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STRESS REPORT

7/0510/3

GENERAL A/C
ANALYSIS FOR
SYMMETRIC
LOADING CASES

~~CONFIDENTIAL~~

Classification cancelled / Changed to UNCLASS
By authority of AVRES
Date 30 Sept 96
Signature [signature]
Unit / Rank / Appointment AVRSS

A. V. ROE CANADA LIMITED
MALTON - ONTARIO

ANALYZED

# TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: C 105

REPORT NO. 7/0510/3

FILE NO:

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TITLE: GENERAL AIRCRAFT ANALYSIS FOR SYMMETRIC LOADING CASES

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Unit / Rank / Appointment AVESS



PREPARED BY R. N. Shearly DATE Sept. 1956

CHECKED BY [signature] DATE Sept. 1956.

SUPERVISED BY [signature] DATE Sept 1956

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FORM 1316A

AVRO AIRCRAFT LIMITED
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| AIRCRAFT | | REPORT No 7/0510/3 | |
|---|---|---|---|
| | | SHEET No 1 | |
| | | PREPARED BY | DATE |
| C 105 | General Aircraft Analysis | R. N. Shearly | Sept 1956 |
| | | CHECKED BY | DATE |
| | | | Sept 56 |

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SUMMARY

The purpose of this analysis is to join the component parts of the complete aircraft (wing, beam, tank, center fuselage, rear fuselage and stiff fin) together by means of the border or closed circuit redundancies and statically determinate reactions.

The results of this analysis are:

a) the border or closed circuit redundancies to general aircraft load matrix, $F_{PA}$;

b) the displacement matrix for the general aircraft analysis loading points, $Z_{AB}$;

c) the stress to general aircraft load matrix for each component, $\overset{*}{S}_{iA}$

NOTATION

Indices:

$\overset{*}{i}$, $\overset{*}{k}$ stress points of the individual analyses,

$\overset{*}{a}$, $\overset{*}{b}$ load points including border or closed circuit redundancies of the individual analyses.

The symbol * stands for W, B, T, C and R for wing, beam, tank, center fuselage and rear fuselage respectively.

U, V fictitious stress points of the general aircraft analysis,

P, Q, R border or closed circuit redundancies of the general aircraft analysis,

A, B load points of the general aircraft analysis.

See Table I for the relationship between

$\overset{*}{a}$, $\overset{*}{b}$ and U, V

$\overset{*}{a}$, $\overset{*}{b}$, $\overset{*}{c}$ and P, Q, R

$\overset{*}{a}$, $\overset{*}{b}$ and A, B

Matrices:

$C_{UV}$ Elastic Influence Coefficients (symmetric) to be made up of $\overset{*}{Z}_{ab}$ matrices of the individual component analyses,

$K_{UP}$ fictitious stress to border or closed circuit redundant group matrix,

$T_{UA}$ statically determinate fictitious stress to general aircraft load matrix,

$\overset{*}{S}_{iU}$ stress to fictitious stress matrix for particular component,

$\delta_{UV}$ unit matrix (Kronecker Delta).

The lower case letter indices of the above matrices have the range and are defined as in the particular component analysis. The capital letter indices of the above matrices have the range and are defined as follows:

1) general aircraft analysis loading point indices

   A, B = 1, 2, 3 .......... 88

2) fictitious stress point indices

   U, V = 1, 2, 3 ......... 119

3) border or closed circuit redundant group indices

   P, Q, R = 1, 2, 3 ..... 14

Indices of the same group are interchangeable, the first index denoting the row, the second index the column of the matrix.

METHOD

The general aircraft analysis for symmetrical loading cases is performed in the following way. First, the complete aircraft is thought to be divided into components as shown in fig. 1. The components considered are wing, beam, tank, center fuselage, rear fuselage and stiff fin. Initially the beam is thought to be cut free from the wing at the transport joint rib and attached to the tank which in turn is attached to the center fuselage which is attached to the rear fuselage which is supported by an imaginary foundation at two pick up points per side. The wing is considered to be supported by the imaginary foundation at the same two pick up points per side. To establish compatibility of the components the border or closed circuit redundancies are applied as shown in fig. 1. The stiff fin is the medium for applying the effects of redundancies 13 and 14 (see fig. 1) to the rear fuselage.

Next each of the components is analysed separately, see reports 7/0510/4, /7, /8, /9 and /14 /15 with the redundancies considered to be applied loads. From these analyses are obtained the following matrices for each component:

$\overset{*}{S}_{ia}$ stress to unit load

$\overset{*}{Z}_{ab}$ displacement to unit load

For convenience a portion of report Gen/1090/336 is reproduced here with one slight change - the indices associated with the general aircraft analysis are capitalized to avoid misunderstanding.

"In order to combine the partial problems for final solution, a unified index and notation system is introduced for the whole structure.

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| | | CHECKED BY | DATE |
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Redundancies 8, 9, 10, 11 and 12 are triples acting as shown at the center line and in the opposite direction at the fuselage sides.

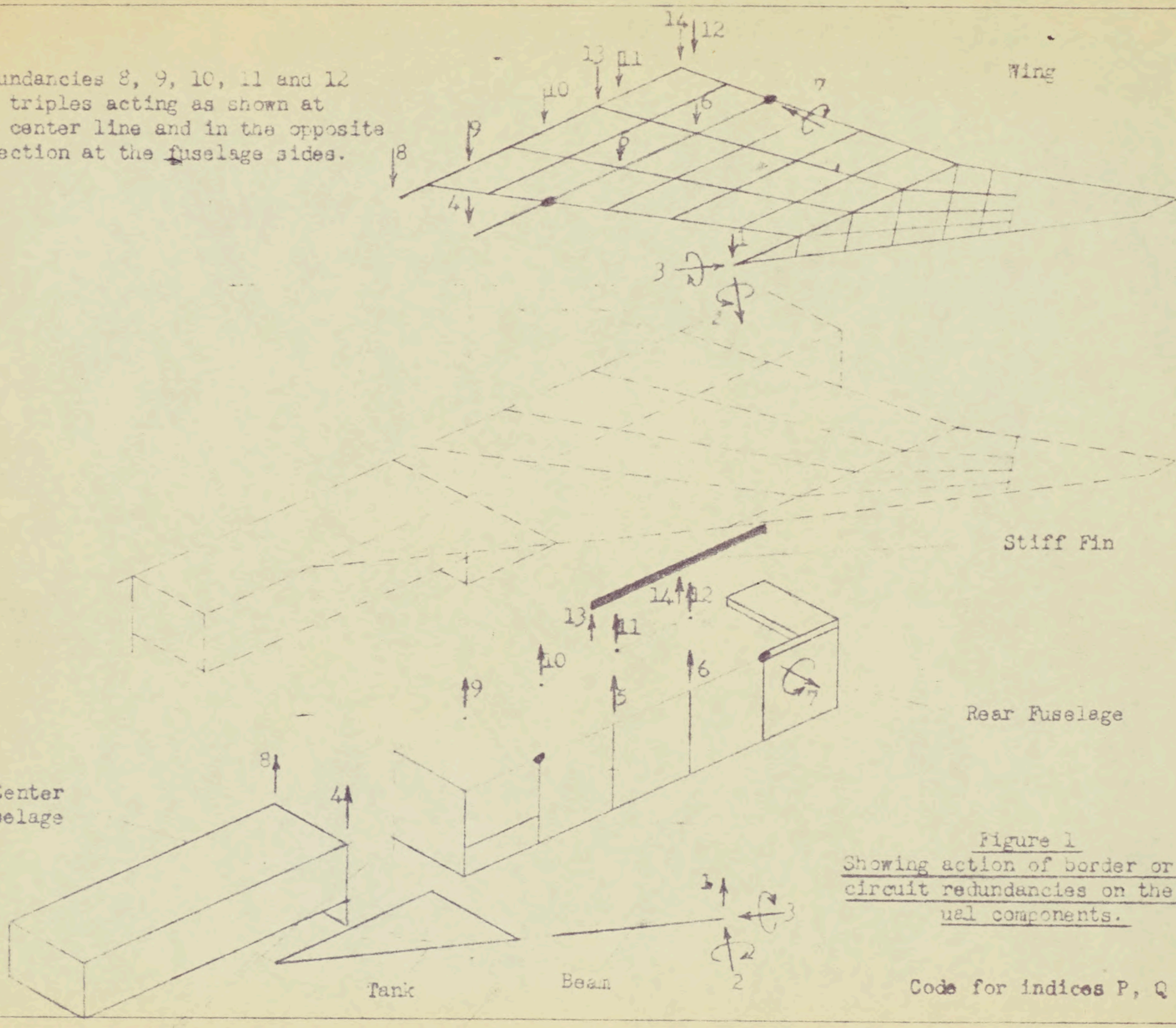


Figure 1
Showing action of border or closed circuit redundancies on the individual components.

Code for indices P, Q and R

Statically determinate attachment

Accordingly:

A) Loads $Q_a$ of partial problems (acting loads, border and closed circuit redundancies) are denoted as fictitious stresses $S_U$; index system U, V.

B) These loads are expressed in terms of the remaining redundancies $F_P$ by means of a matrix $K_{UP}$; index system P, Q, R and by means of

C) The loads applied to the whole structure. These loads are denoted $Q_A$; index system A, B. Here the indices A, B run through all applied load numbers obtained when all partial problems are put together. The matrix relation is $I_{UA}$.

D) The overall strain energy matrix is built up consequently of all partial matrices $\overset{*}{Z}_{ab}$ and is denoted $C_{UV}$. Thus the procedure of Chapter III (report Gen/1096/56) can be applied with index U written for i, and two new matrices can be obtained:

1) $S_{UA}$ expressing all loads and all redundancies, treated as loads in partial problems, in terms of acting air and inertia loads.

2) $Z_{AB}$ presenting the overall displacement matrix.

The overall stress to unit load matrix is evidently

$$S_{iA} = S_{iU} S_{UA}$$

where the index i runs through all stress points of the structure."

However the following work is based on the five relationships

$$\overset{*}{S}_{iA} = \overset{*}{S}_{iU} S_{UA}$$

This eliminates the necessity of having a unified index system for the stress points i, which would be a very large system (of the order of 400).

The stresses in the individual components can be found by recoding the $\overset{*}{S}_{iA}$ matrix of the individual analyses to become the $\overset{*}{S}_{iU}$ matrix. Then the $\overset{*}{S}_{iA}$ matrix is found as in the above equation.

The matrices calculated as a result of this analysis are:

| | | |
|---|---|---|
| 1 matrix | $F_{PA}$ | border or closed circuit redundancies to general aircraft load matrix, |
| 1 matrix | $Z_{AB}$ | displacement matrix for general aircraft analysis, |
| 5 matrices | $\overset{*}{S}_{iA}$ | stress to general aircraft load matrix for particular component. |

COMPUTATION PROGRM PART 1 Establishing the $C_{UV}$, $K_{UP}$, $T_{UA}$, $\overset{*}{S}_{iU}$ Matrices.

The following matrices are available from the individual component analyses

| Component | Report No. | Matrix |
|---|---|---|
| Wing | 7/0510/7 | $\overset{W}{S}_{ia}$ and $\overset{W}{Z}_{ab}$ |
| Beam | 7/0510/1[illegible] | $\overset{B}{S}_{ia}$ and $\overset{B}{Z}_{ab}$ |
| Tank | 7/0510/8 | $\overset{T}{S}_{ia}$ and $\overset{T}{Z}_{ab}$ |
| Center Fuselage | 7/0510/9 | $\overset{C}{S}_{ia}$ and $\overset{C}{Z}_{ab}$ |
| Rear Fuselage | 7/0510/1[illegible] | $\overset{R}{S}_{ia}$ and $\overset{R}{Z}_{ab}$ |
| **Wing webs** | 7/0510/15 | $\overset{W}{S}_{ia}$ continued |

Table 1 gives the relationship between indices of the general aircraft analysis and those of the individual component analyses..

$C_{UV}$ Matrix

In theory the $C_{UV}$ matrix can be formed directly from the known $\overset{*}{Z}_{ab}$ matrices. Unfortunately in practice this is not true because due to small unavoidable computational errors the $\overset{*}{Z}_{ab}$ matrices are not exactly symmetrical. To overcome this difficulty the following procedure is advised for wing, center fuselage and rear fuselage displacement to unit load matrices $\overset{W}{Z}_{ab}$, $\overset{C}{Z}_{ab}$ and $\overset{R}{Z}_{ab}$ resp.. Add to the $\overset{*}{Z}_{ab}$ matrix of the particular component its transpose matrix and divide the resulting matrix by two. In this manner the $\overset{*}{Z}_{ab}$ matrix is made exactly symmetrical. After this is done the $C_{UV}$ matrix is made up as follows:

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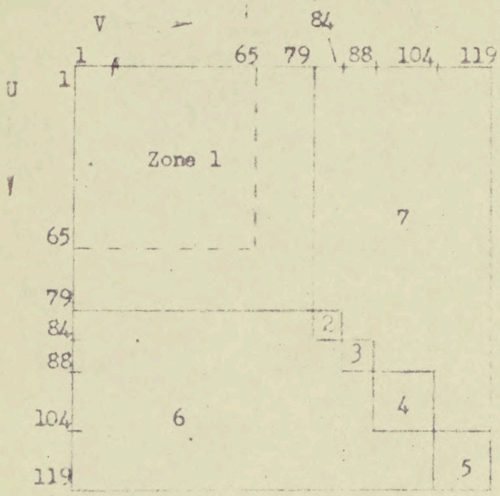
| | | CHECKED BY: | DATE: |

Stage (a)

Key to the $C_{UV}$ Matrix




Non zero elements

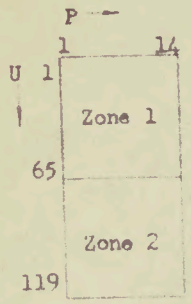
| | | |
|---|---|---|
| Zone 1 | 6241 | |
| 2 | 21 | see section entitled, "Established Matrices" |
| 3 | 16 | |
| 4 | 256 | |
| 5 | 225 | |
| 6 | 0 | |
| 7 | 0 | |
| Total | 6759 | |

Elements Total 14161

For zone 1, the elements of the $C_{UV}$ matrix consist of the elements of the exactly symmetrical $Z_{ab}$ matrix of the wing rounded off to 6 decimal places. The indices of the IBM numbering system correspond to those of the numbering system of the general aircraft analysis. The check row and column will have to be recalculated.

For zones 2, 3, 4 and 5 the elements and check sums are shown in the section entitled, "Established Matrices".

Key to the $K_{UP}$ Matrix



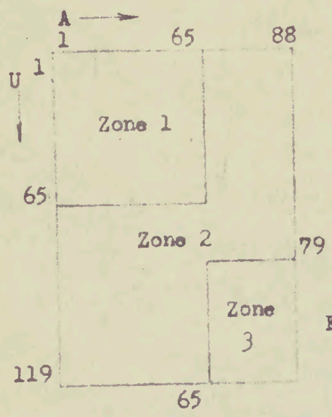

Non zero elements

Zone 1  0
2  50 — see section entitled, "Established Matrices"

Total  50

Elements Total 1666

Key to the $T_{UA}$ Matrix




Non zero elements

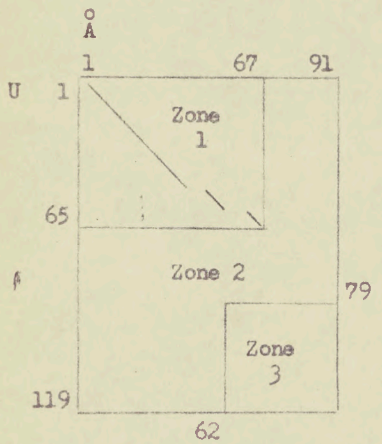
Zone 1  65  Kronecker Delta
2  0
3  76 -- see section entitled, "Established Matrices"

Total  141

Elements Total 10472

Since the load point index system $\overset{o}{A}$, $\overset{o}{B}$ as defined in report 7/0510/13 has already been issued to the stress office and considerable work has been done using this index system, it will be the official load point system. The index system A, B as used in this report up to this sheet has been used for numerical convenience. However to reduce the possibility of error and additional work in the future the matrix $T_{UA}$ will be recoded to $T_{U\mathring{A}}$ and the following sheets in this report will use the load point indices $\mathring{A}$, $\mathring{B}$.

Key to the $T_{U\mathring{A}}$ matrix




Non zero elements

| | | | |
|---|---|---|---|
| Zone | 1 | 65 | see note below |
| | 2 | 0 | |
| | 3 | 76 | see section entitled, "Established Matrices" |
| Total | | 141 | |

Elements Total 10829

In zone 1 the elements $T_{U\mathring{A}}$ are equal to unity for $U = \mathring{A} = 1$ to 57 inclusive

and for

| | U | $\mathring{A}$ |
|---|---|---|
| (i) | U = 58 | $\mathring{A}$ = 59 |
| (ii) | 59 | 60 |
| (iii) | 60 | 61 |
| (iv) | 61 | 62 |
| (v) | 62 | 64 |
| (vi) | 63 | 65 |
| (vii) | 64 | 66 |
| (viii) | 65 | 67 |

all others are equal zero.

Stage (b)

$\overset{*}{S}_{iU}$ Matrix

The elements of the $\overset{*}{S}_{iU}$ matrix are the elements of the $\overset{*}{S}_{ia}$ matrix of the individual component analyses rounded off to 5 decimal places.

For wing (* = W) no recoding necessary. Check sums to be recalculated.

For beam (* = B) }
For tank (* = T) } see section entitled, "Established Matrices"

For center fuselage (* = C) } the $\overset{*}{S}_{iU}$ matrix will be added to the section
For rear fuselage (* = R) } entitled, "Established Matrices", at a later date.

COMPUTATION PROGRAM PART 2

A) Established Matrices:

$C_{UV}$ Elastic Influence Coefficients (symmetric)

$K_{UP}$ Fictitious stress to border or closed circuit redundancies

$T_{U\overset{o}{A}}$ Statically determinate fictitious stress to load

$\overset{W}{S}_{iU}$ Stress to fictitious stress for wing

$\overset{B}{S}_{iU}$ beam

$\overset{T}{S}_{iU}$ tank

$\overset{C}{S}_{iU}$ center fuselage

$\overset{R}{S}_{iU}$ rear fuselage

with indices

$\overset{o}{A}$, $\overset{o}{B}$ = 1, 2, .......... 91

U, V = 1, 2, .........119

P, Q, R = 1, 2, .......14

for wing (webs included) i, k = 1, 2, .........138, 201, 202, ..... 282 excluding 279 and 281

for beam i, k = 1, 2, .....4

for tank i, k = 1, 2, .....30

for c/fus. i, k = 101, 102, .. 143, 201, 202, .. 243, 301, 302, .. 343, 401, 402, ... 434 excluding 427

for r.fus. i, k = 1, 2, .......51

B) Elementary Operations:

Transpose to $A_{iP}$ is $A_{Pi}$

Matrix product of $A_{Ak}$ and $B_{ki}$ is $C_{Ai}$, denoted as

$$A_{Ak} \; B_{ki} = C_{Ai}$$

Inverse to $D_{PQ}$ is $D^{-1}_{QP}$

C) Checks to be printed:

Inversion Error $\qquad D_{PR} \; D^{-1}_{RQ} - \delta_{PQ}$

Symmetry of $D_{PQ}$

Symmetry of $Z_{AB}^{\circ\circ}$

D) Results to be printed: (Punched cards to be retained for future use)

Border or closed circuit redundancies to general aircraft unit loads $\qquad F_{PA}^{\circ}$

Displacement to general aircraft unit loads $\qquad Z_{AB}^{\circ\circ}$

Component stresses to general aircraft unit loads $\qquad \overset{*}{S}{}_{iA}^{\circ}$

E) Operations: (Operations 1 - 10 identical with operations 1 - 10 of Report Gen/1090/334, Type Program No. 1)

**Stage (a)**

1) Multiply $\qquad H_{UP} = C_{UV} \; K_{VP}$

2) Multiply $\qquad D_{PQ} = K_{PU} \; H_{UQ}$ $\qquad$ print

3) Invert $\qquad D_{PQ} \longrightarrow D^{-1}_{QP}$

4) Perform $\qquad D_{PR} \; D^{-1}_{RQ} - \delta_{PQ}$ $\qquad$ print

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5) Multiply $M_{PU} = D_{PQ}^{-1} H_{QU}$

6) Multiply $F_{P\mathring{A}} = - M_{PU} T_{U\mathring{A}}$ print

7) Multiply $N_{U\mathring{A}} = K_{UP} F_{P\mathring{A}}$

8) Add $S_{U\mathring{A}} = T_{U\mathring{A}} + N_{U\mathring{A}}$ print

9) Multiply $C_{\mathring{A}U} = T_{\mathring{A}V} C_{VU}$

10) Multiply $Z_{\mathring{A}\mathring{B}} = O_{\mathring{A}U} S_{U\mathring{B}}$ print

**Stage (b)**

11) Multiply $\overset{W}{S}_{i\mathring{A}} = \overset{W}{S}_{iU} S_{U\mathring{A}}$ print

12) Multiply $\overset{B}{S}_{i\mathring{A}} = \overset{B}{S}_{iU} S_{U\mathring{A}}$ print

13) Multiply $\overset{T}{S}_{i\mathring{A}} = \overset{T}{S}_{iU} S_{U\mathring{A}}$ print

14) Multiply $\overset{C}{S}_{i\mathring{A}} = \overset{C}{S}_{iU} S_{U\mathring{A}}$ print

15) Multiply $\overset{R}{S}_{i\mathring{A}} = \overset{R}{S}_{iU} S_{U\mathring{A}}$ print

The above computations will be checked by:

a) applying check sums in the conventional way,

b) symmetry of $D_{PQ}$ in most significant figures,

c) inversion error of $D_{QP}^{-1}$,

d) symmetry of $Z_{AB}$ in four significant figures,

e) analysis of final results.

REFERENCES

Avro report Gen/1090/334 Type Programs April 1955; Alex. Grzedzielski

Avro report Gen/1090/336 Theory of Multi-Spar and Multi-Rib Wing Structures June 1955; Alex. Grzedzielski

Avro report 7/0510/14 F/S Beam Analysis May 1956; R.N.Shearly

Avro report 7/0510/7 Wing Analysis June 1955; V.F.Gardener, R.N.Shearly, D.L.Turner.

Avro report 7/0510/8 Tank 3 Analysis March 1955; Alex. Grzedzielski and W. Roberts.

Avro report 7/0510/9 Center Fuselage Analysis Dec. 1955; E.Augustine, V.F.Gardener and C.Burrell

Avro report 7/0510/12 Rear Fuselage Analysis Sept. 1956; J.Andrews, E.Augustine, C.Burrell and C.Gundesen

Avro report 7/0510/13 Load System of General Stress Analysis of the Aircraft May 1956; Alex. Grzedzielski and R.N.Shearly

Avro report 7/0510/15 Wing Web Shear Flows ; C.Burrell and C.Gundesen

## CALCULATIONS

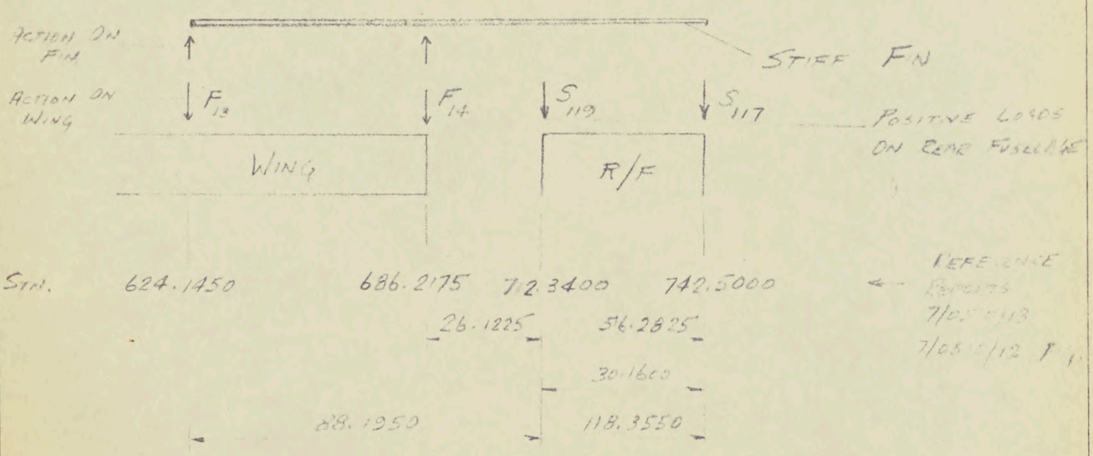
### CALCULATION OF $K_{UP}$ & $T_{UA}$ MATRIX ELEMENTS

ALL OF THE NON ZERO ELEMENTS OF THE $K_{UP}$ & $T_{UA}$ MATRICES ARE UNITY & SELF-EVIDENT WHEN THE DUMMY MATRICES ARE STUDIED IN CONJUNCTION WITH THE ANALYSES OF THE WING, F/S BEAM, TANK 3, CENTER FUSELAGE AND REAR FUSELAGE EXCEPT:

(a) $K_{UP}$ ELEMENTS FOR $U = 117$ & $119$,
(b) $K_{UP}$ ELEMENTS FOR $P = 1, 2$ & $3$ AND $U = 85$ to $119$ INCL.,
(c) $T_{UA}$ ELEMENTS FOR $U = 105$ AND $A = 72$ to $83$ INCL.,
(d) $T_{UA}$ ELEMENTS FOR $A = 66, 67, 68$ & $69$ AND $U = 85$ to $119$ INCL.

THE EXCEPTIONS WILL NOW BE CONSIDERED

(a) THE INTERACTION REDUNDANT LOAD, $F_{13}$ OF THE GENERAL ANALYSIS IS EQUAL TO LOAD $Q_{113}$ OF THE WING ANALYSIS. HENCE CONSIDERING THE RIGID FIN TO ACT AS A BEAM, $F_{13}$ PRODUCES THE FOLLOWING FICTITIOUS STRESSES AT $U = 117$ & $119$.




$$S_{117} = \frac{88.1950}{30.1600} F_{13} = 2.924237\ F_{13}$$

$$S_{119} = -\frac{118.3550}{30.1600} F_{13} = -3.924237\ F_{13}$$

FORM 1319A

SIMILARLY

$$S_{117} = \frac{26.1225}{30.1600} F_{14} = .866131\ F_{14}$$

$$S_{119} = -\frac{56.2825}{30.1600} F_{14} = -1.866131\ F_{14}$$

CONSEQUENTLY

$$K_{117,13} = 2.924237$$

$$K_{119,13} = -3.924237$$

$$K_{117,14} = .866131$$

$$K_{119,14} = -1.866131$$

(c) THE GENERAL AIRCRAFT ANALYSIS LOADS $Q_{72}$ TO $Q_{83}$ INCL. PRODUCE BENDING MOMENTS AT FICTITIOUS STRESS POINT IN THE REAR FUSELAGE, U=105 WHICH FOR ONE KIP LOADS ARE AS FOLLOWS IN UNITS OF 100 IN KIPS.

| ① A | ② STN. OF A REF. REPORT 7/0510/3 FIG. 2 | ③ MOMENT ARM 485 - ② | ④ $T_{105,A}$ |
|---|---|---|---|
| 72 & 73 | 468.75 | 16.25 | .1625 |
| 74 & 75 | 430.50 | 54.50 | .5450 |
| 76 & 77 | 386.50 | 98.50 | .9850 |
| 78 & 79 | 342.50 | 142.50 | 1.4250 |
| 80 & 81 | 298.50 | 186.50 | 1.8650 |
| 82 | 254.50 | 230.50 | 2.3050 |
| 83 | 120.00 | 365.00 | 3.6500 |

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| REPORT No | 7/0510/3 |
| SHEET No | 20 |
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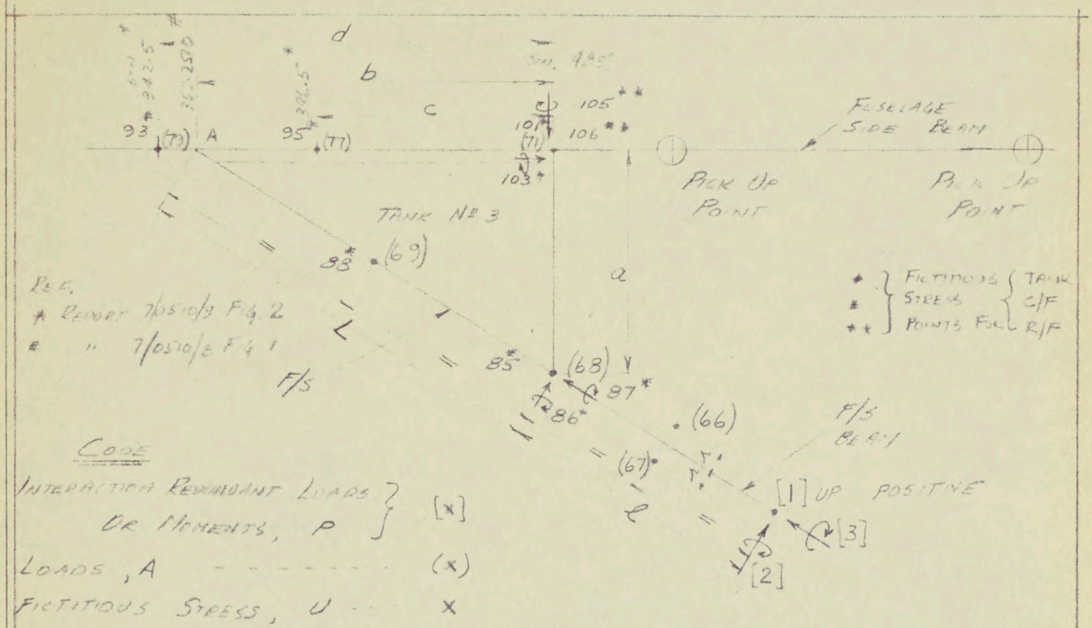
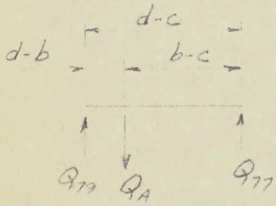
| | GENERAL AIRCRAFT ANALYSIS |
| PREPARED BY | R.M. SHEARLY |
| DATE | JUNE 4/56 |
| CHECKED BY | |
| DATE | |

(b) & (d)

THE EXCEPTIONS (b) & (d) WILL BE CONSIDERED TOGETHER. FOR THE COMPONENT STRUCTURES AS SHOWN BELOW




THE LOAD AT INTERSECTION OF F/S & FUSELAGE SIDE BEAM, POINT A IN ABOVE DIAGRAM, IS DISTRIBUTED TO LOAD POINTS 77 & 79 AS FOLLOWS:




$$Q_{77} = \frac{d-b}{d-c}\, Q_A = \alpha\, Q_A$$

$$Q_{79} = \frac{b-c}{d-c}\, Q_A = \beta\, Q_A$$

$\alpha + \beta = 1$ CHECK

FIGURE 2

THE FICTITIOUS STRESSES IN TANK 3 STRUCTURE, CENTER FUSELAGE STRUCTURE & REAR FUSELAGE STRUCTURE,

$\overset{T}{S_U}$, $\overset{C}{S_U}$ & $\overset{R}{S_U}$ RESP. ARE AS GIVEN IN THE FOLLOWING

FORM 1319A

MATRIX EQUATIONS

$$\overset{T}{S}_U = \overset{B}{K}_{UP}\ \overset{B}{F}_P + \overset{B}{T}_{UA}\ \overset{B}{Q}_A$$

$$\overset{C}{S}_U = \overset{T}{\mathcal{T}}_{UV}\ \overset{T}{S}_V + \overset{T}{T}_{UA}\ \overset{T}{Q}_A$$

$$\overset{R}{S}_U = \overset{C}{\mathcal{T}}_{UV}\ \overset{C}{S}_V + \overset{C}{T}_{UA}\ \overset{C}{Q}_A$$

WHERE $\overset{B}{F}_P$ ARE INTERACTION REDUND. LOADS OR MOMENTS ACTING ON F/S BEAM

$\overset{B}{Q}_A$ ARE LOADS ACTING ON F/S BEAM

$\overset{T}{S}_V$ ARE FICTITIOUS STRESSES ACTING ON TANK 3

$\overset{T}{Q}_A$ ARE LOADS ACTING ON TANK 3

$\overset{C}{S}_V$ ARE FICTITIOUS STRESSES ACTING ON CENTER FUSELAGE

$\overset{C}{Q}_A$ ARE LOADS ACTING ON CENTER FUSELAGE

$\overset{B}{K}_{UP}$, $\overset{B}{T}_{UA}$, $\overset{T}{\mathcal{T}}_{UV}$, $\overset{T}{T}_{UA}$, $\overset{C}{\mathcal{T}}_{UV}$, $\overset{C}{T}_{UA}$ ARE THE MATRICES EXPRESSING THE RELATIONSHIP BETWEEN (respectively):

- $\overset{T}{S}_U$ & $\overset{B}{F}_P$
- $\overset{T}{S}_U$ & $\overset{B}{Q}_A$
- $\overset{C}{S}_U$ & $\overset{T}{S}_V$
- $\overset{C}{S}_U$ & $\overset{T}{Q}_A$
- $\overset{R}{S}_U$ & $\overset{C}{S}_V$
- $\overset{R}{S}_U$ & $\overset{C}{Q}_A$

These equations can be represented graphically as follows:

$$\overset{T}{S}_U = \overset{B}{K}_{UP} \times \overset{B}{F}_P + \overset{B}{T}_{UA} \times \overset{B}{Q}_A$$

(U = 85, 86, 87, 88; P = 1, 2, 3; A = 66, 67)

$$\overset{C}{S}_U = \overset{T}{\tilde{J}}_{UV} \times \overset{T}{S}_V + \overset{T}{T}_{UA} \times \overset{T}{Q}_A$$

(U = 93, 95, 101, 103; V = 85, 86, 87, 88; A = 68, 69)

$$\overset{E}{S}_U = \overset{C}{\tilde{J}}_{UV} \times \overset{C}{S}_V + \overset{C}{T}_{UA} \times \overset{C}{Q}_A$$

(U = 105, 106; V = 93, 95, 101, 103; A = 71, 77, 79)

The required matrices are:

$\overset{B}{K}_{UP}$

| U ↓ / P → | 1 | 2 | 3 |
|---|---|---|---|
| 85 | -1 | | |
| 86 | -l | 1 | |
| 87 | | | 1 |
| 88 | | | |

$\overset{B}{T}_{UA}$

| U ↓ / A → | 66 | 67 |
|---|---|---|
| 85 | 1 | 1 |
| 86 | $\frac{l}{2}$ | $\frac{l}{2}$ |
| 87 | r | -r |
| 88 | | |

AVRO AIRCRAFT LIMITED
MALTON - ONTARIO

# TECHNICAL DEPARTMENT

REPORT NO. 7/0510/3
SHEET NO. 23

| AIRCRAFT: | | PREPARED BY | DATE |
|---|---|---|---|
| C-105 | GENERAL AIRCRAFT ANALYSIS | R.N. SHERRILL | JUNE 4/56 |
| | | CHECKED BY | DATE |
| | | β | SEPT 56 |

THE REQUIRED MATRICES (CONT)

$T^{T}_{UV}$

V →, U ↓

| | 85 | 86 | 87 | 88 |
|---|---|---|---|---|
| 93 | | $-\frac{\beta}{L}$ | $-\frac{\beta a}{bL}$ | $\frac{\beta}{2}$ |
| 95 | | $-\frac{\alpha}{L}$ | $-\frac{\alpha a}{bL}$ | $\frac{\alpha}{2}$ |
| 101 | 1 | $\frac{1}{L}$ | $\frac{a}{bL}$ | $\frac{1}{2}$ |
| 103 | a | $\frac{a}{L}$ | $\frac{a^2+L^2}{bL}$ | $\frac{a}{2}$ |

$T^{T}_{UA}$

A →, U ↓

| | 68 | 69 |
|---|---|---|
| 93 | | $\frac{\beta}{2}$ |
| 95 | | $\frac{\alpha}{2}$ |
| 101 | 1 | $\frac{1}{2}$ |
| 103 | a | $\frac{a}{2}$ |

$T^{c}_{UV}$

V →, U ↓

| | 93 | 95 | 101 | 103 |
|---|---|---|---|---|
| 105 | d | c | | |
| 106 | 1 | 1 | 1 | |

$T^{c}_{UA}$

A →, U ↓

| | 71 | 77 | 79 |
|---|---|---|---|
| 105 | | c | d |
| 106 | 1 | 1 | 1 |

WHEN

$r = 6''$ *

$\ell = 85.7962''$ * $\ell/2 = 42.8981''$

$a = 68.4717''$ ** $L = \sqrt{68.4717^2 + 132.7490^2} = 149.3676$

$b = 132.7490''$ # $\alpha = \frac{9.750}{44.0000} = .221614$

$c = 18.5000''$ ## $\beta = \frac{34.2490}{44.0000} = .778386$

$d = 142.5000''$ ##

REFERENCES:
* F/S BEAM ANALYSIS
** REPORT 7/0510/13
# REPORT 7/0510/8 FIG. 1
## FIG. 2

FORM 1319A

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

| | |
|---|---|
| REPORT NO. | 7/0510/3 |
| SHEET NO | 24 |

| AIRCRAFT: | | PREPARED BY | DATE |
|---|---|---|---|
| C-105 | GENERAL AIRCRAFT ANALYSIS | R.N. SHEARLY | AUG. 28/56 |
| | | CHECKED BY | DATE |
| | | β | SEPT 56 |

THE INFORMATION ON THE PREVIOUS PAGES IS APPLICABLE WHEN LOADS AND MOMENTS A, B; REDUNDANCIES P, Q AND FICTITIOUS STRESSES U, V ARE IN UNITS OF KIPS AND INCH-KIPS.

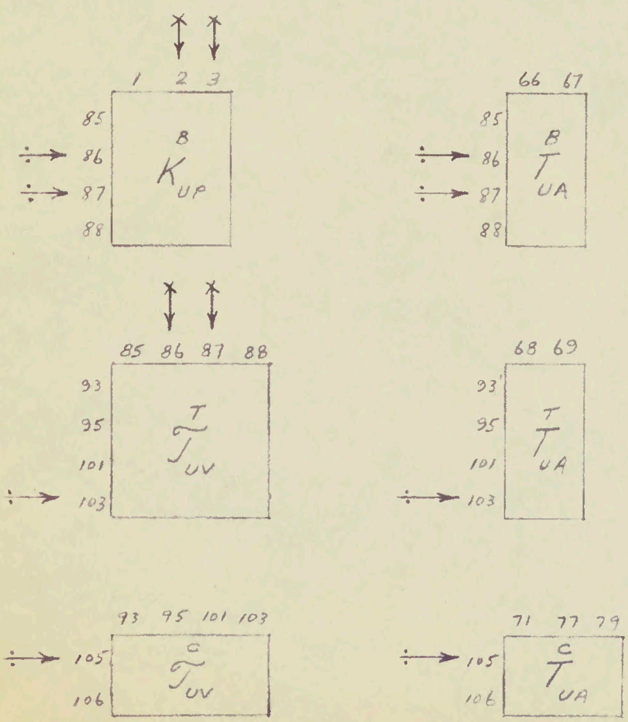
HOWEVER FOR THIS ANALYSIS MOMENTS ARE IN UNITS OF 100 INCH-KIPS. CONSEQUENTLY FOR

MOMENTS

REDUNDANCIES WHICH ARE MOMENTS AND

FICTITIOUS STRESSES WHICH STAND FOR MOMENTS

IN 100 INCH-KIP UNITS THE MATRICES $\overset{B}{K}_{UP}$, $\overset{B}{T}_{UA}$, $\overset{T}{\tilde{T}}_{UV}$, $\overset{T}{T}_{UA}$, $\overset{C}{\tilde{T}}_{UV}$ AND $\overset{C}{T}_{UA}$ MUST BE ALTERED TO SUIT AS SHOWN BELOW.




CODE

COLUMNS MARKED THUS ↕ MUST BE MULTIPLIED BY 100

ROWS MARKED THUS ÷→ MUST BE DIVIDED BY 100

THE NUMERICAL VALUES OF THE ALTERED MATRICES ARE SHOWN ON THE NEXT PAGE.

FORM 1319A

| AIRCRAFT: | | PREPARED BY | DATE |
|---|---|---|---|
| C-105 | General Aircraft Analysis | R.H. Shearly | June 4/56 |
| | | CHECKED BY | DATE |
| | | B | Sept 5th |

$\overset{B}{K}_{UP}$

| U ↓ / P → | 1 | 2 | 3 |
|---|---|---|---|
| 85 | ⁻1.00000 | | |
| 86 | ⁻.85796 | 1.00000 | |
| 87 | | | 1.00000 |
| 88 | | | |

$\overset{B}{T}_{UA}$

| U ↓ / A → | 66 | 67 |
|---|---|---|
| 85 | 1.00000 | ⁻1.00000 |
| 86 | .42898 | .42898 |
| 87 | .06000 | ⁻.06000 |
| 88 | | |

$\overset{T}{\tau}_{UV}$

| U ↓ / V → | 85 | 86 | 87 | 88 |
|---|---|---|---|---|
| 93 | | ⁻.52112 | ⁻.26879 | .38919 |
| 95 | | ⁻.14837 | ⁻.07653 | .11081 |
| 101 | 1.00000 | .66949 | .34532 | .50000 |
| 103 | .68472 | .45841 | ⁻.88874 | .34236 |

$\overset{T}{T}_{UA}$

| U ↓ / A → | 68 | 69 |
|---|---|---|
| 93 | | .38919 |
| 95 | | .11081 |
| 101 | 1.00000 | .50000 |
| 103 | .68472 | .34236 |

$\overset{C}{\tau}_{UV}$

| U ↓ / V → | 93 | 95 | 101 | 103 |
|---|---|---|---|---|
| 105 | 1.42500 | .98500 | | |
| 106 | 1.000 | 1.00000 | 1.00000 | |

$\overset{C}{T}_{UA}$

| U ↓ / A → | 71 | 77 | 79 |
|---|---|---|---|
| 105 | | .98500 | 1.42500 |
| 106 | 1.00000 | 1.00000 | 1.00000 |

FORM 1319A

THE EQUATIONS FOR $\overset{T}{S}_U$, $\overset{C}{S}_U$ & $\overset{R}{S}_U$ MAY BE REWRITTEN AS FOLLOWS

$$\overset{T}{S}_U = \overset{B}{K}_{UP}\,\overset{B}{F}_P + \overset{B}{T}_{UA}\,\overset{B}{Q}_A$$

$$\overset{C}{S}_U = \underline{\overset{T}{\mathcal{T}}_{UV}\,\overset{B}{K}_{VP}}\,\overset{B}{F}_P + \underline{\overset{T}{\mathcal{T}}_{UV}\,\overset{B}{T}_{VA}}\,\overset{B}{Q}_A + \overset{T}{T}_{UA}\,\overset{T}{Q}_A$$

$$\overset{R}{S}_U = \underline{\overset{C}{\mathcal{T}}_{UV}\,\overset{T}{\mathcal{T}}_{VW}\,\overset{B}{K}_{WP}}\,\overset{B}{F}_P + \underline{\overset{C}{\mathcal{T}}_{UV}\,\overset{T}{\mathcal{T}}_{VW}\,\overset{B}{T}_{WA}}\,\overset{B}{Q}_A + \underline{\overset{C}{\mathcal{T}}_{UV}\,\overset{T}{T}_{VA}}\,\overset{T}{Q}_A + \overset{C}{T}_{UA}\,\overset{C}{Q}_A$$

WHERE THE UNDERLINED QUANTITIES ARE STILL TO BE CALCULATED.

$\overset{T}{\mathcal{T}}_{UV}\,\overset{B}{K}_{VP}$

| U ↓ / P → | 1 | 2 | 3 |
|---|---|---|---|
| 93 | .44710 | $\overline{.52112}$ | $\overline{.26879}$ |
| 95 | .12730 | $\overline{.14837}$ | $\overline{.07653}$ |
| 101 | $\overline{1.57440}$ | .66949 | .34532 |
| 103 | $\overline{1.07802}$ | .45841 | $\overline{.88874}$ |

$\overset{T}{\mathcal{T}}_{UV}\,\overset{B}{T}_{VA}$

| U ↓ / A → | 66 | 67 |
|---|---|---|
| 93 | $\overline{.23968}$ | $\overline{.20742}$ |
| 95 | $\overline{.06824}$ | $\overline{.05906}$ |
| 101 | 1.30792 | 1.26648 |
| 103 | .82804 | .93469 |

$\overset{C}{\mathcal{T}}_{UV}\,\overset{T}{\mathcal{T}}_{VW}\,\overset{B}{K}_{WP}$

| U ↓ / P → | 1 | 2 | 3 |
|---|---|---|---|
| 105 | .76251 | $\overline{.88874}$ | $\overline{.45841}$ |
| 106 | $\overline{1.00000}$ | | – |

$\overset{C}{\mathcal{T}}_{UV}\,\overset{T}{\mathcal{T}}_{VW}\,\overset{B}{T}_{WA}$

| U ↓ / A → | 66 | 67 |
|---|---|---|
| 105 | $\overline{.40876}$ | $\overline{.35375}$ |
| 106 | 1.00000 | 1.00000 |

FORM 1319A

AVRO AIRCRAFT LIMITED
MALTON - ONTARIO
TECHNICAL DEPARTMENT

REPORT No. 7/0510/3
SHEET No. 27

| AIRCRAFT: | | PREPARED BY | DATE |
|---|---|---|---|
| C-105 | GENERAL AIRCRAFT ANALYSIS | R. A. SHEARLY | JUNE 4/56 |
| | | CHECKED BY | DATE |
| | | B | SEPT '56 |

$\mathcal{T}^{C}_{UV} \quad T^{T}_{VA}$

A →

U ↓

| | 65 | 69 |
|---|---|---|
| 105 | - | .66374 |
| 126 | 1.00000 | 1.00000 |

FORM 1319A

AVRO AIRCRAFT LIMITED
MALTON · ONTARIO
TECHNICAL DEPARTMENT

| AIRCRAFT: | | REPORT No. 7/0510/3 | |
|---|---|---|---|
| | | SHEET No. 28 | |
| | | PREPARED BY | DATE |
| C-105 | GENERAL AIRCRAFT ANALYSIS | R.M. SHEARLY | SEPT. 1956 |
| | | CHECKED BY | DATE |
| | | [illegible] | SEPT 56 |

## ESTABLISHED MATRICES

THIS SECTION CONSISTS OF:

1) DUMMIES OF MATRICES $C_{UV}$, $K_{UP}$ & $T_{UA}$ & $T_{U\mathring{A}}$
2) ELEMENTS OF $C_{UV}$ MATRIX ZONES 2, 3, 4 & 5
3) ELEMENTS OF $K_{UP}$ MATRIX ZONE 2
4) ELEMENTS OF $T_{UA}$ MATRIX ZONE 3 & $T_{U\mathring{A}}$ MATRIX ZONE 3
5) ELEMENTS OF $\overset{B}{S}_{LU}$ MATRIX
6) ELEMENTS OF $\overset{T}{S}_{LU}$ MATRIX

FORM 1319A

C-105 GENERAL AIRCRAFT ANALYSIS

REPORT Nº 7/0510/3 SHEET Nº 30

TABULATED BY R. N. Shearly DATE June 6/56

CHECKED BY Bucell DATE Sept 56

SUPERVISED BY ________ DATE ________

APPROVED BY ________ DATE ________

## $C_{UV}$ MATRIX (ZONE 2)

| U ↓ / V → | 80 | 81 | 82 | 83 | 84 | Σ |
|---|---|---|---|---|---|---|
| 80 | .238680 | $\overline{.417291}$ | | $\overline{.078317}$ | $\overline{.078317}$ | $\overline{.335245}$ |
| 81 | $\overline{.417291}$ | .972749 | | .113016 | .113016 | .781490 |
| 82 | — | | 2.918238 | $\overline{.087547}$ | .087547 | 2.918238 |
| 83 | $\overline{.078317}$ | .113016 | $\overline{.087547}$ | .034958 | .026203 | .008313 |
| 84 | $\overline{.078317}$ | .113016 | .087547 | .026203 | .034958 | .183407 |
| Σ | $\overline{.335245}$ | .781490 | 2.918238 | .008313 | .183407 | |

REF. REPORT 7/0510/14 SHT. 2

## $C_{UV}$ MATRIX (ZONE 3)

| U ↓ / V → | 85 | 86 | 87 | 88 | Σ |
|---|---|---|---|---|---|
| 85 | .034381 | .038099 | $\overline{.078367}$ | .011357 | .005470 |
| 86 | .038099 | .387474 | .062546 | $\overline{.046723}$ | .441396 |
| 87 | $\overline{.078367}$ | .062546 | .470541 | $\overline{.050294}$ | .404426 |
| 88 | .011357 | $\overline{.046723}$ | $\overline{.050294}$ | .029372 | $\overline{.056288}$ |
| Σ | .005470 | .441396 | .404426 | $\overline{.056288}$ | |

REF. REPORT 7/0510/8 SHT. 109

TABLE I

| V | Wing IBM No. | Wing $W_a$ | Beam $B_a$ | Tank $T_a$ | C/F $C_a$ | R/F $R_a$ |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | | | | |
| 2 | 2 | 2 | | | | |
| 3 | 3 | 3 | | | | |
| 4 | 4 | 4 | | | | |
| 5 | 5 | 5 | | | | |
| 6 | 6 | 6 | | | | |
| 7 | 7 | 7 | | | | |
| 8 | 8 | 8 | | | | |
| 9 | 9 | 9 | | | | |
| 10 | 10 | 10 | | | | |
| 11 | 11 | 11 | | | | |
| 12 | 12 | 12 | | | | |
| 13 | 13 | 13 | | | | |
| 14 | 14 | 14 | | | | |
| 15 | 15 | 15 | | | | |
| 16 | 16 | 16 | | | | |
| 17 | 17 | 17 | | | | |
| 18 | 18 | 18 | | | | |
| 19 | 19 | 19 | | | | |
| 20 | 20 | 20 | | | | |
| 21 | 21 | 21 | | | | |
| 22 | 22 | 22 | | | | |
| 23 | 23 | 23 | | | | |
| 24 | 24 | 24 | | | | |
| 25 | 25 | 25 | | | | |
| 26 | 26 | 26 | | | | |
| 27 | 27 | 27 | | | | |
| 28 | 28 | 28 | | | | |
| 29 | 29 | 29 | | | | |
| 30 | 30 | 30 | | | | |
| 31 | 31 | 31 | | | | |
| 32 | 32 | 32 | | | | |
| 33 | 33 | 33 | | | | |
| 34 | 34 | 34 | | | | |
| 35 | 35 | 35 | | | | |
| 36 | 36 | 36 | | | | |
| 37 | 37 | 37 | | | | |
| 38 | 38 | 38 | | | | |
| 39 | 39 | 39 | | | | |
| 40 | 40 | 40 | | | | |
| 41 | 41 | 41 | | | | |

| P | Wing IBM No. | Wing $W_a$ | Beam $B_a$ | Tank $T_a$ | C/F $C_a$ | R/F $R_a$ |
|---|---|---|---|---|---|---|
| 1 | 66 | 101 | 201 | | | |
| 2 | 67 | 102 | 202 | | | |
| 3 | 68 | 103 | 203 | | | |
| 4 | 69 | 104 | | | 20 | |
| 5 | 70 | 105 | | | | 3 |
| 6 | 71 | 106 | | | | 4 |
| 7 | 72 | 107 | | | | 5 |
| 8 | 73 | 108 | | | 23 | |
| 9 | 74 | 109 | | | | 9 |
| 10 | 75 | 110 | | | | 10 |
| 11 | 76 | 111 | | | | 11 |
| 12 | 77 | 112 | | | | 12 |
| 13 | 78 | 113 | | | | |
| 14 | 79 | 114 | | | | |

| A | Gen. Load System (1) $O_A$ | Wing IBM No. | Wing $W_a$ | Beam $B_a$ | Tank $T_a$ | C/F $C_a$ | R/F $R_a$ |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | | | | |
| 2 | 2 | 2 | 2 | | | | |
| 3 | 3 | 3 | 3 | | | | |
| 4 | 4 | 4 | 4 | | | | |
| 5 | 5 | 5 | 5 | | | | |
| 6 | 6 | 6 | 6 | | | | |
| 7 | 7 | 7 | 7 | | | | |
| 8 | 8 | 8 | 8 | | | | |
| 9 | 9 | 9 | 9 | | | | |
| 10 | 10 | 10 | 10 | | | | |
| 11 | 11 | 11 | 11 | | | | |
| 12 | 12 | 12 | 12 | | | | |
| 13 | 13 | 13 | 13 | | | | |
| 14 | 14 | 14 | 14 | | | | |
| 15 | 15 | 15 | 15 | | | | |
| 16 | 16 | 16 | 16 | | | | |
| 17 | 17 | 17 | 17 | | | | |
| 18 | 18 | 18 | 18 | | | | |
| 19 | 19 | 19 | 19 | | | | |
| 20 | 20 | 20 | 20 | | | | |
| 21 | 21 | 21 | 21 | | | | |
| 22 | 22 | 22 | 22 | | | | |
| 23 | 23 | 23 | 23 | | | | |
| 24 | 24 | 24 | 24 | | | | |
| 25 | 25 | 25 | 25 | | | | |
| 26 | 26 | 26 | 26 | | | | |
| 27 | 27 | 27 | 27 | | | | |
| 28 | 28 | 28 | 28 | | | | |
| 29 | 29 | 29 | 29 | | | | |
| 30 | 30 | 30 | 30 | | | | |
| 31 | 31 | 31 | 31 | | | | |
| 32 | 32 | 32 | 32 | | | | |
| 33 | 33 | 33 | 33 | | | | |
| 34 | 34 | 34 | 34 | | | | |
| 35 | 35 | 35 | 35 | | | | |
| 36 | 36 | 36 | 36 | | | | |
| 37 | 37 | 37 | 37 | | | | |
| 38 | 38 | 38 | 38 | | | | |
| 39 | 39 | 39 | 39 | | | | |
| 40 | 40 | 40 | 40 | | | | |
| 41 | 41 | 41 | 41 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 32 | 32 | 32 | | | |
| 33 | 33 | 33 | | | |
| 34 | 34 | 34 | | | |
| 35 | 35 | 35 | | | |
| 36 | 36 | 36 | | | |
| 37 | 37 | 37 | | | |
| 38 | 38 | 38 | | | |
| 39 | 39 | 39 | | | |
| 40 | 40 | 40 | | | |
| 41 | 41 | 41 | | | |
| 42 | 42 | 42 | | | |
| 43 | 43 | 43 | | | |
| 44 | 44 | 44 | | | |
| 45 | 45 | 45 | | | |
| 46 | 46 | 46 | | | |
| 47 | 47 | 47 | | | |
| 48 | 48 | 48 | | | |
| 49 | 49 | 49 | | | |
| 50 | 50 | 50 | | | |
| 51 | 51 | 51 | | | |
| 52 | 52 | 52 | | | |
| 53 | 53 | 53 | | | |
| 54 | 54 | 54 | | | |
| 55 | 55 | 55 | | | |
| 56 | 56 | 56 | | | |
| 57 | 57 | 57 | | | |
| 58 | 58 | 59 | | | |
| 59 | 59 | 60 | | | |
| 60 | 60 | 61 | | | |
| 61 | 61 | 62 | | | |
| 62 | 62 | 64 | | | |
| 63 | 63 | 65 | | | |
| 64 | 64 | 66 | | | |
| 65 | 65 | 67 | | | |
| 66 | 66 | 101 | | | |
| 67 | 67 | 102 | | | |
| 68 | 68 | 103 | | | |
| 69 | 69 | 104 | | | |
| 70 | 70 | 105 | | | |
| 71 | 71 | 106 | | | |
| 72 | 72 | 107 | | | |
| 73 | 73 | 108 | | | |
| 74 | 74 | 109 | | | |
| 75 | 75 | 110 | | | |
| 76 | 76 | 111 | | | |
| 77 | 77 | 112 | | | |
| 78 | 78 | 113 | | | |
| 79 | 79 | 114 | | | |
| 80 | | | 201 | | |
| 81 | | | 202 | | |
| 82 | | | 203 | | |
| 83 | | | 204 | | |
| 84 | | | 205 | | |
| 85 | | | | 1 | |
| 86 | | | | 2 | |
| 87 | | | | 3 | |
| 88 | | | | 4 | |
| 89 | | | | | 1 |
| 90 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 32 | 32 | 32 | 32 | | | | |
| 33 | 33 | 33 | 33 | | | | |
| 34 | 34 | 34 | 34 | | | | |
| 35 | 35 | 35 | 35 | | | | |
| 36 | 36 | 36 | 36 | | | | |
| 37 | 37 | 37 | 37 | | | | |
| 38 | 38 | 38 | 38 | | | | |
| 39 | 39 | 39 | 39 | | | | |
| 40 | 40 | 40 | 40 | | | | |
| 41 | 41 | 41 | 41 | | | | |
| 42 | 42 | 42 | 42 | | | | |
| 43 | 43 | 43 | 43 | | | | |
| 44 | 44 | 44 | 44 | | | | |
| 45 | 45 | 45 | 45 | | | | |
| 46 | 46 | 46 | 46 | | | | |
| 47 | 47 | 47 | 47 | | | | |
| 48 | 48 | 48 | 48 | | | | |
| 49 | 49 | 49 | 49 | | | | |
| 50 | 50 | 50 | 50 | | | | |
| 51 | 51 | 51 | 51 | | | | |
| 52 | 52 | 52 | 52 | | | | |
| 53 | 53 | 53 | 53 | | | | |
| 54 | 54 | 54 | 54 | | | | |
| 55 | 55 | 55 | 55 | | | | |
| 56 | 56 | 56 | 56 | | | | |
| 57 | 57 | 57 | 57 | | | | |
| 58 | 59 | 58 | 59 | | | | |
| 59 | 60 | 59 | 60 | | | | |
| 60 | 61 | 60 | 61 | | | | |
| 61 | 62 | 61 | 62 | | | | |
| 62 | 64 | 62 | 64 | | | | |
| 63 | 65 | 63 | 65 | | | | |
| 64 | 66 | 64 | 66 | | | | |
| 65 | 67 | 65 | 67 | | | | |
| 66 | 63 | | | 205 | | | |
| 67 | 73 | | | 204 | | | |
| 68 | 74 | | | | 1 | | |
| 69 | 75 | | | | 4 | | |
| 70 | 77 | | | | | 19 | |
| 71 | 76 | | | | | 20 | |
| 72 | 79 | | | | | 12 | |
| 73 | 78 | | | | | 18 | |
| 74 | 81 | | | | | 10 | |
| 75 | 80 | | | | | 17 | |
| 76 | 83 | | | | | 8 | |
| 77 | 82 | | | | | 16 | |
| 78 | 85 | | | | | 6 | |
| 79 | 84 | | | | | 15 | |
| 80 | 87 | | | | | 4 | |
| 81 | 86 | | | | | 14 | |
| 82 | 88 | | | | | 2 | |
| 83 | 89 | | | | | 1 | |
| 84 | 68 | | | | | | 6 |
| 85 | 69 | | | | | | 8 |
| 86 | 70 | | | | | | 13 |
| 87 | 71 | | | | | | 7 |
| 88 | 72 | | | | | | 14 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 65 | 65 | 67 | | | | |
| 66 | 66 | 101 | | | | |
| 67 | 67 | 102 | | | | |
| 68 | 68 | 103 | | | | |
| 69 | 69 | 104 | | | | |
| 70 | 70 | 105 | | | | |
| 71 | 71 | 106 | | | | |
| 72 | 72 | 107 | | | | |
| 73 | 73 | 108 | | | | |
| 74 | 74 | 109 | | | | |
| 75 | 75 | 110 | | | | |
| 76 | 76 | 111 | | | | |
| 77 | 77 | 112 | | | | |
| 78 | 78 | 113 | | | | |
| 79 | 79 | 114 | | | | |
| 80 | | | 201 | | | |
| 81 | | | 202 | | | |
| 82 | | | 203 | | | |
| 83 | | | 204 | | | |
| 84 | | | 205 | | | |
| 85 | | | | 1 | | |
| 86 | | | | 2 | | |
| 87 | | | | 3 | | |
| 88 | | | | 4 | | |
| 89 | | | | | 1 | |
| 90 | | | | | 2 | |
| 91 | | | | | 14 | |
| 92 | | | | | 4 | |
| 93 | | | | | 15 | |
| 94 | | | | | 6 | |
| 95 | | | | | 16 | |
| 96 | | | | | 8 | |
| 97 | | | | | 17 | |
| 98 | | | | | 10 | |
| 99 | | | | | 18 | |
| 100 | | | | | 12 | |
| 101 | | | | | 20 | |
| 102 | | | | | 19 | |
| 103 | | | | | 21 | |
| 104 | | | | | 23 | |
| 105 | | | | | | 1 |
| 106 | | | | | | 2 |
| 107 | | | | | | 3 |
| 108 | | | | | | 4 |
| 109 | | | | | | 5 |
| 110 | | | | | | 6 |
| 111 | | | | | | 7 |
| 112 | | | | | | 8 |
| 113 | | | | | | 9 |
| 114 | | | | | | 10 |
| 115 | | | | | | 11 |
| 116 | | | | | | 12 |
| 117 | | | | | | 13 |
| 118 | | | | | | 14 |
| 119 | | | | | | 15 |

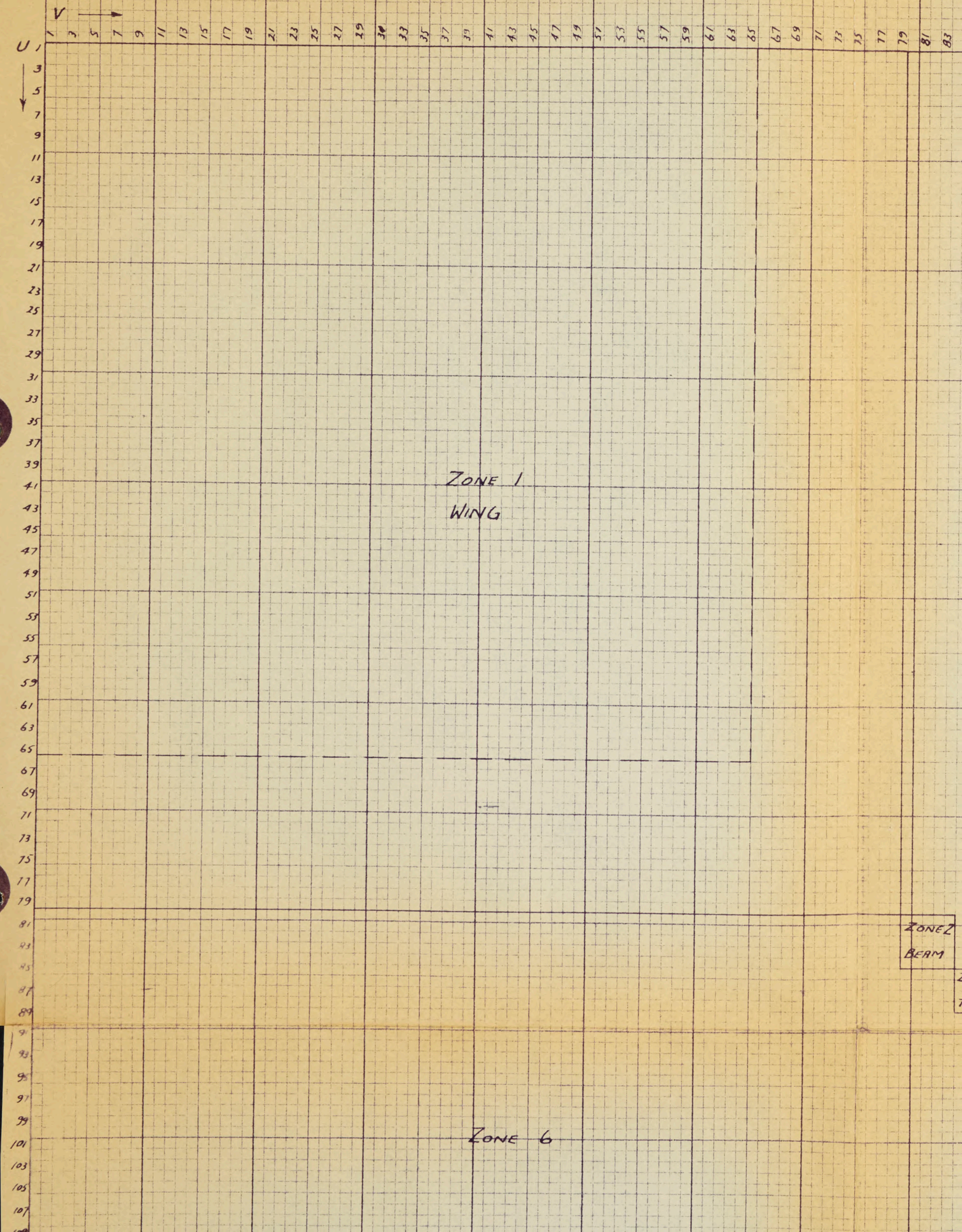
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 65 | 67 | 65 | 67 | | | | |
| 66 | 63 | | | 205 | | | |
| 67 | 73 | | | 204 | | | |
| 68 | 74 | | | | 1 | | |
| 69 | 75 | | | | 4 | | |
| 70 | 77 | | | | | 19 | |
| 71 | 76 | | | | | 20 | |
| 72 | 79 | | | | | 12 | |
| 73 | 78 | | | | | 18 | |
| 74 | 81 | | | | | 10 | |
| 75 | 80 | | | | | 17 | |
| 76 | 83 | | | | | 8 | |
| 77 | 82 | | | | | 16 | |
| 78 | 85 | | | | | 6 | |
| 79 | 84 | | | | | 15 | |
| 80 | 87 | | | | | 4 | |
| 81 | 86 | | | | | 14 | |
| 82 | 88 | | | | | 2 | |
| 83 | 89 | | | | | 1 | |
| 84 | 68 | | | | | | 6 |
| 85 | 69 | | | | | | 8 |
| 86 | 70 | | | | | | 13 |
| 87 | 71 | | | | | | 7 |
| 88 | 72 | | | | | | 14 |

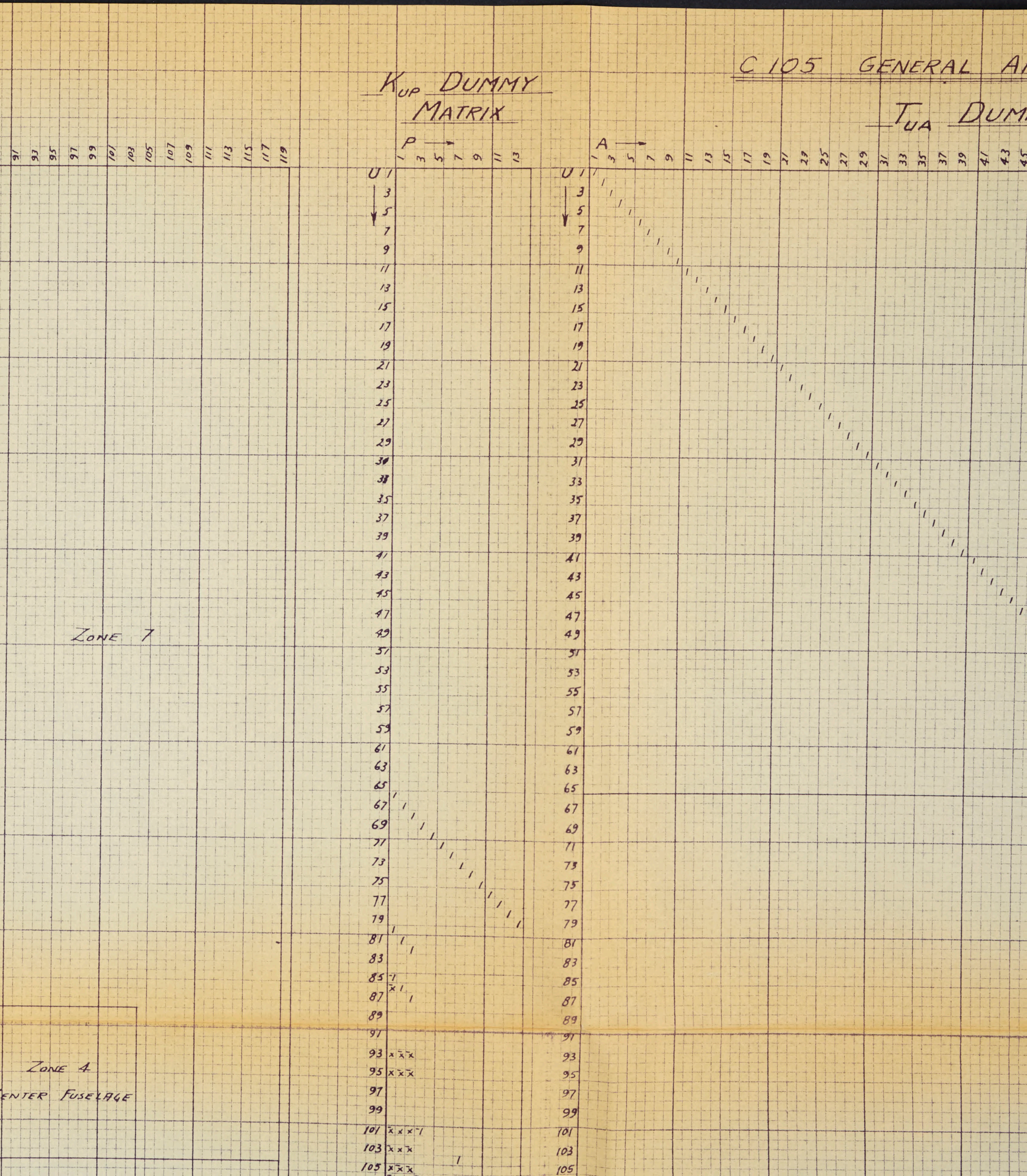
(1) Reference Report 7/0510/13

Å, B̊ of this report identical to

a, b of 7/0510/13

# $C_{UV}$ DUMMY MATRIX




C 105 GENERAL A
$K_{UP}$ DUMMY MATRIX
$T_{UA}$ DUM
P →
A →
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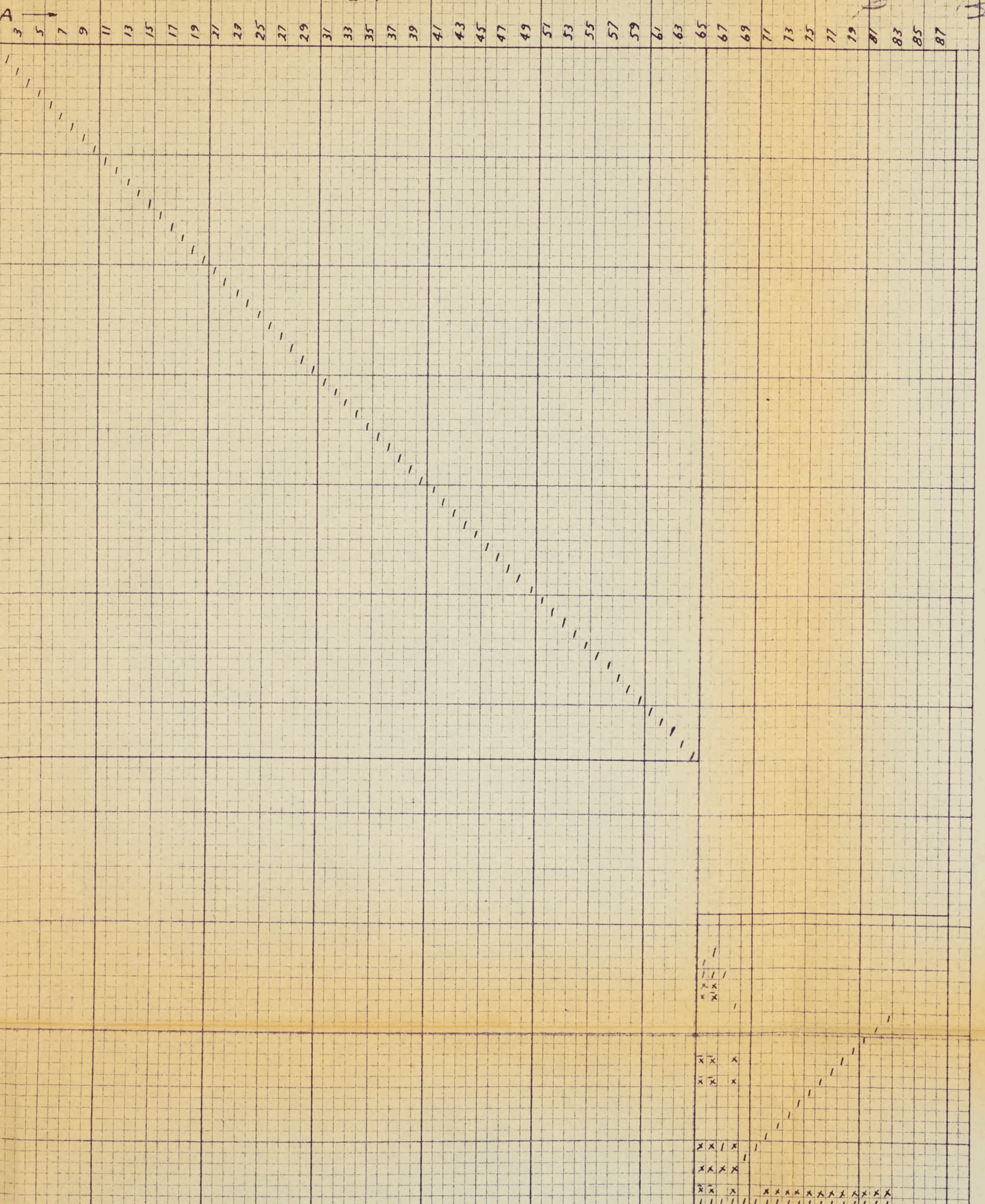
ZONE 7
ZONE 4
ENTER FUSELAGE

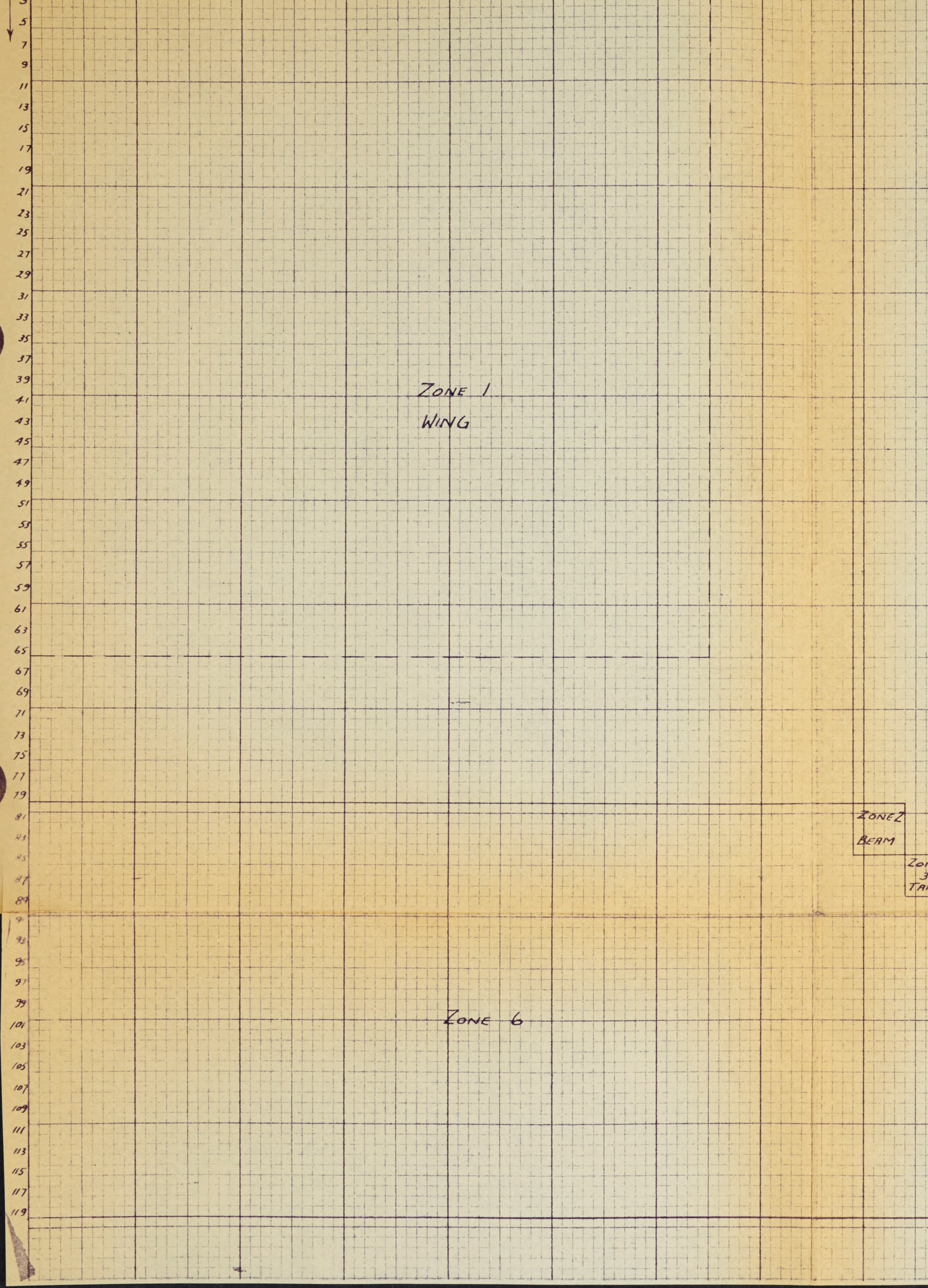
# C 105 GENERAL AIRCRAFT ANALYSIS

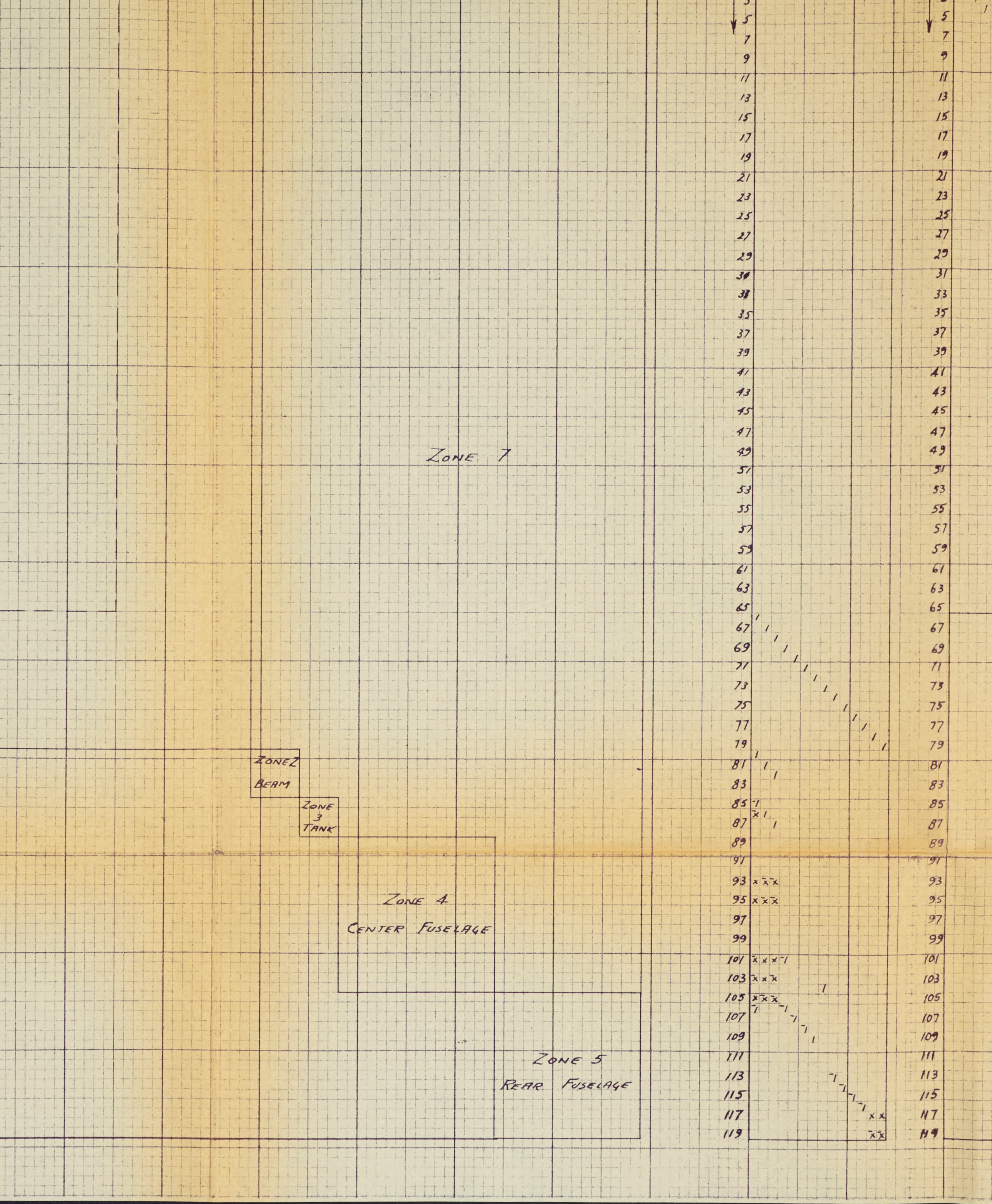
REPORT Nº 7/0510/3
SHEET Nº 29

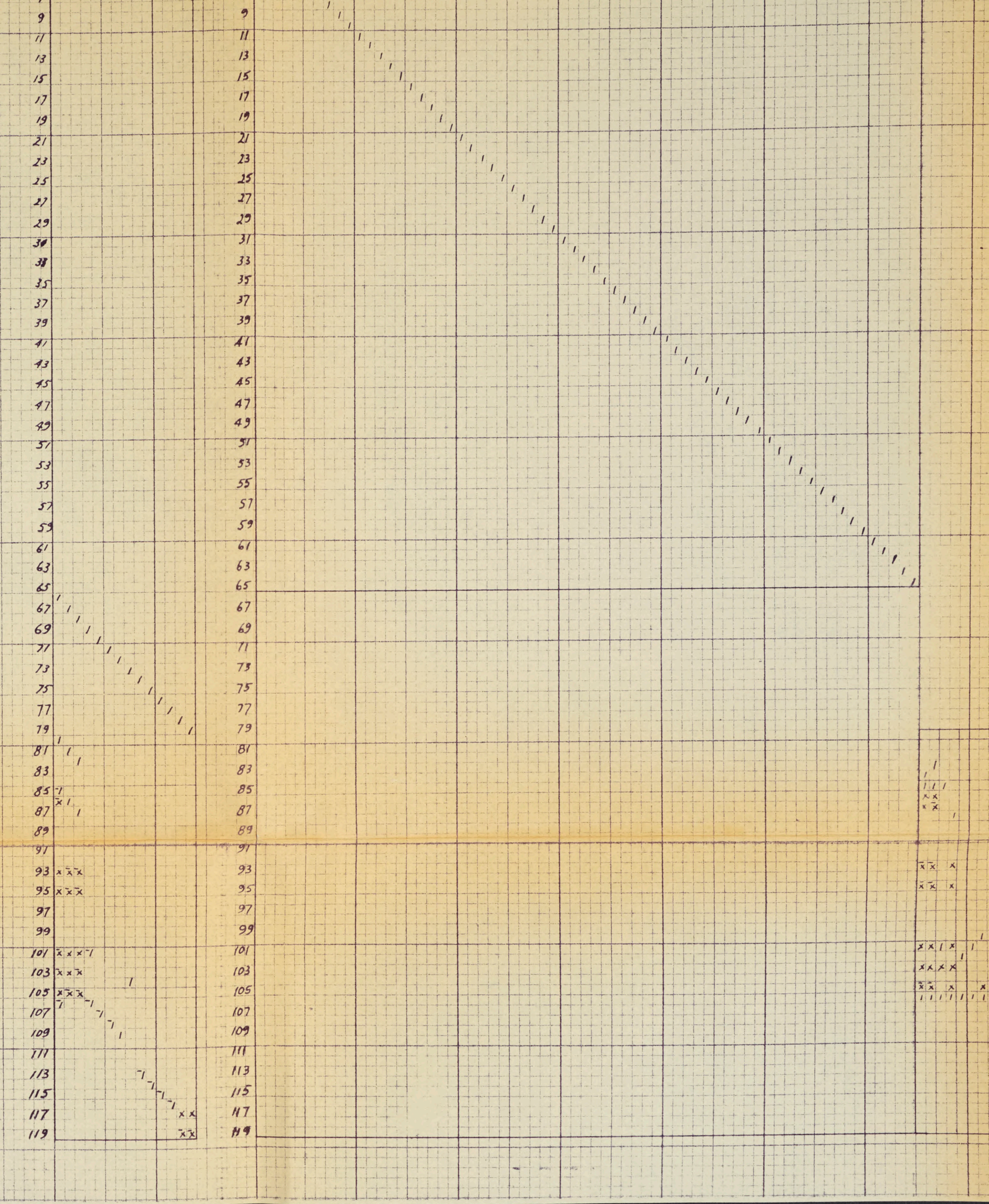
## $T_{UA}$ DUMMY MATRIX

R.N. SHEARLY  JUNE 7/56.




ZONE 1
WING
ZONE 2
BEAM
ZONE 6


ZONE 7
ZONE 2 BEAM
ZONE 3 TANK
ZONE 4 CENTER FUSELAGE
ZONE 5 REAR FUSELAGE
5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 101 103 105 107 109 111 113 115 117 119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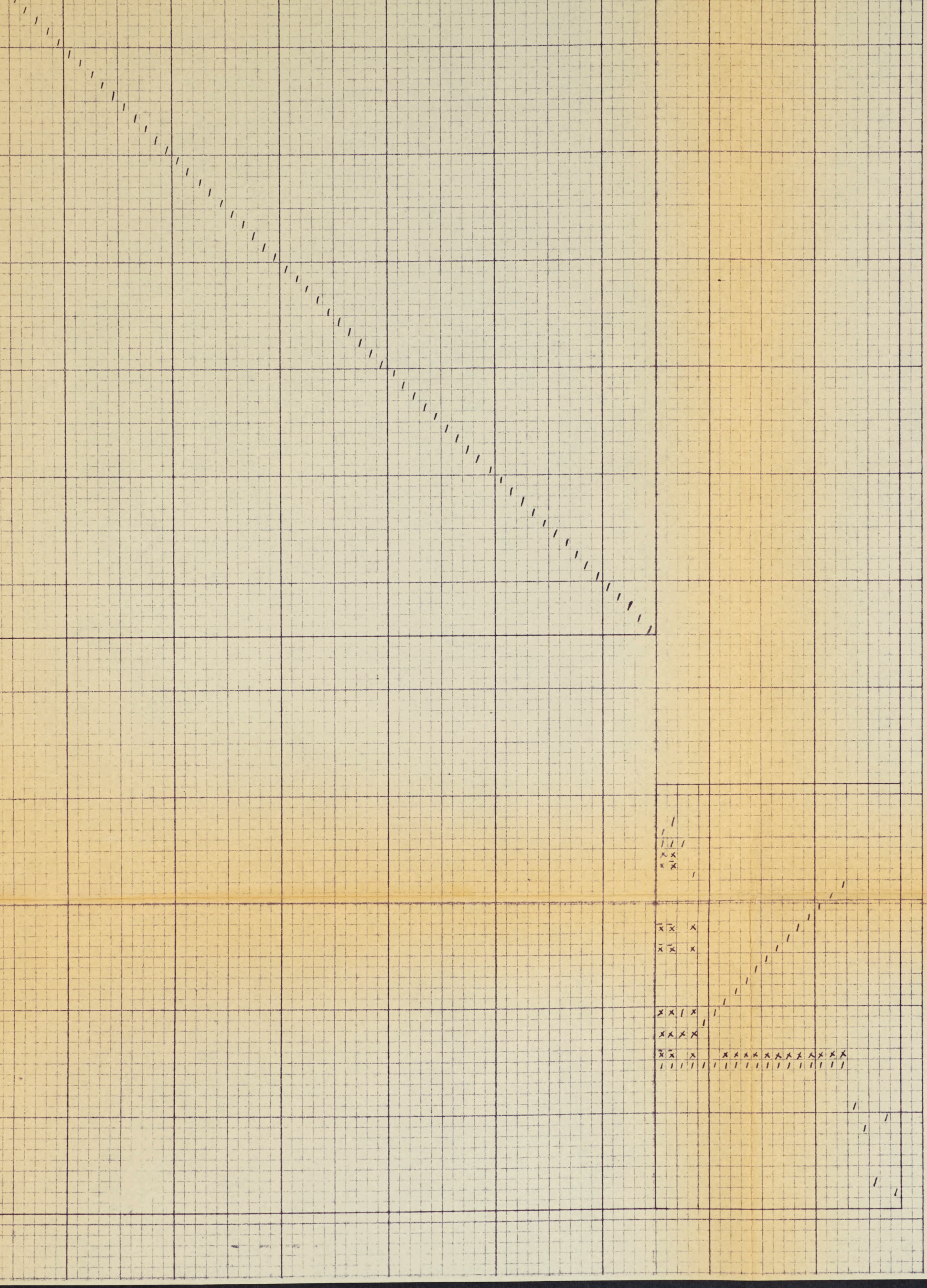

REPORT Nº 7/0510/3
SHEET Nº 33

COMPUTED [illegible] DATE June 5/56
CHECKED [illegible] DATE Sept 26
SUPERVISED ______ DATE ______
APPROVED ______ DATE ______

# C-105 GENERAL AIRCRAFT ANALYSIS

## $K_{UP}$ MATRIX (ZONE 2)

P →

| U ↓ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Σ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 66 | 1.00000 | | | | | | | | | | | | | | 1.00000 |
| 67 | | 1.00000 | | | | | | | | | | | | | 1.00000 |
| 68 | | | 1.00000 | | | | | | | | | | | | 1.00000 |
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| 80 | 1.00000 | | | | | | | | | | | | | | 1.00000 |
| 81 | | 1.00000 | | | | | | | | | | | | | 1.00000 |
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| 73 | | | | | | | | 1.00000 | | | | | | | 1.00000 |
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| 84 | | | | | | | | | | | | | | | |
| 85 | $\bar{1}$.00000 | | | | | | | | | | | | | | $\bar{1}$.00000 |
| 86 | $\overline{.85796}$ | 1.00000 | | | | | | | | | | | | | .14204 |
| 87 | | | 1.00000 | | | | | | | | | | | | 1.00000 |
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| 92 | | | | | | | | | | | | | | | |
| 93 | .44710 | $\overline{.52112}$ | $\overline{.26879}$ | | | | | | | | | | | | $\overline{.34281}$ |
| 94 | | | | | | | | | | | | | | | |
| 95 | .12730 | $\overline{.14837}$ | $\overline{.07653}$ | | | | | | | | | | | | $\overline{.09760}$ |
| 96 | | | | | | | | | | | | | | | |
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| 100 | | | | | | | | | | | | | | | |
| 101 | $\bar{1}$.57440 | .66949 | .34532 | $\bar{1}$.00000 | | | | | | | | | | | $\bar{1}$.55959 |

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| 84 | | | | | | | | | | | | | | | |
| 85 | $\bar{1}.00000$ | | | | | | | | | | | | | | $\bar{1}.00000$ |
| 86 | $\overline{.85796}$ | 1.00000 | | | | | | | | | | | | | .14204 |
| 87 | | | 1.00000 | | | | | | | | | | | | 1.00000 |
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| 92 | | | | | | | | | | | | | | | |
| 93 | .44710 | $\overline{.52112}$ | $\overline{.26879}$ | | | | | | | | | | | | $\overline{.34281}$ |
| 94 | | | | | | | | | | | | | | | |
| 95 | .12730 | $\overline{.14837}$ | $\overline{.07653}$ | | | | | | | | | | | | $\overline{.09760}$ |
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| 100 | | | | | | | | | | | | | | | |
| 101 | $\bar{1}.57440$ | .66949 | .34532 | $\bar{1}.00000$ | | | | | | | | | | | $\bar{1}.55959$ |
| 102 | | | | | | | | | | | | | | | |
| 103 | $\bar{1}.07802$ | .45841 | $\overline{.88874}$ | | | | | | | | | | | | $\bar{1}.50835$ |
| 104 | | | | | | | | 1.00000 | | | | | | | 1.00000 |
| 105 | .76251 | $\overline{.88874}$ | $\overline{.45841}$ | | | | | | | | | | | | $\overline{.58464}$ |
| 106 | $\bar{1}.00000$ | | | $\bar{1}.00000$ | | | | | | | | | | | $\bar{2}.00000$ |
| 107 | | | | | $\bar{1}.00000$ | | | | | | | | | | $\bar{1}.00000$ |
| 108 | | | | | | $\bar{1}.00000$ | | | | | | | | | $\bar{1}.00000$ |
| 109 | | | | | | | 1.00000 | | | | | | | | 1.00000 |
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| 112 | | | | | | | | | | | | | | | |

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| 97 | | | | | | | | | | | | | | | |
| 98 | | | | | | | | | | | | | | | |
| 99 | | | | | | | | | | | | | | | |
| 100 | | | | | | | | | | | | | | | |
| 101 | $\bar{1}.57440$ | .66949 | .34532 | $\bar{1}.00000$ | | | | | | | | | | | $\bar{1}.55959$ |
| 102 | | | | | | | | | | | | | | | |
| 103 | $\bar{1}.07802$ | .45841 | $\bar{.}88874$ | | | | | | | | | | | | $\bar{1}.50835$ |
| 104 | | | | | | | | 1.00000 | | | | | | | 1.00000 |
| 105 | .76251 | $\bar{.}88874$ | $\bar{.}45841$ | | | | | | | | | | | | $\bar{.}58464$ |
| 106 | $\bar{1}.00000$ | | | $\bar{1}.00000$ | | | | | | | | | | | $\bar{2}.00000$ |
| 107 | | | | | $\bar{1}.00000$ | | | | | | | | | | $\bar{1}.00000$ |
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| 109 | | | | | | | 1.00000 | | | | | | | | 1.00000 |
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| 112 | | | | | | | | | | | | | | | |
| 113 | | | | | | | | | $\bar{1}.00000$ | | | | | | $\bar{1}.00000$ |
| 114 | | | | | | | | | | $\bar{1}.00000$ | | | | | $\bar{1}.00000$ |
| 115 | | | | | | | | | | | $\bar{1}.00000$ | | | | $\bar{1}.00000$ |
| 116 | | | | | | | | | | | | $\bar{1}.00000$ | | | $\bar{1}.00000$ |
| 117 | | | | | | | | | | | | | 2.92424 | .86613 | 3.79037 |
| 118 | | | | | | | | | | | | | | | |
| 119 | | | | | | | | | | | | | $\bar{3}.92424$ | $\bar{1}.86613$ | $\bar{5}.79037$ |
| Σ | $\bar{2}.17347$ | 2.56967 | 1.65285 | $\bar{1}.00000$ | | | 2.00000 | 2.00000 | | | | | | | |

REF. SHEETS 18 - 27 INCL.

C 105 GENERAL AIRCRAFT AN

COMPUTED R. N. [signature] DATE O

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| U ↓ | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
|---|---|---|---|---|---|---|---|---|---|---|
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| 84 | 1.00000 | | | | | | | | | |
| 85 | 1.00000 | | | | | | | | | |
| 86 | .42898 | | | | | | | | | |
| 87 | .06000 | | | | | | | | | |
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| 90 | | | | | | | | | | |
| 91 | | | | | | | | | | |
| 92 | | | | | | | | | | |
| 93 | $\bar{.}23968$ | | | | | | | | | |
| 94 | | | | | | | | | | |
| 95 | $\bar{.}06824$ | | | | | | | | | |
| 96 | | | | | | | | | | |
| 97 | | | | | | | | | | |
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| 99 | | | | | | | | | | |
| 100 | | | | | | | | | | |
| 101 | 1.30792 | | | | | | | | | |
| 102 | | | | | | | | | | |
| 103 | .82804 | | | | | | | | | |
| 104 | | | | | | | | | | |
| 105 | $\bar{.}40876$ | | | | | | | | | |
| 106 | 1.00000 | | | | | | | | | |
| 107 | | | | | | | | | | |
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| 110 | | | | | | 1.00000 | | | | |
| 111 | | | | | | | | | 1.00000 | |

GENERAL AIRCRAFT ANALYSIS  $T_{uÅ}$ MATRIX (ZONE 3)

R. N. [signature]  DATE OCT. 2/56  CHECKED [signature]  DATE Oct 2/56  SUPERVI

| 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1.00000 | | | | | | | | | | |
| | | | | 1.00000 | 1.00000 | | | | | | | | | |
| | | | | .42898 | | | | | | | | | | |
| | | | | ‾.06000 | | | | | | | | | | |
| | | | | | | 1.00000 | | | | | | | | |
| | | | | ‾.20742 | | .38919 | | | | | | | | |
| | | | | ‾.05906 | | .11081 | | | | | | | 1.00000 | |
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| | | | | 1.26648 | 1.00000 | .50000 | 1.00000 | | | | | | | |
| | | | | | | | | 1.00000 | | | | | | |
| | | | | .93469 | .68472 | .34236 | | | | | | | | |
| | | | | ‾.35375 | | .66374 | | | .16250 | .16250 | .54500 | .54500 | .98500 | .98 |
| | | | | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.000 |
| | | 1.00000 | | | | | | | | | | | | |

REPORT No 7/0510/3 SHEET No 34 (a)

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| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | Σ |
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| | | | | | | | | | | | .85796 |
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| | | | 1.00000 | | | | | | | | .94209 |
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| | 1.00000 | | | | | | | | | | .98351 |
| | | 1.00000 | | | | | | | | | 1.00000 |
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| | | | | | | | | | | | 2.78981 |
| | | | | | | | | | | | |
| 54500 | .98500 | .98500 | 1.42500 | 1.42500 | 1.86500 | 1.86500 | 2.30500 | 3.65000 | | | 15.82123 |
| 00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | | | 18.00000 |
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| 87 | .06000 | | | | | | | | | | |
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| 92 | | | | | | | | | | | |
| 93 | ¯.23968 | | | | | | | | | | |
| 94 | | | | | | | | | | | |
| 95 | ¯.06824 | | | | | | | | | | |
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| 101 | 1.30792 | | | | | | | | | | |
| 102 | | | | | | | | | | | |
| 103 | .82804 | | | | | | | | | | |
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| 105 | ¯.40876 | | | | | | | | | | |
| 106 | 1.00000 | | | | | | | | | | |
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| 112 | | | | | | | 1.00000 | | | | |
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| 117 | | | | | | | | 1.00000 | | | |
| 118 | | | | | | | | | | 1.00000 | |
| 119 | | | | | | | | | | | |
| Σ | 4.90826 | | | | | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 4 |
| A | 66 | | | | | 84 | 85 | 86 | 87 | 88 | |

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| | | | | | | .42[illegible] | | | | | | | | |
| | | | | | | $\overline{.06000}$ | | | | | | | | |
| | | | | | | | | 1.00000 | | | | | | |
| | | | | | | $\overline{.20742}$ | | .38919 | | | | | | |
| | | | | | | $\overline{.05906}$ | | .11081 | | | | | | |
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| | | | | | | 1.26648 | 1.00000 | .50000 | 1.00000 | | | | | |
| | | | | | | | | | | 1.00000 | | | | |
| | | | | | | .93469 | .68472 | .34236 | | | | | | |
| | | | | | | $\overline{.35375}$ | | .66374 | | | 16250 | .16250 | 54500 | .5450 |
| | | | | | | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.0000 |
| | 1.00000 | | | | | | | | | | | | | |
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| | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 4.94992 | 3.68472 | 4.00610 | 2.00000 | 2.00000 | 2.16250 | 2.16250 | 2.54500 | 2.5450 |
| | 84 | 85 | 86 | 87 | 88 | 67 | 68 | 69 | 71 | 70 | 73 | 72 | 75 | 74 |

REF. SHEETS 34 & 9.

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| | | 1.00000 | | | | | | | | | | .98351 |
| | | | 1.00000 | | | | | | | | | 1.00000 |
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| | | | | | | | | | | | | 2.78981 |
| | | | | | | | | | | | | |
| 0 | .54500 | .98500 | .98500 | 1.42500 | 1.42500 | 1.86500 | 1.86500 | 2.30500 | 3.65000 | | | 15.82123 |
| 0 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | | | 18.00000 |
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| | | | | | | | | | | | | 1.00000 |
| | | | | | | | | | | | | |
| 00 | 2.54500 | 2.98500 | 2.98500 | 3.42500 | 3.42500 | 3.86500 | 3.86500 | 4.30500 | 5.65000 | | | |
| | 74 | 77 | 76 | 79 | 78 | 81 | 80 | 82 | 83 | | | |

# C-105 General Aircraft Analysis

Report No. 7/0510/3
Sheet No. 35

## $\overset{B}{S}_{iu}$ Matrix

| i ↓ \ u → | 80 | 81 | 82 | 83 | 84 | Σ |
|---|---|---|---|---|---|---|
| 1 | | 3.91304 | | | | 3.91304 |
| 2 | | | 4.80890 | | | 4.80890 |
| 3 | $\overline{4}.11617$ | 4.79762 | | 2.05809 | 2.05809 | 4.79763 |
| 4 | | | 4.80890 | $\overline{.28853}$ | .28853 | 4.80890 |
| Σ | $\overline{4}.11617$ | 8.71066 | 9.61780 | 1.76956 | 2.34662 | |

Ref. Report 7/0510/14 Sheet 2

| | | | |
|---|---|---|---|
| Tabulated By | R. N. Sheely | Date | June 12/56 |
| Checked By | [illegible signature] | Date | Sept '56 |
| Supervised By | | Date | |
| Approved By | | Date | |

## $\overset{T}{S}_{iu}$ Matrix

| i ↓ \ u → | 85 | 86 | 87 | 88 | Σ |
|---|---|---|---|---|---|
| 1 | .10624 | .30814 | $\overline{.17302}$ | $\overline{.16713}$ | .07423 |
| 2 | $\overline{.05042}$ | .65461 | .48042 | $\overline{.39044}$ | .69417 |
| 3 | $\overline{.12138}$ | .19006 | .50058 | $\overline{.22265}$ | .34661 |
| 4 | $\overline{.03264}$ | 1.12149 | .57699 | $\overline{.65904}$ | 1.00680 |
| 5 | .08548 | .96072 | .27920 | $\overline{.23966}$ | 1.08574 |
| 6 | $\overline{.05500}$ | 2.03655 | 1.35134 | $\overline{.56343}$ | 2.76946 |
| 7 | 1.35090 | .90400 | $\overline{1.75300}$ | .67550 | 1.17740 |
| 8 | .01558 | $\overline{.89896}$ | $\overline{.45581}$ | .41693 | $\overline{.92226}$ |
| 9 | .16248 | .13768 | $\overline{.48449}$ | .09510 | $\overline{.08923}$ |
| 10 | 1.16075 | 1.23507 | $\overline{2.13840}$ | .34190 | .59932 |
| 11 | .27684 | $\overline{.73229}$ | $\overline{1.55007}$ | .29754 | $\overline{1.70798}$ |
| 12 | .76575 | 1.53519 | $\overline{3.02906}$ | .06369 | $\overline{.66443}$ |
| 13 | $\overline{.08155}$ | .40063 | $\overline{7.01330}$ | $\overline{.01951}$ | $\overline{6.71373}$ |
| 14 | $\overline{.02163}$ | $\overline{.01014}$ | .06294 | $\overline{.04689}$ | $\overline{.01572}$ |
| 15 | $\overline{.02422}$ | .57068 | .33409 | $\overline{.29858}$ | .58197 |
| 16 | $\overline{.14858}$ | .37472 | .66479 | $\overline{.32779}$ | .56314 |
| 17 | .03571 | .05144 | $\overline{.01575}$ | $\overline{.04697}$ | .02443 |
| 18 | $\overline{.00443}$ | .67570 | .57560 | $\overline{.14385}$ | 1.10302 |
| 19 | .09020 | .34476 | .77422 | .02167 | 1.23085 |
| 20 | $\overline{.03471}$ | $\overline{.10066}$ | .05652 | .05460 | $\overline{.02425}$ |
| 21 | .11212 | .46666 | $\overline{.04353}$ | $\overline{.54228}$ | $\overline{.00703}$ |
| 22 | .12975 | 1.24507 | .02163 | $\overline{.42555}$ | .97090 |
| 23 | .01007 | 4.57052 | 2.05770 | .00241 | 6.64070 |
| 24 | .07273 | .16250 | $\overline{.14396}$ | .03990 | .05137 |
| 25 | .04395 | .00373 | $\overline{.20068}$ | .01408 | $\overline{.13892}$ |
| 26 | .11445 | $\overline{.03388}$ | $\overline{1.22244}$ | .02751 | $\overline{1.11436}$ |
| 27 | .03329 | .07426 | $\overline{.06594}$ | $\overline{.01820}$ | .02341 |
| 28 | $\overline{.00876}$ | $\overline{.06978}$ | $\overline{.04348}$ | .02507 | $\overline{.09695}$ |
| 29 | .04708 | $\overline{.02302}$ | $\overline{.64604}$ | .00958 | $\overline{.61240}$ |
| 30 | $\overline{.07121}$ | .02092 | $\overline{.53947}$ | $\overline{.01707}$ | $\overline{.60683}$ |
| Σ | 3.95884 | 16.17637 | $\overline{11.78242}$ | $\overline{2.12336}$ | |

Ref. Report 7/0510/8 Sheet 104

C-135 GENERAL AIRCRAFT ANALYSIS

$C_{uv}$ MATRIX (ZONE 4)

v →, u ↓

| u | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 89 | .461231 | .243372 | .172817 | .173542 | .114503 | .115093 | .066621 | .067665 | .029359 | .031131 | .00 |
| 90 | .243372 | .143598 | .107602 | .108144 | .074960 | .075325 | .045595 | .046458 | .020960 | .022727 | .00 |
| 91 | .172817 | .107602 | .087685 | .084021 | .062667 | .061155 | .038949 | .038979 | .018304 | .019763 | .00 |
| 92 | .173542 | .108144 | .084021 | .089212 | .061097 | .063421 | .038381 | .040017 | .018151 | .020179 | .00 |
| 93 | .114503 | .074960 | .062667 | .061097 | .050627 | .046250 | .032492 | .031102 | .015720 | .016568 | .003 |
| 94 | .115093 | .075325 | .061155 | .063421 | .046250 | .051965 | .030680 | .033920 | .015170 | .017836 | .003 |
| 95 | .066621 | .045595 | .038949 | .038381 | .032492 | .030680 | .026287 | .021978 | .013269 | .012749 | .00 |
| 96 | .067665 | .046458 | .038979 | .040017 | .031102 | .033920 | .021978 | .027934 | .011788 | .015739 | .00 |
| 97 | .029359 | .020960 | .018304 | .018151 | .015720 | .015170 | .013269 | .011788 | .010922 | .007523 | .00 |
| 98 | .031131 | .022727 | .019763 | .020179 | .016568 | .017836 | .012749 | .015739 | .007523 | .014017 | .001 |
| 99 | .004377 | .003964 | .003479 | .003471 | .003159 | .003060 | .002856 | .002589 | .002637 | .001987 | .00 |
| 100 | .007900 | .006877 | .006464 | .006617 | .005936 | .006490 | .005120 | .006613 | .003647 | .007276 | .00 |
| 101 | $\overline{.000827}$ | $\overline{.000749}$ | $\overline{.000811}$ | $\overline{.000834}$ | $\overline{.000851}$ | $\overline{.000950}$ | $\overline{.000935}$ | $\overline{.001133}$ | $\overline{.000680}$ | $\overline{.001472}$ | $\overline{.000}$ |
| 102 | .001168 | .001165 | .001803 | .001852 | .001887 | .002107 | .001855 | .002517 | .001512 | .003264 | .000 |
| 103 | $\overline{.004134}$ | $\overline{.005208}$ | $\overline{.006291}$ | $\overline{.006462}$ | $\overline{.006594}$ | $\overline{.007355}$ | $\overline{.006464}$ | $\overline{.008786}$ | $\overline{.005279}$ | $\overline{.011399}$ | $\overline{.002}$ |
| 104 | $\overline{.001696}$ | $\overline{.002414}$ | $\overline{.002613}$ | $\overline{.002685}$ | $\overline{.002742}$ | $\overline{.003057}$ | $\overline{.002687}$ | $\overline{.003652}$ | $\overline{.002194}$ | $\overline{.004737}$ | $\overline{.000}$ |
| Σ | 1.483132 | .892186 | .694092 | .693204 | .506181 | .511110 | .326844 | .333748 | .160709 | .173151 | .03 |

REF. REPORT 7/0510/9 SHEET 16-

REPORT Nº 7/0510/3 SHEET Nº 31

TABULATED BY R. [illegible] DATE Sept 13/[illegible]

... AIRCRAFT ANALYSIS — CHECKED BY [illegible] DATE [illegible]

SUPERVISED BY — DATE

$C_{uv}$ MATRIX (ZONE 4) — APPROVED BY — DATE

| 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | Σ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| .115093 | .066621 | .067665 | .029359 | .031131 | .004977 | .007900 | $\overline{.000527}$ | .001168 | $\overline{.004084}$ | $\overline{.001696}$ | 1.483132 |
| .075325 | .045595 | .046458 | .020960 | .022727 | .003854 | .006877 | $\overline{.000749}$ | .001665 | $\overline{.005808}$ | $\overline{.002414}$ | .892186 |
| .061155 | .038749 | .038999 | .018304 | .019763 | .003498 | .006464 | $\overline{.000811}$ | .001803 | $\overline{.006291}$ | $\overline{.002613}$ | .694092 |
| .063421 | .038381 | .040017 | .018151 | .020179 | .003471 | .006617 | $\overline{.000834}$ | .001852 | $\overline{.006462}$ | $\overline{.002685}$ | .698204 |
| .046250 | .032492 | .031102 | .015720 | .016568 | .003159 | .005936 | $\overline{.000851}$ | .001887 | $\overline{.006594}$ | $\overline{.002742}$ | .506781 |
| .051965 | .030680 | .033920 | .015170 | .017836 | .003060 | .006490 | $\overline{.000950}$ | .002107 | $\overline{.007355}$ | $\overline{.003057}$ | .511110 |
| .030680 | .026287 | .021978 | .013269 | .012749 | .002856 | .005120 | $\overline{.000835}$ | .001853 | $\overline{.006464}$ | $\overline{.002687}$ | .326844 |
| .033920 | .021978 | .027934 | .011788 | .015739 | .002589 | .006613 | $\overline{.001133}$ | .002517 | $\overline{.008786}$ | $\overline{.003652}$ | .333748 |
| .015170 | .013269 | .011788 | .010922 | .007523 | .002637 | .003647 | $\overline{.000680}$ | .001512 | $\overline{.005279}$ | $\overline{.002194}$ | .160709 |
| .017836 | .012749 | .015739 | .007523 | .014017 | .001987 | .007276 | $\overline{.001472}$ | .003264 | $\overline{.011399}$ | $\overline{.004737}$ | .173151 |
| .003060 | .002856 | .002589 | .002637 | .001987 | .002574 | .001232 | $\overline{.000297}$ | .000659 | $\overline{.002300}$ | $\overline{.000955}$ | .033001 |
| .006490 | .005120 | .006613 | .003647 | .007276 | .001232 | .008704 | $\overline{.002025}$ | .004495 | $\overline{.015699}$ | $\overline{.006525}$ | .053122 |
| $\overline{.000950}$ | $\overline{.000835}$ | $\overline{.001133}$ | $\overline{.000680}$ | $\overline{.001472}$ | $\overline{.000297}$ | $\overline{.002025}$ | .005603 | .003079 | .006752 | .002523 | .006793 |
| .002107 | .001853 | .002517 | .001512 | .003264 | .000659 | .004495 | .003079 | .008681 | $\overline{.012798}$ | $\overline{.005597}$ | .018147 |
| $\overline{.007355}$ | $\overline{.006464}$ | $\overline{.008786}$ | $\overline{.005279}$ | $\overline{.011399}$ | $\overline{.002300}$ | $\overline{.015699}$ | .006752 | $\overline{.012798}$ | .110082 | .019548 | .037063 |
| $\overline{.003057}$ | $\overline{.002687}$ | $\overline{.003652}$ | $\overline{.002194}$ | $\overline{.004737}$ | $\overline{.000955}$ | $\overline{.006525}$ | .002523 | $\overline{.005597}$ | .019548 | .008122 | $\overline{.011361}$ |
| .511110 | .326844 | .333748 | .160709 | .173151 | .033001 | .053122 | .006793 | .018147 | .037063 | $\overline{.011361}$ | |

7/0510/3 Sheets 16-1, 16-2, 16-3 & 16-4

# C-105 General Aircraft Analysis

## Cuv Matrix (Zone 5)

| | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 |
|---|---|---|---|---|---|---|---|---|---|---|
| 105 | .028496 | .008862 | -.002228 | -.002209 | .012151 | -.003800 | -.005886 | -.003441 | .000105 | .000015 |
| 106 | .008862 | .011829 | -.000939 | -.001059 | .006907 | -.002197 | -.003423 | -.001990 | .001711 | .000007 |
| 107 | -.002228 | -.000939 | .006592 | .003604 | -.001777 | -.000073 | -.000364 | -.000262 | .001109 | -.00407[illegible] |
| 108 | -.002209 | -.001059 | .003604 | .007372 | -.004482 | .000286 | -.000029 | | .000468 | -.000005 |
| 109 | .012151 | .006907 | -.001777 | -.004482 | .525329 | -.034344 | -.041664 | -.035352 | .000846 | -.000006 |
| 110 | -.003800 | -.002197 | -.000073 | .000286 | -.034344 | .015550 | .017327 | .014240 | -.000391 | .000003 |
| 111 | -.005886 | -.003423 | -.000364 | -.000029 | -.041664 | .017327 | .025526 | .018527 | -.000642 | .000004 |
| 112 | -.003441 | -.001990 | -.000262 | | -.035352 | .014240 | .018527 | .034597 | -.000465 | .000006 |
| 113 | .000105 | .001711 | .001109 | .000468 | .000846 | -.000391 | -.000642 | -.000465 | .194700 | -.000050 |
| 114 | .000015 | .000007 | -.004073 | -.000005 | -.000006 | .000003 | .000004 | .000006 | -.000050 | .473883 |
| 115 | -.000060 | .000025 | .000213 | -.003659 | .001859 | -.000737 | -.001211 | -.000687 | .000097 | -.000073 |
| 116 | -.003023 | -.001571 | .001660 | .004241 | -.055877 | .009310 | .007433 | .017002 | -.000344 | -.000010 |
| 117 | -.003082 | .001784 | -.000451 | -.000286 | -.036360 | .012930 | .019728 | .054955 | -.000539 | .00000[illegible] |
| 118 | -.005269 | -.003069 | -.000682 | -.000495 | -.042081 | .011112 | .020598 | .050477 | -.000746 | .000006 |
| 119 | -.001233 | -.000700 | -.000031 | .000197 | -.041031 | .003282 | .007647 | .032250 | -.000224 | .000005 |
| Check Sum | .019398 | .016177 | .002298 | .003944 | .254118 | .042498 | .063571 | .179857 | .195635 | .46972[illegible] |

REPORT. No 7/0510/3 SHEET No 32
TABULATED BY CBG DATE SEPT 56
CHECKED BY [signature] DATE SEPT 56
SUPERVISED BY DATE
APPROVED BY DATE

ANALYSIS

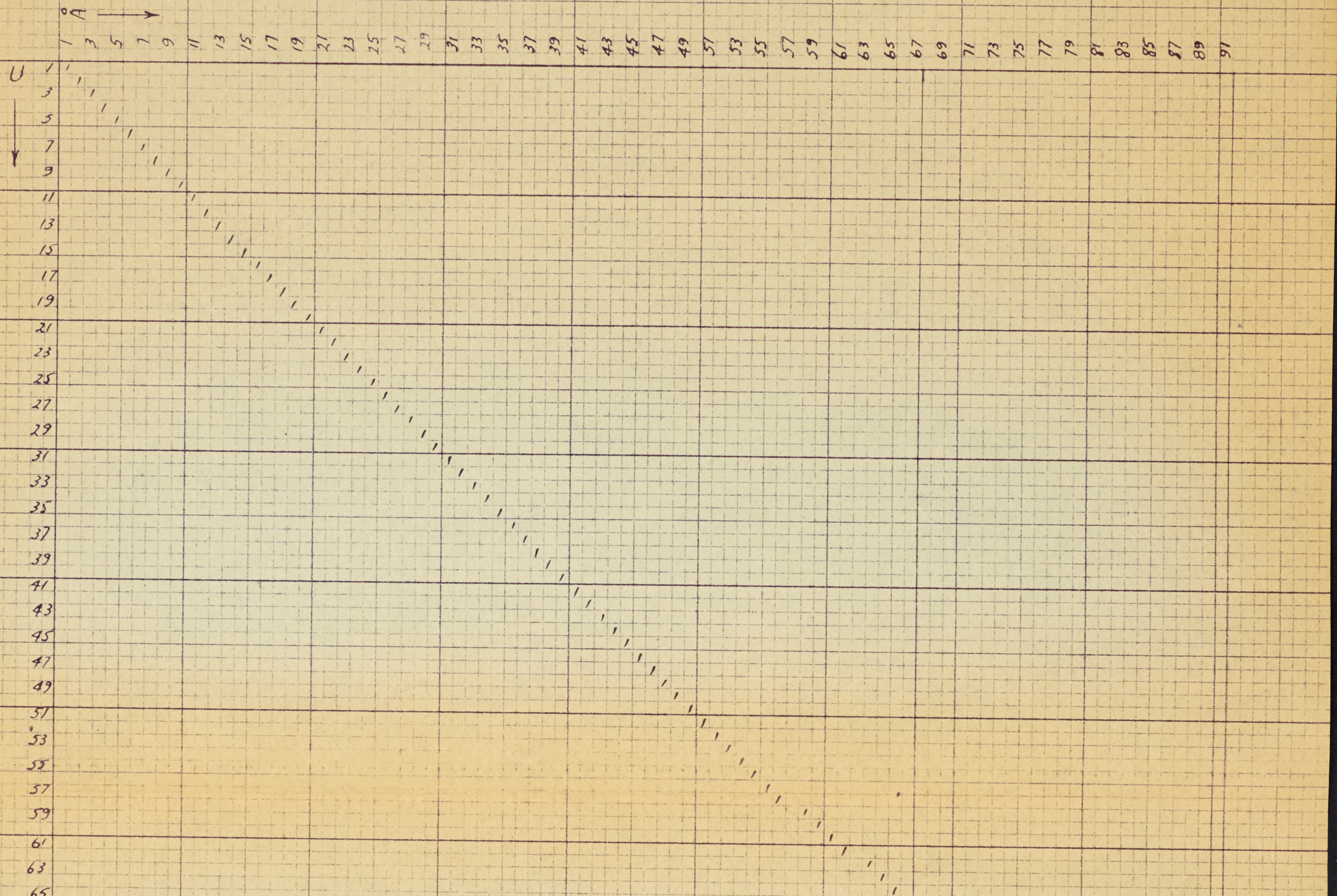
5)

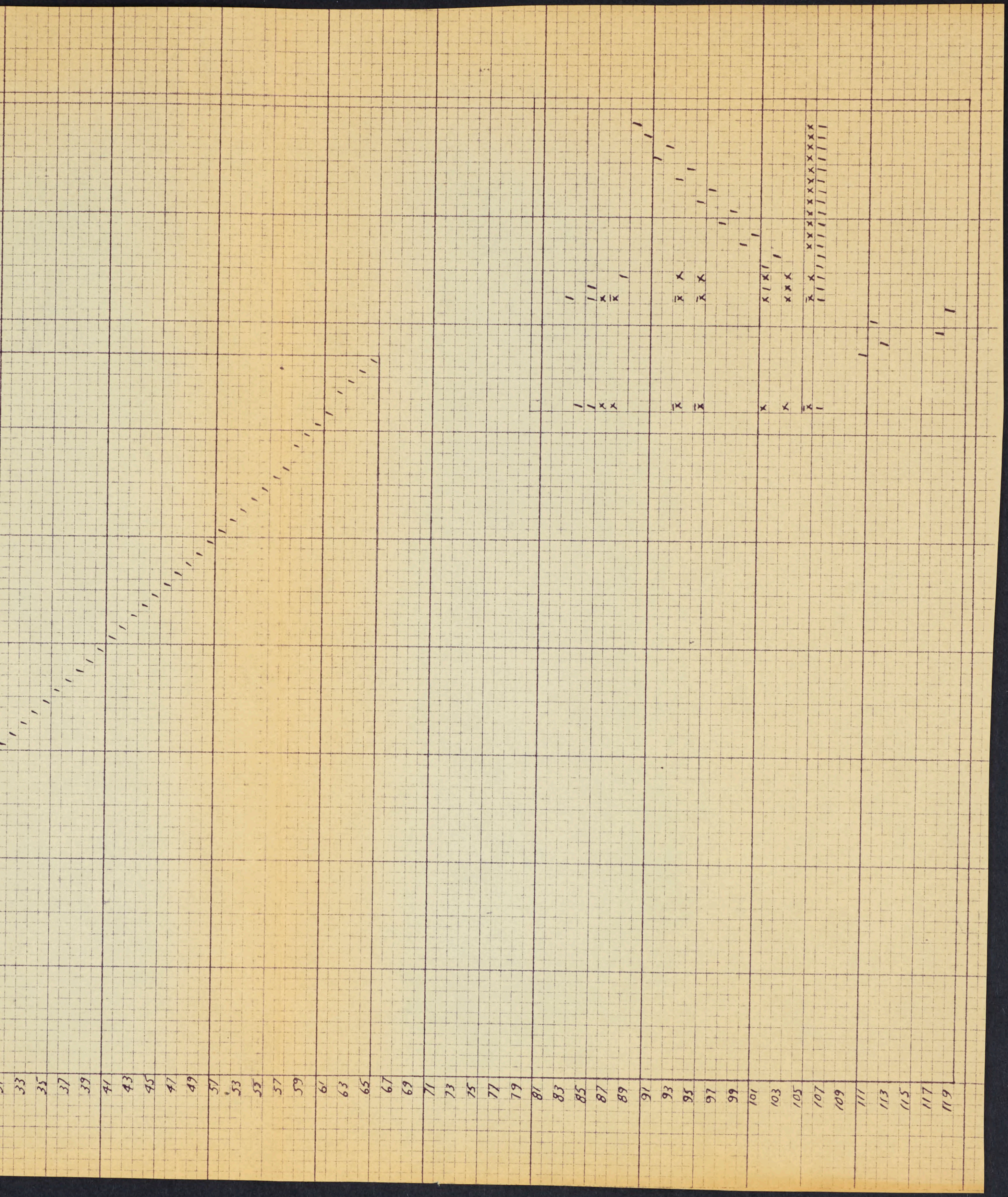
| | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | CHECK SUM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | -.003800 | -.005886 | -.003441 | .000105 | .000015 | -.000060 | -.003023 | -.003082 | -.005269 | -.001233 | .019398 |
| 7 | -.002197 | -.003423 | -.001990 | .001711 | .000007 | .000025 | -.001571 | .001784 | -.003069 | -.000700 | .016177 |
| 7 | -.000073 | -.000364 | -.000262 | .001109 | -.004073 | .000213 | .001660 | -.000451 | -.000682 | -.000031 | .002298 |
| 2 | .000286 | -.000029 | | .000468 | -.000005 | -.003659 | .004241 | -.000286 | -.000495 | .000197 | .003944 |
| 29 | -.034344 | -.041664 | -.035352 | .000846 | -.000006 | .001859 | -.055877 | -.036360 | -.042081 | -.041031 | .254118 |
| 4 | .015550 | .017327 | .014240 | -.000391 | .000003 | -.000737 | .009310 | .012930 | .011112 | .003282 | .042498 |
| 4 | .017327 | .025526 | .018527 | -.000642 | .000004 | -.001211 | .007433 | .019728 | .020598 | .007647 | .063571 |
| 2 | .014240 | .018527 | .034597 | -.000465 | .000006 | -.000687 | .017002 | .054955 | .050477 | .032250 | .179857 |
| 6 | -.000391 | -.000642 | -.000465 | .194700 | -.000050 | .000097 | -.000344 | -.000539 | -.000746 | -.000224 | .195635 |
| 6 | .000003 | .000004 | .000006 | -.000050 | .473883 | -.000073 | -.000010 | .000009 | .000006 | .000005 | .469721 |
| 9 | -.000737 | -.001211 | -.000687 | .000097 | -.000073 | .437513 | .014590 | -.000636 | .000124 | -.000203 | .447155 |
| 7 | .009310 | .007433 | .017002 | -.000344 | -.000010 | .014590 | .428617 | .024694 | .027692 | .017722 | .492136 |
| 0 | .012930 | .019728 | .054955 | -.000539 | .000009 | -.000636 | .024694 | .096980 | .089844 | .061218 | .320788 |
| 1 | .011112 | .020598 | .050477 | -.000746 | .000006 | .000124 | .027692 | .089844 | .093175 | .058351 | .299037 |
| 1 | .003282 | .007647 | .032250 | -.000224 | .000005 | -.000203 | .017722 | .061218 | .058351 | .107855 | .245105 |
| 3 | .042498 | .063571 | .179857 | .195635 | .469721 | .447155 | .492136 | .320788 | .299037 | .245105 | 3.051438 |

C-105 GENERAL AIRCRAFT ANALYSIS

REPORT Nº 7/0510/3
SHEET Nº 29 (a)
R.N. SHEARLY Oct. 2/56.

$T_{U\mathring{A}}$ DUMMY MATRIX




33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 101 103 105 107 109 111 113 115 117 119