARED BY	DATE
C105		[illegible]	9/1/55
		CHECKED BY	DATE

$$\therefore P_{cr} = 115000 \frac{1}{1 + 115000\left(100 \times 10^{-6}\right)}$$

$$= 9200\#$$

$$\Sigma P_c \text{ ACTUAL} = 1840 \times .0620 \times 2 = 2300\#$$

$$\therefore M.S. = 9200/2300 - 1 = +3.0$$

THE ABOVE MARGIN IS HARDLY MORE THAN AN INDICATION OF COLUMN STRENGTH. IT MERELY INDICATES THAT AS A LATTICED COLUMN THE STIFFNERS ARE STABLE.

CHECKING UPPER FLANGE AS PINNED COLUMN B/T BATTENS -

$C = 2$ ASSUMED (SEE PAG "PLASTIC STABILITY" TIMO.)

$$\frac{L}{\rho} = 36$$

USING MODIFIED EULER EQ - (PARABOLIC)

$$f_c = 52000^{\#} - \frac{52000^2 (36^2)}{4 \times 1 \times \pi^2 \times 10.5 \times 10^6 \times 2}$$

$$= 52000 - \frac{7750}{2} = 48125^{\#} \text{ PSI}$$

$$\therefore M.S. = 48125^{\#}/18450 - 1 = +1.61$$

* CRIPPLING ALLOW.

FORM 1319A

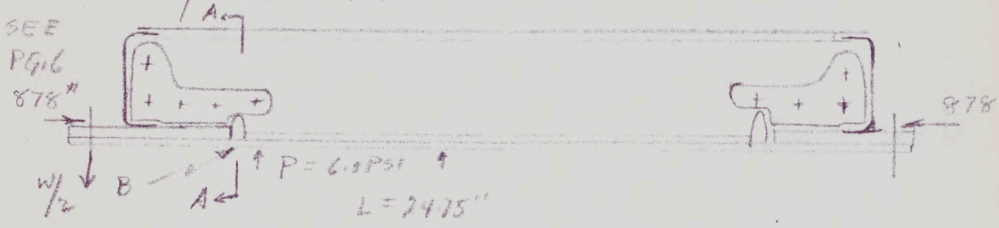
A. V. ROE CANADA LIMITED
MALTON ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556 52
SHEET No. 2-17

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	DEC. 1/56
		CHECKED BY	DATE

CHECK TRANSVERSE STIFFENERS FOR MISSILE BLAST PRESSURE CASE

P_A - 6.0 PSI ULT.



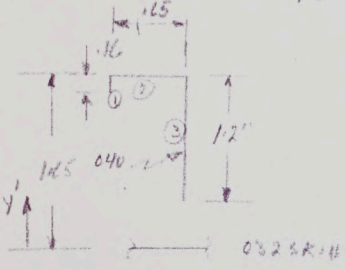
$$W/2 = \frac{6.0 \times 4.8'' \times 24.15''}{2} = 356\#$$

AT SECTION A-A, POINT B

$$P = 878\# \text{ COMP}$$

$$BM = +878 \times (.032 + .125) + \frac{6.0 PSI \times 4.8'' \times 3.2^2}{2} - 356 \times 3.2''$$

$$= +138 + 147 - 1130 = -845 \text{ in-}\#$$



USE .032" SKIN

ITEM	A	Y'	AY'	AY'²	I_o
1	.0048	1.57	.0076	.0121	—
2	.0260	1.6	.0416	.0665	—
3	.0480	1.05	.0504	.0529	.0057
SKIN	.0307	0	0	0	—
Σ	.1095	.91	.0996	.1315	.0057

$$I = .1315 + .0057 - .1095 \times .91^2 = .1281$$

SKIN Y_c = .91

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

REPORT No 7-0556 64
SHEET No 2-18

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	DEC. 1/55
		CHECKED BY	DATE

AT CENTROID OF SECTION A-A

$P = 878$ # COMP

$BM = -845$ "# $- 878 \times .91 = 1645$ "#

SKIN $f_c = \frac{1645 \times .91}{.1281} + \frac{878}{.1095}$

$= 11700 + 7940 = 19{,}640$ PSI COMP

ALLOW INTER RIVET BUCKLING STRESS

$t/t = \frac{.190}{.1052} = 28.2$

$F_{in} = 37000$ PSI

$MS = \frac{.92E \times 37000}{19640} - 1$ .173

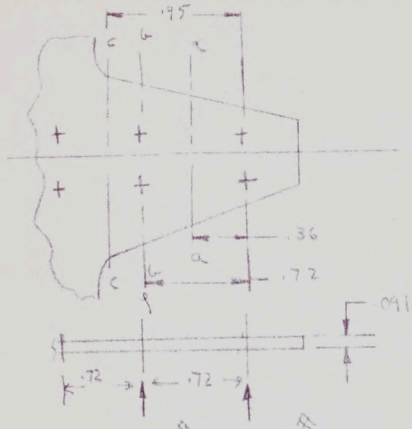
FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

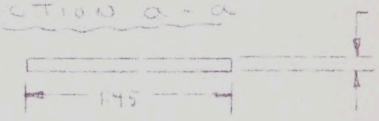
REPORT No. 7-0556-62
SHEET No. 2-13

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S	PREPARED BY	DATE
C105		[illegible]	9/13/57
		CHECKED BY	DATE

CHECKING BENDING ON DOOR EDGE D'B'R' -



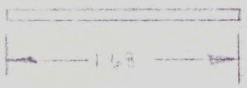
SECTION a - a



$I = \frac{1}{12} \times 1.45 \times .091^3$
$= 87 \times 10^{-6}$

$A = 1.45 \times .091$
$= .132 \text{ in}^2$

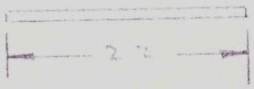
SECTION b - b



$I = \frac{1}{12} \times 1.68 \times .091^3$
$= 101 \times 10^{-6}$

$A = 1.68 \times .091$
$= .153$

SECTION C C



$I = \frac{1}{12} \times 2.2 \times .091^3$
$= 136 \times 10^{-6}$

$A = .200$

BENDING STRESS -

AT SECTION a-a

$f_b = \frac{32.6 \times .091}{2 \times 87 \times 10^{-6}}$

$= 17000 \text{ PSI}$

$f_c = 292 / .132 = 2210 \text{ PSI}$

$\Sigma f = 19210 \text{ PSI}$

TRYING D'B'R .072" t -

$f_b = \frac{32.6 \times .072}{2 \times 44 \times 10^{-6}} = 26700$

$f_c = 292 / .104 = 2800$

$\Sigma = 29500 \text{ PSI}$

* FOR RIV. TENSION LOADING SEE P-5

RM 1319A

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

REPORT No. 7-0556-62
SHEET No. 2-30

AIRCRAFT:	ACCESS DOOR HYDRAULIC C/S	PREPARED BY	DATE
C105		[illegible]	
		CHECKED BY	DATE

AT SECTION 6-6 - (.072 D'B'R)

$f_b = \frac{65.2 \times .072}{2 \times 51 \times 10^{-6}} = 46000$ PSI

$f_c = 292 / .121 = 2410$ PSI

$\Sigma = 48410$ PSI

AT SECTION C-C -

$M_o = 90.6 \times .95 + 57 \times .23 = 99$ ft lbs

$\therefore f_b' = \frac{99 \times .072}{2 \times 66.8 \times 10^{-6}} = 53200$ PSI

$f_c = 584 / .121 = 3680$

$\Sigma = 56880$ PSI

USING STRESS LEVEL = 60000 PSI
FOR SHORT COLUMN BUCKLING -

M.S. = $60000 / 56880 - 1 = +.05$

SEE P 19 FOR CRITICAL M.S.

USE D'B'R = .072 .75 T6 MIN.

CHECKING END FASTENERS & MEMBERS -

TOTAL PRESSURE LOADING -

$25.50 \times 17 \times 5.5 = 2390$ #

UNIT LOAD / IN OF PERIPHERY

$= 2390 / (25.50 \times 17) = 56.3$ #/in. *

SHEAR / in. - USE 200 #/in.

PORTION OF LOAD IN EDGE MEMBERS @ STAS 553 & 572 = 1/3 x 56.3 = 18.8 #/in.

* DUE TO TRANSVERSE STIFFNESS OF DOOR ENTIRE PRESSURE LOAD IS ASSUMED IN LONG. EDGE MEMS.

FORM 1519A

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

REPORT No. E-0556-62
SHEET No. 2-21

AIRCRAFT:		PREPARED BY	DATE
C105	ACCESS DOOR HYDRAULIC C/S	[illegible]	9/15/55
		CHECKED BY	DATE

AT TRANSVERSE EDGE D'BR -
THE STRUCTURAL ADEQUACY OF
THE DOOR WILL BE DETERMINED
BY THE ABILITY OF THE D'BR TO
TRANSMIT 18.8 #/in. IN BENDING
& A MEDIAN STRESS (MEMBRANE) PLUS SKIN TENSION
OF 8880 PSI (SEE P 2)

$I/in = \frac{1}{12} \times 1 \times .072^3 = 30 \times 10^{-6}$

$\therefore f_b = \frac{18.8 \times 1.2^* \times .072}{2 \times 30 \times 10^{-6}}$

$= 27000$ PSI

MEMBRANE TENSION -

$8880 \times .032/.072 = 4400$ PSI

$\therefore \Sigma f = 31400$ PSI

$M.S. = 72000/31400 - 1 = +1.3$

FASTENER CHECK -
AT TRANSVERSE EDGE - CRITICAL
CAMLOCS @ APPROX. 2.5" C-C +

$P_{DIRECT} = 2.5 \times 18.8 = 47$ * TENSION
$P_{SHEAR} = 2.5 \times 200 = 500$ * SHEAR
$P' = 2.5 \times .032 \times 8880 = 800$ * SHEAR
Σ SHEAR $= (500^2 + 800^2)^{\frac{1}{2}} = 945$ *
PALLOW FOR CAMLOCS = *500*

∴ SPACE SCREWS B/T CAMLOCS OR
USE CAMLOCS @ 2.40/2 = 1.20"

$M.S. = 500/472 - 1 = +.06$

* DIST FROM RIV. TO FASTENER.
* BASED ON DEF.

CRM 1319A

A. V. ROE CANADA LIMITED MALTON - ONTARIO **TECHNICAL DEPARTMENT (Aircraft)**	REPORT NO. 7-0556 62 SHEET NO. 2-22
AIRCRAFT: C105	PREPARED BY: Powell — DATE: CHECKED BY: — DATE:

CHECKING D'BR FOR BENDING AT BASE OF CLEAT – NOTE → Change [illegible] – [illegible] now [illegible] 1.4

$M_0 = 225^* \times 1 = 225$ #in.

FOR EFFECTIVE WIDTH $= \frac{2}{3} \times 2.40 = 1.6$

$I = 101 \times 10^{-6}$ (.091 D'B'R.)

$\therefore f_b = \dfrac{225 \times .091}{2 \times .0001} = 102000$ PSI

$f_{b\,ALLOW} = 1.5 \times 72000 = 108000$ PSI

∴ M.S. $= 108000/102000 - 1 = +.06$ ←

CHECKING AREA AS WIDE BEAM PER P 123 "FORMULAS FOR STRESS & STRAIN" ROUARK –

$MAX\ S = \dfrac{3.05\ P}{t^2}$

$= \dfrac{3.05 \times 225}{.091^2} = 80000$ PSI

∴ M.S. $= 108000/80000 - 1 = +.35$ ←

IT WOULD APPEAR THAT THE TRUE M.S. WOULD LIE B/T ABOVE TWO EXTREMES

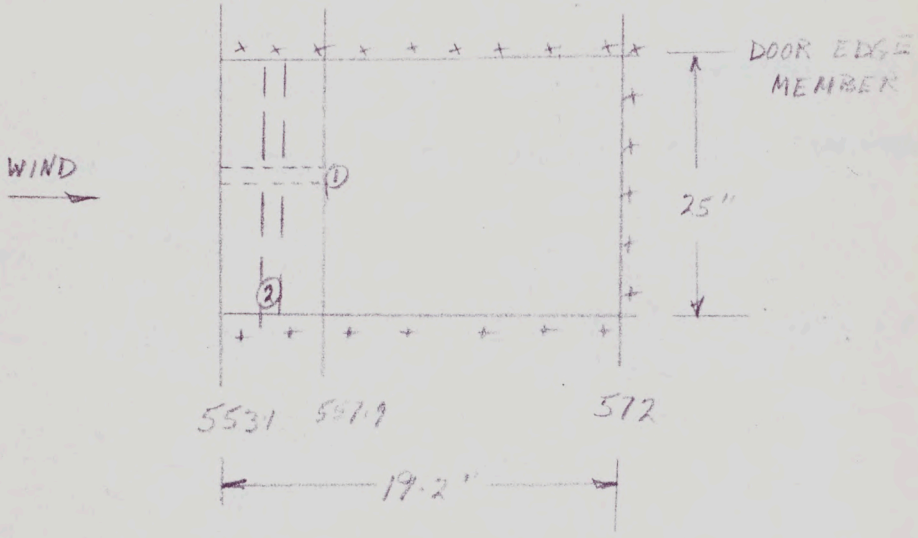
* SEE P 5 REPORT

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

REPORT No 7-0556-62
SHEET No 2-23

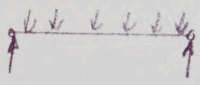
AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	OCT 23/55
		CHECKED BY	DATE

CONSIDER THAT THE LEADING EDGE OF THE DOOR IS NOT FASTENED BUT THAT THE OTHER THREE SIDES ARE FASTENED.



PRESSURE = 5.5 PSI ULT (SUCTION ON BOTTOM SKIN)
FRONT PANEL SIZE .032 × 25" × 4.8"

① CONSIDER 120% OF LOAD CARRIED BY BEAM BENDING ACTION BETWEEN FORMERS



$$\frac{\delta}{L} = \frac{5}{384}\,\frac{WL^3}{EI}$$

ON 1" STRIP WIDTH

$L = 4.8"$

$W = 1" \times 4.8" \times 5.5\ PSI = 26.4\ \#$

FORM 1309A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. [illegible] (L
SHEET NO. [illegible] 24

AIRCRAFT:	HYDRAULIC ACCESS DOOR	PREPARED BY	DATE
C105		S. YOUNG	OCT. 23/55
		CHECKED BY	DATE

$$I = \frac{bt^3}{12} = \frac{1'' \times .032^3}{12} = \frac{2.73}{10^6}$$

$$\delta = \frac{5}{384} \frac{26.4 \times 4.8^3}{10^7 \times \frac{2.73}{10^6}} = 1.385''$$

(2) CONSIDER 100% OF LOAD CARRIED BY MEMBRANE ACTION TO DOOR EDGE MEMBERS

FROM R&M 2094 $\delta^3 = \frac{3}{64} \frac{pL^4}{Et}$ FOR 1" STRIP

$$\delta^3 = \frac{3}{64} \frac{5.5 \times 25^4}{10^7 \times .032} = .316$$

$$\delta = .68''$$

COMBINING BOTH LOAD PATHS AND TRIAL & ERROR CALCULATIONS,

$$\delta = .57''$$

PLATE (BENDING) ACTION, $f_p = 2.265$ PSI

MEMBRANE (TENSION) ACTION, $f_m = 3.735$ PSI

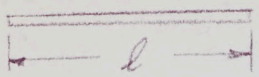
ORM 1394A

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

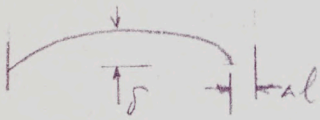
REPORT No. 7-0556-12
SHEET No. 2-25

AIRCRAFT:	
C105	HYDRAULIC ACCESS DOOR

PREPARED BY	DATE
S. YOUNG	OCT. 23/58
CHECKED BY	DATE



WITHOUT LOAD



UNDER LOAD

ASSUMING SINE CURVE DEFLECTED SHAPE,

SHORTENING $\Delta l = \frac{\pi^2 \delta^2}{4l} = \frac{\pi^2 \times .57^2}{4 \times 4.8''} = 0.167''$

SEE FOLLOWING PAGE FOR FORMULA.

FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-82
SHEET No 2-26

AIRCRAFT:	
C105	HYDRAULIC ACCESS DOOR

PREPARED BY	DATE
S. YOUNG	OCT. 25/56
CHECKED BY	DATE

REFERENCE ; THEORY OF ELASTIC STABILITY
- TIMOSHENKO Pg. 28

SHORTENING OF THE DEFLECTED CURVE

$$\lambda = \frac{1}{2}\int_0^l \left(\frac{dy}{dx}\right)^2 . dx$$

ASSUME A SINE CURVE DEFLECTED SHAPE, $y = \delta \sin \frac{\pi x}{l}$

$y = 0 \quad x = 0, l$
$y = \delta \quad x = l/2$

$$y' = \frac{\pi\delta}{l} \cos \frac{\pi x}{l}$$

$$\lambda = \frac{1}{2}\int_0^l \left(\frac{\pi\delta}{l} \cos \frac{\pi x}{l}\right)^2 dx = \frac{\pi^2\delta^2}{2l^2}\int_0^l \cos^2 \frac{\pi x}{l} . dx$$

AND $\int \cos^2 a\theta . d\theta = \frac{\theta}{2a} + \frac{\sin 2\theta}{4a}$

$$\lambda = \frac{\pi^2\delta^2}{2l^2}\left[\frac{\pi/l\, x}{2\pi/l} + \frac{\sin 2\pi/l . x}{4\pi/l}\right]_0^l = \frac{\pi^2\delta^2}{2l^2}\left[\frac{l}{2}\right]$$

$$\therefore \lambda = \frac{\pi^2\delta^2}{4l}$$

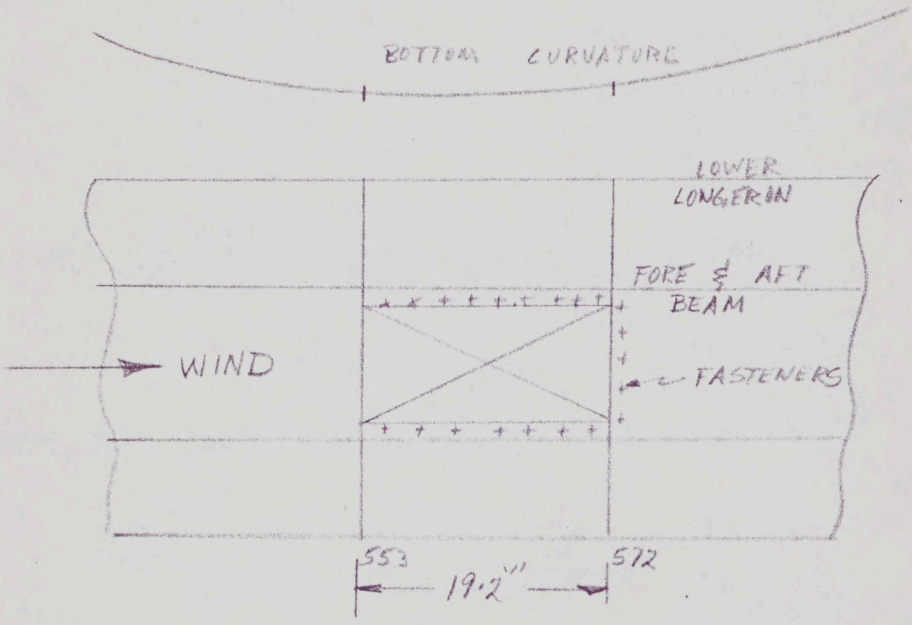
FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. T-0556-62
SHEET No. 2-27

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	OCT. 27/55
		CHECKED BY	DATE

COMPUTE "DOOR GAPPING" WITH NEGATIVE ℄ ON THE A/C ; i.e., TENSION IN THE BOTTOM SKIN.



BOTTOM SKIN TENSION STRESS IS 20,000 PSI AS QUOTED BY L. GOULD

$$\therefore \text{STRAIN} = \frac{f}{E} = .002 \text{ "/"}$$

℄ SHORTENING = .002"/" × 19.2" DOOR LENGTH

= .0384"

FORM 1319A

A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556 62
SHEET No. 2-28

AIRCRAFT:	
C105	HYDRAULIC ACCESS DOOR

PREPARED BY	DATE
S. YOUNG	OCT 24/55
CHECKED BY	DATE

COMPUTE DOOR STIFFENER DEFLECTION AT STA 557.9.

LOAD = 2.265 PSI × 4.8" BAY WIDTH × 25" BEAM LENGTH

= 272 #

BEAM I = .06458 IN^4 PG & HYDRAULIC ACCESS DOOR REPORT

$$\delta = \frac{5}{384}\frac{WL^3}{EI} = \frac{5}{384}\frac{272 \times 25^3}{10^7 \times .06458} = .086"$$

PUT THIS DETLECTION ON THE DOOR STIFFENERS AND CALCULATE DOOR "GAPPING."

ASSUME ℄ δ = .086" CONSERVATIVE

$$\therefore \Delta l = \frac{\pi^2 \delta^2}{4l} = \frac{\pi^2 \times .086^2}{4 \times 19.2} = .00095$$

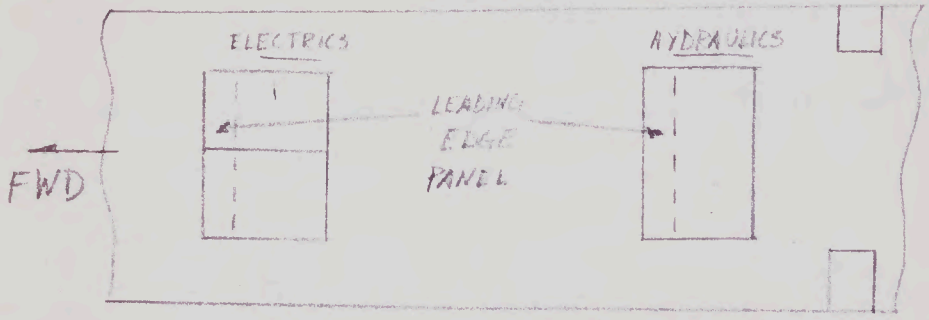
FORM 1319A

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

REPORT No. 7-0556-66
SHEET No. 2-29

AIRCRAFT:	HYDRAULICS ACCESS DOOR	PREPARED BY	DATE
C105		S. YOUNG	OCT. 28/65
		CHECKED BY	DATE

RECALCULATE DOOR 'GAPPING' WITH LIMIT LOADS.



BOTTOM SKIN SUCTIONS ARE CONSERVATIVE SINCE THE DOORS ARE BETWEEN THE DIVE BRAKES AND NOT IN A FORE & AFT LINE WITH THEM.

AERO MEMO 4643/20/J; SEPT 13/54 QUOTES 430 P.S.F. AT ELECTRICS DOOR & 375 PSF AT HYDRAULICS DOOR FOR SEA LEVEL, M=.95 CASE.

THE SKIN TENSION STRESS AT ELECTRICS DOOR IS 10 000 PSI & AT HYDRAULICS DOOR IS 20 000 PSI FROM L. GOULD.

THE L.E. PANELS ARE 4.9×13.25 (ELECTRICS) & 4.8×25 (HYDRAULICS).

BY INSPECTION, THE HYDRAULICS DOOR IS CRITICAL.

FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-62
SHEET No. 2 - [illegible]

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULICS ACCESS DOOR	S. YOUNG	OCT. 28/58
		CHECKED BY	DATE

HYDRAULICS DOOR

375 P.S.F. LIMIT SUCTION

$$\text{i.e } \frac{375}{144} = 2.6 \text{ PSI}$$

① 100% OF LOAD CARRIED BY BEAM BENDING ACTION BETWEEN FORMERS

$$\delta_L = \frac{5}{384}\frac{WL^3}{EI} = \frac{2.6 \text{ PSI}}{5.5 \text{ PSI}} \times 1.385 = 0.655"$$

② 100% OF LOAD CARRIED BY MEMBRANE ACTION TO DOOR EDGE MEMBERS.

$$\delta^3 = \frac{3}{64}\frac{pL^4}{Et} = \frac{2.6}{5.5} \times .316 = .1492$$

$$\delta = .53"$$

COMBINING BOTH LOAD PATHS AND TRIAL & ERROR CALCULATIONS

$$\delta = .391"$$

PLATE (BENDING) ACTION, $p_p = 1.55$ PSI

MEMBRANE (TENSION) ACTION, $p_m = 1.05$ PSI

FORM 1394

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

REPORT No. 7-0556-6L
SHEET No. 2 - 31

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	OCT. 28/55
		CHECKED BY	DATE

DOOR 'GAPPING'

$$\Delta l = \frac{\pi^2 \delta^2}{4l} = \frac{\pi^2 \times \cdot 391^2}{4 \times 4 \cdot 8} = \cdot 078''$$

UNDER SKIN TENSION OF 20,000 PSI

$$\Delta l = \frac{f}{E} l = \frac{20000}{10^7} \times 19 \cdot 2'' = \cdot 0384$$

$$\therefore \Delta l = \cdot 116''$$

THE SEATING OF THE DOOR ON THE FORMER EDGE MEMBER LIP IS

0·24" NOMINAL
0·20" ADVERSE TOLERANCES

26

FORM 1319A

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

REPORT No. 7-0556-62
SHEET No. 2-32

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	OCT. 28/55
		CHECKED BY	DATE

ELECTRICS DOOR

① 100% PLATE $p = \frac{430}{144} = 2.99$ PSI

$\delta = \frac{2.99}{5.5} \times 1.385 = 0.754"$

② 100% MEMBRANE

$\delta^3 = \frac{3}{64}\frac{pl^4}{Et} = \frac{3}{64}\frac{2.99 \times 13.25^4}{10^7 \times .032} = .01355$

$\delta = .238"$

BY TRIAL & ERROR, $\delta = .212$

$p_P = 0.84$ PSI

$p_M = 2.15$ PSI

DUE TO PRESSURE $\Delta l = \frac{\pi^2 \times .212^2}{4 \times 4.8} = .0231$

DUE TO SKIN TENSION $\Delta l = \frac{10000 \text{ PSI}}{10^7} \times 197 = .0197"$

$\therefore \Delta l = .0428"$

FORM 1319A

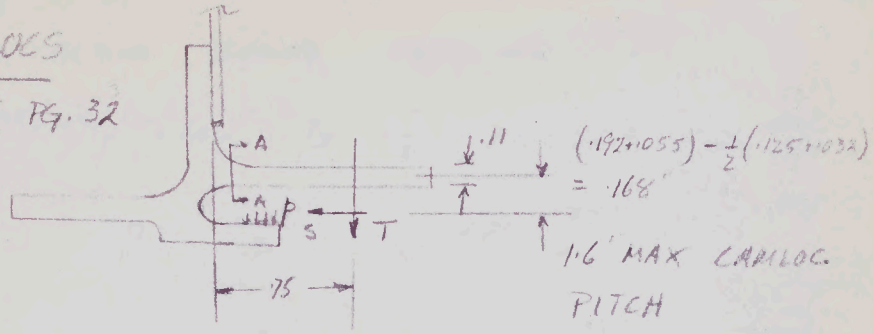
A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0256-62
SHEET No. 2-33

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	OCT 27/62
		CHECKED BY	DATE

CAMLOCS

SEE PG. 32



$(.192+.1055) - \frac{1}{2}(.125+.1032) = .168''$

1.6" MAX CAMLOC. PITCH

AT A-A

CONSIDER $f_b = 40000$ PSI $\qquad I/c = \frac{bt^2}{6} = \frac{1.6 \times .11^2}{6}$

$M = .75T + .168S$

$f = \frac{M}{I/c} \qquad 40000 = \frac{M}{\frac{1.6 \times .11^2}{6}}$

$\therefore M = \frac{40000 \times 1.6 \times .11^2}{6} = 129$ "# ALLOW.

THE HYDRAULIC ACCESS DOOR WAS CHECKED TO

CAMLOC SHEAR $= \left(200\ \#/_{"}\ \text{SHEAR} + 210\ \#/_{"}\ \text{MEMBRANE TENSION}\right) 1.6"\ \text{PITCH} = 468\ \#$

" TENSION $= \frac{1.6"\ \text{PITCH}}{1.2"\ \text{PITCH}} \times 47 = 63\ \#$

$\therefore$ DESIGN $M = .75 \times 63 + .168 \times 468 = 116$ "#

HENCE ACTUAL STRESS $= \frac{116}{129} \times 40000 = 36{,}000$ PSI

FORM 1319A

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

REPORT No. 7-6552-6
SHEET No. 2-34

AIRCRAFT:	
C105	HYDRAULICS ACCESS DOOR

PREPARED BY	DATE
S. YOUNG	OCT 27/55
CHECKED BY	DATE

BEAM ACTION BEARING PRESSURE, p

LOADING/" SPAN = $p_p \cdot \frac{4.8}{2}$ = 2.265 × 2.4 = 5.44 #/"

$p = \frac{5.44}{.20"\text{ LIP WIDTH}}$ = 27, PSI - LOW
(ADVERSE TOLERANCE)

LIP BM = 5.44 #/" SPAN × .28" = 1.52 "#/"

$I/c = \frac{bt^2}{6} = \frac{1" \times .07^2}{6} = \frac{.0049}{6}$

$f_b = \frac{1.52}{\frac{.0049}{6}}$ = 1870 PSI - LOW

WITH NO CAMLOCS FASTENED ON DOOR L.E.,

LOAD/CAMLOC ON DOOR EDGE MEMBERS

p_m = 3.235 P.S.I. δ = .57

$f_t = \frac{p l^2}{8t\delta} = \frac{3.235 \times 25^2}{8 \times .032 \times .57}$ = 13,900 PSI

T = 13900 × .032 = 445 #/"

LOAD/CAMLOC = 445 #/" × 16" MAX PITCH = 710 # MEMBRANE TENSION

THERE IS AN ADDITIONAL BOTTOM SKIN SHEAR LOAD ON THE DOOR CAMLOCS.

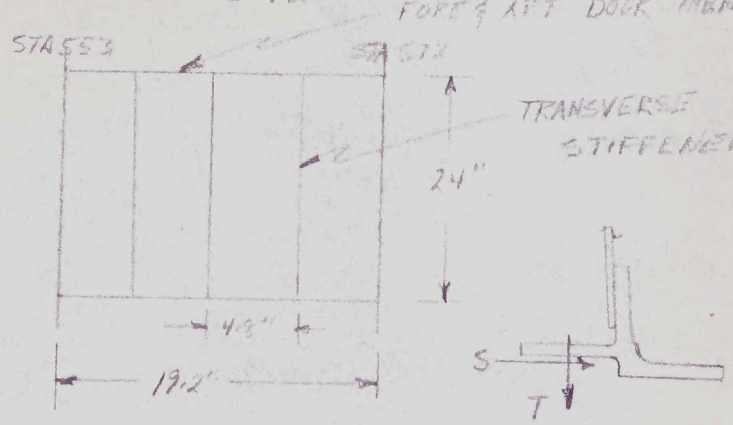
FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556-61
SHEET No. 2-35

AIRCRAFT:		PREPARED BY	DATE
C.105	HYDRAULIC ACCESS DOOR	S. YOUNG	OCT 28/58
		CHECKED BY	DATE

CAMLOCS ON FORE & AFT MEMBER SPANNING STA 553 - 572



FORMER 553

SHEAR / CAMLOC = 11" (200 #/" DOOR SHEAR → 209 #/" MEMBRANE ACTION)
= 468 # PG 26

TENSION / CAMLOC = 5.5 PSI × $\frac{4.8}{2}$ × 1.6 PITCH = 18.5 #

SEE PG 26

∴ M = .75 × 18.5 + 1.168 × 46.8 = 13.8 + 78.8 = 92.6

∴ $f_b = \frac{92.6}{\frac{1.6 \times .11^2}{6}}$ = 28,700 PSI

FORE & AFT DOOR MEMBER

SHEAR / CAMLOC = 200 #/" × 1.6 = 320 #

MEMBRANE ACTION NEGLIGIBLE.

CONSIDER TRANSVERSE STIFFENER LOAD TAKEN BY THREE CAMLOCS

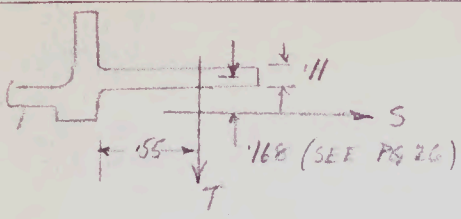
TENSION / CAMLOC = 5.5 PSI × 4.8" × $\frac{24"}{2}$ × $\frac{1}{3 \text{ CAMLOCS}}$ = 106 #

RM 1319A

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

REPORT No. 2-0556-12
SHEET No. 2.32

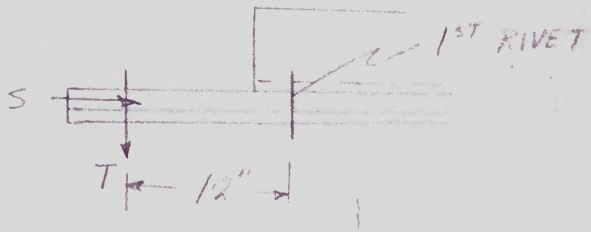
AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	OCT 28/58
		CHECKED BY	DATE



$$M = .168 \times 320 + .55 \times 106 = 53.8 + 58.3 = 112.1 \text{ "}\#$$

$$f_b = \frac{112.1}{\frac{1.6 \times .11^2}{6}} \rightarrow 34{,}800 \text{ PSI}$$

DOOR DOUBLER BENDING



$$M = 1.2 \times 106 \text{ }\#/\text{CAN LOC} = 127 \text{ "}\#$$

$$I/c = \frac{1.6 \times .125^3}{6} + \frac{1.6 \times .032^3}{6} = .00417 + .00027 = .00444$$

$$f_b = \frac{127}{.00444} = 28{,}600 \text{ PSI}$$

THE DOOR EDGE MEMBER BENDING STRESSES WERE CHOSEN LESS THAN 40,000 PSI FOR FATIGUE REASONS.

RM 1318A

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

REPORT NO 7-9536-67
SHEET NO 2-37

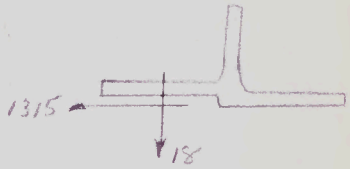
AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	DEC. 1/55
		CHECKED BY	DATE

FROM REPORT BOTTOM SKIN TENSION

LOADING
FORMER 553
FOR 20 000 PSI TENSION IN SKIN

LOAD / CAMLOC = (20 000 × .132 #/in + 181 #/in MEMBRANE TENSION) 1.6" PITCH = 1315 #

CAMLOC TENSION = 18 #



$\frac{P}{A} = \frac{1315}{1.6 \times .11} = 7450 PSI$

BM = −.75 × 18 + .168 × 1315 = 207 "#

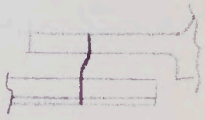
PLASTIC BENDING $f_b = \frac{1}{1.6} \frac{207}{\frac{1.6 \times .11^2}{6}} = 42800 PSI$

NEGLECTING BOLT CLAMPING ACTION $MS = \frac{.73 \times 75000}{42800} - 1$ .08

CAMLOC BEARING PRESSURE CAMLOC DIA = 3/8"

$P/A = \frac{1315}{\frac{3}{8} \times .11} = 31800 PSI$

CONSIDER A POINT OF INFLECTION IN CAMLOC PIN SUCH THAT PIN BM = $\frac{207}{2}$ = 104 " #



PLACTIC BENDING $f_b = \frac{1}{1.5} \frac{104}{\frac{3/8 \times .11^2}{6}} = 91600 PSI$

MAX. BEARING PRESSURE $f_{br} = 91600 + 31800 = 123400 PSI$

$F_{BR_U} = 133000$ PSI 'B' VALUE 75ST EXTRUSION

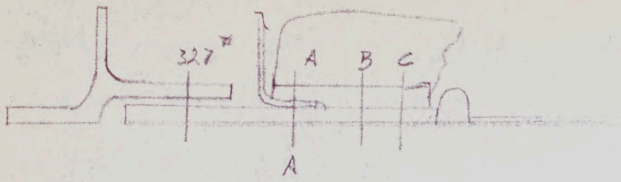
$MS = \frac{133000}{123400} - 1$ .08

FORM 1319A

A. V ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT NO. 7-0556-62
SHEET NO. 2-38

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	NOV. 28/55
		CHECKED BY	DATE



$BM_{A-A} = 327\# \times 1.35" = 442"\#$

USE 2" WIDTH OF .125 DOUBLER & .032 SKIN

$$I/c = \frac{bt^2}{6} = \frac{2" \times .157^2}{6} = .00821$$

$$f_b = \frac{442}{.00821} = 53{,}800 \text{ PSI}$$

$F_{tu} = 70000 \times .73 = 51{,}100$ PSI

ELASTIC BENDING M.S. $= \frac{51100}{53800} - 1 = -.05$

WITH 1.5 FORM FACTOR

$$f_b = \frac{53800}{1.5} = 35{,}800 \text{ PSI}$$

PLASTIC BENDING M.S. $= \frac{51100}{35800} - 1 = .42$

LOADS ON 10 BOLTS A, C DIRECT LOAD $= \frac{327}{6} = 55\#$

ABOUT B; B.M. $= 327 \times 2.1" = 687"\#$

LOAD A & C $= \frac{687}{1.43"} = 480\#$ ∴ BOLT LOAD $= 55 + \frac{480}{2} = 295\#$

ALLOW TENSION FOR 5/32 10 BOLT NOT AVAILABLE BUT CONSIDERED ADEQUATE.

5/32 HUCK IN TENSION IS 850# ALLOW.

FORM 1319A

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

REPORT NO. 7-0556 62.
SHEET NO 2-39

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	NOV. 29/55
		CHECKED BY	DATE

OFFSET OF BOLTS 'A' FROM CLEAT WEB = .31

LOCAL THICKNESS = .125 - .040 = .085"

LOCKHEED STRESS MEMO #89

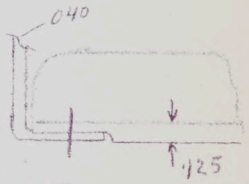
ALLOW P = 250# FOR 1/16" - 24ST4 EXTRUSION

$$\therefore P = \frac{70000}{36000} \times 250 \times \left(\frac{.085}{1/16}\right)^2 = 900\#/" \text{ WIDTH}$$

FOR .7" EFF WIDTH $\qquad MS = \frac{900 \times .7}{295} - 1$

STRESS LEVEL UNDER +60 PSI ULT

$$BM = \frac{60}{515} \times 295\# \times .31 = 100."\#$$



EFF. t OF .040 CHANNEL & .085 CLEAT

$$= \sqrt{.040^2 + .085^2} = .094$$

$$f_b = \frac{100.}{\frac{.7 \times .094^2}{6}} = 97,000 \text{ PSI}$$

RE DESIGN 'T' ATTACHMENT

FORM 1319A

A. V. ROE CANADA LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT (Aircraft)

REPORT No. 7-0556 12
SHEET No. 2-40

AIRCRAFT:		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR		
		CHECKED BY	DATE

B.M. = 100 " #

EFFECTIVE t OF .040 CHANNEL & .115 CLEAT

$$\approx \sqrt{.040^2 + .115^2} = .121$$

$$f_b = \frac{100}{\frac{.7 \times .121^2}{6}} = 58,600 \text{ PSI}$$

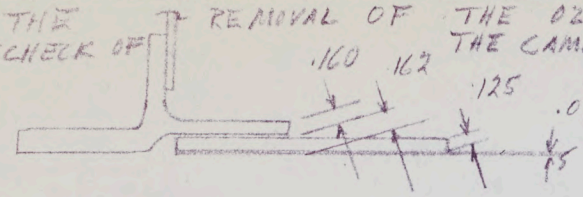
DRM 1319A

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

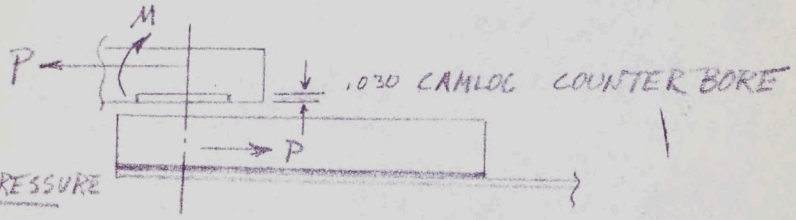
REPORT No. 7-0552-[illegible] C2
SHEET No. 2-91

AIRCRAFT		PREPARED BY	DATE
C105	HYDRAULIC ACCESS DOOR	S. YOUNG	JAN. 11/56
		CHECKED BY	DATE

WITH THE REMOVAL OF THE .025 SEALING STRIP THE CAMLOCS WILL BE DONE A RECHECK OF



NOTE THAT THE BONDING BETWEEN THE .125 DOUBLER AND .032 SKIN COULD VARY IN THICKNESS BETWEEN .005 & .010. ASSUME .050 BOND THICKNESS.



BEARING PRESSURE

$$f = \frac{P}{A} + \frac{M}{I/c}$$

$$M = \left(\frac{.162}{2} + .030 + \frac{.160 - .030}{2}\right)P = (.081 + .030 + .065)P = .176P$$

$$A = dt = .377 \cdot .13 = .049 \qquad \frac{I}{c} = \frac{dt^2}{6} = \frac{.377 \cdot .13^2}{6} = .001062$$

$$f = \frac{P}{.049} + \frac{.176P}{.001062} = 20.4P + 165.5P = 185.9P$$

FOR $e/D = 2.0$ $F_{BR_0} = 125000$ PSI R.T. & 73% AT 250°F

00 ALLOW $P = 673$ # AT ROOM TEMP

$\frac{1}{4}$ 490 # AT 250°F

FORM 1319A

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

REPORT No 7-058 62
SHEET No 2 42

AIRCRAFT:		PREPARED BY	DATE
CX2	HYDRAULIC ACCESS DOOR	S. YOUNG	JAN 11/56
		CHECKED BY	DATE

CONSIDER NOW BOLT CLAMPING ACTION

ALLOW CLAMPING MOMENT IS DEPENDENT ON BENDING OF THE EXTRUSION BETWEEN CAMLOCS (1.6").

ALLOW. CLAMPING $M = f_b \frac{I}{c}$ $\quad \frac{I}{c} = \frac{1.16 \times .16^2}{6} = .0071$

$= 70000 \times .0071 = 497$ "# RT

ASSUME 50% BOLT CLAMPING, ie $M = 250$ "#

ASSUME $P = 1900$ # PER CAMLOC

∴ OFFSET $M = .176 \times 1900 = 335$ "#

BOLT CLAMPING $M = 250$ "#

BRG. PRESSURE $BM = 85$ "#

$\therefore f = \frac{1900}{.049} + \frac{85}{.0016^2} = 38800 + 80000 = 118800$ "#

~ 125000 F_{BRU}

∴ ALLOW CAMLOC LOAD = 1900 # R.T.

1380 # 250 #

PG. 35 MAX LOAD $P = 1315$ #

$MS = \frac{1380}{1315} - 1$

ORM 1139A

SNAP-LOCK BINDER, 1½ inch capacity

NO. 4872-W

MANUFACTURED IN CANADA BY

THE CHAS. CHAPMAN CO. LIMITED

London - Canada