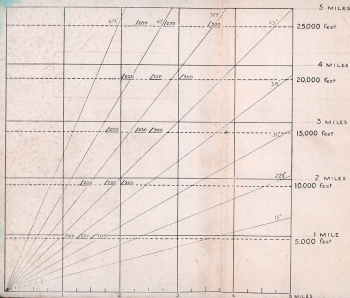


N.A.S.C.
NOTE BOOK



ANGLE GRAPH

Scale

1" = 1 mile = 5280 ft.

Use of Graph, see p. 47

TABLES AND USE OF TABLES.

see Overview

/ 200

shows Direction, Speed
and Position of Bomber,
see pp. 51 and 52

TABLE FOR USE WITH GRAPH, see previous page
Table giving Lateral Distances (Miles) when HEIGHT is estimated

Angle of Elevation	Vertical Height (Feet)									
	2,000	5,000	7,500	10,000	12,500	15,000	17,500	20,000	22,500	25,000
15°	1.77	3.54	5.3	7.07	8.82	10.6	12.4	14.1	15.8	17.7
22½°	1.14	2.24	3.3	4.37	5.71	6.86	8.0	9.5	10.5	11.4
30°	0.82	1.64	2.5	3.28	4.10	4.82	5.75	6.6	7.37	8.22
37½°	0.62	1.24	1.85	2.47	3.09	3.75	4.31	4.9	5.46	6.17
45°	0.47	0.95	1.42	1.89	2.37	2.84	3.32	3.6	4.08	4.74
52½°	0.36	0.72	1.1	1.45	1.82	2.18	2.54	2.9	3.27	3.64
60°	0.27	0.54	0.82	1.09	1.37	1.64	1.92	2.18	2.46	2.74
67½°	0.19	0.39	0.58	0.78	0.98	1.18	1.37	1.56	1.72	1.96

This table can also be used to find the corresponding height when the angle of elevation is known and lateral distance is estimated; e.g., angle of elevation 60°, lateral distance 1 mile; the height is then shown as 10,000 feet (approx.).

It should be noted that for any given angle the height and distance increase in constant proportion:

From this can also be seen the margin of error resulting from a miscalculation of height or distance:

at 15° height error 2,500 feet, distance error 1½ miles
at 45° height error 2,500 feet, distance error ½ mile, and vice versa.

Note.—Too high = too far; too low = too near.

It will be seen from the Table and the Graph that at high angles errors in height may be great but in distance small, while at low angles a small error in height will cause a big error in distance, while at 45° errors in height and distance correspond.

NATIONAL ASSOCIATION OF SPOTTERS CLUBS.

FOREWORD BY THE PRESIDENT-GENERAL.

I believe that this Pocket Book will not only be welcomed by all Spotters, but will prove of great value to them.

A concise and handy pocket reference book, such as has been produced, seems to me to fill a definite need and to provide just the sort of information which Spotters need to have constantly and easily available. I think the Editor is to be congratulated on the skill with which he has achieved this aim.

P. L. Hodder

President-General.

Vice-Chairman: E. J. HODGSON, Esq.

Vice-Presidents.

THE PRESIDENTS OF THE REGIONAL COUNCILS.

The General Council.

Hon. General Secretary (South): P. T. SAMPSON, 89, Farning Road, E.11.

Hon. General Secretary (North): Miss M. DUNN, 16, Eldon Street, Fiddie, Glasgow.

Hon. General Treasurer: M. R. T. HOWARD, 118, Cannon Street, E.C.4.

Hon. Organising Secretary: P. O. MANNING, c/o The Aeroplane Spotters, Hoving Green Lane, H.C.1.

Hon. Librarian: L. S. LOVING, The Yew Tree, St. Albans Road, Hatfield.

R.O.C. Representatives: D. H. SAMPSON, "Whitcomb," West Chiswick, near Goldford.

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Region 1.—Yorkshire (W. R. & E. R.). (North-Eastern Regional Council. Hon. Secretary: W. M. SAMPSON, 8, Grange Park Place, Leeds, S.1.)

Region 2.—Durley, Wotton, Lincoln, Rutland, Northampton. (North Midlands Regional Council. Hon. Secretary: RICHARD S. LESTER, 86, Cornhill Road, Nottingham, Northants.)

Region 3.—Norfolk, Hunts, Beds, Herts, Cambridgeshire, Essex, Suffolk. (Eastern Regional Council. Hon. Secretary: R. A. G. LIVING, 18, New Road, Great Baddow, Essex.)

Region 4.—Middlesex, Parts of Essex and Herts, The London Region. (London Regional Council. Hon. Secretary: H. CONNOR COLEMAN, 3, Portland Rise, Heston Park, M.4.)

Region 5.—Bucks, Oxford, Berks, Hants, Surrey, Dorset. (Southern Regional Council. Hon. Secretary: L. F. BARR, 56, Marlborough Terrace, Reading.)

Region 6.—Gloucestershire, Wilts, Somerset, Devon, Cornwall. (South-Western Regional Council. Hon. Secretary: K. T. HAVES-GUNN, Barnhill, Curry River, Somerset.)

Region 7.—Staffs, Salop, Warwick, Worcester, Hereford. (Midland Regional Council. Hon. Secretary: J. W. H. GUNN, Standard Motor Co., No. 1 Factory, Flitcheamstead, Coventry.)

Region 8.—Cumberland, Westmorland, Lancs, Cheshire. (North-West Regional Council. Hon. Secretary: H. PRINCE, 12, Plymouth Street, Oldham.)

Region 9.—All Scotland. (Scottish Regional Council. Hon. Secretary: Miss Mac DONALD, 33, Elm Street, Glasgow.)

Region 10.—York, Somerset. (South-Eastern Regional Council. Hon. Secretary: P. CANNON, "Little Heathfield," Herts, Essex.)

ADDRESSES OF CLUBS AND SECRETARIES

- | | | |
|----|---|---|
| 1 | SCOTTISH-AMERICAN (No. 4) | R. W. GARDNER, 161 Richmond Avenue, Leigh-on-Sea. |
| 2 | BLACKBURN (No. 10) | R. G. HARRIS, 21 Chapel Street, Manchester. |
| 3 | CARLISLE S.C. (No. 4) | J. A. LINDSEY, 18 New Road, Great Dalboe, Lancs. |
| 4 | HARTFORD S.C. (No. 4) | M. S. MONAGH, 15 The Parade, St. Albans Rd., Hatfield. |
| 5 | THE FAIR'S GARDEN and
CHARTWELL ROAD SPORTS
GROUND INSTRUCTORS' CLUB
(No. 8) | D. WATKINSON, St. John's Lodge, Craykehorpe, Darby. |
| 6 | CHESTER & DIST. (No. 10) | G. W. STODOL, 4111 Delaware Dept., Town Hall. |
| 7 | CHESHIRE S.C. (No. 4) | F. H. PILLINGER, 100 Chertsey Street, Oldham. |
| 8 | C.M. S.C. (No. 8) | S. P. HALL, 10 Chertsey Street, Oldham. |
| 9 | BLACKBURN (No. 10) | R. LITTLE, 28 Conway, Runcorn, Wirral. |
| 10 | SCOTT LONDON S.C. (No. 8) | V. GORTNER, Bankway House, Runcorn, Wirral. |
| 11 | N. BIRMINGHAM S.C. (No. 8) | CHURTON, 142 East Edwale Grove, London, S.E. 22. |
| 12 | ST. PAUL'S S.C. (No. 8) | D. F. FORTUNE WILKES, 24 Holly Lane, Ealingham, Hants. |
| 13 | A. C. WICKHAM, LTD. (8) | R. ROBERTS, 2000, R. Fowling Lane, Flusbury Park. |
| 14 | MCC. GERRARD CLUB
(No. 8) | L. K. JONES & A. C. WICKHAM, Ltd., Watlington Avenue,
Cirencester. |
| 15 | WIMBORNE A.T.C. (No. 8) | J. S. SHERWOOD, 41 Woking Reg. Co., Ltd., Mevo Works,
Weymouth Road, Weymouth. |
| 16 | DELAWARE COUNTY S.C. (2) | F. F. MCGRAW, "Lancaster," 2 Rosedale Court, Wembley. |
| 17 | ROBEY S.C. (No. 8) | R. T. HAWLEY, 200, E. Raleigh, Curry River, Somerset. |
| 18 | BUTTER LONDON (No. 8) | S. G. R. WITT, Main St., Ryeley Oak, Abingdon, Dorset. |
| 19 | ROBEY-HILLMAN S.C. (No. 8) | H. G. HARRIS, British Tankers, Ltd., Cannon Rd., Birmingham. |
| 20 | WIMBORNE S.C. (No. 8) | C. E. WAIN, 3 Humber Road, Cirencester. |
| 21 | WEST HAM S.C. (No. 8) | L. J. GERRARD, 28 Gloucester Avenue, Brickfield. |
| 22 | BARNSLEY & DIST. (8) | T. J. SHERWOOD, Clanning Town Glass Works, S.W. |
| 23 | SCOTTSBORO & DIST. (8) | L. HARRIS, 112 Broad Avenue, Birmingham. |
| 24 | SCOTTSBORO (No. 8) | J. BARRETT, The Raleigh Cycle Co., Ltd., Lepton
Road, Nottingham. |
| 25 | PRESTON S.C. (No. 4) | R. W. GERRARD, "Admiral," London Road, Woodston
Village, Peterborough. |
| 26 | STREET S.C. (No. 8) | H. M. GERRARD, Bucks House, Storey, Bockingham. |
| 27 | GLASGOW and WEST of
SCOTLAND R.S.A. (No. 1) | M. M. GERRARD, 10 Edin. Street, Kilmind, Glasgow. |
| 28 | SCOTLAND S.C. DIST.
S.C. (No. 1) | J. HARRIS, 17 Penarth Road, Southampton. |
| 29 | LIVERPOOL & DIST. S.C.
(No. 10) | H. C. MOORE, J. Ribby & Sons, Ltd., Great Howard
Street, Liverpool 5. |
| 30 | WATFORD (Herts.) DISTRICT
(No. 1) | W. H. TAYLOR, 21 Haverhill Place, St. Julian's, Park. |
| 31 | HARTFORD CANTON (Hants.)
DIST. (No. 1) | R. L. CARRINGTON, School Road, Brighton College, Tonbridge. |
| 32 | BIRMINGHAM S.C. (No. 1) | ANDREW A. WARD, 20 Filson Place, East Filson, Pittsburgh. |
| 33 | SCOTT BIRMINGHAM (No. 2) | M. E. A. O'NEILL, Congregational Mission, Bockingham. |
| 34 | NOTTINGHAM (No. 8) | J. W. TAYLOR, 20 Wimpole Road, Ealingham, Hants. |
| 35 | NOTTINGHAM (No. 8) | M. HARRIS, 29 Woodville Avenue, Luton. |
| 36 | HARTFORD S.C. (No. 10) | L. PATTISON, 218 Old London Road, Hastings. |
| 37 | BLACKBURN & DIST. S.C.
(No. 8) | T. K. SLIGHT, 18 Chander Road, Bockingham. |
| 38 | WIMBORNE & DIST. (2) | J. E. BROWN, 3 Lyndale Avenue, Derby, Bockingham. |
| 39 | SCOTT WIMBORNE S.C. (8) | J. A. B. WITT, 200 W. Hill, South Woodland, S.W. |
| 40 | ROBEY & DIST. (No. 8) | R. ROBERTS, 15 W. Hill, South Woodland, Newbury. |
| 41 | ROBEY & DIST. (No. 8) | JOHN L. BROWN, 71 Downgate Road, Reading. |
| 42 | EPSON COLLEGE (No. 8) | G. C. DAVIES, Epson College, Epson. |
| 43 | WIMBORNE (No. 10) | D. HARRIS, 11 West Bockingham, Wokingham. |

ADDRESSES OF CLUBS AND SECRETARIES—*contd.*

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|----|--|---|
| 60 | LEITCHES BROS. S.C. (No. 10) | H. A. DENNIS, 24 Mileway Road, Leamster |
| 61 | STEVEN-DE-TREIT S.C. (No. 3) | A. DENNIS, Bush Glade Street, Ransgay |
| 62 | STANDARD MOTOR CO. (No. 10) | J. W. H. GASTAL, The Standard Motor Co., Ltd., No. 1 Factory, Marchwood, Seventy |
| 63 | CLIMAX S.C. (No. 3) | T. M. JAMES, 374 Commercial Rd., Canewood, Canewood |
| 64 | SPECIAL R.S.C. (No. 3) | J. PITT, Special Repair Factory, Ayrall, Northampton |
| 65 | R.N.E.R. GIMBERT & DUT. (No. 3) | W. DORRIST, 24 Elmhor Street, Grimsby |
| 66 | SAFELY WELD (No. 3) | J. L. ADAMS, 30 Plymouth Street, Swindon, Wilts |
| 67 | PAUL AUGUSTUS A.T.C. and Air Scouts (No. 11) | M. McQuinn, The Abbey School, Port Augustus |
| 68 | FORBES OF WIMBOR (No. 3) | A. DOUGLAS, 41 Gladwin Gardens, 383 Hill, N.W.7 |
| 69 | BLISSFORD & DUT. (No. 12) | A. F. SMIL, c/o J. E. Hall, Ltd., Knowles, Bedford, Beds |
| 70 | A.T.C. REPAIRS (No. 1) | PLA. CHAS. G. F. H. PATTEN, 24 Lillie Grove, Rodon, Yorks |
| 71 | HARRIS & DUT. S.C. (No. 3) | R. J. HENDER, Kodak, Ltd., c/o Control Room, the Works, Walsworth, Walsworth |
| 72 | SCOTCHMAN S.C. (No. 11) | R. H. NEWMAN, 378 Old Shanklin Rd., Southwick |
| 73 | ARMLEY WOODS S.C. (No. 4) | R. M. MACDONALD, 6 Grantham Court, Waltham |
| 74 | REPAIRS & DUT. (No. 4) | H. V. HARRIS, c/o Crystal, Ltd., Reptilian Works |
| 75 | SALMONSWORTH & DUT. (No. 12) | R. HARRIS, 4 Star Cottage, Appenall, nr. Clifton |
| 76 | REARVIEW S.C. S.C. (No. 12) | CHAS. C. CROFT, c/o "The School" Ltd., Bedford St., Reading |
| 77 | WALLINGBOROUGH & DUT. (No. 3) | K. C. CHAMBER, "Conservatory," Flaxford, Wallingborough, Northampton |
| 78 | L.L.L. (ALLIANCE), Lymington (No. 10) | R. EVANS, 25 James Street, Northwick, Cheshire |
| 79 | St. LAWRENCE COLLEGE (No. 3) | J. B. CHAMBERMAN, St. Lawrence College, Costesford, Leics |
| 80 | FERRISBURGH S.C. (No. 3) | R. H. LOUIS GERRARD, 8 Ralph Street, Bathurst, near Portsmouth |
| 81 | DUNHAM S.C. (No. 3) | K. DUNHAM, Dunham Station, Cambridge, Middlesex |
| 82 | KENTFORD & DUT. (No. 3) | R. H. LANCY, 40 Cornwell Road, Kilmarnock, N. Ayrshire |
| 83 | BLACKBURN S.C. (No. 11) | F. PARRY, 228 Lytton Road, G.E. Millwall |
| 84 | SCOTCHMAN S.C. (No. 3) | H. P. G. MUIR, 18 Hillside Road, Highfield, Southampton |
| 85 | MICHAEL S.C. (No. 3) | R. A. BUCKINGHAM, c/o Micaelite Insulator Co., Ltd., Empire Works, Wallingham, E.17 |
| 86 | WATSON AND WATSON S.C. (No. 4) | FERRIS B. BAKER, 11 Sandy Way, New Zealand Way, Walsoken-on-Thames |
| 87 | WATSON AND WATSON S.C. (No. 4) | R. J. JAMES, Buck House, Friends' School, Salfron, Walsden |
| 88 | R.E. LOONEY (No. 4) | R. G. JAMES, 212 Blenheim Road, Sidcup, Kent |
| 89 | DUNHAM S.C. (No. 3) | H. D. GERRARD, 39 Colford Avenue, Bournemouth, Hants |
| 90 | PIERCELY A.T.C. (No. 3) | T. O. HAMM, 34 Maxwell Road, Mowden Hill, N.10 |
| 91 | WALLINGBOROUGH GREEN S.C. (No. 3) | G. C. PARRY, 14 College Street, Wallingborough |
| 92 | DUNHAM S.C. (No. 3) | D. B. APPENDANT, 49 Oakfield Road, Clifton, Bristol |
| 93 | LEITCHES S.C. (No. 3) | D. A. COOPER, 44 Bullock Rd., Letchworth, Herts |
| 94 | DOUGLAS & DUT. R.S.C. (No. 3) | FRANK W. HARRIS, 11 Thatched Ann, Wheatley Hill |
| 95 | ROYAL LIONS CLUB (No. 4) | E. E. ALBERT, 14a, 15 Chandos Rd., Buckingham |
| 96 | SCOTCHMAN S.C. (No. 4) | R. C. H. JAMES, 87 Clifton Road, S.11 |
| 97 | REPAIR S.C. (No. 3) | E. C. WHITTINGTON, 24 Shirley Road, Solihull |
| 98 | REPAIRS & DUT. (No. 3) | E. C. PARRY, 323 Southdown Lane, Bromley |

ADDRESSES OF CLUBS AND SECRETARIES—contd.

202	DART & DART S.C. (No. 2)	A. R. BIRD, 28 Wilson Rd., Sloughway Lane, Littleover
203	THURMAL S.C. (No. 2)	P. HALLIDAY, Dale View, Tushill Ln., Cambridge, Leeds
204	1224 Squares (Hobart) A.T.C. (No. 2)	J. T. CRANCK, The Wicunga, Parkhouse, Halifax, Cornwall
205	PATHEMARIA DARTS LEAGUE S.C. (No. 12)	ROBERT COOK, 41 Court Street, Paveham
207	DARTS & DART S.C. (No. 10)	W. WARRICK, 27 Stanford Avenue, Bolton
208	DART & DART, (No. 10)	ARTHUR HOWARD, 4 Larkspur Avenue, Bury
209	LANCASHIRE AND MANCHESTER S.C. (No. 10)	C. PONS, 30 Palatine Avenue, Lancaster
210	"HARROG" (No. 8)	W. L. LORREY, 54 Dunsborough Rd., London, S.E.5
211	HARROG (No. 8)	R. M. BACCHAMAN, Busby, Bucknall, Runcorn, Merseyside
212	CHESTERHAM GOLF AND COUNTRY S.C. (No. 7)	D. G. PATTERICK-SMITH, 185 Old Bath Rd., Chesham
213	708 Squares A.T.C. (1)	J. B. PATTERICK, 120 Squares A.T.C., High School for Boys, Southborough
214	CHESHAM S.C. (No. 1)	A. CANNON, 14 Alexandra Terrace, Crook, Ca. Thirsk
215	NOTTINGHAM & DART (2)	F. M. HOPKINSON, 10 Bethel Road, Rochester
216	CHESHAM & DART (2)	L. GOSWAMI, 18 Mansbury Avenue, Bishopthorpe Road, York
217	DART CLUB SCHOOL, CHESHAM (No. 10)	F. W. BLACKBURN, M.A., The Elm Crest School, Colham
218	HARROG AND PAVING S.C. (No. 4)	S. RANNEY, Herman & Procter, Ltd., Worcester
219	188 Squares A.T.C. (No. 4)	CAROL P. R. HODGINS, Greyhound, Donhead Road, Colney Bay
220	WILSON A.T.C. (No. 7)	B. W. JENNINGS, 2 Ashdale Rd., Weston-super-Mare
221	WILSON GOLF S.C. (No. 8)	G. H. GRAY, "School House," Wyckiffe College, Langport, Cardiganshire
222	HARROG A.T.C. (No. 4)	SCOT. H. PARRISH, 4 Olla Street, Hoxford
223	1418 Squares Spon. A.T.C. (No. 11)	PER-SER. DONALD MACDONALD, Torphoe, Kirkcaldy Road, Newlyn House, Newbury, Berkshire
224	CHESHAM & DART S.C. (No. 2)	CAROL T. HARRISON, "Trevina," Stonehouse Road, Darlington, Wilt
225	NOTTINGHAM & DART (10)	M. C. MOORE, "The Nook," 9 Albert Road, Southport
226	1818 (2nd Worcester) Squares (No. 4)	PER-SER. V. L. CHAMBER, 21 Herwick Rd., Worcester
227	484 (Hampshire) Squares A.T.C. (No. 5)	T. D. COOPER, 60 Limes Road, Horney, S.3
228	PENARTH GOLF AND COUNTRY S.C. (No. 8)	K. PEARCE, Flinchley County School, 453 High Road, Flinchley, N.12
229	89th (St. Marylebone) Spon. A.T.C. (No. 5)	R. T. WILLIAMS, 3 Scott Hill Gardens, N.W.3
230	GRANHAM MOORS FLYING CLUB (No. 1)	D. E. WYNN, 35 Pelicans Rd., Seaborn, Ca. Durham
231	DOVER SECRETARY S.C. (No. 5)	K. R. GRAY, 185 South Street, Andover, Hants
232	PATHEMARIA GOLF AND COUNTRY S.C. (No. 9)	G. TURNER, Jordine Park Road, Parnham, Surrey
233	WILSON & DART S.C. (No. 11)	D. J. PARR, Tennyson, High Street, Waltham
234	NOTTINGHAM & DART S.C. (No. 11)	W. HARRIS, Small & Patten, Ltd., Northam Vale Works, Manchester, 9
235	CHESHAM GOLF AND COUNTRY S.C. (No. 10)	R. G. LITTLE, 9 Dale Street, Colne, Lancs

ADDRESSES OF CLUBS AND SECRETARIES—contd.

236	LEIGH & DART (No. 10)	J. BLACKMAN, 22 Widdowson Street, Leigh, Lancs
237	HILLARY (St. Helen) S.C. (No. 10)	T. C. BERRITT, St. Helen, Cockerham, Cumberland
238	721 SQUARES SQUAD A.T.C. (10)	COL. TULLITT, 72, Park Drive, Sittingbourne
239	NORFOLK DARTS (No. 1)	MR. C. PARR, "Widdowson," Broomfield Road, Northfleet
240	SWANSEA GOLF AND COUNTRY S.C. (No. 6)	MR. J. L. COLE, 125 Devonian Park Rd., Sketty, Swansea
241	HARROG (No. 8)	A. JACQUES, 13 Lonsdale Road, Chiswick, W.4
242	HAYES GOLF AND COUNTRY S.C. (No. 8)	G. T. M. KAMAR, Hayes Grammar School, Uxbridge Road, Hayes, Middlesex
243	NOTTINGHAM & DART (11)	R. BARR, 44 Vineyard Road, Motherwell
244	CITY OF LONDON A.T.C. (10)	STAN H. PARRIS, 37 Abingdon Road, Harlow, Essex
245	NOTTINGHAM & DART (2)	R. PARRIS, 189, The Hardlands, Northampton
246	478 Spon. A.T.C. (No. 1)	CAROL K. BARR, 2 Canfield Rd., West Hartlepool
247	CHESHAM & DART S.C. (No. 10)	R. CLARKE, 10 Myra Street, Graysbrook
248	NOTTINGHAM & DART (10)	H. D. BUTTERFIELD, The Green, Sherborne, Dorset
249	PER-SER. & DART (No. 10)	JAMES HAMILTON, 45 Bailey Road, Preston
250	703 (Newcastle-upon-Tyne) Municipal Coll. (Ca. G.) Spon. A.T.C. (No. 1)	CAROL W. H. DUFF, No. 723 Squares, A.T.C., College Street, Newcastle-upon-Tyne, 2
251	HIGH GOLF SCHOOL, CHESHAM (No. 10)	KATH L. TROW, 283 Portland Road, Hove, S. Sussex
252	172 (Mid-Sussex) Spon. A.T.C. (No. 12)	CAROL K. E. PARR, "Quarry Way," Hookway Way, Haywards Heath, Sussex
253	St. Paul's S.C. (No. 2)	L. C. P. LLOYD, 200 Ashwood Road, Worcester
254	484 SQUARES A.T.C. (10)	COL. C. GAVESON, 134 Church Rd., Basingstoke, Hants. 24
255	LANCASHIRE S.C. (No. 10)	H. WARRICK, Bee Moss Farm, Rochester, Ca. Chertsey
256	CHESHAM WING A.T.C. (10)	CAROL W. ROBERTSON, 19 Tudor Street, Colham
257	WILSON S.C. (No. 8)	F. HARRIS, 9 Beaumont Road, N.11
258	GRANHAM GOLF AND COUNTRY S.C. (10)	D. S. McLENNAN, 43 Croydon Road, Reigate, Surrey
259	SWANSEA DARTS S.C. (2)	T. R. ALLERTON, 35 Ashley Walk, Halifax

PROFICIENCY TESTS (Revised Nov., 1941).

THE THIRD CLASS LIST.

1. Alford Oxford I.	20. Consolidated	39. Hatched 114 111224.
2. Armstrong Whitworth	Liberator II.	40. Hatched 115333.
3. Armstrong Whitworth	21. Carline Rhythmic II.	41. Hatched 115333.
4. Avro-Anson I.	22. Carline Rhythmic II.	42. Jankins 10 222222.
5. Avro-Anson I.	23. de Havilland Albatross.	43. Jankins 10 222222.
6. Avro-Anson I.	24. de Havilland Albatross.	44. Jankins 10 222222.
7. Avro-Anson I.	25. Dornier Do 17c.	45. Jankins 10 222222.
8. Avro-Anson I.	26. Dornier Do 17c.	46. Jankins 10 222222.
9. Avro-Anson I.	27. Dornier Do 17c.	47. Lockwood 111111.
10. Avro-Anson I.	28. Dornier Do 17c.	48. Lockwood 111111.
11. Avro-Anson I.	29. Douglas Boston III.	49. Lockwood 111111.
12. Avro-Anson I.	30. Douglas Boston III.	50. Lockwood 111111.
13. Avro-Anson I.	31. Douglas Boston III.	51. Martin 111111.
14. Avro-Anson I.	32. Douglas Boston III.	52. Martin 111111.
15. Avro-Anson I.	33. Douglas Boston III.	53. Martin 111111.
16. Avro-Anson I.	34. Douglas Boston III.	54. Martin 111111.
17. Avro-Anson I.	35. Douglas Boston III.	55. Martin 111111.
18. Avro-Anson I.	36. Douglas Boston III.	56. Martin 111111.
19. Avro-Anson I.	37. Douglas Boston III.	57. Martin 111111.
20. Consolidated Catalina I.	38. Douglas Boston III.	58. Martin 111111.

PROFICIENCY TESTS—contd.

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|-------------------------|--------------------------|-------------------------|
| 87. Phillips and Pencil | Supernatural Spitzer Vs. | 83. Fought-Silkenby |
| 88. Miles Master II. | Vickers-Armstrongs | Champeau I |
| 89. Short String I. | Willington I. | 64. Vicker Vengeance I. |
| 90. Short Standard I. | 62. Vickers-Armstrongs | 65. Westland Lynx I. |
| 91. Vickers-Armstrongs | Willington II. | |

THE SECOND CLASS LIST.

- | | | |
|------------------------------|-----------------------------|-------------------------------|
| 92. Haden and Von Ha 139a. | 87. Handley Page Harrow II | 105. Perchard Qui Pated I. |
| 93. Haden and Von Ha 140. | 88. Handley Page Harrow I | 106. Phillips and Pencil |
| 94. Bristol Harbinger II. | 89. Hawker Hawk III. | 107. Miley Magister I. |
| 95. Bristol Harbinger I. | 90. Handley Ha 115. | 108. Phillips and Pencil |
| 96. Curt 2 1007104. | 91. Handley Ha 123. | Miles Master I. |
| 97. Curt 2 1007105. | 92. Jokers Ju 88. | 109. Peter 82-11. |
| 98. Curtiss Mooney. | 93. Lockheed Electra. | 110. Saunders-Roe |
| 99. Curtiss Observer I. | 94. Lockheed 12A. | Savo Lerwick I. |
| 100. Curtiss Mohawk IV. | 95. Lockheed 14. | 111. Savola Macchetti S.M.79. |
| 101. Dornier Do 215. | 96. Lockheed Lobster. | 112. Savola Macchetti S.M.82. |
| 102. Dornier Do 200. | 97. Dornier-Older Ltd 45. | 113. Savola Macchetti S.M.84. |
| 103. Douglas Digby I. | 98. Macchi C.200. | 114. Short Empire Scout. |
| 104. Fairley Albatross I. | 99. Messerschmitt Albat. | 115. Simon C-24. |
| 105. Fairley Battle Bomber. | 100. North American | 116. Simon Helmut. |
| 106. Fairley Battle Trainer. | Harvard I. | 117. Simon Voyager. |
| 107. Fairley Condor I. | 101. North American | 118. Vickers-Armstrongs |
| 108. Fiat B.R.20. | Harvard II. | Supernatural Wain I. |
| 109. Fiat B.R.42. | 102. North American | 119. Vickers-Armstrongs |
| 110. Fiat G.50. | Mustang I. | Wellenby II. |
| 111. Focke-Wulf Fw 100. | 103. Parnell Hardy Hawk II. | 120. Westland Widgeon I. |
| 112. Gloster Gladiator I. | 104. Parnell Freighter I. | |

THE FIRST CLASS LIST.

- | | | |
|------------------------------|------------------------------|------------------------------|
| 121. Alcock Gannet. | 131. de Havilland | 171. General Aircraft |
| 122. Alcock Harrier III. | Gipsy Moth. | Manchester Universal |
| 123. Arado Ar 95a. | 132. de Havilland Hornet | 172. General Aircraft Gwilt. |
| 124. Arado Ar 95a. | Moth II. | 173. Grassman Gwilt I. |
| 125. Arado Ar 190. | 133. de Havilland Leopard | 174. Grassman Gwilt II. |
| 126. Arado Tutor I. | Moth | 175. Hawker-Armstrongs |
| 127. Arco Proctor I. | 134. de Havilland Moth | 176. Hawker-Armstrongs |
| 128. Bechthorn II. | Misc. | 177. Handley Ha 58. |
| 129. Blackburn B.2 | 135. de Havilland Moth | 178. Handley Ha 114. |
| 130. Blackburn Shark III. | Misc. | 179. Handley Ha 114. |
| 131. Black 151 C-2. | 136. de Havilland Puss Moth. | 180. Handley Ha 114. |
| 132. Black 220. | Misc. Comp. | 181. Handley Ha 114. |
| 133. Haden and Von Ha 139a. | 137. de Havilland Tiger Moth | 182. Handley Ha 114. |
| 134. Boeing 242-10. | 138. de Havilland Tiger Moth | 183. Handley Ha 114. |
| 135. Boeing Clipper. | 139. de Havilland Tiger Moth | 184. Handley Ha 114. |
| 136. Bristol 45. | 140. de Havilland Tiger Moth | 185. Handley Ha 114. |
| 137. Bristol 95. | 141. Dornier Do 200. | 186. Handley Ha 114. |
| 138. Bristol 100. | 142. Dornier Do 200. | 187. Handley Ha 114. |
| 139. Curt 2 1007104. | 143. Dornier Do 200. | 188. Handley Ha 114. |
| 140. Curtiss Mooney. | 144. Douglas DC-2. | 189. Handley Ha 114. |
| 141. Curtiss R.E. 2000. | 145. Douglas DC-2. | 190. Handley Ha 114. |
| 142. Curtiss Standard I. | 146. Douglas DC-2. | 191. Handley Ha 114. |
| 143. Curtiss Standard II. | 147. Douglas DC-2. | 192. Handley Ha 114. |
| 144. Curtiss Standard III. | 148. Douglas DC-2. | 193. Handley Ha 114. |
| 145. Curtiss Standard IV. | 149. Douglas DC-2. | 194. Handley Ha 114. |
| 146. Curtiss Standard V. | 150. Douglas DC-2. | 195. Handley Ha 114. |
| 147. de Havilland D.H. 88a. | 151. Douglas DC-2. | 196. Handley Ha 114. |
| 148. de Havilland Dragon. | 152. Douglas DC-2. | 197. Handley Ha 114. |
| 149. de Havilland Dragonfly. | 153. Douglas DC-2. | 198. Handley Ha 114. |
| 150. de Havilland Fox Moth. | 154. Douglas DC-2. | 199. Handley Ha 114. |

THE RAID SPOTTER'S POCKET BOOK

Compiled by C. GRIFFITH (R.O.C.C.)

Containing descriptions and illustrations of 65 types of Aircraft. Information on Recognition, Spacing, Formations, Bombing, Airborne Troops, etc., etc.

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The Editor is pleased to acknowledge with thanks the helpful co-operation of "The Aeroplane Spotter" in providing the use of "The Aeroplane" drawings throughout to illustrate the types described in this book. Also for permission to use information already published in "The Aeroplane Spotter," on Progress and Design, Formations, Symbols.

With Pencil, Two Shillings and Sixpence

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INTRODUCTION

The revised edition of this pocket book aims to cover all air-borne objects of interest to Raid Spotters, whether aeroplanes, their occupants or contents; once landed, these objects become the concern of others, e.g., R.A.F. personnel, Home Guard, the Military, or A.R.P. workers. Great strides have recently been made in the technique of recognition and its application; consequently the scope of types included and of subjects introduced has been considerably amplified.

It is hoped that the contents will help individuals in any capacity to give accurate reports and make correct decisions under active conditions. The objects of the Raid Spotting System remain the same.

Military.—To protect troops and vital areas from high or low-level attacks by hostile aircraft and to destroy the raiders.

Civil.—(1) To reduce interruption of production and national work of all kinds to a minimum vital to the winning of the War.

(2) To maintain the confidence of the workers while carrying on production during the public alert.

(3) To keep up morale.

Civil Spotting will not protect the factory itself; this is a matter for the A.A. Defence, which works independently.

The Civil Spotter's duties are to warn the workers should imminent danger threaten, and signal the return to work when the danger has passed.

To fulfil these duties you must gain the confidence of both the management and your fellow-workers by having a sound knowledge of recognition, knowing the position of all the factory shelters and the minimum time required to get everyone under cover, as this will determine the moment you give the alarm.

Let the Raid Spotter's motto be: "The Bell before the Bomb."

It must not be thought that Civil Raid Spotters should sound the danger warning only when aircraft have been recognised as hostile.

Discretion and judgment are the Spotter's main armament. For this reason other subjects of immediate interest to the Spotter are included, the knowledge and practice of which will help towards the efficient exercise of these two important factors.

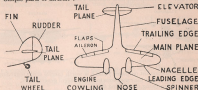
Recognition itself at long range is the hall-mark of the civil expert, but for members of the Forces and the Royal Observer Corps it is a necessity. Under certain conditions recognition at close range, however, may be of the utmost importance.

Treated systematically, as described in the following pages, it is easier than the uninitiated may believe. Know one type—others will follow. How many makes of motor car can you identify? A large number, no doubt. Then why not aircraft?

The Editor will be pleased to receive comments and suggestions likely to increase the usefulness of this Pocket Book.

POINTS OF RECOGNITION

Simple parts of aircraft:—



Recognition should be studied in a regular sequence. The official method includes the following features in the following order:

WINGS.	ENGINE.	FUSELAGE.	TAIL UNIT.	UNDERCARRIAGE.
Number Position Type Shape	Number Type Position	Shape Length Cabin Gun position	Fin(s) Rudder(s) Tailplane	Flood Retractable

It is not wise to attempt recognition of an aeroplane by one salient feature alone. For instance, the high single fin and rudder of the Wellington is also a feature of the Boston, Havoc, Sunderland, Stirling and Lerwick.

The outline produced by all features from nose to tail should be considered the one salient feature. It should be noted here that the general outline does not alter with distance.

It is dangerous to generalise on differences between British and German construction, such as British bombers are mid-wing—German low or high-wing—British head on view rectangular—German circular, etc., etc.; there are certainly examples, but there are also exceptions, and their number may well increase.

Recognition of silhouettes should be carried out in the following order: (1) Head-on view; (2) Plan or underneath view; (3) Side view; the reason being that low-level attacks are the most dangerous and can occur at the shortest notice, when the head-on view would be presented, followed by the plan view as the aeroplane passed overhead, and, finally, for distant recognition a side view would be presented.

The following simple formula, W.E.F.T. (Wings, Engine, Fuselage, Tail) is used throughout the descriptions in this book.

Recognition—continued.

WINGS.—If Monoplane, note whether Parasol-wing, High-wing, Mid-wing, or Low-wing construction.



The Classification list on pages 7 and 8 is worth careful study regarding Wing position. Note the exceptions to any apparent general rules.

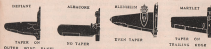
Average Span (wing tip to wing tip):—

Fighters (single engine)	..	35 - 40 feet
Multi-engined Fighters	..	50 - 60 "
Medium Bombers	..	55 - 90 "
Heavy Bombers	..	90 - 100 "

If Biplane, note: the span of upper and lower planes; if staggered; the number of bays (Albatross, single bay; Swedish, two bays).

Dihedral is the upward tilt of the wing from the horizontal, as seen in the head-on view; also occurs in tail planes, e.g., Boston, Marauder. It is designed to prevent rolling, and is therefore more pronounced in low-wing than high-wing construction. It is an important factor in recognition. Note particularly the degree and also the point along the wing at which it starts.

Abschral is the downward tilt, and starts from the fuselage and combines with Dihedral to form a Cranked Wing.



Taper (the diminishing chord (width) of the wing) is another important factor, as it varies considerably between different types. It may occur on both edges, one edge, or neither edge. It may start from the fuselage or at a point along the wing.

Recognition—continued.

Wing Tip may be squared, rounded or pointed.
Wing Section (Head-on) may be thick, e.g., Whitley, or thin, e.g., Fw Kurfir.



Engines are constructed with the cylinders set either In-line or Radial. Note the number of engines.

Note whether engines are underslung or built into the wing section.

Note cases where the nacelle extends behind the trailing edge, e.g., Harrier, Oxford.

In-line Engines have the cylinders arranged one behind the other, are narrower and longer in appearance and project farther in front of the wing. They are often liquid-cooled and require radiators, which show below the engine, or, in some cases, the wing (Spitfire and Me 109).

Note the JU 88 has in-line engines of radial appearance.

Radial Engines.—Cylinders arranged as spokes of a wheel, being air-cooled, require no radiators. Large circular front view; side view short.



FUSELAGE.—Points to look for:—

Front View.—In multi-engined machines, whether circular or rectangular. In single in-line engined types the cockpit, nose and radiator combine to produce an oblong of varying depth and width.

If radial engine the nose appears circular.

Side View.—Note shape of the nose—whether short or long, blunt or pointed; position of pilot's cockpit; also the gun positions. The latter may be above, below, or in the sides of the fuselage, as well as in the tail and nose.

Recognition—continued.

Note whether the fuselage is rounded and tapers to a point (e.g., Heinkel), or is slab-sided with blunt tail (e.g., Wellington). A blunt tail end denotes tail gun position common in British types (e.g., Wellington, Whitley, Seeling). A German example is the Ju 89.

Undercarriage.—*Note whether this is fixed or retractable. If fixed, whether cantilever or braced, and if wheels are spatted or uncovered.*



TAIL unit consists of the vertical part Fin(s) (fixed) and Rudder(s) (movable), and the horizontal part Tail Plane and Elevators.

Note whether single fin and rudder or twin fins and rudders and their position.

Single Fin and Rudder are worth very careful study, as they form perhaps the most distinctive single feature between one type and another.

Tail Plane and Elevators.—*Note whether in high, low or mid-wing position. If set in the high-wing position they are apparent in the true head-on view. Shapes vary considerably. They may be rectangular, oval, diamond, etc. Note whether there is a cutaway portion in the trailing edge.*

Twin Fin and Rudder.—*Note whether outrigger or inset on tail plane. Shapes again vary—some round, some rectangular, etc.*

GENERAL.—The foregoing details can easily be distinguished in photographs and photographs and should therefore be memorized until they are *known*. Only thus will you recognise aircraft in flight, which is the sole reason for the study of this subject.

Having recognised an aeroplane, watch it until out of sight, studying its features at every angle. You will then recognise its individual "sit" or the way it "rides" the air. Only by this feature can you recognise aircraft at long range. Examples of "sit": (1) Nose-down Whitley; (2) nose-up Seeling; (3) level-tail Wellington. Examples of outline: Straight-topped Spitfires, humped-back Hurricanes, barrel-shaped Buffaloes, egg-shaped Hudsons, cigar-shaped Heinkels; Flying Pencil Dorniers, etc.

MONOPLANES CLASSIFIED

Mark Nos. have only been inserted where a change in category is justified.

(U/C=Undercarriage. B=British. A=American. G=German.)

SINGLE MOTOR SINGLE FIN AND RUDDER U/C RETRACTS

INLINE MOTOR

Low-wing.

B. Battle,
B. Defiant,
B. Fulmar,
B. Hurricane,
B. Master I,
B. Spitfire,
B. Tomado,
B. Typhoon,
A. Albatross,
A. Kittyhawk,
A. Mustang,
A. Tomahawk,
G. Heinkel He 111,
G. Heinkel He 111B,
G. Messerschmitt Bf 109,
B. Hawkeye,

Low-wing.

RADIAL MOTOR

Low-wing.

B. Master II,
B. Roc,
B. Skua,
A. Chesapeake,
A. Harvard,
A. Lancer,
A. Mohawk,
A. Northrop A-17A,
A. Thunderbolt,
A. Vanguard,
B. Wellesley,
A. Bermuda,
A. Buffalo,
A. Martlet,
A. Vengeance,

Mid-wing.

SINGLE MOTOR

SINGLE FIN AND RUDDER

U/C FIXED

INLINE MOTOR

Low-wing.

B. Magister,
B. Minster,
B. Proctor,
G. Junkers Ju 87A,
B. Leopard Moth,
B. Puss Moth,
B. Taylorcraft,
B. Waco,
G. Storch,

Low-wing.

High-wing.

RADIAL MOTOR

Low-wing.

High-wing.

Parasol-wing.

G. Henschel He 100, * Also with Retractable U/C.

SINGLE MOTOR

TWIN FINS AND RUDDERS

U/C FIXED

(Triplane).

INLINE MOTOR

Low-wing.

B. Cygnet,
B. Owl,

Low-wing.

"

Classification—continued.

TWO MOTORS		SINGLE FIN AND RUDDER		U/C RETRACTS	
INLINE MOTORS		RADIAL MOTORS			
E. Cornet,	<i>Low-wing.</i>	B. Anson,	<i>Low-wing.</i>		
*E. Percival Q.6,	"	B. Emroy,	"		
B. Whirlwind,	"	B. Oxford,	"		
G. Fox 85,	"	A. Douglas D.C.2,	"		
G. Heinkel He 111K,	"	A. Douglas D.C.3,	"		
G. Junkers Ju 88,	"	B. Beaufighter 1,	<i>Mid-wing.</i>		
(Note see p. 3.)		B. Beaufort,	"		
B. Beaufighter II,	<i>Mid-wing.</i>	B. Blenheim,	"		
B. Wellington II,	"	B. Wellington I & III,	"		
		A. Baltimore,	"		
		A. Boston,	"		
		A. Digby,	"		
		A. Harrier,	"		
		A. Marauder,	"		
		A. Maryland,	"		
		B. Botha,	<i>High-wing.</i>		

* Also with Fixed U/C.

TWO MOTORS		TWIN FINS AND RUDDERS		U/C RETRACTS	
INLINE MOTORS		RADIAL MOTORS			
G. Mc Jaguar,	<i>Low-wing.</i>	G. Junkers Ju 86K,	<i>Low-wing.</i>		
G. Junkers 86K,	"	B. Hampden,	<i>Mid-wing.</i>		
G. Merio,	"	B. Manchester,	"		
B. Hornard,	<i>Mid-wing.</i>	B. Whitley III,	"		
B. Whitley V,	"	A. Hudson,	"		
G. Dornier Do 215,	<i>High-wing.</i>	A. Lockheed 14,	"		
		A. Lockheed,	"		
		A. Ventura,	"		
		B. Flamingo,	<i>High-wing.</i>		
		G. Dornier Do 17z,	"		
		G. Dornier Do 217,	"		

TWO MOTORS		TWIN FINS AND RUDDERS		U/C FIXED	
		RADIAL MOTORS			
		B. Bombay,	<i>High-wing.</i>		
		B. Hantow,	"		

TWO MOTORS		TWIN FINS AND RUDDERS		TWIN TAIL BOOMS	
INLINE MOTORS		RADIAL MOTORS			
G. Fox 89,	<i>Low-wing.</i>	B. Caniff-Owen,	<i>High-wing.</i>		
A. Lightning,	<i>Mid-wing.</i>	(D.A. 1 Flying-wing.)			

TRIMOTOR		SINGLE FIN AND RUDDER		U/C FIXED	
		RADIAL MOTORS			
		G. Junkers Ju 52/3m,	<i>Low-wing.</i>		
		A. Ford,	<i>High-wing.</i>		

Classification—continued.

FOUR MOTORS		SINGLE FIN AND RUDDER		U/C RETRACTS	
		RADIAL MOTORS			
		A. Fortress,	<i>Low-wing.</i>		
		G. Condor,	"		
		G. Kurier,	"		
		G. Heinkel He 16,	"		
		B. Scirling,	<i>Mid-wing.</i>		
		G. Heinkel He 177,	"		
		B. Ensign,	<i>High-wing.</i>		

FOUR MOTORS		TWIN FINS AND RUDDERS		U/C RETRACTS	
INLINE MOTORS		RADIAL MOTORS			
B. Albatross,	<i>Low-wing.</i>	G. Blohm & Voß BV 142,	<i>Low-wing.</i>		
G. Junkers Ju 89,	"	G. Junkers Ju 90,	"		
B. Halifax,	<i>Mid-wing.</i>	A. Liberator,	<i>High-wing.</i>		

GLOSSARY OF TERMS

AEROFOIL.—A surface such as a wing, tail plane, fin, etc.
AILERONS.—Banking controls. Flaps on the trailing edge of each wing near the wing tip. They move in opposite, one up to depress the wing, the other down to raise that wing.
ANNEAL.—Downward tilt of the wing from the fuselage.
ASPECT RATIO.—Ratio of total wing span to mean chord. Determined by the formula

$$\frac{\text{Span} \times \text{span}}{\text{Total wing area}}$$

Example: Consolidated Liberator.

$$\frac{\text{Span } 110 \times 110 \text{ ft.} = 12,100 \text{ sq. ft.}}{\text{Total wing area } 1,050 \text{ sq. ft.}} = 11.5$$

Varies between 12 high and 4 low.

Examples of High .. Liberator, Wellington, Fo Kirin.
 .. Moderate .. Blenheim, Ju 88.
 .. Low .. Buffalo, Mustang, Spitfire.

BAY.—The subdivision(s) between the wings produced by the inter-plane struts on one side of a biplane, e.g., Albatross single bay, Sparrow two bay.

BRACED.—Indicates presence of struts or wires connecting two surfaces. Wings to fuselage, etc.

CANTILEVER.—Unbraced wing, tail plane, etc.

CHORD.—Width between leading edge and trailing edge of wing or tail plane or fin, may be measured at any point, and is therefore not a standard dimension in tapered or "shaped" wings, etc.

Glossary—continued.

COWLING.—The forward metal covering of the power unit of an aero motor.

DIHEDRAL.—The upward tilt of the wing from the horizontal.

ELEVATOR.—The hinged trailing edge of the tail plane. Controls upward or downward direction.

FIN.—The fixed leading edge of the vertical portion of the tail unit. Gives directional stability.

FLAPS.—Hinged portion of the trailing edge of the wing. Placed between fuselage and ailerons. When lowered, act as brakes and steepen the angle of glide.

FUSELAGE.—The body part of an aeroplane.

GULL WING.—Wings with anhedral and dihedral.

INLINE MOTORS.—Motors with cylinders arranged one behind the other in one or more blocks. Cylinder blocks may be arranged in V, X, H, etc., shapes, may be air cooled or liquid cooled requiring radiators.

LEADING EDGE.—The forward edge of a wing, tail plane or fin.

NACELLE.—The motor housing behind the cowling of multi-engined aircraft.

PORT.—A nautical and aeronautical term denoting the left-hand side.

RAINFALL MOTOR.—A motor with the cylinders arranged outward from the crankshaft as spokes of a wheel. The cylinders remain stationary, as opposed to the rotary type, now extinct. Usual number of cylinders, 7 or 9 single row, 14 or 18 double row. Air-cooled.

RUDDER.—The after section of the vertical portion of the tail unit. It is set behind the fin and acts like a ship's rudder.

SLOTS.—Hinged portion of the leading edge of the wing. They increase the lift and so reduce the stalling speed.

SPAN.—Overall measurement from wing tip to wing tip.

SPINNER.—A cone-shaped fairing covering the air-screw hub.

STAGGER.—In biplanes, when the lower plane is set either forward or backward of the upper plane.

STARBOARD.—A nautical and aeronautical term denoting the right-hand side.

SPONSON.—Miniature wings built low into the hull of flying-boats. They act as stabilisers when afloat.

STRUTS.—Separate two surfaces.

UNDERCARRIAGE.—Landing wheels and their supporting legs. Usually two wheels, but some types (e.g., *Hawker, Gipsy*) have three, one being forward under the nose, to assist night landing and taxiing. Undercarriages may be fully or partially retractable, or fixed.

TANDEM.—Two aero motors and their airscrews arranged one behind the other (e.g., *Dornier 15 and 26*).

TAPER.—The angle of the wing edge towards the wing tip which tends to reduce the wing area, applies also to fins, rudders, etc.

SOME AERO MOTORS

AMERICAN

Allison (Inline).—*Airscoops, Kitchcock, Lightning, Mustang, Tomahawk.*

Pratt & Whitney Twin Wasp (Radial).—*Boston I, Catalina, Havoc I, Lancer, Liberator, Mayfield, Vanguard, Venture.*

Pratt & Whitney Twin Wasp Junior (Radial).—*Chesapeake.*

Pratt & Whitney Double Wasp (Radial).—*Baltimore, Marauder.*

Wright Cyclone (Radial).—*Buffalo, Cleveland, Fortress I, Hudson I and III, Marlin, Mohawk.*

Wright Double-Row Cyclone (Radial).—*Boston III, Fortress II, Havoc II, Furygator.*

Lycensing (Radial).—*Reliant.*

BRITISH

Armstrong Siddeley Cheetah (Radial).—*Assau, Oxford.*

DH Gipsy Major (Inline).—*Magister, Tiger Moth II.*

DH Gipsy III (Inline).—*Tiger Moth I.*

DH Gipsy Six (Inline).—*Dominie, Percival Q6.*

DH Gipsy Twelve (Inline).—*Albatross.*

Bristol Mercury (Radial).—*Bombardier IV, Gladiator, Lynx, Master II.*

Bristol Pegasus (Radial).—*Hampton, Sunderland, Sycorax, Wellington I, Whitley.*

Bristol Perseus (Radial).—*Beech, Flamingo, Lynx, Master II, Roar, Shark.*

Bristol Taurus (Radial).—*Albatross, Brantford I.*

Bristol Hercules (Radial).—*Bombardier I, Lerwick, Stirling I.*

Napier Dagger (Inline).—*Brantford I.*

Napier Sabre (Inline).—*Typhoon I.*

Rolls-Royce Kestrel (Inline).—*Master I, Singapore III.*

Rolls-Royce Merlin (Inline).—*Matilda, Defiant, Fulmar, Halifax, Hurricane, Spitfire, Wellington II, Whitley IV and V.*

Rolls-Royce Peregrine (Inline).—*Whitley.*

Rolls-Royce Vulture (Inline).—*Manchester I, Torquay.*

GERMAN

Argus (Inline).—*Fw 190, Fieseler Storch.*

BMW (Radial).—*Bf 109, Bf 108, Bf 109, Bf 110, Bf 111, Bf 112, Bf 113, Bf 114, Bf 115, Bf 116, Bf 117, Bf 118, Bf 119, Bf 120, Bf 121, Bf 122, Bf 123, Bf 124, Bf 125, Bf 126, Bf 127, Bf 128, Bf 129, Bf 130, Bf 131, Bf 132, Bf 133, Bf 134, Bf 135, Bf 136, Bf 137, Bf 138, Bf 139, Bf 140, Bf 141, Bf 142, Bf 143, Bf 144, Bf 145, Bf 146, Bf 147, Bf 148, Bf 149, Bf 150, Bf 151, Bf 152, Bf 153, Bf 154, Bf 155, Bf 156, Bf 157, Bf 158, Bf 159, Bf 160, Bf 161, Bf 162, Bf 163, Bf 164, Bf 165, Bf 166, Bf 167, Bf 168, Bf 169, Bf 170, Bf 171, Bf 172, Bf 173, Bf 174, Bf 175, Bf 176, Bf 177, Bf 178, Bf 179, Bf 180, Bf 181, Bf 182, Bf 183, Bf 184, Bf 185, Bf 186, Bf 187, Bf 188, Bf 189, Bf 190, Bf 191, Bf 192, Bf 193, Bf 194, Bf 195, Bf 196, Bf 197, Bf 198, Bf 199, Bf 200, Bf 201, Bf 202, Bf 203, Bf 204, Bf 205, Bf 206, Bf 207, Bf 208, Bf 209, Bf 210, Bf 211, Bf 212, Bf 213, Bf 214, Bf 215, Bf 216, Bf 217, Bf 218, Bf 219, Bf 220, Bf 221, Bf 222, Bf 223, Bf 224, Bf 225, Bf 226, Bf 227, Bf 228, Bf 229, Bf 230, Bf 231, Bf 232, Bf 233, Bf 234, Bf 235, Bf 236, Bf 237, Bf 238, Bf 239, Bf 240, Bf 241, Bf 242, Bf 243, Bf 244, Bf 245, Bf 246, Bf 247, Bf 248, Bf 249, Bf 250, Bf 251, Bf 252, Bf 253, Bf 254, Bf 255, Bf 256, Bf 257, Bf 258, Bf 259, Bf 260, Bf 261, Bf 262, Bf 263, Bf 264, Bf 265, Bf 266, Bf 267, Bf 268, Bf 269, Bf 270, Bf 271, Bf 272, Bf 273, Bf 274, Bf 275, Bf 276, Bf 277, Bf 278, Bf 279, Bf 280, Bf 281, Bf 282, Bf 283, Bf 284, Bf 285, Bf 286, Bf 287, Bf 288, Bf 289, Bf 290, Bf 291, Bf 292, Bf 293, Bf 294, Bf 295, Bf 296, Bf 297, Bf 298, Bf 299, Bf 300, Bf 301, Bf 302, Bf 303, Bf 304, Bf 305, Bf 306, Bf 307, Bf 308, Bf 309, Bf 310, Bf 311, Bf 312, Bf 313, Bf 314, Bf 315, Bf 316, Bf 317, Bf 318, Bf 319, Bf 320, Bf 321, Bf 322, Bf 323, Bf 324, Bf 325, Bf 326, Bf 327, Bf 328, Bf 329, Bf 330, Bf 331, Bf 332, Bf 333, Bf 334, Bf 335, Bf 336, Bf 337, Bf 338, Bf 339, Bf 340, Bf 341, Bf 342, Bf 343, Bf 344, Bf 345, Bf 346, Bf 347, Bf 348, Bf 349, Bf 350, Bf 351, Bf 352, Bf 353, Bf 354, Bf 355, Bf 356, Bf 357, Bf 358, Bf 359, Bf 360, Bf 361, Bf 362, Bf 363, Bf 364, Bf 365, Bf 366, Bf 367, Bf 368, Bf 369, Bf 370, Bf 371, Bf 372, Bf 373, Bf 374, Bf 375, Bf 376, Bf 377, Bf 378, Bf 379, Bf 380, Bf 381, Bf 382, Bf 383, Bf 384, Bf 385, Bf 386, Bf 387, Bf 388, Bf 389, Bf 390, Bf 391, Bf 392, Bf 393, Bf 394, Bf 395, Bf 396, Bf 397, Bf 398, Bf 399, Bf 400, Bf 401, Bf 402, Bf 403, Bf 404, Bf 405, Bf 406, Bf 407, Bf 408, Bf 409, Bf 410, Bf 411, Bf 412, Bf 413, Bf 414, Bf 415, Bf 416, Bf 417, Bf 418, Bf 419, Bf 420, Bf 421, Bf 422, Bf 423, Bf 424, Bf 425, Bf 426, Bf 427, Bf 428, Bf 429, Bf 430, Bf 431, Bf 432, Bf 433, Bf 434, Bf 435, Bf 436, Bf 437, Bf 438, Bf 439, Bf 440, Bf 441, Bf 442, Bf 443, Bf 444, Bf 445, Bf 446, Bf 447, Bf 448, Bf 449, Bf 450, Bf 451, Bf 452, Bf 453, Bf 454, Bf 455, Bf 456, Bf 457, Bf 458, Bf 459, Bf 460, Bf 461, Bf 462, Bf 463, Bf 464, Bf 465, Bf 466, Bf 467, Bf 468, Bf 469, Bf 470, Bf 471, Bf 472, Bf 473, Bf 474, Bf 475, Bf 476, Bf 477, Bf 478, Bf 479, Bf 480, Bf 481, Bf 482, Bf 483, Bf 484, Bf 485, Bf 486, Bf 487, Bf 488, Bf 489, Bf 490, Bf 491, Bf 492, Bf 493, Bf 494, Bf 495, Bf 496, Bf 497, Bf 498, Bf 499, Bf 500, Bf 501, Bf 502, Bf 503, Bf 504, Bf 505, Bf 506, Bf 507, Bf 508, Bf 509, Bf 510, Bf 511, Bf 512, Bf 513, Bf 514, Bf 515, Bf 516, Bf 517, Bf 518, Bf 519, Bf 520, Bf 521, Bf 522, Bf 523, Bf 524, Bf 525, Bf 526, Bf 527, Bf 528, Bf 529, Bf 530, Bf 531, Bf 532, Bf 533, Bf 534, Bf 535, Bf 536, Bf 537, Bf 538, Bf 539, Bf 540, Bf 541, Bf 542, Bf 543, Bf 544, Bf 545, Bf 546, Bf 547, Bf 548, Bf 549, Bf 550, Bf 551, Bf 552, Bf 553, Bf 554, Bf 555, Bf 556, Bf 557, Bf 558, Bf 559, Bf 560, Bf 561, Bf 562, Bf 563, Bf 564, Bf 565, Bf 566, Bf 567, Bf 568, Bf 569, Bf 570, Bf 571, Bf 572, Bf 573, Bf 574, Bf 575, Bf 576, Bf 577, Bf 578, Bf 579, Bf 580, Bf 581, Bf 582, Bf 583, Bf 584, Bf 585, Bf 586, Bf 587, Bf 588, Bf 589, Bf 590, Bf 591, Bf 592, Bf 593, Bf 594, Bf 595, Bf 596, Bf 597, Bf 598, Bf 599, Bf 600, Bf 601, Bf 602, Bf 603, Bf 604, Bf 605, Bf 606, Bf 607, Bf 608, Bf 609, Bf 610, Bf 611, Bf 612, Bf 613, Bf 614, Bf 615, Bf 616, Bf 617, Bf 618, Bf 619, Bf 620, Bf 621, Bf 622, Bf 623, Bf 624, Bf 625, Bf 626, Bf 627, Bf 628, Bf 629, Bf 630, Bf 631, Bf 632, Bf 633, Bf 634, Bf 635, Bf 636, Bf 637, Bf 638, Bf 639, Bf 640, Bf 641, Bf 642, Bf 643, Bf 644, Bf 645, Bf 646, Bf 647, Bf 648, Bf 649, Bf 650, Bf 651, Bf 652, Bf 653, Bf 654, Bf 655, Bf 656, Bf 657, Bf 658, Bf 659, Bf 660, Bf 661, Bf 662, Bf 663, Bf 664, Bf 665, Bf 666, Bf 667, Bf 668, Bf 669, Bf 670, Bf 671, Bf 672, Bf 673, Bf 674, Bf 675, Bf 676, Bf 677, Bf 678, Bf 679, Bf 680, Bf 681, Bf 682, Bf 683, Bf 684, Bf 685, Bf 686, Bf 687, Bf 688, Bf 689, Bf 690, Bf 691, Bf 692, Bf 693, Bf 694, Bf 695, Bf 696, Bf 697, Bf 698, Bf 699, Bf 700, Bf 701, Bf 702, Bf 703, Bf 704, Bf 705, Bf 706, Bf 707, Bf 708, Bf 709, Bf 710, Bf 711, Bf 712, Bf 713, Bf 714, Bf 715, Bf 716, Bf 717, Bf 718, Bf 719, Bf 720, Bf 721, Bf 722, Bf 723, Bf 724, Bf 725, Bf 726, Bf 727, Bf 728, Bf 729, Bf 730, Bf 731, Bf 732, Bf 733, Bf 734, Bf 735, Bf 736, Bf 737, Bf 738, Bf 739, Bf 740, Bf 741, Bf 742, Bf 743, Bf 744, Bf 745, Bf 746, Bf 747, Bf 748, Bf 749, Bf 750, Bf 751, Bf 752, Bf 753, Bf 754, Bf 755, Bf 756, Bf 757, Bf 758, Bf 759, Bf 760, Bf 761, Bf 762, Bf 763, Bf 764, Bf 765, Bf 766, Bf 767, Bf 768, Bf 769, Bf 770, Bf 771, Bf 772, Bf 773, Bf 774, Bf 775, Bf 776, Bf 777, Bf 778, Bf 779, Bf 780, Bf 781, Bf 782, Bf 783, Bf 784, Bf 785, Bf 786, Bf 787, Bf 788, Bf 789, Bf 790, Bf 791, Bf 792, Bf 793, Bf 794, Bf 795, Bf 796, Bf 797, Bf 798, Bf 799, Bf 800, Bf 801, Bf 802, Bf 803, Bf 804, Bf 805, Bf 806, Bf 807, Bf 808, Bf 809, Bf 810, Bf 811, Bf 812, Bf 813, Bf 814, Bf 815, Bf 816, Bf 817, Bf 818, Bf 819, Bf 820, Bf 821, Bf 822, Bf 823, Bf 824, Bf 825, Bf 826, Bf 827, Bf 828, Bf 829, Bf 830, Bf 831, Bf 832, Bf 833, Bf 834, Bf 835, Bf 836, Bf 837, Bf 838, Bf 839, Bf 840, Bf 841, Bf 842, Bf 843, Bf 844, Bf 845, Bf 846, Bf 847, Bf 848, Bf 849, Bf 850, Bf 851, Bf 852, Bf 853, Bf 854, Bf 855, Bf 856, Bf 857, Bf 858, Bf 859, Bf 860, Bf 861, Bf 862, Bf 863, Bf 864, Bf 865, Bf 866, Bf 867, Bf 868, Bf 869, Bf 870, Bf 871, Bf 872, Bf 873, Bf 874, Bf 875, Bf 876, Bf 877, Bf 878, Bf 879, Bf 880, Bf 881, Bf 882, Bf 883, Bf 884, Bf 885, Bf 886, Bf 887, Bf 888, Bf 889, Bf 890, Bf 891, Bf 892, Bf 893, Bf 894, Bf 895, Bf 896, Bf 897, Bf 898, Bf 899, Bf 900, Bf 901, Bf 902, Bf 903, Bf 904, Bf 905, Bf 906, Bf 907, Bf 908, Bf 909, Bf 910, Bf 911, Bf 912, Bf 913, Bf 914, Bf 915, Bf 916, Bf 917, Bf 918, Bf 919, Bf 920, Bf 921, Bf 922, Bf 923, Bf 924, Bf 925, Bf 926, Bf 927, Bf 928, Bf 929, Bf 930, Bf 931, Bf 932, Bf 933, Bf 934, Bf 935, Bf 936, Bf 937, Bf 938, Bf 939, Bf 940, Bf 941, Bf 942, Bf 943, Bf 944, Bf 945, Bf 946, Bf 947, Bf 948, Bf 949, Bf 950, Bf 951, Bf 952, Bf 953, Bf 954, Bf 955, Bf 956, Bf 957, Bf 958, Bf 959, Bf 960, Bf 961, Bf 962, Bf 963, Bf 964, Bf 965, Bf 966, Bf 967, Bf 968, Bf 969, Bf 970, Bf 971, Bf 972, Bf 973, Bf 974, Bf 975, Bf 976, Bf 977, Bf 978, Bf 979, Bf 980, Bf 981, Bf 982, Bf 983, Bf 984, Bf 985, Bf 986, Bf 987, Bf 988, Bf 989, Bf 990, Bf 991, Bf 992, Bf 993, Bf 994, Bf 995, Bf 996, Bf 997, Bf 998, Bf 999, Bf 1000.*

BMW VI (Inline).—*Heinkel 59, Heinkel 60.*

Bramo Fafnir (Radial).—*Arado 196, Dornier 172 2.*

Junkers Ju 200 (Diesel) (Inline).—*Bf 109, Bf 110, Bf 111, Bf 112, Bf 113, Bf 114, Bf 115, Bf 116, Bf 117, Bf 118, Bf 119, Bf 120, Bf 121, Bf 122, Bf 123, Bf 124, Bf 125, Bf 126, Bf 127, Bf 128, Bf 129, Bf 130, Bf 131, Bf 132, Bf 133, Bf 134, Bf 135, Bf 136, Bf 137, Bf 138, Bf 139, Bf 140, Bf 141, Bf 142, Bf 143, Bf 144, Bf 145, Bf 146, Bf 147, Bf 148, Bf 149, Bf 150, Bf 151, Bf 152, Bf 153, Bf 154, Bf 155, Bf 156, Bf 157, Bf 158, Bf 159, Bf 160, Bf 161, Bf 162, Bf 163, Bf 164, Bf 165, Bf 166, Bf 167, Bf 168, Bf 169, Bf 170, Bf 171, Bf 172, Bf 173, Bf 174, Bf 175, Bf 176, Bf 177, Bf 178, Bf 179, Bf 180, Bf 181, Bf 182, Bf 183, Bf 184, Bf 185, Bf 186, Bf 187, Bf 188, Bf 189, Bf 190, Bf 191, Bf 192, Bf 193, Bf 194, Bf 195, Bf 196, Bf 197, Bf 198, Bf 199, Bf 200, Bf 201, Bf 202, Bf 203, Bf 204, Bf 205, Bf 206, Bf 207, Bf 208, Bf 209, Bf 210, Bf 211, Bf 212, Bf 213, Bf 214, Bf 215, Bf 216, Bf 217, Bf 218, Bf 219, Bf 220, Bf 221, Bf 222, Bf 223, Bf 224, Bf 225, Bf 226, Bf 227, Bf 228, Bf 229, Bf 230, Bf 231, Bf 232, Bf 233, Bf 234, Bf 235, Bf 236, Bf 237, Bf 238, Bf 239, Bf 240, Bf 241, Bf 242, Bf 243, Bf 244, Bf 245, Bf 246, Bf 247, Bf 248, Bf 249, Bf 250, Bf 251, Bf 252, Bf 253, Bf 254, Bf 255, Bf 256, Bf 257, Bf 258, Bf 259, Bf 260, Bf 261, Bf 262, Bf 263, Bf 264, Bf 265, Bf 266, Bf 267, Bf 268, Bf 269, Bf 270, Bf 271, Bf 272, Bf 273, Bf 274, Bf 275, Bf 276, Bf 277, Bf 278, Bf 279, Bf 280, Bf 281, Bf 282, Bf 283, Bf 284, Bf 285, Bf 286, Bf 287, Bf 288, Bf 289, Bf 290, Bf 291, Bf 292, Bf 293, Bf 294, Bf 295, Bf 296, Bf 297, Bf 298, Bf 299, Bf 300, Bf 301, Bf 302, Bf 303, Bf 304, Bf 305, Bf 306, Bf 307, Bf 308, Bf 309, Bf 310, Bf 311, Bf 312, Bf 313, Bf 314, Bf 315, Bf 316, Bf 317, Bf 318, Bf 319, Bf 320, Bf 321, Bf 322, Bf 323, Bf 324, Bf 325, Bf 326, Bf 327, Bf 328, Bf 329, Bf 330, Bf 331, Bf 332, Bf 333, Bf 334, Bf 335, Bf 336, Bf 337, Bf 338, Bf 339, Bf 340, Bf 341, Bf 342, Bf 343, Bf 344, Bf 345, Bf 346, Bf 347, Bf 348, Bf 349, Bf 350, Bf 351, Bf 352, Bf 353, Bf 354, Bf 355, Bf 356, Bf 357, Bf 358, Bf 359, Bf 360, Bf 361, Bf 362, Bf 363, Bf 364, Bf 365, Bf 366, Bf 367, Bf 368, Bf 369, Bf 370, Bf 371, Bf 372, Bf 373, Bf 374, Bf 375, Bf 376, Bf 377, Bf 378, Bf 379, Bf 380, Bf 381, Bf 382, Bf 383, Bf 384, Bf 385, Bf 386, Bf 387, Bf 388, Bf 389, Bf 390, Bf 391, Bf 392, Bf 393, Bf 394, Bf 395, Bf 396, Bf 397, Bf 398, Bf 399, Bf 400, Bf 401, Bf 402, Bf 403, Bf 404, Bf 405, Bf 406, Bf 407, Bf 408, Bf 409, Bf 410, Bf 411, Bf 412, Bf 413, Bf 414, Bf 415, Bf 416, Bf 417, Bf 418, Bf 419, Bf 420, Bf 421, Bf 422, Bf 423, Bf 424, Bf 425, Bf 426, Bf 427, Bf 428, Bf 429, Bf 430, Bf 431, Bf 432, Bf 433, Bf 434, Bf 435, Bf 436, Bf 437, Bf 438, Bf 439, Bf 440, Bf 441, Bf 442, Bf 443, Bf 444, Bf 445, Bf 446, Bf 447, Bf 448, Bf 449, Bf 450, Bf 451, Bf 452, Bf 453, Bf 454, Bf 455, Bf 456, Bf 457, Bf 458, Bf 459, Bf 460, Bf 461, Bf 462, Bf 463, Bf 464, Bf 465, Bf 466, Bf 467, Bf 468, Bf 469, Bf 470, Bf 471, Bf 472, Bf 473, Bf 474, Bf 475, Bf 476, Bf 477, Bf 478, Bf 479, Bf 480, Bf 481, Bf 482, Bf 483, Bf 484, Bf 485, Bf 486, Bf 487, Bf 488, Bf 489, Bf 490, Bf 491, Bf 492, Bf 493, Bf 494, Bf 495, Bf 496, Bf 497, Bf 498, Bf 499, Bf 500, Bf 501, Bf 502, Bf 503, Bf 504, Bf 505, Bf 506, Bf 507, Bf 508, Bf 509, Bf*

KEY TO AMERICAN TYPE DESIGNATIONS

The letters and figures allotted to different types of American aircraft conform to a definite code. This code differs for the U.S. Navy and U.S. Army. The prefix X is common to both and denotes Experimental, or is omitted. For U.S. Navy, aircraft symbols and figures take the following order: (1) Purpose, (2) Maker's design number, (3) Maker's symbol, (4) The modification number of that type.

Example:—X 511 A C 1.

X	511	A	C	1
Experimental.	Scout Bomber.	Maker's Design Number.	Maker's Symbol (Curtis).	Modification Number.

U.S. NAVY SYMBOLS

Purpose Symbols	Maker's Symbols
B = Bomber	A = Brewster
BF = Bomber Fighter	B = { Beech Boeing
F = Fighter	C = Curtiss
G = Transport (Single Motor)	D = Douglas
J = Utility (General Purpose)	E = Bellanca
JB = Utility Transport	F = Grumman
M = Miscellaneous	G = Great Lakes
N = Training	H = { Hall Aluminium Stearman Hammond
O = Observation	J = North American
OS = Observation Scout	K = { Kinner Keston Fairchild
P = Patrol plane	M = Glenn Martin
PB = Patrol Bomber	N = Naval Aircraft Factory
PT = Patrol Torpedo plane	O = Lockheed
R = Transport (Multi-Motor)	P = Pitcairn
S = Scout	Q = Stinson
SB = Scout Bomber	R = Ford
SO = Scout Observation	S = Stearman
T = Torpedo plane	T = Northrop
TB = Torpedo Bomber	U = Vought-Sikorsky
	W = Waco
	X = Experimental
	Y = Consolidated

Where the purpose is indicated by more than one letter, the first letter denotes its primary purpose, e.g., SO, Scout Observation; OS, Observation Scout.

Symbols—continued.

For the U.S. Army Air Corps the maker's name is given first and in full, followed by (1) X if experimental or omitted, (2) the purpose according to the Army Code, (3) a number indicating the Army specification number, (4) the modification letter. Thus the Boeing B 17 E is

B	17	E
Purpose (Bomber).	Army Specification Number (17th Bomber Specification).	Modification Letter (5th Revision).

U.S. ARMY AIR CORPS SYMBOLS

A = Attack	O = Autogiro
AT = Advanced Trainer	OB = Observation
B = Bomber	OA = Observation Amphibian
BC = Basic Combat (Advanced Fighting Training)	P = Pursuit Fighter
BT = Basic Trainer (Intermediate Training)	PF = Pursuit Two-seat Fighter
C = Cargo (Transport)	PT = Primary Trainer
F = Photographic	R = Rotary Wing Aircraft
FM = Fighter (Multi-seat)	X = Experimental
	Y = Service Trial Model
	Z = Obsolete

The constructors also have their own system of numbers and names for export, and, finally, the R.A.F. choose their own name when a type is taken over. E.g., Curtiss Hawk 75A, Manufacturer's designation.
Curtis P.36A. U.S. Army Air Corps.
Mohawk R.A.F.

BRITISH SYMBOLS

Each new type of Service aircraft, when named, automatically becomes the Mark I, which therefore does not necessarily indicate the existence of a Mark II version. The installation of a new motor or a major alteration of structure involves a new Mark No., but alteration to equipment or armament is denoted by a suffix letter.

E.g., *Wallagles* with Pegasus motors = Mk. I.

Wallagles with Pegasus motors and altered armament, etc. = Mk. Ia (b or c).

Wallagles with Merlin motors = Mk. II.

GERMAN SYMBOLS

The following is a key to the German symbols.

He, He, Ju, etc., are abbreviations of the makers' names, Heinkel, Henschel, Junkers, etc. The letter K stands for Krieg (War) and is added where a civil design is adapted for war purposes; W for Wasser (water). gm, indicates tri-motor. The numbers following the name represent the makers' type number and the subsidiary numbers and letters follow the principle of the British marks and modification letters.

INDEX TO AIRCRAFT DESCRIPTIONS

For easy reference the types described have been arranged alphabetically under their country of origin in the following order: British, American, German.

[illegible]

W. Wings.	E. Engine.	F. Fuselage.	T. Tail.
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ALBACORE I (FAIREY)
British Torpedo-Carrier (Fleet Air Arm)

- W. Biplane, not staggered, equal span, rounded wing tips. No taper.
Span 50 feet.
- E. Single radial (Taurus).
- F. Three-seat. *Reinforced cockpit extending in front and behind the wing.* Fixed
cantilever undercarriage.
- T. Large single in and saddle. Tail plane curved and rounded tips.
Cut away trailing edge.

Compare with SpeedRAID

W.	Wing.	E.	Engine.	F.	Fuselage.	T.	Tail.
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ANSON I (AVRO)—British Reconnaissance and Training

- W. Low wing. Slight dihedral. Even taper to rounded wing tips.
- E. Twin radial. (Chester)
- F. Head-on view square, rectangular. Side view distinctive large glasshouse with gun turret behind it. Wheels retract partially into engine nacelles. Glass panel under the nose.
- T. Single fin and rudder with rounded top. Tail plane in low-wing position, diamond shaped.

Continued on next page



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STAFFLIGHTER I (BRISTOL)

British Long-Range and Night Fighter

- W. Mid-wing. Straight centre wing section, dihedral on outer section.
Tapered to rounded tips. Span 38 feet.
E. Twin radial (Hercules). Protrude beyond the nose.
F. Two-seat. Head-on solid square with glass cockpit above. Side
view similar to Blenheim I F but high cockpit and shorter nose.
T. Single fin and rudder. Fin slopes sharply back to pointed rudder
tip. Tail plane in high position. Rounded tips.

Container with Windows, MacOs, Linux, etc.

W. Wings. E. Engine. F. Fuselage. T. Tail.



BEAUFORT I (BRISTOL)—British Torpedo Bomber

- W. Mid-wing monoplane. Dihedral starting from engines. Rounded wing tips. Slight taper. A modified version has hudge on trailing edge in line with nacelles. Span 58 feet.
- E. Twin radial (Taurus).
- F. Head-on view rectangular. Cockpit, stepped up above glass nose, runs back without glass to gun position midway along top of fuselage. Oil coolers on the leading edge outside each engine.
- T. Single fin and rudder similar to Blenheim. Tail plane, straight leading edge, narrow chord.

Compare with Junker 88 and Blenheim.



BLenheim IF (BRISTOL)—British Long-Range Fighter

- W. Mid-wing. Dihedral from straight centre wing section. Even-tapered wings to pointed tips. Span 58 feet.
- E. Twin radial (Mercury). Centred on wing section. Large appearance.
- F. Three-seat. Head-on rectangular. Side view short, transparent nose sloping sharply down. Top gun turret midway. Trough of 4 guns below and forward.
- T. Single fin and rudder, high pointed tip. Fin with sharp slope back. Tail plane curved and rounded.

Compare with Ju 88, Blenheim IVP, Beaufort, Beaufighter.

W. Wings. E. Engine. F. Fuselage. T. Tail.



BLenheim IVP (BRISTOL)—British Bomber

- W. Mid-wing. Dihedral from straight centre wing section. Even taper to pointed tips. Span 58 feet.
- E. Twin radial (Mercury). Centred on wing section. Large appearance.
- F. Three-seat. Head-on rectangular with gun mounting below to starboard. Side view long nose. Top gun turret midway.
- T. Single fin and rudder, high-pointed tip, fin with sharp slope back. Tail plane curved and rounded.

Compare with Ju 88, Blenheim IF, Beaufort, Beaufighter.



BOTHA I (BLACKBURN)—British Reconnaissance and Training

- W. High-wing. Dihedral from motors. Sharp taper on trailing edge on outer wing panel. Pointed tips. Span 55 feet.
- E. Twin radial (Perseus), underslung.
- F. Head-on view rectangular, with glass panel set to starboard. Box-eyed appearance. Side view tapers to a fine point. Gun turret central on top.
- T. Tail single fin and rudder, set rather forward. Tail plane with taper on leading edge to rounded tips.

W. Wings. E. Engine. F. Fuselage. T. Tail.



DEFIANT I (BOULTON AND PAUL)—British Fighter

- W. Low-wing monoplane. Slight dihedral commencing half-way along the wings. Trailing edge appears to have been cut with scissors. Span 33 feet.
- E. Single inline (Merlin).
- F. Two-seat with pointed nose. High cockpit with gun turret adjoining aft. Oil cooler below nose, placed just forward of leading edge of main planes. Radiator below and central.
- T. Single fin and rudder in shape of triangle. Tail plane leading edge swept back.

Compare with Spitfire, Hurricane, Me 109.



**DOMINIE I or DRAGON RAPIDE (DE HAVILLAND)
British Transport**

- W. Biplane of equal span tapered to pointed tips. Slight dihedral both planes. 2 bays. Span 48 feet.
- E. Twin inline (Gipsy Six). Projecting from lower plane above landing wheels.
- F. Head-on view rectangular. Side view deep with pointed nose sloping sharply down. Landing wheels built into engine nacelles.
- T. Single fin and rudder of distinctive De Havilland design. Tail plane set on high-wing position, tapered to pointed wing tip.

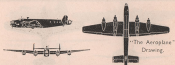
W. Wings. E. Engine. F. Fuselage. T. Tail.



FULMAR I (FAIREY)—British Fighter (Fleet Air Arm)

- W. Low-wing monoplane. Noticeable dihedral. Thick wing section, also wide chord, tapered with rounded tips. Span 46 feet.
- E. Single inline (Merlin).
- F. Two-seat. Front view rectangular. Side view stream-lined, with deep radiator placed well forward. Opaque panel between pilot's cockpit and observer. Long pointed nose.
- T. Single fin and rudder. Rudder, with straight trailing edge, extends well beyond tail plane.

Compare with Hurricane, Defiant, Mustang, Bristol Beaufighter.

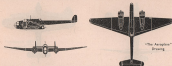


HALIFAX I (HANDLEY-PAGE)—British Heavy Bomber

- W. Mid-wing. Dihedral from inboard motors. Tapered from inboard motors to square-cut wing tips. Span 99 feet.
- E. Four inline (Merlin). Partly underslung.
- F. Head-on view rectangular. Side view slab-sided with double glazed nose. Rear gun turret. Underside with upsweep to tail end.
- T. Twin fins and rudders, outrigger. Tail plane rectangular.

Compare with Ju 89 and 90

W. Wings. E. Engine. F. Fuselage. T. Tail.



HAMPDEN I and HEREFORD I (HANDLEY-PAGE)—British Bomber

- W. Mid-wing monoplane. Dihedral starting from engines. Bat-shaped wings. Trailing edge, marked sweep forward. Span 69 feet.
- E. HAMPDEN—Twin radial (Pegasus).
HEREFORD—Twin inline (Dagger).
- F. Rectangular head-on view. Side view "flying-pan" appearance. Gun positions in nose and behind cockpit, also below in line with trailing edge of main plane.
- T. Twin fins and rudders, inset along tail plane. Tail plane rounded ups, straight trailing edge.

Illustrations are of the Hampden.



HURRICANE I (HAWKER)—British Fighter

- W. Low-wing monoplane. Slight dihedral. Straight tapered wings, rounded wing tips. Span 40 feet.
- E. Single inline (Merlin). Radiator in central position below cockpit.
- F. Single-seat. Rectangular front view. Very pointed nose. Cockpit set above main planes. *Humped-back* appearance.
- T. Rounded single fin and rudder. Tail planes have rounded outer edges.

Compare with Spitfire, Defiant, Meteor, Heinkel He 113.

W. Wings. E. Engine. F. Fuselage. T. Tail.



LERWICK I (SAUNDERS & ROE)—British Flying-Boat

- W. High-wing. Slight dihedral from engines. Marked taper from centre section to pointed tips. Floats with vertical struts. Span 81 feet.
- E. Twin radial (Hercules).
- F. Head-on deep, but narrowing at the top. Side view tubby, gun turret on top and step below. Tail gun turret cut in below rudder.
- T. High single fin and rudder, flat-topped. Tail plane in high position, taper on leading edge to rounded tips.

Compare with Sunderland.



LYSANDER II (WESTLAND)—British Army Co-operation

- W. High-wing strutted. Note cut-away of leading edge at the root. Trailing edge tapers sharply forwards. Span 50 feet.
- E. Single radial (Perseus).
- F. Two-seat. Short and squat. Marked slope down to fin. Enclosed cockpit below the wing extending in front and behind. Fixed undercarriage, spoked wheels. Bomb racks (if fitted) visible outside each seat.
- T. Large single fin and rudder. Tail plane in low position.

Compare with Heinkel He 113.

W. Wings. E. Engine. F. Fuselage. T. Tail.



MANCHESTER I (AVRO)—British Bomber

- W. Mid-wing. Dihedral from straight centre wing section. Most of taper on leading edge from centre section to rounded wing tips. Span, 90 feet.
 E. Twin in line (Vulture).
 F. Head-on rectangular. Side view slab sided with gun turret mid-way on top and tail gun position.
 T. High oval twin fin and rudders, set forward. An early version has an additional central fin.



MASTER I and II (PHILLIPS & POWIS)—British Trainer

- W. Low-wing. Anhedral and dihedral, tapered to rounded wing tips. Span 39 feet.
 E. Master I—Single inline (Kestrel). Master II—Radial (Mercury).
 F. Two-seat. Master I—Head-on view deep, due to large radiator below the fuselage. Side view, the radiator is again apparent in line with the main plane. Deep glass-covered cockpit.
 Master II. Head-on view circular. Side view flat nose. No radiator.
 T. Large single fin and rudder, rounded top and base. Tail plane in high-wing position set forward of rudder. Straight edges.

Illustrations are of the Master I.

W. Wings. E. N. Engine. F. Fuselage. T. Tail.



OXFORD I (AIRSPEED)—British Trainer

- W. Low wing. Distinct dihedral. Tapered to rounded wing tips. Engine nacelles extend beyond the trailing edge.
 E. Twin radial (Cherub). Mounted rather high on the wings.
 F. Head-on view rectangular. Side view deep with glasshouse well forward. Blacked-out nose curves sharply down. Gun turret (if fitted) above midway along fuselage. Wheels retract partially into engine nacelles.
 T. High pointed single fin and rudder. Tail plane in low-wing position, leading edge curved, trailing edge marked taper to rounded wing tips cut away at rudder. *Compare with Anson.*



**SKUA II (BLACKBURN) Dive-Bomber (Fleet Air Arm)
 ROG I (") British Fighter (" " ")**

- W. Low-wing monoplane. SKUA has marked dihedral of wing tips. ROG has dihedral starting near fuselage. Span 46 feet.
 E. Single radial (Peregrine).
 F. Two-seat. Circular front view. Long nose. SKUA has long glasshouse. ROG has short glasshouse with gun turret behind adjoining.
 T. Single high fin and rudder, inverted U shape in front of tail plane. Tail plane tapered.

Illustrations are of the Skua.

W. Wings. E. Engine. F. Fuselage. T. Tail.



SPITFIRE I (SUPERMARINE)—British Fighter

- W. Low-wing monoplane. Marked dihedral. Wings elliptical in shape with pointed tips. Radiator under starboard wing. Span 37 feet.
- E. Single inline (Merlin).
- F. Single-seat. Rectangular front view. Cockpit set above trailing edge of main plane. Appearance in flight, straight topped and nose up. Top curves up to fin.
- T. Single fin and rudder with curved trailing edge. Tail plane leading edge shaped as trailing edge of main plane.

Compare with Hurricane, Defiant, Me 109, Heinkel He 113.



STIRLING I (SHORT)—British Heavy Bomber

- W. Mid-wing. Dihedral from fuselage. Tapered to pointed tips. Span 99 feet.
- E. Four radial (Hercules or Cyclone). Outboard engines set wide.
- F. Head-on view deep rectangular. High cockpit in the nose sloping sharply down to forward gun turret. Slab-sided, sloping up to tail gun turret. Plan form as Short G-bomb.
- T. Tall single fin and rudder set forward of tail gun turret. Tail plane low, tapered to rounded tips.

Compare with Whitley, Wallington, Fin. Kiehl.

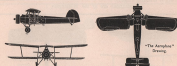
W. Wings. E. Engine. F. Fuselage. T. Tail.



SUNDERLAND I (SHORT)—British Reconnaissance Flying-Boat

- W. High-wing. No dihedral. Tapered finely rounded wing tips. Floats strutted to wings outboard of motors. Span 115 feet.
- E. Four radial (Pegasus).
- F. Head-on view deep and narrow. Side view deep. Two steps, one below the wing and another further aft. Blunt rear end for tail gunner.
- T. High tapering single fin and rudder. Tail plane in high-wing position set forward. Tapers to rounded wing tip.

Military version of Short G-class flying-boat.



SWORDFISH I (FAIREY)

British Torpedo-Carrier (Fleet Air Arm)

- W. Biplane, staggered. Upper plane swept back. Noticeable dihedral. Considerably larger area than lower plane. Cut away above cockpit. Lower plane straight. No dihedral. Span 45 feet.
- E. Single radial (Pegasus).
- F. Three-seat. Long. Slopes sharply down to the nose. Open cockpit, behind the upper plane. Fixed undercarriage.
- T. Large single fin and rudder. Elevators overlap on the tail plane.

Compare with Albacore.

W. Wings. E. Engine. F. Fuselage. T. Tail.



**WELLINGTON I and II (VICKERS-ARMSTRONG)
British Bomber**

- W. Mid-wing monoplane. Slender well-tapered wings, with trailing edge swept forward. Span 66 feet.
E. Mk. I : Twin radial (Pegasus). Nacelles humped-back appearance.
Mk. II : Twin inline (Merlin).
F. Head-on view rectangular. Side view deep hull-shaped. Hunt tail end denoting rear gun turret.
T. Very high single fin and rudder. Tail plane leading edge swept back. Straight trailing edge.

Illustrations are of the Wellington I.



TIGER MOTH II (DE HAVILLAND)—British Trainer

- W. Biplane, marked back stagger, equal span, swept back, single bay. Slight dihedral upper plane marked dihedral lower plane. Span 34 feet.
E. Single, inline. (D. H. Gipsy Major).
F. Two seat. Open cockpits. Deep nose.
T. Single fin and rudder. Characteristic D.H. slope to fin and curved rudder. Tail plane with D.H. style curve.

W. Wings. E. Engine. F. Fuselage. T. Tail.



WHITLEY V (ARMSTRONG-WHITWORTH)—British Bomber

- W. Mid-wing monoplane. Dihedral starting from engines. Thick wing section. Wide chord, slightly tapered. Span 84 feet.
E. Mark I, twin radial (Tiger). Mark IV and V, twin inline (Merlin).
F. Head-on view rectangular. Side view "coffin-shaped." Finer and more pointed downwards. Thick tail end denoting rear gun turret. Gun turret in nose. Pointed glass nose for bomb aimer.
T. Twin fins and rudders, set on top and halfway along tail plane. Tail plane no longer, rounded tips.

Note.—Illustrations show the cross bracing of fins to fuselage in the head-on view. The tail plane is not apparent.



AIRACOBRA I (BELL P-39)—Fighter, American Built

- W. Low-wing monoplane. Dihedral. Most of the taper on the trailing edge to rounded wing tips. "Shoulder" at fuselage.
E. Single inline (Allison). Engine hidden behind pilot's cockpit.
F. Head-on view narrow, with high glazed cockpit. Side view distinctive clean lines. Long pointed nose. Sloping cockpit with air intake for radiator behind. Retractable tricycle undercarriage.
T. Large single fin and rudder. Tail plane in high-wing position.

Compare with American, Spitfire and Tempest.

W. Wings. E. Engine. F. Fuselage. T. Tail.



BUFFALO I (BREWSTER F2A)
Fleet Air Arm Fighters, American Built

- W. $\frac{1}{2}$ low-wing monoplane. Slight dihedral. Straight leading edge. Slight taper on trailing edge to rounded wing tips. Span 35 feet.
E. Single radial (Cyclone).
F. Head-on view circular. Side view short and bulky. Long cockpit enclosure.
T. Low rounded single fin and rudder. Symmetrical tail plane.
Compare with Martin.



CATALINA I (CONSOLIDATED P.B.Y.-5)
Flying-Boat, American Built

- W. High-wing. No dihedral. Rectangular appearance. Supported above the hull and braced by parallel struts. Wing tip floats retractable. Span 104 feet.
E. Twin radial (Wasp). Set close together above the hull.
F. Head-on squat appearance. Side view shallow, with blower gun turrets either side behind the wings. Knife-edge step below the turrets.
T. Single fin and rudder. Fin curves into hull. Tail plane set high. Straight trailing edge. Tips rounded.

W. Wings. E. Engine. F. Fuselage. T. Tail.



CHESAPEAKE I (VOUGHT-SIKORSKY S.B.3 U-3)
Attack Bomber, American Built

- W. Low-wing. Dihedral starting part-way along the wing. Trailing edge with taper starting part-way along the wing. Span 42 feet.
E. Single radial (Wasp).
F. Two-seat. Head-on view circular. Side view long glasshouse with blacked-out panel behind pilot's cockpit. Printed end.
T. High single fin and rudder with rounded top. Tail plane in high-wing position, marked taper.



CLEVELAND I (CURTISS S.B.C.4)—Dive-Bomber,
American Built

- W. Biplane. Staggered. Upper plane no dihedral, lower plane slight dihedral. $\frac{1}{2}$ bay, nearly equal span. Upper plane leading edge straight centre section tapering to rounded wing tip. Lower plane no taper.
E. Single radial (Cyclone).
F. Two-seat. Head-on view circular. Glasshouse behind upper plane.
Retractable undercarriage.
T. High rounded single fin and rudder. Tail plane in high-wing position with tapered leading edge, rounded wing tips.

W. Wings. E. Engine. F. Fuselage. T. Tail.



"The Aeroplane"
Drawing.

FORTRESS I (BOEING B-7C)—Bomber, American Built

- W. Low-wing. Marked dihedral from fuselage. Tapered to rounded wing tip. Span 103 feet.
E. Four radial (Cyclone).
F. Front view circular. A distinctive feature is the number of "blisters," one either side of the fuselage, one below, and a long one on top. Short between main and tail planes, finely tapered.
T. Single fin and rudder of slender sloping appearance. Tail planes with swept-back leading edge and finely rounded wing tips.

Compare with F.W. Knieer.



"The Aeroplane"
Drawing.

**HARVARD I and II (NORTH AMERICAN B.C.1)
Trainer, American Built**

- W. Low-wing. Dihedral starting a short way from the fuselage. Marked taper, starting from the same position on the leading edge. Trailing edge no taper. Rounded wing tip for Model I, almost square cut for Model II. Span 43 ft. I; 48 ft. II.
E. Single radial (Wasp).
F. Two-seat. Head-on circular. Side view deep with large glass-house.
T. Single fin and rudder. Model I curved rudder, Model II triangular with curved tip. Tail plane, leading edge swept back, trailing edge curved. Illustrations are of the Harvard I.

W. Wings. E. Engine. F. Fuselage. T. Tail.



"The Aeroplane"
Drawing.

HAVOC I (DOUGLAS)—Night Fighter, American Built

- W. High-wing monoplane. Dihedral. Straight leading edge, swept forward trailing edge. Rounded wing tips. Span 61 feet.
E. Twin radial (Wasp), underwing. *Nostrils extend beyond trailing edge.*
F. Front view, like sole of a shoe, point upwards. Protruding opaque nose stepped up to pilot's glass-covered cockpit, extending with opaque panel to glass-covered gun position. Pointed end, general appearance ball-shaped. Tricycle undercarriage retractable.
T. Very high pointed single fin and rudder. Tail plane elliptical and with marked dihedral.

BOSTON

The original Bomber version is similar in appearance except for glass panel in the nose.



"The Aeroplane"
Drawing.

**HUDSON III (LOCKHEED)—Reconnaissance-Bomber,
American Built**

- W. $\frac{1}{2}$ low-wing monoplane. Marked dihedral. Symmetrical wings tapered to a point. Flat girder extnd on trailing edge. Span 65 feet.
E. Twin radial (Cyclone or Wasp).
F. Oval-shaped front view. Side view deep and short like a "Flying Egg." Gun turret on top near tail unit. Windows in side.
T. Twin fins and rudders, inset. Tail plane tapers to rounded tip. Compare with A6 110.

W. Wings. E. Engine. F. Fuselage. T. Tail.



KITTYHAWK I (CURTISS P-40)—Fighter, American Built

- W. Low-wing. Dihedral. Leading edge straight, trailing edge tapered to curved wing tips. Undercarriage housing shows on leading edge. A Curtiss characteristic. Span 34½ feet.
 E. Single inline (Allison).
 F. Head-on view oblong. Side view deep, radiator well forward and sharp-pointed spinner. Cockpit well back over wings. Long bulge below.
 T. Small single fin and rudder. Tapered tail plane to rounded tips. High-wing position.

Compare with Tomahawk.



LANCER I (REPUBLIC P-43)—Fighter, American Built

- W. Low-wing. Marked dihedral. Leading edge straight, trailing edge straight, centre wing section curved taper to pointed tip. Span 28 feet.
 E. Single radial (Wasp).
 F. Single-seat. Head-on view oval, side view tubby.
 T. Single fin and rudder. Pointed with rounded trailing edge. Tail plane with sharp taper on leading edge. Clover-leaf trailing edge.

Compare with Buffalo and Mustang.

W. Wings. E. Engine. F. Fuselage. T. Tail.



LIBERATOR II (CONSOLIDATED B-24)—Bomber, American Built

- W. High-wing. Very slight dihedral. Long narrow wing tapering to rounded wing tips. Span 110 feet.
 E. Four radial (Wasp).
 F. Head-on view oval. Side view short and deep with protruding nose. Note sharp slope up to tail.
 T. Large twin fins and rudders outriggered, rounded appearance. Tail plane rectangular.

Compare with Halifax.



LIGHTNING I (LOCKHEED)—Fighter, American Built

- W. Mid-wing. Dihedral from fuselage. Tapered to pointed wing tips. Span 32 feet.
 E. Twin inline (Allison). Housed in tail booms.
 F. Single-seat. Head-on view oval. Side view tapered. Plan view twin tail booms with central nacelle extending beyond engines.
 T. Twin fins, rudder shield-shaped, inset. Narrow tail plane with rounded wing tips.

Compare with P-60, 109.

W. Wings. E. Engine. F. Fuselage. T. Tail.



MARAUDER I (MARTIN B-25)—Attack Bomber, American Built
W. Shoulder-wing. No dihedral. Tapered to rounded tips. Nacelles extend beyond trailing edge. Span 63 feet.

E. Twin radial (Wasp). Underwing.

F. Head-on circular. Side view streamlined with protruding glass nose. Gun turret on top well aft. Rear gun turret in pointed tail end.

T. High single fin and rudder, rounded top. Tail planes with marked dihedral in high position. Slight taper to rounded tips.

Compare with Blane.



MARTLET I (GRUMMAN F-4, F-3)
Fleet Air Arm Fighter, American Built

W. Mid-wing monoplane. Marked dihedral. Straight, slightly tapered wings. Square wing tips. Span 38 feet.

E. Single radial. (Cyclone).

F. Head-on view circular. Side view tubby. Small glass-covered cockpit over the wings. Two windows below.

T. Square cut single fin and rudder. Tail plane with taper on leading edge, square tips.

Compare with Buffalo.

W. Wings. E. Engine. F. Fuselage. T. Tail.



MARYLAND I (MARTIN)—Bomber, American Built

W. Mid-wing. Dihedral. Tapered to rounded wing tips. Span 64 feet.

E. Twin radial (Wasp).

F. Head-on oval. Side view protruding glass nose and step up to pilot's cockpit. Note also the gun position behind the wings. Gun turret on top.

T. Large single fin and rudder. Curved top and rudder. Tail planes set forward of the rudder in high-wing position. Slight taper to rounded wing tips.



MUSTANG I (NORTH AMERICAN P-43)—Fighter, American Built

W. Low-wing. Marked dihedral. Marked taper on trailing edge. Square wing tips. Span 37 feet.

E. Single inline (Allison).

F. Single-seat. Rectangular front view. Side view low set cockpit over wings. Radiator below behind the wings.

T. Single fin and rudder square cut. Tail plane set forward of rudder, rectangular.

Compare with Mustang, H-113.

W. Wings. E. Engine. F. Fuselage. T. Tail.



RELIANT I (STINSON)—Light Transport, American Built

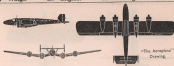
- W. High-wing, braced. No dihedral. Leading edge straight, trailing edge sharp taper to pointed wing tip. Span 42 feet.
- E. Single radial (Lycoming).
- F. Multi-seat. Wide and deep. Glass-covered cabin below the wings. Fixed undercarriage with single strut. The single wing strut and undercarriage leg join at the bottom of the fuselage.
- T. Large rounded single fin and rudder. Tail plane mid to high position. Taper on leading and trailing edge, rounded tips. Compare with *Lynx*, *Henschel* 106.



TOMAHAWK I (CURTISS P40)—Fighter, American Built

- W. Low-wing monoplane. Dihedral. Straight leading edge. Trailing edge tapered to rounded tips. Shoulder by fuselage. Span 37 feet.
- E. Single inline (Allison).
- F. Head-on view deep due to prominent radiator well forward under the nose. Two gun ports above. Side view prominent spinner with radiator below. Pilot's cockpit well back above trailing edge of wings. Humped-back appearance.
- T. Large single fin and rudder. Tail plane in high-wing position. Rounded and cut out by rudder. Compare with *Hurricane*, *Spitfire*, *Albatross* and *Henschel* 113.

W. Wings. E. Engine. F. Fuselage. T. Tail.



BLOHM & VOESS Bragg—German Troop Carrier

- W. Low-wing. Marked anhedral from wing root, dihedral from inboard engines. Untapered rectangular wing with curved back tips. Span 81 feet.
- E. Four radial (B.M.W.). Inboard engine nacelles project beyond trailing edge.
- F. Head-on view circular. Side view streamlined, with pointed nose and tail end.
- T. Twin fins and rudders, outrigger. Note pointed leading edge of fin. Rectangular tail plane with shortened elevators.



DORNIER Dory—German Reconnaissance Bomber

- W. High-wing monoplane. Very slight dihedral. Slight taper to rounded wing tips. Span 59 feet.
- E. Twin radial (B.M.W.) underslung, or twin inline (D.B.600).
- F. Three seat. Head-on view circular. Side view slender. Flying Fencil. Plan view robust. Glazed nose extending well beyond engines, with cockpit above and gun position over wings. Gun position also below.
- T. Angular twin fins and rudders outrigger. Tail plane rectangular taper on leading edge.

Illustrations show radial engines.

W. Wings. E. Engine. F. Fuselage. T. Tail.



DORNIER Do 24—German Reconnaissance Flying-Boat

- W. High-wing on narrow superstructure. Braced to spars. No dihedral. Slight taper to rounded wing tips. Double wing flaps on trailing edge. Span 78 feet.
- E. Twin in tandem inline (Junkers Ju 205 Diesel).
- F. Slim streamlined hull. Sponsons attached. Gun position in nose and behind wings.
- T. Single fin and rudder. Braced tail plane in high-wing position. Elevators overlap square-cut tail plane.



DORNIER Do 24—German Reconnaissance Flying-Boat

- W. High parasol wing. Slight dihedral starting half-way along the wing. Sweep-back leading edge. Stub wings or sponsons fitted from fuselage in place of floats. Span 83 feet.
- E. Three radial (B.M.W.).
- F. Step midway below fuselage with sweep up to tail end. Three gun turrets—nose, midway on top of fuselage, and tail.
- T. Twin fin and rudders (Dornier style), outriggered. Tail plane in high-wing position.

W. Wings. E. Engine. F. Fuselage. T. Tail.



DORNIER Do 24—German Flying-Boat

- W. High gull-wing. Taper on leading edge, straight trailing edge. Square tips. Span 98 feet 6 inches.
- E. Four in two tandem pairs over wing-inline (Junkers Ju 205, Diesel).
- F. Tapered hull with pointed nose. Gun turret on nose and two behind wings on the sides. Double step below the hull.
- T. High pointed single fin and rudder. Straight trailing edge. Tail plane in high position, taper on leading edge. Elevators overlap on the tail plane.



DORNIER Do 24—German Bomber

- W. High-wing. Very slight dihedral, slightly tapered to rounded tips. Span 50 feet.
 - E. Twin inline (DB 601A).
 - F. Head-on circular, glazed nose. Side view slim, with enclosed cockpit in front of the wings. The nose projects well forward of the engines.
 - T. Twin fins and rudders, outriggered. Tail plane rectangular with taper on leading edge.
- N.B.—A later series—Do 172 Mf. H—has radial BMW Fafnir engine; appearance otherwise in the same.*

W. Wings. E. Engine. F. Fuselage. T. Tail.



FOCKE-WULF Fw190

German Army Co-operation and Ground Attack

- W. Low-wing. Dihedral from centre section. Taper on leading edge from rectangular centre section. Rounded wing tips. Span 60 ft.
 E. Twin inline (Argus).
 F. Two/three seat. Head on view, large transparent dome. Side view, finely tapered tail boom. Plan view, twin tail booms with cockpit nacelle. Short nosed. Also extending aft.
 T. Twin fins and rudders rounded top. Rectangular tail plane. *Compare with Lightning.*



Fw 190A8 KURIER—German Bomber

Fusell CONDOR—Troop Carrier

- W. Low-wing. Marked dihedral from outboard engines. Tapered to rounded wing tips. Slight bulge in trailing edge. Span 100 feet.
 E. Four radial (H.M.W.). Project well beyond main planes. The inboard engines appear underslung.
 F. Head-on view squat. Side view streamlined, except for long narrow blister under the wings. Pointed nose slopes up to pilot's cockpit.
 T. Large square-cut single fin and rudder. Tail plane tapered to rounded wing tips.
 The Condor is similar, except for the absence of the blister and more rounded fin and rudder. *Illustrations are of the Kurier.*

W. Wings. E. Engine. F. Fuselage. T. Tail.



HENSCHEL Hs126—German Army Co-operation

- W. High-wing. Parasol. No dihedral. Leading edge with marked sweep back. Trailing edge cut away at root, swept back, tapered, rounded wing tips. Span 47 feet.
 E. Single radial (B.M.W.).
 F. Two-seat. Head-on view circular. Side view slim, partially enclosed cockpit.
 T. Small single fin and rudder. Tail plane in high-wing position. No taper. Rounded wing tips. *Compare with Lynx.*



HEINKEL He111—German Bomber

- W. Low-wing monoplane. Dihedral. Leading edge swept back to rounded wing tip. Wide chord. Trailing edge with "bite" at root. Span 74 feet.
 E. Twin inline (Junkers Ju200) (or D.R. 602).
 F. Head-on view circular. Side view cigar shaped. Transparent nose offset to starboard. Gun position on top and below.
 T. Large single fin and rudder inverted U shape. Cut away notch between rudder and fuselage. Elliptical tail plane.

W. Wings. E. Engine. F. Fuselage. T. Tail.



HEINKEL He 113—German Fighter

- W. Low-wing. Long and narrow. Slight anhedral. Marked dihedral starting quarter-way along wing. Span 30 feet.
 E. Single inline (D.B.601). Radiator central below fuselage.
 F. Circular front view. Pointed nose. Low cockpit, set well back.
 T. Single fin and rudder with vertical trailing edge. Flat top. Tail plane narrow.

Compare with Delfant, Hurricane, and Spitfire.



HEINKEL He 119 Ka—Reconnaissance Twin-Float Seaplane

- W. Mid-wing. Dihedral from engines. Pronounced taper on leading edge. Straight trailing edge. Span 73 feet.
 E. Twin radial (B.M.W.).
 F. Head-on view oval. Side view slender with transparent nose and long glass-covered cockpit. Twin floats braced to engine nacelles.
 T. Single fin and rudder, square-cut. Tail plane in high-wing position; braced.

W. Wings. E. Engine. F. Fuselage. T. Tail.



JUNKERS Ju 52/300—German Troop-Carrier

- W. Low-wing monoplane. Dihedral. Tapered to square edge. *Junkers* double-wing appearance. Span 56 feet.
 E. Three radial (B.M.W.).
 F. Head-on view rectangular. Side view nose engine is prominent. Stepped up to pilot's cockpit. Fixed undercarriage. May accommodate 30 soldiers.
 T. Single fin and rudder. Sloped leading edge, straight rudder edge. Tail plane double-wing appearance, elevator covers tail plane.



JUNKERS Ju 88A—German Bomber

- W. Low-wing monoplane. Dihedral from fuselage. Angular in appearance, leading edge swept back. Span 55 feet.
 E. Twin inline, but radial appearance, extend almost in line with the nose. Underwing. (*Junkers Ju 88C*.)
 F. Squat glass-faced nose. Short glasshouse well forward, with gun position at the rear. Gun position below and to starboard.
 T. High single fin and rudder. Rudder projects prominently beyond tail plane. Tail plane rounded and tapered.

Compare with Blenheim.

W. Wings. E. Engine. F. Fuselage. T. Tail.



JUNKERS Ju 86K and 36—German Bomber and Troop-Carrier

- W. Low-wing monoplane. Dihedral from fuselage. Tapered, with straight wing tip. *Junkers double-wing appearance.* Span 74 feet.
- E. Twin radial (B.M.W.) or twin inline (*Junkers Ju 86K*).
- F. Ju 86K Bomber.—Head-on view narrow. Side view long projecting glass nose, stepped up to pilot's cockpit. Gun position on top behind trailing edge of wing. Retractable gun position below.
- Ju 36 Troop-Carrier.—Similar, but no glass panel in the nose and no gun positions visible. Five windows in cabin for 12 soldiers.
- T. Twin fins and rudders outrigger. Tail plane rectangular.

Illustrations are of the Ju 86K.



JUNKERS Ju 37—German Dive-Bomber

- W. Low-wing, with pronounced W-shaped anhedral and dihedral—tapered. *Junkers double wing flaps on trailing edge.* Dive brake on under surface of wing. Span 45 feet.
- E. Single inline (*Junkers Ju 37*). Prominent radiator under nose.
- F. Two-seat. Long glasshouse. Fixed undercarriage with large spats. Fuselage runs away to a finely pointed tail in the plan view.
- T. Large single fin and rudder, with straight trailing edge. Rectangular tail plane.

W. Wings. E. Engine. F. Fuselage. T. Tail.



JUNKERS Ju 52—German Troop-Carrier

- W. Low-wing monoplane. Slight dihedral. *Junkers double-wing appearance.* Pronounced sweep back of leading edge. Span 115 feet.
- E. Four radial (B.M.W.).
- F. Head-on view square, but rounded at the top. Side view long clean lines to pointed tail and extending well beyond tail plane. Cabin windows apparent. Accommodates about 40 soldiers.
- T. Twin fins and rudders outrigger. Tail plane rectangular.
- Ju 53 Bomber is similar, but with inline Ju 211 D engines. Gun turret in nose and tail.



MESSERSCHMITT Me 109—German Fighter

- W. Low-wing monoplane. Slight dihedral. Taper to squared-ended wing tips. Span 32 feet.
- E. Single inline (Daimler-Benz) 3 radiators—one under each wing, one well forward under the nose.
- F. Single-seat. Noticeable length between main and tail planes. In the plan view looks like a cross. Cockpit well back over main plane.
- T. Low small single fin and curved rudder. Low and broad appearance. Tail plane single strutted, rounded tips.

Compare with Hurricane and Spitfire, Me 109E.

W. Wings. E. Engine. F. Fuselage. T. Tail.



MESSERSCHMITT Me262—German Fighter

- W. Low-wing. Moderate dihedral. Straight taper to rounded wing tips. Span 33 feet.
 E. Single inline (D.B.601). Supercharger air intake on port side. Radiators under each wing and under the nose.
 F. Single-seat. Noticeable length between main and tail planes. Cockpit set low and well back over the main plane.
 T. Single fin and flat-topped rudder. Tail plane is cantilever and set in high position. Compare with Hurricane.



MESSERSCHMITT Me110—German Fighter

Me JAGUAR—Reconnaissance Bomber

- W. Low-wing monoplane. Marked dihedral from fuselage. Well-tapered wings with square tips. Span 32 feet.
 E. Twin inline. Underwing (D.B.601). Radiators under each wing.
 F. Two- or three-seat. Long greenhouse above main plane. Circular front view. Side view straight appearance.
 T. Twin fins and rudders set on outer edge of tail plane. Long narrow tail plane set on top of fuselage.
 Me JAGUAR is similar, except for retractable tail wheel, glass panel under the nose for the bomb aimer, and shorter greenhouse.

Compare with Hudson.

RAID-SPOTTING

Observation by eye and ear alone cannot be made an exact science, but training and practice can produce worth-while results. The following articles are intended only as an aid to the practice of locating aircraft and are therefore set out in general and approximate terms.

VISUAL SPOTTING

Sky Charting

A simple exercise in height and distance judging

To determine the actual position of an object in the sky (cloud, balloon, aeroplane or A.A. burst), two out of the following three factors are required : Angle of vision, height, lateral distance.

Of these three, angle of vision is most easily obtained. Having gauged or measured the angle of vision, the graph shown on the front endpaper will show the corresponding heights and distances at which the object could be at that particular angle—either height or distance must now be estimated to determine its actual position.

Example I.—Aeroplane seen at 45° , estimated height 10,000 feet, then lateral distance would be approximately $\frac{1}{4}$ mile.

Example II.—Cloud base seen at 30° , estimated distance 1 mile, height would then be 3,000 feet.

Example III.—Aeroplane seen at $22\frac{1}{2}^\circ$, estimated height 20,000 feet, estimated distance 3 miles. Reference to the graph will show this to be an impossibility.

Further scrutiny of the object will suggest an obvious error in judgment of either height or lateral distance, or both. Refer again to the graph and recalculate your estimate. Practice will work wonders.

Friendly competition with two or more individuals pooling their estimates of height and distance on a given object at the determined angle gives added interest and accuracy.

Aids to Estimating Angle—Distance—Height

Angle.—The following are rough-and-ready means of gauging the angle of sight. The average closed fist with the knuckles held vertical at arm's length covers an angle of approximately 10° ; with the thumb extended, 15° ; with fingers and thumb outstretched, 20° .

A makeshift protractor can be made by taking any piece of paper, one corner being a right angle (a corner of a newspaper will do) and folding over and over three times, edge upon edge—the creases resulting from the corner will each cover an angle of $11\frac{1}{2}^\circ$. A square of wood with suitable angles clearly marked will prove more effective. When sighting upon an object, hold the corner close to the eye, making sure that the base is horizontal.

It is worth noting that the angle at which you see the Pole Star is the same number of degrees as the latitude of your position, and is, of course, constant, e.g., John o' Groat 55° , London 51° , Gibraltar 36° .

Visual Spotting—continued.

Distance—Land Marks.—Learn the distance from your point of observation of outstanding landmarks—spire, hilltop, wood, etc. The objects selected should, where possible, be at different points of the compass.

By travelling the eye from an object in the sky to its nearest landmark below, a guide to its lateral distance will be obtained.

Height—Cloud Formations and Heights.—Besides providing a most interesting study, cloud forms can give a very valuable guide to the height at which aircraft are flying. With careful scrutiny it will be found that shape, texture and height vary considerably.

There are three main types of clouds:—

High clouds—CIRRUS (Latin), meaning curl or wing.

Medium clouds—CUMULUS (Latin), meaning heap.

Low clouds—STRATUS (Latin), meaning layer or covering.

These types merge and combine into an infinite variety of forms, but under an international code have been classified into 16 forms, illustrations and descriptions of which appear on the back endpaper.

Make a habit of estimating the heights of clouds. Here the graph described on the previous page and shown on the front endpaper will help. Speaking generally, heights are greater in summer than in winter, but familiarity and practice will soon enable an observer to judge height from the "texture" of the cloud as well as from its type.

Alto Cumulus and Alto Stratus.—The wide range of heights at which these clouds occur is a major difficulty, but a good plan is to assume 10,000 or 12,000 feet as a standard and decide, in the light of other available information, whether the cloud layer is higher or lower. In the case of *alto cumulus* the larger the central waves or globular units, the lower in height. In the case of *alto stratus* a good rule is that when the sun is faintly visible it is at about 12,000 feet, but when the sun becomes invisible it is 10,000 feet or less. It thickens as it descends.

Clouds—Mistral.—Generally speaking, the more widely the individual cloud extends, the higher the summit is likely to go.

How Far Away Can Aircraft be Seen?—The answer to this question must necessarily depend upon many factors—size and height of aircraft, sky and light conditions, and, not least, upon the observer himself.

It is estimated that high-flying aircraft in good visibility will not be seen until at an angle of 45°-50°. One interpretation can be 20,000 feet at a lateral distance of 4 miles, direct distance 5-6 miles (see graph).

This is a significant fact to Raid-spotters when the question of bombing angles is considered (see page 54).

Low-flying aircraft of the larger types, say, at 2,000 feet, with visibility very good, may be watched out of sight up to 12-14 miles away.

Visual Spotting—continued.

Identification.—With the naked eye, given average sight, and visibility no worse than moderate (objects visible 6½ miles away), it should be possible to identify single-engined types at a distance of 1 mile to 1½ miles, with an extra ½ mile added for the larger multi-engined machines, provided, of course, the details of construction of that particular type are known to the observer. Beyond that, the "sit" of the aeroplane in the air must be your guide.

What Do Aircraft Look Like at a Distance?—A useful method of training personnel is to use the 1/32nd scale models, obtainable from most stores. These models, when viewed at a distance of 10 feet through the exit end of a pair of binoculars, represent the actual appearance of the aeroplane as seen by the naked eye at 20,000 feet or approximately 4 miles direct distance.

SEARCHLIGHTS

Searchlights, when in use, by their beam groups give a valuable guide as to the number and course of hostile aircraft.

In clear weather hostile aircraft will approach well-defended areas at high altitudes, say, 20,000 feet and upwards. A rough-and-ready estimate of distance may be obtained by considering the angle of vision and the meeting point of a group of searchlight beams (see angle graph).

TRAILS OR VORTICES

Owing to the great height and speed at which modern aircraft can fly, the moisture content of the atmosphere is made visible by the sudden fall in temperature caused by the vacuum behind the wing tips and air screw blades.

Trails are, therefore, condensation, which, in continuous form, usually first occurs at, say, 20,000 feet; they are, in fact, drizzle clouds.

SOUND SPOTTING

Not only at night, but on many occasions in the daytime, the first indication of the presence of aircraft will be given by sound. It is therefore of some importance to spotters that attention be given to this subject.

Identification by Sound.—Identification, as the word implies, must be positive; otherwise it is valueless and may even be harmful.

Practised Spotters can often name correctly an aeroplane heard and subsequently seen; this, however, can only apply to types which have frequently been heard by an individual, whereas by visual means types not previously seen in the air can be identified from the study of silhouette, etc.

American types of engines approach the sound of hostile engines more nearly than our own; an added consideration is the fact that many types are now fitted with a variety of engines.

As an additional aid to visual spotting the study of recognition by sound is valuable.

Sound Spotting—continued.

A Few Facts About Sound.—Sound from aircraft is produced by (1) the air-screw, (2) passage of the machine through the air, (3) the engine. The manoeuvre of the machine will vary each and all of these. The resulting sound is therefore not constant.

Experience will help to distinguish (1) the heavy beat of the loaded bomber, (2) the constant drone of the fighter, (3) the "popping" of a light trainer, but not between hostile and friendly aircraft. All twin-engined aircraft, hostile or friendly, produce an intermediate drone. Note, also, two single-engined aircraft flying together often produce the same effect.

At ground level sound travels at approximately 750 m.p.h., or 1 mile in 5 seconds. Aircraft at 350 m.p.h. travel 1 mile in 10 seconds.

"	300	"	"	1	"	12	"
"	250	"	"	1	"	14	"

Velocity of sound for our purpose can be taken as constant, regardless of weather conditions or its volume.

The direction from which sounds emanate can be best judged by "balancing" the sound evenly upon both ears.

The apparent effect of an aeroplane leaving its sound behind is produced by the fact that the rays of light which enable you to see the aeroplane reach your eye instantaneously, whereas its sound takes 5 seconds for each mile of distance to reach your ear.

The angle for aim-off being 15° at 300 m.p.h., 20° at 350 m.p.h., 25° at 400 m.p.h., 30° at 450 m.p.h. It should be noted that these are maximum angles and that any deviation in course either towards you or away from you will cause a decrease. See page 47 for gauging angles.

Practice your estimate of speed and angle. Compare sounds at different heights, and for different manoeuvres.

A reasonably accurate method of counting seconds is to say aloud and with deliberation, "One and two and three and," etc. Practice this with a watch.

The range of sound is affected by wind. A favourable wind has the effect of throwing the sound waves downwards, thus increasing its range. An adverse wind throws the sound waves upwards, decreasing its range.

The direction and strength of wind should therefore be noted while on duty.

Wind Force	0-10 m.p.h.	Gentle Breeze.	Light flag extended, leaves and twigs in motion.
"	10-20	Mod. Breeze.	Dust raised—loose paper blows about.
"	20-30	Strong Breeze.	Telegraph wires whistle, branches sway.
"	30+	High Wind.	Walking difficult, whole trees in motion.

Sound Spotting—continued.

On a night of hard frost it has been known for high-flying aircraft to be heard 20 miles away.

From observations made at night, the average distance at which high-flying aircraft will be first or last heard is:—

Wind 0-20 m.p.h.—8-10 miles in all directions.

Wind 20-30 m.p.h.—10-12 miles up wind, 7-8 miles side wind, 5-6 miles down wind.

Wind 30-40 m.p.h.—12-14 miles up wind, 5-6 miles side wind, 4-5 miles down wind.

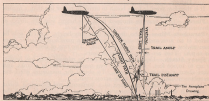
Wind 40 m.p.h. and over, the sound becomes confused and even the direction is difficult to determine, but down-wind aircraft may pass within 1-2 miles undetected.

Clouds can both reduce range and alter direction by refraction of sound waves. Ground noises must also be allowed for.

The sound of very low-flying aircraft, say, 1,000 feet or less, will only be detected at very close range.

The direct distance in miles of A.A. bursts can be determined (as in the case of lightning and thunder) by counting 5-second intervals between the view of the burst and the arrival of the sound.

BOMBING ANGLES, ETC.



The distance from its target at which a bomb is released depends upon the height and speed of the plane and the time of fall of the bomb.

The time of fall of an H.E. bomb is only slightly affected by the speed of the plane or the weight of the bomb.

The time of fall is roughly 10,000 feet 28 seconds, 15,000 feet 34 seconds, 20,000 feet 38 seconds, 25,000 feet 41 seconds. A bomb dropped from a great height, after falling 20,000 feet, may reach a velocity approaching

Bombing—continued.

that of sound (1,100 feet per second), but the pressure of the air at ground level prevents this velocity being finally attained.

The following table gives the approximate angle of vision and distance in miles from their target at which bombs will be released from aircraft travelling at different speeds and heights.

Height in feet	Speed 300 m.p.h.	Angle of vision	Speed 450 m.p.h.	Angle of vision	Speed 600 m.p.h.	Angle of vision
10,000	1½ miles	55°	1½ miles	47°	2 miles	43°
15,000	1½ "	58°	2½ "	50°	2½ "	48°
20,000	2 "	62°	2½ "	55°	3 "	50°
25,000	2½ "	65°	2½ "	60°	3½ "	53°

High-flying aircraft can, therefore, be immediately dangerous when seen at an angle between 43° and 65°.

Providing the aeroplane continues on its course, it will be over the target as the bomb lands, irrespective of its height and speed.

Heavy bombers' speed approx. 300 m.p.h.

Medium " " " " " 250 "

Fighter " " " " " 300 "

It is therefore possible for a bomb to arrive in rather less than 1 minute or, at most, 1½ minutes after first sighting the bomber.

Flares.—These may be dropped from any height with the object of illuminating an area, not necessarily the target area.

Parachute Mines.—Also dropped from any height, but can only be aimed at an area and not single targets. The parachute is rather more than 20 feet diameter and green in colour. The rate of descent is about 40 m.p.h. They are often dropped in pairs.

Spray Attack.—Liquid mustard gas can be released from low heights, or up to 10,000 feet. About 1—1½ tons may be carried in 2 tanks, and takes about 1 minute to flow out. To obtain the maximum effect the aeroplane would be expected to fly across wind.

On release it might be likened to a horizontal rod extending about 3 miles. It would quickly disintegrate into drops, the largest to reach the ground being 5 mm., the smallest 0.5 mm., from 10,000 feet; the largest would take 5 minutes and the smallest ½ hour to reach the ground, that is, with wind about 10 m.p.h. It is estimated that the maximum number of drops likely to fall on any one person would be 2 large and 10 2 mm. drops, whereas to cause a casualty it requires 250 2 mm. drops. Hence its value is chiefly surprise, nuisance and danger of liquid in the eyes. Mica eye-shields should therefore be kept handy. Outer clothing should be quickly removed and allowed to air for 24 hours.

AIR-BORNE TROOPS

These consist of parachute troops and air-landing troops. The former make a parachute jump while their transport aeroplane is air-borne; the latter tumble out the moment their transport has landed.

The types of aeroplane which it is expected may be used for the transport of troops and/or towing of gliders are Junkers Ju52, Junkers Ju60, Junkers Ju89, Junkers Ju90, Focke-Wulf Fw Condor, Focke-Wulf Fw Kurier and the Blériot & Vois Br142, with a fighter escort drawn from the following types: Me109E, Me109F, Me110, and Fw189.

TROOP-CARRYING GLIDERS



The following are distinctive features of gliders:—

Wings.—High wing, braced or cantilever, wide span nearly double the length of the fuselage. Slender wing sections. May be semi-transparent. May have hook-shaped skids towards outer edge of each wing.

Engine.—None.

Fuselage.—Short; circular in section. Cabin and portholes under the wing. Main skid under the belly. Note wheels on either side. Tail skid set well back.

Tail.—High, single fin and rudder. Rudder extends well beyond tail plane. Tail plane elliptical and may be single-strutted.

Having no engine, gliders are slow and silent, except for a swish only heard at short range. They may be towed as many as five in line ahead, but would be loosed before reaching the coast-line to avoid being detected by the noise of the towing aircraft.

The following types of aircraft, themselves carrying troops, have been used for towing: Junkers 52/jm. Junkers 39 and 90, also Fw. Condor. The towing speed is something over 100 m.p.h.

Gliders can carry 20-40 equipped men each and would therefore be expected to land several near together.

They make a flat landing with a run of only 10 yards at about 40 m.p.h.

They would mainly be used at night, and even then, when detected, would make a wonderful target to A.A. guns or our night-fighters.

The equipment of the smaller types may include 6 Tommy guns, 6 Schmeisser sub-machine guns, 1 heavy machine gun, 1 light machine gun and their ammunition, also a portable radio set.

PARACHUTE TROOPS



The Junkers Ju 52 is the type of aeroplane chiefly used for the transport of parachute troops. Each aeroplane can carry 10-12 equipped men. The troops are dropped from an altitude of 500 feet or less while the flying speed is 80-100 m.p.h. While the troops are actually descending observers are apt to overestimate their number. Coloured parachutes may be used by leaders and for the containers of equipment.

Uniform.—(1) High boots laced at the side, with heavy rubber soles.

(2) Loose grey trousers fastened like plus-fours.

(3) Tunic same colour with brown or yellow piping and white metal eagle on the collar. Shoulder straps piped; pockets have buttoned flaps.

(4) Over tunic and trousers overalls of grey-green gabardine are worn, loose in the body with short legs and long full sleeves; loose collar. On the right breast is an embroidered badge (white) of a flying eagle holding a swastika. For the descent the overalls are worn over the equipment to prevent it from fouling the parachute. On landing, the parachute harness is discarded and belt with equipment taken from underneath and put on outside the overalls.

(5) Gauntlet gloves drawn in at the wrist.

(6) Steel helmet, without a flat rim, is secured by two straps, one in front and one behind the ears.

Weapons.—These are dropped separately in cylindrical or six-sided containers. Three or four in each aeroplane, one to about five men, are dropped singly by parachute nearby ready for instant use, with loaded rifle, stick grenades, anti-tank rifle, light and heavy machine-guns.

Each man carries a revolver, two grenades, a spring knife, revolver and rifle ammunition, about 500 rounds for each, and machine-gun ammunition.

One man in five has a machine-pistol with folding stock. Fired from the shoulder or hip, effective range about 75 yards.

SOME FIGHTER FORMATIONS USED BY R.A.F. & LUFTWAFFE



1. "Sections in Vic." Forward firing fighters require protection from rear attack. The weapons do this, packing 8 arms at high speed.

2. "Sections in Diamond."



3. "Sections in Line Astern." 4. "Line Astern," often used by the Luftwaffe.



5. "Squadron Echelon to Port." 6. "Sections in Echelon to Port." Sub-Commands or units do not always fly at the same level, often at increasing heights from front to rear.

SOME BOMBER FORMATIONS USED BY R.A.F. & LUFTWAFFE



1. "Flights in Line Astern" 2. "A Wing with Sections in Vic."



3. "Diamond Section in Echelon to Starboard." 4. "Line Astern." 5. "Squadron Vic."



6. "Echelon to Port." In both Fighter and Bomber formations the leader flies in front in full view of his command. More open formation is kept on active service flights than on drill flights.

PURPOSE AND DESIGN

As air warfare develops more and more specialised work is required of aeroplanes and the men who fly in them. Specialisation being still in the stage of development, aircraft in service to-day are called upon to perform many duties and are well equipped to do so; e.g., Spitfires not only act as interceptor fighters, but they escort day bombers and also carry out ground strafing sweeps on their own account. Similarly, Messerschmitts, Stirlings, etc., bomb both by day and night.

In general outline, purpose and design can be grouped under three headings—Spotting and Ground Observation, Pursuit and High-wing, Weight-carrying, Mid-wing, Fighting View and Manoeuvring, Low-wing.

The following summary is intended to add interest and understanding to the work of ground observers and not to suggest that the types mentioned are necessarily used for that specified purpose only.

FIGHTERS

Interceptor Fighters. *Purpose:* To intercept and attack day raiders, which implies working within a comparatively short range of their base.

Design: For fast climbing, high speed and high fire power, endurance and weight-carrying must to some extent be sacrificed.

Example: Spitfire, Messerschmitt.

High Flying Fighters. *Purpose:* To counter the very high flying bomber.

Design: Extra power to attain great heights and the need for longer endurance involve heavier weight at the expense of sheer speed.

Example: Hurricane II, Messerschmitt.

Low Attack Fighters. *Purpose:* To defend our low flying aircraft, e.g., reconnaissance or low attack bombers and to attack enemy troops and low flying aircraft.

Design: High speed, high fire power and heavy armour.

Example: Albatross.

Long Range Fighters. *Purpose:* Escort for day bombers and convoys and attack on enemy aerodromes.

Design: Long range, speed and fire power.

Example: Hurricane with extra fuel tanks, Beaufighter, Messerschmitt.

Two-Seater Fighters. *Purpose:* For escort and night fighting when a team of two is required.

Design: Endurance, fire power, and power-operated gun turret for accurate shooting.

Example: Defiant.

Night Attack Fighters. *Purpose:* Night attack on enemy aerodromes to harass bombers returning from a raid or on the ground.

Design: Long range, crew of two, blacked-in cockpit, powerful armaments, as well as accommodation for a few bombs.

Example: Havoc.

Fighters—continued.

Night Interceptor. *Purpose:* Night patrol, tracking and destroying enemy raiders.

Design: Long endurance, speed, reliability and weight carrying, also heavy armament for a quick kill, as the enemy once found may be quickly lost. Again a team of two is required. The cockpit blacked in from below to counter the glare from searchlights.

Example: Beaufighter.

Fighter Bombers. *Purpose:* Low level precision bombing.

Design: Power for weight carrying, speed and manoeuvrability.

Example: Hurricane (Hurricane Bomber).

Fleet Fighters. *Purpose:* To intercept enemy raiders, bombers or torpedo-bombers. To escort our bombers and torpedo-bombers.

Design: Long range for reaching shore or locating their aircraft-carrier. Quick take-off and slow landing speed for operating from aircraft-carrier. Folding wings or small dimensions for compact stowage.

Example: Fulmar, Martlet, Buffalo.

BOMBERS

Dive Bombers. *Purpose:* To dive on its objective aiming machine and bomb at the target.

Design: Great strength of wing with marked dihedral and dive brakes, for steadiness in a power dive.

Example: Barracuda, Vengeance, Judy.

Attack Bombers. *Purpose:* Low attack on enemy positions with machine gun, cannon and light bombs.

Design: Compact, sturdy build for control and weight-carrying.

Example: Northrop, Boston.

Reconnaissance Bombers. *Purpose:* Long distance, high speed flights by day over enemy territory for locating and photographing objectives.

Design: Speed, endurance and defensive armament.

Example: Maryland, Hudson, Jaguar.

Torpedo Bombers. *Purpose:* To deliver low attacks with air-borne torpedoes on enemy ships.

Design: Multi-seat with steady flying qualities to ensure accurate launching of the torpedoes.

Example: Beaufort, Albatross, Swordfish, Heinkel He 115.

Day Bombers and Night Bombers. *Purpose:* To reach their objective and deliver the goods at the right address.

Design: Varies from Medium Bomber to Heavy Bomber to Super-Heavy Bomber. Provision in each case has to be made for the combined qualities of speed, endurance, defensive power, weight-carrying and high flying.

Example: Medium Bomber—Heinkel; Heavy Bomber—Whitley; Super-Heavy Bomber—Stirling; Stratosphere Bomber—Fortress.

PRISMATIC BINOCULARS (Eyepiece Focusing)

Use.—Complete comfort and absence of strain is of great importance. Brain and eye cannot act in harmony when neck and arms are strained. A.A. crews have armchairs, but Road-sportsmen will probably have to be content with a leaning post or parapet. The eyepieces should be held gently but firmly to the eyes. NEVER LOOK AT THE SUN.

Keep your eyes on the object and raise the binoculars to the eyes.

Focusing.—The bar is marked in millimetres to register the distance between your eyes. The markings on the eyepieces have no special denomination.

First see that the eyepieces are adjusted on the zero mark, then open out the binoculars to their full extent. Sight on a distant object by using first one eyepiece then the other, both eyes being kept normal, thus focusing each in turn. Note the marking on each eyepiece. Then, using both eyes, close the binoculars until one clear vision is comfortably obtained. Note the degrees (millimetres) marked on the bar. The use of these adjustments will enable you to obtain a quick focus with any standard type.

Care of.—Kings and jolts affect the alignment, also disturb the balsam which cements together the object lenses. To clean, use soft material free of dust or grit. Moisture, especially dew, forms a film on the inner surface of the lens. Examine through the reverse way; if a film is seen professional treatment will be required.

MOONLIGHT (Midnight is in Greenwich Mean Time)

- (i) When the Moon is Full there is moonlight all night.
- (ii) Thereafter the Moon rises and sets progressively later each night, but sets after daylight.
- (iii) At Last Quarter it rises at near midnight.
- (iv) It continues to rise later until, at New Moon, there is no moonlight.
- (v) Thereafter, until First Quarter, when the Moon sets around midnight, there is progressively more moonlight for the first part of darkness.
- (vi) Until Full Moon, when the position described in (i) above is again reached, the Moon sets later each night after midnight.

The Moon rises and sets on an average about fifty minutes later each day.

VISIBILITY TABLE

Fog (dense to moderate)	Objects not visible 1,100 yards.
Haze or mist	" " " 1½ miles.
Poor visibility	" " " 2½ "
Moderate visibility	" " " 6½ "
Good visibility	" " " 12½ "
Very good visibility	" " " 31 "
Excellent visibility	" " " visible over 31 "

Stratosphere.—The upper portion of the atmosphere in which the temperature remains constant with height 33,000 feet to 36,000 feet and up.

GENERAL HINTS

Day signs of danger: Sounds of aerial combat, gunfire, or bombing.

Night signs of danger: Gunfire, searchlight concentrations, flares, sounds of aerial combat, aircraft circling or hovering and bombing.

Local tactics: Note the tactics employed: (a) Aircraft passing en route for a distant target; (b) sporadic attack; (c) continuous attack, even then a quiet period may intervene, when, with shelter accommodation close at hand, work may be resumed.

During a Public "Alert" at least two should be on duty.

Sun glasses are very useful. Small formations attack from out of the sun. Large formations rely on their strength to take the shortest route.

Tactics change, but hostile aircraft in large formations fly very close together, to make a small target. Small formations may fly in line ahead. Our fighters fly in more open formation—often 12 in three v's with two as scouts weaving in and out.

If aircraft are spotted in one direction, do not ignore the rest of the sky.

If friendly aircraft are recognised, keep in touch with their movements; they will not later take you by surprise.

If there are two layers of clouds, hostile craft may fly between to obtain cover from above and to seek an opening below.

During an airtight hostile aircraft may appear to be shot down, but in reality be making a dive attack.

If in doubt, sound the alarm. Having sounded the alarm and found the aircraft to be friendly, remember it takes 10 minutes to smoke a cigarette. An attempt to recall to work in two or three minutes will not improve confidence.

So that your warning may be given in good time, it is essential you know the time taken by the personnel in the building to reach their shelter. See Notes on Bombing Angles, page 52.

Remember the Bald Spotter's motto: "The Bell before the Bomb."

BRIEF DETAILS OF ROOF POST

Good view in all directions is essential. If necessary site the post away from the building. This would also be desirable for a noisy factory.

Alarm bell in handy position.

Protection, sides and overhead, should be provided.

Protection from the wind has more than comfort importance.

Sheltering below a wall of brick, sandbags, etc., not only reduces the noise and disturbance of the wind, but improves sound detection.

Steel helmets, respirators, eye shields, first-aid kit, waterproof coats, hats and boots should be provided; light and heat where possible.

Binooculars more than double the efficiency of recognition.

Silhouettes, recognition and log books should be kept.

Compass points marked on the walls and a map are useful and interesting

FIRE FIGHTING HINTS

1. Watch as well as listen for incendiary bombs and fires.

2. Speed, caution and a cool head are essential in fire fighting. Incendiary bombs should be considered explosive. Carry dustbin lid, door mat or heavy overcoat with a stick through the arms.

3. Deal with bombs on buildings first; on the ground after.

4. Always use sand or earth in the open; water in buildings. Bombs continue to burn under sand or earth. Sand bags should be half full and are easily carried by gripping both ends in one hand.

5. A stirrup pump is really effective. Use spray on bomb, jet on fire. Tackle the surrounding fires first. Direct it at the heart of the fire, not only flames. Avoid electric fires or cables, water conducts electricity.

6. The pump operator should keep in clear, cool air. Pump steadily, 70 to the minute on jet, 35 on spray. Coal gas is poisonous and explosive. Your gas mask is not effective in this case.

7. Carbon tetrachloride extinguishers give off phosgene gas. Take care in a confined space.

8. Foam extinguishers are necessary for burning oils or fats.

9. Keep a reserve supply of water. Clear your loft of all articles.

10. Inform somebody before entering a burning building.

11. Don't let fire get behind you. Search from the top downwards to safety. Fire may travel under floors or behind panels.

12. Open doors with care, keeping your feet within a few inches to act as a stopper.

13. When smoke is present, crawl with a damp cloth over mouth and nose; it's cooler and clearer on the floor. Keep close to the walls on stairs or floors; it's safer.

14. If your clothes catch fire, roll on the floor, clapping your hands over your mouth and nose. If someone else, then force them down with burning part uppermost and roll in a rug or coat; don't let them run away.

15. Doors and windows, if open, cause a draught which feeds fire.

16. Avoid unnecessary damage by smashing or flooding. Move smoldering pillows, etc., outside.

17. To move an unconscious person, kneel across him and tie his wrists together over your head, and crawl. Apply artificial respiration as soon as possible.

18. To move him downstairs, grasp him beneath the armpits with his head in the crook of your arm and drag him down on his back.

19. Don't jump from a window, but hold on to the sill and lower to arm's length; then fall with the knees bent.

20. A good first-aid remedy for burns is lint soaked in strong tea and allowed to dry, or in a solution of bicarbonate of soda, a teaspoon to a pint of water, when it must be kept wet. If a small child has been badly burnt about the body, immerse the whole body in a bath of warm water until medical aid arrives.

POSSIBLE WAY CASES

Gas	Small	Visible Signs	Immediate Irritant Effects	First Aid Treatment
Teas Gas. HCl, HBr, Phosgene.	Piercing odor. Irritant (tears). Red throat.	Chills, yellowish-brown liquid.	Irritation or stinging of eyes, nose, throat, and mucous parts of mouth. Not deadly, rarely fatal.	Remove clothing. Wash with warm water or saline solution. Breathe fresh air.
Gas (arsenic). D.M. Nerve poisonant.	Heavy odor. Nausea. Coughing. Arrested.	Wet spots on chest, face, neck, and throat. Not irritable in effect. No manifestations.	Burning pain in nose, mouth, throat, and eyes. Slight edema of airway. No danger in descending. Not fatally.	Remove to pure air. Remove clothing. Wash with warm water. Breathe fresh air. Mouthwash solution (No. 4) if necessary.
Gas (arsenic). Phosgene. Non-poisonous.	Musty hay.	Green as white about at nostrils. In damp weather, otherwise irritable.	Coughing at back of throat. Coughing, possible sneezing. Large, becoming flooded of mouth.	Remove to pure air. Wash with warm water. Breathe fresh air. Mouthwash solution (No. 4) if necessary.
Ammonia (Vapor). Gas causing poisoning. Gas causing poisoning. Gas causing poisoning. Gas causing poisoning.	No small amount in high concentration. Irritant. Piercing odor. Faint smell of ammonia.	Irritable (vapors). Solid in small amount. No irritant. No irritant.	Gas acts as local poison and suppresses without respiratory may be fatal. Small doses have cumulative effect.	Remove to pure air. Remove clothing. Wash with warm water. Breathe fresh air. Mouthwash solution (No. 4) if necessary.
Gas (arsenic). Musty. Non-poisonous.	Musty, garlic-like odor. Nausea. Coughing. Arrested.	Chills, drops yellow in dark brown. No irritant. Daily stain of mouth.	No transitory effect except slight irritation of eyes. No danger in descending.	Remove to pure air. Wash with warm water. Breathe fresh air. Mouthwash solution (No. 4) if necessary.
Gas (arsenic). Musty. Non-poisonous.	Gas (arsenic). Musty. Non-poisonous.	Chills, drops yellow in dark brown. No irritant. Daily stain of mouth.	Transitory irritation of nose from vapors. Stinging of eyes from liquid. No danger in descending. No danger in descending.	Remove to pure air. Wash with warm water. Breathe fresh air. Mouthwash solution (No. 4) if necessary.

N.B.—There is NO NEED to become a casualty from gas. Put up your gas mask the moment you hear the WARREN'S siren, and you needn't direct its operation by hand, while signs are displayed above. Keep it on until you hear the WARREN'S bell, which signals danger past.

DON'T GET THE WIND UP—GET UP WIND of the gas or into a gas-proofed room. Avoid sleeping in any room which may be on the ground. Attach your children under its to flame extinguished room.

[illegible]

FIRSTAID IN BRIEF

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Ministry of Health Leaflet.

AFTER AN AIR ATTACK. First Aid Parties will reach the wounded within a few minutes. Even such a short time counts. The man or woman on the spot can save lives by immediate and proper action.

Be prepared to see severe wounds. Be courageous and keep your head. Keep your mind on your duty to your injured fellow man.

Everyone in these days of danger should carry several clean handkerchiefs or small towels. These can be used as bandages, and their inner laundered surfaces are quite suitable for application to open wounds as a first dressing.

Unless a patient is in a highly dangerous place you should treat him where he lies. To lift or drag the wounded can do serious damage. Your general rule is that the moving and transport should be left to trained units.

The first and most important duty of the civilian helper who first reaches a casualty is to stop bleeding.

When you cut a thumb you naturally grab it firmly with the fingers of your other hand. That application of pressure to a bleeding wound is the correct thing to do in all cases.

TO STOP ILLICIT

Press on the bleeding point with fingers or hands. As soon as possible apply a clean thick pad of folded handkerchief or towel. Use an inner surface of your handkerchiefs or towels. Keep up the pressure through this pad. Bandage the pad firmly in position over the wound. Be sure that the dressing is applied firmly enough to control the loss of blood. If there is still oozing of blood past or through the pad, renew pressure over the whole dressing.

BLEEDING FROM AN ARM OR LEG

Press on the wound with fingers or hands. Apply a clean thick pad as soon as possible. Keep up pressure through the pad. Bandage the pad firmly over the wound. If this fails, pass a bandage, tie, handkerchief, elastic or fabric belt, or similar article, round the limb as close to the wound as possible, at a point between the wound and the trunk. Knot the fabric so that the limb is loosely encircled. Pass a stick through the slack loop and twist till the tightening of the band round the limb stops the blood flow, taking care not to pinch the skin. Hold tight till the First Aid Party arrives. If you have to do this, make a note of the time when you tighten the loop and give it to the patient or attach it to the limb. It is very important that the hospital surgeon should know this.

BLINDING FROM THE HEAD

From with fingers or hands on the bleeding parts. Apply a clean pad as soon as possible. Keep up pressure through the pad. Bandage the pad firmly in position.

First Aid—continued.

BLEEDING FROM THE TRUNK

These wounds are usually grave. Cover them with several layers of dressing. Keep up gently firm pressure over the pads.

SHOCK OR COLLAPSE

All wounded are liable to collapse. Control bleeding at once. Keep the patient lying down. Loosen clothing at neck and waist, but do not expose the patient to chill. Prop the head comfortably. Wrap blankets or coats round the patient, not forgetting gently to slip some under him. Put hot bottles, if available, outside the blankets. Let him smoke if he will. Give him plenty to drink, warm drinks preferably (not alcohol), and the best of all is warm very sweet tea. By your presence and helpfulness encourage him.

Follow this routine even in apparently slight cases. It will save lives.

WARNING

DO NOT GIVE FLUID TO CASES OF WOUNDING OF BELLY
Patients who have injuries to the belly must not be given anything by mouth; not even sips of water should be swallowed, but the mouth may be rinsed out.

SUFFOCATION

Pressure of fallen debris may compress the chest and cause suffocation. To release a person so buried is a matter of the utmost urgency. Do not waste a second.

CLOTHES ON FIRE

Take a rug or heavy coat. Wrap it round the victim. Prevent him running about. Lay him on the ground, using force if necessary. Smother the flames by pressure or beating through the rug.

TREATMENT OF BURNS

Treat first for shock as described above. Treat the burn later. DO NOT APPLY OIL OF ANY KIND. The best thing to use is a series of layers of dressing moistened with cold tea. If this is not at hand, cover the burn with dry clean dressings several layers thick.

IF YOU EXCEED THESE INSTRUCTIONS YOU MAY DO GREAT HARM. LEAVE ALL OTHER TREATMENT TO TRAINED MEN. LIVES ARE AT STAKE—PLAY FOR SAFETY.

Aircraft Models

Japanese Ju 87B (Stuka)

Wesland Whirlwind

Wesland Whirlwind S.S.5 (Helicopter)

Boeing Stearman

Mig 15

Hawker

Boeing Stratofortress

Hurricane

Spitfire

Regulus II

Typhoon

Spitfire

Grumman F4U Corsair

Avro Lancaster

De Havilland

Bombardier

Avro York

Handley

Aircraft Books

Aircraft Identification (Part I)

(British & German Fighter Bombers)

Aircraft Identification (Part II)

American Types for the R. A. F.

N.A.S.C. (NOTE AND RECOGNITION BOOK). Aircraft Recognition

BOMBER COMMAND

Avro

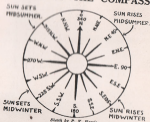
COASTAL COMMAND

Modeler

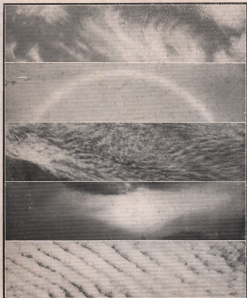
FLYING REVIEW

LL

POINTS OF THE COMPASS.



Sketch by P. F. Davis
Compass showing principal points, degrees, and sunrise and sunset in the latitude of London.



HIGH CLOUDS. Height 20,000—40,000 ft.

Cirrus (Mare's Tails). Detached clouds of delicate threadlike or wispy or feathery form, silvery white in colour.

Cirro-Stratus. A translucent milky or white cloud-sheet, sometimes covering the whole sky, and frequently recognisable by the presence of "halos"—wide circles—round sun or moon. These are produced by the ice crystals of which the cloud is composed.

Cirro-Cumulus. Very small wavelets or flakes without shadows, and usually accompanied by threads of cirrus.

MEDIUM CLOUDS.

Medium clouds may occur anywhere between 7,000 and 20,000 ft.

Alto-Stratus. A uniform or fibrous sheet of light or darkish grey colour according to its thickness; when thin the sun or moon can be dimly seen through the cloud.

Alto-Cumulus (Mackerel Sky). Waves or globular patches of moderate to small size, usually showing slight shadows, and often grouped in flotillas.



LOW CLOUDS.

Stratus. A uniform layer of cloud resembling fog but not lying on the ground. Height 500—2,000 ft.

Cumulus-Nimbus (Thunder or Shower Cloud). Continuous cloud rising upward in the form of mountains, towers and walls, generally having a series of dense borders called "walls" around at their summits. Height of base 2,000—5,000 ft., the summit may reach upward of 10,000 ft. from the base.

Cumulus (Wisp) Cloud. Cloud whose summit is dome-shaped, and shows protuberances, and whose base is flat and generally horizontal. They often develop into Cumulus-Nimbus. Height of base 2,000—5,000 ft.

Nimbus. Dark ragged "scud" clouds found usually below a higher sheet of Alto-Stratus. The combined mass usually gives rise to steady rain or snow. Height 500—2,000 ft.

Stratus. A uniform layer of cloud resembling fog but not lying on the ground. Height 500—2,000 ft.