

8055
\$22-50
COPY FOR OFFICIAL USE.

AIR PUBLICATION 1107

3rd Edition, Feb., 1931

A MANUAL OF RIGGING FOR AIRCRAFT

This handbook, which deals briefly with the theory and practice of the rigging of aircraft, is issued for the information and guidance of all concerned.

By Command of the Air Council,

C. G. Bullock

AIR MINISTRY
Published March, 1931.

[*Crown Copyright Reserved.*]



LONDON:

PRINTED AND PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

To be purchased directly from H.M. STATIONERY OFFICE at the following addresses:
Austral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh;
York Street, Manchester; 1, St. Andrew's Crescent, Cardiff;
15, Donegall Square West, Belfast;
or through any bookseller.

1931

Price 4s. 6d. Net

22-67-0-31.

CONTENTS.

	<i>Page</i>
List of tables	ii
List of illustrations	iii
Introduction	1
 <i>Chapter</i>	
I.—Aerodynamic principles	3
II.—Tools and instruments	15
III.—Furniture and equipment	22
IV.—Principles of construction	32
V.—Wood and composite construction	50
VI.—Metal construction	68
VII.—Assembling and truing of a stripped fuselage	87
VIII.—Assembling and truing and covering of planes, control surfaces and undercarriages	94
IX.—Assembling and truing up a complete tractor biplane	101
X.—Truing up on board ship	119
XI.—Flying boats, float planes and ship planes	125
XII.—Bonding, screening and earth systems	134
XIII.—Repairs and maintenance	140
XIV.—Practical information for riggers	157
 <i>Appendix</i>	
I.—Method of checking centre of gravity of an aeroplane	168
II.—Thread and tapping drill sizes	169
III.—Possible extension of tolerances on blade angles of wooden airscrews	171

LIST OF TABLES.

<i>Index</i>	
I.—Furniture and equipment	23
II.—Sizes of adjustable trestles	28
III.—Leg lengths for adjustable trestles	28
IV.—Approximate loads for trestles	29
V.—Rigging allowances	118
VI.—Cutting lubricants, proportions	144

LIST OF ILLUSTRATIONS.

<i>No.</i>	<i>Title.</i>	<i>Page.</i>
1.	Diagram of forces of an aerofoil	4
2.	Lift and drag curve	6
3.	Pressure distribution curve	7
4.	Aircraft terms	8
5.	Aileron types	10
6.	Automatic slot diagram	12
7.	Vernier	15
8.	Micrometers	17
9.	Rigging instruments	19
10.	Adjustable level	20
11.	Ladders	25
12.	Miscellaneous standard equipment	26
13.	New equipment	30
14.	Sheer legs	31
15.	Stress extension curve	33
16.	Lines of stress in a drilled bar under tension	35
17.	Loaded and unloaded beam	38
18.	Diagram of stress distribution in a spar	39
19.	Typical beam sections	40
20.	Loaded pin ended and fixed ended struts	41
21.	Braced strut	42
22.	Lines of action in fittings	43
23.	Single and double shear	44
24.	Laminated plate fitting	44
25.	Wiring lug attachment	45
26.	Perfect and imperfect frames	45
27.	Braced frames	46
28.	Typical forms of bracing	46
29.	Types of internal wing bracing	47
30.	Cellule bracing	48
31.	Splice in wooden member	52
32.	Typical wooden plane	53
33.	Wooden interplane strut fittings	54
34.	Composite plane rib attachments	55
35.	Composite wing fitting	55
36.	Wooden spar details	56
37.	Hollow wood strut sections	57
38.	Composite strut sections	58
39.	Typical deep section wooden rib	58
40.	Wooden fuselage	59
41.	Wooden fuselage fittings	59
42.	Wooden monocoque construction	60
43.	Composite fuselage	61
44.	Composite fuselage fittings	61
45.	Fabric lacing on fuselages	62
46.	Wiring lugs	64
47.	Wooden undercarriage	64
48.	Wooden tailskids	65
49.	Wooden tail plane and elevator	66
50.	Wooden fin and rudder	66
51.	Welded parts	72
52.	Section of metal plane	73
53.	Frise aileron	74

<i>No.</i>	<i>Title.</i>	<i>Page.</i>
54.	Automatic slot construction	74
55.	Steel spar sections and rib attachments	75
56.	Light alloy spar sections and rib attachments	76
57.	Metal spar end fitting	77
58.	Metal spar fitting	77
59.	Typical metal fuselages—1	78
60.	Typical metal fuselages—2	79
61.	Metal monocoque construction	79
62.	Built up metal struts	79
63.	Tubular strut end attachments	80
64.	Metal tailplane and elevator	81
65.	Tail adjusting gear	81
66.	Metal fin and rudder	82
67.	Metal undercarriage with through axle	83
68.	Metal two unit or divided undercarriage	84
69.	Oleo legs	85
70.	Metal tail skids	86
71.	Types of braced fuselages	88
72.	Truing a fuselage	88
73.	Bracing wire attachments	93
74.	Fabric attachment by sewing	95
75.	Fabric attachments to ribs	96
76.	Truing an undercarriage	100
77.	Typical rigging diagram	101
78.	Truing a top centre section	104
79.	Truing a complete tractor biplane	107
80.	Measuring tail plane incidence	109
81.	Control system—aileron and elevator	110
82.	Control system—rudder	111
83.	Vibration preventers on bracing wires	112
84.	Truing ship plane fuselage and undercarriage	120
85.	Truing ship plane main planes	121
86.	Boat and float seaplane and amphibian	125
87.	Construction of a ring plated hull	128
88.	Construction of a longitudinally plated hull	129
89.	Launching chassis and beaching trolley	130
90.	Miscellaneous seaplane equipment	131
91.	Mooring and towing gear	132
92.	Boat seaplane. Jacking trestles in position	133
93.	Methods of bonding	134
94.	Diagram of connections for resistance tester	139
95.	Types of rivets	143
96.	Riveted joints	144
97.	Repairs to solid drawn tubes	147
98.	Repairs to strip steel tubes	148
99.	Repairs to spars and ribs	149
100.	Methods of determining right angles	158
101.	Spanners and wire holders	160
102.	Telescopic trammel	161
103.	Method of loop splicing flexible steel cables	162
104.	Knots	163
105.	Rip off patches on planes	164
106.	Aileron stop	167
107.	Nomogram for the solution of triangles	167
108.	Checking C.G. of an aeroplane	168

NOTE.

Nothing in this manual is intended to overrule official instructions issued to cover any specific point.

INTRODUCTION

1. The tendency in scientific and mechanical matters is generally towards specialisation. In the early years of practical aviation, say 1908 or 1909, it was not usual to specialise in any particular phase of aeronautical work. It was the rule then for one man to try out his own theories by designing, building, and flying his own aircraft. Many of the pioneers did wonderful work in these combined capacities, but the system obviously could not continue. To-day, the design, construction, and piloting of aircraft are sub-divided into a large number of highly specialised tasks, with a consequent increase in efficiency. Every good rigger should realise that from the first thoughts of the theorist to the actual flying of the aircraft there is a complete chain of workers, and that the links in the chain are all interdependent. If any one of the widely different kinds of work is performed badly, or if any mistake is made, all the good work of the rest cannot set matters right. The design of the aircraft must be right, mathematically, aerodynamically, and mechanically; the construction must be sound, both in workmanship and choice of materials; the aircraft must be rigged according to the designer's intentions, and, lastly, the pilot must be capable. If any of these links in the chain should be faulty, failure, and perhaps disaster, follows.

2. The function of the rigger should now be more or less clear. His duties are to make the best use of the work of designer and constructor, so that the pilot may fly an aeroplane that is rigged truly and safely and in accordance with the designer's ideas. The days when a rigger had, so to speak, to finish off the designer's work are now past. In the early days of the war it was not unusual for the efficiency of the rigger to make up for minor faults in design, and many a good pilot and rigger between them obtained a better performance from an aeroplane than the designer had thought possible. On the other hand, careless or ignorant rigging has sometimes caused the loss of just that excellence of performance that would have enabled a pilot to overcome an opponent.

3. To-day it is no longer the rigger's function to question or alter the designer's arrangements. He must simply make certain that the relations of the various surfaces are exactly

as the designer planned, and that the various adjustments are properly made and securely locked. This does not mean that the studies of a rigger need be curtailed in any way. On the contrary, a study of the aerodynamical and mechanical sides of aviation will help him to grasp the great importance of accuracy in his adjustments and repairs, and assist him to work with sympathy and intelligence.

4. The rigger takes over an aircraft either assembled, if delivered by air, or dismantled, if it arrives by road or other transport. There are, in addition, many occasions on which a rigger must assemble and true up an aircraft which has been dismantled for repair or other purposes. In any case, his duty is to check very carefully the disposition of the fuselage and planes, tail and undercarriage, and other parts, and to examine, as far as possible, all wires, cables, struts, sockets, etc. He must make quite sure that the geometry of the aircraft is correct, i.e., that the undercarriage is symmetrical, the planes are symmetrical to the fuselage, and so on. Also he must watch for frayed cables, faulty wires or fork ends, loose nuts and damaged or missing split pins. The great responsibility of the work is self-evident. The pilot is more or less at the mercy of all who have been concerned with the design, construction, and erection of his aircraft, and it is not likely that the rigger, who is generally in fairly close contact with the pilot, would fail to realise his own responsibilities.

5. So far as Service aircraft are concerned, the duties of the rigger, and the periods between overhauls and inspections, are dealt with in Air Ministry Weekly Order 25 of 1929, as amended by subsequent orders, and in the King's Regulations and Air Council Instructions, paras. 702 and 788.

This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.



LIGHTNING MK. 1
COVER PITOT HEAD
EB2-88-5111