Lib sc. 7; 1970; PAPER C.

Air Vehicle Wing Production: Depth Classification Version of CC.
(Classification problems. 36). (Design series. 14).

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[A depth classification version of CC for compound Subjects going with the Host Subject Air Vehicle Wing Production is given. The methodology for the design of freely-faceted scheme for classification has been used. A large number of the isolates constituting the different schedules for the classification of subjects going with each of the different Host Subjects for the production of the different parts and sub-assemblies of an aircraft — such as Wing, Fuselage, Nose cone, Control system, and Landing system — have common array divisions. Eight provisional schedules of such array divisions of isolates relevant to subjects in the field of aircraft production are presented and their use in the formation of isolate numbers illustrated with examples. The schedules of common array divisions given are: Directional relation, Location, Shape of edge, Attributes of surface, Shape (General), Mach Number, Range of dimension, and Matetrial of construction. A provisional schedule of common organ isolates is also given. The Numerical Device is explained. The use of these devices helps in conforming to the Canon of Helpful Sequence, the Canon of Consistent Sequence, the Canon of Scheduled Mnemonics, and the Law of Parsimony, in schedule building. In this way, the enumeration of isolates in the schedules has been reduced by about fifty percent. An Alphabetical Index to the schedules and a list of twelve examples of subjects classified according to the scheme for calssification are given].

ABBREVIATIONS USED:

(BS)	= Basic Subject	[1P1]	= Personality Facet, Round 1
CC	= Colon Classification	(QI)	= Quasi Isolate
(HS)	= Host Subject	(SCC)	= Schedule for Common Array Division
(IN)	= Isolate Number		
(MM)	= Matter (Merhod) Isolate		
(ND)	= Numerical Device		

0 Introduction

01 Series

This paper is one of a series demonstrating the construction of a depth classification version of CC for subjects going with the (HS) Aircraft Production Engineering. An aircraft is a composite machine. Many of its component parts are produced separately. The production of an aircraft consists essentially of the proper assembly of the various components. It is, therefore, a convenience if depth classification versions of CC for subjects going with each of the different (HS) such as Wing Production Engineering, Fuselage Production Engineering, Nose Cone Production Engineering, Control Surfaces Production Engineering, Propulsion System Production Engineering, and Landing System Production Engineering, are constructed. For. several of the (QI) and isolates of these schedules can be used in the design of the depth classification version of CC for subjects going with the (HS) Aircraft Production Engineering, because any kind any special organ such as those mentioned above may be used as qualifiers in the schedule for a whole aircraft. It will help to conform to the Canon of Helpful Sequence, the Canon of Consistent Sequence, the Canon of Scheduled Mnemonics, and the Law of Parsimony in schedule building. In this paper, a provisional depth classification version of CC for subjects going with the (HS) Air Vehicle Wing Production Engineering is given.

1 Methodology of Design

11 Freely Faceted Classification

The methodology for the design and development of a freely faceted scheme for classification has already been described (3, 5). It has been found helpful in the design of several depth versions of CC for subjects going with different (BS). This methodology for design has been used here.

12 Source of Isolates

In addition to comprehensive treatises and micro documents such as articles in periodicals, and technical reports pertaining to aeronautical engineering, the following schemes for classification and thesauri have also been used extensively in the present work.

1 Aslib, Aeronautical Group, Classification (Working Party on —). Aero/Space engineering classification. A bibliographic classification on UDC principles on aeronautical and astronautical engineering. (Aircraft, Missiles, Rockets, and Space Vehicles). 1960. (Mimeographed).

2 Universal Decimal Classification for 532.5 and 533.6. Fluid motion, hydrodynamics, and aerodynamics, with alphabetical index. (Incorporating all official amendments upto and including those given in extensions and corrections to the UDC Series, 5, N 1, Feb 1963).

3 CLEVERDON (C) and others. ASLIB Cranfield research project. Factors determining performance of indexing systems. 1966. 1·V; Design, Part 2; Appendices.
4 ROYAL AIRCRAFT ESTABLISHMENT (Cranfield). [Schedule for aeronautics] (mimeographed).
5 NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, (Washington DC), RESEARCH INFORMATION (Division of —). Index to NACA technical publications, June 1954 to May 1965. v–viii.
6 AIR INDIA INTERNATIONAL. [Schedule for Aeronautics]. (1964) (Typed).
7 FEDERAL AVIATION AGENCY, LIBRARY SERVICE (Division), INFORMATION RETRIEVAL (Branch). Thesaurus of FAA descriptors. Ed 2. 1965.
8 UNITED STATES DEFENCE, (Department of —), NAVAL RESEARCH (Office of—), PROJECT LEX, and ENGINEERS JOINT COUNCIL. Thesaurus of engineering and scientific terms. 1967.
9 BS 185: 1962–5. BRITISH STANDARDS INSTITUTION. Glossary of aeronautical terms. 1962–5.

13 Depth Versions of CC

The following are some of the depth classification versions of CC for subjects in aeronautical engineering and propulsion systems used or consulted in the preparation of the present schedules.

1 RANGANATHAN (T) and NEELAMEGHAN (A). Air vehicle wing production: Depth classification. (Annual seminar, (DRTC). 4;1966; Paper P).
2 RANGANATHAN (S R). [An unpublished draft scheme for the classification of subjects going with the (BS) Aeronautics] (c1961).
3 RANGANATHAN (T). [Aircraft production engineering: A scheme for depth classification.]. 1967. (Unpublished).
4 ANJANEYULU (V). Production engineering of missile: Depth classification. (Annual seminar, (DRTC). 3;1965; Paper K).
5 RANGANATHAN (T). Production engineering of gas turbine engine: Depth classification. (Annual seminar, (DRTC). 2;1964; Paper 1–4).
6 VASUDEVA RAO (K N). Chemical rocket engine production: Depth classification. (Annual seminar, (DRTC). 4;1966: Paper Q).

2 Host Subject

21 DEFINITION

211 *Air Vehicle*

An air-supported vehicle

212 *Aircraft*

An air-supported heavier-than-air vehicle.

213 *Wing*

In relation to an aircraft, a wing is a flat or a slightly cambered plate. It is symmetrical about a median plane. Compared to its other dimensions, such as length and width, its thickness is very small. The function of the wing is to provide the lifting force enabling the heavier-than-air vehicle to fly.

WING AS (1P1) ISOLATE

In our earlier article (6), the helpfulness of classifying and arranging the documents on Air Vehicle Wing Production Engineering in close juxtaposition to the documents on the production engineering of some of the other components specific to aircraft and also to the documents dealing with the production engineering of the aircraft itself, has been discussed. In CC the Main Subject Engineering has been divided into a few canonical (BS). One such (BS) is "D8 Commodity Production Engineering". It has been found convenient to deem the subject Air Vehicle Wing Production Engineering as going with the (BS) Commodity Production Engineering. The isolate "Wing" can be derived on the basis of the characteristic "By Commodity". Thus, the subject Air Vehicle Wing Production Engineering may be represented by the following (HS):

Commodity Production Engineering (BS), Air vehicle wing [1P1]

3 First Characteristics

The first characteristics — that is, (QI) in [1P1] — are given in Table 1 in Sec 31. The sequence among the characteristics has been determined using the Group Strategy.

31 TABLE 1. QUASI ISOLATES IN [1P1].

SN	Sector	Quasi Isolate
a	*b*	*c*
1	(S — (A))	By Designation of wing
2	(S — (a))	By Predicted life of wing
3–8	(S — Z( ))	By Air vehicle in which used
3	(S — ZA)	By Make
4	(S — Za)	By Purpose
5	X	By Speed
6	T	By Altitude
7–8	KZ	By Propulsion system
7	P	By Number
8	L	By Kind
9–23		By Spatial property of wing
9	Z0	By Part of wing affected
10	Z	By Shape of wing
11–17		[Special (QI) for camber]
11	G	By Thickness/chord ratio
12	F	By Thickness
13	E	By Tip chord
14	D	By Root chord

a	b	c
15	C	By Chord
16	B	By Extent of deviation from chord
17	A	By Position of maximum mean camber from leading edge
18	Z	By Attribute of wing surface
19	Zy	By Shape of edge
20	Zx	By Wing area
21	Zw	By Wing span
22	Zv	By Wing width
23	Zt	By Aspect ratio
24–49	(S — Za)	By Wing design factor
	(S — A)	
24–49		Aerodynamic attributes of air foil
24	ZpZ	By Cutout and fitting
25–33		By Wing load factor
25	Zk	By Total wing load
26	Zj	By Ultimate design load
27	Zh	By External airload during normal cruise
28	Zg	By Total wing load during 2–5 g maneuver
29	Zf	By Wing dead weight
30	Ze	By Net shear load to fuselage
31	Zd	By Gust load
32	Zc	By Maneuver load
33	Zb	By Load distribution
34	X	By Nusselt number
35	W	By Prandtl number
36	V	By Reynold's number
37–38	T	By Laminar flow
37	TB	By Full chord flow
38	TA	By Boundary layer
39	S	By Maximum value of C_L/C_D
40	R	By Moment coefficient at zero lift C_{m0}
41	Q	By Ratio $C_{L max.}/C_{L mix.}$
42	P	By Minimum drag coefficient $C_{D min.}$
43	N	By Maximum lift coefficient $C_{L max.}$
44	M	By Maximum lift curve slope (× 100 per degree)
45	L	By Maximum value of C_L3/C_D2 (for ceiling)
46	K	By Ratio C_L/C_D at $C_L = 0.7$ (for climb)
47	J	By Value of C_L for maximum profile drag
48	H	By Value of C_L for maximum C_L/C_D
49	C	By Wing profile drag
50	(S — 9ZA)	By Construction of wing
51–53		By Support to wing box
51	9Z	By Construction of skin
52	9Zw	By Material
53	9Zv	By Thickness
54–56		By Kind of construction
54	9Zh	By Construction of beam
55	9Zg	By Kind of construction
56	9Ze	By Material
57–59		By Thickness
57	9Zc	By Construction of web
		By Number

a	b	c
58	9Zb	By Material
59	9Za	By Sheet thickness
60–68		By Wing box
60	9S	By Material of top of wing box
61	9N	By Dimension
62–63		By Wing root
62	9K	By t/c
63	9J	By Taper rate
64–65		By Wing tip
64	9F	By t/c
65	9E	By Taper rate
66–67		By Bottom of wing box
66	9C	By Material
67	9B	By Taper ratio
68		By Rib of wing
68	91A	By Material
69–74	(S — 9a)	By Attributes of leading edge
69–71		By Kind
69	9r	By Mach number
70	9p	By Shape
71	9n	By Slatting
72–74		By Construction
72	9k	By Material
73	9d	By Thickness
74	9c	By Bevel-edge angle
75–79	(S — zZa)	By Attributes of trailing edge
75–76		By Kind
75	(S — 0A)	By Mach number
76	(S — 0a)	By Shape
77–78		By Construction
77	zA	By Skin construction
78	zZx	By Angle of trailing edge
79	zZb	By Tab
80–106	(S — zA) (S — a)	By Attributes of control surfaces
80–88	(S — zA)	By Flap
80	zX	By Number
81	zV	By Location
82	(zR — zU)	By Kind
83	zP	By Material
84	(zM — zN)	By Length
85–86		By Chord
85	zK	By Kind
86	zJ	By Percentage
87	zG	By Angle of setting
88	zF	By Angle of deflection
89–91		By Hinge
89	zE	By Number
90	zD	By Material
91	zC	By Kind of bearing
92–102	(S — za)	By Aileron
92	zv	By Number per wing
93	zt	By Kind

a	b	c
94	zs	By Material
95	zr	By Chord ratio
96	zn	By Shape
97	zm	By Surface
98	zk	By Shape of edge
99	zj	By Location
100	zg	By Thickness of edge
101-102	zb	By Attributes of hinge
101	zd	By Kind
102	ze	By Material
103-107		By Spoiler
103	x	By Number
104	v	By Kind
105	t	By Material
106	r	By Shape
107	p	By Direction
108-112		By Suction slot
108	k	By Number
109	h	By Shape
110	g	By Direction
111	f	By Spacing
112	e	By Method of operation

4 Design of Schedules

41 Array Division

An examination of the isolates constituting the different schedules for the classification of subjects going with each of the different (HS) for the Prodution Engineering of the different components of an aircraft, indicated that many of the isolates ihave common components in array of order 1, or 2 or later orders. Therefore, if schedules of common divisions are prepared, they can be conveniently used for the formation of isolates n the different schedules. This will help in conforming to the Canon of Helpful Sequence, the Canon of Consistent Sequence the Canon of Scheduled Mnemonics, and the Law of Parsimony, in the design and development of schemes for the depth classification of subjects going with the different (HS) mentioned in Sec 01. With this in view, a few Schedules for array division of Isolates (SCC) have been prepared (*See* Sec 6). In Table 2 in Sec 411, examples of their use in the formation of (IN) in the scheme for the classification of subjects going with the (HS) Air Vehicle Wing Production Engineering are given.

411 Table 2. Use of the Schedules of Common Array Divisions

SCC	Example of Array Divisions		Example of formation of (IN) 1		2		3		Other cases in the schedule
1		*Directional relation*	g	*By Direction of suction slot*	p	*By Direction of spoiler*			
	j	Lateral							
	j1	Chordwise	gj1	Chordwise	pj1	Chordwise			
	j2	Spanwise	gj2	Spanwise	pj2	Spanwise			
2		*Location*	zj	*By Location of aileron*	Z	*By Surface of wing affected*			
	06	Under	zj06	Under	Z06	Under surface			
	0H	Upper	zj0H	Upper	Z0H	Upper surface			
	9b	Internal	zj9b	Internal					
	9d	External	zj9d	External					
3		*Shape of edge*	0	*By Shape of trailing edge*	9p	*By Shape of leading edge*	Zz	*By Shape of edge of wing*	zk
	c	Sharp	0c	Sharp	9pc	Sharp			
	e	Twisted					Zze	Twisted	
	i	Blunt	0j	Blunt	9pj	Blunt	Zzj	Blunt	
	j2	Bluffed					Zzj2	Bluffed	
	m	Drooped	0m	Drooped	9pm	Drooped			
4		*Attributes of surface*	zm	*By Surface of aileron*	Z	*By Wing surface*			
	zB	Smooth	zmB	Smooth	ZzB	Smooth			
	zJ	Slotted	zmJ	Slotted	ZzJ	Slotted			
	zM	Drilled	zmM	Drilled	ZzM	Drilled			

SCC	Example of Array Divisions		Example of formation of (IN) 1		2		3		Other cases in the schedule
5		*Shape* (General)	h	*By Shape of suction slot*	r	*By Shape of spoiler*	Z	*By Shape of wing*	zn
	0n	Triangular	h0n	Triangular	r0n	Triangular	Z0n	Triangular	
	0s2	Rectangular			r0s2	Rectangular			
	0t	Polygon	h0t	Polygon					
	0zr	Cambered					Z0zr	Cambered	
6		*Mach Number*	0	*By Mach Number for trailing edge*	9r	*By Mach Number for leading edge*	X	*By Aircraft speed*	
	D	Transonic	0D	Transonic	9rD	Transonic	XD	Transonic	
	E	Supersonic	0E	Supersonic	9rE	Supersonic	XE	Supersonic	
	G	Hypersonic	0G	Hypersonic	9rG	Hypersonic	XG	Hypersonic	
7		*Dimension*	9E	*By Wing tip taper rate*	9J	*By Wing root taper rate*	C	*By Wing profile drag*	Zp
	D	Small, Low	9ED	Low	9JD	Low	CD	Low	
	E	Medium, Moderate	9EE	Moderate	9JE	Moderate	CE	Medium	
	F	Large, High	9EF	High	9JF	High	CF	High	
8		*Material of construction*	t	*By Material of spoiler*	zc	*By Material of hinge*	9k	*By Material of leading edge*	zP, 9C, 9S, 9Zb, 9Zg, 9Z0
	C2	Carbon steel	tC2	Carbon steel					
	C5	Manganese steel	tC5	Manganese steel	zCc5	Manganese steel	9kC5	Manganese steel	
	C6	Nickel steel					9kC6	Nickel steel	
	F	Aluminium alloy	tF	Aluminium alloy					
	R5	Molybdenum alloy			zCR5	Molybdenum alloy	9kRT	Molybdenum alloy	

In the schedules, a note such as "Division by SCC-3" is given under the appropriate (IN). The use of the schedules of common array divisions in the formation of (IN) has resulted in reducing enumeration of isolates in the schedules by about 50 percent.

42 NUMERICAL DEVICE

In a large number of cases (about fifty in the schedules presented in this paper) an isolate is conveniently divided in the basis of an Unit of Measure. In each of such cases it is convenient to suffix the data for the measure as given in the document to the appropriate (IN) given in the schedule. The component thus added is read as given in the document. If the component added consists of two parts as in the case of a decimal fraction, the digits representing the two parts are connected by an "=" (equal to sign). This is similar to the use of this indicator digit in Alphabetical Device in the case of multinomials (1, 2). This device for the formation of the (IN) is provisionally named as Numerical Device (ND). It has been used extensively in the formation of (IN) during the last four years.

In the present schedules, the units of measure are given in the CGS system, which is taken as the favoured system. However, if the FPS system or any other system is used as the Favoured System, the (ND) can be used in a similar manner. If the (IN) are to be formed on the basis of a less favoured system also, the digit 'B' is to be interpolated between the (IN) given in the schedule and the component digits for the unit of measure added to it.

Example

9c	*By Thickness (in cm)*	C	*By Length of Chord (in metres)*
9c2	2 cm	C2	2 metres
9c3	3 cm	C2=4	2.4 metres
9c3=5	3.5 cm	C3=1	3.1 metres
9c4=1	4.1 cm	CB6=1	6'1"
9cB2	2 inches	CB7=3	7'3"
9cB2=6	2.6 inches	CB7=5=1	7'5.1"

In the schedules, under the appropriate isolates the note "Division by (ND)" is given.

43 COMMON ORGAN ISOLATES

About 1965, while designing schemes for the depth classification of subjects going with the (BS) D8 Commodity Production Engineering, it was found that

1 Certain kinds of "Organ" are common to many commodities; Examples of such common organs are:
Edge, tip, depression, cavity, hole, kink, and connection.
2 A schedule of Common Organ Isolates should be Constructed; and
3 Wherever warranted the organ isolates should be taken from the schedule of Common Organ Isolates.
A provisional list of such organ isolates is given in Sec 7.

44 (MP), (E) AND (2P) ISOLATES

The schedules presented in this paper are largely confined to the isolates in [1P1].

441 (MP) *Isolates*

A short schedule of aerodynamic properties in relation to air vehicle wing is given. The schedule of Common Property Isolates (4) has also been used in classifying.

442 (E) *Isolates*

The schedule of Common Energy Isolates (unpublished) has also been used in classifying.

443 (MM) *Isolates*

A set of (Ql) for the (MM) isolate "I Wind tunnel" associated with the (E) isolate "fR Testing" is given.

The above-mentioned schedules are expected to be developed more fully as and when the depth classification versions of CC for the different subjects in aircraft production mentioned in Sec 01 are worked out.

45 NOTATION

The sectors allocated to the schedules of (1P1) isolates are indicated in column (b) in Table I in Sec 31.

Some of the canonical (BS) going with the Main Subject D Engineering are as follows:

D Engineering
D6 Power production
D7 Service production
D8 Commodity production

A few of the relevant (1P1) isolates derived on the basis of the characteristic "By Commodity" for subjects going with the (BS) Commodity Production Engineering are as follows:

961 Airframe
96B Air vehicle wing
96C Fuselage

Thus, the Host Class Number for Air Vehicle Wing Production Engineering will be: D8,96B

46 MNEMONICS

To facilitate the use of mnemonics, wherever convenient, letters of the Roman Alphabet have been equated with the digits of the Hindu-Arabic numerals according to the following scheme:

b = B = 1	f = F = 5	k = K = 91	q = P = 95
c = C = 2	g = G = 6	m = L = 92	r = Q = 96
d = D = 3	h = H = 7	n = M = 93	s = R = 97
e = E = 4	j = J = 8	p = N = 94	t = S = 98

5 Index to Schedules

Material of
aileron [1P], zs
beam [1P], 9Zg
flap [1P], zP
hinge of
aileron [1P], zc
flap [1P], zC
leading edge [1P], 9k
rib [1P], 91A
skin [1P], 9ZD
spoiler [1P], t
wing box
bottom [1P], 9C
top [1P], 9S
Maximum
lift
coefficient [1P], N
curve slope [1P], M
value of
C_L/C_D [1P], S
C_L/C_D 1P], L
Mean camber
Position of [1P], A
Mechanical element (Org) [1P], zt
Median (SCC-2), 23
Medium (SCC-7), E
Membrane (Org) [1P1], r
Metal (SCC-8), B
Middle (SCC-2), 0C
Midplane (SCC-2), 12
Midpoint (Scc-2), 11
Military air vehicle [1P], Zzv
Minimum drag coefficient
[1P], P
Missile [1P], Zzf
Model testing [2P1], Zb
Moderate (SCC-7), E
Modified diamond shape (SCC-5)
0s34
Molybdenum
alloy (SCC-8), R5
steel (SCC-8), CD
Moment coefficient at
zero lift
[1MP], 0zR
[1P], R
Monocoque [1P1], 9ZF
Motion [1MP], 09c
Multi-
axial (SCC-1), e8
directional (SCC-1), b8
tapered (SCC-3), b8
Multiple cell [1P], 9Zr1Z
aecile [1P], Zq
(Org) [1P], 186

Near (SCC-1), 0g

Neck (Org) [1P], yc
Negative *irt* Camber [1P], BG
Net shear load
[1MP], 0ze
[1P], Ze
Neutral point [1MP], 09m
Nickel
base alloy (SCC-8), G
chromium
molybdenum steel (SCC-8), Ch
steel (SCC-8), C8
steel (SCC-8), C6
Node (SCC-2), 9m6
Non-
air breathing engine [1P], L8
axisymmetrical (SCC-5), 016
circular (SCC-5), 0zb6
planar (SCC-4), zX
slatted leading edge [1P], 9nb
symmetrical (SCC-5), 06
Nonweiler (SCC-5), 0n5
North (SCC-1), zN
east (SCC-1), zP
west (SCC-1), zM
Nose (Org) [1P], jd
Notch, (SCC-4), zxb
(Org) [1P], xb
Nuclear rocket engine [1P], LM
Number of
ailerons [1P], zv
flaps [1P], zX
hinges [1P], ze
of flap [1P], zD
spoilers [1P], x
of flap [1P], zD
suction slots [1P], k
webs [1P], 9Zc
Nusselt number *irt* Design [1P], X
Nut (Org) [1P], zc4

Observation air vehicle [1P], Zp
Obstacle (Org). [1P], wr
Octagon (SCC-5), 0t8
Octahedral (SCC-5), 0zC
Off-centre (SCC-2), 15
Ogee (SCC-5), 0z5
Ogival (SCC-5), 0zN
On (SCC-2), 0m
One
cell *irt* Wing box [1P], 9Zr1
concentrated *irt* Wing box [1P],
9Zm1
dimensional (SCC-5), 0b
Open wind tunnel [2P1], FP
Orientation (SCC-1), zA
Orthogonal (SCC-5), 0g5
Oscillating flap[1P], zU6

Unscreened horn flap [1P], zR16
Unsteady motion [1MP], 09c4
Unswept (SCC-5), 0mk
Untapered (SCC-3), db
Up (SCC-1), p1
Upper *irt* Wing surface [1P], Z0t
Upstream (SCC-1), r1
Utility air vehicle [1P], Zv

V shape (SCC-5), 0nV
Vanadium (SCC-8), RD
Variable
load distribution [1P], Zb4
irt Camber [1P], BD
Varying
along span *irt*
Sweep (SCC-5), 0mp
Thickness of leading edge [1P], 9d
cross-section *irt* Wing box [1P], 9Zk
flange *irt* Wing box [1P], 9Zm
Venetian blind flap [1P], z185
Vertical plane (SCC-2), 01
Very
high (SCC-7), Ca
large (SCC-7) G
low (SCC-7), C
small (SCC-7), C

W shape (SCC-5), 0nW
Waist (Org) [1P], yj
Wake [1MP], 0F
Wavy (SCC-4), zF
Web construction [1P], 9Y
Webbed [1P], 9ZH
Wedge (SCC-5), 0zD8

Weight, Dead [1P], Zj
West (SCC-1), zJ
Whole (Org) [1P], b
Wide
chord *irt* Flap [1P], zK3
spacing *irt* Suction slot [1P], f3
Width of
shock tube [2P1], Bc
wind tunnel [2P1], Fc
wing [1P], Zv
Wind tunnel [2P1], F
Windward (SCC-1), t2
Wing
body combination [1MP], 0X
box [1P], 91
design factor [1P], A
load in 2.5 g maneuver [1MP], 0R
profile drag *irt* Design [1P], C
root [1P], 9H
shape [1P], Z
surface [1P], Z
affected [1P], Z
tip [1P], 9D
Within (SCC-2), 9c
Wood (SCC-8), 2
Wrinkled (SCC-4), zG

X shape (SCC-5), 0nx

Yawing moment [1MP], 0b

Z shape (SCC-5), 0nZ
Zap flap [1P], zU2
Zero lift [1MP], 0zR
irt Design [1P], R

6 Common Divisions for Isolates (SCC)

61 SCC-1: Directional Relation

a	Spatial Relation
b	Directional relation
b1	Unidirectional
b8	Multidirectional
c	Parallel
d	Angular
d1	Inclined
d2	Gradient
e	Axial
e1	Uniaxial
e5	Coaxial
e8	Multiaxial
f1	Radial
f3	Centrifugal
f6	Centripetal
g	Rotary
g1	Clockwise
g6	Anti-clockwise
g8	Counter-rotation
j	Lateral. Transverse
j0	Side
j01	Right
j05	Left
j1	Chordwise
j2	Spanwise
j3	Across
j5	Equatorial
m	Longitudinal
m1	Edgewise
m2	Along. Past
m3	Forward

m4 Toward. At
m5 Away
m6 Reverse. Counter
m7 Backward
p1 Up
p2 Down
p3 Incoming
p5 Outgoing
p6 Through
p8 Tangential
r Streamwise
r1 Upstream
r2 Downstream
t1 Leeward
t2 Windward

zA Orientation
zB East
zF South East
zG South
zH South West
zJ West
zM North West
zN North
zP North East

62 SCC 2: LOCATION

0a Location
General
0b Located. Present
0c Distant
0d Isolated
0e Removed
0f Beyond
0g Near
0h Adjacent
0j Contiguous
0k In contact
0k8 Tangential
0m On
0p Joined
0q Entering
0r Circumjance
0s Environment
0t Ambient
0v Surround
0x Spanning
01 Vertical plane
02 Below
03 Deep
033 Low
04 Shallow level
06 Under
07 Submerged
08 Buried
0B Breast high
0C Middle
0F High
0G Above, over
0H Upper
0J Overhang
0K Perpendicular
0N Horizontal plane
0P Ahead. Front
0Q Leading
0R Behind. Rear
0S Following
0T Horizontally
0V Plane
0X Level

0Z Centricality
1 Central
11 Midpoint
12 Midplane
13 Concentric
14 Eccentric
15 Off-centre
2 Axis
21 Centreline
22 Bisector
23 Median
3 Inboard
5 Peripheral
51 Fringe
53 Outboard
54 Circumferential
9b Internal. Inner
9c Within. In
9d Outer. External
9e Outside
9f Margin
9g Limit
9h Interface. Interplane
9m Between
9m1 Interlayer
9m2 Interstage
9m3 Interangular
9m4 Intersection
9m5 Junction
9m6 Node
9zh Tip. Extreme. End

63 SCC 3: SHAPE OF EDGE

b Shape of edge
c Sharp
c1 Abrupt
d Pointed
d1 Crisp
d2 Tapered
d5 Multitapered
d6 Untapered
e Twisted
f Reflexed. Folded
g Rounded

j Blunt
j1 Bluffed
k Cut
k1 Cropped
k2 Clipped
k4 Truncated
m Drooped
p Extended
p1 Elongated
p2 Flared
p3 Skirted
p5 Stretched
r Hammerhead
s Boat-tailed
v Bevelled

64 SCC-4: ATTRIBUTES OF SURFACE

za Attribute of surface
zb Smooth
zc Rough
zk Flat
zm Planar
zp Coplanar
zq Non-planar
zs Isotropic

Note.— *The following divisions are mnemonic with* "w Prominence to xp Cut-out" *in the* "Schedule of Common Organ Isolates" *in* [1P].

zw Prominence
zwb Projection
zwd Protrusion
zwe Corrugated
zwf Wavy
zwj Toothed
zwm Bumped
zwn Spiked
zwp Lobed
zwr Stepped
zwv With ridge
zx Depression
zxb Cracked
zxf Grooved
zxg Perforated
zxh Holed, Slotted
zxk With gap
zxm With cavity
zxp Cut out
zxr Drilled

65 SCC 5: SHAPE

0a Shape
0b One-dimensional
0c Straight
0d Out-of straight
0e Curved
0e1 Arc
0e2 Sinusoidal
0g Bent
0g3 Angular
0g5 Orthogonal
0j Two-dimensional
0k Rectilinear
0k1 Planform
0m Swept
0mD Forward (°)

Note:- *Use* (ND).

0mH Backward (°)

Note:-*Use* (ND).

0mP Varying along span
0mK Unswept
0n Triangular
0n1 Equilateral
0n2 Isosceles
0n3 Delta (Caret)
0n32 Double
0n36 Reverse
0n5 Nonweiler
0nH H
0nI I
0nM M
0nT T
0nV V
0nV6 Inverted V
0nW W
0nX X
0nY Y
0nZ Z
0p Lambda
0q Theta
0s Quadrangular
0s2 Rectangular
0s21 Square
0s23 Parallellogram
0s24 Rhomboid
0s26 Sextic
0s28 Trepezoid
0s3 Diamond
0s32 Double wedged
0s34 Modified
0s35 Arrow
0t Polygon
0t5 5 sided
0t6 6 sided (Hexagon)
0t8 8 sided (Octagon)
0t94 12 sided (Dodecagon)
0v Cruciform
0x Aeroisoclinic
0za Curvilinear
0zb Circular
0zb6 Non circular
0zb7 Annular ring
0zc Horseshoe

0zd Crescent
0ze Cranked
0zf Gulling
0z Fan
0zm Convex
0zn Concave
0zp Biconvex (Lenticular)
0zr Cambered
0zs Uncambered
0zt Fusiform
0zu Oval (Elliptical)
0zu2 Half
0zv Parabolic
0z1 Recti-curvilinear
0z2 Semicircular
0z3 Circular arc
0z5 Ogee
0z6 Gothic
0z61 Parabolic gothic
0z7 Hyperbolic
0z8 Hypeliptic
0zA Three dimensional
0zB Faceted
0zC Octahedral
0zD Prismatic
0zD7 Pyramidal
0zD8 Wedge
0zE Cylindrical
0zF Conical
0zF2 Quasi-conical
0zF3 Spiked
0zF4 Tori-conical
0zG Helical
0zH Spiral
0zK1 Spheroid
0zK2 Oblate
0zK3 Prolate
0zK4 Hemi-spherical
0zK5 Torispherical
0zK6 Spherical
0zM Ellipsoidal
0zM2 Semi-ellipsoidal
0zN Ogival
0zP Skewed
0zR Toroidal
0zS Paraboloidal
01 Symmetrical
011 Axi-symmetrical
016 Non-axisymmetrical
06 Non-symmetrical
07 Cross-sectional
071 Convergent
074 Divergent
07D Thin
07F Thick

66 SCC 6: AIRCRAFT SPEED

(MACH NUMBER)

B Subsonic (upto 0.9)
C Sonic
D Transonic (0.91–1.5)
E Supersonic (1.51–4.0)
F High supersonic (4-1–5.0)
G Hypersonic (5.1–15.0)
H Re-entry (over 15)

67 SCC 7: RANGE OF DIMENSION

B Infinitesimal
C Very small. Very low
D Small. Low
E Medium, Moderate
F Large, High
G Very large, Very High

68 SCC 8: MATERIAL OF CONSTRUCTION

2 Wood
21 Spruce
7 Doped convass
B Metal

T1 (A2) *into* (A1) *begins*

C Steel alloy
C1 Stainless steel
C2 Carbon steel
C3 Free cutting carbon steel
C5 Manganese steel
C6 Nickel steel
C8 Nickel-chromium steel
CB Inconel
CD Molybdenum steel
CE Chromium-molybdenum steel
CH Nickel-chromium molybdenum steel
CM Chromium vanadium steel
CP Silicon manganese steel
E Alluminium
F Aluminium alloy
F2 24S-T
F7 75S-T
G Nickel base alloy
H Manganese alloy
J Cobalt base alloy
M Titanium alloy
P Copper alloy
R Refractory group
R2 Chromium alloy
R3 Columbium alloy
R5 Molybdenum alloy
R6 Platinum group

T (A3) *into* (A2) *begins*

RB Tantalum
RC Tungsten

RD Vanadium
T (A3) *into* (A2) *ends*
T1 (A2) *into* (A1) *ends*

V Reinforced plastics
W Refractories
X Ceramics

7 Schedules

71 (1P) ISOLATES

Schedule of Common Organ Isolates

b Whole
c Part
ca Component
cb Element
cc Sample
cd Specimen
ce Piece
cf Factor
cg Fraction
cj Section
ck Slice
cm Sector
cp Segment
d Bottom
da Foundation
dc Foot
de Bed
dg Base
dm Leg

f Trunk
fb Stem

g Top
ga Peak
gc Head
ge Crown
gg Crest
gi Apex
j Forepart
jb Bow
jd Nose
m Afterbody
n Interior
nb Core
nd Kernel
nf Centre
p Face
pb Outerwall
pd Surface
r Membrane
rb Undersurface
re Layer
rh Interface
s Envelope
sb Covering
sd Lining

t Extremity
th Edge
v Ridge
vb Rim
vd Lip
ve Tip
vh End
w Prominence
wb Projection
wd Protrusion
we Corrugation
wf Excrescence
wg Ridge
wj Tooth
wm Bump
wn Spike
wp Lobe
wr Obstacle
x Depression
xb Notch
xd Crack
xf Groove
xg Perforation
xh Hole
xk Gap
xm Cavity
xp Cut out
y Connection
yb Corner
yd Kink
ye Neck
yg Throat
yh Knee
yj Waist

Telescoping point
Earlier level

(S — za) General Purpose Machine Element (=ME)
Note.— Division as in the schedule of Machine Elements in [1P1] *for subjects going with the* (BS) *Commodity Production Engineering.*
(*Illustrative*]
za Machine element
zb Mechanical element
zc Fastener
zc3 Screw
zc4 Nut

zk Bearing

Telescoping point
Earlier level
1 Support
11 Prime box
12 Structural panel
143 Beam
15 Internal brace
151 Stiffener
152 Spar
153 Rib
186 Nacelle
2 Casing
27 Skin
3 Fastening mechanism
3B Hinge
93 Control mechanism
932 Aileron
933 Flap
934 Spoiler
935 Brake
936 Tab
9D Protection device
9D2 Anti-ice
9D5 Fly-warding

Telescoping point
Earlier level
B Leading edge
D Trailing edge

Earlier level
c BY ATTRIBUTES OF CONTROL SURFACE

T1 (A2) into (A1) begins
d *By Attributes of suction slot*

T1 (A3) into (A1) begins
e *By Method of operation*
e1 Fixed
e2 Manual
e6 Automatic

f *By Spacing*
f1 Close
f3 Wide

g *By Direction*
Note.— Division by SCC-1
h *By Shape*
Note.— Division by SCC-5
k *By Number*
Note.— Division by (ND)
T1 (A3) into (A1) ends

n *By Attributes of spoiler*

T2 (A3) into (A1) begins
p *By Direction*
Note.— Division by SCC-1

r *By Shape*
Note.— Division by SCC-5

t *By Material*
Note.—Division by SCC-8

By Kind
v1 Cover type (plate)
v6 Plug type

x *By Number*
Note.—Division by (ND)
T2 (A3) into (A1) ends

za *By Attributes of aileron*

T3 (A3) into (A1) begins
zb *By Attributes of hinge of aileron*

T1 (A4) into (A1) begins
zc *By Material*
Note.—Division by SCC-8

zd *By Kind*
zd1 Hook-and-eye
zd2 Strap
zd3 H
zd4 T
zd5 Flap
zd6 Blind
zdB Skew
zdD Gate
zdF Turn-over
zdH Fast joint
zdJ Sliding
zdM Caliper

ze *By Number*
Note.—Division by (ND)
T1 (A4) into (A1) ends

zg *By Thickness of edge of aileron* (in cm)
Note.—Division by (ND)

zj *By Location*
Note.—Division by SCC-2

zk *By Shape of edge*
Note.—Division by SCC-3

zm *By Surface*
Note.—Division by SCC-4

zn *By Shape*
Note.—Division by SCC-5

zr *By Chord ratio (%)*
Note.—Division by (ND)

zs *By Material*
Note.—Division by (SCC-8)

zt *By Kind*
zt1 Friese
zt2 Semi-span
zt3 Feeler (guide)
zt5 Flap
zt6 Floating
ztD Balanced
ztF Spoiler-slot
ztH Retractable (spoiler-aileron)
ztK Slot-lip
ztM Plug type

zv *By Number per wing*
Note.—Division by (ND)
T3 (A3) *into* (A1) *ends*

zA *By Attributes of Flap*

T4 (A3) *into* (A1) *begins*
zB *By Hinge of flap*

T2 (A4) *into* (A1) *begins*
zC *By Kind of bearing*
zC1 Plain
zC5 Roller

zD *By Material of hinge*
Note.—Division by SCC-8

zE *By Number of hinges*
Note.—Division by (ND)
T2 (A4) *into* (A1) *ends*

zF *By Angle of deflection of flap*
Note.—Division by (ND)

zG *By Angle of setting of flap*
Note.—Division by (ND)
zH *By Chord*

T3 (A4) *into* (A1) *begins*
zJ *By Percentage of chord*
Note.—Division by (ND)

zK *By Kind of chord*

zK3 Wide
zK7 Constant
T3 (A4) *into* (A1) *ends*

By Length of flap
zM *In relation to wing span (%)*
zM0 Full span
Note.— Other (IN) *to be derived by* (ND)
(Illustrative)
zM59 59 per cent
zM66 66 per cent
zN *In metres*
Note.— Division by (ND)

zP *By Material of flap*
Note.— Division by SCC-8

By Kind of flap
zR Balanced
zR1 Horn
zR13 Triangular
zR15 Screened
zR16 Unscreened
zR2 Shrouded
zS1 Plain
zS3 Dive
zS4 Extension
S5 Recovery
zS6 True contour
zS7 Straight contour
zT6 Split
zT8 Slotted
zT82 Double
zT85 Venetian blind
zU1 Alfaro
zU2 Zap
zU3 Fowler
zU4 Jet
zU5 Rotating
zU6 Oscilalting

zV *By Location*
zV1 Leading edge-located
zV3 Trailing edge-located
zV5 External foil-located

zX *By Number of flaps*
Note.— Division by (ND)
T4 (A3) *into* (A1) *ends*
T1 (A2) *into* (A1) *ends*

zZa BY ATTRIBUTES OF TRAILING EDGE

T2 (A2) *into* (A1) *begins*

zZb *By Tab*

T5 (A3) into (A1) begins
zZd Balanced
zZe Link
zZf Controlled
zZj Servo
zZm Spring
zZp2 Geared

By Construction
zZx *By Angle of trailing edge*
Note.— Division by (ND)

zZ *By Construction*
Note.— Divide as "9Z By kind of construction of skin of wing"
(Illustrative)
zZ91 Single skin and corrugation
zZ97 Reveted

By Kind of trailing edge
0 *By Shape*
Note.— Division by SCC-3

0 *By Mach number*
Note.— Division by SCC-6

9b BY ATTRIBUTES OF LEADING EDGE

T3 (A2) into (A1) begins
By Construction
9c *By Bevel-edge angle*
Note.— Division by (ND)
9d *By Thickness* (in cm)
Note.— Division by (ND)
9e Varying along span

9k *By Material*
Note.— Division by SCC-8

By Kind of leading edge
9n *By Slatting*
9n1 Slatted
9n6 Non-slatted

9p *By Shape*
Note.— Division by SCC-3

9r *By Mach number*
Note.— Division by SCC-6
T3 (A2) into (A1) ends

9I BY WING BOX
9IA *By Rib*
T1 (A3) into (A2) begins
By Material of rib
Note.— Division by SCC-8
T1 (A3) into (A2) ends

9A *By Botton of wing box*

T4 (A2) into (A1) begins
9B *By Taper ratio*
Note.— Division by (ND)
9C *By Material*
Note.— Division by SCC-8

9D *By Wing tip*
T7 (A3) into (A1) begins
9E *By Taper rate*
Note.— Division by SCC-7

9F *By* t/c
Note.— Division by (ND)
T7 (A3) into (A1) ends

9H *By Wing root*

T8 (A3) into (A1) begins
9J *By Taper rate*
Note.— Division by SCC-7

9K *By* t/c
Note.— Division by (ND)
T8 (A3) into (A1) ends

9M *By Top of wing box*

T9 (A3) into (A1) begins

9N *By Dimension* (in cm.)
Note.— Division by (ND)

9S *By Material of top of wing box*
Note.— Divide using SCC-8
T9 (A3) into (A1) ends

9X *By Construction of Wing box*

T5 (A2) into (A1) begins
9Y *By Construction of web*

9Za *By Sheet thickness*
Note.— Division by (ND)

9Zb *By Material of web*
Note.— Division by SCC-8

9Zc *By Number of webs*
Note.— Division by (ND)

9Zd *By Construction of beam*

T10 (A3) into (A1) begins
9Ze *By Thickness* (in cm)
Note.— Division by (ND)

9Zg *By Material of beam*
Note.— Division by SCC-8

9Zh *By–Kind of construction*

T4 (A3) into (A1) begins
9Zj I-Section
9Zk Varying cross-section
9Zk1 Straight
9Zk3 Curved
9Zm Varying flange
9Zm1 One-concentrated
9Zm2 Two-concentrated
9Zm3 Three-concentrated
9Zn1 With axial loading
9Zm8 Excentric loading
9Zp Conjugated
9Zq Closed box

T1 (A5) into (A1) begins
9Zr Cell
9Zr1 One
9Zr1Z Multiple
9Zr2 Two
9Zr3 Three
9Zr4 Four
9Zr5 Five
T1 (A5) into (A1) ends
T4 (A4) into (A1) ends

9Zv *By Construction of skin*

T6 (A2) into (A1) begins
9Zw *By Thickness of skin* (in cm)
Note.— Division by (ND)

9Z0 *By Material of skin*
Note.— Division by SCC-8

9Z0Z *By Kind of construction of skin*
9Z1 Single skin and corrugation
9Z2 Double skin and corrugation
9Z3 Honeycomb with two skins
9Z5 Thick plate with stringers
9Z6 Machined grid
9Z7 Riveted
9Z8 Sculptured plate
T6 (A2) into (A1) ends

9ZA *By Support to wing box*

T 7 (A2) into (A1) begins
9ZB External bracing
9ZB2 Two spar
9ZD Full cantilever
9ZD1 Drag truss
9ZF Monocoque
9ZG Semi-monocoque
9ZH Webbed
9ZJ Rigid
9ZK Sagging
T 7 (A2) into (A1) ends

A BY WING DESIGN FACTORS

T 8 (A2) into (A2) begins
B *By Aerodynamic attributes of airfoil*

T 11 (A3) into (A1) begins
C *By Wing profile drag*
Note— Division by SCC-7
H *By Value of* C_L *for maximum* C_L/C_D
J *By Value of* C_L *for maximum profile drag*
K *By Ratio* C_L/C_D *at* C_L 0.7 (*for climb*)
L *By Maximum value of* C_L3/C_D2 (*for ceiling*)

M *By Maximum lift curve slope (× 100 per degree)*
N *By Maximum lift coefficient* $C_{Lmax.}$
P *By Minimum drag coefficient* $C_{Dmin.}$
Q *By Ratio* $C_{Lmax.}/C_{Dmin.}$
R *By Moment coefficient at zero lift* Cm_0
S *By Maximum value of* C_L/C_D
T *By Laminar flow*
TA *By Boundary layer*
TB *By Full chord flow*
V *By Reynolds number*
W *By Prandtl number*
X *By Nusselt number*

T11 (A3) *into* (A1) *ends*

Za *By Wing load factor*

T12 (A3) *into* (A1) *begins*

Zb *By Load distribution*
Zb1 Uniform
Zb11 Chordwise
Zb12 Spanwise
Zb13 Spanwise-chordwise
Zb4 Variable
Zb41 Chordwise
Zb42 Spanwise
Note.— In forming (IN) *derived on the basis of each of the* (Q1) " *By Manoeuver load* " *to* " *By Ultimate design load* ", *the given figure is to be divided by* 1000 *before using* (ND).
Zc *By Manoeuver load*
Zd *By Gust load*
Ze *By Net shear load to fuselage*
Zf *By Wing dead weight*
Zg *By Total wing load during 2.5g maneuver*
Zh *By External airload during normal cruise*
Zj *By Ultimate design load*
Zk *By Total wing load* (g/cm^2)
T12 (A3) *into* (A1) *ends*

ZpZ *By Cutout and fitting*
Zq Nacelle
Zq1 Fuselage
Zq2 Engine
Zq3 Passenger carrier
Zr Dust and fly warding device
Zr1 Dust
Zr5 Fly
Zs Anti-ice device
Zs3 Inflatable rubber bladder
Zs4 Hot leading edge

By Spatial Property

Zt *By Aspect ratio*
ZtD Low (Less than 6)
ZtF High (6 and above)
ZtM Finite
ZtN Infinite

Zv *By Wing width (in meters)*
Note.— Division by (ND)
Zw *By Wing span (in meters)*
Note.— Division by (ND)
Zx *By Wing area (in* m^2*)*
Note.— Division by (ND)
Zy *By Shape of edge*
Note.— Division by SCC-3
Z *By Attribute of wing surface*
Note.— Division by SCC-4

Zz( ) *(Differentiated schedule for attributes of camber)*
A *By Position of maximum mean camber from leading edge (in tenths of chord)*
Note.— Division by (ND).
B *By Extent of deviation from chord (%)*
Note.— Division by (ND).
In addition, the following (IN)
BD Variable
BG Negative
BH Positive

C *By Chord (in meters)*
D *By Root chord (in metres)*
E *By Tip chord (in meters)*
F *By Thickness (in meters)*
G *By Thickness/Chord ratio (%)*
Note.— Division of (IN) C *to* G *by* (ND).
2 *Superimpose* (IN) *derived according to Note* 1, *as required, and place the resulting compound isolate within the circular brackets in* Zz( ).

(Illustrative)

Z0zr–Zz(C1=5–A0=4) Cambered wing, Chord 1·5 meters, Maximum mean camber 0.4c

Z *By Shape of Wing*
Note.— Division by SCC-5

Z *By Part of wing affected*
Z06 Under
Z0H Upper
WHICH WING IS USED
Z( ) BY AIR VEHICLE IN
KZ *By Propulsion system*
By Kind
L Internal combustion engine
L1 Air breathing
L2 Reciprocating
L5 Rotary
L58 Gas turbine
L7 Reaction engine (Jet)
L72 Ramjet
L73 Pulsejet
L75 Turbojet
L76 Turbo-ramjet
L8 Non-air breathing
LH Reaction engine
LJ Rocket
LK Chemical rocket
LM Nuclear rocket
LN Solar engine
LP Electromagnetic propulsion
P *By Number*
Note.— Division by (ND).
P *By Number*
Note.— Division by (ND).
T *By Altitude* (KM)
Note.—Division by (ND).
X *By Speed* (*Mech* N)
Note.— Division by SCC-6
By Purpose
Zb Passenger carrier
Zc Freight
Zd Troop carrier
Ze Bomber
Zf Fighter
Zg Counter measure
Zh Anti-submarine
Zj Director
Zk Target and drone
Zm Target tow
Zn Liaison
Zp Observation
Zq Patrol
Zr Refueling tanker
Zs Research
Zt Rescue
Zu Trainer
Zv Utility
Zw Administrative
Zx Experimental
Zy Service test
Zzb Space travel
Zzd Interplanetary
Zzf Missiles
Zzm Commercial
Zzp Civilian
Zzv Military
ZA *By Make*
Note.— Division by (AD)
(Illustrative)
ZB Boeing
ZD Douglas
Note.— To construct the (IN) *for "Air Vehicle", superimpose* (IN) *from* ZD *to* 1 *in the above schedule as required and place the compound isolate within brackets in* Z( ).
(Illustrative)
Z(ZD-Zf-L7) Douglas, Fighter, Jet aircraft

(a) BY WING LIFE (*in 1000 hr*)
(b) Safe life
(c) Fail safe
(c)30 30,000 fail safe hr

(A) BY DESIGNATION OF WING
Note.— Division by (AD)
(Illustrative)
(N2412) NACA 2412
(R103) RAE 103

72 ISOLATES IN [1MP]

The following is a provisional short list of aerodynamic and other properties helpful in the classification of subjects going with the (BS) Air Vehicle Wing Production Engineering. A more complete list of (MP) isolates for subjects in aeronautical engineering is expected to be published later in an article in this series.

z1 Aerodynamic property

T 1 (A2) *into* (A1) *begins*
z2 Reynold number effect
z4 Heat transfer (Aerothermochemistry)
z5 Compressibility effect (Mach number effect)
z54 Shock wave
z8 Superaerodynamics

0b	Force
0c	Drag
	T 1 (A3) into (A1) begins
0d	Form
0f	Pressure
0g	Breakaway flow
0h	Surface friction
0j	Boundary layer
0k	Laminar flow
0k1	Area rule
0n	Induced drag
0p	Wave resistance
	T 1 (A3) into (A1) ends
0zF	Lift
z0H	Value of C_L for maximum C_D/C_D
0zJ	Value of C for maximum drag
0zK	Ratio of C_L/C_D at $C_L=0.7$
0zL	Maximum value of C_L3/C_L2
0zM	Maximum lift curve slope
0zN	Maximum lift coefficient $C_{Lmax.}$
0zP	Minimum drag coefficient $C_{Dmin.}$
0zQ	Ratio $C_{Lmax.}/C_{Dmin.}$
0zR	Moment coefficient at zero lift C_{m0}
0zS	Maximum value of C_L/C_D
02	Lateral force
03	Moment
	T 2 (A3) into (A1) begins
04	Pitching
05	Rolling
06	Yawing
07	Hinge
	T2 (A3) into (A1) ends
08	Thrust
09c	Motion
09c1	Steady
09c4	Unsteady
09f	Stability
	T 1 (A4) into (A1) begins
09g	Directional
09h	Lateral
09k	Longitudinal
09m	Neutral point
09p	Derivative
09r	Inertia coupling
	T 1 (A4) into (A1) ends

0B0	Aeroelasticity
0B1	Flutter
0B3	Damping
0B32	Mass balance
0B4	Divergence
0B43	Oscillation
0D	Airflow variable
	T 2 (A4) into (A1) begins
0E	Pressure
0F	Wake
0G	Slipstream
0Za	Load
	T 1 (A5) into (A1) begins
0Zc	Manoeuver
0Zd	Gust
0Ze	Net shear load to fuselage
0Zg	Wing load in 2.5g manoeuver
0Zh	External air load in normal cruise
0Zj	Design load
	T 1 (A5) into (A1) ends
	T 2 (A4) into (A1) ends
0X	Wing-body combination interference
	T 1 (A2) into (A1) ends

73 (MM) ISOLATE

1 Wind tunnel

(QI) for the (MM) isolate "1 Wind tunnel"

z	*By Location of object in tunnel* *Note.— Division by* SCC-2
z	*By Angle of attack* *Note.— Division by* (ND)
zB	*By Fluid density* *Note.— Division by* (ND)
zC	*By Reynolds number* ($\times 10^3$) *Note.— Division by* (ND)
9	*By Mach Number* *Note.— Division by* SCC-6
B	*By Shock tube*
Bb	*By Length of shock tube* *Note.— Division by* (ND)
Bc	*By Diameter (width) of shock tube* *Note.— Division by* (ND)

	By Kind of shock tube		*By Kind of wind tunnel*
BB	Straight	FB	Blow down
BC	Reflected	FD	In-draft
BF	Constant diameter	FF	Continuous
		FG	Intermittent
F	*By Attributes of Wind tunnel*	FK	Arc discharge
Fb	*By Length of wind tunnel*	FM	Closed
	Note.— Division by (ND)	FP	Open
Fc	*By Diameter (width) of wind tunnel*		*By Scale of testing*
		Zb	Model
	Note.— Division by (ND)	Zg	Full-scale
		Zm	Flight
F	*By Shape of wind tunnel*		
	Note.— Division by SCC-5		

8 Examples

D8,96B
PRODUCTION ENGINEERING, AIR VEHICLE WING

D8,96B-Z0n3-Z0mH60-Zzk-9d0=005;0f;b33:fR;1-9B11=8-zC42-z50
AIR VEHICLE WING, DELTA SHAPE, BACKWARD SWEEP 60°, FLAT SURFACE, LEADING EDGE THICKNESS 0.005, PRESSURE, DISTRIBUTION, TESTING, WIND TUNNEL, MACH NUMBER 11.8, REYNOLDS NUMBER 42,000, ANGLE OF ATTACK 50°.

1 N66 BARBER (E A). Some experiments on delta wings in hypersonic flow. (AIAA J. 4; 1966; 72-83)

D8,96B-Z0n3-Z0mH75-ZtD1=07-zU6;0f;b33
AIR VEHICLE WING, DELTA SHAPE, BACKWARD SWEEP 75°, ASPECT RATIO 1.07, OSCILLATING FLAP, PRESSURE, DISTRIBUTION

2 N56 LAIDLAW (W R) and HALFMAN (R L). Experimental pressure distributions on oscillating low aspect ratio wings. (J Aeron Sc. 23; 1956; 117)

D8,96B-Z0s2-ZtD-9ZH;a247
AIR VEHICLE WING, RECTANGULAR SHAPE, LOW ASPECT RATIO WEBVED CONSTRUCTION, DEFORMATION

3 N62 GALLAGHER (R H) and RATTINGER (I). Deformational behaviour of low aspect ratio multiweb wings. (Aeron Q. 13; 1962; 71-87).

D8,96B-Z0zr-Z0mH-Zye-Zb13;nf;bB;fP
AIR VEHICLE WING, CAMBERED, BACKWARD SWEEP, TWISTED EDGE, SPANWISE-CHORDWISE UNIFORM LOAD DISTRIBUTION, CENTRE SHAPE, DESIGN

4 N57 WEBER (J). Shape of the centre part of a swept-back wing with a required load distribution. (Gr Br. RAE, TN. Aero 2591. 1957).

D8,96B-Z0zr(G3-DB9=5=4)-Z0zp-Z0mH50-0e0=006 →0=008-9c11=8;0j:fR;1-9E2=5→5-z0
AIR VEHICLE WING, CAMBERED, THICKNESS/CHORD RATIO 3%, ROOT CHORD 9' 5.4", BICONVEX SHAPE, BACKWARD SWEEP 50°, LEADING EDGE THICKNESS VARIATION 0.006 TO 0.008, LEADING EDGE BEVEL ANGLE 11.80, BOUNDARY LAYER, TESTING, WIND TUNNEL, MACH NUMBER 2.5 TO 5, ZERO ANGLE OF ATTACK

5 N66 PATE (S R) and GROTH (E E). Boundary layer transition measurements on swept wings with supersonic leading edges. (AIAA J. 4; 1966; 737–8).

D8,96B–Z0zA–Z0zu–ZwM–ZtF6=37;0zF&fD8,96B;0j
AIR VEHICLE WING, THREE DIMENSIONAL, ELLIPTICAL SHAPE, FINITE SPAN, ASPECT RATIO 6.37, LIFT *influenced by* BOUNDARY LAYER

6 N63 SQUIRE (L C). Effect of boundary layer on the lift of finite wings. (Aeron Q. 14; 1963; 214–53).

D8,96B–Z07D–Z0z5–9rB–0E;0p;b2
AIR VEHICLE WING, THIN CROSS SECTION, OGEE SHAPE, SUBSONIC LEADING EDGE, SUPERSONIC TRAILING EDGE, WAVE RESISTANCE, CALCULATION

7 N65 BEASLEY (J A). Some notes on the calculation of the zero lift wave drag of slender wings with swept trailing edges. (Gr Br. RAE, TN. 65107. 1965).

D8,96B–Z(XE)–Z0s35–zr13;07:b2
AIR VEHICLE WING, (FOR) SUPERSONIC AIRCRAFT, ARROW SHAPE, TRIANGULAR HORN BALANCED FLAP, HINGE MOMENT, CALCULATION

8 N57 NAYLOR (D). Aerodynamic action of triangular hornbalanced control surfaces on the supersonic delta wing. (J Aeron Sc. 1957 Aug; 574–8).

D8,96B–Z(Zc–XB)–Z07F–Z0mH–Zq3;0f;b33&gD8,96B;0ZG
AIR VEHICLE WING, (FOR) FREIGHT CARRIER, SUBSONIC AIRCRAFT, THICK CROSS SECTION, BACKWARD SWEEP, PASSENGER CARRIER IN WING, PRESSURE, DISTRIBUTION *influenced by* THICKNESS/CHORD RATIO

9 N63 BEASLEY (J A). Design of very thick aerofoils for moderately high subsonic speed. (Gr Br. RAE, TN 2864. 1963).

D8,96B–Z(ZB=111–Zb)–Z0mH–Zs–9Z3–9Z0F–9ZwB0 - 125–9Zr3–9SP4=0–zZ97–zX6–zV1–zU3–ztD–zr25–ze4–zdM–x4
AIR VEHICLE WING, (FOR) BAC 111, PASSENGER TRANSPORT AIRCRAFT, BACKWARD SWEEP, ANTI-ICE DEVICE, HONEYCOMB WITH TWO SKINS CONSTRUCTION, ALUMINIUM ALLOY MATERIAL, SKIN THICKNESS 0.125", THREE CELL CLOSED BOX CONSTRUCTION, TOP OF WING BOX OF 4.0% COPPER ALLOY, TRAILING EDGE OF RIVETED CONSTRUCTION, SIX LEADING EDGE-LOCATED FOWLER FLAPS, BALANCED AILERON, CHORD RATIO 25%, FOUR CALIPER HINGE MOUNTING, FOUR SPOILERS

10 N63 BENTLEY (K). Structural design. (Aircr Eng. 35; 1963; 142–4).

D8,96B–Z(ZBE=CMK1–Zc)–Z0mH–ZxB2466–ZwB158=8—ZtF10=22–Zs–N3–9K0=17–9F0=13–9B0=27–zV1—zT82–zM59–zG15
AIR VEHICLE WING, (FOR) BELFAST CMK1, FREIGHT AIRCRAFT, BACKWARD SWEEP, WING AREA 2466 SQ FT, WING SPAN 158.8 FT, ASPECT RATIO 10.22, ANTI-ICE DEVICE, MAXIMUM LIFT COEFFICIENT 3, ROOT T/C 0.13, TIP T/C 0.27, LEADING EDGE-LOCATED DOUBLE SLOTTED FLAP, WING-FLAP SPAN 59%, ANGLE OF SETTING 15°

11 N63 AERODYNAMIC DESIGN. (Aircr Eng. 35; 1963; 253).

D8,96B-Z(ZH-Zb-XD-L75)-Z0mD15-ZxB324=4-ZwB47=4-ZtF6-9Zq-9B0=33
AIR VEHICLE WING, (FOR) HANSA, PASSENGER TRANSPORT, TRANSONIC, TURBOJET PROPULSION AIRCRAFT, FORWARD SWEEP 15°, WING AREA 324.4 SQ FT, WING SPAN 47.4", ASPECT RATIO 6, BOX CONSTRUCTION, TAPER RATIO 0.33

12 N64 STEPFORWARD WINGS for the HFB 320 Hansa. (Aircr Eng. 36; 1964; 248-51).

91 Bibliographical References

1 Sec 42 GOPINATH (M A), NEELAMEGHAN (A), RANGANATHAN (S R) and SEETHARAMA (S). Connecting symbol for alphabetical device for multinomials. (Herald lib sc. 4; 1965; Paper ZZA).

2 Sec 42 NEELAMEGHAN (A) and BHATTACHARYYA (G). Locomotive production engineering: Depth classification; (Lib sc. 3; 1966; Paper P, Sec 52).

3 Sec 11 ——, GOPINATH (M A) and DENTON (P H). Motor vehicle production: Depth classification: A demonstration. (Lib sc. 4; 1967; Paper H).

4 Sec 441 RANGANATHAN (S R). Common property isolates. (An lib sc. 7; 1960; 1-12). [This schedule has subsequently been revised to some extent].

5 Sec 11 ——. Design of depth classification: A methodology. (Lib sc. 1; 1964; Paper A).

6 Sec 22 RANGANATHAN (T) and NEELAMEGHAN (A). Air vehicle wing production: Depth classification. (Annual seminar, (DRTC). 4;1966; Paper P, Sec 32).