ROYAL NAVAL AIRCRAFT REPAIR YARD, FLEETLANDS.

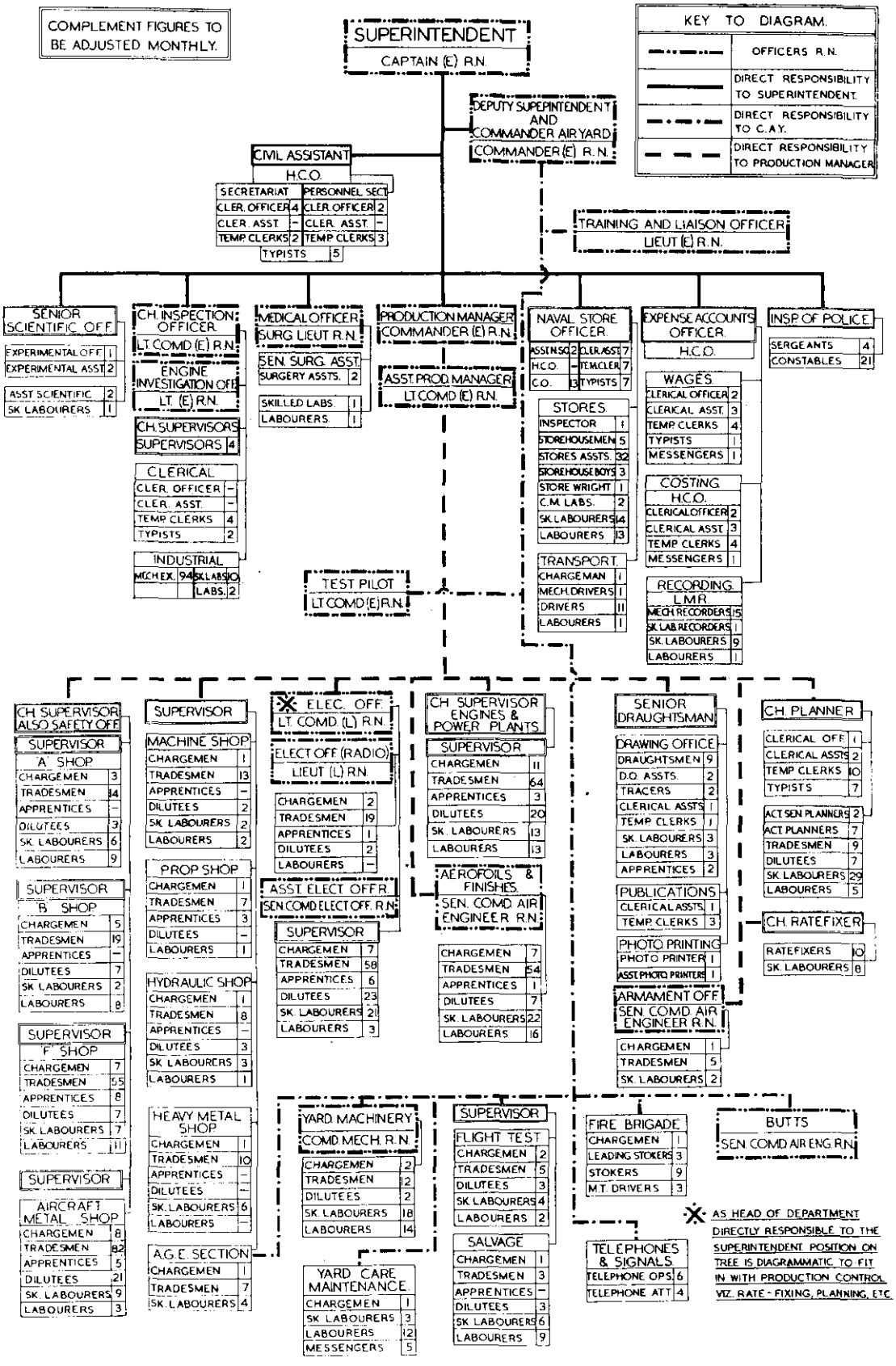

PLATE 1

PLANNED AIRCRAFT REPAIR

by

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This paper aims to present in simple language and sketches the Planned Aircraft Repair Scheme evolved at the Royal Naval Aircraft Repair Yard, Fleetlands, for the repair and complete overhaul of Naval aircraft. It is not a technical paper for the Production Engineer but an introduction to modern practice employed at Fleetlands.

Preface

Before the recent world war the bulk of Naval aircraft were fabric covered and they presented quite a different proposition in the engineering sense when compared with the modern all-metal type.

Just prior to and during the war the all-metal aircraft was rapidly developed. With such aircraft a heavier power unit was incorporated as also were many additional complicated units, mechanical, electrical, hydraulic and pneumatic. At this stage therefore the aircraft became an intricate machine and repair work throughout became an engineering problem for which facilities and method had to be developed.

During the war and partly because the repair set-up for aircraft had not kept pace with design, repairs became largely a matter of replacement of components. While meeting war requirements this method was obviously far too expensive to continue as a peace-time procedure.

From the above it can be seen that it was not until after the war that the real business of getting down to large repair work with modern aircraft on an economical basis had to be faced up to. It was this problem which confronted Naval Engineering and which subsequently led up to the present scheme being evolved and developed at Fleetlands. Plate 1 gives an idea of the personnel set-up required to carry it out at Fleetlands with a basic repair task of about 150 aircraft, 360 aero engines and 240 power plants per year, complete overhauls in every case. The same set-up also deals with a very large volume of miscellaneous, investigation and manufacturing work.

STANDARD PLANNED REPAIRS

Introduction

The complete overhaul of an aircraft is based on the findings of the Repair Establishment and not on defect lists compiled by the users.

The Establishment carrying out the overhaul is therefore faced with two major problems :—

(*a*) To ensure that all defects and modifications are covered.
(*b*) To evolve a system which will return the aircraft to the users in the shortest possible period of time.

The orthodox method of compiling a defect list is for a team of Examiners to survey the aircraft as received and on its merits. In theory, therefore, only necessary work is undertaken and many components may remain in situ.

In practice, however, it is found that the original defect list does not fill the bill as numerous supplementary defects come to light during the repair process, thus completely upsetting original estimates of time and cost.

Equally unsatisfactory is the time lost at the preliminary stages ; for instance the workshops are not concerned until the defect list is completed and the many job cards made out for the different Sections of the Repair Yard. This time lag also reacts on other work such as estimating and store demands.

The compiling of a defect list by the orthodox method does not, therefore, in the earlier stages meet the important requirement at (*b*), nor does it do so during the intermediate stages due to the many supplementary defects arising. There is also a psychological disadvantage as the team of Examiners who carry out the Survey have no further interest ; their activities and interests pass on to other aircraft awaiting survey.

It is obvious therefore, that an ideal scheme for large repair work is one which enables the aircraft to be taken in hand by Workshops on arrival, which keeps supplementary defects to a bare minimum and which enables all Examiners to be interested throughout the refit. It should be noted that Examiners are apart from Production, they are mainly concerned with the noting of defects and the quality of all work being carried out to the required inspection standards.

Standard Repair at Fleetlands

A scheme to meet the requirements at (*a*) and (*b*) is now in practice at Fleetlands and is known as Standard Repairs. This Scheme provides a standard procedure for the complete breakdown of the aircraft into interchangeable groups, incorporation of modifications at suitable stages and reassembly for test flight. By this method all aircraft are treated alike ; they are taken in hand by Workshops on arrival, the master job cards being pre-printed, and the Examiners are confined to certain groups or components with which they are associated throughout repairs to final clearance from Workshops.

The complete dismantling of the aircraft into interchangeable groups, each of which is surveyed and refitted to schedule, ensures thorough and adequate repairs without loss of time. For instance, in the case of the Firefly aircraft, a reconditioned centre section from a previous aircraft is immediately available. By the time the carcase or fuselage is repaired and the centre section fitted, all other components are completed and waiting in the Assembly Shops ; it is then a matter of reassembly and functional tests. The groups, being interchangeable, could if necessary be exchanged between aircraft; in practice, however, and excluding the centre section, this is more the exception than the rule. As all repairs are worked on a time basis and to schedule, estimation of completion and costs is a much simpler matter and in fact is practically pre-determined.

A reconditioned power plant, that is one which has been subjected to a complete overhaul of the engine and ancillaries, is fitted in every case. The airframe and engine are therefore brought into line and both commence a new lease of life together.

It may be thought that subjecting each aircraft to a standard procedure would tend to increase the work and period of time under repair and that the quantity of spares and stores required would be excessive. In actual practice, however, the period of time is very considerably reduced as also is the amount of spares and stores demanded. It is an established fact that the turn-round time is halved by standard method.

The outstanding advantages of Standard Repairs where complete overhauls are concerned is therefore as follows :—

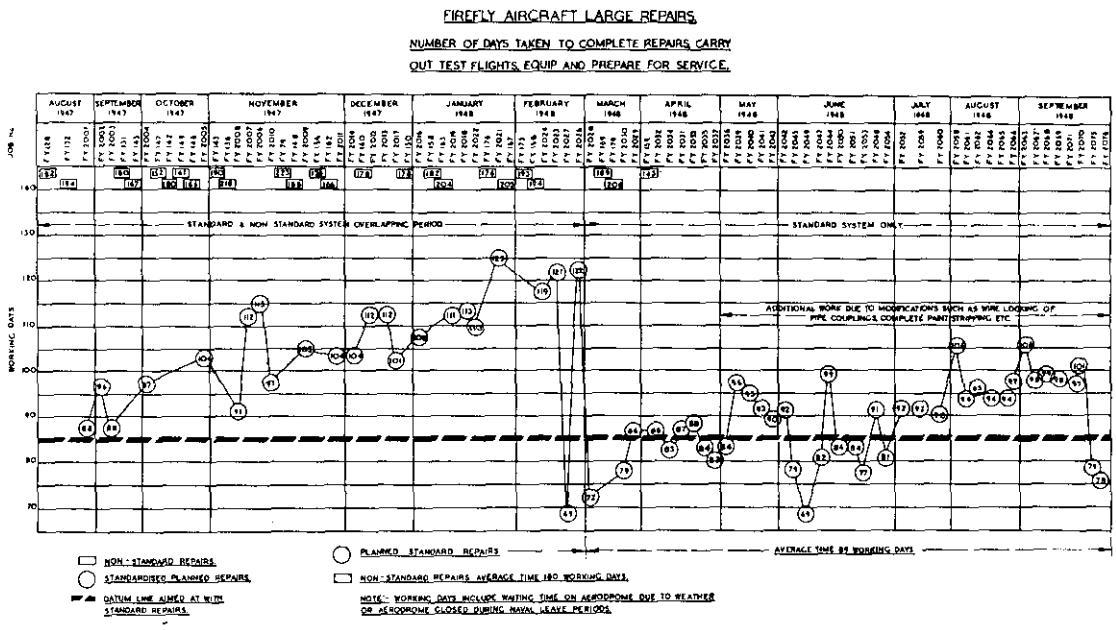


PLATE 2

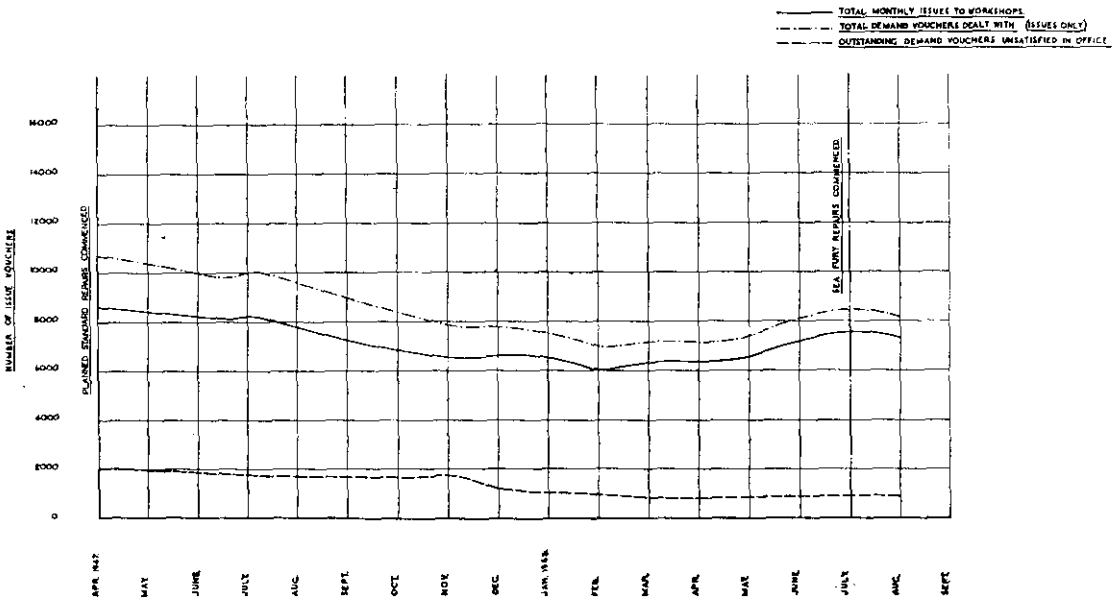


PLATE 3

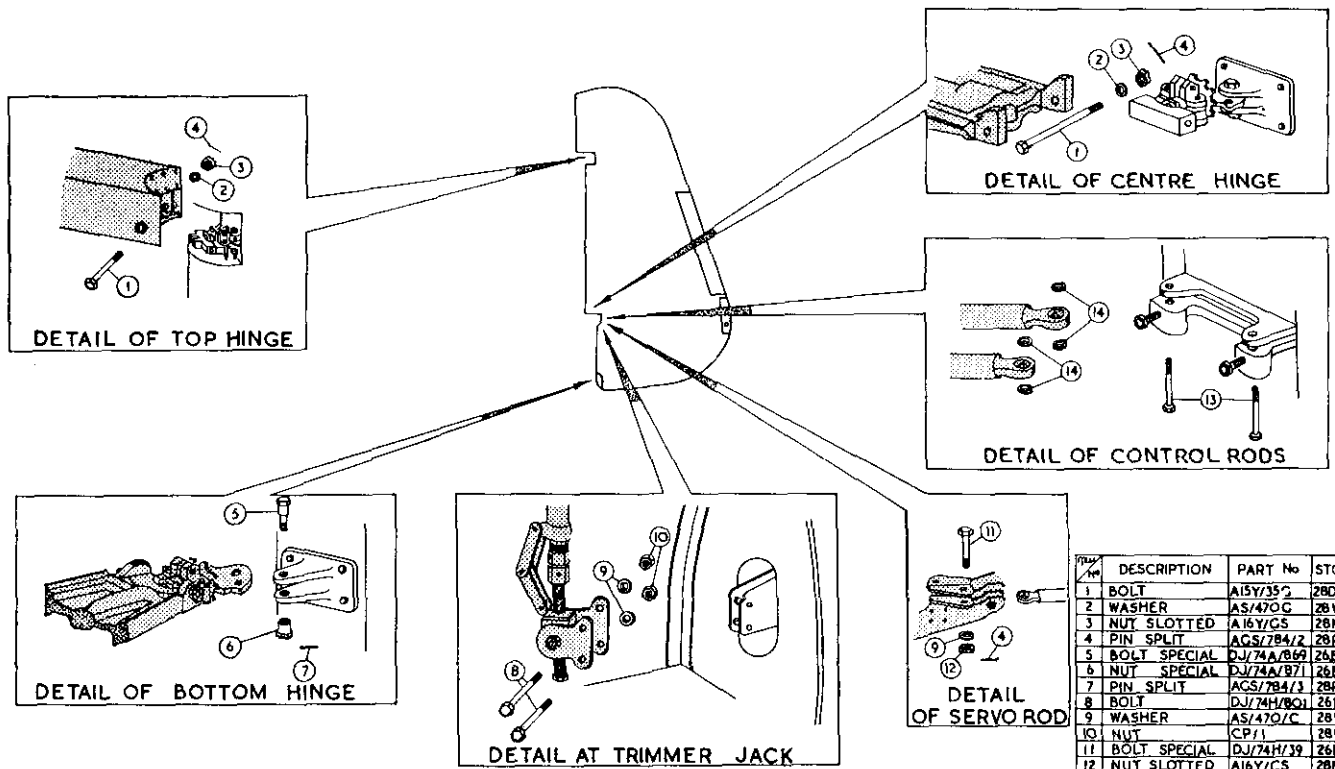
(i) Pre-determined estimation of time and approximate costs.
(ii) Quicker turn-round.
(iii) Marked economy.
(iv) A minimum risk of overlooking defects, particularly deterioration which is of paramount importance and which cannot be in full evidence unless the aircraft is completely stripped.

Reduction in turn-round time

Plate 2 shows the reduction in turn-round time achieved by adopting a standard system. It will be seen that with the standard system only working, the datum line was straddled with the average turn-round time working out at 89 days.

FIREFLY MARK I.

TAIL UNIT COMPONENTS REMOVED ON ROUTINE 6. OP. 4. REPLACED ON ROUTINE 12. OP. 6.



ITEM No.	DESCRIPTION	PART No	STORES R.	No. OFF
1	BOLT	A15Y/35	28D/7934	2
2	WASHER	AS/470G	28W/8520	2
3	NUT SLOTTED	A16Y/GS	28M/770	2
4	PIN SPLIT	AGS/784/2	28P/5031	3
5	BOLT SPECIAL	DJ/74A/869	26BZ/2602	1
6	NUT SPECIAL	DJ/74A/871	26BZ/2618	1
7	PIN SPLIT	AGS/784/3	28P/5032	1
8	BOLT	DJ/74H/801	26BZ/7971	2
9	WASHER	AS/470/C	28W/8516	3
10	NUT	CP/1	28M/5851	2
11	BOLT SPECIAL	DJ/74H/39	26BZ/2605	1
12	NUT SLOTTED	A16Y/CS	28M/767	1
13	BOLT	A15Y/1BG	28D/7312	2
14	SHIM LAMINUM	DJ/71A/847	26BZ/456	4

TYPICAL PICTORIAL SCHEDULE

PLATE 4

Oscillations in the curve are caused by hold up of test flights for various reasons such as weather, etc., and delay in supply of modification sets or spares beyond local manufacture capacity. The system otherwise provides for a straight run through on the repair side.

Falling off in Spares and Stores Requirements

This is illustrated in Plate 3 and is brought about by the method of group completeness on dismantling. For instance, when removing a component from an aircraft, certain fittings, such as special bolts, washers, etc., are by Pictorial Schedule required to remain with the component or with the carcase, the job not being complete for inspection or bonus payment unless these conditions are fulfilled.

It will be observed that a proportion of demands are not satisfied ; these are met by local manufacture.

A typical sheet from the Pictorial Schedule is shown in Plate 4. Complete sets of Pictorial Schedules in convenient form are displayed and available for the use of all operators.

METHOD

Schematic Sketch entry and departure for Flight Test

Plate 5 shows the entry of aircraft into the Yard by " Queen Mary " and the various stages up to readiness for flight test. Aircraft are also towed into the Yard and sometimes fly in ; they all go through the same procedure.

The sketch being schematic is not intended to give any idea as to the volume of work in hand ; at the time of writing this paper, the number of aircraft being worked upon in the shops and aerodromes was 65.

Break Down of Firefly Aircraft

The break down shown in Plate 6 is Standard and the time allowed to carry it out is fixed. Other types of aircraft are treated similarly.

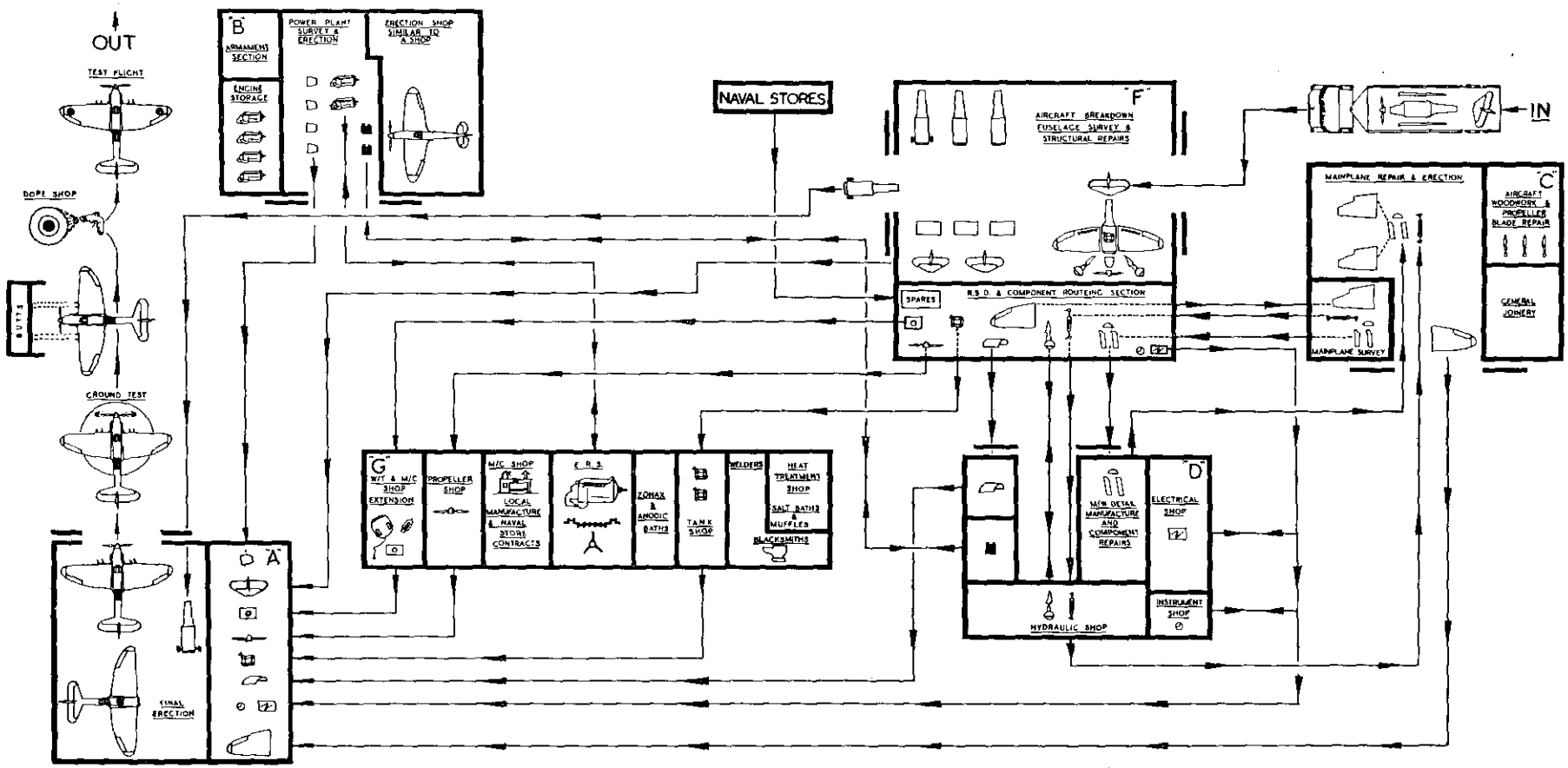
Basic Floor Time Chart Firefly

Plate 7 shows the Basic Time Chart for a Firefly aircraft, other aircraft having similar charts. The working days exclude Saturdays, Sundays and public holidays.

In actual practice these charts are behind perspex covers and a cursor is fitted to enable shop officers and others to pin-point commencement and completion dates.

It will be seen from the chart that the complete break down and cleaning is scheduled for seven days and reassembly (erection) fourteen days. The latter includes the various functional tests in place such as folding main planes, working flaps, retraction of undercarriage, etc. Repairs, it will be noticed, are all scheduled for completion before erection commences, the centre section being the exception, this, as previously stated, comes from an aircraft taken in hand at an earlier date. The break down, reassembly and bench testing of the engine is controlled by a similar chart and the overall time allowed is 26 days, thus giving ample time for its inclusion in the building up of the power plant to fit in with the commencement of the assembly of the aircraft.

A common basic floor chart of this nature is extremely valuable to all departments, it contributes towards law and order, is uniform, automatically applied, comprehensive, simple and exact.



SCHEMATIC SKETCH SHOWING AIRCRAFT ENTERING & LEAVING YARD

PLATE 5

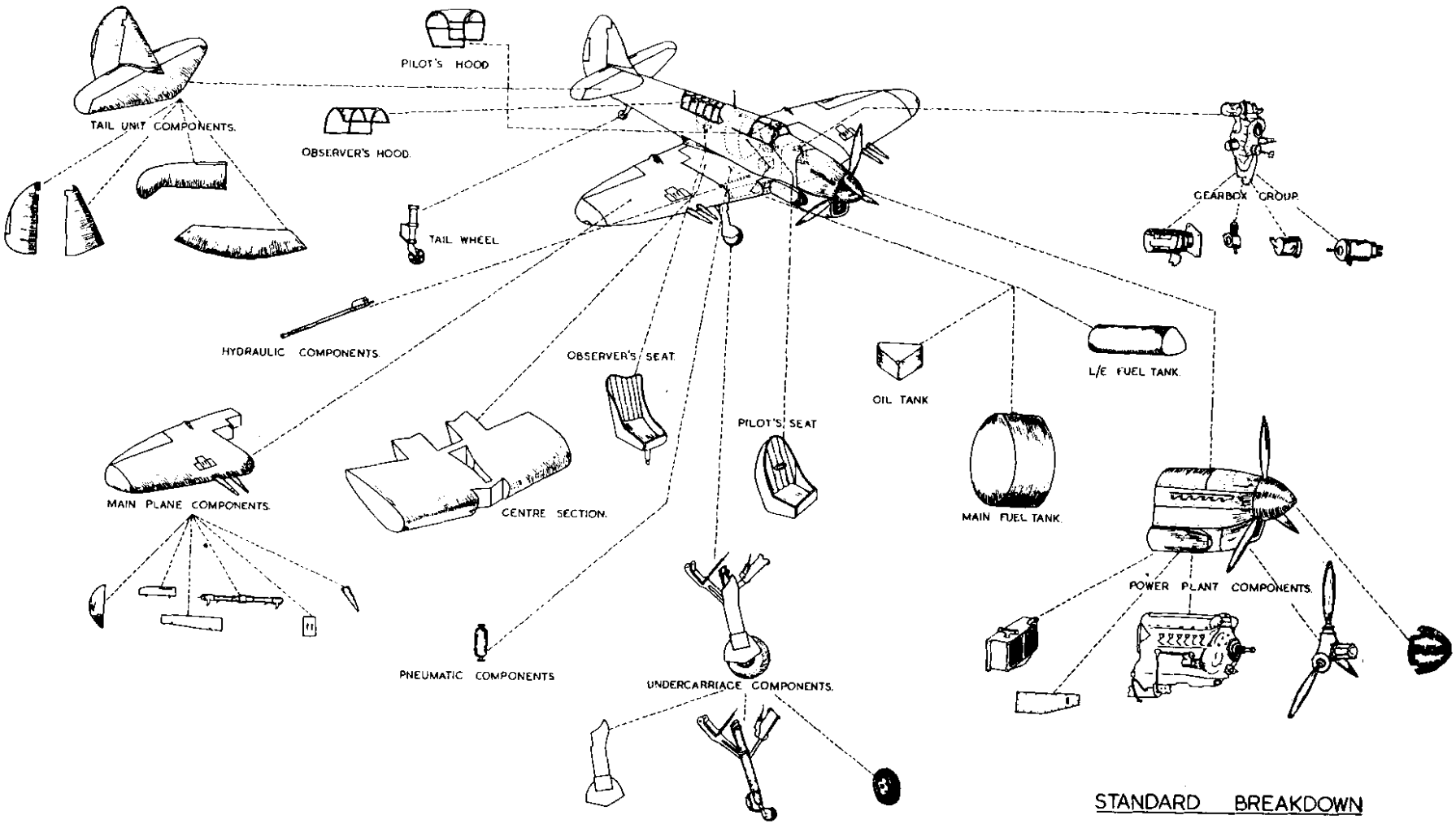

PILOT'S HOOD
TAIL UNIT COMPONENTS.
OBSERVER'S HOOD.
TAIL WHEEL
GEARBOX GROUP.
HYDRAULIC COMPONENTS.
OBSERVER'S SEAT
L/E FUEL TANK.
OIL TANK
PILOT'S SEAT
MAIN PLANE COMPONENTS.
CENTRE SECTION.
MAIN FUEL TANK.
POWER PLANT COMPONENTS.
PNEUMATIC COMPONENTS
UNDERCARRIAGE COMPONENTS.
STANDARD BREAKDOWN
FIREFLY AIRCRAFT

PLATE 6

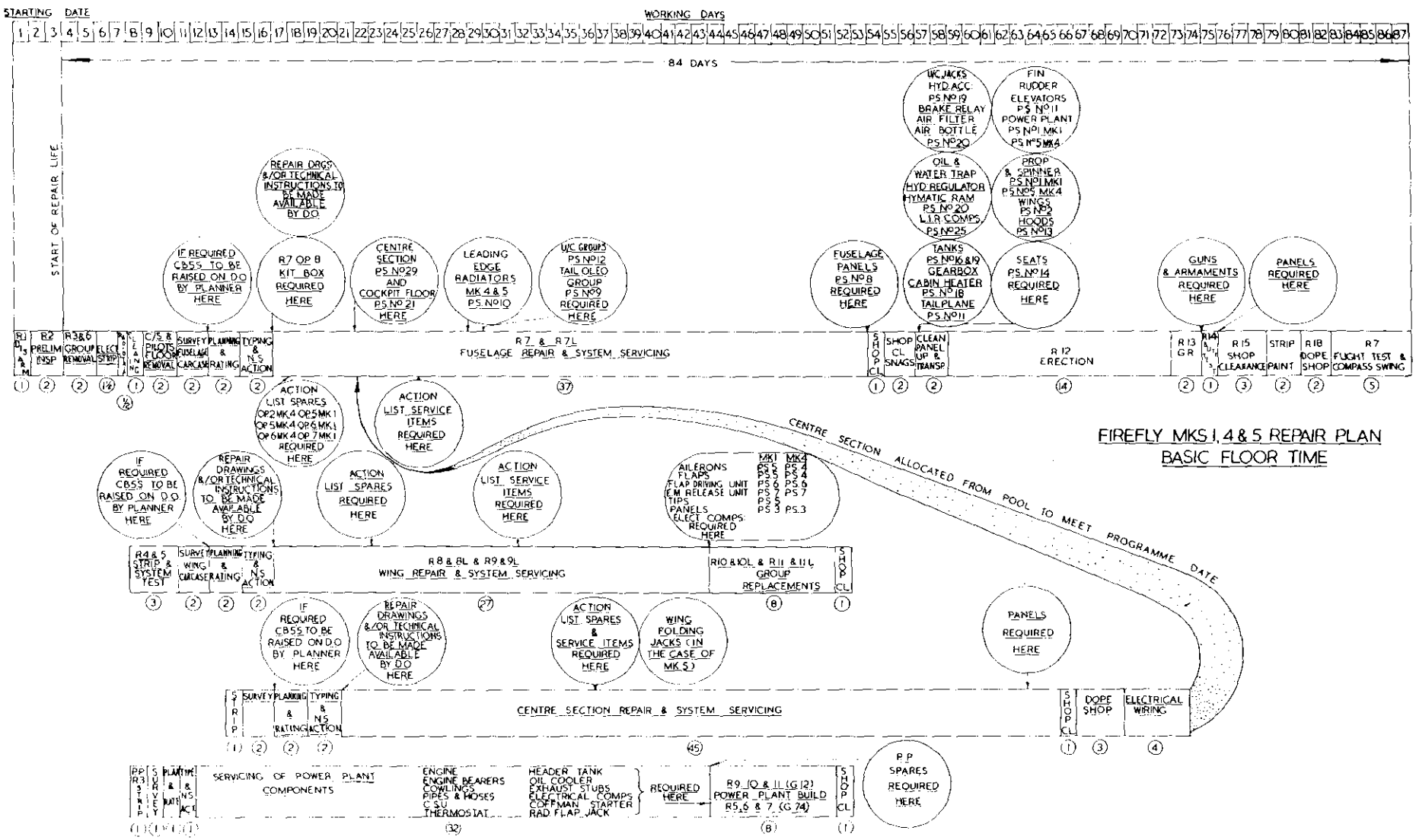
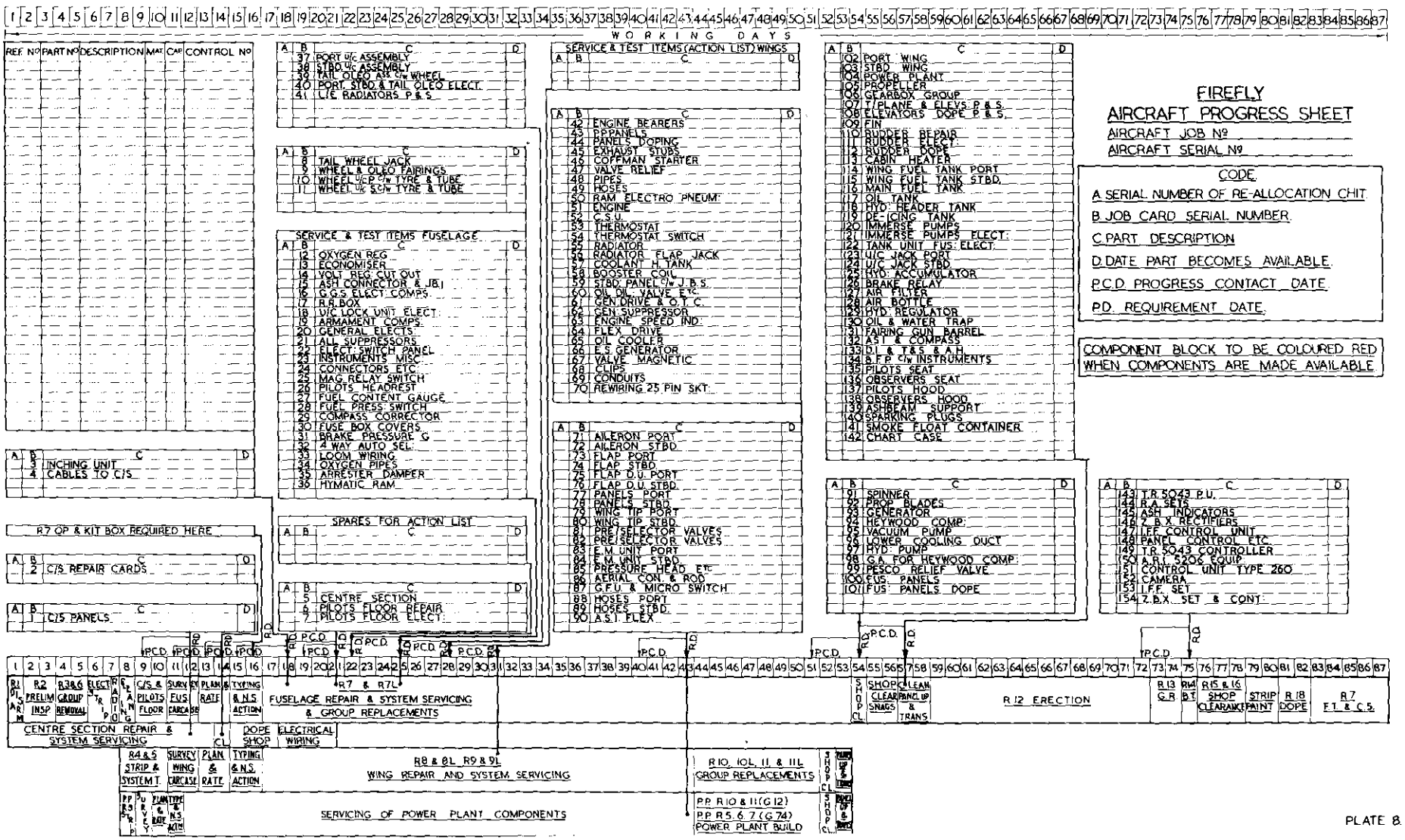
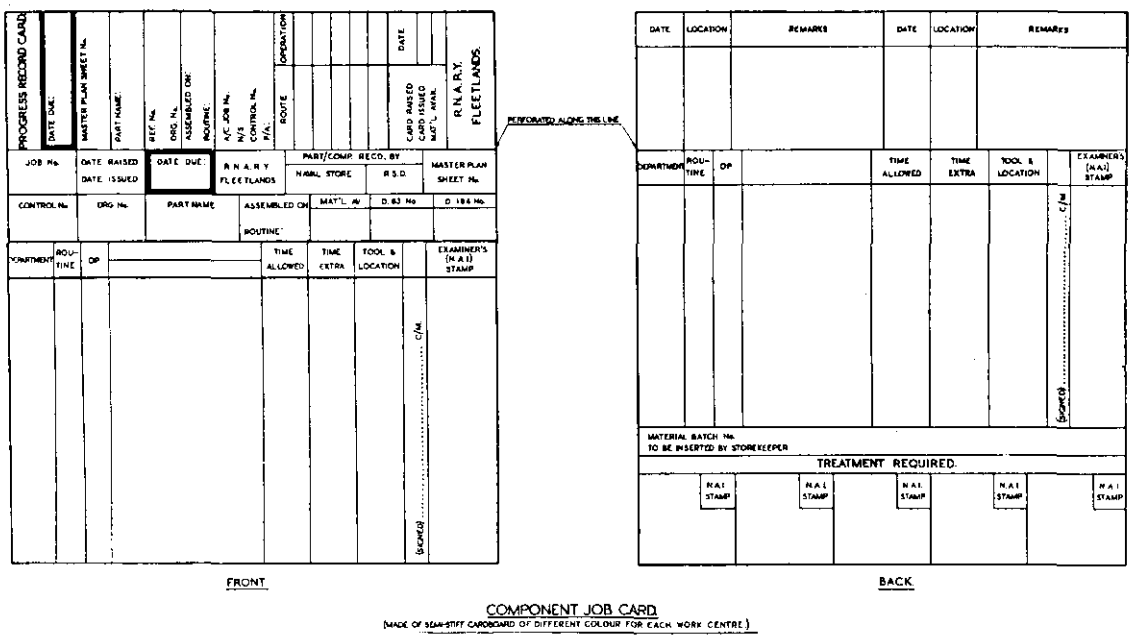

STARTING DATE
WORKING DAYS
84 DAYS
START OF REPAIR LIFE
REPAIR DRGS &/OR TECHNICAL INSTRUCTIONS TO BE MADE AVAILABLE BY D.O
IF REQUIRED CBSS TO BE RAISED ON D.O BY PLANNER HERE
R7 OR 8 KIT BOX REQUIRED HERE
CENTRE SECTION PS.No29 AND COCKPIT FLOOR PS.No21 HERE
LEADING EDGE RADIATORS MK 4 & 5 PS.No10
U/C GROUP 3 PS.No12 TAIL OLEO GROUP PS.No9 REQUIRED HERE
U/C JACKS HYD ACC PS.No19 BRAKE RELAY AIR FILTER AIR BOTTLE PS.No20
FIN RUDDER ELEVATORS PS No11 POWER PLANT PS No1 MK1 PS No5 MK4
OIL & WATER TRAP HYD REGULATOR HYMATIC RAM PS No20 L.I.R COMPS. PS No25
PROP & SPINNER PS No1 MK1 PS No5 MK4 WINGS PS No2 HOODS PS No13
FUSELAGE PANELS PS No8 REQUIRED HERE
TANKS PS No16 & 19 GEARBOX CABIN HEATER PS No18 TAILPLANE PS No11
SEATS PS No14 REQUIRED HERE
GUNS & ARMAMENTS REQUIRED HERE
PANELS REQUIRED HERE
R1 R2 PRELIM INSP R3&6 GROUP REMOVAL ELECT STRIP R4 & 5 STRIP & SYSTEM TEST C/S & PILOTS FLOOR REMOVAL SURVEY FUSELAGE CARCASE PLANNING & RATING TYPING & N.S ACTION
R7 & R7L FUSELAGE REPAIR & SYSTEM SERVICING
SHOP CL SNAGS
CLEAN PANEL UP & TRANSP
R12 ERECTION
R13 GR
R14 & R14L
R15 SHOP CLEARANCE
STRIP PAINT
R18 DOPE SHOP
R7 FLIGHT TEST & COMPASS SWING
ACTION LIST SPARES OP2 MK4 OP5 MK1 OP5 MK4 OP6 MK1 OP6 MK4 OP7 MK1 REQUIRED HERE
ACTION LIST SERVICE ITEMS REQUIRED HERE
CENTRE SECTION ALLOCATED FROM POOL TO MEET PROGRAMME DATE
FIREFLY MKS 1, 4 & 5 REPAIR PLAN
BASIC FLOOR TIME
IF REQUIRED CBSS TO BE RAISED ON D.O BY PLANNER HERE
REPAIR DRAWINGS &/OR TECHNICAL INSTRUCTIONS TO BE MADE AVAILABLE BY D.O HERE
ACTION LIST SPARES REQUIRED HERE
ACTION LIST SERVICE ITEMS REQUIRED HERE
AILERONS MK1 PS 2 PS 5 MK4 PS 4 PS 4
FLAPS PS 5 PS 4
FLAP DRIVING UNIT PS 6 PS 6
E.M RELEASE UNIT PS 7 PS 7
TIPS PS 5
PANELS PS 3 PS 3
ELECT COMPS. REQUIRED HERE
R4 & 5 STRIP & SYSTEM TEST
SURVEY WING CARCASE
PLANNING & RATING
TYPING & N.S ACTION
R8 & 8L & R9 & 9L WING REPAIR & SYSTEM SERVICING
R10 & 10L & R11 & 11L GROUP REPLACEMENTS
SHOP CL
IF REQUIRED CBSS TO BE RAISED ON D.O BY PLANNER HERE
REPAIR DRAWINGS &/OR TECHNICAL INSTRUCTIONS TO BE MADE AVAILABLE BY D.O HERE
ACTION LIST SPARES & SERVICE ITEMS REQUIRED HERE
WING FOLDING JACKS (IN THE CASE OF MK 5)
PANELS REQUIRED HERE
STRIP
SURVEY
PLANNING & RATING
TYPING & N.S ACTION
CENTRE SECTION REPAIR & SYSTEM SERVICING
SHOP CL
DOPE SHOP
ELECTRICAL WIRING
PP R3 STRIP
SURVEY
PLANNING & RATE
TYPING & N.S ACTION
SERVICING OF POWER PLANT COMPONENTS
ENGINE
ENGINE BEARERS
COWLINGS
PIPES & HOSES
C.S.U
THERMOSTAT
HEADER TANK
OIL COOLER
EXHAUST STUBS
ELECTRICAL COMPS
COFFMAN STARTER
RAD FLAP JACK
REQUIRED HERE
R9 (10 & 11 LG 12) POWER PLANT BUILD R5, 6 & 7 (G 74)
SHOP CL
P.P SPARES REQUIRED HERE

PLATE 7


WORKING DAYS
REF Nº PART Nº DESCRIPTION MAT CAT CONTROL Nº
A B C D
3 INCHING UNIT
4 CABLES TO C/S
R7 OP & KIT BOX REQUIRED HERE
2 C/S REPAIR CARDS
1 C/S PANELS
37 PORT U/C ASSEMBLY
38 STBD U/C ASSEMBLY
39 TAIL OLEO ASS'Y C/W WHEEL
40 PORT, STBD & TAIL OLEO ELECT.
41 L/E RADIATORS P & S
8 TAIL WHEEL JACK
9 WHEEL & OLEO FAIRINGS
10 WHEEL U/C P C/W TYRE & TUBE
11 WHEEL U/C S C/W TYRE & TUBE
SERVICE & TEST ITEMS FUSELAGE
12 OXYGEN REG
13 ECONOMISER
14 VOLT REG CUT OUT
15 ASH CONNECTOR & JB1
16 G.G.S. ELECT COMPS
17 R.R. BOX
18 U/C LOCK UNIT ELECT
19 ARMAMENT COMPS.
20 GENERAL ELECTS.
21 ALL SUPPRESSORS
22 ELECT: SWITCH PANEL
23 INSTRUMENTS MISC.
24 CONNECTORS ETC.
25 MAG RELAY SWITCH
26 PILOTS HEADREST
27 FUEL CONTENT GAUGE
28 FUEL PRESS SWITCH
29 COMPASS CORRECTOR
30 FUSE BOX COVERS
31 BRAKE PRESSURE G
32 4 WAY AUTO SEL
33 LOOM WIRING
34 OXYGEN PIPES
35 ARRESTER DAMPER
36 HYMATIC RAM
SPARES FOR ACTION LIST
5 CENTRE SECTION
6 PILOTS FLOOR REPAIR
7 PILOTS FLOOR ELECT
SERVICE & TEST ITEMS (ACTION LIST) WINGS
42 ENGINE BEARERS
43 P.P. PANELS
44 PANELS DOPING
45 EXHAUST STUBS
46 COFFMAN STARTER
47 VALVE RELIEF
48 PIPES
49 HOSES
50 RAM ELECTRO PNEUM:
51 ENGINE
52 C.S.U.
53 THERMOSTAT
54 THERMOSTAT SWITCH
55 RADIATOR
56 RADIATOR FLAP JACK
57 COOLANT H. TANK
58 BOOSTER COIL
59 STBD. PANEL C/W J.B.S.
60 OIL DIL. VALVE ETC.
61 GEN DRIVE & O.T.C.
62 GEN SUPPRESSOR
63 ENGINE SPEED IND.
64 FLEX DRIVE
65 OIL COOLER
66 E.S. GENERATOR
67 VALVE MAGNETIC
68 CLIPS
69 CONDUITS
70 REWIRING 25 PIN SKT.
71 AILERON P.O.A.T.
72 AILERON STBD.
73 FLAP PORT
74 FLAP STBD.
75 FLAP D.U. PORT
76 FLAP D.U. STBD.
77 PANELS PORT
78 PANELS STBD.
79 WING TIP PORT
80 WING TIP STBD.
81 PRE/SELECTOR VALVES
82 PRE/SELECTOR VALVES
83 E.M. UNIT PORT
84 E.M. UNIT STBD.
85 PRESSURE HEAD ETC.
86 AERIAL CON. & ROD
87 G.F.U. & MICRO SWITCH
88 HOSES PORT
89 HOSES STBD.
90 A.S.I. FLEX
102 PORT WING
103 STBD WING
104 POWER PLANT
105 PROPELLER
106 GEARBOX GROUP
107 T/PLANE & ELEVS P & S.
108 ELEVATORS DOPE P & S.
109 FIN
110 RUDDER REPAIR
111 RUDDER ELECT
112 RUDDER DOPE
113 CABIN HEATER
114 WING FUEL TANK PORT
115 WING FUEL TANK STBD.
116 MAIN FUEL TANK
117 OIL TANK
118 HYD. HEADER TANK
119 DE-ICING TANK
120 IMMERSE PUMPS
121 IMMERSE PUMPS ELECT:
122 TANK UNIT FUS: ELECT.
123 U/C JACK PORT
124 U/C JACK STBD.
125 HYD. ACCUMULATOR
126 BRAKE RELAY
127 AIR FILTER
128 AIR BOTTLE
129 HYD. REGULATOR
130 OIL & WATER TRAP
131 FAIRING GUN BARREL
132 A.S.I. & COMPASS
133 D.I. & T&S & A.H.
134 B.F.P. C/W INSTRUMENTS
135 PILOTS SEAT
136 OBSERVERS SEAT
137 PILOTS HOOD
138 OBSERVERS HOOD
139 ASHBEAM SUPPORT
140 SPARKING PLUGS
141 SMOKE FLOAT CONTAINER
142 CHART CASE
91 SPINNER
92 PROP BLADES
93 GENERATOR
94 HEYWOOD COMP:
95 VACUUM PUMP
96 LOWER COOLING DUCT
97 HYD: PUMP
98 G.A. FOR HEYWOOD COMP:
99 PESCO RELIEF VALVE
100 FUS: PANELS
101 FUS: PANELS DOPE
143 T.R. 5043 P.U.
144 R.A. SETS
145 ASH INDICATORS
146 Z.B.X RECTIFIERS
147 I.F.F. CONTROL UNIT
148 PANEL CONTROL ETC
149 T.R. 5043 CONTROLLER
150 A.R.I. 5205 EQUIP
151 CONTROL UNIT TYPE 260
152 CAMERA
153 I.F.F. SET
154 Z.B.X. SET & CONT:
FIREFLY
AIRCRAFT PROGRESS SHEET
AIRCRAFT JOB Nº
AIRCRAFT SERIAL Nº
CODE
A SERIAL NUMBER OF RE-ALLOCATION CHIT
B JOB CARD SERIAL NUMBER
C PART DESCRIPTION
D DATE PART BECOMES AVAILABLE
P.C.D. PROGRESS CONTACT DATE
P.D. REQUIREMENT DATE
COMPONENT BLOCK TO BE COLOURED RED WHEN COMPONENTS ARE MADE AVAILABLE
P.C.D.
P.D.
R.D.
R7 & R7L
FUSELAGE REPAIR & SYSTEM SERVICING & GROUP REPLACEMENTS
R12 ERECTION
CENTRE SECTION REPAIR & SYSTEM SERVICING
DOPE SHOP
ELECTRICAL WIRING
R8 & 8L R9 & 9L
WING REPAIR AND SYSTEM SERVICING
R10 10L 11 & 11L
GROUP REPLACEMENTS
SERVICING OF POWER PLANT COMPONENTS
P.P. R10 & 11 (G12)
P.P. R5.6.7 (G74)
POWER PLANT BUILD
PLATE 8.



COMPONENT JOB CARD
(MADE OF SEMI-STIFF CARDBOARD OF DIFFERENT COLOUR FOR EACH WORK CENTRE)

PLATE 9

Detail Progressing

For the daily use of Planning and Progress in following up additional detail not shown on the Basic Floor Chart, a Progress Chart (Plate 8) is used. Each aircraft has its own Progress Chart.

Each Shop or Section has a different coloured job card for the convenience of reference, a sample of which is shown in Plate 9. The progress tab of the card is removed and kept by the Progress Section for following up and day-to-day reference. This method of progressing is required in addition to Basic Floor and Progress Charts to cover all detail and in connection with the large volume of work carried out over and above that required for Fleetlands aircraft.

GENERAL POINTS OF INTEREST

Premium Bonus

The Rate-fixing Section is a specialist Section ; qualified Rate-fixers fix a time for every job and workmen are in a position to increase their basic pay by bonus. There is no doubt that this incentive greatly accelerates the tempo of the workmen without adversely affecting quality, observing that all jobs are examined and passed by an independent Inspection Department.

The bonus scheme is worked on the Halsey system and so arranged to urge on and encourage the moderate and average worker as well as suitably remunerating the fast worker.

Inspection Department

This department is an Inspectorate and not a Section of the Production Department. It is directly concerned with the aircraft from entry into the Yard to the final examination prior to test flight. The department is responsible for the quality of work throughout to standards laid down by drawings and publications ; its responsibilities also include the correct modification state of the aircraft on completion of repairs.

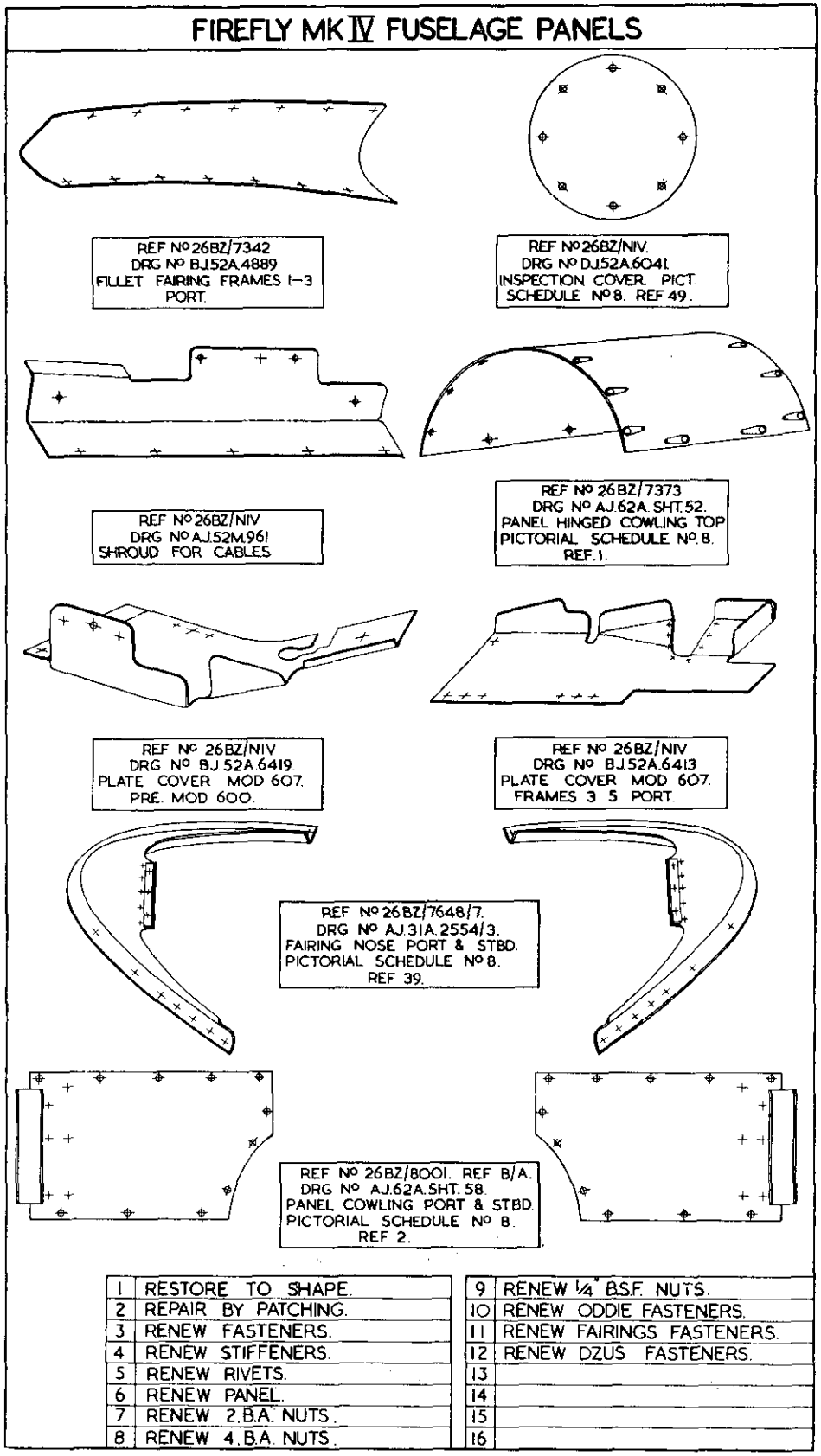


PLATE 10

TYPICAL INSPECTION SURVEY SHEET

CODE NUMBERS ARE INSERTED WHERE REPAIR OR RENEWAL IS REQUIRED

Survey Tempo

It may be gathered from this paper that efficiency of repairs together with economy and turn-round time are the main points aimed for with standard repairs. It might, therefore, be of minor interest to include Plate 10 which is a typical survey sheet planned to improve tempo with notification of defects. Defects are notified by inserting the code number where repairs or renewal is required.

Test Flight

The test flying of Fleetlands aircraft is a function of the establishment and the work of the test pilots is closely allied with the Inspection Department.

Planning and Progress

This Section is the hub of the Production Department ; all work is organised and progressed from here, thereby reducing to its simplest form overall man-loading, economical use of facilities and ready reference to the state of work throughout the Yard.

An idea of the volume of work carried out by this Section may be gathered from some of its functions as under :—

(i) Raise all job cards.
(ii) Plan the break down, reassembly and pictorial schedules for the various types of aircraft.
(iii) Raise Basic Floor and Progress Charts for the different types.
(iv) Plan use of floor space.
(v) Progress all work both from the office and floor angle ; progress chasers are provided for the latter.
(vi) Compile and keep all records in the way of input, output and disposition of the work.

Stores

The set-up includes a Naval Store Department which of a necessity with this type of work is close to Production and, in common with other departments, is very much a member of the team. The liaison is kept constant by internal paper work being made common as far as possible and placing the ready use stores in the workshops under the direct control of the Naval Store Officer. This department has first-hand information of day-to-day expenditure which is invaluable in connection with replenishment of ready use stock without loss of time.

Costing, Expense Accounts

In addition to the normal functions of this department the Expense Accounts Officer, by reason of his intimate dealings with all work, is able to call attention to the economical state or otherwise of any centre of the Yard. This information which as a weekly routine is widely promulgated in tabulated form, shows waiting time of all workshops and individuals and relevant reasons. Besides being extremely valuable in many ways this information provides an infallible check on labour loading in current circumstances and gives great assistance in connection with the economical expenditure on wages.

Materials Laboratory

Although not an integral part of the planned aircraft repair system, the fully equipped and staffed materials laboratory contributes extensively by providing scientific advice and by exercising control of certain chemical and metallurgical

processes in the Yard. It holds a watching brief on new materials likely to be of value in Naval aircraft, and also investigates the causes of material failures in service.

OVERHEADS

With a standard repair scheme, and indeed with any repair scheme, the ideal overhead set-up is one which, consistent with economy, enables the tradesman to spend the maximum time at his trade to the exclusion as far as possible of all extraneous work.

The overheads at Fleetlands in connection with Standard repairs were envisaged and built up with the above principle in view

In present practice, therefore, very close connecting up of all departments is exercised to ensure the absorption of all work extraneous to the various trades. This is achieved in a measure through the medium of the job card. For instance the average number of job cards in use on the workshop floors is approximately 27,000 and each card is concerned with the Planning, Rate-fixing, Production, Stores, Progress, Recording, Inspection and Expense Accounts Departments. This wide range of overheads dealing with a job card is a pointer to considerable overhead expenses, but it is also a pointer to the close knitting together of the various departments and therefore to team work.

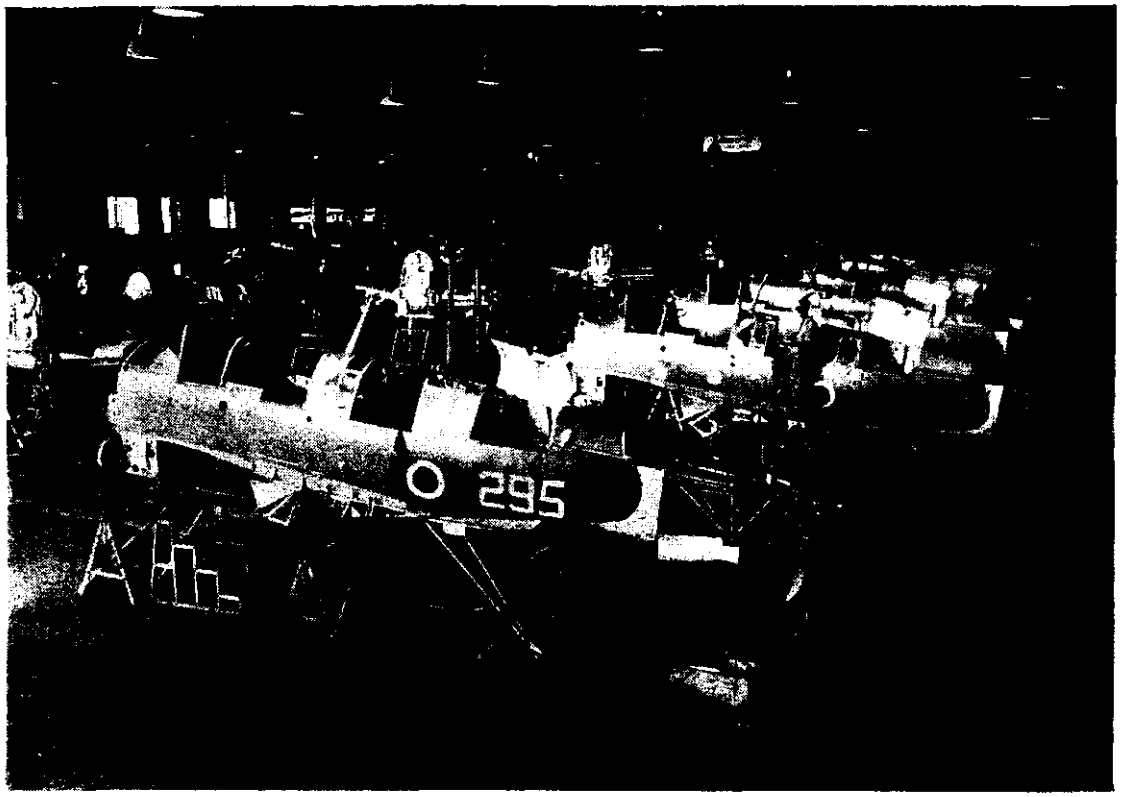
The combined efforts of the Yard's overheads enable the craftsman in the various trades to receive instructions concerning his task, the rated time in connection with bonus, notification of stores, materials and special tools required. It also supplies him with working drawings and easy access to pictorial schedules.

It will be observed, therefore, that the overheads appear adequate as far as eliminating extraneous work is concerned ; the next point of interest is are they economical ? It is an established fact that they are most economical but this could only be demonstrated by the final cost of the task set in comparison with Ministry of Supply contract prices, etc. For the purposes of this paper, Plate 2 supplies the ready answer in kind as far as the old and new schemes practised at Fleetlands are concerned. Furthermore it is a common occurrence for Ministry of Supply Officials to visit Fleetlands when working out contract prices for repair work.

Conclusion

When the compilation of this paper was considered, there appeared to be no satisfactory middle course. The paper had to be short and general or long and detailed, the latter for various reasons was considered impracticable. It is hoped, however, that sufficient information has been laid out to give a general idea of standard repairs to aircraft and some of its outstanding advantages.

A series of photographs, shown on the following pages, helps to give some idea of the shops at Fleetlands and their scope.

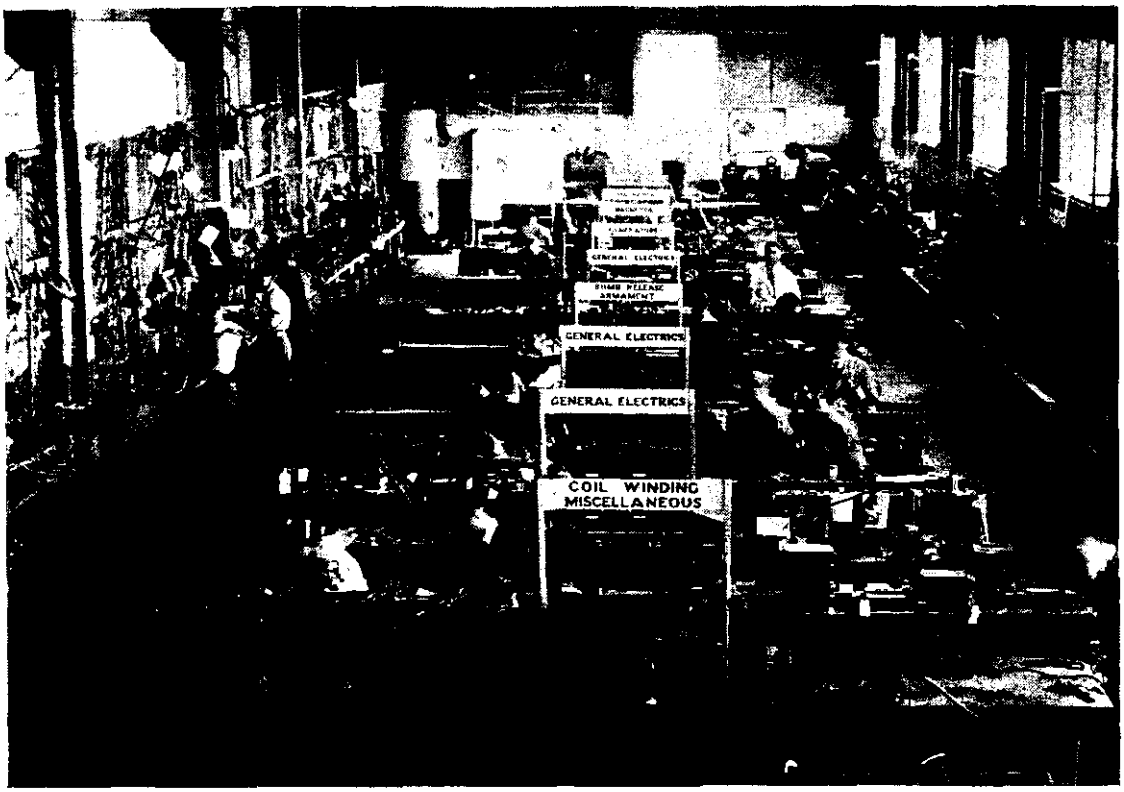


CARCASE OR FUSELAGE REPAIRS—FUSELAGES WITH RECONDITIONED CENTRE SECTIONS FITTED CAN BE SEEN IN THE CENTRE OF THE SHOP

SECTION OF HYDRAULIC SHOP SHOWING RE-CONDITIONED UNDERCARRIAGE PARTS

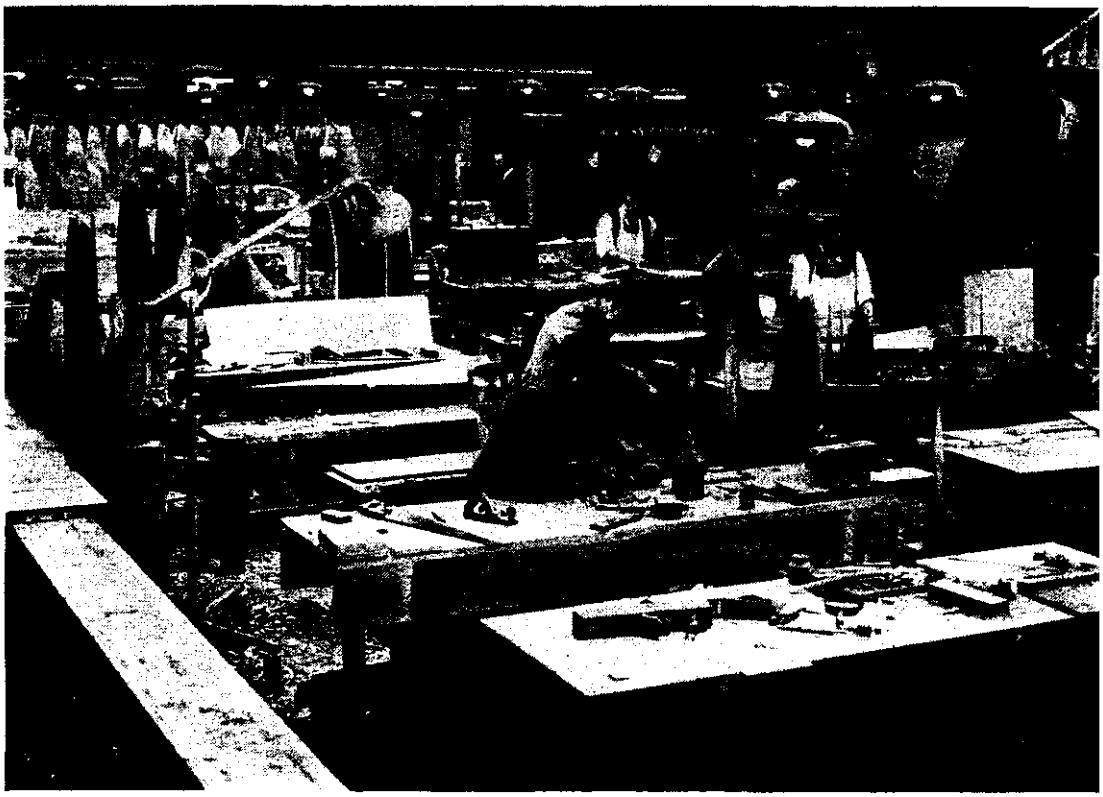
MAIN PLANE REPAIR SHOP

COWLING REPAIR SHOP

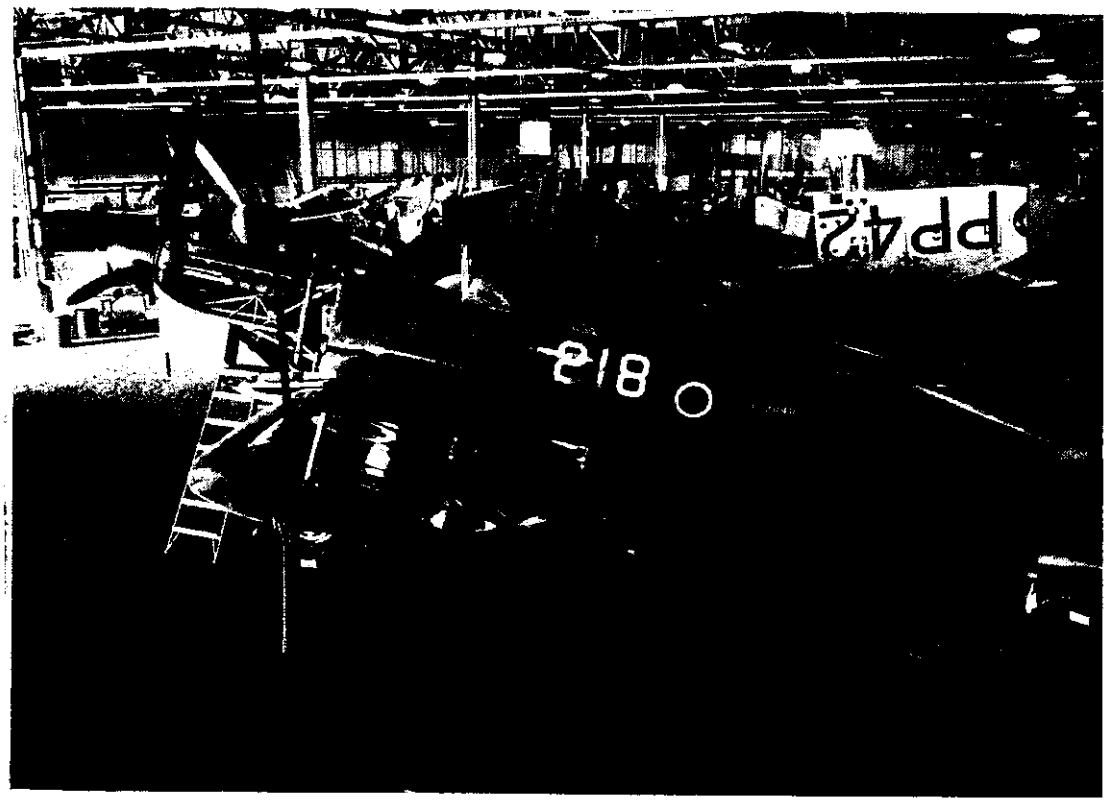


ELECTRICAL REPAIR SHOP

SECTION OF ENGINE REPAIR SHOP



SECTION OF AIRCRAFT JOINERS' SHOP SHOWING PROPELLER BLADES UNDER REPAIR



FIREFLY FINAL ERECTION SHOP

BUTT TEST

RUNNING UP BAY—GROUND RUN TEST AFTER FINAL ERECTION