14388

RESTRICTED

AIR PUBLICATION

4321H, M & P

VOLUME I

AVON

Mk. 10800, 11400 AND 11600 SERIES

ENGINE CHANGE UNITS AND ASSOCIATED JET PIPES

GENERAL AND TECHNICAL INFORMATION

Prepared by direction of
the Minister of Supply

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Promulgated by Order
of the Air Council

M. J. Dean.

AIR MINISTRY

(A.L.14, Nov. 55)

AMENDMENT RECORD SHEET

To record the incorporation of an Amendment List in this publication, sign against the appropriate A.L. No. and insert the date of incorporation.

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(continued overleaf)

NOTE TO READERS

The subject matter of this publication may be affected by Air Ministry Orders, or by " General Orders and Modifications " leaflets in this A.P., in the associated publications listed below, or even in some others. If possible, Amendment Lists are issued to correct this publication accordingly, but it is not always practicable to do so. When an Order or leaflet contradicts any portion of this publication, the Order or leaflet is to be taken as the overriding authority.

The inclusion of references to items of equipment does not constitute authority for demanding the items.

Each leaf bears the date of issue and, when applicable, the number of the Amendment List with which it was issued. New or amended technical information on new leaves which are inserted when this publication is amended will be indicated by triangular marks in the text at the beginning and end of the changed material. The triangles are positioned in the text thus:— ◄.......... ► to show the extent of the amended text and thus:— ►◄ to show where text has been deleted. These triangles merely denote a change and are not a mark of emphasis. When a section or Chapter is issued in a completely revised form, the triangles will not appear.

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LIST OF ASSOCIATED PUBLICATIONS

	A.P.
Electrical equipment (Power services airborne)	*1095C*
Fuel system components for gas turbine aero-engines ...	*4282 Series*
Instrument manual, general instruments	*1275A*
Preservation of Aero-engines, Engine Change Units, Accessories, Propellers and Associated Equipment	*4471A*
Pressure operated control equipment for aircraft	*4303B*
R.A.F. engineering	*1464 Series*
Rotol accessory gearboxes and drives	*2240A*
Starting systems for aero-engines	*1181*
Scales of contents of aero-engine tool kits	*1957*
Also relevant aircraft publications and Pilot's Notes	

LAYOUT OF A.P.4321H & M

AVON Mk. 10800 and 11400 SERIES

ENGINE CHANGE UNITS

VOLUME 1 **Parts 1, 2 and 3**	**General and technical information**
VOLUME 2	**General orders and modifications**
VOLUME 3, Part 1	**Schedule of spare parts**
VOLUME 3, Part 2	*Not applicable*
VOLUME 3, Part 3	*Not applicable—refer to A.P.1957*
VOLUME 3, Part 4	**Schedule of servicing spares**
VOLUME 4	Planned servicing schedules (*application to be decided later*)
VOLUME 5	Basic servicing schedules (*refer to relevant aircraft publication*)
VOLUME 6, Part 1	**Minor repairs**
VOLUME 6, Part 2	**Major repairs**
VOLUME 6, Part 3	**Schedule of fits, clearances and repair tolerances**
VOLUME 6, Part 4	**Reconditioning instructions** (*requirement not yet decided*)

(The publications issued to date are listed in A.P.113)

PREFACE

The Avon series of engine change units described in this publication are completely detachable units and consist of the basic mark of the Avon aero-engine built up to the minimum standard necessary to enable the unit to be installed in or removed from the airframe within the time specified for the aircraft type.

Supplements providing for E.C.U. differences are included when necessary at the end of each chapter. In certain instances, the information given in the supplement is devoted to those items comprising the E.C.U. which are additional to the basic engine, the latter being the subject of the main chapter. In others, particularly in the case of those chapters dealing with any technical procedure which is influenced by aircraft installational differences, that part of the procedure which is peculiar to the installation is given in the supplement, in full, in order that the sequence of operations and continuity of detail may be preserved.

◀Since the issue of this publication the engine of the Mk. 11400 Series E.C.U. has been uprated to a nominal thrust of 7,350 lb. at 7,900 r.p.m. (normal) and 9,950 lb. at 7,900 r.p.m. (re-heat). Those engines that have been so uprated have been re-designated Mk. 11600.

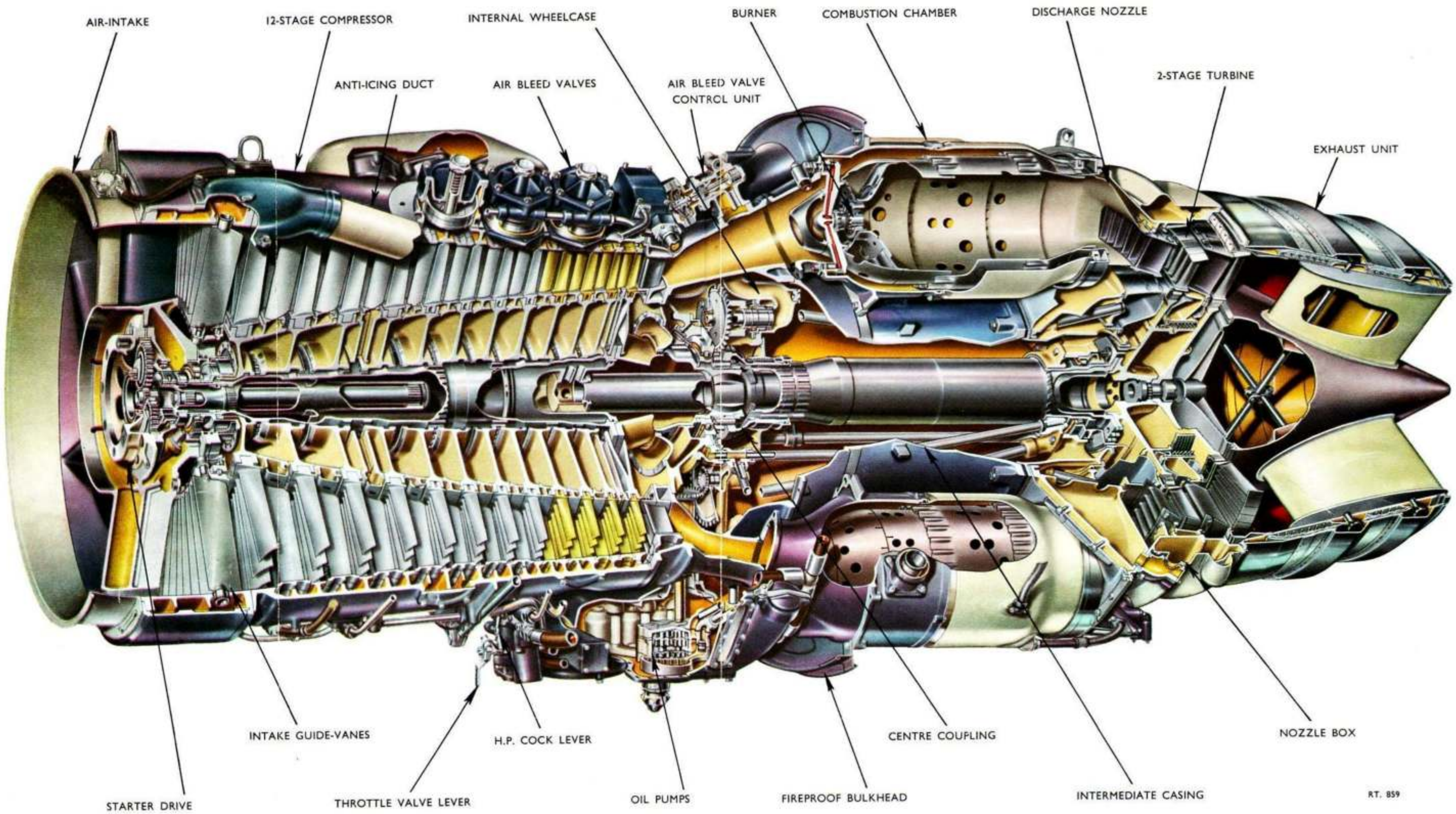
The additional thrust has been obtained by:—

1. Adjustments to the fuel system settings.
2. Increased nozzle guide vane throat area.
3. 30 in. diameter re-heat jet pipe.
4. Minor modifications to improve air-flow.

A top-temperature limiter is also incorporated, and revised Operating Limitations will apply.

References in this publication to the Mk. 11400 are equally applicable to the Mk. 11600 except where stated. The suffix letter P has been added to the publication number in respect of the Mk. 11600 and will be included in the normal course of future amendments.▶

FRONTISPIECE



Frontispiece—Internal Construction

INTRODUCTION

1. The Avon Mk. 10800 and 11400 Series Engine Change Units are complete power units, designed to facilitate rapid replacement and, therefore, turn round of the aircraft with maximum economy in man-hours. Each Mark of Engine Change Unit in these series consists of the basic engine together with a number of additional items. These additional items will vary according to the installational requirements of the aircraft concerned and are listed in the Engine Change Unit specification.

2. The basic engine for each of these Series of E.C.U.'s consists of the following main components:—

(1) A multi-stage, axial flow compressor fitted with an air-bleed system to control air flow and prevent surge within the compressor.

(2) Eight straight-flow combustion chambers to heat and direct the flow of gas.

(3) A nozzle box to direct the flow from the combustion chambers on to the turbine.

(4) A two-stage axial flow turbine which converts part of the gas energy into rotating motion to drive the compressor.

(5) An exhaust unit which directs the gases into a jet pipe and propelling nozzle where the gases are accelerated still further in their passage to atmosphere.

(6) An internal and external wheelcase to house the gears which drive the engine components and remotely-situated accessory gearbox.

3. The engine systems consist of:—

(1) A starting system comprising, a turbo-starter to turn the engine, and high-energy igniter plugs to initiate combustion of the fuel burner spray during the starting cycle.

(2) A high pressure fuel system to deliver the correct quantity of fuel to the burners under all operating conditions.

(3) A self-contained, single-pressure, lubrication system incorporating a fuel-cooled oil cooler.

(4) An internal cooling system using air tapped from the compressor.

(5) An electrically-operated hot air anti-icing system serving the air-intake and intake guide vanes.

(6) A fire extinguishing system consisting of spray pipes fitted around the engine and a fire-proof bulkhead to screen the main fuel system components from the combustion chambers.

(7) A reheat system comprising a burner assembly in the jet pipe, a reheat control unit, and a turbo-driven high pressure fuel pump together with an arrangement of moveable 'eye-lids' to vary the jet pipe nozzle area.

Compressor

4. The rotating assembly of the axial-flow compressor is formed by a hollow cone-shaped shaft splined to receive steel rings to which are pinned twelve rows of matched and graded rotor blades. The stator assembly consists of an initial row of variable-pitch inlet guide-vanes carried in the intake casing, followed by eleven rows of stator blades secured radially in a two-piece outer casing. A row of outlet guide-vanes is provided at the compressor exit.

5. The compressor shaft is flexibly coupled to the turbine shaft and the complete rotating assembly is supported in roller bearings at the front and rear ends and by a ball thrust bearing at the centre. A toothed dog at the forward end of the shaft transmits the torque derived from the turbo-starter when turning the engine for starting.

6. Labyrinth seals are fitted at the front end of the compressor shaft to control the flow of cooling air to the front bearing and at the rear end to restrict the air leakage from the last stage of the compressor into the hub area, which is vented to atmosphere. By these means the forward thrust caused by delivery pressure on the rear of the compressor and consequently the loading in the centre bearing is reduced.

7. Control of the air flow through the compressor is effected by an air bleed control unit, operated by seventh and twelfth-stage air pressure, which actuates air bleed valves to minimize compressor surge at low engine speeds. The variable-pitch inlet guide-vanes (*para.* 4) which assist airflow by imparting the necessary swirl to the incoming air, are controlled by a ram, operated hydraulically by fuel from an engine-driven governor pump.

8. Provision is made to supply air from the compressor to the cabin pressurizing system of the aircraft and also for gun heating, windscreen demisting and airframe anti-icing. A two-way pressure tapping is also provided to operate the air-driven L.P. fuel tank pumps and to pressurize the fuel tanks.

Wheelcases

9. A single gear mounted on the rear of the compressor shaft transmits the drive to four spur gears housed in an internal wheelcase behind the compressor. The top spur gear incorporates a centrifugal breather and the others drive the triple oil pumps, an accessory gearbox drive-shaft and the gears of the external wheelcase.

10. The external wheelcase is secured to the wall of the internal wheelcase and houses the gears for the fuel pump, tachometer generator, governor pump for the intake guide-vane ram and an alternative drive-shaft for a remote accessory gearbox.

Fuel system

11. Fuel from the aircraft supply is delivered at low pressure through a felt filter, situated on the underside of the engine, to the engine driven H.P. fuel pump. The high pressure pump output is fed through a fuel-cooled oil cooler to the throttle valve, pressurizing valve and so to the burner manifolds feeding the burners in the combustion chambers.

12. To satisfy fuel flow requirements, the engine is fitted with a twin pump which comprises two complete pumping mechanisms sharing a common housing. The pumping mechanisms are of positive displacement, multi-plunger type and the pump stroke is controlled by means of a variable-position cam plate. A servo system controls output to suit specific running conditions and a single diaphragm-operated governor limits the overspeed. Provision is made for external adjustment of the governor.

13. Fuel flow is controlled by a main control unit, an acceleration control unit and metering valves. The fuel control unit comprises:—

(1) A manually-operated throttle valve to meter fuel to the burners.

(2) A fuel-operated pressurizing valve to proportion fuel flow between the primary and main burners in accordance with engine requirements.

(3) A barometric pressure control which varies pump output in relation to throttle position and barometric pressure.

(4) A manually-operated high pressure shut-off cock.

14. A reheat control unit delivers high pressure fuel from the H.P. pump to the reheat pilot burner when reheat conditions are selected. The fuel supply for the main reheat burners, which is taken direct from the low pressure supply from the aircraft tanks, is boosted to high pressure by a special air-driven turbo-pump.

15. The acceleration control unit operates in conjunction with the metering valves and is fitted to prevent an excess supply of fuel during periods of rapid acceleration which would cause excessive jet pipe temperature, surge, or flame extinction. It operates by utilising the pressure difference across the metering valves to measure and subsequently restrict the fuel flow to match the specific compressor delivery pressure during the acceleration phase. An evacuated capsule in an atmospheric chamber ensures sensitive operation at all altitudes.

16. The throttle valve is a rack and pinion operated plunger which controls engine speed by metering fuel to the burners via the pressurizing valve. Full range of plunger travel is set by adjustable stops, the minimum stop being used in conjunction with a fuel by-pass to adjust the idling speed and synchronise throttle settings on multi-engined aircraft.

17. A solenoid-operated isolating valve is provided as a safety device to ensure that fuel delivery equal to the maximum output of at least one unit of the dual pump is available in the event of a fault developing in the fuel pumps or within the servo system.

18. A drain system is fitted to prevent accumulation of fuel in the combustion chambers and jet pipe when the engine is shut down and so prevent 'torching' from the jet pipe when restarting the engine.

Oil system

19. The self-contained oil system uses a special oil circulated by a single pressure pump and two scavenge pumps, driven by a common shaft from the internal wheelcase and mounted in a reservoir-type sump situated beneath the wheelcase. Each pump is provided with inlet filters and the pressure pump with a pressure filter.

20. Oil is drawn from the sump by the pressure pump and passed through a fuel-cooled oil cooler to the pressure filter, after which it is distributed throughout the engine by pipes and drillings in the casings. A relief valve fitted in the delivery line from the high pressure filter regulates the oil pressure and spills excess oil to the sump and a pressure-operated by-pass valve protects the oil cooler against excessive pressures.

21. Lubrication of the compressor and turbine shaft bearings and the gears in both wheelcases is by pressure oil directed by metering jets fitted with fine mesh filters. The ball and roller bearings in the wheelcases are lubricated by splash oil from the gears; the plain bearings of the triple-pump drive and the tachometer drive are pressure fed. Leakage of oil past the main bearings is prevented by labyrinth seals pressurized by third stage air from the compressor.

22. Scavenge oil from the front and rear bearings is returned to the sump through the scavenge pumps and a de-aerator funnel. Surplus oil from the centre bearing and internal wheelcase gravitates to the sump through the oil pump drive shaft shroud and oil from the external wheelcase returns through a pipe from the base of the wheelcase. The sump is vented to atmosphere through the internal and external wheelcases and a centrifugal breather at the top of the engine. The centrifugal breather separates the outgoing air from the oil and allows the oil to return to the sump.

23. Provision for transmitting the oil pressure reading to an instrument in the aircraft cockpit is made by a tapping in the high pressure line before the relief valve; the oil operates an electrical oil pressure transmitter mounted on the port lower side of the wheelcase.

Reheat system

24. The reheat system embraces a special jet pipe containing a burner assembly to increase the temperature of the exhaust gases, and a nozzle section fitted with moveable two-position eyelids to suit the gas flow characteristics with and without reheat. The system also incorporates an engine-mounted reheat control unit and a turbo-driven high pressure fuel pump. Initial operation of the reheat cycle is performed electrically when the pilot selects reheat conditions.

25. The reheat control unit regulates a supply of fuel from the engine high pressure fuel pumps to the reheat pilot burners and also operates an air throttle which governs the supply of air to the air-driven turbo fuel pump. The turbo-pump draws fuel from the low pressure supply and converts it into a very high pressure feed to the main burners. A high-tension igniter plug is also fitted to initiate reheat combustion.

26. The nozzle section of the jet pipe carries the ' eyelids,' which are opened when reheat is selected and closed when reheat is cancelled, by the action of pneumatic rams actuated by compressor outlet air pressure.

Combustion chambers

27. The combustion chambers are designed to ensure stable burning of the fuel-air mixture and facilitate the rapid expansion of the gases rearwards. Each combustion chamber consists of an expansion chamber and outer casing, inside which a flame tube is centrally mounted. The flame tube is separated from the outer casing by an annular air space. To ensure even pressure distribution and allow the flame to spread during starting, the flame tube and air casings of adjacent combustion chambers are interconnected.

28. Air entering the combustion chambers is used to combine with the fuel to promote efficient combustion and also to cool the flame tubes and outer air casings. The apportioning of air between the flame tubes and the annular spaces is accomplished by perforations and flutes in the flame tube walls. The air flowing in the annular spaces is progressively admitted into the flame tubes to mix with the burning gases and cool them to a temperature acceptable at the turbine inlet.

29. A tripod type Duple burner feed ring is provided in each expansion chamber, the burner head projecting into the snout of the flame tube.

Internal cooling

30. Internal cooling of the main bearings, turbine and nozzle box is by air bled from various stages of the compressor and directed throughout the engine by pipes, ducts and transfer holes. The flow between static and rotating components is controlled by labyrinth seals.

31. The three main bearings are cooled by third stage air which is led through the hollow compressor shaft to a labyrinth seal at the front bearing and also rearwards through transfer holes in the hollow shaft to the centre bearing, intermediate casing and rear bearing. Outlets for the rear bearing cooling air are provided through the nozzle box to atmosphere and air from the front bearing escapes into the compressor inlet.

32. The turbine discs are cooled by air tapped from the compressor eleventh stage and restricted twelfth stage air. The twelfth stage air is directed from an annular space around the compressor outlet casing through internal transfer pipes to the front face of the first-stage turbine disc. The eleventh stage air passes through the hollow turbine shaft to cool the space between both turbine discs and the rear face of the second-stage turbine disc. After cooling the discs, the air joins the main gas stream through the roots of the turbine blades. The labyrinth seals between the rotating and static parts of the turbine, and the higher pressure of the cooling air, prevent reverse flow of gas from the main stream.

Starting

33. Starting is effected by a cartridge-operated turbo-starter, which accelerates the engine until it becomes self-sustaining, together with a high-energy igniter system to ignite the fuel injected into the combustion chambers by the burners. The period and sequence of the starting cycle is controlled by a time switch in the aircraft starter panel.

34. The turbo-starter is actuated by an electrically ignited cartridge containing a slow-burning charge, the gases from which impinge on the turbine blades of the starter to produce a very high torque. This torque is transmitted through reduction gearing and dogs to a spring drive assembly connected to the compressor shaft. An engagement and disengagement mechanism is incorporated.

35. The high-energy igniter system comprises dual high energy units energizing two sparking plugs which are located in two separate combustion chambers. A booster coil in each igniter unit transforms the normal aircraft electrical supply to a higher voltage which passes through a rectifier to a storage condenser. When the potential across the condenser reaches a predetermined value the stored energy is discharged by a flashover at the sparking plugs.

36. When ' light up ' occurs, the flame spreads rapidly to all combustion chambers through the balance pipes (*para.* 27) and sufficient energy is produced to drive the turbine and thus induce self-sustaining speed. At this stage the time switch (*para.* 33) cuts out the igniter system.

37. Starting the engine in flight is accomplished by a relight switch in the aircraft electrical system which operates the igniters. Operation of the turbo-starter for this purpose is unnecessary since the compressor continues to rotate due to the forward speed of the aircraft.

Anti-icing

38. Ice formation in the air-intake, which would adversely affect engine performance, is prevented by an anti-icing system which is brought into operation by a switch in the pilot's cockpit. The system is fed by hot air from the compressor twelfth stage via an electrically operated gate valve. A feed pipe from the gate valve carries the hot air to a manifold surrounding the front bearing housing from which it passes down the hollow intake support struts and guide-vanes before escaping to the main air stream passing through the engine.

Fire extinguisher

39. To combat fire, should it occur, the engine is fitted with interconnected spray rings, one around the rear end of the compressor casing and the other around the nozzle box; these are connected to bottles of fire extinguisher fluid in the aircraft.

Installation and handling

40. Provision for mounting the engine in the aircraft is by trunnion mountings on each side of the nozzle box and a flexible framework with vibration-insulated eye-fittings at the front end. To facilitate interchangeability in multi-engined aircraft the accessory gearbox drive, the fuel inlet, and the fire extinguisher connections are duplicated, and the throttle valve and H.P. cock levers can be moved on their hubs to accommodate the aircraft linkwork.

41. Slinging eyes are provided for lifting the engine, one on top of the front end of the compressor casing and two fitted to brackets on the nozzle box flange.

This leaf issued with A.L. No. 1, August, 1953

LEADING PARTICULARS

NAME	AVON Mk. 10800 and 11400
TYPE OF ENGINE	STRAIGHT-FLOW, TURBO-JET
ARRANGEMENT ...	TWELVE-STAGE, AXIAL-FLOW COMPRESSOR DRIVEN BY TWO-STAGE AXIAL-FLOW TURBINE
NOMINAL THRUST (NON-REHEAT)	MR. 10800 7,150 lb. (STATIC SEA LEVEL)
NOMINAL THRUST (REHEAT)	MR. 10800 9,450 lb. (STATIC SEA LEVEL)
NOMINAL THRUST (NON-REHEAT) / NOMINAL THRUST (REHEAT)	MR. 11400 ... *(To be issued later)*
DIRECTION OF ROTATION ...	ANTI-CLOCKWISE AS VIEWED FROM REAR OF ENGINE

HANDLING DATA

Maximum diameter ...	*42·4 in. across the trunnions.*
Overall length ...	*9 ft. approx. (less jet pipe).*
Weight of engine (dry) ...	*2,439 lb. approx. (less jet pipe and nozzle).*
Centre of gravity ...	*Approx. 2 ft. forward of the mounting trunnions.*

COMPRESSOR

Type ... ... *Twelve-stage axial flow incorporating automatic bleeds and progressively-variable intake swirl vanes.*

Number of blades

Stage	1	2	3	4	5	6	7	8	9	10	11	12
Rotor	43	67	73	91	89	89	89	89	97	97	97	97
Stator	73	83	97	113	103	103	103	109	137	137	137	80

COMBUSTION SYSTEM

Type ...	*Interconnected, straight-flow.*
Number of chambers ...	*Eight.*
Numbering ...	*Anti-clockwise viewed from the turbine end, No. 1 and 8 at the top.*

TURBINE

Type ... ... *Two-stage, axial flow*

Number of blades

Stage	1	2
Rotor	103	71
Stator	73	67

FUEL SYSTEM

Fuel ...	*Aviation turbine fuel to Specification D.Eng. R.D.2482, AVTUR or D.Eng. R.D. 2486, AVTAG.*
Fuel pump ...	*Twin D type, multi-plunger, variable stroke.*
Fuel control unit ...	*Combined B.P.C., H.P. cock, throttle valve, pressurizing valve and L.P. filter.*
Burners ...	*Twin-orifice, emitting co-axial atomized sprays.*
Acceleration control unit (A.C.U.) ...	*Altitude-sensitive unit, controlling fuel flow increase during engine acceleration.*
Reheat control unit ...	*Controls the supply of air from the compressor to the reheat, air driven, high pressure, turbo-fuel pump.*

APPROXIMATE FUEL CONSUMPTION

(Static sea level)

Condition	Consumption gall. per hr. Mk. 10800	Mk. 11400
Idling	112	To be issued later
Max. Continuous	681	
Take-off (non-reheat)	865	
Take-off (reheat)	2215	

OIL SYSTEM

Type ... ... *Self-contained, wet-sump with continuous circulation by one pressure and two scavenge pumps.*

Circulation *Tank—pressure pump—oil cooler—pressure filter—bearings and gears—scavenge pumps or gravity drain—tank.*

Sump capacity ... ... *17 pints approx.*

Consumption ... ... *1·5 pints per hr. max.*

Pressure / *Temperature* } ... ...*See Operating Limitations.*

Oil ... ... *Specification D.Eng. R.D.2487, OX-38, (Stores Ref. 34A/266).*

COOLING SYSTEM

Type ... ... *Pressure-air to main bearings and turbine*

Low pressure ... ... *Tapped from compressor third stage to bearings.*

Intermediate pressure ... ... *Tapped from eleventh stage to low pressure turbine.*

High pressure ... ... *Tapped from twelfth stage to high pressure turbine.*

L.P. cooling air outlet temperature ... ... *Up to 275 deg. C*

STARTING SYSTEM

Type ... ...*Turbo-starting with centrifugal disengaging mechanism and high-energy ignition under automatic time control.*

Starter ... ... *Triple-breech turbo-starter.*

Safety device ... ... *Pressure relief valve in each breech of starter.*

Cartridge ... ... *Cordite, 720 grammes, type No. 10, Mk. I.*

High-energy igniters ... ... *Sparking plug directly igniting main fuel spray at the burners in No. 3 and No. 6 combustion chambers.*

ANTI-ICING SYSTEM

Type ... ... *Hot air from the compressor twelfth stage via electrically-operated gate valve with provision for automatic operation.*

Gate valve ... ... *Operated by electric actuator through rack and pinion gear.*

Inching control unit *Thermal switch and electrical relay controlling gate valve position consistent with intake temperature.*

FIRE EXTINGUISHER SYSTEM

Spray rings ... ... *Dual, interconnected, covering both the fuel and oil system and the nozzle box zone.*

JET PIPE
(including transition section)

Length (Mk. 10800) / *(Mk. 11400)* } (" *eyelids* " *in closed position*).... ... ... *161 in.*

Weight (Mk. 10800) / *(Mk. 11400)* } ... ... *474lb.*

Variable nozzle ... ... *Two position,* " *eyelids* " *operated by pneumatic rams controlled by an electro-pneumatic valve.*

LEADING PARTICULARS—(*contd.*)

COMPONENT TYPE NUMBERS

Unit	Manufacturer	Type Numbers	
		Mk. 10800	Mk. 11400
Fuel pump	Lucas	GTD5/1A	GTD5/1A
Fuel control unit	Rolls-Royce	BA.35155	BA.35155
Acceleration control unit	Rolls-Royce	BA.44900	BA.44900
Fuel pressure warning indicator	Smiths	Mk. 1E with Mod. 1	Mk. 1E with Mod. 1
Burners (Duple)	Rolls-Royce	BA.33781	BA.33781
High energy igniter plug centre	Lodge } Interchangeable	LR.102/1	LR.102/1
	K.L.G.	KR.102	KR.102
High energy igniter screen tube	Lodge } Interchangeable	LP.1128	LP.1128
	K.L.G.	BK.907	BK.907
High energy igniter unit	Lodge } Interchangeable	CIOTS/2	CIOTS/2
	K.L.G.	NB.25/1	NB.25/1
Turbo-starter	Rolls-Royce	TBS.720 Mk. 1	TBS.720 Mk. 1
Oil pressure transmitter	Smiths	482/PG/SB	482/PG/EB
Tachometer generator	Smiths	106RU/SB	106RU/SB
P.V. Intake guide-vane ram	Rolls-Royce	BA.37139	BA.37139
Intake guide-vane governor pump	Rolls-Royce	BA.38749	BA.38749
Intake guide-vane re-setting unit	Rolls-Royce	BA.50961	BA.50961
Air bleed control unit	Rolls-Royce	BA.33791	BA.33791
Anti-icing gate valve	Teddington	FKH/A/1	FKH/A/1
Anti-icing inching control unit	Teddington	FDF/A/4020	FDF/A/4020
Auxiliary gearbox drive	Rolls-Royce	BA.41932	BA.41932
Reheat components			
Reheat fuel control unit	Rolls-Royce	BA.41949	BA.41949
Reheat fuel turbo-pump	Lucas	R.H. Mk. 1	R.H. Mk. 1
Reheat jet pipe	Rolls-Royce	BA.50152	B.A.50152
Temperature control amplifier	Smiths	E.C.2	E.C.2
	Ultra	A.134	A.134

OPERATING LIMITATIONS

AVON Mk. 10801

Condition	Maximum R.P.M.	Maximum J.P.T. deg. C.	Time Limit
GROUND IDLING	**2,750 ± 100**	**530**	Unrestricted
TAKE-OFF AND OPERATIONAL NECESSITY — **Re-heat ON** / **Re-heat OFF**	***7,950 ± 25**	**680**	10 minutes (combined total)
INTERMEDIATE (MAXIMUM)	**7,750**	**625**	30 minutes
CONTINUOUS (MAXIMUM)	**7,500**	**585**	Unrestricted
APPROACH	**4,500**	**480**	Unrestricted

Oil pressure

Normal (at 7,500 r.p.m.) ... ... 20 lb. per sq. in.

Minimum (at 7,500 r.p.m.) ... 15 lb. per sq. in.

*The engine is governed at 7,950, r.p.m. at which speed maximum thrust is obtained. At low air temperatures the engine may underspeed to as low as 7,800 r.p.m. at full throttle whilst still maintaining maximum thrust.

OPERATING LIMITATIONS

AVON Mk. 11401

Condition	Maximum R.P.M.	Maximum J.P.T. deg. C.	Time Limit
GROUND IDLING	**2,750 ± 100**	**550**	Unrestricted
TAKE-OFF AND OPERATIONAL NECESSITY (Re-heat ON / Re-heat OFF)	***7,900 ± 50**	**700**	10 minutes (combined total)
INTERMEDIATE	**7,800**	**685**	30 minutes
CONTINUOUS (MAXIMUM)	**7,550**	**645**	Unrestricted
APPROACH	**4,500**	**500**	Unrestricted

Oil pressure

Normal (at 7,550 r.p.m.) ... ... 20 lb. per sq. in.

Minimum (at 7,550 r.p.m.) ... ... 15 lb. per sq. in.

*The engine is governed at 7,900 r.p.m. at which speed maximum thrust is obtained. At low air temperatures the engine may underspeed to as low as 7,750 r.p.m. at full throttle whilst still maintaining maximum thrust.

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