BULLDOG SERIES 100

OWNER'S HANDBOOK

INCORPORATING

APPROVED FLIGHT MANUAL DOC. No. SH.3.1

Amendment No. 10
Issued October 2003

SCOTTISH AVIATION

BULLDOG SERIES 100

OWNER'S HANDBOOK

This handbook incorporates the ARB-approved Flight Manual, Document No. SH.3.1, and complies with British Civil Airworthiness Requirements, Section A, General Information and Procedure, Chapter A6-7, Crew Manuals. The technical content has been verified and is certified as correct.

Signed W. Gordon Watson .

Date 15 June 71

ARB Approval No. AD/1051/44

SE-LLM

Per-Olov Brink
Luftfartsingenjör
LUFTFARTSVERKET

This aircraft manual is a copy of the original C.A.A. Approved aircraft Flight Manual document SH.3.1. This A.F.M. has been retyped to improve print quality.

There has been no technical content change during this retype.

Signed .....

Date .....7 November 2000.....

SECTION 0
General

CONTENTS

SECTION 0

INTRODUCTION

GENERAL

This Owner's Handbook contains all the instructions and information necessary for the safe operation of the Scottish Aviation Bulldog Series 100. It is divided into two parts; a Flight Manual and an Operating Manual, originally prepared and published by the constructor, Scottish Aviation Ltd., Prestwick, Ayrshire, now maintained by the Type Design Organisation, de Havilland Support Ltd, Duxford.

The Flight Manual comprises Sections 1 to 6 of this handbook and contains limitations, recommended procedures and information of a nature such that adherence to it will enable the level of safety which is intended by the Airworthiness Requirements and the operating regulations to be regularly achieved. It forms part of the Certificate of Airworthiness for the aeroplane and is approved by the United Kingdom Civil Aviation Authority in accordance with British Civil Airworthiness Requirements, Section K, Light Aeroplanes.

The Operating Manual contains additional instructions and information not required for inclusion in the Flight Manual and is published under the authority of the Design Approval held by the Type Design Organisation.

A table of the contents of this handbook is given on Page 0-3. The layout adopted groups together all sections forming the Flight Manual. It is the responsibility of the pilot to be familiar with the contents of this handbook including all amendments and any relevant supplements.

AMENDMENTS

The current amendment state of this copy is given on the record sheet on Page 1-4, 1-5 or 1-6. A marginal line will indicate the position of the most recent amendment to the text on a page, with the amendment number being shown at the foot of that page.

Amendments are published by the Type Design Organisation. Amendments to the Flight Manual were approved by the United Kingdom Air Registration Board prior to 1 Apr 72 and the United Kingdom Civil Aviation Authority after that date; the date of approval is shown on each page. Amendments to the Operating Manual are not required to be approved by the Civil Aviation Authority; the date of issue is shown on each page.

SUPPLEMENTS

A list of the approved supplements which have been embodied in Section 6 of this copy is recorded on Page 6-2.

Supplements are published either by the constructor or by an organisation producing a modification to the aircraft and approved by the United Kingdom Civil Aviation Authority or the appropriate foreign authority.

UNITS

The following units of measurement are used throughout this handbook.

PRIMARY UNITS

Units used on graphs and in the text are as follows:

Quantity		Unit	
		Name	Symbol
Distance: horizontal - large		nautical mile	n mile
	small	metre	m
vertical		foot	ft
Linear dimension		inch	in
		foot	ft
		metre	m
Speed: horizontal		knot	kn
vertical		foot per minute	ft/min
Gradient		percent	%
Temperature		degree Celsius	°C
Weight		kilogramme	kg
Moment		kilogramme metre	kg m
Pressure		pound per square inch	lb/in^2
		inch mercury	in Hg
Liquid quantity		UK gallon	UKgal
Liquid flow		UK gallon per hour	UKgal/h

NOTES: (1) The standard unit symbol kn is used in this handbook for knot. Relevant instruments and placards in the aeroplane may however be marked with the common-usage unit symbol kt.

(2) The UK gallon with symbol UKgal is used in this handbook as the primary unit for liquid quantity and is the unit approved by the British Standards Institution which replaces (and is equal to) the Imperial Gallon with symbol Imp gal. Relevant instruments and labels in the aeroplane may however be marked with the unit symbol Imp gal.

SECONDARY UNITS

Text

Units used in parenthesis in the text as conversions to primary units are as follows:

Quantity	Unit	
	Name	Symbol
Distance (vertical)	metre	m
Linear dimension	millimetre	mm
Speed (horizontal)	kilometre per hour	km/h
Weight	pound	lb
Pressure	kilogramme per square centimetre	kg/cm^2
Liquid quantity	US gallon litre	USgal l

Unit Conversion

Graphs to enable conversion between primary units and other commonly used units are given in Section 1.

SECTION 1
Leading Particulars

DOCUMENT NO. SH.3.1

APPROVED
FLIGHT MANUAL
FOR THE
BULLDOG
SERIES 100

Nationality and Registration Marks	:	
Constructor's Serial Number	:	BH.100/
Designed and Constructed by	:	Scottish Aviation Ltd., Prestwick Airport, Ayrshire.

This is the Flight Manual referred to in the Certificate of Airworthiness number issued on and was approved by the Air Registration Board on 15 June 71.

This aeroplane shall be operated in accordance with the limitations given in Section 2 and any additional limitations in the Supplements contained in Section 6.

DOCUMENT NO. SH.3.1

SECTION 1

GENERAL

DOCUMENT REFERENCE NUMBER

The document reference number of this Flight Manual is SH.3.1.

APPLICATION

Amend No 2 | This Flight Manual applies only to the aeroplane having the Constructor's Serial Number specified on Page 1-1. It is the responsibility of the pilot to be familiar with the contents of this manual including all amendments and any relevant supplements.

AMENDMENTS

The amendment system is explained on Page 0-5. The current amendment state of this copy is given on the record sheet on Page 1-4, 1-5 or 1-6.

SUPPLEMENTS

The supplement system is explained on Page 0-5. A list of approved supplements which have been embodied in Section 6 of this copy is recorded on Page 6-2.

GENERAL ARRANGEMENT AND PRINCIPAL DIMENSIONS

The general arrangement and principal dimensions of the aeroplane are given in Figure 1-1 on page 1-7.

DETERMINATION OF TEMPERATURE IN RELATION TO ISA

A graph to enable temperature to be determined in relation to ISA is given in Figure 1-2 on Page 1-8.

UNIT CONVERSION

Graphs to enable conversions between units used in this manual and other commonly used units are given as follows:

Parameter	Units	Figure	Page
Weight	kg - lb		
Speed: horizontal	kn - mile/h, km/h	1-3	1-9
vertical	ft/min - m/s	1-4	1-10
Distance	ft - m	1-5	1-11
	n mile - km	1-6	1-12
Linear dimensions	m - in	1-7	1-13
Temperature	°C - °F	1-8	1-14
Liquid flow	UKgal/h - USgal/h, l/h	1-9	1-15
Moment	kg m - lb in	1-10	1-16
Pressure	lb/in^2 - kg/cm^2	1-11	1-17

DOCUMENT NO. SH.3.1

AMENDMENT RECORD SHEET

NOTE: Refer to Page 0-5 for explanation of the embodiment system. All amendments must be embodied consecutively. This Page (or Page 1-5 or 1-6) will be used to record amendments to the Operating Manual as well as amendments to the Flight Manual and will be re-issued with each amendment. In the former case the description of the amendment will include the statement "This amendment is published under the authority of the Design Approval held by the constructor and is not subject to approval by the Civil Aviation Authority". For amendments to the Flight Manual the date of approval will be recorded in the appropriate column and for amendments to the Operating Manual the date of issue.

Amendment number	Date of Approval or Issue	Description of Amendment	Pages Affected
1	25 Jan 72	This amendment is published under the authority of the Design Approval held by the constructor and is not subject to approval by the Air Registration Board. Additional propeller type designation. Addition of dual dimmer control to and re-arrangement of starter panel. Additional external access point. Correction to jacking point information. Correction to lifting point information.	 7-3, 7-8 7-5, 7-6 7-11, 7-12 7-12 7-13
2	25 Jan 72	Text correction. Additional propeller type designation. Correction to idling rotational speed. Addition of taxying warning. Amplification of flight in low temperature conditions. Revision of electrical system diagram. Correction of battery capacity to 1 h rating. Addition of example line to maximum take-off and landing weight for altitude and temperature chart. Revision of format for Record of Supplements.	1-3 2-1, 5-1 4-4 4-4 4-8 4-14 4-15 5-11 6-2
3	3 Jul 72	This amendment is published under the authority of the Design Approval held by the constructor and is not subject to approval by the Civil Aviation Authority. CAA Approval. Extension of the forward centre of gravity limit at light weight.	 0-5 7-8, 10-7
4	3 Jul 72	Extension of forward centre of gravity limit at light weight. Revision of battery capability for flight following alternator failure. Re-scheduling of climb-dependent performance.	2-2, 2-5, 4-3, 4-9, 4-14, 5-2 3-5 5-11, 5-16, 5-17 5-19, 5-21, 5-23 5-29

DOCUMENT NO. SH.3.1

AMENDMENT RECORD SHEET

Amendment number	Date of Approval or Issue	Description of Amendment	Pages Affected
5	20.2.73	This amendment is published under the authority of the Design Approval held by the constructor and is not subject to approval by the Civil Aviation Authority. Cross references concerning: Canopy closing procedures, Engine limitations.	 7-3 8-1
6	20.2.73	Engine limitations. Canopy limitations. Engine emergency procedures. Emergency evacuation procedures. Engine operating procedures. Pre-stalling and aerobatic checks. Fuel system procedures. Canopy closing procedures. Volt-ampere change-over switch, purpose of.	2-3 2-6 3-2, 3-4 3-4 4-4, 4-8, 4-12 4-9 4-2, 4-5, 4-9, 4-11, 4-15 4-17 4-16
7	25.1.74	Amplification of instructions for checking the position of the fuel selector in engine emergency cases. Reduction of time engine may be run on one magneto during engine run-up check. Revision of section relating to operation under low temperature conditions.	 3-1, 3-3 4-4 4-8, 4-17
8	21.7.76	This amendment is published under the authority of the Design Approval held by the constructor and is not subject to approval by the Civil Aviation Authority. Editorial changes. Amplification of instructions for adjusting and locking seat backs.	 0-3 7-4

DOCUMENT NO. SH.3.1

AMENDMENT RECORD SHEET

Amendment number	Date of Approval or Issue	Description of Amendment	Pages Affected
9	21 July 1976	Editorial changes. Addition of fuel pressure information. Amplification of Maximum Overspeed data. Further prohibition on smoking. Amplification of information. Engine failure - Notes on improved technique. Alternator failure - Improved technique for checking. Normal procedures - Miscellaneous improvements to techniques. Throttle control - To avoid overspeeds. Rudder trim - Cold weather operation. Editorial improvement. Notes on aerobatics. Additional notes on leaving aeroplane. Improved notes on use of alternator.	2-1 2-1 2-3 2-6 2-8 3-1 3-5 4-2, 4-3, 4-4, 4-5 4-8 4-8 4-9 4-10A 4-12, 4-15 4-16
10	07 Oct 03	Limitations - Certification Category. Normal Procedures - Amplification of spinning information and clarification of spin recovery technique. Editorial changes (not subject to CAA approval).	2-5 4-9, 4-10, 4-10A, 4-10B, 4-10C Title page, 0-5, 7-1

DOCUMENT NO. SH.3.1

GENERAL ARRANGEMENT DRAWING

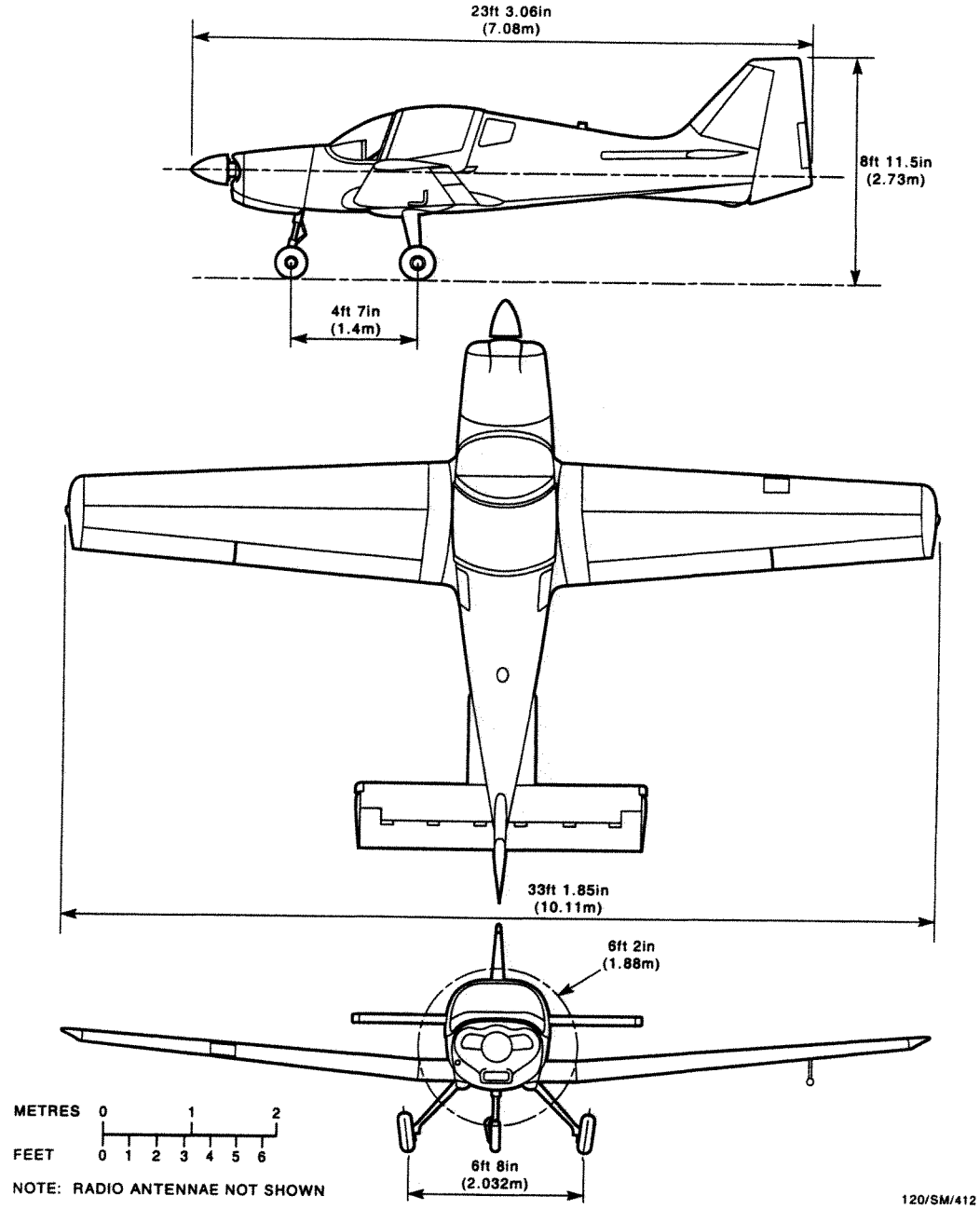


Fig 1-1

ARB Approved 15 June 71

DETERMINATION OF TEMPERATURE IN RELATION TO ISA

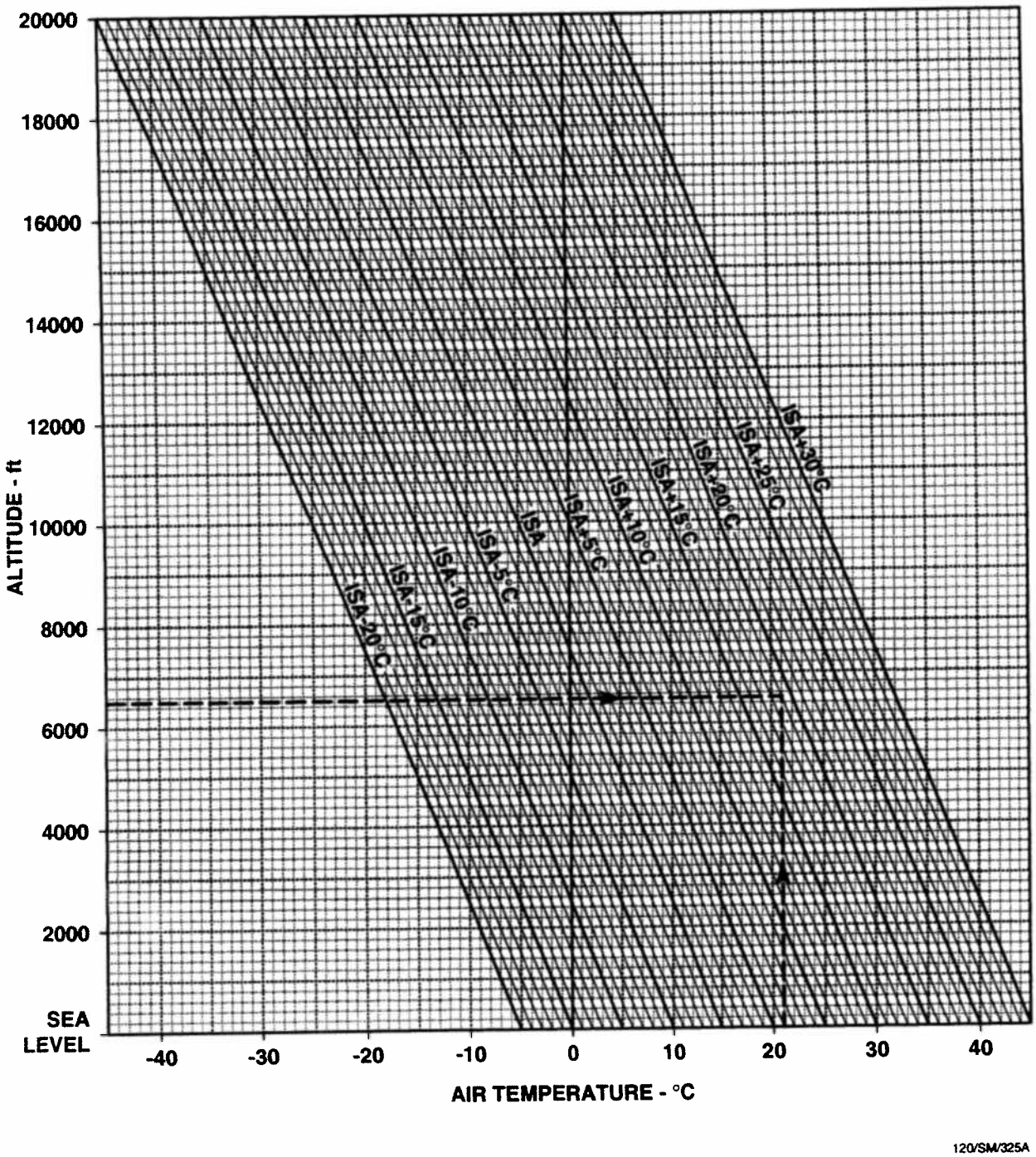
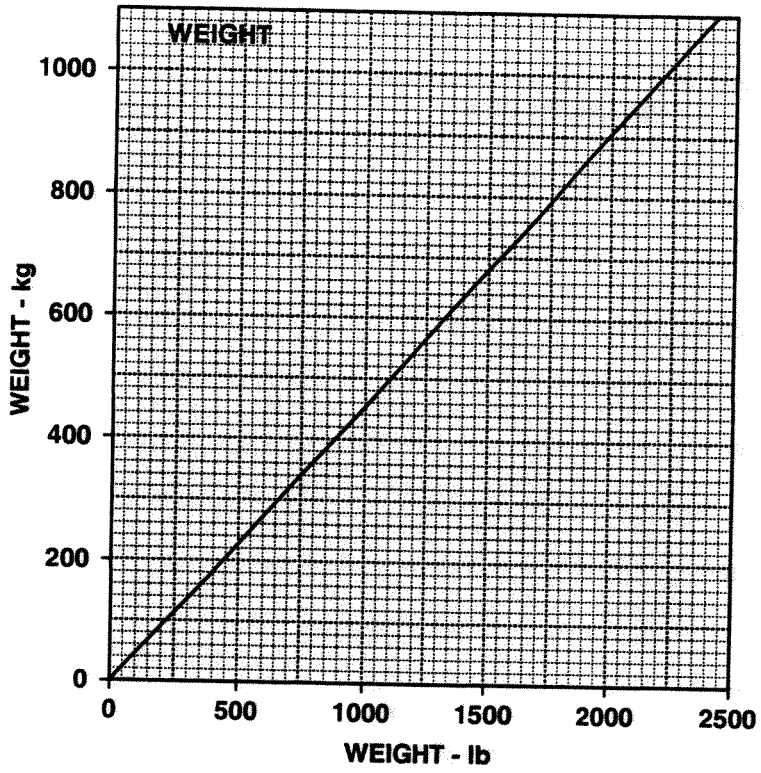
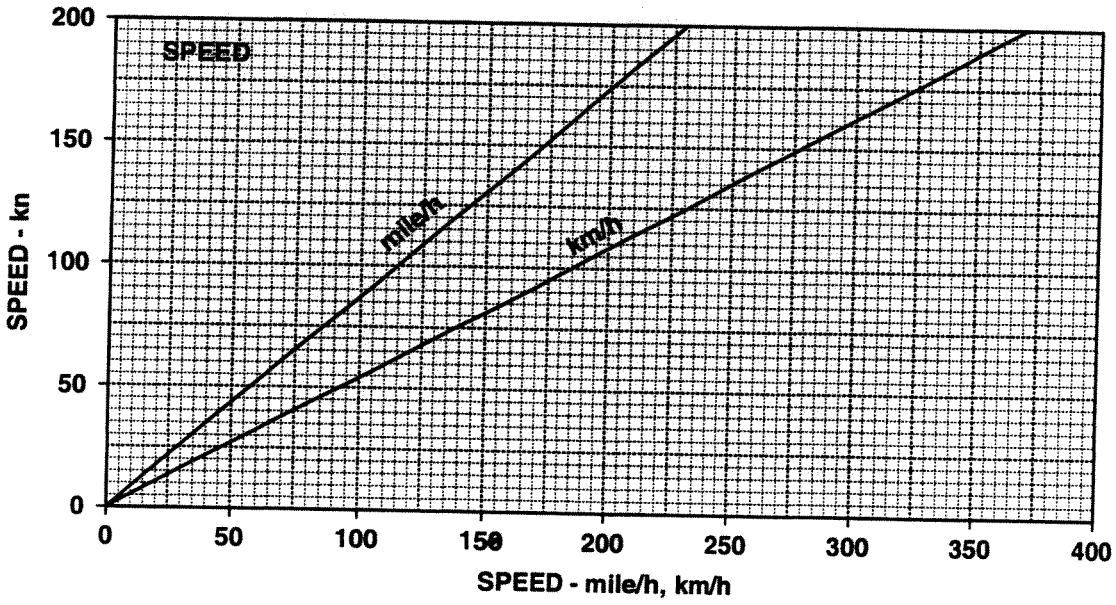


Fig 1-2

CONVERSION CHARTS





120/SM/326A

Fig 1-3

CONVERSION CHARTS

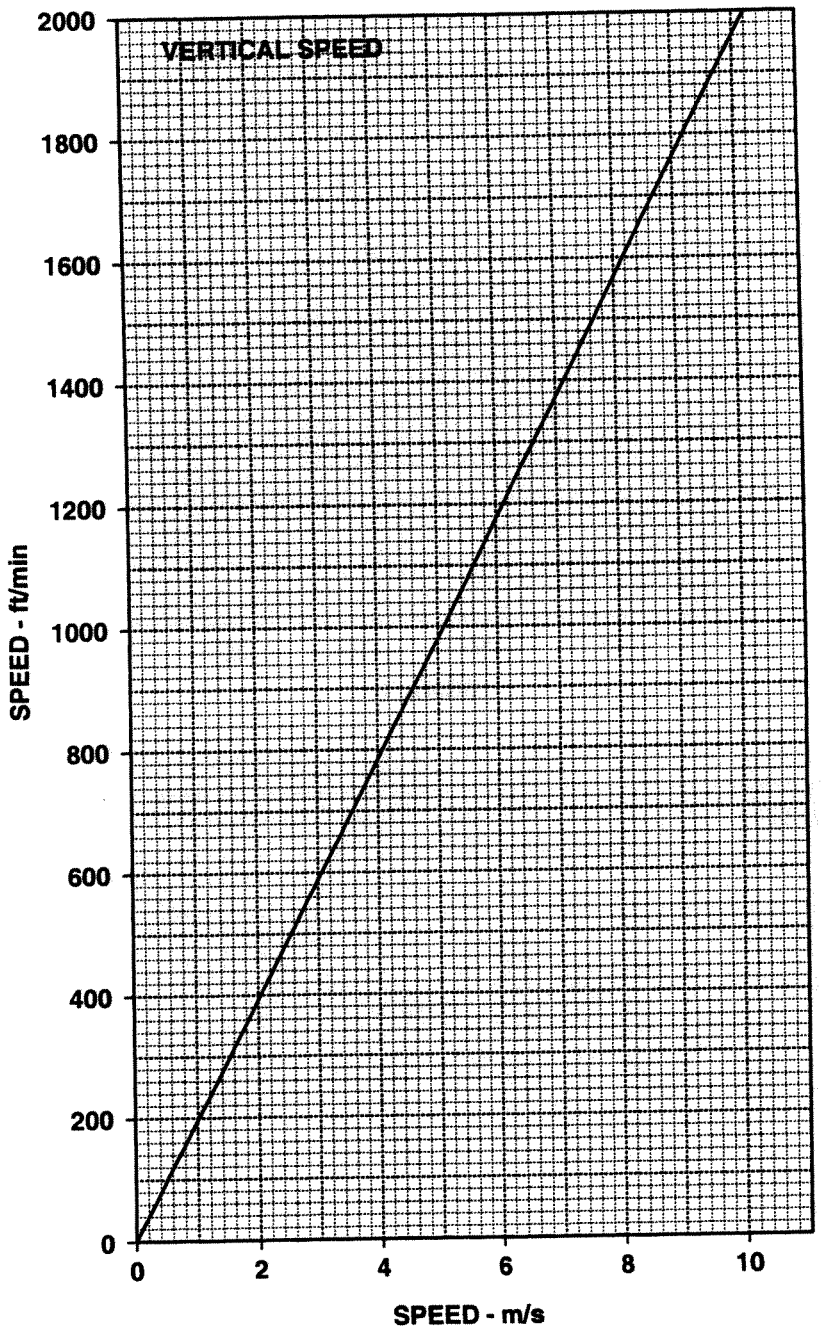


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Fig 1-4

CONVERSION CHARTS

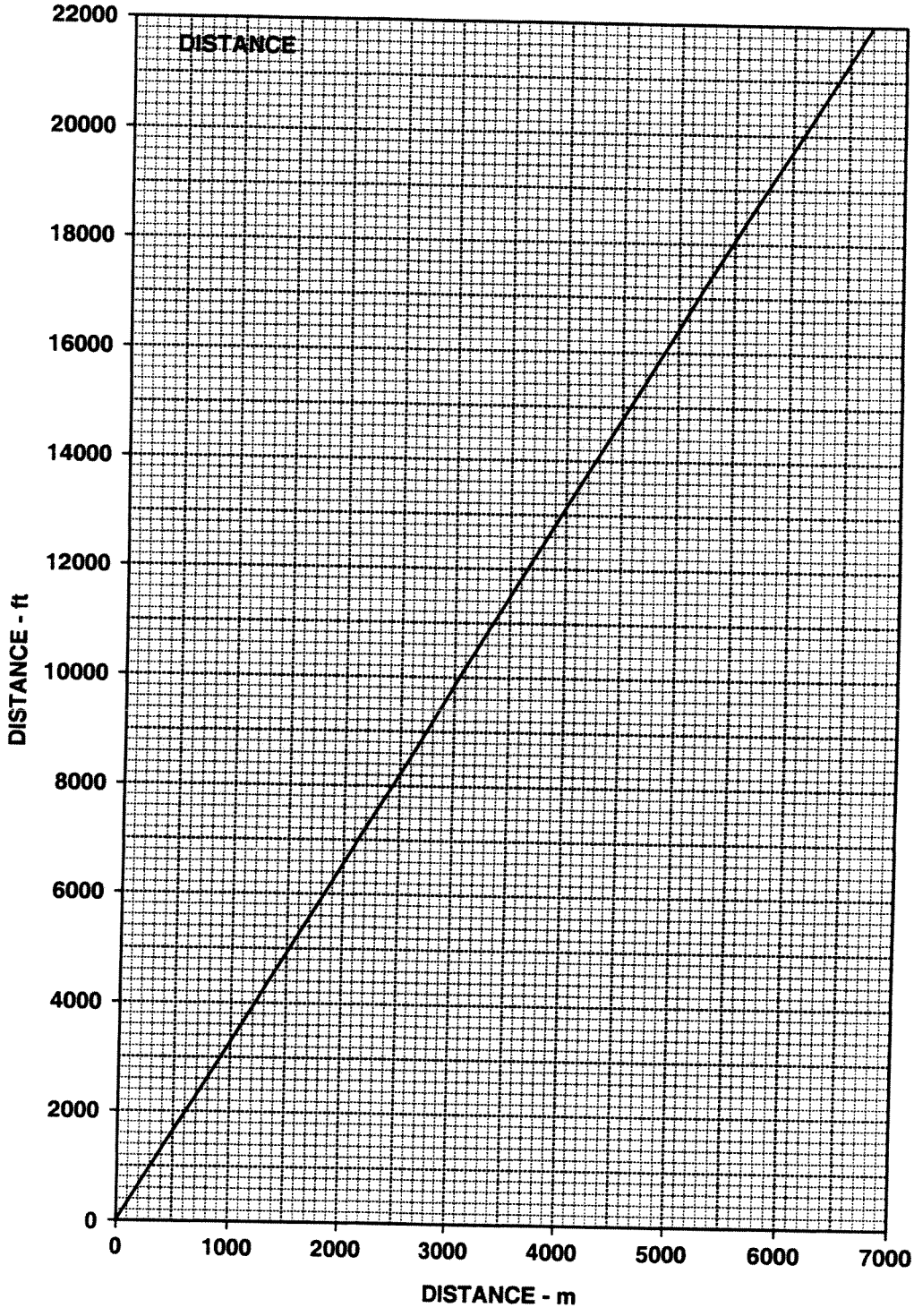

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Fig 1-5

CONVERSION CHARTS

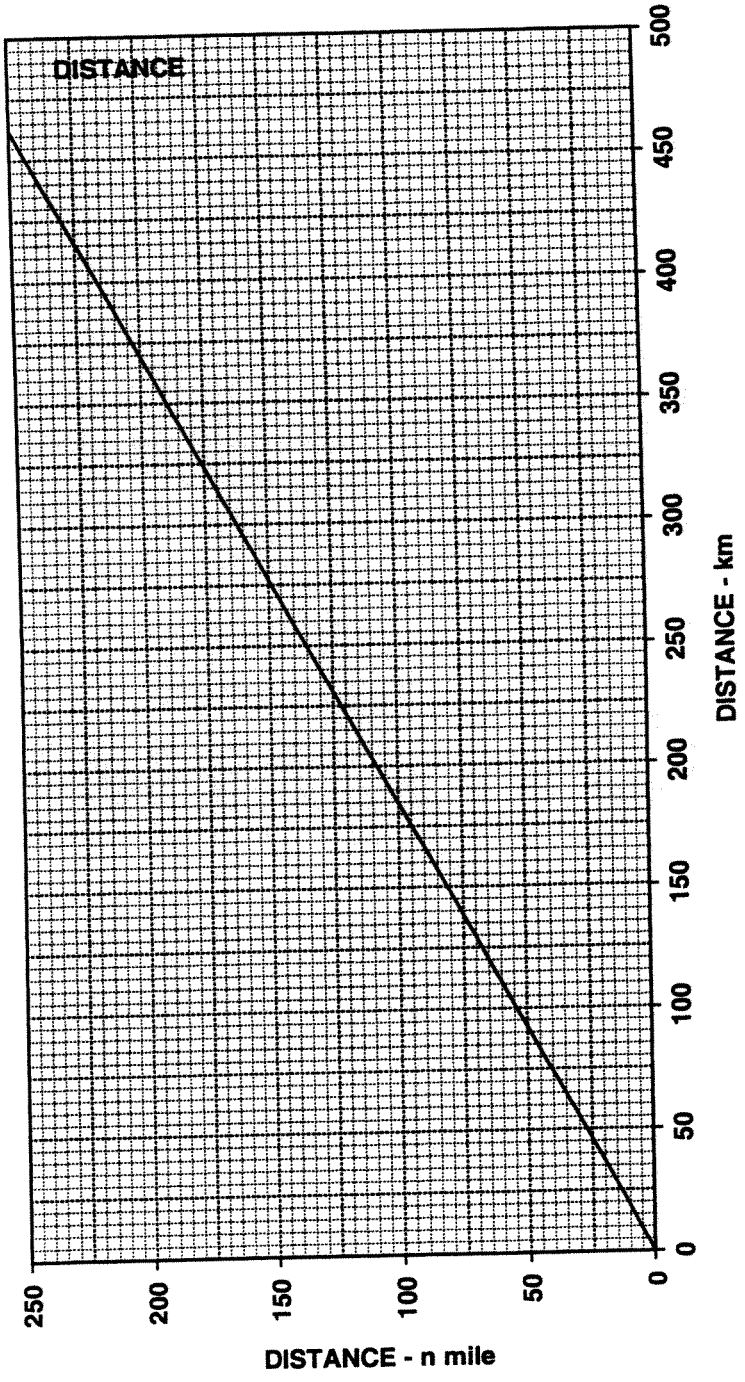

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Fig 1-6

CONVERSION CHARTS

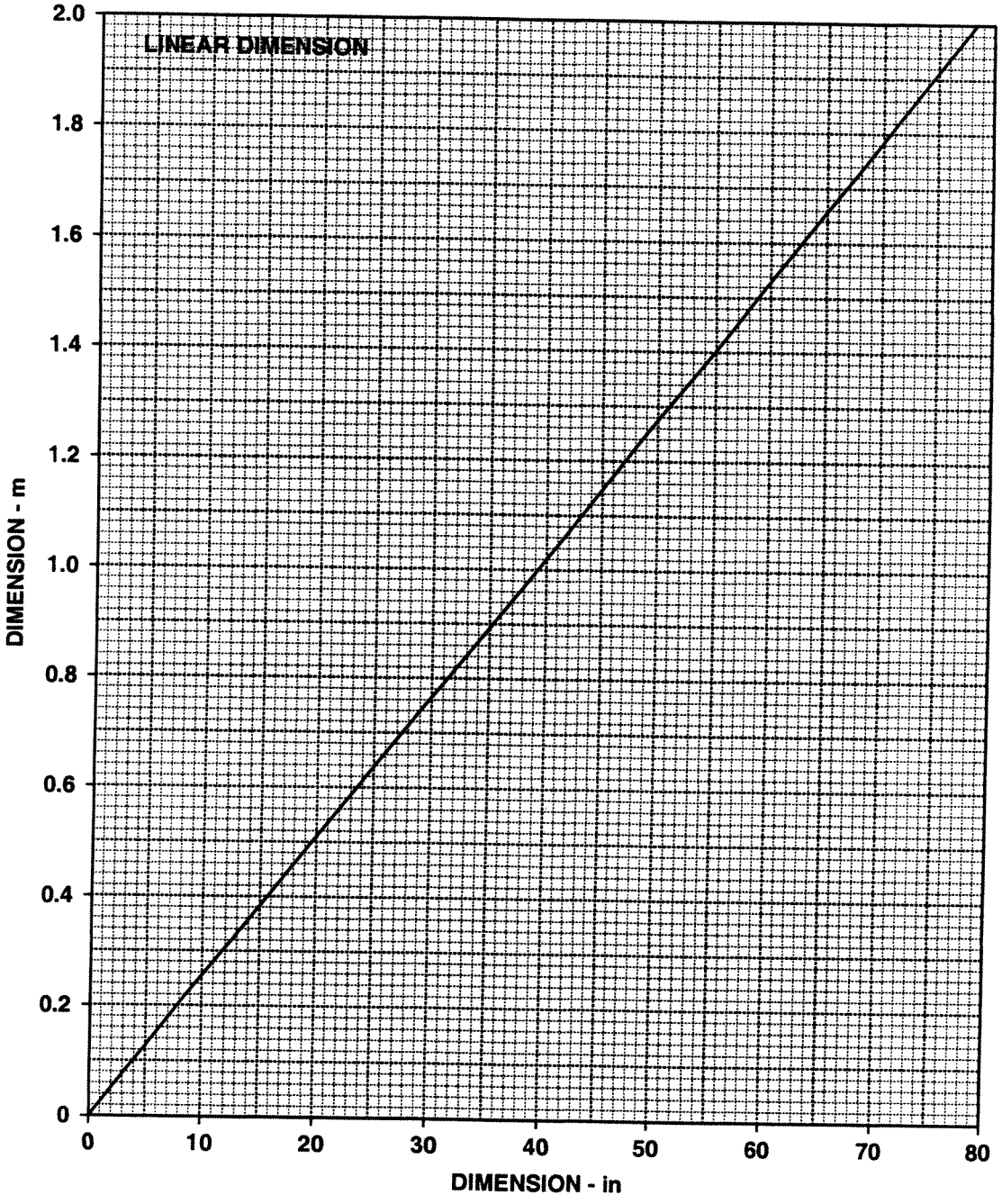

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Fig 1-7

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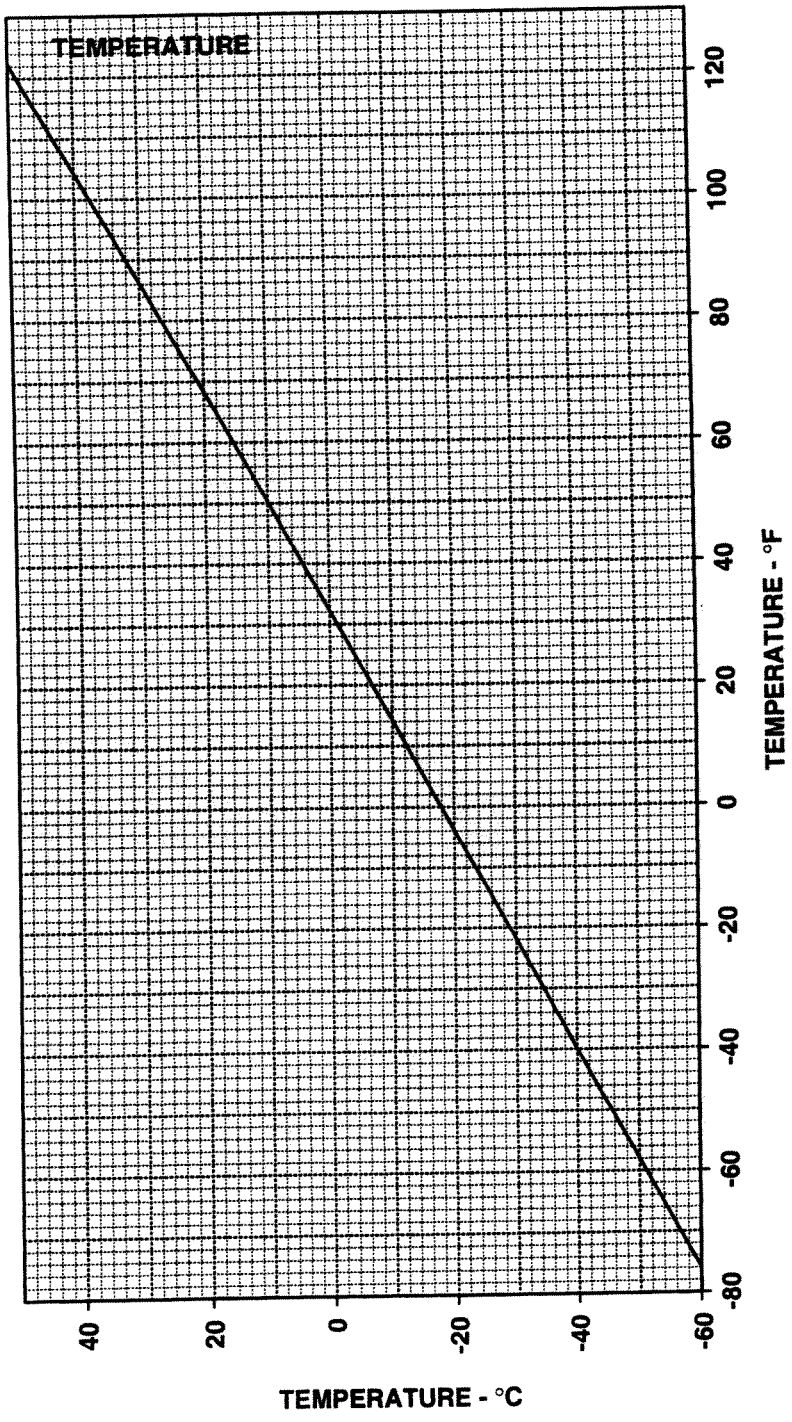

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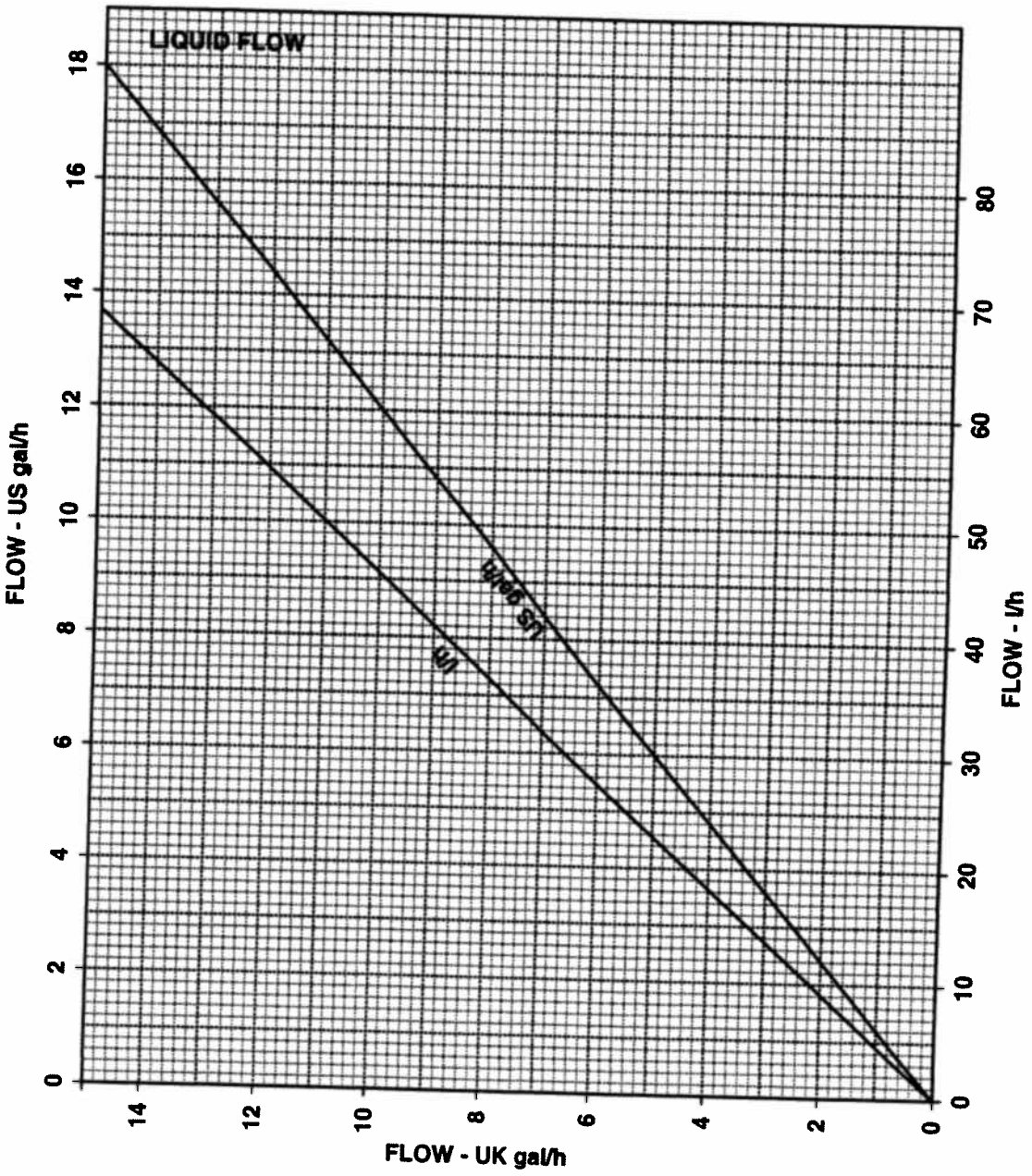
Fig 1-8

CONVERSION CHARTS



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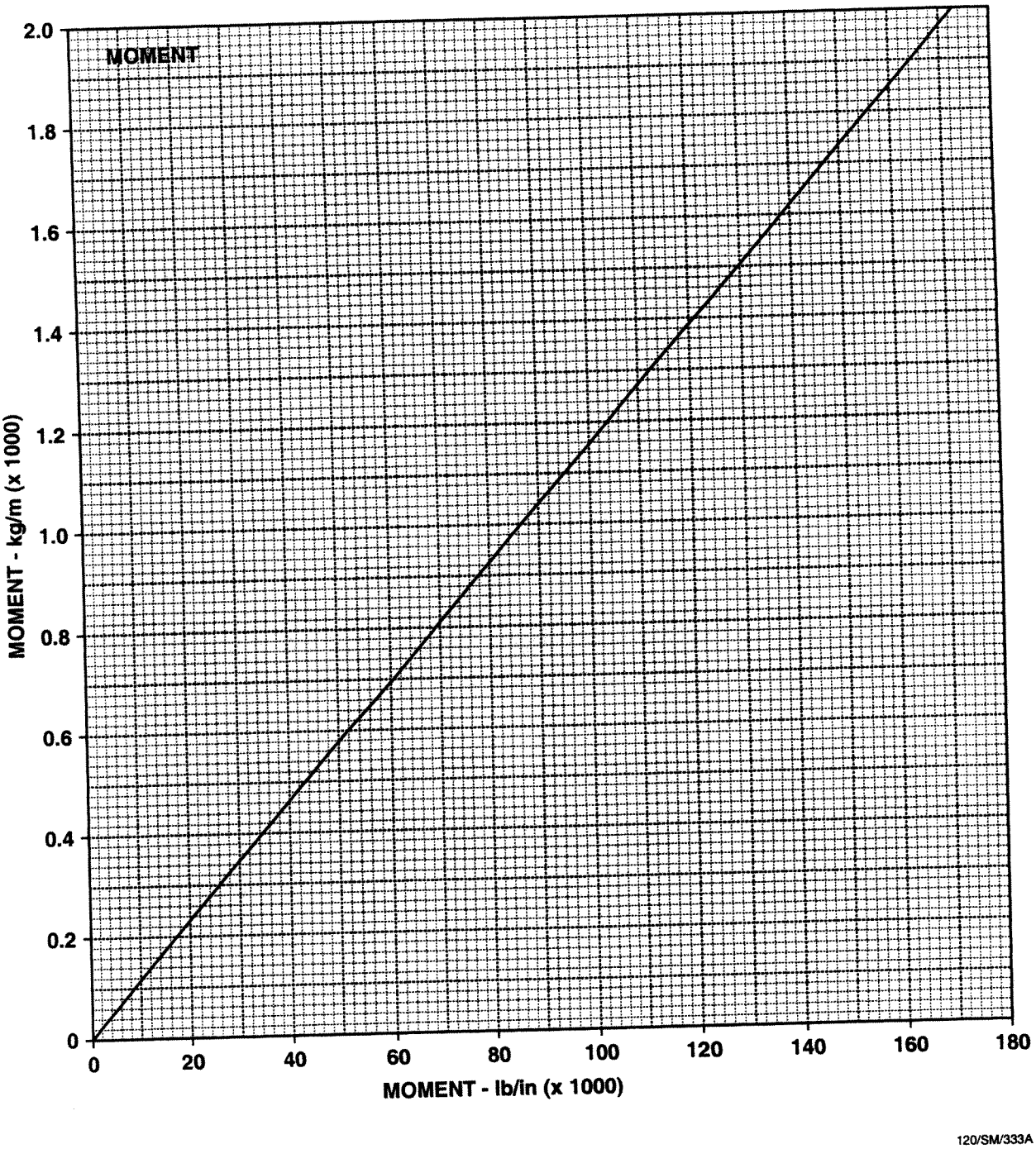
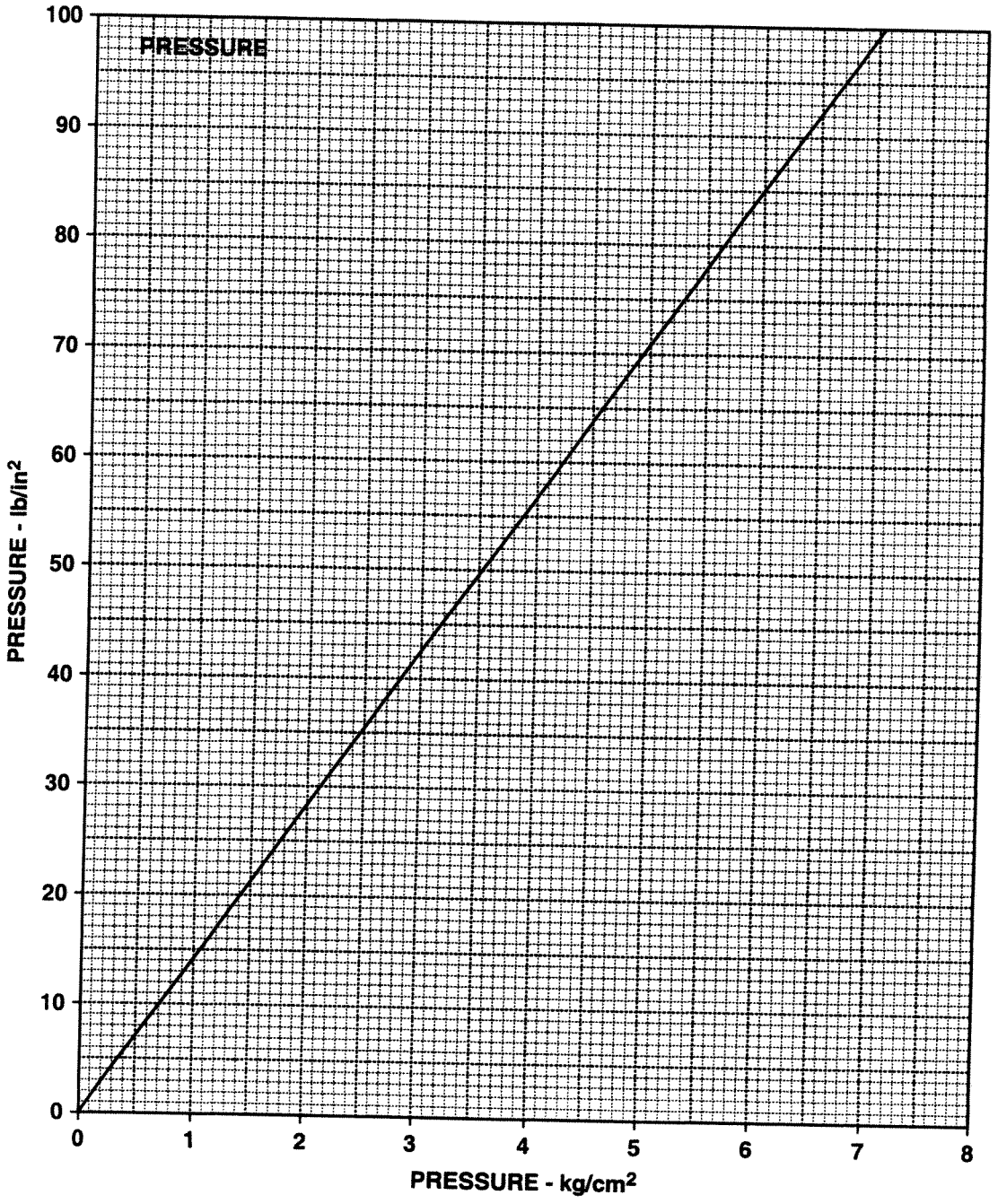


Fig 1-10

CONVERSION CHARTS



120/SM/334A

Fig 1-11

DEFINITIONS

Terms used in various sections of this manual are defined below.

Air temperature :The temperature of the free air near to, but uninfluenced by, the aeroplane. This temperature may be a reported or a forecast temperature when permitted by the Air Navigation Regulations.

Altitude :Pressure altitude, which is the expression of atmospheric pressure in terms of altitude above mean sea level according to the interrelation of these factors in the International Standard Atmosphere (ISA, see below). This may be obtained by setting the sub-scale of an accurate pressure type altimeter at 1013.2 millibars or 29.92 inches of mercury or 760 millimetres of mercury.

Gradient of Climb :The ratio, in the same units, and expressed as a percentage, of:

$$\frac{\text{change in height}}{\text{horizontal distance travelled}}$$

The gradient of climb referred to in this manual is true gradient, i.e., derived from true (not pressure) rate of climb.

The term 'slope' is used instead of gradient when referring to aerodrome surfaces.

Gross Performance :The average performance which a fleet of aeroplanes can be expected to achieve if satisfactorily maintained and flown in accordance with the associated techniques described in this manual. To obtain gross performance, it is usually necessary to adjust the measured performance for such parameters as engine power and humidity.

Height :The vertical distance between the lowest part of the aeroplane in an unbanked attitude and the relevant datum.

ISA :International Standard Atmosphere. The interrelationship of air temperature and altitude in the International Standard Atmosphere and in various atmospheres above and below this standard is shown in Figure 1-2 on Page 1-8. Arrowed example lines illustrate its use.

Net Performance :The gross performance diminished by the amounts prescribed in the relevant requirements to allow for various contingencies which cannot be directly accounted for operationally, e.g., the need to manoeuvre, unavoidable variations in piloting technique, temporary below average performance, etc. It is extremely improbable that the net performance will not be achieved in operation provided the aeroplane is flown in accordance with the recommended techniques.

Speeds: IAS - Indicated Air Speed, which is the reading obtained from an instrument having no calibration error. As the permitted tolerances are small the Air Speed Indicator Reading (ASIR) may be taken to be equal to IAS.

EAS - Equivalent Air Speed, which is the IAS corrected for position and compressibility errors.

TAS - True Air Speed of the aeroplane relevant to the undisturbed air which is the EAS corrected for altitude and temperature.

Take-off Safety Speed, V_2:The minimum speed at which, following sudden and complete failure of the engine in the take-off configuration, adequate control exists to establish a glide at a safe margin above the stall, and is used in determining take-off performance.

V_{s1} :A stalling EAS, power off, of the aeroplane in the configuration appropriate to the case under consideration.

V_{so} :The stalling EAS, power off, of the aeroplane with the wing flaps in the landing position.

Unusable Fuel :The declared quantity of drainable fuel remaining in the tanks and fuel lines when, under the most adverse conditions, the first evidence of engine malfunction occurs.

Usable Fuel :The declared total fuel capacity less the declared quantity of unusable fuel.

Unconsumable Fluids :Fluids carried in the aeroplane other than unusable fuel and oil which are not normally expended in flight and which, for this aeroplane, comprise hydraulic fluid and any undrainable fuel and oil.

Basic Equipment :The unconsumable fluids and non-expendable equipment common to all roles in which the operator intends to use the aeroplane.

Personal Equipment :Equipment carried on the person of an occupant of the aeroplane such as flying suit, protective helmet and parachute.

Role Equipment :Equipment the carriage of which is dependent on the particular role in which the operator intends to use the aeroplane for the particular flight.

Portable Equipment :Equipment associated with the operation of the aeroplane such as manuals, documents and maps.

Variable Load :The weight of the pilot in command of the aeroplane, his personal equipment, the portable equipment, and the role equipment.

Payload :The weight of any occupant of the aeroplane other than the pilot in command, his personal equipment, and any load carried in the aeroplane in addition to the variable load and the fuel.

Disposable Load :The weight of the payload and the fuel carried.

Weight :Unless qualified, the total weight of the aeroplane, including fuel, oil, equipment, pilot in command, and payload.

Basic Weight :The weight of the aeroplane with basic equipment, the declared quantity of unusable fuel and oil, and full usable fuel.

Equipped Weight :The weight of the aeroplane fully equipped for the particular role in which the operator intends to use it for the particular flight, i.e., equal to basic weight plus the weight of the portable equipment and the role equipment.

Take-off Weight :The weight of the aeroplane fully equipped and loaded for the particular flight, i.e., equal to equipped weight plus the weight of the pilot in command of the aeroplane, his personal equipment, and the disposable load.

Zero-fuel Weight :The weight of the aeroplane fully equipped and loaded for the particular flight but less the weight of the fuel required, i.e., equal to take-of weight less the weight of the fuel.

SECTION 2
Limitations

SECTION 2

LIMITATIONS

THE AEROPLANE MUST BE OPERATED SO THAT THE LIMITATIONS AND INSTRUCTIONS CONTAINED IN THIS SECTION ARE OBSERVED.

WEIGHTS

The maximum permissible take-off, landing and zero-fuel weight for non-aerobatic operation is 1066 kg (2350 lb). For aerobatic manoeuvres the maximum weight is restricted to 975 kg (2150 lb).

These are maximum structural weights. A lower weight may, in particular circumstances, be advised or enforced by operational considerations.

CENTRE OF GRAVITY

The centre of gravity of the aeroplane must lie between the forward and aft limits given in Figure 2-1 on Page 2-2 appropriate to weight.

A.9 The datum to which these limits relate is fuselage station zero located 1854.2 mm (73.0 in) forward of the weighing reference point which is the main spar datum and is indicated by a plate on the underside of the fuselage.

BAGGAGE LOADING

Baggage compartment maximum load is 100 kg (220 lb). Maximum load intensity of the compartment is 366 kg/m² (75 lb/ft²).

These are maximum structural loadings. Actual loadings may be limited due to balance and operational performance considerations.

Baggage shall be suitably secured.

Baggage must not be carried when performing aerobatic manoeuvres.

FUEL SYSTEM

The fuel approved for use with the engine is of aviation quality with a minimum grade of 100/130 octane.

A.9

Total tank capacity is 33 UKgal (39.63 USgal, 150.02 l) of which 32 UKgal (38.43 USgal, 145.47 l) is usable. This full usable quantity of fuel can be safely used in all normal flight conditions.

Caution should be exercised in the management of the fuel system when the indicated contents of either tank have fallen within the yellow arc marked on the fuel contents gauge.

Fuel system management procedures are given on Page 4-15.

POWER PLANT

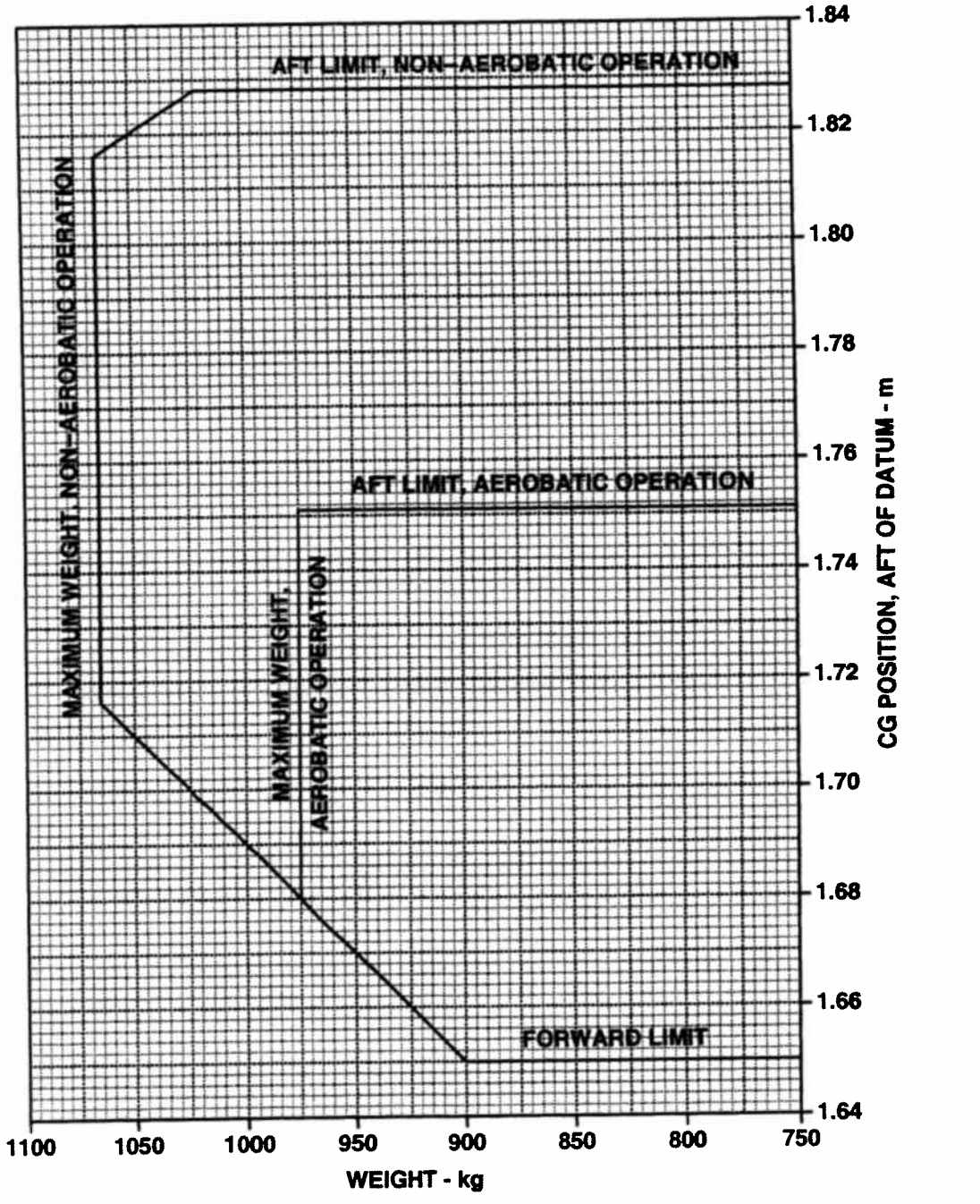
The limitations stated below apply to a standard aeroplane fitted with an Avco-Lycoming IO-360-A1B6 engine and a Hartzell two-blade constant speeding propeller type HC-C2YK-4/C7666A-2 or HC-C2YK-4F/FC7666A-2 of 74.0 in (1879.6 mm) diameter.

FUEL PRESSURE

A.9 The maximum fuel pressure is 12 psi. This is an engine limitation; usually a fuel pressure higher than 9 psi indicates a blocked fuel injector nozzle causing rough running and loss of power.

DOCUMENT No SH.3.1

CENTRE OF GRAVITY LIMITATIONS



OIL

The oil approved for use with this engine is to specification MIL-L-22851 in accordance with Avco-Lycoming Service Instruction 1014. The grade together with the associated minimum permissible oil inlet temperatures before opening up to high powers and the maximum permissible oil temperatures under any conditions are as follows:

Ambient Temperatures (°C)	Viscosity Grade, SAE		Temperature (°C)	
	Single - Viscosity	Multi - Viscosity	Minimum	Maximu
Above 16	50	40 or 50	82	118
-1 to +32	40	40	82	118
-18 to +21	30	40 or 20W-30	77	107
Below -12	20	20W-30	71	99

A straight mineral based oil to specification MIL-L-6082B should be used in a new or newly overhauled engine for a minimum of 50 h or until oil consumption has stablised.

Total sump capacity is 1.67 UKgal (2.0 USgal, 7.57 l).

OIL PRESSURES

The minimum permissible oil pressure under idling conditions is 25 lb/in² (1.76 kg/cm²) and for normal operation 60 lb/in² (4.22 kg/cm²).

The maximum permissible oil pressure for normal operation is 90 lb/in² (6.33 kg/cm²) and for starting and warm up 100 lb/in² (7.03 kg/cm²).

MAXIMUM TAKE-OFF AND CONTINUOUS POWER

The maximum permissible rotational speed is 2700 rev/min at full throttle.

The maximum permissible associated cylinder head temperature is 246°C.

The engine may be operated continuously under conditions not exceeding those quoted but this power is normally only to be used when it is operationally essential.

MAXIMUM OVERSPEED

Continuous operation at more than 2700 rev/min is not permitted.

Momentary overspeeds up to 2755 rev/min require determination and correction of the cause. Post flight inspection of the engine is not required.

Overspeeds greater than 2755 rev/min and up to 2915 rev/min require a post flight inspection of the engine to be carried out with rectification of defects as required, in accordance with the engine manufacturer's recommendations. The extent of the required inspection depends on the amount of overspeed experienced.

A.9

An overspeed exceeding 2915 rev/min requires removal of the engine from the aircraft for complete overhaul as recommended by the engine manufacturer.

NOTE: The engine manufacturer's recommendations are laid down in Avco-Lycoming Service Bulletin No. 369B.

DOCUMENT No SH.3.1

Amend No.6

ROTATIONAL SPEED - POWER LIMITATIONS

At the following engine rotational speeds the manifold pressure must not be permitted to exceed the values given.

Rev/min	1800	1900	2000	2100	2200	2300	2400 and over
Man. pressure at sea level (in Hg)	25.0	25.6	26.3	26.9	27.5	28.2	full throttle at all altitudes
Reducing to (in Hg): at *) altitude (ft):	23.2 6,000	24.1 5,000	25.0 4,000	26.0 3,000	26.9 2,000	27.8 1,000	

*) These altitudes correspond to Full Throttle Height for the associated engine rotational speed.

INSTRUMENT COLOUR MARKINGS

The colour markings on the power plant instrument dials have the following meaning:

Red radial line	:Minimum and maximum values -	
	Oil temperature	:118°C (maximum only)
	Oil pressure	:25 and 100 lb/in² (1.76 and 7.03 kg/cm²)
	Cylinder head temperature	:246°C (maximum only)
	Fuel pressure	:12 lb/in² (0.84 kg/cm²) (maximum only)
	Rotational speed	:2700 rev/min (maximum only)
Green arc	:Normal operating range -	
	Oil temperature	:30-118°C
	Oil pressure	:60-90 lb/in² (4.22-6.33 kg/cm²)
	:Cylinder head temperature	:38-246°C
	Fuel pressure	:0.5-8 lb/in² (0.04-0.56 kg/cm²)
	Rotational speed	:0-2700 rev/min
Yellow arc	:Cautionary range -	
	Fuel contents	:0-2 UKgal (2.4 USgal, 9.1 l)

SPEED

NEVER EXCEED SPEED (V_{NE})

V_{NE} is 185 kn (343 km/h) IAS.

This speed must not be exceeded otherwise overstressing of the aeroplane could occur.

NORMAL OPERATING LIMIT SPEED (V_{NO})

V_{NO} is 135 kn (250 km/h) IAS.

This is the maximum cruising speed. The aeroplane must not be flown at speeds greater than V_{NO} except on occasions when, in the opinion of the pilot, appreciable atmospheric turbulence is unlikely to be encountered.

MANOEUVRING SPEED (V_A)

Full application of aileron, rudder or elevator control may be made at speeds not exceeding 140 kn (259 km/h) IAS subject to the accelerations in the resultant manoeuvre being consistent with the design manoeuvring load factors stated on Page 2-6.

NOTE: A violent manoeuvre suddenly checked by application of full control movement at this speed might cause excessive loads to be imposed on the structure.

WING-FLAPS EXTENDED SPEED (V_{FE})

The maximum permissible speed for extending the wing-flaps and for flight with the wing-flaps extended is 135 kn (250 km/h) IAS for extension to the 10° position (INTER setting) and 100 kn (185 km/h) IAS for extension to the 45° position (FULL setting).

INSTRUMENT COLOUR MARKINGS

The colour markings on the airspeed indicator have the following meaning:

Red radial line	:V_{NE} (185 kn (343 km/h) IAS)
Yellow arc	:Cautionary range, from V_{NE} to V_{NO} (185-135 kn (343-250 km/h) IAS)
Green arc	:Normal operating range with wing-flaps retracted, from (V_{NO} to V_{S1} (135-53 kn (250-98 km/h) IAS)
White arc	:Normal operating range with wing-flaps fully extended, from V_{FE} to V_{SO} (100-50 kn (185-92.5 km/h) IAS).

MISCELLANEOUS

CERTIFICATION CATEGORY

This type of aeroplane is eligible for certification in the Transport (Passenger) Category. However, this aeroplane may be restricted to particular use or to another category; this will be stated in the Certificate of Airworthiness.

TYPE OF OPERATION

VFR, IFR day and night operation are permitted when the required equipment is installed and when allowed by the operating regulations.

The stall warning system must be installed and serviceable for all operations.

The aeroplane is not approved for flight into icing conditions.

MANOEUVRES

The following aerobatic manoeuvres are permitted with wing-flaps retracted provided the weight and loading limitations with respect to aerobatic manoeuvres given on Page 2-1 and Figure 2-1 and the associated manoeuvring load factors given on Page 2-6 are observed, otherwise operation is restricted to normal flying manoeuvres and stalling:

Manoeuvre	Recommended Entry IAS	
	kn	km/h
Spins	V_{S1} or 60	V_{S1} or 111
Inside loops	140	259
Half loop and roll out	145	269
Half roll and dive out	85	158
Stall turns	120	222
Slow rolls	120	222
Barrel rolls	120	222
Flick rolls	65-80	120-148

For flick rolls the speed of 80 kn (148 km/h) IAS must not be exceeded.

When carrying out aerobatic manoeuvres, the rear seat shall not be occupied and each seat in use shall be provided with a safety harness.

Due to engine limitations, the aeroplane is not approved for sustained inverted flight.

MANOEUVRING LOAD FACTORS

The maximum positive normal accelerations at which compliance has been shown with the structural requirements and which the structure has been designed to withstand without any significant deformation being permanently sustained are 3.8 g with wing-flaps retracted and 2.0 g with wing-flaps extended. At the maximum weight permitted for aerobatic manoeuvres the strength is increased to 6.0g and -3.0 g with wing-flaps retracted.

MINIMUM CREW

The minimum crew is one pilot.

MAXIMUM NUMBER OF OCCUPANTS

The total number of persons carried shall not exceed three or the number of seats fitted. Children under the age of three years when carried in the arms of a passenger need not be included in this total.

When carrying out aerobatic manoeuvres the rear seat shall not be occupied.

SMOKING

A.9 Smoking is not permitted unless ashtrays are provided.

Smoking is not permitted during take-off, landing, and when carrying out aerobatic manoeuvres.

MAXIMUM OPERATING AIR TEMPERATURE

Operation of the aeroplane is not permitted when the outside air temperature is greater than 30°C above the ISA temperature appropriate to the altitude.

No minimum temperature has been established.

MAXIMUM PERMISSIBLE OPERATING ALTITUDE

For the purpose of public transport, operation of the aeroplane is not permitted above an altitude of 10000ft (3048 m) unless oxygen sufficient for continuous use by the pilot is provided and above an altitude of 13000 ft (3962 m) unless oxygen sufficient for continuous use by all occupants is provided. Operation is at no time permitted above an altitude of 20000 ft (6096 m).

OPENING OF COCKPIT CANOPY IN FLIGHT

Unless for the purpose of emergency exit, the canopy must not be opened in flight at speeds greater than 120 kn (222 km/h) IAS. At or below this speed the canopy may be opened up to 8.87 in (200 mm). Recommended closing procedures are given on Page 4-17.

With the canopy open or unlocked gentle manoeuvres only should be performed.

PLACARDS

Notices which are required to be placarded are displayed as follows:

Instrument Panel

AIRSPEED LIMITATIONS NOT MARKED ON ASI			
SPEED		IAS	
		kn	km/h
MANOEUVRING	V_A	140	259
WING-FLAPS, INTER EXTENSION	V_{FE}	135	250
OPENING CANOPY IN FLIGHT (NOT MORE THAN 8.87 in (200 mm))		120	222

MANOEUVRES				
OPERATION	NON-AEROBATIC	AEROBATIC		
MAX PERMISSIBLE WEIGHT (kg)	1066	975		
AFT CG LIMIT, AFT OF DATUM (m)	1.816	1.751		
MAX PERMISSIBLE NORMAL ACCELN., FLAPS UP (g)	+3.8 -1.52	+6.0 -3.0		
PERMITTED MANOEUVRES	STALLS ONLY, AEROBATIC MANOEUVRES PROHIBITED	STALLS,	Recommended Entry IAS	
			kn	km/h
		WITH FLAPS UP:		
		SPINS	V_{S1} or 60	V_{S1} or 11
		INSIDE LOOPS	140	259
		HALF LOOP & ROLL OUT	145	269
		HALF ROLL & DIVE OUT	85	158
		STALL TURNS	120	222
		SLOW ROLLS	120	222
		BARREL ROLLS	120	222
		FLICK ROLLS	65-80	120-148
			max	max
	SUSTAINED INVERTED FLIGHT PROHIBITED			
WHEN PERFORMING AEROBATIC MANOEUVRES- REAR SEAT SHALL NOT BE OCCUPIED EACH SEAT IN USE SHALL BE PROVIDED WITH SAFETY HARNESS BAGGAGE SHALL NOT BE CARRIED				
WITH CANOPY OPEN GENTLE MANOEUVRES ONLY SHOULD BE PERFORMED				

NO SMOKING DURING TAKE-OFF, LANDING OR AEROBATICS

OPERATION

OPERATE IN ACCORDANCE WITH APPROVED FLIGHT MANUAL

VFR, IFR DAY & NIGHT OPERATIONS PERMITTED WHEN REQUIRED EQUIPMENT INSTALLED & WHEN ALLOWED BY OPERATING REGULATIONS

STALL WARNING SYSTEM MUST BE INSTALLED & SERVICEABLE

FLIGHT INTO ICING CONDITIONS PROHIBITED

Canopy

A.9 In red on white background.

TO JETTISON CANOPY FOR EMERGENCY EXIT
PULL DOWN YELLOW & BLACK STRIPED HANDLE.
PUSH OUTWARDS.

Baggage Compartment

BAGGAGE		
MAX. LOAD	(kg)	100
MAX. FLOOR LOADING	(kg/m^2)	366

Magnetic Compass

The compass deviation card is displayed on the magnetic compass.

SECTION 3
Emergency
Procedures

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SECTION 3

EMERGENCY PROCEDURES

This section contains operating procedures for flight and system emergency conditions which are essential for the continued safe operation of the aeroplane.

ENGINE FAILURE AFTER TAKE-OFF

Should the engine fail immediately after take-off, maintain an airspeed not less than the take-off safety speed scheduled in Figure 5-6 on Page 5-9 and, if possible, land straight ahead, selecting the best clear area and turning only as necessary to avoid obstacles, using wing-flaps to best advantage.

If time permits, check:

A.9

(1)	Booster pump	: ON.
(2)	Ignition	: BOTH.
(3)	Mixture	: FULL RICH.
(4)	Fuel selector	: BOTH, or set for the fuller tank (see Page 4-15)

Before landing ensure:

(1)	Ignition	: OFF.
(2)	Fuel selector	: OFF.

LANDING WITH ENGINE INOPERATIVE (FORCED LANDING)

Should the engine fail at any time other than immediately after take-off, close the throttle, retract the wing-flaps if extended and trim the aeroplane for the en route gliding speed with wing-flaps retracted given on Page 5-22. Select a suitable landing area and proceed as follows:

(1) Check:

A.9

(a)	Ignition	: BOTH.
(b)	Mixture	: FULL RICH.
(c)	Propeller	: FINE.
(d)	Fuel selector	: BOTH, or set for the fuller tank (see Page 4-15)
(e)	Fuel booster pump	: ON.
(f)	Throttle	: Slightly open.

(2) If blockage of the air filter is suspected, select HOT induction air immediately.

(3) If the cause of the failure cannot be rectified or is of an obvious permanent nature, continue the approach and complete the following safety checks:

(a)	Harness	: Tight, adjust.
(b)	Throttle	: CLOSED.
(c)	Mixture	: CUT-OFF.
(d)	Fuel selector	: OFF.
(e)	Fuel booster pump	: OFF.
(f)	Ignition	: OFF.
(g)	Fire extinguisher	: Ready for use.
(h)	Brakes	: OFF.

(4) Position aeroplane so as to be at a height of 1000 ft (305 m) above ground level at the end of the downwind leg maintaining a minimum airspeed of 72 kn (133 km/h) IAS and judging the point to turn across wind according to the wind strength.

(5) Proceed on to approach, maintaining minimum airspeed of 72 kn (133 km/h) IAS. If an excessive overshooting tendency is apparent, sideslipping is effective in steepening the angle of approach.

(6) When certain that the selected landing area can be reached, extend the wing-flaps to the FULL setting (45° position).

(7) Switch battery master switch OFF.

(8) Proceed as for a normal landing as prescribed in Section 4.

NOTES: (1) Sideslipping is permitted with wing-flaps extended up to appropriate V_{FE} (see Page 2-5).

A.6 (2) As wing-flaps are electrically operated they will not be available for landing if an electrical failure has occurred. Final approach must then be in accordance with the following technique.

LANDING WITH WING-FLAPS RETRACTED

In the event of an electrical failure or some malfunction preventing extension of the wing-flaps, final approach should be made at 72 kn (133 km/h) IAS. Proceed as for a normal landing as prescribed in Section 4.

FIRE

Procedure for dealing with fire is as follows.

ENGINE FIRE

On Ground

The following sequence of action is recommended:

A.6
(1) Booster pump : OFF
(2) Throttle : CLOSED
(3) Mixture : CUT-OFF
(4) Ignition : OFF
(5) Fuel selector : OFF
(6) Battery : OFF
(7) Heating system : OFF
(8) Use hand fire extinguisher.
(9) If necessary, release brakes to enable aircraft to be pushed away from burning fuel on ground.

A.6 NOTES: (1) Sealing of the induction air intake with a piece of material when the propeller has ceased to rotate will effectively extinguish an intake fire if a chemical extinguisher is not available.

(2) When extinguishing fluid has been used on or around the engine, on no account may a re-start be attempted until the engine has been inspected and certified as serviceable.

In Flight

As no fire extinguisher system is fitted in the engine compartment, in the event of an engine fire in flight a forced landing must be made immediately.

(1) Immediately fire is detected, fuel booster pump OFF, reduce airspeed.
(2) Throttle : CLOSED
(3) Mixture : CUT-OFF
(4) Ignition : OFF
(5) Fuel selector : OFF
(6) Heating system : OFF
(7) Alternator field switch : OFF
(8) Trim : As required
(9) Transmit emergency call.
(10) Extend wing-flaps if considered necessary.
(11) Battery : OFF
(12) Select a suitable landing area and make a forced landing as soon as possible.
(13) If fire persists try the effect of sideslipping which, if effective, should be employed throughout the descent.
(14) Use hand fire extinguisher to the best advantage, if necessary.

CABIN FIRE

(1) If electrical fire is suspected:
(a) Battery : OFF
(b) Alternator field switch : OFF
(2) Heating system : OFF
(3) Use hand fire extinguisher.
(4) Prepare for emergency landing.

NOTES: (1) The hand fire extinguisher contains bromochlorodifluoromethane (BCF) and is located on the centre line behind the front seats. This extingishant is suitable for electrical or burning liquid fires and is of low toxicity.

(2) If certain that fire was not electrical, battery and alternator field switches may be turned ON.

RESTARTING ENGINE IN FLIGHT WITH PROPELLER STOPPED

If the reason for engine stoppage is other than fuel shortage or mechanical failure, proceed as follows:

Amend No.7

(1) Fuel selector : BOTH, or set for the fuller tank (See Page 4-15)
(2) Fuel booster pump : ON
(3) Mixture : FULL RICH
(4) Propeller : FINE
(5) Ignition : BOTH
(6) Throttle : Slightly open
(7) If height is available dive the aeroplane until the engine starts.
(8) If height is limited press starter button and release immediately engine fires; check that starter warning lamp goes out.
(9) Reintroduce power as necessary.

NOTES: (1) Propeller may not commence to windmill below an airspeed of 120 kn (222 km/h) IAS.

(2) As icing of the induction air filter may have been a contributing factor to engine stopping, use induction air heat as necessary to avoid recurrence.

EMERGENCY EVACUATION

IN FLIGHT

Canopy Jettison

The cockpit canopy is jettisonable for emergency evacuation and the aeroplane capable of flight with the canopy jettisoned.

The canopy has been demonstrated to be capable of clear jettisoning in flight, including one demonstration from spinning flight. It has also been demonstrated that the canopy can be easily and quickly opened fully in a spin and will maintain that condition until rotation ceases on recovery.

For emergency evacuation from any flight condition except spinning it is recommended that the canopy be jettisoned.

A.6 For emergency evacuation from spinning flight it is recommended that initially an attempt be made to open the canopy fully in the normal manner. Only when such an attempt fails, should the canopy be jettisoned in a spin.

To jettison the canopy, proceed as follows:

(1) Pull down the release handle located on the roof of the canopy on the centre line.
(2) Push the canopy away outwards.

ON GROUND

From Inside

If necessary, the canopy can be jettisoned as prescribed above.

From Outside

The canopy cannot be released from its rails from the outside the aircraft.

In the event of a ground emergency requiring outside assistance, the canopy should be opened in the normal manner by pulling the centre-line knob rearwards and sliding the canopy open or, if jammed on its rails, by breaking the canopy open.

SYSTEMS CONTROL

Procedures for systems control in emergencies not already referred to are as follows:

FUEL SYSTEM

A.6 Failure of the engine-driven fuel pump with booster pump OFF will be indicated by a loss of fuel pressure and will result in loss of engine power. Power will be restored by closing the throttle, switching the booster pump ON and then re-opening the throttle. Should the engine have stopped completely, carry out the engine re-starting procedure given on Page 3-3.

ELECTRICAL SYSTEM

Alternator Failure

Failure of the alternator will be indicated by the illumination of the alternator warning lamp and a negative reading on the ammeter. Carry out the following procedure:

A.9

(1) ALTERNATOR switch : Switch OFF then ON; this may bring alternator back on line.

(2) Alternator circuit breakers : With ALTERNATOR switch OFF, check and reset if necessary, then ALTERNATOR switch ON.

(3) If this procedure does not result in the alternator charging, a failure must be assumed:
(a) ALTERNATOR switch : OFF
(b) Reduce electrical load as appropriate.
(c) Land as soon as possible.

NOTE: In the event of failure of the alternator all services are available on the aircraft battery only. The aircraft battery should have sufficient capacity to permit a flight of 50 min duration at night or 1 h 10 min duration by day.

Flap Actuator Failure

Failure of the wing-flaps to operate when selected will be indicated by the flap position indicator. If visibility is adequate, the position of the wing-flaps can be checked by visual inspection.

If satisfied that the wing-flaps have failed to operate when selected, check the wing-flap circuit breaker and reset if tripped. If the wing-flaps still fail to operate, an actuator failure must be assumed and the flight continued with the wing-flaps in the setting reached. The appropriate limiting speed must be observed.

Landing Lamp Failure

If the landing lamp fails, switch taxi lamp ON.

BRAKE SYSTEM

Failure of One Wheel Brake

If one wheel brake fails, the aeroplane may be stopped by careful use of the opposite brake, countering any tendency to swing by use of the nosewheel steering. Do not taxi into confined spaces.

Failure of Both Wheel Brakes

If both wheel brakes fail, it may be necessary to stop the engine, particularly on hard surfaces. Use the nosewheel steering to avoid obstacles.

SECTION 4
Procedures

SECTION 4

NORMAL PROCEDURES

This section contains recommended procedures and information which are necessary for safety in relation to the handling of the aeroplane, its engine and its equipment.

EXTERNAL INSPECTION

Before carrying out external inspection:

(1) Ensure ignition OFF.
(2) Remove and stow flying control locks (internal and external, if fitted).

Before entering aeroplane check:

(1)	External fire extinguisher	:	Available.
(2)	Main wheel chocks	:	In.
(3)	Mooring lines	:	Removed.
(4)	Transparencies	:	Condition. Clean.
(5)	Canopy	:	Condition. Operation. Lock operation.
(6)	Airframe	:	Condition. Clean.
(7)	Control surfaces	:	Condition. Full and free movement.
(8)	Wing flaps	:	Condition. Retracted. Rigging.
(9)	Main undercarriage legs	:	Condition. Secure.
(10)	Nosewheel strut	:	Extension. Leaks. Secure.
(11)	Steering arm	:	Removed.
(12)	Tyres	:	Inflation. Cuts. Creep.
(13)	Brake pipes	:	Condition. Secure.
(14)	Access panels	:	Fitted and secure.
(15)	Propeller	:	Condition. Secure.
(16)	Spinner	:	Condition. Secure.
(17)	Engine	:	For first flight of day turn through at least 4 revolutions by hand.
(18)	Exhaust pipes	:	Condition. Secure.
(19)	Landing/taxi light	:	Condition.
(20)	Pitot-static head	:	Cover removed. Condition.
(21)	Stall warning vane	:	Condition. Free movement.

(22)	Fuel	:	Leaks. Quantity sufficient (visual). Filler caps secure. Vent holes clear. Drain completed and secure.
(23)	Oil	:	Leaks. Quantity sufficient.
(24)	Antennae	:	Secure.
(25)	Tail bumper	:	Condition.
(26)	Battery	:	Fitted and secure.

INTERNAL INSPECTION

On entering the aeroplane check:

(1)	Seats	:	Free from contaminating substances. Backs adjusted and locked as seats must not be adjusted in flight.
(2)	Safety harnesses	:	Condition. Secure.
A.9 (3)	Canopy jettison handle	:	Indicator aligned.
(4)	Control columns	:	Secure. Full and free movement in both axis.
(5)	Rudder pedals	:	Adjusted evenly and locked.
(6)	Elevator trim	:	Full and free movement.
(7)	Rudder trim	:	Full and free movement.
(8)	Engine controls	:	Full and free movement.
(9)	Baggage	:	Secure.
(10)	Loose articles	:	None.
(11)	Fire extinguisher	:	Available and secure.

BEFORE STARTING ENGINE

Before starting engine:

(1)	Strap in.		
(2)	Check:		
	(a) Brakes	:	Set ON.
	(b) Throttle	:	CLOSED.
	(c) Propeller	:	FINE.
	(d) Mixture	:	FULL RICH.
	(e) Friction lock	:	Set appropriately.
	(f) Induction air	:	COLD.
	(g) Ignition	:	OFF.
	(h) Battery	:	ON.
	(i) Alternator warning lamp	:	On.
	(j) Fuel	:	Gauge indicating. Quantity sufficient.
	(k) Fuel selector	:	BOTH, or set for the fuller tank (see Page 4-15).
	(l) Fuel booster pump	:	OFF.
A.9	(m) ALTERNATOR switch	:	OFF.
	(n) Circuit breakers:	:	Set.
	(o) Radio	:	OFF.
	(p) Instruments	:	Check.
	(q) Wing-flaps	:	Operate. Check full and free movement. Check indicator. Set UP.

(r) Stall warning : Move vane, check horn operates.
(s) Lights : Check operation.
Set as required.

STARTING ENGINE

COLD

To start engine from cold, carry out the following procedure:

(1) Fuel booster pump : OFF.
(2) Prime engine : Flick fuel booster pump ON, then OFF.
(3) Throttle : 1/4 in open.
(4) Ignition : L (i.e., left).
A.9 (5) Starter button : Push ON (See Note 3).
(6) When engine starts:
(a) Starter button : Release.
Check starter warning lamp out.
(b) Ignition : BOTH.

NOTES: (1) It is very easy to overprime the engine. Care should be taken in using the fuel booster pump.
(2) If the starter warning lamp does not go out the engine must be shut down and the cause investigated.
A.9 (3) If the engine fails to start after 10 - 12 seconds make the next attempt to start as for hot engine.

HOT

To start engine from hot, carry out the following procedure:

(1) Mixture : CUT-OFF.
(2) Throttle : FULL.
A.9 (3) Ignition : L (i.e., left).
(4) Starter button : Push ON.
(5) When engine starts:
(a) Starter button : Release.
Check starter warning lamp out.
(b) Mixture : FULL RICH.
(c) Throttle : CLOSED.
(d) Ignition : BOTH.

NOTE: If the starter warning lamp does not go out the engine must be shut down and the cause investigated.

AFTER STARTING ENGINE

(1) As soon as the engine starts adjust the throttle to obtain 800 rev/min. If the oil pressure does not rise to the minimum for idling stated on Pa 2-3 within 30 s of the engine starting, the engine must be shut down and the cause investigated.
(2) When engine is running smoothly check:

A.9 (a) ALTERNATOR : ON.
(b) Alternator warning lamp : OUT between 800 and 1200 rev/min.
(c) Ammeter : Positive reading.
(d) Vacuum : Indicating.

(3) Open throttle to 1200 rev/min and warm up engine. This rotational speed must not be exceeded until the oil temperature has reached 30°C, and the cylinder head temperature has reached 100°C. Prolonged idling should be avoided.

(4) Radio : ON, test.

(5) Altimeter : Set.

(6) Gyro instruments : Uncage.

ENGINE RUN UP

When the power plant temperatures have reached the normal operating ranges as indicated by the green arcs on the instrument dials (see Page 2-4), carry out following:

(1) Magnetos : Check for dead cut.

(2) Propeller : With pitch control fully forward (FINE), increase rotational speed to 1800 rev/min. Exercise propeller by pulling pitch control back towards COARSE until rotational speed decreases. Return to FINE and check that rotational speed is restored. For first flight of day carry this out 3 times to circulate oil. Do not allow speed to decrease more than 500 rev/min.

(3) Magnetos : Increase rotational speed to 2100 rev/min and check drop and difference between magnetos (not greater than 175 rev/min (100 rev/min normal) and 50 rev/min respectively). Engine should not be operated on one magneto for periods longer than a few seconds.

(4) Induction air : Pull to HOT and observe rotational speed decrease. Return to COLD.

(5) Heating and ventilating controls: As required.

(6) Pitot heat : Switch ON then OFF; observe volt-ammeter.

(7) Vacuum : Check (4 1/2 in Hg)

A.9 (8) Engine : Close throttle and check idling rotational speed (730 rev/min approximately).

NOTES: (1) Ground running should be carried out with mixture FULL RICH.
(2) High power engine operation on the ground should be kept as brief as possible to avoid overheating.

TAXYING

Taxying has been demonstrated in winds up to 50 kn (93 km/h).

Ensure wheel chocks are removed. Release parking brake and open the throttle sufficiently to move the aeroplane. As soon as the aeroplane starts to move, check brake operation. Whilst taxying, check operation of nosewheel steering and rudder, and gyro instruments.

NOTE: In high winds, taxying must not be attempted with the control lock engaged.

BEFORE TAKE-OFF

Carry out the following pre-take-off checks at 1200 rev/min:

	(1)	Canopy	: Closed and locked.
	(2)	Harness	: Tight, adjust.
	(3)	Elevator trim	: Set in TO band (front edge for aft CG, rear edge for forward CG).
	(4)	Rudder trim	: TO.
	(5)	Mixture	: FULL RICH (see Note below).
	(6)	Propeller	: FINE.
	(7)	Friction lock	: As required.
	(8)	Induction air	: COLD.
A.9	(9)	Fuel	: Check gauge. Contents sufficient.
	(10)	Fuel selector	: BOTH, or set for the fuller tank (see Page 4-15).
	(11)	Fuel booster pump	: ON.
	(12)	Wing-flaps	: INTER Check indicator.
	(13)	Ignition	: BOTH.
	(14)	Instruments	: Functioning. Readings in normal operating ranges.
	(15)	Alternator warning lamp	: Out.
	(16)	Pitot heat	: As required.
	(17)	Flying controls	: Full free and correct operation.
	(18)	Radio	: ON.
	(19)	Lights	: As required.

NOTE: At high altitude aerodromes, open up to FULL throttle against the brakes and adjust the mixture so that the fuel pressure is appropriate to the altitude as shown in Figure 4-1 on Page 4-7, as explained under CLIMB on Page 4-6.

TAKE-OFF

Align the aeroplane with the take-off path, release the brakes and open the throttle fully. There is little tendency to swing. Nosewheel steering is effective in keeping the aeroplane straight. Check operation of the ASI. Rotate at 45 kn (83 km/h) IAS, lift off at 55 kn (102 km/h) IAS and hold the aeroplane down until the take-off safety speed appropriate to the take-off weight (see Figure 5-6 on Page 5-9) is reached, the aeroplane being climbed away at this speed through the 50 ft (15 m) height point.

A.9 At a safe height of approximately 200 ft (60 m), the wing-flaps may be retracted and the airspeed adjusted to the en route climbing speed scheduled on Page 5-22, the climb being continued at this speed and configuration. There is no loss of height and negligible trim change when raising the wing-flaps.

A.9 Set fuel booster pump OFF, at 1000 ft (300 m) AGL minimum.

CLIMB

The best gradient of climb is obtain if the aeroplane is flown in accordance with the data for en route climb scheduled in Section 5.

AIRSPEED

The speed for the en route climb data scheduled in Section 5 is the "en route climbing speed" with wing-flaps retracted and is given on Page 5-22.

TECHNIQUE

The en route climb data scheduled in Section 5 is dependent on maximum continuous power. Rich mixture should always be used unless leaning is necessary to eliminate rough running or loss of power due to an over-richness at altitude. This should not normally occur below 5000 ft (1524 m).

The relationship between fuel pressure and altitude for maximum power (i.e., maximum take-off and maximum continuous) with "best power" mixture is given in Figure 4-1 opposite. The relationship between fuel flow and fuel pressure is given in Figure 8-1 on Page 8-2.

Mixture should be adjusted at maximum power so that the fuel pressure is appropriate to the altitude as shown in Figure 4-1. Once set up at low altitude, the semi-automatic mixture control will reduce the fuel pressure at approximately the correct rate for maximum power.

NOTE: The fuel pressure-altitude relationship of Figure 4-1 may be marked on the fuel pressure gauge in which case reference to Figure 4-1 will be unnecessary.

CRUISE

When cruising altitude has been reached, set up the desired power condition as follows:

(1) Throttle and propeller pitch : Obtain manifold pressure from Figure 8-2 on Page 8-3 appropriate to the rotational speed, altitude and power condition.
Correct manifold pressure for temperature as stated on Page 8-1.
Set throttle and propeller pitch to give corrected manifold pressure and required rotational speed.

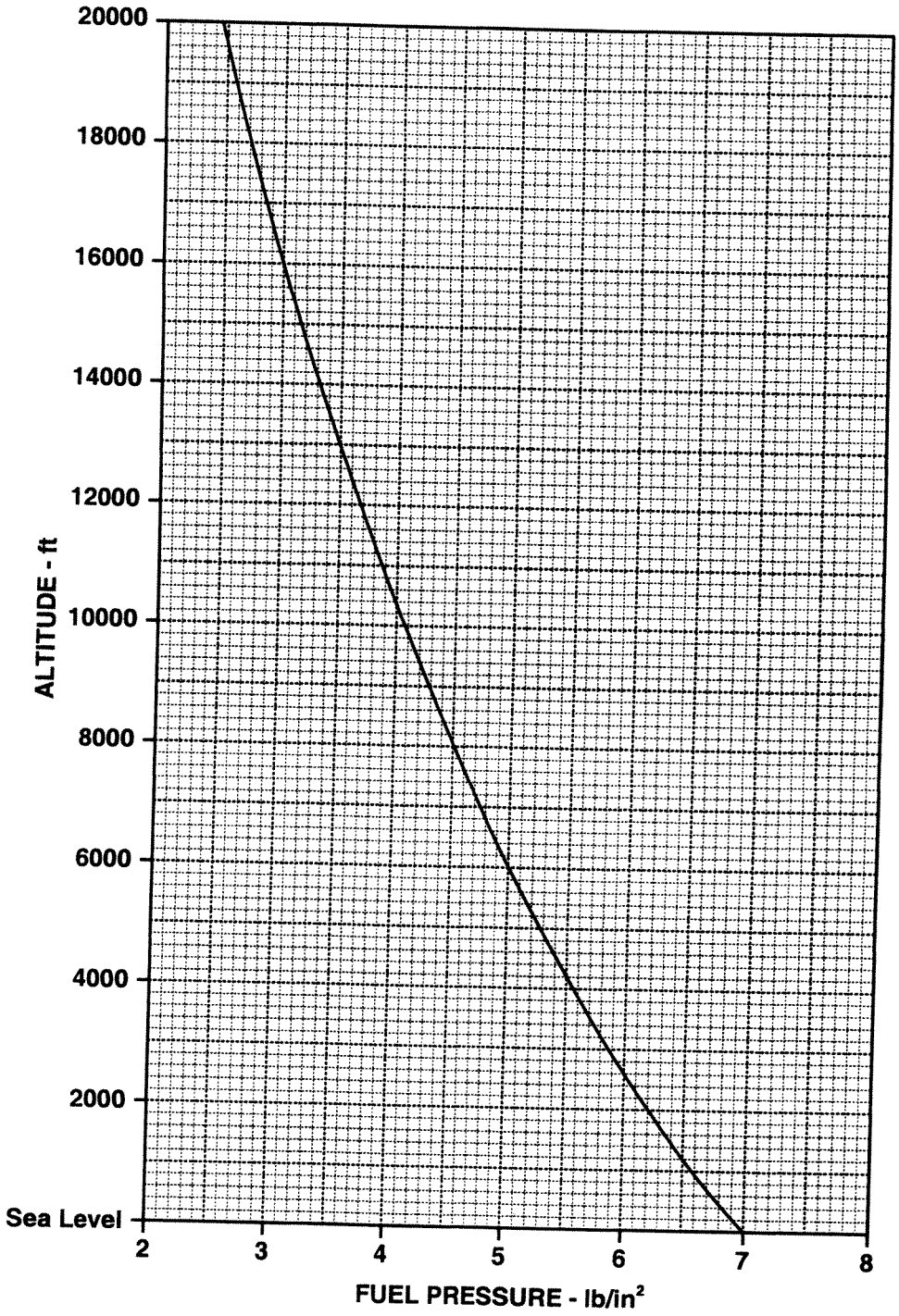
(2) Mixture : Set to give the fuel pressure given in Figure 8-3 on Page 8-4 appropriate to the rotational speed, mixture condition and power condition.

(3) Check power plant instruments.
(4) Adjust trim as required.

NOTES: (1) Leaning of fuel-air mixture is permitted for cruise speeds and cruise powers at all altitudes.
(2) Mixture must be returned to FULL RICH before increasing power settings.
(3) At low power settings care must be taken when setting "best economy" fuel pressures. Any rough running must be prevented by increasing fuel pressure until engine runs smoothly again.

DOCUMENT No SH.3.1

MAXIMUM POWER FUEL PRESSURE



120SM/34

(4) The rotational speed-power condition limitation shown on Page 2-3 and in Figure 8-3 for continuous operation must be observed. Rotational speed limitations stated on Page 2-3 must also be observed.
(5) To facilitate setting fuel pressure, bands of fuel pressure appropriate to "best power" mixture for power conditions of 75%, 65%, 55% and 45% may be marked on the fuel pressure gauge.

Procedures for managing the fuel system are given on Page 4-12.

GENERAL FLYING

The aeroplane is easy to fly and has no unusual features.

THROTTLE CONTROL

A.9 The throttle control should always be operated slowly and smoothly when increasing or decreasing power. Failure to observe this can result in overspeeding the engine (see Page 2-3A).

MIXTURE CONTROL

The engine is fitted with a semi-automatic mixture control. The mixture should be set to FULL RICH for starting, ground-running, take-off and landing.

Changes in altitude will require corresponding adjustments of the mixture control. It should always be return to the FULL RICH position before commencing a dive and/or aerobatics and before increasing power settings.

If marked, the altitude scale on the fuel pressure gauge is appropriate only to maximum power. Cruise fuel pressures should be set up by the mixture control as described under CRUISE.

LOW TEMPERATURE CONDITIONS

For flight in low temperature conditions see Page 4-17.

RUDDER TRIM

A.9 The rudder trimmer may become stiff to operate or become completely immovable due to icing up of the operating cable. Should this occur do not attempt to overpower this condition but leave the trimmer alone.

FLIGHT IN ROUGH AIR

AIRSPEED

The recommended speed for flight in severe turbulence is 85 kn (158 km/h) IAS with wing-flaps retracted.

TECHNIQUE

Wing-flaps should not be lowered except during final approach.

Before the turbulence is entered, the aeroplane should be slowed and trimmed for level flight and the fuel booster pump switched ON.

If icing conditions are expected and cannot be avoided, turn the pitot heater ON and set induction air to HOT.

GLIDING

With the engine inoperative, the best gradient of descent is obtained if the aeroplane is flown in accordance with the data scheduled in Section 5.

The speed scheduled in Section 5 is the "en route gliding speed" with the wing-flaps retracted and is given on Page 5-22.

PRE-STALLING AND AEROBATIC CHECKS

Before practising stalls or performing aerobatic manoeuvres, ensure that the area is clear and sufficient height is available, then carry out the following:

(1)	Canopy	:	Closed and locked securely.
(2)	Harness	:	Tight, adjust.
(3)	Friction lock	:	Loosen.
(4)	Mixture	:	FULL RICH
(5)	Propeller	:	Set for 2600 rev/min.
(6)	Fuel booster pump	:	ON.
(7)	Fuel selector	:	BOTH, set for the fuller tank (see Page 4-15).
(8)	Fuel	:	Quantity sufficient.
(9)	Wing-flaps	:	UP.
(10)	Fire extinguisher	:	Secure.
(11)	Loose objects	:	None.
(12)	Gyro instruments	:	CAGED.

STALLING

Adequate warning of the approach of the stall is given in all configurations. Natural warning is given by aerodynamic buffet and depends on CG position, varying from 3 kn (6 km/h) above the true stall at the non-aerobatic aft limit to zero at the extreme forward limit. To ensure adequate warning in all configurations of wing-flap and aircraft loading, an audible warning is provided by a horn, varying from 10 kn (19 km/h) above the true stall at the non-aerobatic aft CG limit to 5 kn (9 km/h) above the true stall at the extreme forward CG limit.

At the stall, the nose drops gently. Any tendency to roll can be held with the ailerons. Recovery is normal on relaxing back pressure on the control column. Maximum altitude lost is less than 100 ft (30 m).

Power-off stalling speeds are given on Page 5-2.

AEROBATICS

The aeroplane has been demonstrated to have safe handling characteristics in the aerobatic manoeuvres stated on Page 2-5. The limitations prescribed in Section 2 with respect to aerobatic manoeuvres must be observed. Before performing aerobatic manoeuvres the wing-flaps must be retracted.

Recommended entry speeds are given on Page 2-5.

SPINNING

The aircraft is approved for intentional spinning with the wing-flaps retracted, and when it is loaded within the aerobatics weight and CG limitations. The rear seat must not be occupied.

Before Spinning

Good visibility and ground reference are essential as the rate of rotation during the spin can cause disorientation. Carrying baggage during spinning is prohibited and the pilot should make sure that all loose items in the cockpit are removed or securely stowed, including the second pilot's seat belts if the aircraft is flown solo. Seat belts and shoulder harnesses should be fastened securely and the seat belts adjusted first to hold the occupants firmly into the seats before the shoulder harness is tightened. Before take-off, with the seat belts and shoulder harness tight, check that full rudder travel and both full back and full forward control column movements can be obtained.

Check that the seat backs are securely locked in position. Spins should only be started at altitudes high enough to recover fully by at least 4,000 ft AGL, so as to provide an adequate margin of safety.

Using the recommended procedures, 350 ft per turn should be used for the calculation of the height at which recovery is to be initiated and a further 1000 ft included to allow for additional height that may be lost during the pull-out recovery when the spin has stopped.

The aircraft should be trimmed with the elevator trim set in the take-off band and the rudder trimmed to neutral. The throttle should be confirmed as fully closed with the aircraft in a glide at 75 kn (139 km/h) before entering the spin manoeuvre.

Spin Entry

Enter the spin from a power-off glide reducing speed at about 1 kn (2 km/h) per second. At 60 kn (111 km/h) apply full rudder in the required spin direction and at the same time bring the control column fully back.

The aircraft pitches up as it rolls onto its back during entry, the nose passes down through the vertical and then upwards to achieve, after half a turn, an erect spin with the nose 30° to 50° below the horizon, each turn taking about 2 seconds. Some degree of oscillation in pitch, roll and yaw may be experienced. The IAS settles below 40 kn (74 km/h) in a spin to the left and between 50 and 55 kn (92 and 102 km/h) in a spin to the right.

For a slow entry off a full stall, gradually raise the nose above the horizon with the wings level. At the point of stall, apply full rudder in the required direction of the spin, holding the control column centrally and fully back. The aircraft will roll reluctantly into the first turn of the spin.

Spiral Dive

At or close to the forward limit of the CG range, particularly if any in-spin aileron is applied, a spiral dive can result.

A spiral dive may also occur if the spin entry control movement is not fully applied. This can be recognised by an increasing indicated airspeed, moderate airframe and elevator buffet and a slow rate of rotation. Recovery from a spiral dive is effected in the normal manner on approaching 80 to 90 kn (148 to 167 km/h).

During The Spin

Hold the spin entry control configuration throughout the spin and ensure that the ailerons remain neutral and the throttle closed. Monitor the height.

Note:- Failure to maintain full aft column deflection in a normal spin will result in a fast rotation. Displacement of the ailerons from neutral will alter the characteristics of the spin and cause a delay in recovery. Spinning with fast idling power on will increase the height loss and produce considerable airframe and engine vibration.

Spin Recovery

Monitor height.
Ensure the throttle is closed.
Check direction of spin as indicated by the turn pointer.

Apply and maintain FULL rudder to oppose rotation and the turn pointer.

After the rudder hits the stop, move the control column smoothly and firmly forward until the spin stops, ensuring that the ailerons are neutral throughout. If the control column movement is delayed, a fast rotational spin may develop.

When the spin stops, centralise the rudder.

Level the wings and smoothly recover from the ensuing dive.

The control forces during recovery are moderate.

Note:- There is only one recommended spin recovery technique and this has been established to minimise turns and height loss.

On no account should any other method be attempted.

The immediate effect of applying the recommended spin recovery controls may be an increase in rate of spin rotation. This characteristic indicates that the aircraft is recovering from the spin and it is essential to maintain full anti-spin rudder and to continue to move the control forward until the spin stops. The control column should be moved forward quite quickly but smoothly, continuing to the forward stop if necessary and should be held there.

This is vitally important because the steep spin attitude may deter the pilot from moving the control column forward positively and completely but failure to do so may well prevent recovery.

In most cases, spin recovery will occur before the control column reaches the fully forward position. When the spin has stopped, the aircraft pitches nose down quickly as the elevator takes effect and, depending on the control position, it may be necessary to move the column partially back almost immediately to avoid an unnecessarily steep nose down attitude, possible negative 'g' forces and excessive loss of altitude. The aircraft will recover from any point in a spin in one to two additional turns after normal application of controls. Because the aircraft recovers from a spin in quite a steep nose down attitude, speed builds up quickly in the dive-out. The rudder should be centralised as soon as the spin stops. Delay in centralising the rudder may result in yaw and 'fish-tailing'. If the rudder is not centralised it would be possible to exceed the maximum manoeuvre speed with the surface fully deflected.

If the engine stops during a spin, the spin recovery and aircraft response are not affected. Recover normally from the spin and if the engine has not already started by windmilling action, restart using the starter motor. Do not prolong the recovery diveout in an attempt to increase engine windmilling speed.

Should the aircraft show a reluctance to recover from the spin, check the direction of the spin from the turn pointer and confirm that full opposite spin rudder is being maintained and the control column is being held fully forward. The rate of recovery is particularly dependant on elevator position. Slow or hesitant forward movement of the control column will delay the recovery, causing an increase in loss of height. Even momentary relaxation of full rudder or full forward control column may prejudice recovery and therefore no control movements should be made unless they are to correct positively identified errors. If the control column is released during the recovery the control surfaces float to the full pro-spin position. The aircraft will not recover until the correct recovery procedure is reapplied.

Mishandling

The aircraft will recover from a spin resulting from mishandling (for example in aerobatics) and from mishandled spin entries and recoveries, provided the recommended spin recovery procedure is followed. Improper application of recovery controls can increase the number of turns to recover and the resulting altitude loss. A spin with a fast rotation characteristic may result from an improper entry or positioning of the controls during the spin.

There is no need to retract the wing-flaps if they were extended in an inadvertent spin, but care should be taken to avoid exceeding +2.0g and the appropriate wing-flap limiting speed during the post-recovery dive.

Fast Rotation Spin

If when applying controls for recovery the control column is not moved firmly and progressively forward, if necessary to the forward stop, the rate of rotation in the spin may increase markedly, coupled with a steep nose down attitude and the spin may become oscillatory. If the control column remains in an intermediate position and is not moved and held against the forward stop, the spin may persist. The normal spin recovery technique must be used.

In a fast rotation spin the IAS is increased. The spin rate may be in excess of one turn per second, the motion can be markedly more oscillatory and the nose may pitch down to 70 degrees or more below the horizon. Airframe buffet is higher than in a normal spin.

Because of the significantly increased rate, disorientation may occur. The recommended spin recovery technique must be used.

FLICK ROLL

With power on at an airspeed between 65 and 80 kn (120 and 148 km/h) IAS apply full rudder and full up elevator simultaneously.

Application of aileron in the direction in which rudder is applied will increase the rate of rotation whereas application of opposite aileron will inhibit the manoeuvre.

To stop the manoeuvre centralise the controls.

If the manoeuvre is mishandled at low airspeeds a spin may result. Close the throttle and take standard spin recovery action.

STALL TURN

With power on, pull up at 120 kn (222 km/h) IAS. Apply full rudder in the desired direction of turn at 70 kn (130 km/h) IAS.

In turns to starboard, close the throttle immediately; in turns to port the throttle should not be closed until the nose has dropped below the horizontal. Centralise rudder, move control column forward and dive away.

If the control column is not moved forward as soon as the nose drops a spin may result. Take standard spin recovery action.

If aerodynamic control is lost and an inadvertent tail slide is about to develop, close the throttle and brace the control column and rudder pedals in the central position until the nose drops through the horizon.

INVERTED FLIGHT

Sustained inverted flight is prohibited. Damage to the engine may result if negative g conditions are held for any length of time. (Aerobatic manoeuvres involving transient negative g conditions are permitted.)

DESCENT

During final stage of descent before commencing approach and landing:

(1)	Harness	:	Tight, adjust.
(2)	Friction lock	:	Loosen.
(3)	Mixture	:	FULL RICH.
(4)	Propeller	:	FINE.
(5)	Induction air	:	COLD.
(6)	Fuel	:	Quantity sufficient for landing.
(7)	Fuel selector	:	BOTH, set for the fuller tank (see Page 4-15).
(8)	Fuel booster pump	:	ON.
(9)	Brakes	:	OFF.
(10)	Altimeter	:	Set to local setting.
(11)	Gyro instruments	:	Uncage if previously performing aerobatics.
(12)	Pitot head	:	As required.

APPROACH

Enter the approach at 100 kn (185 km/h) IAS with wing-flaps retracted. Adjust elevator trim and maintain 5% descent gradient by adjusting power.

LANDING

NORMAL

On nearing the runway threshold following a normal powered approach, extend the wing-flaps to FULL (45° position) and fly the aeroplane to achieve the approach speed scheduled on Page 5-25 over the end of the runway at the 50 ft (15 m) height point. At the threshold close the throttle and land the aeroplane following a smooth transition. Lower the nosewheel immediately after touchdown and commence wheel braking as soon as possible.

The technique for landing with the engine inoperative and for landing with wing-flaps retracted is prescribed in Section 3.

BALKED LANDING

In the event of having to go round again, the throttle should be opened fully and smoothly, the wing-flaps retracted and a climb initiated at the en route climbing speed scheduled on Page 5-22, re-trimming as necessary. There is little change of trim and no sink during flap retraction.

AFTER LANDING

Carry out the following checks after landing when clear of the runway or, on an all-over field, having stopped:

(1)	Canopy	:	As required.
(2)	Trim	:	Neutral.
(3)	Wing-flaps	:	UP.
(4)	Fuel booster pump	:	OFF.
(5)	Pitot heat	:	OFF.

ENGINE SHUT-DOWN

To stop the engine, proceed as follows:

(1) Brakes : Set ON.
(2) Idle engine at 800 to 1000 rev/min until cylinder head temperature has dropped below 180°C.
(3) Test magnetos at this speed for dead cut.
(4) Pull mixture control to CUT-OFF.
(5) After engine stops set ignition OFF.

LEAVING THE AEROPLANE

After stopping the engine and before leaving the aeroplane check:

(1) Ignition : OFF.
(2) Throttle : CLOSED.
A.9 (3) Fuel selector : Left or Right (See also Page 4-15).
(4) Alternator field switch : OFF.
(5) Battery : OFF.
(6) Fuel booster pump : OFF.
(7) Radio : OFF.
(8) Gyro instruments : CAGED.
(9) Wing-flaps : UP.
(10) Pitot heat : OFF.
(11) Flying controls : Lock.
(12) Brakes : ON.
(13) Lights : OFF.

After leaving the aeroplane ensure that the mainwheels are chocked if the aeroplane is to be parked for any length of time. External control locks should be fitted in strong or gusty wind conditions. As a general rule the canopy should be closed.

A.9 If winds of 40 kt and more are present or forecast the aircraft should be picketed in accordance with the instructions in the Aircraft Servicing Manual Chapter 4 page 3 para 10.

GROUND HANDLING

The aeroplane should be moved on the ground with the aid of the steering arm provided. Do not push on the trailing edges of the wing or horizontal tail.

The rudder must not be used to steer the nosewheel.

SYSTEMS CONTROL

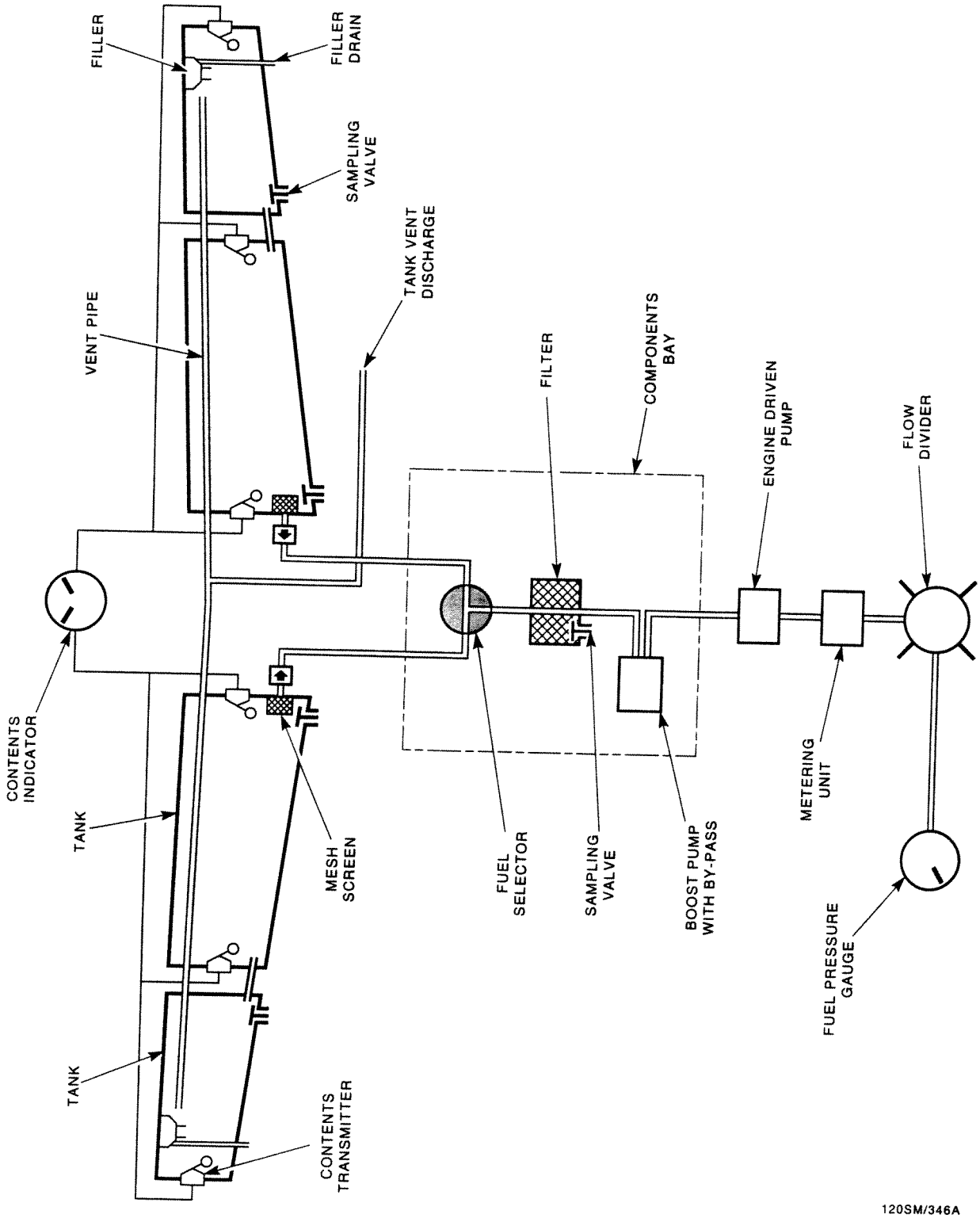
Procedures for systems control not already referred to are given as follows.

FUEL SYSTEM

System

The fuel system fitted to this aeroplane is shown in Figure 4-5 on Page 4-13 and consists on an inner and outer interconnected tank in each wing supplying fuel through a non-return valve to a fuel selector, a filter and booster pump grouped together beneath the floor in front of the left hand front seat and thence through the engine-driven pump to the injector unit. The fuel selector is marked FUEL, OFF-L (i.e., Left tank) - BOTH - R (i.e., Right tank).

FUEL SYSTEM


FILLER
FILLER DRAIN
SAMPLING VALVE
TANK VENT DISCHARGE
VENT PIPE
FILTER
COMPONENTS BAY
ENGINE DRIVEN PUMP
FLOW DIVIDER
CONTENTS INDICATOR
TANK
MESH SCREEN
FUEL SELECTOR
SAMPLING VALVE
BOOST PUMP WITH BY-PASS
METERING UNIT
FUEL PRESSURE GAUGE
TANK
CONTENTS TRANSMITTER
120SM/346A

ELECTRICAL SYSTEM

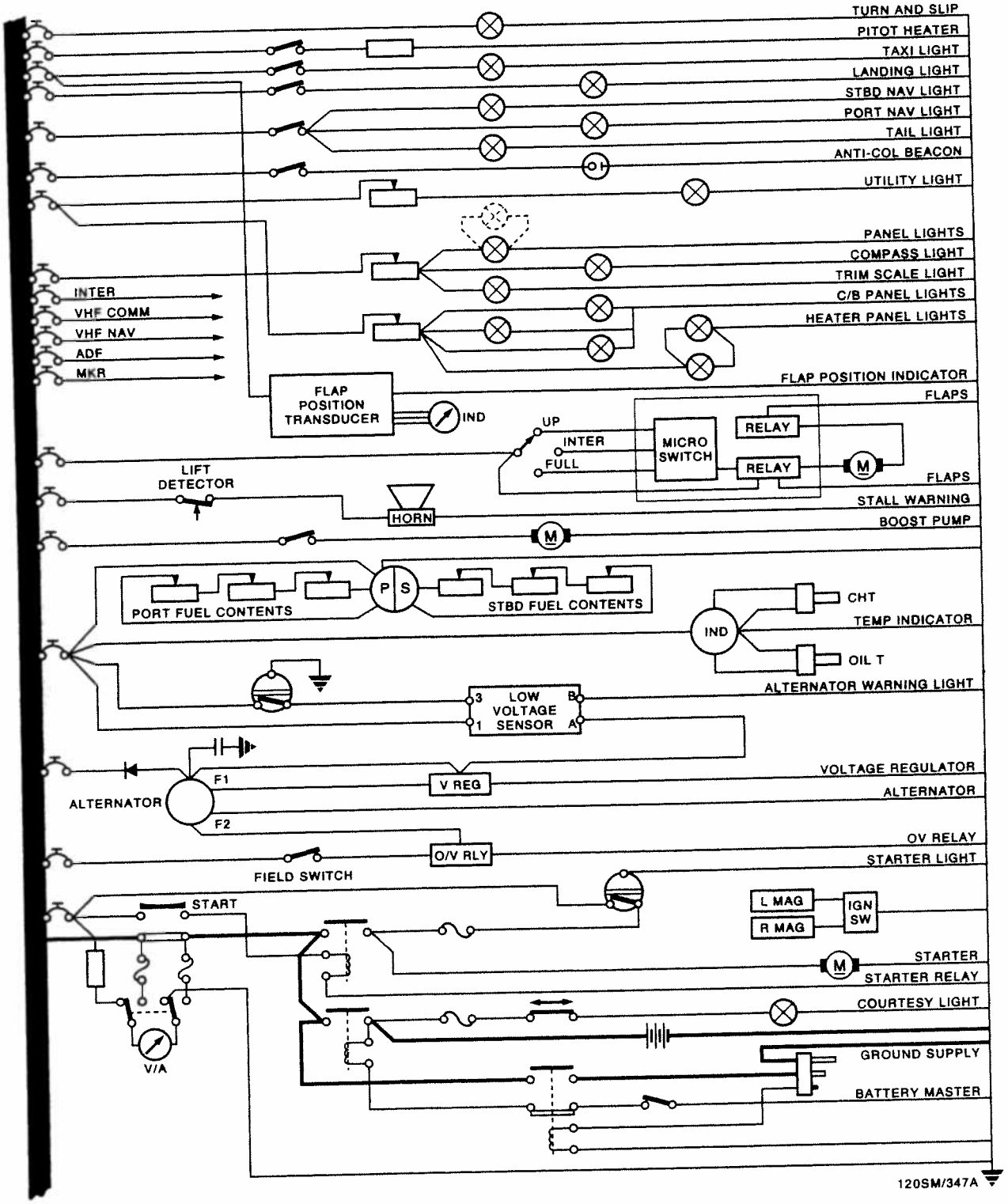


Fig 4-6

The booster pump has sufficient capacity to feed the engine at take-off power should the engine-driven pump fail. The switch is mounted on the starter panel located at the forward end of the console. The booster pump is used to prime the engine as described on Page 4-3.

A filler cap is provided at the outer end of each outer tank.

Fuel quantity is indicated by a single dual-indicating gauge on the starter panel showing the fuel quantity in each wing tank pair. The gauge does not show the total quantity of the fuel, this being obtained by adding the two indications together. Readings are accurate in level flight only.

Tank capacities are given on Page 2-1.

Fuel pressure is indicated by gauge on the instrument panel showing nozzle pressure at the injector. The gauge may be marked with an altitude scale to show the maximum power altitude-fuel pressure relationship and/or cruise power condition bands showing "best power" mixture fuel pressures appropriate to 75%, 65%, 55% and 45% powers.

Procedures

For normal flight the fuel selector may be kept in the BOTH position. However, in this condition, uneven emptying of the tanks may occur; when the indicated contents of either tank have fallen within the yellow arc marked on the fuel contents gauge, selection of left (L) or right (R) tank should be made as appropriate to prevent running one side dry. Should one tank have inadvertently been permitted to run dry, the engine will rapidly loose power. Selection to the fuller tank will cause the engine to pick up quickly again. Should the engine have stopped however, the engine re-starting procedure given on Page 3-3 should be initiated.

The fuel selector should not be left in the BOTH position when executing aerobatics and/or preparing for landing when the indicated contents of the fuel tanks differ by more than 3 UK gallons (15 litres), in which case the fuller tank should be selected.

The booster pump should be ON for take-off, approach and landing, for flight in severe turbulence and when executing aerobatics or stalling exercises.

A.9 The fuel selector should be selected to L (left tank) or R (right tank) to obviate the possibility of fuel draining and venting overboard should the aircraft be parked on (or be moved to) laterally sloping ground.

Procedures for emergency operation are given in Section 3.

VACUUM SYSTEM

Suction for vacuum-driven gyroscopic flight instruments is supplied by an engine-driven pump. Vacuum is indicated by a gauge on the instrument panel.

ELECTRICAL SYSTEM

System

The electrical system fitted to this aeroplane is shown in Figure 4-6 on Page 4-14. The system is nominally 24 V and is supplied by an engine-driven self-exciting alternator with built-in rectification providing a 28 V DC output at 50 A. A transistorised voltage regulator controls the field current and regulates the output to a nominal 28 V under all load conditions. A 24 V 18 A h lead acid battery, located in the fuselage aft of the baggage compartment, is connected across the alternator output to stabilise the supply and maintain all services in the event of an alternator failure or when the engine is not operating. The output from the alternator is supplied through the voltage regulator, over-voltage relay and circuit breaker to a continuous busbar.

An alternator low voltage warning lamp is located on the starter panel beside the alternator field switch and illuminates whenever the battery master switch is ON and the voltage is less than approximately 26 V.

The battery is brought into circuit through a relay controlled by a master switch.

The starter motor is operated by a starter relay controlled by a push switch. The starter motor is protected by a warning lamp which illuminates when the relay is closed to warn against relay failure preventing disengagement of the starter motor.

A circuit breaker protects each circuit. All are located below the left hand instrument panel.

An integral dimmer switch in the roof-mounted floodlight and a rotary switch for the instrument pillar lights control the intensity of instrument panel illumination.

Battery, alternator field and booster pump switches are grouped together on the starter panel at the front of the console. All other electrical services switches are located below the left hand instrument panel.

A volt-ampere meter with adjacent change-over switch is mounted on the starter panel. With the switch in the VOLT position, the meter indicates battery voltage. With the switch in the AMP position, the meter shows alternator load, a positive (negative) indication signifying battery charge (discharge).

Operation

The battery switch must be ON to operate any circuit. When ground power is connected and the engine is not running the alternator should be switched OFF.

When the engine is running the battery master switch should not be switched OFF with the alternator switch ON.

A.9

The alternator should always be switched OFF before the alternator field circuit breaker is opened or the battery master switch is selected OFF.

Procedures for emergency operation are given in Section 3.

ENVIRONMENTAL CONTROL SYSTEM

This aeroplane is fitted with a heating and ventilating system to supply warm and/or cold air to the cabin as desired.

Heat is supplied by a heat exchanger on the exhaust manifold. Air from the forward-facing air intake passes through the heat exchanger to a temperature control valve on the forward face of the engine bulkhead and from there into the cabin, being discharged in way of the front seat occupants' feet, the rear cabin when the appropriate duct is fitted, and the rear face of the windscreen. Control of the system is by two levers marked HEAT located below the right hand instrument panel, the upper lever controlling the volume of heat and marked OFF - FULL, and the lower lever the direction of discharge and marked CABIN - SCREEN.

Cold air is supplied to the cabin through external intakes on each side of the fuselage. Air from these intakes passes through manually adjustable louvres at each side of the instrument panel and from the right hand intake to the rear face of the windscreen for demisting purposes. Control of the latter is by a knob located to the right of the heating controls and marked DEMIST, PULL ON.

CANOPY CLOSING PROCEDURES

The canopy should be closed with a continuous and firm action without using excessive force. Air loads acting on the canopy in flight will assist in the closing operation and no attempt should be made to resist these air loads by holding the canopy back.

If the canopy is being closed too slowly, either one or both bottom rear locating pins may fail to engage the fittings mounted on the canopy side rails. Should this occur, the canopy should be opened again and a somewhat faster attempt be made to close it, if necessary at a lower air speed. Failure of one pin to engage does not affect the safety of the canopy, nor is the jettison capability of the canopy impaired. Should both rear locating pins persistently fail to engage, the canopy should be treated as being unlocked and the limitations given on Page 2-6 should be observed.

BRAKE SYSTEM

The brake system is of toe-operated differential type. Disc brakes are fitted to the main wheels, each with its own hydraulic system actuated by master cylinders toe-operated from the rudder pedals. The master cylinders are mounted on the forward face of the engine bulkhead. The fluid is of DTD.585 A type.

A parking facility is provided to operate the brakes collectively. A handle marked PARKING BRAKE, PULL ON is located to the left of center under the instrument panel. To operate, the handle is pulled out of the panel. To release, the end is rotated and the handle pushed back. It is recommended that braking pressure be applied with the toe pedals to assist use of the handle.

GENERAL FLYING (continued from Page 4-8)

LOW TEMPERATURE CONDITIONS

Amend No.7

Although the engine is fitted with a fuel injection system, impact icing of pressure sensing tubes in the venturi of the fuel control unit may occur when flying, at low temperatures, in cloud or in other conditions of high humidity. If impact icing is suspected, as shown by a reduction in fuel pressure and rough running of the engine due to an excessively lean mixture, HOT INDUCTION AIR should be selected until fuel pressure is restored and the engine is again running smoothly. COLD INDUCTION AIR may then be re-selected unless the symptoms of impact icing re-occur.

In actual icing conditions the air filter may become blocked. When this occurs a spring-loaded flap immediately behind the filter will open automatically admitting hot air to the engine (see also Page 7-9). When flying in known icing conditions, or when (partial) blockage of the air filter is suspected as shown by a drop in manifold pressure, the flap should be manually opened by selecting HOT INDUCTION AIR and may be kept in that position for as long as the icing conditions persist.

HOT INDUCTION AIR should not be selected for take-off or landing, or in other conditions when maximum engine power is required.